BPS Series Fire Alarm Power Supply Technical Reference Manual

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FCC compliance

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Contact information

For contact information, see www.edwardsfiresafety.com.

Content

Important information

Regulatory information

This product has been designed to meet the requirements of NFPA 72 *National Fire Alarm and Signaling Code*, UL 864 *Standard for Control Units and Accessories for Fire Alarm Systems*, and CAN/ULC-S527-11 *Standard for Control Units for Fire Alarm Systems*.

Note: All references to Access Control applications and associated modules in this document are for repair and replacement units only. As of December 2, 2018, the products covered in this Manual are not listed to the UL 294 Standard for use in access control applications.

Limitation of liability

To the maximum extent permitted by applicable law, in no event will Carrier be liable for any lost profits or business opportunities, loss of use, business interruption, loss of data, or any other indirect, special, incidental, or consequential damages under any theory of liability, whether based in contract, tort, negligence, product liability, or otherwise. Because some jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages the preceding limitation may not apply to you. In any event the total liability of Carrier shall not exceed the purchase price of the product. The foregoing limitation will apply to the maximum extent permitted by applicable law, regardless of whether Carrier has been advised of the possibility of such damages and regardless of whether any remedy fails of its essential purpose.

Installation in accordance with this manual, applicable codes, and the instructions of the authority having jurisdiction is mandatory.

While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, Carrier assumes no responsibility for errors or omissions.

Advisory messages

Advisory messages alert you to conditions or practices that can cause unwanted results. The advisory messages used in this document are shown and described below.

WARNING: Warning messages advise you of hazards that could result in injury or loss of life. They tell you which actions to take or to avoid in order to prevent the injury or loss of life.

Caution: Caution messages advise you of possible equipment damage. They tell you which actions to take or to avoid in order to prevent the damage.

Note: Note messages advise you of the possible loss of time or effort. They describe how to avoid the loss. Notes are also used to point out important information that you should read.

FCC compliance

This equipment can generate and radiate radio frequency energy. If the equipment is not installed in accordance with this manual, it may cause interference to radio communications. This equipment has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart B of Part 15 of the FCC Rules. These rules are designed to provide reasonable protection against such interference when this equipment is operated in a commercial environment. Operation of this equipment is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Introduction

This installation manual is intended for use by installers and field technicians. It provides the installation procedures, wiring diagrams, DIP switch settings, etc. required to install and set up BPS Series fire alarm power supplies.

Models covered

The following table lists the BPS Series fire alarm power supply models that are covered in this manual.

Catalog number	Description
BPS6A	Power supply, 120 V, 50/60 Hz, 6.5 A max. output, Edwards
BPS6A-RM	Power supply, 120 V, 50/60 Hz, 6.5 A max. output, Edwards, rack mount, Canada
BPS6A/230	Power supply, 240 V, 50/60 Hz, 6.5 A max. output, Edwards
BPS6AC	Power supply, 120 V, 50/60 Hz, 6.5 A max. output, Edwards, Canada
BPS10A	Power supply, 120 V, 50/60 Hz, 10 A max. output, Edwards
BPS10A-RM	Power supply, 120 V, 50/60 Hz, 10 A max. output, Edwards, rack mount, Canada
BPS10A/230	Power supply, 240 V, 50/60 Hz, 10 A, max. output, Edwards
BPS10AC	Power supply, 120 V, 50/60 Hz, 10 A max. output, Edwards
MIRBPS6A	Power supply, 120 V, 50/60 Hz, 6.5 A max. output, Kidde
MIRBPS6A/230	Power supply, 240 V, 50/60 Hz, 6.5 A max. output, Kidde
MIRBPS10A	Power supply, 120 V, 50/60 Hz, 10 A max. output, Kidde
MIRBPS10A/230	Power supply, 240 V, 50/60 Hz, 10 A, max. output, Kidde
EBPS6A	Power supply, 120 V, 50/60 Hz, 6.5 A max. output, Edwards Signaling
EBPS10A	Power supply, 120 V, 50/60 Hz, 10 A max. output, Edwards Signaling

Compatibility

The sense input circuits BPS Series fire alarm power supplies can be connected to 12 VDC or 24 VDC systems.

For details about device compatibility, refer to *Remote Booster Power Supply Compatibility List* (P/N 3100656).

Installation procedure checklist

Follow these steps to install and set up the booster power supply (BPS).

☐ Verify that all power and field wiring are de-energized before proceeding.

☐ Unpack the equipment.

☐ Review “Getting started” on page 3.

☐ Review “Applications” on page 45 to determine how you want to use theBPS Series power supply.

☐ Prepare the site. Make sure the installation location is free from construction dust and debris, and extreme temperature ranges and humidity.

☐ Install the enclosure. See Figure 3 on page 7 for cabinet dimensions.

☐ Install option modules, if required. See “Installing Signature modules in the enclosure” on page 8.

☐ Install the 3-TAMP tamper switch, if required. See “Installing the 3-TAMP tamper switch” on page 34.

☐ Set the jumpers. See “Setting the jumpers” on page 12.

☐ Set the DIP switch options. See “Setting the DIP switches” on page 16.

☐ Review wire routing. See Figure 20 on page 22.

☐ Check field wiring for shorts, opens, and grounds.

WARNING: Make sure that the AC power circuit breaker is off before connecting wires to the terminal block.

☐ Connect the field wiring. See “Connecting the field wiring” on page 23.

☐ Turn on the AC mains power.

Caution: Turn on AC power before connecting the batteries.

☐ Connect the standby batteries.

☐ Verify that the status LEDs do not indicate any faults.

☐ Test the system for proper operation.

Getting started

Description

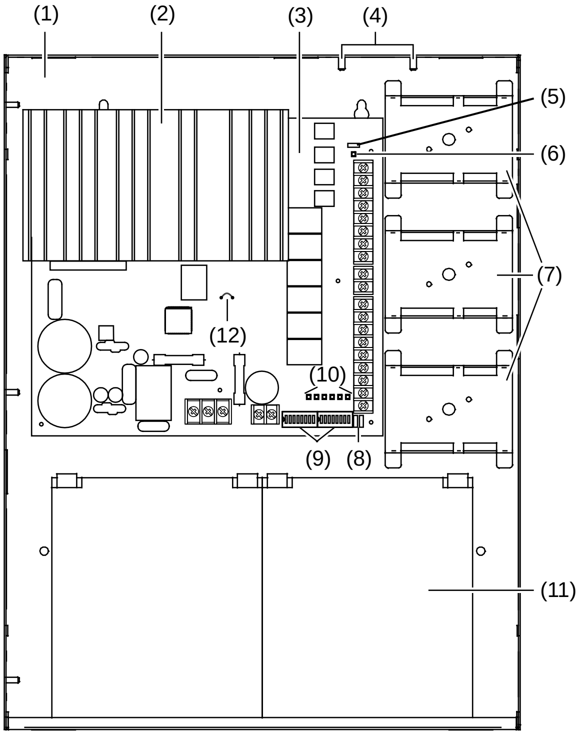
BPS Series power supplies are designed to extend the power capacity of an emergency communication, life safety, fire alarm, security, or access control system. You can activate the BPS from options modules or from a control circuit. It has four independent NAC/AUX circuits that are supervised, when configured for NAC. It is also equipped with a fault relay that you can configure for common trouble (with immediate AC failure indication), or as an AC mains failure indication relay (with delayed output). The BPS's sense input #1 also provides a common fault indicator by opening the output side of the sense circuit.

Note: All references to Access Control applications and associated modules in this document are for repair and replacement units only. As of December 2, 2018, the products covered in this Manual are not listed to the UL 294 Standard for use in access control applications.

Component descriptions

Figure 1 below shows the location of BPS Series power supply components.

Figure 1: BPS Series power supply components



Component	Description
(1)	Enclosure: Houses the electronics and two standby batteries
(2)	Heat sink: Distributes heat away from the circuit board
(3)	Circuit board: Provides connections for all circuits [1]
(4)	Tamper switch standoffs: 3-TAMP mounting standoffs
(5)	Jumper JP3: Ground fault enable or disable option

Component	Description
(6)	AC LED: AC power on
(7)	Mounting brackets: Option module mounting brackets
(8)	Jumpers JP1 and JP2: Class A or Class B NAC option
(9)	DIP switches: Two eight-position DIP switches used for configuration
(10)	Circuit LEDs: NAC, battery, and ground fault trouble LEDs
(11)	Batteries: Up to two 10 Ah batteries fit in the enclosure. For larger batteries, use an external battery cabinet (BC-1 or BC-2).
(12)	Jumper JP4: Battery charging jumper

[1] Power supply circuit board cover (catalog number: BPS-CVR) ordered separately, if needed. For installation instructions, see *BPS-CVR Power Supply Cover Installation Sheet* (P/N 3102686).

Specifications

AC line voltage	
6.5 A BPS	120/240 VAC, 50/60 Hz, 390 watts
10 A BPS	120/240 VAC, 50/60 Hz, 580 watts
Sense input circuits	
Voltage	6 to 45 VDC (FWR and unfiltered DC)
Current	6 mA at 24 VDC, 3 mA at 12 VDC, 12 mA at 45 VDC
NAC output voltage (special application circuit)	18.20 to 26.40 VDC **Note:** All NAC output circuits are supervised. Refer to the *Remote Booster Power Supply Compatibility List* (P/N 3100656) for the maximum number of devices that can be used on a NAC output circuit.
AUX output voltage (special application circuit)	19.1 to 26.48 VDC
NAC/AUX output current	3.0 A max. per circuit with 0.35 power factor 6.5 A or 10 A max. total if all NAC/AUX outputs are configured as NACs 6 A or 8 A max. total if one or more NAC/AUX outputs are configured as AUX power outputs
NAC/AUX capacitive loading	10,000 µF max. for continuous NAC output circuits 2,200 µF max. for coded rate NAC output circuits 2,200 µF max. for AUX power output circuits
Wiring class	
NACs	Class A or Class B
AUX power	Class B
Wire size	18 to 12 AWG (0.75 to 2.5 mm^2)
NAC EOLR	UL: 15 kΩ P/N EOL-15 ULC: Use P/N EOL-P1 and select the 15 kΩ resistor
Auxiliary output (continuous)	1 dedicated unsupervised, unswitched 200 mA auxiliary output Voltage range: 19.49 to 26.85 VDC
Common trouble relay	Form C, 1 A, 30 VDC (resistive)
Battery requirements	
Quantity	2
Size	6.5 to 24 Ah
Type	Sealed lead acid only

Rechargeable battery circuit [1]	
Voltage	24 VDC
Charging current	1.2 A or 2.1 A, field configurable
Charging capacity	24 Ah, max
Operating voltage	20.4 V, min
Battery capacities [2]	6.5 to 24 Ah for ECS/MNS/LSS applications 6.5 to 24 Ah for Security/Access Control applications 10 Ah maximum in power supply enclosure applications
Dimensions	See Figure 3 on page 7
Ground fault impedance	10 kΩ
Operating environment	
Temperature	32 to 122 °F (0 to 50 °C)
Relative humidity	0 to 93%, noncondensing
Intended installation environment	Indoor, dry

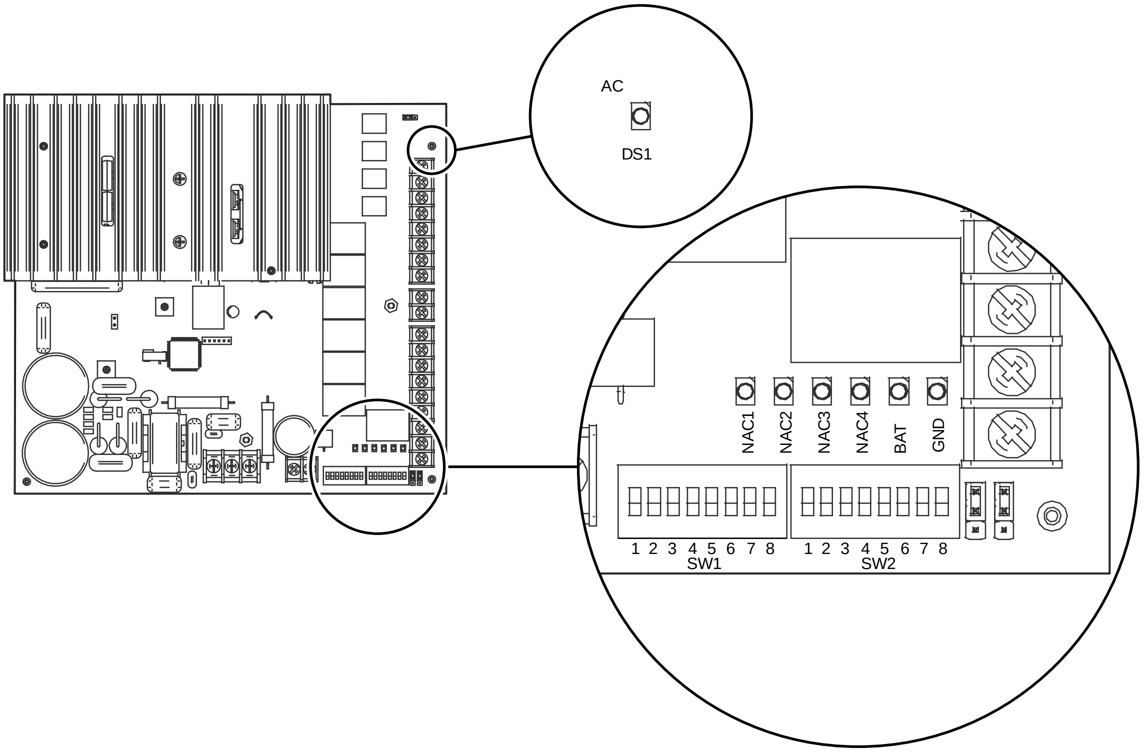
[1] The battery charger circuit is automatically turned off when the unit is activated by either of its sense inputs and will not charge the standby batteries.

[2] All references to Access Control applications and associated modules in this document are for repair and replacement units only. As of December 2, 2018, the products covered in this Manual are not listed to the UL 294 Standard for use in access control applications.

LED indicators

Figure 2 on page 6 shows the location of the LED status indicators on the BPS Series power supply circuit board. The cabinet door also has an LED to indicate whether the BPS Series power supply is operating on AC power.

Figure 2: BPS Series power supply status indicators



LED	Color	Description
AC	Green	AC power on.
NAC1	Yellow	NAC1/AUX1 trouble [1].
NAC2	Yellow	NAC2/AUX2 trouble [1].
NAC3	Yellow	NAC3/AUX3 trouble [1].
NAC4	Yellow	NAC4/AUX4 trouble [1].
BAT	Yellow	Battery trouble. Indicates that the battery level has fallen below acceptable levels.
GND	Yellow	Ground fault. Indicates that a ground fault has been detected on the field wiring.

[1] The NAC LEDs indicate a trouble with the load or external wiring on the NAC/AUX circuit. For circuits configured as NACs, this could be an open circuit trouble, short circuit trouble, or an overload trouble.

For short circuit troubles, the NAC does not activate until the short circuit condition is removed.

For overload troubles, an active NAC is shutdown. After shutdown, if there is no short circuit condition, the NAC reactivates after 30 seconds and checks to see if the overload condition still exists.

For AUX circuits, the trouble indicates an overload condition. The AUX circuit is shut down for 30 seconds and then is reactivated to see if the overload condition still exists.

Trouble indicating and reporting

When the trouble relay is not dedicated to AC power loss reporting (DIP switch SW2-6 OFF), the trouble conditions listed in the table above are reported through the trouble relay. Other internal troubles that do not have an associated LED are also reported via the trouble relay. Other internal troubles include: DIP switch read trouble, RAM failure, code checksum failure, A to D failure, and battery charger failure.

All troubles are also reported through both sense circuits.

Installing the enclosure

When installing the BPS Series power supply, be sure to follow all applicable national and local codes and standards.

The metal conduit is the main path for earth grounding of the enclosure. Use UL Listed conduit connectors designed for painted surfaces.

The enclosure can be surface mounted or semiflush mounted. For enclosure dimensions, see Figure 3 below.

