Booster Power Supply Manual

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FCC WARNING	This equipment can generate and radiate radio frequency energy. If this 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 within 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, is required to take whatever measures may be required to correct the interference.
COMPATIBLE DEVICES	For a complete list of compatible devices, refer to P/N 85000-0285.

DOCUMENT HISTORY: P/N 270946

Date	Revision	Reason for change
June 1999	1.0	Initial release.
July 1999	2.0	Added note to AC power wiring diagram and updated specifications.

Content

Introduction

Models covered

Catalog number	Description
BPS6	6.5 Amp Booster Power Supply
BPS6220	6.5 Amp Booster Power Supply
BPS6C	6.5 Amp Booster Power Supply
MIRBPS6	6.5 Amp Booster Power Supply
MIRBPS6220	6.5 Amp Booster Power Supply
MIRBPS6C	6.5 Amp Booster Power Supply
XLS-BPS6	6.5 Amp Booster Power Supply
XLS-BPS6220	6.5 Amp Booster Power Supply
XLS-BPS6C	6.5 Amp Booster Power Supply
BPS10	10 Amp Booster Power Supply
BPS10220	10 Amp Booster Power Supply
BPS10C	10 Amp Booster Power Supply
MIRBPS10	10 Amp Booster Power Supply
MIRBPS10220	10 Amp Booster Power Supply
MIRBPS10C	10 Amp Booster Power Supply
XLS-BPS10	10 Amp Booster Power Supply
XLS-BPS10220	10 Amp Booster Power Supply
XLS-BPS10C	10 Amp Booster Power Supply

Description

The 10 Amp and 6.5 Amp Booster Power Supplies (BPS) are designed to extend a fire alarm panel's signaling capacity. The Booster can be connected to existing Class A or Class B Notification Appliance Circuits (NACs) or activated via Signature Series modules. There are four independent 3.0 Amp NAC circuits supervised in a non-alarm condition.

The Booster has a trouble relay that operates on any Booster trouble. The Booster contains a battery charger capable of charging up to two 10 amp hour, 12 V batteries to supply a total of 24 Vdc.

Specifications

AC line voltage: 6.5 amp Booster	 120 V / 220/240 Vac (50/60 Hz) 250 watts
10 amp Booster	120 V / 220/240 Vac (50/60 Hz) 375 watts
Sense voltage V (input)	10 V – 45 V DC or 14 V - 32 V FWR (unfiltered DC)
Sense current I (input)	6 mA @ 24 Vdc, 3 mA @ 12 Vdc, 12 mA @ 45 Vdc
NAC output voltage	24 V nominal (special application output use only)
NAC output current	3.0 A max. per circuit, 10 A/6.5 A max total all NACs
Wire size	18 - 12 AWG
NAC EOL	15 KΩ
Auxiliary supv. current	6 amps max. (3 amps max./circuit)
Auxiliary outputs	2 (programmable), replaces NACs
Auxiliary outputs disabled under battery	Optional – programmable after 30 seconds
Battery Requirements	Up to 10 AH
Battery charger current limit	1.0 A max.
Operating environment: Operating temperature Operating humidity	 32 to 120^{O} F (0 to 49^{O} C) 0 to 93% RH

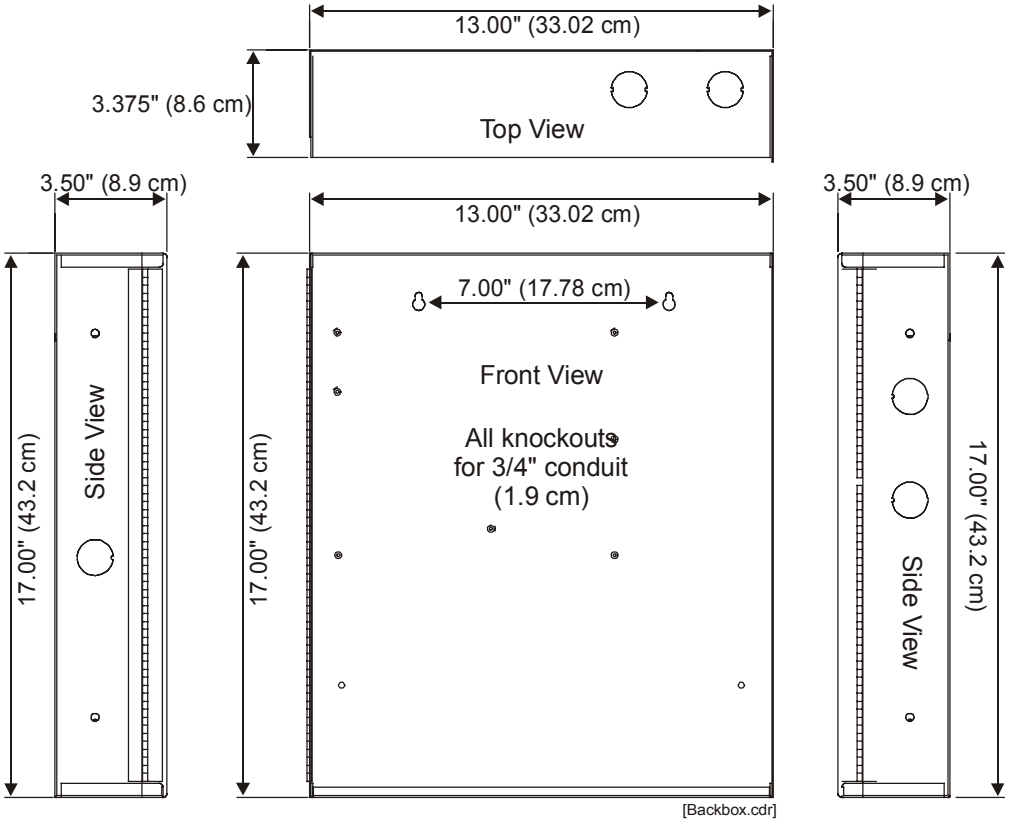
LED indicators

The Booster has six LED indicators. There are four NAC trouble LEDs, one battery trouble LED, and one ground fault LED.

Installing the enclosure

Be sure to follow all applicable national (NFPA 72) and local fire alarm codes and standards when installing this system.

Mount the backbox at the required location. A dedicated 120 Vac (220/240 Vac) 50/60 Hz circuit is required for power. Install all conduit and pull all wiring into the backbox before proceeding.