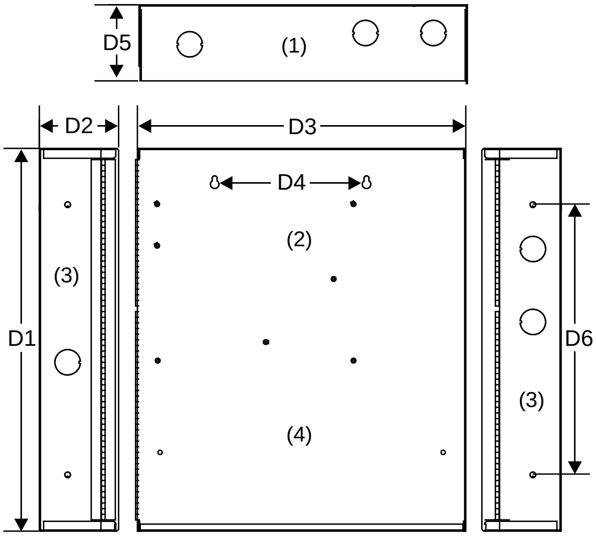
To surface mount the enclosure:

1. Position the enclosure on the finished wall surface.
2. Fasten the enclosure to the wall surface where indicated.
3. Install all conduits and pull all wiring into the enclosure before proceeding.

To semiflush mount the enclosure:

1. Frame the interior wall as required so that it supports the full weight of the enclosure and standby batteries.
2. Fasten the enclosure to the framing studs where indicated.
3. Install all conduits and pull all wiring into the enclosure before proceeding.

Figure 3: Enclosure dimensions



(1) Top view
(2) Front view
(3) Side view
(4) All knockouts are a combination 0.5 in. (1.27 cm) and 0.75 in. (1.9 cm)

D1	D2	D3	D4	D5	D6
17.0 in (43.2 cm)	3.5 in (8.9 cm)	13.0 in (33.0 cm)	6.5 in (16.5 cm)	3.375 in (8.6 cm)	12.0 in (30.4 cm)

Installing Signature modules in the enclosure

Up to three Signature modules can be installed on the mounting brackets inside the enclosure.

Note: For mounting MN-NETRLY4 modules, refer to *MN-NETRLY4 Network Relay Module Installation Sheet* (P/N 3101827).

Installing standard Signature modules

The BPS Series power supply provides three brackets for installing standard single-gang or double-gang Signature modules inside the cabinet. See Figure 4 below.

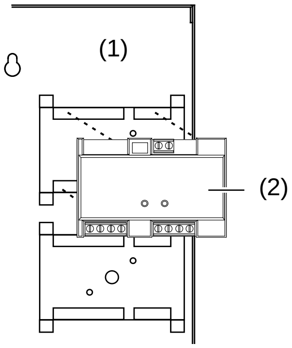
Notes

- To make wiring easier, install and wire the module on the top mounting bracket first, then the module on the middle bracket, and then the module on the bottom bracket.
- Route the wiring around the perimeter of the enclosure. Do not route wires across the circuit board.

To install Signature modules:

1. Insert the top tabs into the top slot on the mounting bracket, and then insert the bottom tabs into the bottom slot until you feel it snap in place.
2. Connect the field wiring. Refer to the module's installation sheet for wiring.

Figure 4: Installing standard Signature modules inside the cabinet



(1) Mounting brackets
(2) Option module

Installing SIGA-SEC2 modules

You can install a SIGA-SEC2 module on any one of the three mounting brackets inside the BPS Series power supply cabinet. See Figure 5 on page 9. Typically, the SIGA-SEC2 module is installed directly below the 3-TAMP.

For installation and wiring instructions, see *SIGA-SEC2 Security Loop Module Installation Sheet* (P/N 387632).

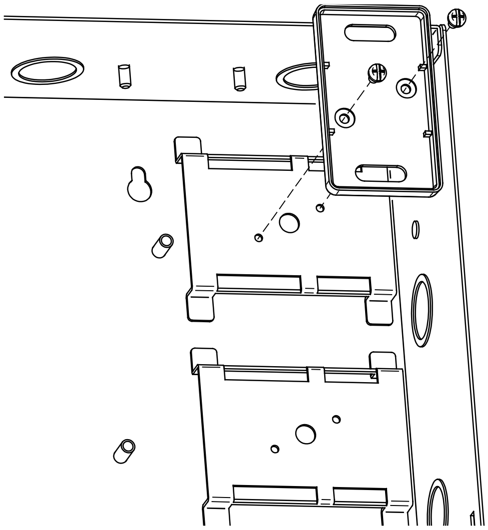
To install SIGA-SEC2 modules:

1. Remove the module's plastic cover.
2. Remove the circuit board from the plastic backing.
3. Screw the plastic backing to the mounting bracket using two #6, 1/4 flat head sheet metal screws. See Figure 5 on page 9.

4. Insert the circuit board into the plastic backing.
5. Snap the module’s plastic cover into place.
6. Connect all wiring. Refer to the module’s installation sheet for wiring information

   Note: Route the wiring around the perimeter of the enclosure, not across the circuit board.

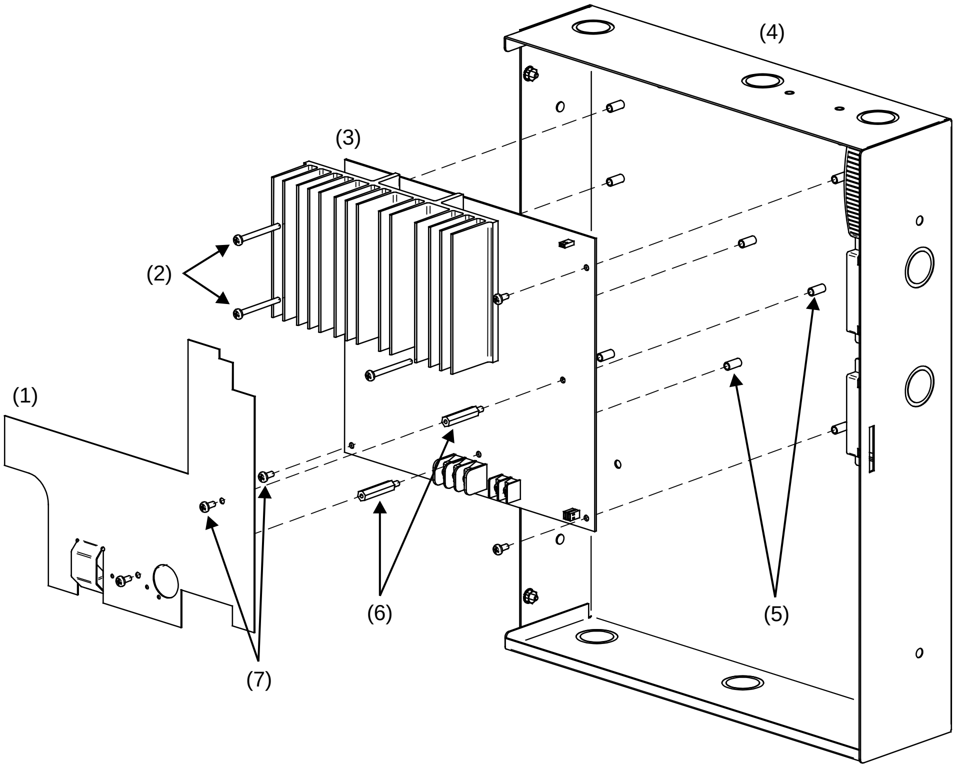
Figure 5: Installing SIGA-SEC2 modules inside the cabinet



Installing the circuit board in the enclosure

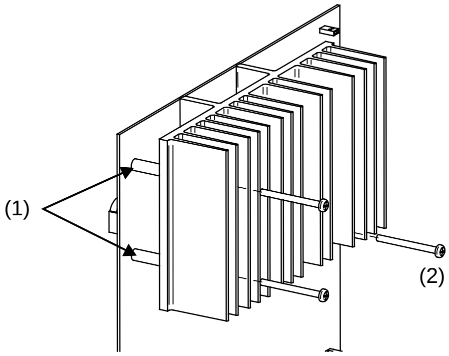
You may have to remove the circuit board to install the enclosure. Reinstalling the circuit board in the enclosure must be done with accuracy to avoid causing ground faults or shorts. The screws and standoffs must be installed correctly and in the right positions. Use the diagrams below to install the circuit board.

Figure 6: Complete circuit board installation



- (1) Cover (“C” models, only)
- (2) Long screws
- (3) Circuit board
- (4) Enclosure
- (5) Enclosure standoffs
- (6) Barrel spacers (“C” models, only), see Figure 7 on page 11
- (7) Short screws

Figure 7: Barrel spacer installation



(1) Barrel spacers
(2) Long screws

Note: The barrel spacers must be positioned correctly so that the long screw can pass through the spacer and into the enclosure standoff.

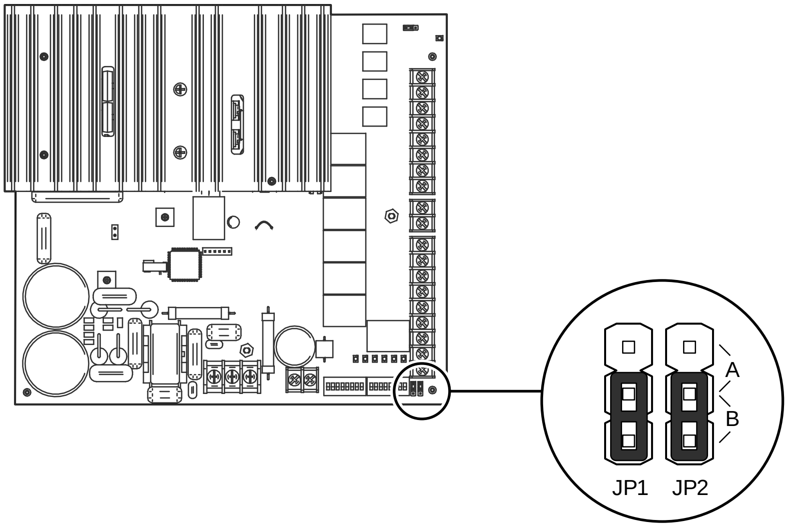
Setting the jumpers

NAC wiring class jumpers (JP1 and JP2)

JP1 and JP2 determine whether NACs are wired Class A or Class B. This setting applies to all NACs. See Figure 8 below.

Note: The settings for JP1, JP2, and SW2-8 must all match.

Figure 8: NAC wiring class jumpers (JP1 and JP2)



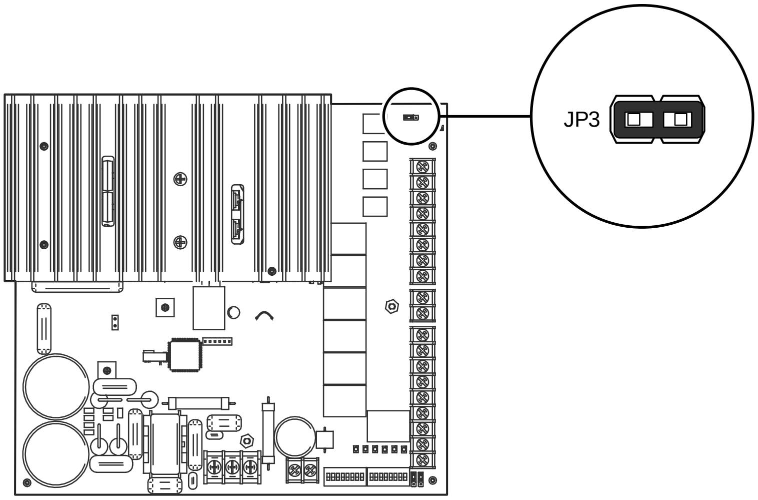
JP1 and JP2	Description
Position A	All NACs are wired Class A
Position B	All NACs are wired Class B (default)

Ground fault detection jumper (JP3)

JP3 determines whether ground fault detection on all NAC/AUX outputs is turned on or off. The sense inputs are always isolated from the power supply ground fault circuits. See Figure 9 on page 13.

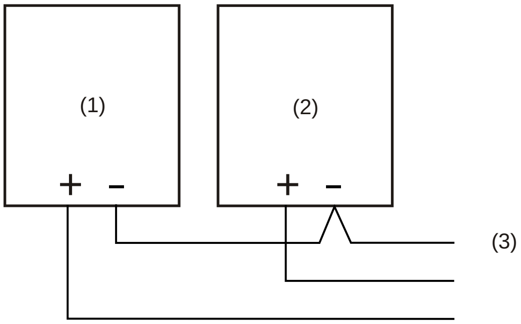
Note: Ground fault detection is required for all fire and security applications. It is recommended that systems, in which ground fault detection is turned off be tested after installation.

Figure 9: Ground fault detection jumper (JP3)



JP3	Description
Installed	The BPS Series power supply performs ground fault detection. This is the *default* position.
Removed	The BPS Series power supply does not perform ground fault detection. Ground fault detection is provided by the control unit.

Disable the BPS Series power supply's ground fault detection if the host control unit is detecting system ground faults. Disabling ground fault detection removes the ability of the BPS Series power supply to detect ground faults and isolates the BPS Series power supply from earth ground. This is what allows the control unit to do the system's ground fault checking.

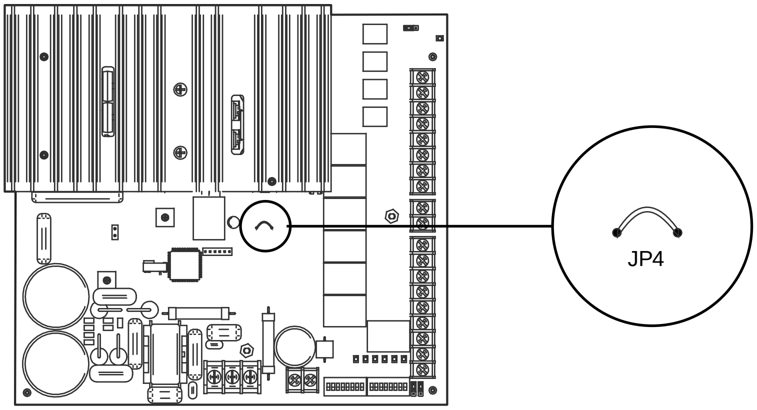


(1) Control unit. The control unit is responsible for ground fault detection when the is wired in this fashion.
(2) BPS. Disable the BPS Series power supply's ground fault jumper (JP3).
(3) To next BPS Series power supply that requires ground fault detection from the control unit.

Battery charging circuit jumper (JP4)

JP4 determines the amount of current that the battery charging circuit uses to charge the standby batteries. See Figure 10 on page 14.

Figure 10: Battery charging circuit jumper (JP4)



JP4	Description
Open (cut)	Battery charging current is 1.5 A. Use to charge standby batteries that are 10 Ah and smaller.
Shorted (uncut)	Battery charging current is 3.0 A. Use to charge standby batteries that are larger than 10 Ah.

UL 864 programming requirements

NOTICE TO USERS, INSTALLERS, AUTHORITIES HAVING JURISDICTION, AND OTHER INVOLVED PARTIES

This product incorporates field-programmable options. In order for the product to comply with the requirements in the Standard for Control Units and Accessories for Fire Alarm Systems, UL 864, certain programming features or options must be limited to specific values or not used at all as indicated below. Some options were permitted under the previous versions of UL 864 and are provided to allow for service replacements on those systems

Programmable feature or option	Permitted in UL 864? (Y/N)	Possible settings	Settings permitted in UL 864
NAC audible synchronization delay [1]	N	ON: 4 second delay OFF: 1 second delay	OFF
AC power delay	Y	ON: 3 hour delay, no dedicated AC power failure contact OFF: No delay	On

[1] This option is controlled by switch SW1-4. See “Synchronization delay (SW1-4)” on page 19.

Setting the DIP switches

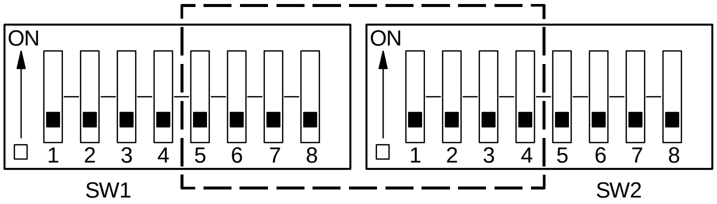
Two eight-position DIP switches are used to configure theBPS Series power supply. The following sections show the DIP switch settings for the various input and output configurations.

Note: As shipped from the factory, all switches are in the OFF position.

Output circuit type (SW1-5 to 8 and SW2-1 to 4)

Switches SW1-5 to SW1-8 and SW2-1 to SW2-4 determine whether the BPS Series power supply output circuits are notification appliance circuits (NACs) or are auxiliary (AUX) power circuits. See Figure 11 below.

Figure 11: Output circuit type switches SW1-5 to 8 and SW2-1 to 4



	NAC1/AUX1		NAC2/AUX2		NAC3/AUX3		NAC4/AUX4	
Operating mode [1]	**SW1-5**	**SW1-6**	**SW1-7**	**SW1-8**	**SW2-1**	**SW2-2**	**SW2-3**	**SW2-4**
Sense Follow NAC	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Continuous NAC	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Temporal NAC	ON	OFF	ON	OFF	ON	OFF	ON	OFF
AUX power	ON	ON	ON	ON	ON	ON	ON	ON

[1] See the descriptions below for operation details

Sense Follow NACs

Sense Follow NACs output a signal that follows the signal applied to the sense inputs. The outputs activate one or four seconds after the sense input activates to allow time for Genesis strobes on the NAC side to synchronize with the signal on the sense side. The sense input signal may be continuous, 120 pulses per minute, temporal, or coded.

Notes

- The four-second delay does not comply with UL 864.
  For more information, see “Synchronization delay (SW1-4)” on page 19.
- Sense Follow must be used when the sense circuit is connected to a compatible Genesis synchronized signal source.

Continuous NACs

Continuous NACs output a 24VDC continuous (steady) signal for connecting conventional or Genesis strobes temporal horns, and temporal horn/strobes. They activate one or four seconds after the sense input activates and restore seven seconds after the sense input restores.

The output signal may be unsynchronized, synchronized, or synchronized with audible on/off control. For more information, see “Genesis signal synchronization for Continuous NACs (SW2-5)” on page 19.

Note: The four-second delay does not comply with UL 864. For more information, see “Synchronization delay (SW1-4)” on page 19.

Temporal NACs

Temporal NACs output an unsynchonized 24VDC temporal signal for connecting compatible horns that are designed or configured for a steady (continuous) horn signal output. They activate one or four seconds after the sense input activates and restore seven seconds after the sense input restores.

Note: The four-second delay does not comply with UL 864. For more information, see “Synchronization delay (SW1-4)” on page 19.

AUX power

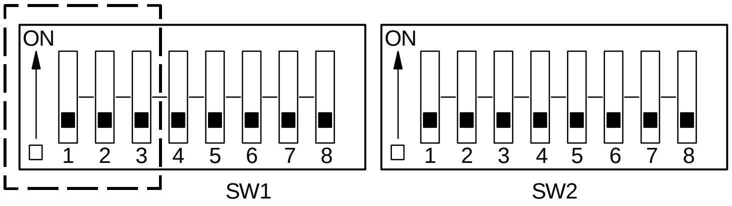
AUX power outputs turn on during power up. AUX power circuits can be configured to stay active during a power fail or load shed on a power fail (after a 30 second delay). For more information, see “AUX power standby operation (SW2-7)” on page 20.

Note: AUX circuits are load shed when the system reaches low battery to prevent deep discharge of the batteries.

NAC modes (SW1-1 to SW1-3)

Switches SW1-1, SW1-2, and SW1-3 determine the operation of BPS Series power supply outputs configured as notification appliance circuits (NACs). See Figure 12 below.

Figure 12: NAC operating mode switches (SW1-1 to SW1-3)



Operating mode [1]	SW1-1	SW1-2	SW1-3
Correlate mode	OFF	–	–
Genesis Master mode	ON	OFF	ON
Nondelayed mode	ON	ON	–

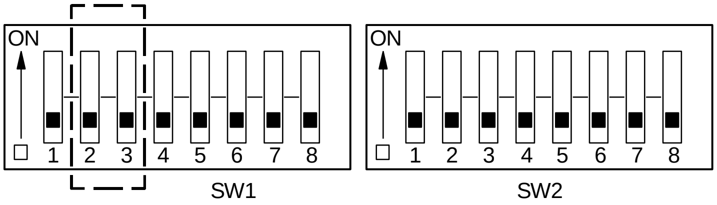
[1] See the descriptions below for operation details

Correlate mode

In Correlate mode, BPS Series power supply NACs turn on and off based on their assigned sense inputs. Switches SW1-2 and SW1-3 determine which NACs the Sense 1 and Sense 2 input circuits activate. See Figure 13 on page 18.

Note: These switch settings do not affect AUX power outputs.

Figure 13: Sense circuit-to-NAC correlation switches – Correlate mode (SW1-2 and SW1-3)



		Class B NACs		Class A NACs	
SW1-2	**SW1-3**	**Sense 1 activates**	**Sense 2 activates**	**Sense 1 activates**	**Sense 2 activates**
OFF	OFF	1, 2, 3, 4	1, 2, 3, 4	1/2, 3/4	1/2, 3/4
OFF	ON	1	2, 3, 4	1/2	3/4
ON	OFF	1, 2	3, 4	–	–
ON	ON	1, 2, 3	4	–	–

Genesis Master mode

In Genesis Master mode, the BPS Series power supply provides Genesis sync signals for connecting Genesis horns, strobes, and horn/strobes. Continuous NACs in Genesis Master mode also provide Genesis audible on/off control signals for silencing Genesis horns while leaving Genesis strobes active.

In Genesis Master mode applications, connect Sense 1 inputs to a visible signal riser and connect Sense 2 inputs to an audible signal riser.

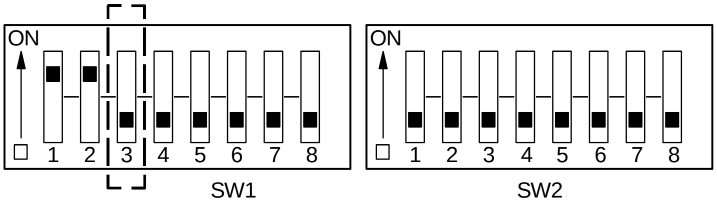
Nondelayed mode

Nondelayed mode is intended to support coders. In this mode, there is no delay between activation of the sense input and activation of the NAC.

In Nondelayed mode, switch SW1-3 determines which NACs the Sense 1 and Sense 2 input circuits activate. See Figure 14 below.

Note: These switch settings do not affect AUX power outputs.

Figure 14: Sense circuit-to-NAC correlation switch – Nondelayed mode (SW1-3)



	Class B NACs		Class A NACs	
SW1-3	**Sense 1 activates**	**Sense 2 activates**	**Sense 1 activates**	**Sense 2 activates**
OFF	1, 2, 3, 4	1, 2, 3, 4	1/2, 3/4	1/2, 3/4
ON	1, 2	3, 4	1/2	3/4

Continuous NACs in Nondelayed mode, generate Genesis sync pulses in accordance with SW2-5. For more information, see “Genesis signal synchronization for Continuous NACs (SW2-5)” on page 19.

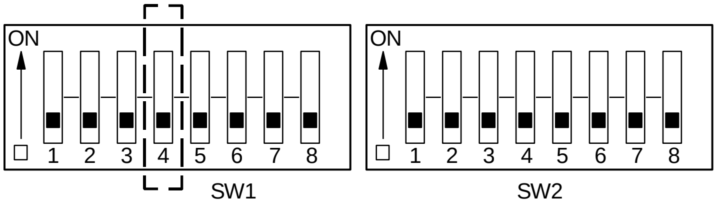
This supports applications that include Genesis strobes and conventional audibles. For this operation, the NACs for the audible signals must be configured Sense Follow NACs. There is no delay for either the visibles or the audibles.

Synchronization delay (SW1-4)

Switch SW1-4 -determines whether NAC signals synchronize after a 1-second or 4-second delay. See Figure 15 below. For more information, see “Worksheet method” on page 39.

Note: SW1-4 is ignored when NAC operation is set for Nondelayed mode.

Figure 15: NAC audible synchronization delay switch (SW1-4)

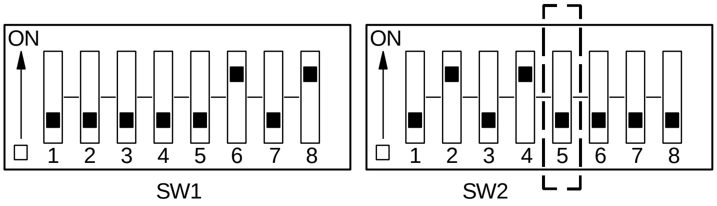


SW1-4	Description
ON	NACs turn on four seconds after their sense input is activated (e.g. Genesis NACs sync with the second round of the temporal signal) **Note:** The 4-second delay setting (SW1-4: ON) does not comply with UL 864.
OFF	NACs turn on one second after their sense input is activated (e.g. the Genesis NACs sync with the second flash of the Genesis strobes)

Genesis signal synchronization for Continuous NACs (SW2-5)

Switch SW2-5 determines whether Continuous NACs provide Genesis signal synchronization. See Figure 16 below.

Figure 16: Genesis signal synchronization for Continuous NACs switch (SW2-5)

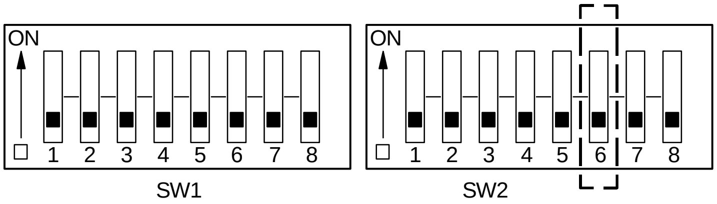


SW2-5	Description
ON	Continuous NACs generate Genesis synchronization signals. Continuous NACs in Genesis Master mode, generate Genesis synchronization signals and Genesis audible on/off control signals.
OFF	Continuous NACs do not provide Genesis signal synchronization.

Trouble relay operation (SW2-6)

Switch SW2-6 determines whether the BPS Series power supply's trouble relay operates as a common trouble relay or as a dedicated AC power fail relay. See Figure 17 below.

Figure 17: Trouble relay operation switch (SW2-6)



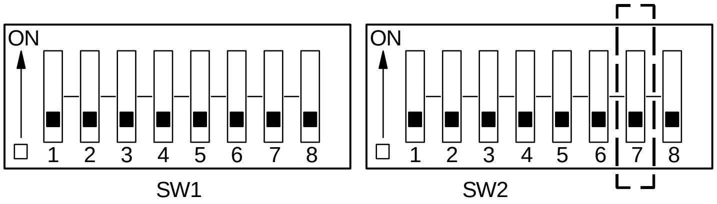
SW2-6	Description
ON	The trouble relay contacts change over within 20 seconds of losing or regaining AC power. The sense circuit integrated fault relays immediately open on all NAC faults and on all power supply faults other than loss of AC power. For AC power loss faults, the relays open after a 3-hour delay provided there are no other power supply faults and AC power has not been restored.
OFF	The trouble relay contacts immediately change over on any power supply fault, including loss of AC power. The sense circuit integrated fault relays only open on all NAC faults for their respective NACs and for all power supply faults other than loss of AC power.

AUX power standby operation (SW2-7)

Switch SW2-7 determines when AUX power outputs turn off while the BPS Series power supply is on battery power (i.e, loses AC power). See Figure 18 below.

Note: The 200 mA continuous AUX power circuit is not affected by AC power loss.

Figure 18: AUX power operation switch (SW2-7)



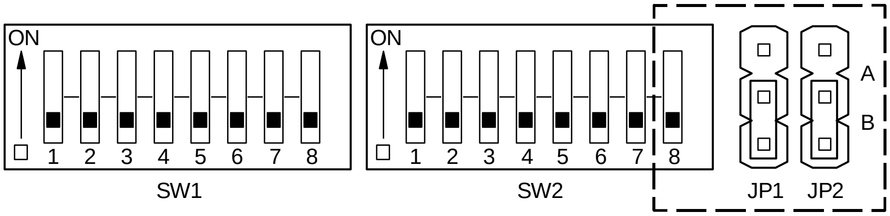
SW2-7	Description
ON	AUX power outputs turn off 30 seconds after losing AC power
OFF	AUX power outputs stay on after losing AC power until battery power is less than 18.4 VDC

NAC wiring class (SW2-8)

Switch SW2-8 determines whether NACs are wired Class A or Class B. See Figure 19 below.

Note: Jumpers JP1 and JP2 must be set to match the operation of this switch.

Figure 19: NAC wiring class switch (SW2-8)



SW2-8	Description
ON	Class A NACs
OFF	Class B NACs

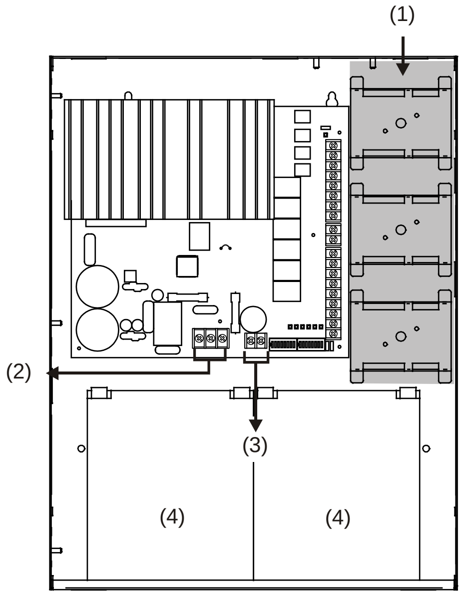
Wire routing

Maintain 1/4-inch spacing between power-limited and nonpower-limited wiring at all times. Keep power-limited wiring in the shaded area and nonpower-limited wiring in the unshaded area as shown in Figure 20 below.

Do not route wiring across the circuit board.

Do not use the bottom knockouts if batteries are placed in the battery compartment area. Position the battery terminals towards the door.

Figure 20: Wire routing



(1) Power-limited wiring area
(2) Route AC supply through knockouts in nonpower-limited area
(3) Battery wiring
(4) Battery

Notes

- NAC circuits are power-limited and supervised for opens, shorts, and overcurrents. When configured as auxiliary power circuits, they are power-limited and supervised for shorts and overcurrents.
- Source must be power-limited. Source determines supervision.

Connecting the field wiring

Caution: Break the wire run at each terminal connection to provide proper connection supervision. Do not loop wires under the terminals.

AC power wiring

Connect the AC power wiring as shown in Figure 21 and Figure 22 on page 24.

Note: AC power wiring is nonpower-limited.

Figure 21: AC terminal block installation

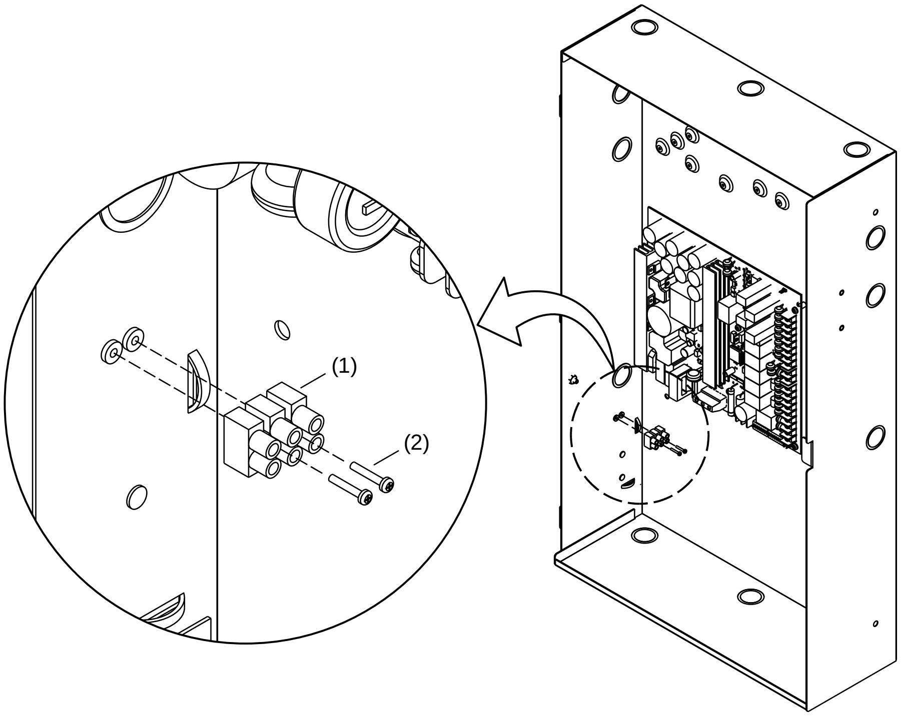
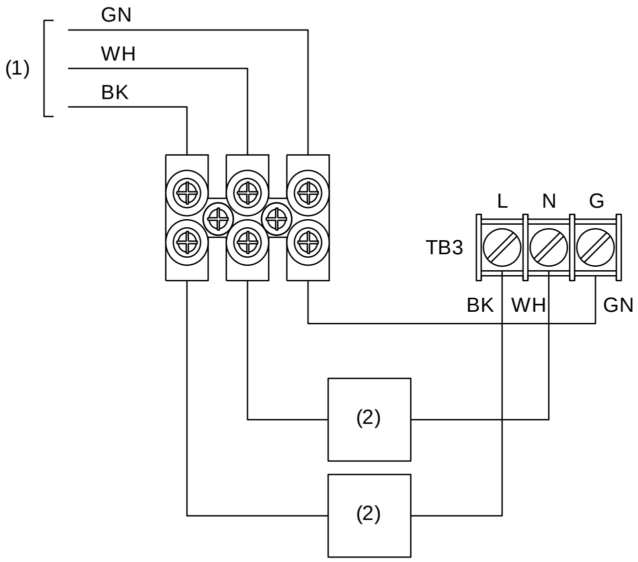


Figure 22: AC power wiring



(1) Dedicated branch circuit. 15 A, max.
(2) Ferrite clamp

Battery wiring

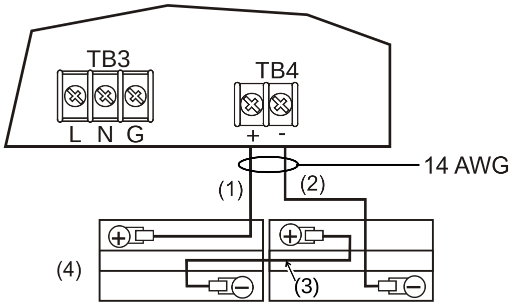
Two backup batteries are required with the BPS Series power supply. The largest batteries that can fit in the power supply enclosure are 10 Ah. Batteries larger than 10 Ah must be installed in a BC-1 or BC-2 battery cabinet.

Caution: For proper battery charging, the battery charging jumper wire (JP4) must be set according to the battery size that you are using. For more information, see “Battery charging circuit jumper (JP4)” on page 13.

Notes

- Batteries should be replaced every five years, or as required by local codes. Refer to local and national codes for battery maintenance requirements.
- Position the battery terminals towards the door.
- Battery wiring is nonpower-limited.

Figure 23: Battery wiring



(1) Red
(2) Black
(3) Blue
(4) Top view

NAC Class B wiring

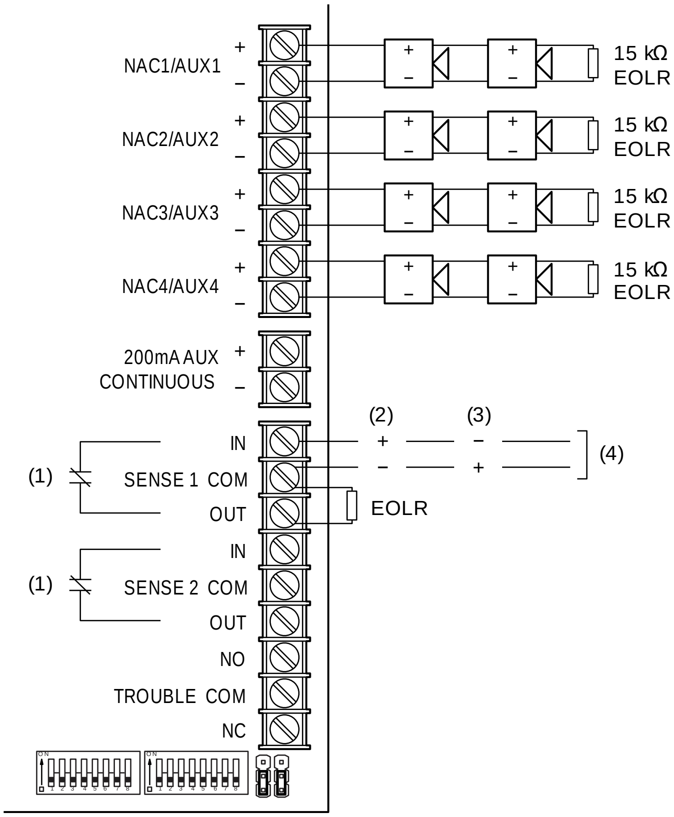
Figure 24 below shows the wiring for NAC/AUX circuits configured as Class B notification appliance circuits.

For Class B NACs, set SW2-8 to the OFF position, and set JP1 and JP2 to the B position. For other NAC configuration settings, see “Setting the DIP switches” on page 16.

For NAC wire distances, see “Notification appliance circuit calculations” on page 37.

Note: NAC wiring is supervised and power-limited.

Figure 24: Class B NAC wiring



(1) Sense circuit integrated fault relay
(2) Signal polarity when the sense circuit riser is active
(3) Signal polarity when the sense circuit riser is not active
(4) Conventional or addressable sense circuit riser source. The source determines the EOLR value.

NAC Class A wiring

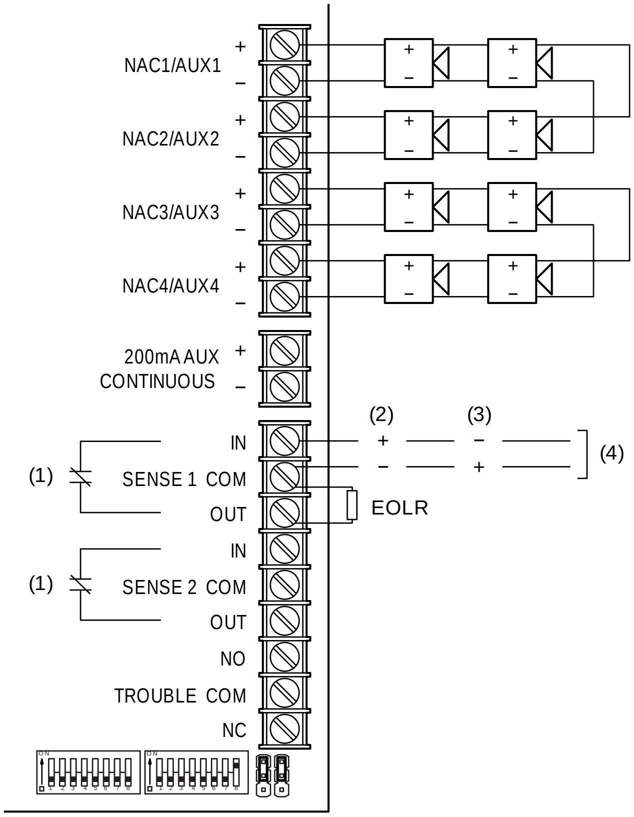
Figure 25 on page 26 shows the wiring for NAC/AUX circuits configured as Class A notification appliance circuits.

For Class A NACs, set SW2-8 to the ON position, and set JP1 and JP2 to the A position. For other NAC configuration settings, see “Setting the DIP switches” on page 16.

For NAC wire distances, see ““Notification appliance circuit calculations” on page 37.

Note: NAC wiring is supervised and power-limited.

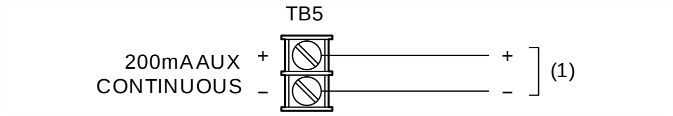
Figure 25: NAC Class A wiring



(1) Sense circuit integrated fault relay
(2) Signal polarity when the sense circuit riser is active
(3) Signal polarity when the sense circuit riser is not active
(4) Conventional or addressable sense circuit riser source. The source determines the EOLR value.

Dedicated 200 mA AUX power wiring

Figure 26: Dedicated200 mA AUX power wiring



(1) To powered devices

Notes

- Dedicated 200 mA AUX power wiring is unsupervised and power-limited.
- The dedicated 200 mA AUX power wiring requires a UL Listed end-of-line supervision relay (e.g., PAM1, 6254A-003, 73402A, or equivalent) unless the wiring remains in the cabinet, or in the same room within 20 ft. (6.1 m) and enclosed in conduit or equivalent protection against mechanical injury.

AUX power circuit wiring

Figure 27 on page 28 shows the wiring for NAC/AUX circuits configured as AUX power circuits.

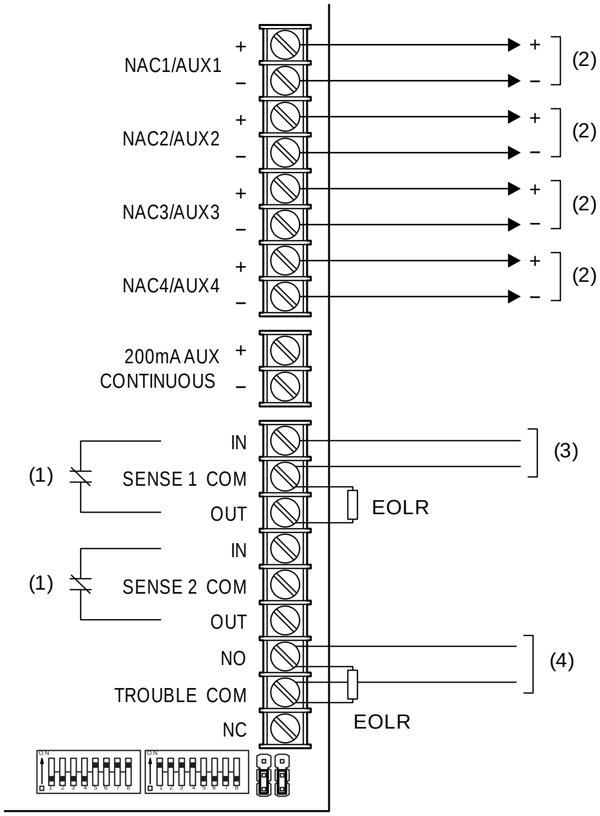
For configuration settings, see, “Output circuit type (SW1-5 to 8 and SW2-1 to 4)” on page 16 and “AUX power standby operation (SW2-7)” on page 20.

This auxiliary configuration is compatible with fire alarm, security, and access control applications, which can be combined in a single system, if all of the devices are listed.

Notes

- All references to Access Control applications and associated modules in this document are for repair and replacement units only. As of December 2, 2018, the products covered in this Manual are not listed to the UL 294 Standard for use in access control applications.
- AUX power wiring is unsupervised and power-limited.
- AUX power circuits require a UL Listed end-of-line supervision relay (e.g., PAM1, 6254A-003, 73402A, or equivalent) unless the wiring remains in the cabinet, or in the same room within 20 ft. (6.1 m) and enclosed in conduit or equivalent protection against mechanical injury.
- When all four NAC/AUX circuits are configured as AUX power circuits and DIP switch SW2-6 is set to the ON position, use two conventional or addressable system inputs to monitor both the Sense 1 integrated fault relay contacts and the trouble relay contacts.

Figure 27: AUX power wiring

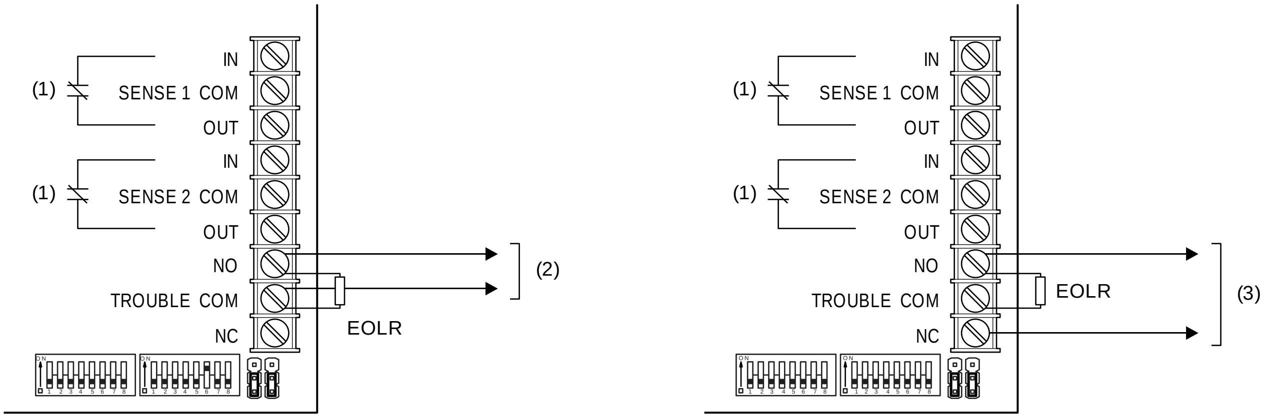


(1) Sense circuit integrated fault relay
(2) To control unit accessories
(3) Conventional or addressable common trouble supervision circuit
(4) Conventional or addressable AC power fail supervision circuit

Trouble relay wiring

Figure 28 on page 29 shows the wiring for the BPS Series power supply’s trouble relay. The trouble relay is field-configurable for use as a dedicated AC power fail relay (SW2-6: ON) as shown on the left or as a common trouble relay (SW2-6: OFF) as shown on the right. For more information, see “Trouble relay operation (SW2-6)” on page 20.

Figure 28: Trouble relay wiring



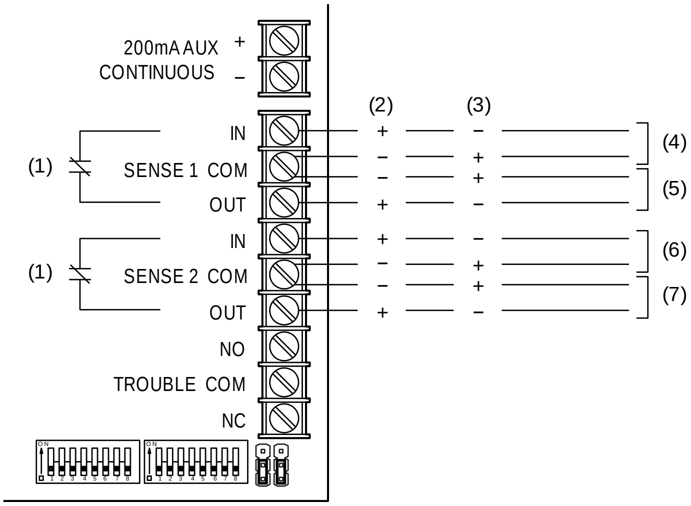
(1) Sense circuit integrated fault relay
(2) Conventional or addressable AC power fail supervision circuit (SW2-6 set to the ON position)
(3) Conventional or addressable common trouble supervision circuit (SW2-6 set to the OFF position)

Sense circuit wiring

The BPS Series power supply has two sense circuits for activating NACs. Sense circuit operation is controlled by the BPS Series power supply's DIP switches. Sense activation of existing NAC circuits reports a trouble condition to the control panel using these circuits.

Note: Any BPS Series power supply trouble opens the sense circuit's integrated fault relay, which sends a trouble signal to the control unit, indicating that a trouble exists on that circuit.

Figure 29: Sense circuit wiring



(1) Sense circuit integrated fault relay
(2) Signal polarity when the sense circuit riser is active
(3) Signal polarity when the sense circuit riser is not active
(4) Conventional or addressable sense circuit riser signal source
(5) To next BPS Series power supply Sense 1 input or to end-of-line resistor (EOLR). The sense circuit riser signal source determines the EOLR value.
(6) Conventional or addressable sense circuit riser signal source

(7) To next BPS Series power supply Sense 2 input or to end-of-line resistor (EOLR). The sense circuit riser signal source determines the EOLR value.

When using sense circuits as common trouble relays, BPS Series power supplies operate as described below.

Scenario 1: Trouble on any non-AC power fault

Result:

- Sense 1 opens.
- An AC power failure closes the trouble contact at 20 seconds and activates Sense 1 at three hours.

For a wiring example, see Figure 27 on page 28.

Scenario 2: Sense 1 activates all four NAC circuits

Result:

- Sense 1 opens.
- An AC power failure closes the trouble contact at 20 seconds and activates Sense 1 at three hours.

For a wiring example, see Figure 31 on page 32.

Scenario 3: Sense 1 and Sense 2 are operating with multiple CC1 modules

Result:

- A fault on NAC 1 or NAC 2 causes Sense 1 to open.
- A fault on NAC 3 or NAC 4 causes Sense 2 to open.
- A panel-related fault other than an AC failure (e.g., ground fault or battery fault) causes Sense 1 and Sense 2 to open.
- An AC power failure closes the trouble contact at 20 seconds and activates Sense 1 at three hours

For a wiring example, see Figure 32 on page 33.

Tests for opens, shorts, and ground faults,

The following are testing procedures for ground fault, open circuit, and short circuit indications.

NAC open circuit test: Remove the EOL resistor from the last device on the circuit. The trouble LED must light.

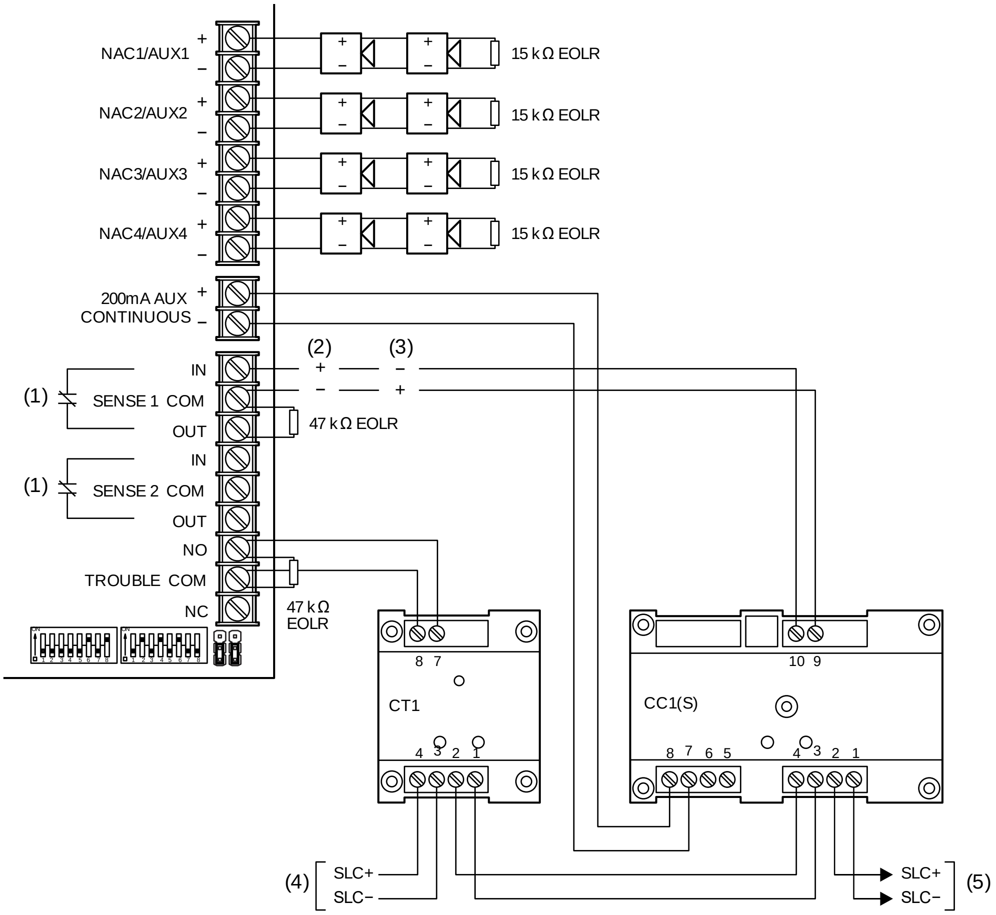
NAC short circuit test: Place a short across each NAC output individually. The individual NAC LED must light.

Ground fault test: Directly short one leg of the circuit to chassis ground. The ground fault and trouble fault LEDs must light.

NAC wiring using CC1(S) modules

The following wiring diagrams show Signature Series CC1(S) module connections. However, other Signature Series modules can be used. Typically, the Signature Series modules are located inside the BPS Series power supply cabinet.

Figure 30: Using Sense 1 and 200 mA continuous AUX power to activate NACs

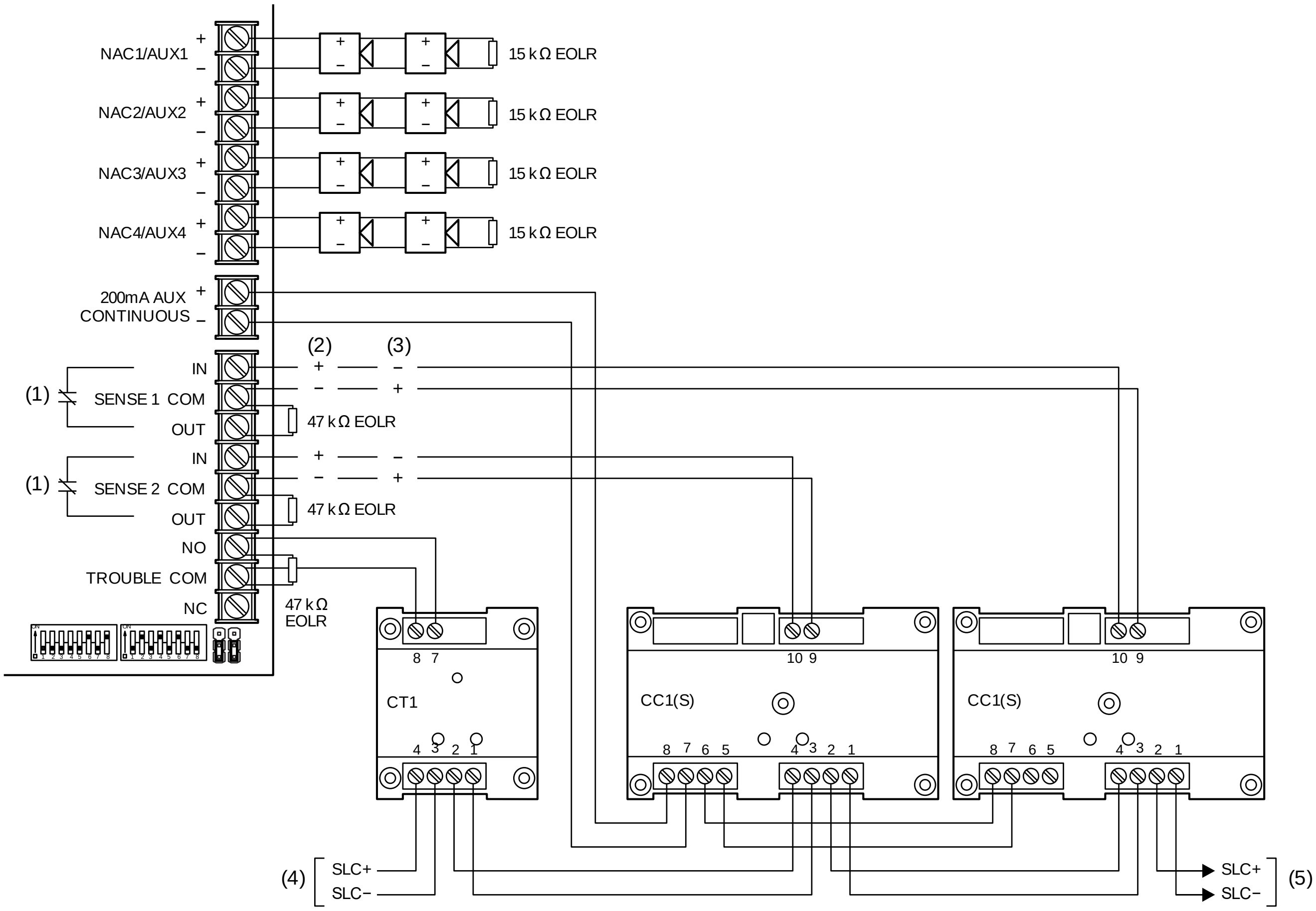


(1) Sense circuit integrated fault relay
(2) Signal polarity when the sense circuit riser is active
(3) Signal polarity when the sense circuit riser is not active
(4) From previous device on the signaling line circuit (SLC)
(5) To next device on the signaling line circuit (SLC)

Notes

- Signature Series modules must be wired and programmed on the Signature controller for proper operation.
- When DIP switch SW2-6 is in the ON position, the CC1(S) module immediately signals NAC faults and power supply faults other than AC power failures. AC power faults are delayed for three hours. The CT1 module signals AC power failures after a 20-second delay.
- The 200 mA AUX circuit wiring must remain inside the cabinet, or in the same room within 20 ft (6.1 m) and enclosed in conduit or equivalent protection against mechanical injury. If not, you must use a UL Listed end-of-line supervision relay (e.g., PAM1, 6254A-003, 73402A, or equivalent) to supervise the wiring.

Figure 31: Using Sense 1, Sense 2 and 200 mA continuous AUX power to activate NACs

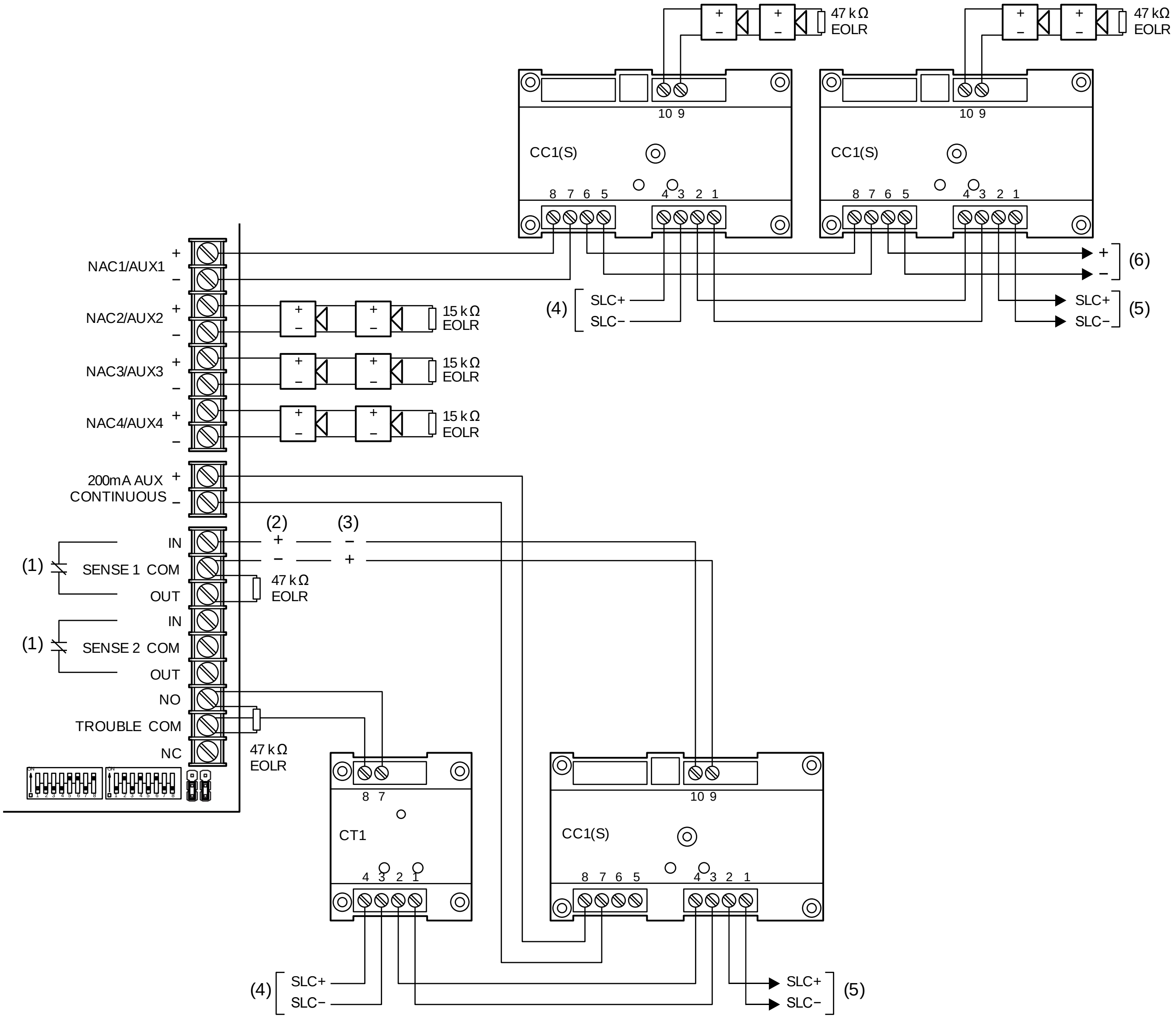


(1) Sense circuit integrated fault relay
(2) Signal polarity when the sense circuit riser is active
(3) Signal polarity when the sense circuit riser is not active
(4) From previous device on the signaling line circuit (SLC)
(5) To next device on the signaling line circuit (SLC)

Notes

- Signature Series modules must be wired and programmed on the Signature controller for proper operation.
- When DIP switch SW2-6 is in the ON position, the CC1(S) modules immediately signal NAC faults and power supply faults other than AC power failures. AC power faults are delayed for three hours. The CT1 module signals AC power failures after a 20-second delay.
- The 200 mA AUX circuit wiring must remain inside the cabinet, or in the same room within 20 ft (6.1 m) and enclosed in conduit or equivalent protection against mechanical injury. If not, you must use a UL Listed end-of-line supervision relay (e.g., PAM1, 6254A-003, 73402A, or equivalent) to supervise the wiring.

Figure 32: Multiple CC1(S) modules using a NAC/AUX circuit as a signal riser



1. (1) Sense circuit integrated fault relay
2. (2) Signal polarity when the sense circuit riser is active
3. (3) Signal polarity when the sense circuit riser is not active
4. (4) From previous device on the signaling line circuit (SLC)
5. (5) To next device on the signaling line circuit (SLC)
6. (6) To next device or UL Listed riser supervision circuit

Notes

- BPS Series power supply outputs programmed as AUX power circuits require a UL Listed end-of-line supervision relay (e.g., PAM1, 6254A-003, 73402A, or equivalent) to supervise the wiring.
- BPS Series power supply outputs programmed as notification appliance circuits require a 15 kΩ EOL resistor to supervise the wiring.

Installing the 3-TAMP tamper switch

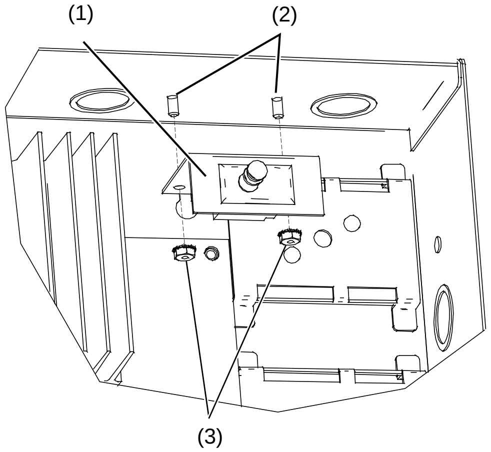
The 3-TAMP tamper switch is used to detect an open enclosure door for security purposes.

Note: The 3-TAMP tamper switch *must* be used for security applications and connected to a SIGA-SEC2 module mounted in the enclosure.

To install the tamper switch:

1. Install an EOL resistor on the 3-TAMP. Refer to the *3-TAMP Installation Sheet* (P/N 387422) for more information.
2. Position the tamper switch over the mounting standoffs. See the diagram below.
3. Use the two locking nuts provided to secure the tamper switch. See the diagram below.
4. Connect all wiring to the tamper switch. Refer to the *3-TAMP Installation Sheet* (P/N 387422) for details on wiring the tamper switch.

Figure 33: Tamper switch installation



(1)	3-TAMP tamper switch
(2)	Mounting standoffs
(3)	Locking nuts

Battery calculation worksheet

Supervisory (AUX1, AUX2, AUX3, AUX4) Note: Only add auxiliary current if SW2-7 is OFF. Auxiliary outputs stay on after AC power failure.				
Device type	Quantity	Current (mA)	Total/device	
Total AUX current [1]				mA (A)
Number of circuits set to AUX		35 mA (per AUX circuit)		mA (B)

200 mA AUX			
Device type	Quantity	Current (mA)	Total/device

Total 200 mA AUX current		mA (C)
Rated base power supply supervisory current		70 mA (D)
Total supervisory current (A + B + C + D)		mA (E)
Hours of supervisory		Hrs (F)
Supervisory mAh (E × F)		mAh (G)

Alarm (NAC1, NAC2, NAC3, NAC4)				
Device type	Quantity	DC current (mA, RMS)	Total/device	
Total NAC current				mA (H)

Rated base BPS alarm current	270 mA (J)
Total alarm current (E + H + J)	mA (K)
Minutes of alarm	Min (L)
Hours of alarm (L/60)	Hr (M)

Alarm mAh required (K × M)	mAh (N)
Total battery mAh (N + G)	mAh (O)
Total battery Ah (O/1000)	Ah (P)
Total battery Ah required with 20% safety factor (P × 1.20)	Ah (Q)
Supervisory battery current (E/1000)	A (R)

[1] 0 if switch SW2-7 is off; 6 A max. if APS6A; 8 A max. if APS10A

To use the load current table below: First, select the column where the load is greater than or equal to (R). Second, select the row from that column where the capacity is greater than or equal to (Q). Third, select the corresponding battery size.

Battery size	**Load current (amps)**													
	0.2	**0.4**	**0.6**	**0.8**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
6.5 Ah	5.4	5.3	5.2	5.0	4.8	4.3	3.9	3.6	3.3	3.0	2.8	2.6	2.5	2.3
10 Ah	8.3	8.3	8.1	7.9	7.7	7.1	6.6	6.2	5.8	5.5	5.2	5.0	4.7	4.5
17 Ah	14.1	14.1	14.1	14.1	13.5	12.8	12.3	11.8	11.3	10.9	10.5	10.1	9.8	9.5
24 Ah	20.0	20.0	20.0	20.0	20.0	18.7	18.1	17.5	17.0	16.5	16.0	15.6	15.2	14.8

Notification appliance circuit calculations

Introduction

This topic shows you how to determine the maximum cable length of a notification appliance circuit (NAC) for a given number of appliances.

Two methods are presented: worksheet and equation. The worksheet method is simpler, but your installation must meet the criteria listed on the worksheet. If your installation does not meet these criteria, you need to use the equation method.

The methods given here determine cable lengths that work under all operating conditions. The calculations ensure that the required operating voltage and current will be supplied to all notification appliances. To do this, we assume these two worst-case conditions:

- The voltage at the NAC terminals is the minimum provided by the power supply
- The notification appliances are clustered at the end of the NAC circuit

Other, more detailed methods that distribute the appliance load along the NAC cable may indicate that longer cable runs are possible.

What you'll need

Appliance and cable values

Whether you use the worksheet method or the equation method, you'll need to know:

- The minimum operating voltage required for the appliances
- The maximum operating current drawn by each appliance
- The resistance per unit length of the wire used (Ω/ft)

This information can be found on the appliance installation sheets and on the cable specification sheet.

Power supply values

For either method, you'll need some fixed or calculated operating values for your specific power supply. The fixed values are:

- Maximum voltage = 26.3 V
- Source voltage = 19.7 V
- Load factor = 0.50 V/A
- Power type = DC (filtered/regulated)

The *maximum voltage* is the highest voltage measured at the NAC terminals. This value is not used in the calculations but is given so you can ensure appliance compatibility.

The *source voltage* is the theoretical operating minimum for the power supply and is calculated as 85% of 24 volts minus the diode drop.

The *load factor* is a measure of how the power supply voltage reacts when a load is applied. The load factor measures the additional voltage drop per ampere of current drawn by the load.

The *power type* reflects the type of power supplied to the NAC terminals at minimum voltage. The current draw of notification appliances can vary substantially with the type of power supplied: full-wave rectified (VFWR) or direct current (VDC). It is important to know the power type at minimum terminal voltage.

You’ll need to calculate the following values relating to your power supply and to the NAC circuit current. These are:

- Minimum voltage
- Voltage drop

The *minimum voltage* is the lowest voltage measured at the NAC terminals when the power supply is under the maximum load for that circuit (i.e. for the appliances that constitute the NAC.)

The *voltage drop* is the difference between the minimum voltage and 16 V. This value is for use with the worksheet only.

Worksheet method

Use this worksheet to determine the maximum cable length of a notification appliance circuit for a given number of appliances.

Use this worksheet only if all the appliances are regulated. That is, they must have a minimum operating voltage of 16 V. For other appliances, use the equation method described in the next section.

Worksheet 1: NAC cable length

		NAC1	NAC2	NAC3	NAC4	
Total operating current [1]						A
Load factor	×	0.50	0.50	0.50	0.50	V/A
Load voltage drop	=					V
Source voltage		19.7	19.7	19.7	19.7	V
Load voltage drop	−					V
Minimum voltage	=					V
Regulated appliance voltage	−	16.0	16.0	16.0	16.0	V
Voltage drop [2]	=					V
Total operating current	÷					A
Maximum resistance	=					Ω
Wire resistance (Ω/ft) [3]	÷					
Maximum wire length	=					ft
	÷	2	2	2	2	
Maximum cable length	=					ft

[1] Total of the maximum operating currents for all appliances as specified for DC power. See the appliance installation sheets for operating currents.

[2] This voltage drop is valid for regulated notification appliances only. For special application appliances, use the equation method described in the next section.

[3] Use the manufacturer's published wire resistance expressed in ohms per foot for the applicable temperature rating. For typical values, see Table 1 on page 40.

Equation method

Appliance operating voltage and current

Regulated notification appliances have an operating range from 16 V to 33 V. Use 16 V as the minimum appliance voltage when using regulated notification appliances.

When using special application appliances, refer to the installation sheets to determine the minimum appliance voltage required.

What if there are different types of appliances in the NAC, and each type has a different minimum operating voltage? In this case, use the *highest* minimum voltage required by any appliance.

The total current requirement for the appliances will be the sum of the individual maximum currents drawn by each appliance when using DC power. Use the maximum current for the appliance over the 16 V to 33 V range.

If all appliances draw the same maximum current, the total current is the maximum current multiplied by the number of appliances. If different appliance types have different maximum currents, the total current is the sum of the maximum current for each appliance type multiplied by the number of appliances of that type.

Wire resistance

Typical wire resistances are shown in the following table.

Table 1: Typical wire resistances

Wire gauge (AWG)	Resistance Solid uncoated copper		Resistance Stranded uncoated copper	
	Ω per foot	Ω per meter	Ω per foot	Ω per meter
12	0.00193	0.00633	0.00198	0.00649
14	0.00307	0.01007	0.00314	0.01030
16	0.00489	0.01604	0.00499	0.01637
18	0.00777	0.02549	0.00795	0.02608

Note: When performing these calculations, always refer to the actual cable supplier documentation and use the actual Ω/ft (or Ω/m) at the appropriate temperature for the cable being used.

Calculating cable length

To calculate the maximum NAC cable length:

1. Calculate the total current (Itot) as the sum of the maximum operating currents for all the appliances.

   Itot = ΣIa

   Where:
   Ia = appliance maximum current

   See the appliance installation sheets for Ia. Remember to use the maximum operating current specified for DC power.

2. Calculate the minimum voltage (Vm).

   Vm = Vs − (Itot × K)

   Where:
   Vs = source voltage
   Itot = total current (from above)
   K = load factor

   For the power supply, Vs is 19.7 V and K is 0.50 V/A.

3. Calculate the allowable voltage drop (Vd) between the power supply and the appliances.

   $\text{Vd} = \text{Vm} - \text{Va}$

   Where:
   Vm = minimum voltage (from above)
   Va = appliance minimum voltage

   For regulated notification appliances, Va is 16 V. For special application appliances, Va is the lowest operating voltage specified on the appliance installation sheet.

4. Calculate the maximum resistance (Rmax) for the wire.

   $\text{Rmax} = \text{Vd} / \text{Itot}$

   Where:
   Vd = voltage drop
   Itot = total current

5. Calculate the maximum length of the cable (Lc), based on the maximum resistance allowed, the resistance of the wire, and the number of wires in the cable (two).

   $\text{Lc} = (\text{Rmax} / \text{Rw}) / 2$

   Where:
   Rmax = maximum resistance
   Rw = wire resistance factor

Example: You're using regulated notification appliances. Assume that the maximum operating current for each appliance is 100 mA for DC power, and that 20 appliances will be placed on the NAC. The cable is 12 AWG wire, and the manufacturer specifies a wire resistance factor of 0.002 Ω/ft.

$$\begin{aligned} \text{Itot} &= \Sigma \text{Ia} \\ &= 20 \times 0.1\ \text{A} \\ &= 2\ \text{A} \end{aligned}$$

$$\begin{aligned} \text{Vm} &= \text{Vr} - (\text{Itot} \times \text{K}) \\ &= 19.7\ \text{V} - (2\ \text{A} \times 0.50\ \text{V/A}) \\ &= 19.7\ \text{V} - 1.0\ \text{V} \\ &= 18.7\ \text{V} \end{aligned}$$

$$\begin{aligned} \text{Vd} &= \text{Vm} - \text{Va} \\ &= 18.7\ \text{V} - 16.0\ \text{V} \\ &= 2.7\ \text{V} \end{aligned}$$

$$\begin{aligned} \text{Rmax} &= \text{Vd} / \text{Itot} \\ &= 2.7\ \text{V} / 2.0\ \text{A} \\ &= 1.35\ \Omega \end{aligned}$$

$$\begin{aligned} \text{Lc} &= (\text{Rmax} / \text{Rw}) / 2 \\ &= (1.35\ \Omega / 0.002\ \Omega/\text{ft}) / 2 \\ &= 675\ \text{ft} / 2 \\ &= 337.5\ \text{ft} \end{aligned}$$

So the maximum wire run for this NAC would be 337.5 ft (rounded down for safety).

Understanding Genesis signal synchronization

When using Genesis devices, the activation of visible and audible output circuits on BPS Series power supplies is determined by how the power supplies are connected. No matter how they are connected, their outputs are “in sync” but there is an output activation delay of either one or four seconds. This section details how BPS outputs work based on how they are connected.

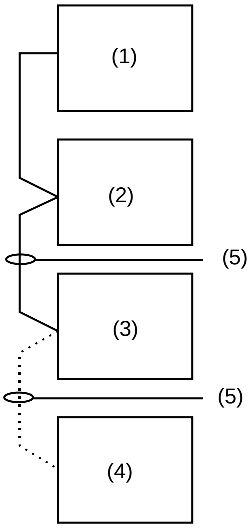
Connection of power supplies

Multiple BPS Series power supplies can be connected in parallel. How you connect the power supplies affects the synchronization of your system’s outputs.

BPS Series power supplies can be connected in parallel using their sense circuits. When connected via the sense circuits, all power supply NAC outputs have either a one- or four-second delay from the time the driver NAC turns on to the time the power supply NACs turn on.

The four-second delay does not comply with UL 864. The amount of delay is controlled by SW1-4. For more information, see “Synchronization delay (SW1-4)” on page 19.

Figure 34: BPS Series power supplies connected in parallel with sense circuits



(1)	NAC circuit	(4)	BPS Series x
(2)	BPS Series 1	(5)	Sense riser circuit
(3)	BPS Series 2		

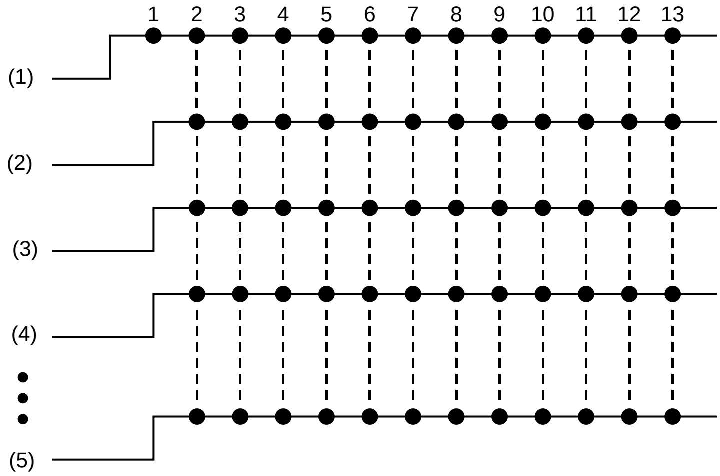
Notes

- To ensure all BPS Series power supplies are synchronized in a Genesis application, the driving NAC must provide the Genesis synchronization pulse. Therefore, the BPS Series power supplies must not be set to Genesis mode.
- The quantity of BPS Series power supplies that can be connected is limited by wire run length and available current.

Synchronization of visible outputs

In the figure below, all visible output circuits on each BPS activate with a one second delay. This requires that the BPSs be connected in parallel through their sense circuits.

Figure 35: Synchronization with a one second output activation delay



(1) On Sense Off
(2) Output booster 1
(3) Output booster 2
(4) Output booster 3
(5) Output booster *n*

Sync diagram key
● Strobe flash
⎍ Audible tone

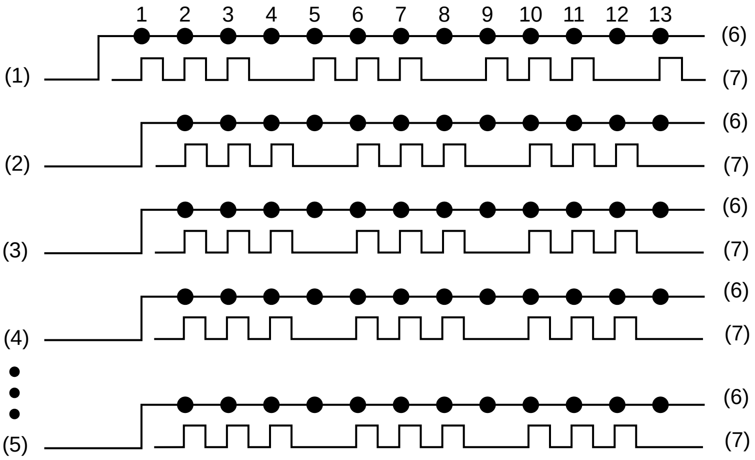
Synchronization of visible and audible outputs

One-second delay of outputs

In the figure below, all visible and audible circuits are synchronized with a one second output activation delay when the BPSs are connected in parallel through their sense circuits.

Note: Delay time is controlled by DIP switch SW1-4. For more information, see “Synchronization delay (SW1-4)” on page 19.

Figure 36: BPSs connected in parallel with sense circuits



(1)	On Sense Off
(2)	Output booster 1
(3)	Output booster 2
(4)	Output booster 3
(5)	Output booster *n*
(6)	Visible
(7)	Audible

Sync diagram key
● Strobe flash
⎍ Audible tone

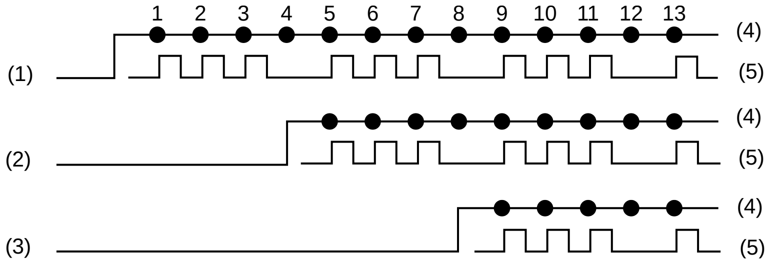
Four-second delay of outputs (temporal setting)

Note: Four-second delay operation does not comply with UL 864 9th edition.

In Figure 37 all visible and audible circuits are synchronized with a four second output activation delay when the BPSs are connected in parallel through their sense circuits.

Note: Delay time is controlled by DIP switch SW1-4. For more information, see “Synchronization delay (SW1-4)” on page 19.

Figure 37: BPSs connected in parallel with sense circuits



(1)	On Sense Off
(2)	Output booster 1
(3)	Output booster 2
(4)	Visible
(5)	Audible

Sync diagram key
● Strobe flash
⎍ Audible tone

Applications

Disclaimer: The applications in this section are shown in general terms. It is the responsibility of the installer and designer to adhere to the local and national codes when applying and installing the BPS.

Key

The following symbols and notations are found on the application diagrams in this section.

Device labels

Symbol	Description
V	Visible device
A	Audible device
G	Genesis visible/audible device
V/A	Visible or audible device
G	Device generating the Genesis sync pulse **Note:** When this symbol appears on a BPS, the Genesis sync pulse is controlled by DIP switch SW2-5.

BPS modes (controlled by DIP switch)

Notation	Description
COR	Correlate mode
GM	Genesis Master mode
ND	Nondelayed mode

NAC settings (controlled by DIP switch)

Notation	Description
SF	Sense follow
CONT	Continuous
Temp/Cal	Temporal/California
AUX	Auxiliary

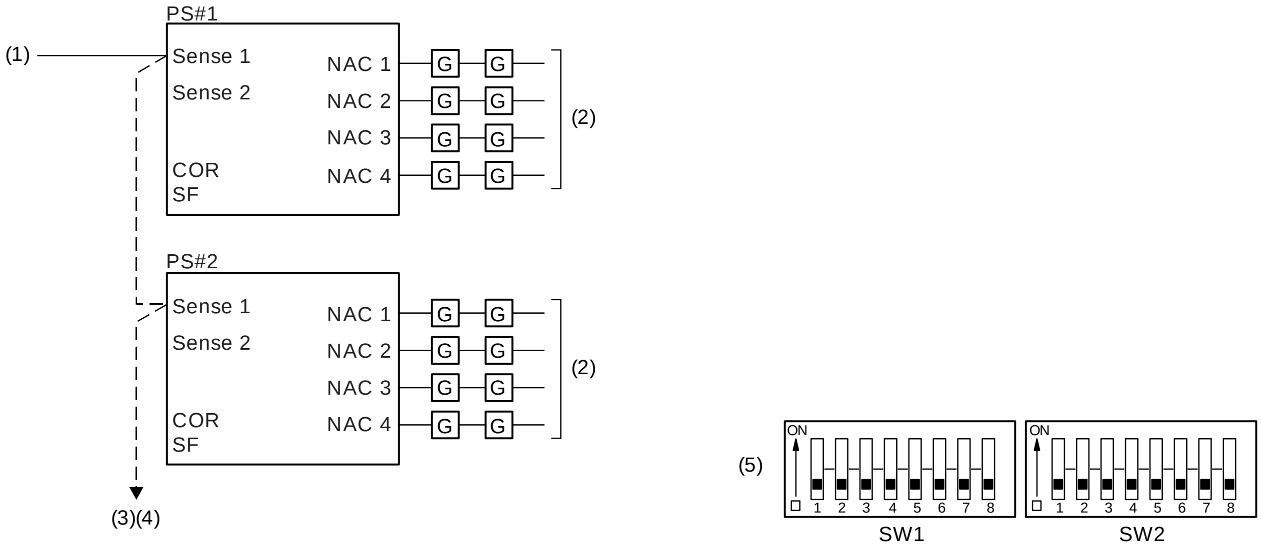
Genesis circuit notification

This application uses the Sense 1 input to turn all four NACS on and off. The common Genesis synchronized signal source provides signal synchronization across all BPS Series power supplies connected to the riser.

For this application:

- Set the output circuit type switches on each BPS Series power supply for Sense Follow NACs. See Figure 11 on page 16.
- Set the NAC operating mode switches on each BPS Series power supply for Correlated mode. See Figure 12 on page 17.
- Set SW2-5 to the OFF position.
- Connect Genesis horns, strobes, or combination horn/strobes to the NAC outputs.

Figure 38: Genesis circuit notification



(1) Genesis synchronized signal source
(2) To next device or 15 kΩ EOLR
(3) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source
(4) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(5) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

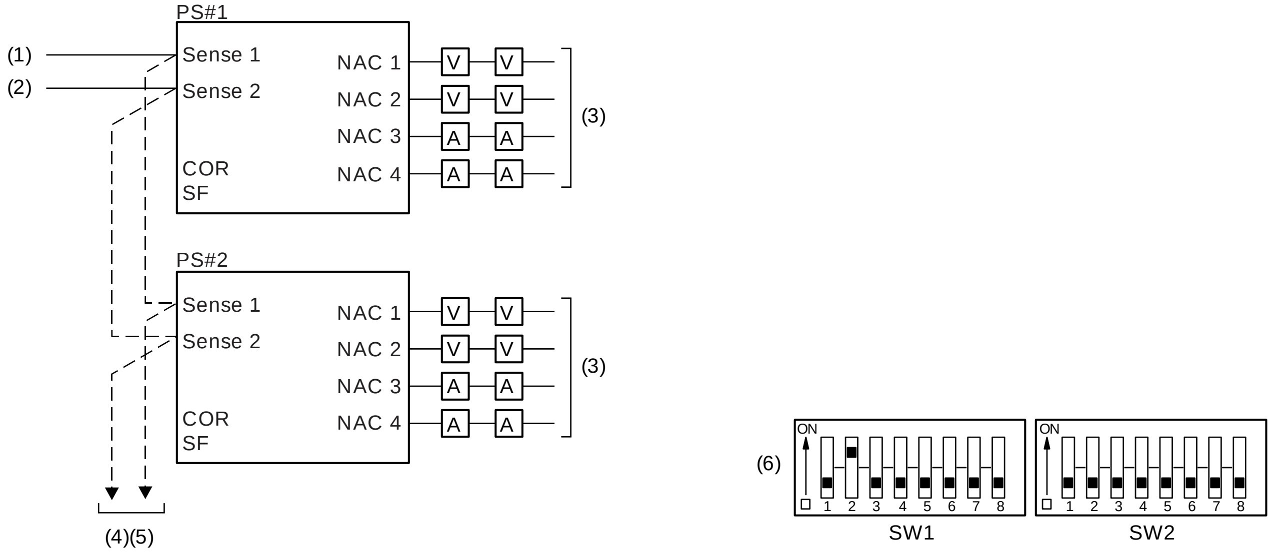
Conventional visible and audible circuit notification

This application uses a common visible signal riser on Sense 1 and a common audible signal riser on Sense 2 to turn on the NAC outputs on one or more BPS Series power supplies. See Figure 39 below.

For this application:

- Set the output circuit type switches on each BPS Series power supply for Sense Follow NACs. See Figure 11 on page 16.
- Set the NAC operating mode switches on each BPS Series power supply for Correlate mode with Sense 1 activating NACs 1 and 2, and Sense 2 activating NACs 3 and 4. See Figure 12 on page 17 and Figure 13 on page 18, respectively.
- Connect conventional strobes to NACs 1 and 2. Connect conventional temporal horns to NACs 3 and 4.

Figure 39: Conventional visible and audible circuit notification

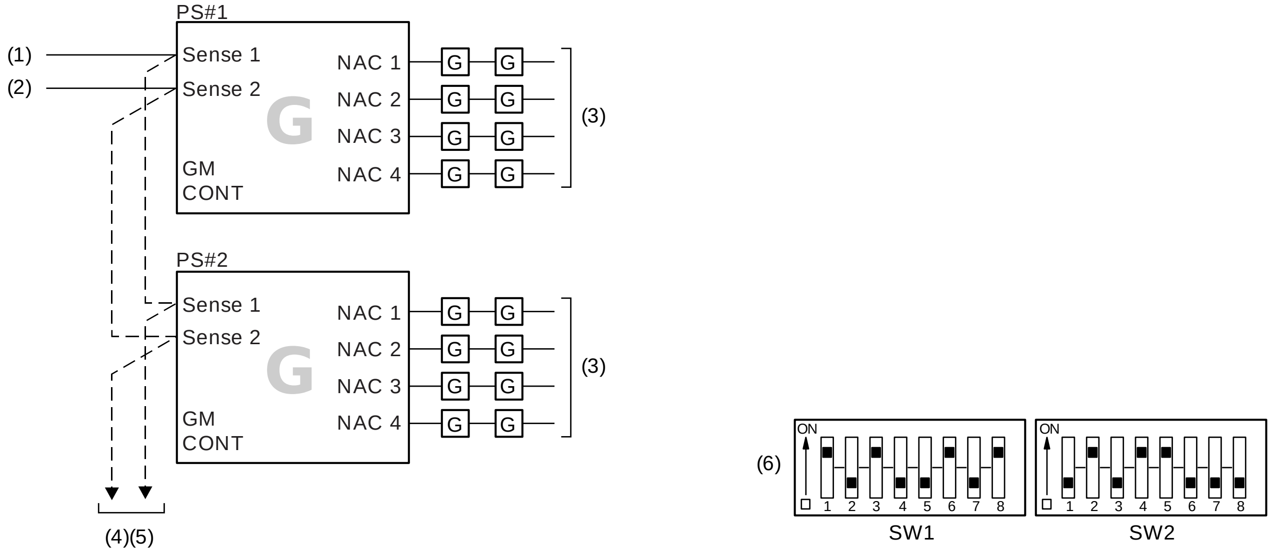


(1) Conventional visible signal riser source
(2) Conventional audible signal riser source
(3) To next device or 15 kΩ EOLR
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "“Specifications” on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see “Setting the DIP switches” on page 16.

Conventional visible and audible circuit to Genesis notification

This application uses the Sense 1 input to turn all four NACS on and off and the Sense 2 input to silence audible signals while leaving visible signals on. The BPS Series power supply provides signal synchronization and the audible on/off controls. Signal synchronization is on a per power supply basis.

Figure 40: Conventional visible and audible circuit to Genesis notification

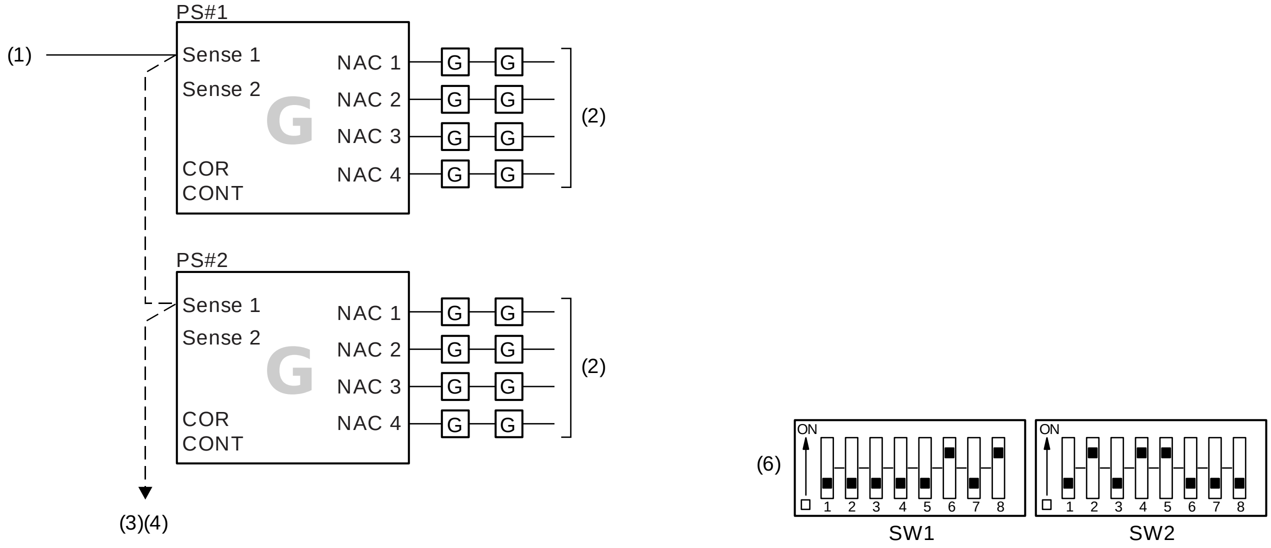


(1) Conventional visible signal riser source
(2) Conventional audible signal riser source
(3) To next device or 15 kΩ EOLR
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

Conventional audible or visible circuit to Genesis notification

This application uses the Sense 1 input to turn all four NACS on and off at the same time. The BPS Series power supply provides signal synchronization but does not provide audible on/off controls. Signal synchronization is on a per power supply basis.

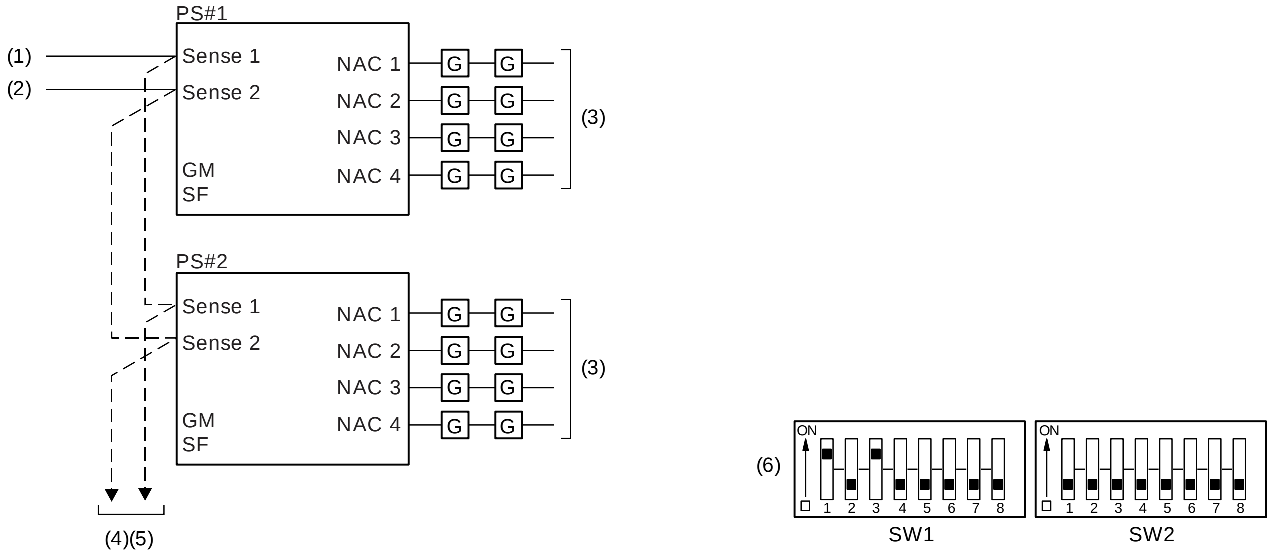
Figure 41: Conventional audible or visible circuit to Genesis notification



(1) Visible or audible signal riser source
(2) To next device or 15 kΩ EOLR
(3) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(4) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(5) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

Genesis visible circuit and conventional audible circuit to Genesis notification

Figure 42: Genesis visible circuit and conventional audible circuit to Genesis notification

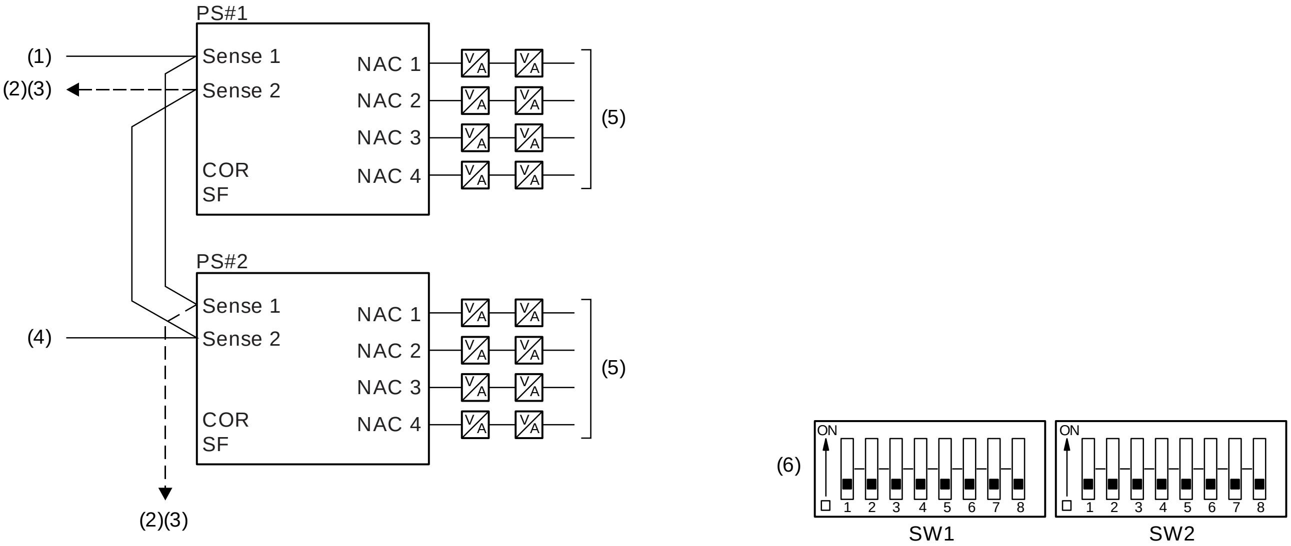


(1) Gensis visible signal riser source
(2) Conventional audible signal riser source
(3) To next device or 15 kΩ EOLR
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See “Specifications” on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see “Setting the DIP switches” on page 16.

Conventional split mode circuit with fault tolerance notification

Note: Fault tolerance can be increased by using Class A wiring

Figure 43: Conventional split mode circuit with fault tolerance

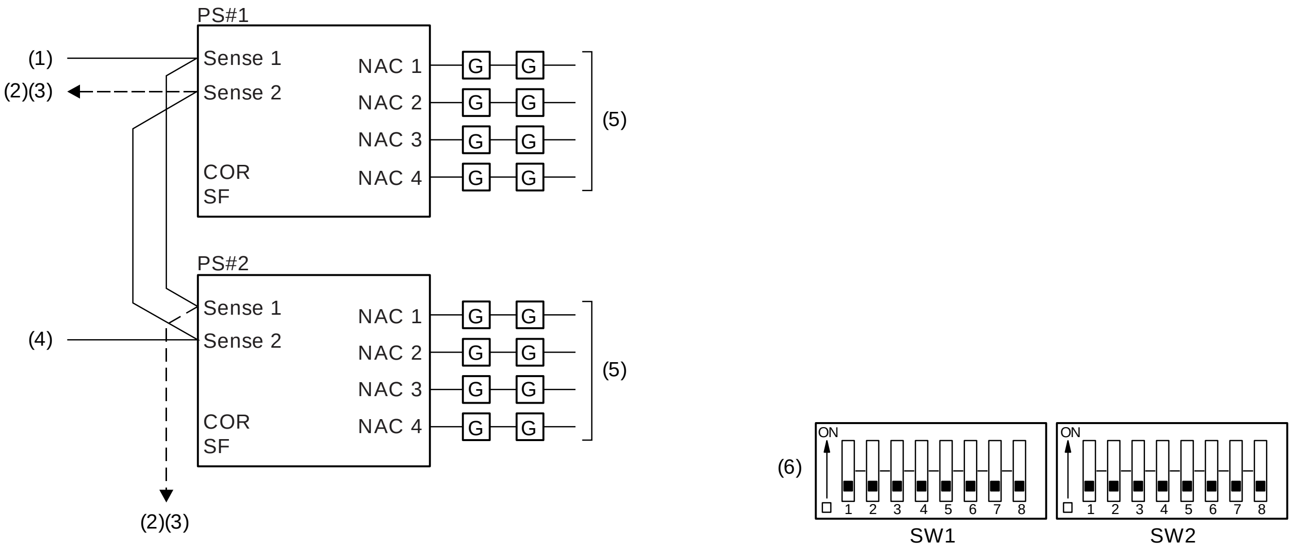


(1) Primary conventional audible or visible signal riser source
(2) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(3) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(4) Secondary (redundant) conventional audible or visible signal riser source
(5) To next device or 15 kΩ EOLR
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

Genesis split mode circuit with fault tolerance notification

Note: Fault tolerance can be increased by using Class A wiring

Figure 44: Genesis split mode circuit with fault tolerance



(1) Primary Genesis audible or visible signal riser source

(2) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.

(3) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.

(4) Secondary (redundant) Genesis audible or visible signal riser source

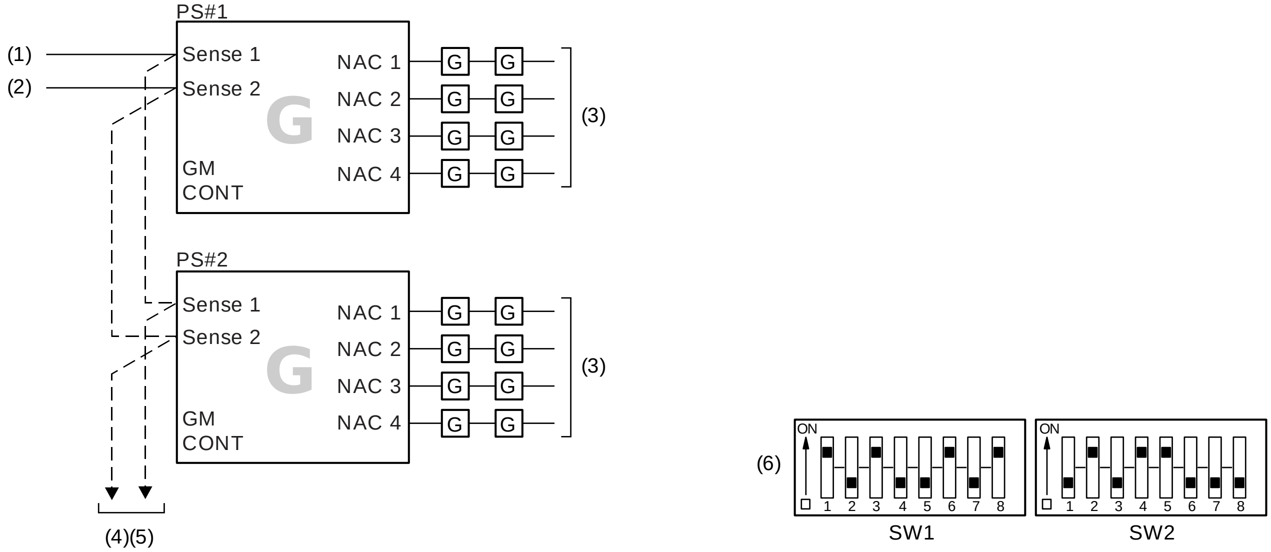
(5) To next device or 15 kΩ EOLR

(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

CDR-3 Coder to Genesis notification

In this application, use Genesis horns that are designed or configured for a steady (continuous) horn signal output.

Figure 45: CDR-3 Coder to Genesis notification

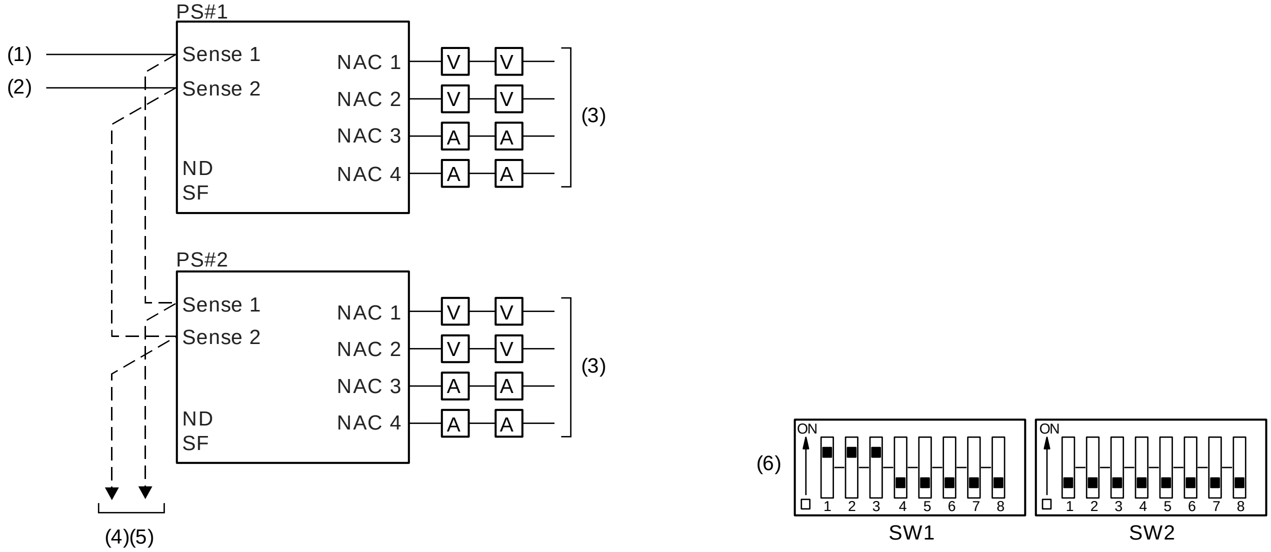


(1) Conventional visible signal riser source
(2) CDR-3/conventional audible signal riser source
(3) To next device or 15 kΩ EOLR.
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

CDR-3 Coder to conventional notification

In this application, use compatible horns that are designed or configured for a steady (continuous) horn signal output.

Figure 46: CDR-3 Coder to conventional notification

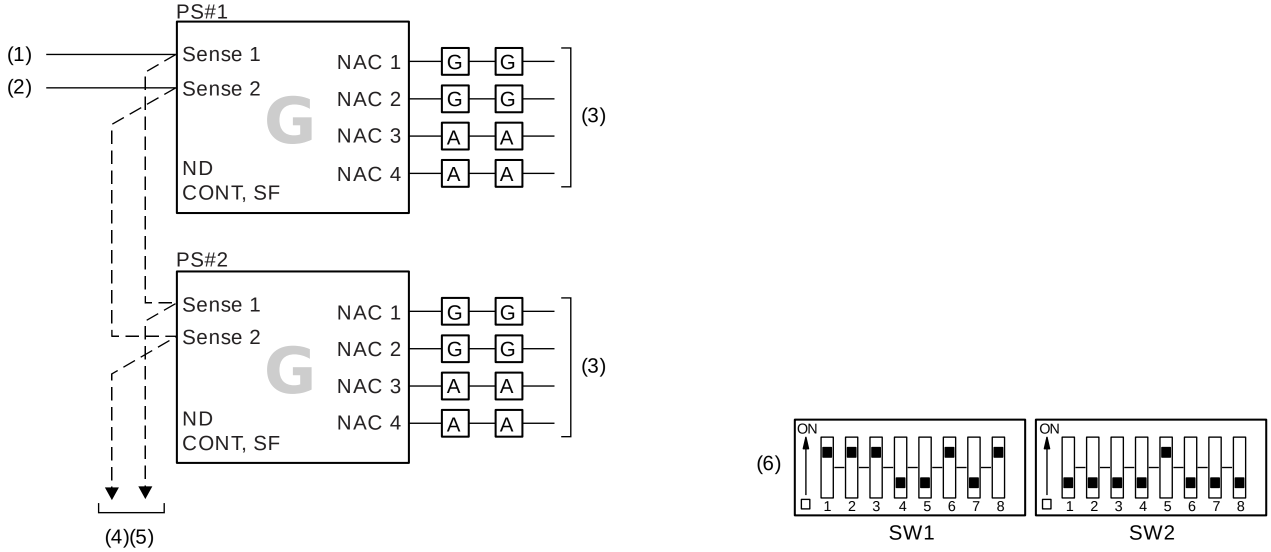


(1) Conventional visible signal riser source
(2) CDR-3/conventional audible signal riser source
(3) To next device or 15 kΩ EOLR
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

CDR-3 Coder to Genesis visibles and conventional audibles

In this application, NAC1 and NAC2 are configured for Continuous mode. NAC3 and NAC4 are configured for Sense Follow mode. SW2-5 is set to generate a sync pulse on the continuous-mode circuits.

Figure 47: CDR-3 Coder to Genesis visibles and conventional audibles

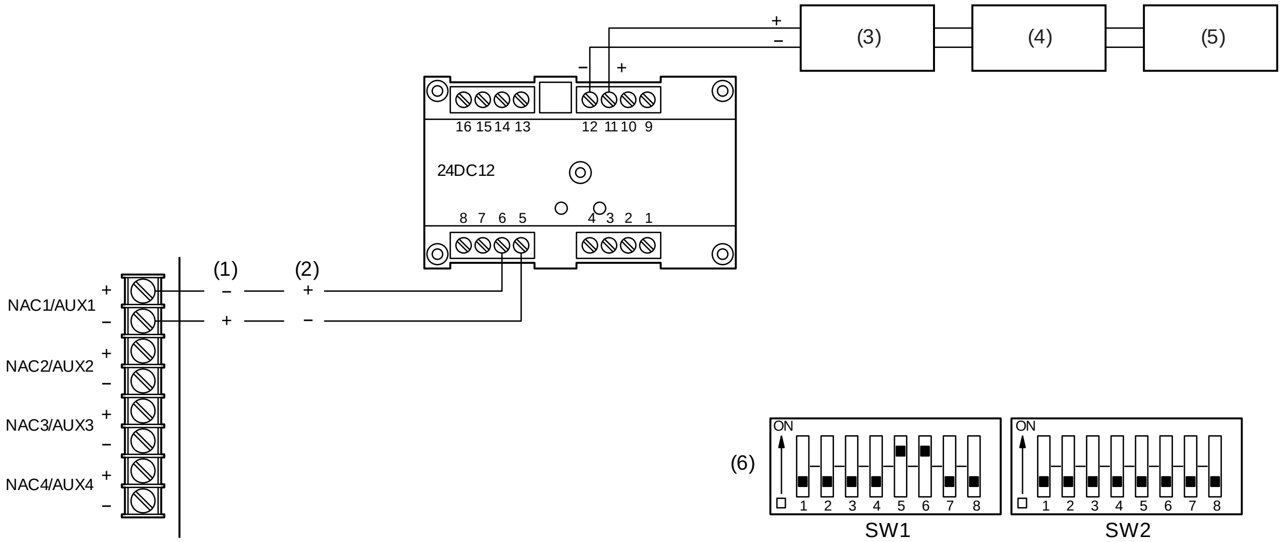


(1) Conventional visible signal riser source
(2) CDR-3 audible signal riser
(3) To next device or 15 kΩ EOLR
(4) To next BPS Series power supply sense circuit or EOL resistor. EOLR value is determined by the signal riser source.
(5) The maximum number of BPS Series power supplies that you can connect on a single sense circuit signal riser is determined by the signal riser's available current and wire run length. See "Specifications" on page 4 for sense input circuit current ratings.
(6) DIP switch settings. Use the same settings for each power supply. If other options are required, see "Setting the DIP switches" on page 16.

Security

In this application, 24 VDC is converted to 12 VDC for use with security devices.

Figure 48: Security 24VDC to 12VDC

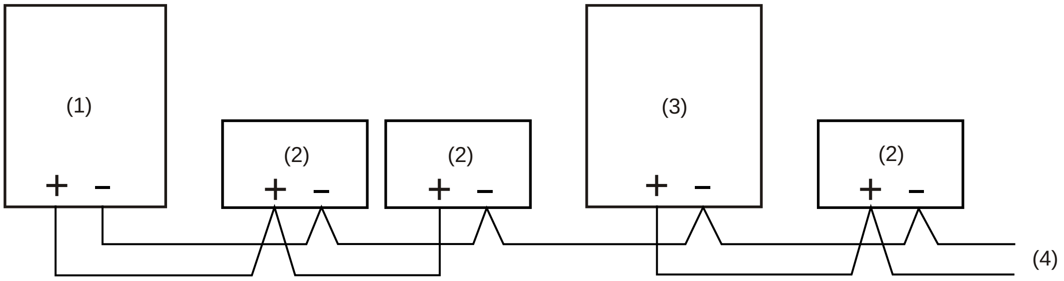


(1) Signal polarity when circuit is not active
(2) Signal polarity when circuit is active
(3) First security device
(4) Last security device
(5) End-of-line supervision circuit
(6) DIP switch settings. If other options are required, see “Setting the DIP switches” on page 16.

Access control power supply

Note: All references to Access Control applications and associated modules in this document are for repair and replacement units only. As of December 2, 2018, the products covered in this Manual are not listed to the UL 294 Standard for use in access control applications.

Figure 49: Access control power supply



(1) Control unit
(2) Card reader controller
(3) BPS Series power supply. Remove the power supply’s ground fault jumper. See “Ground fault detection jumper (JP3)” on page 12.
(4) To next device or end-of-line supervision circuit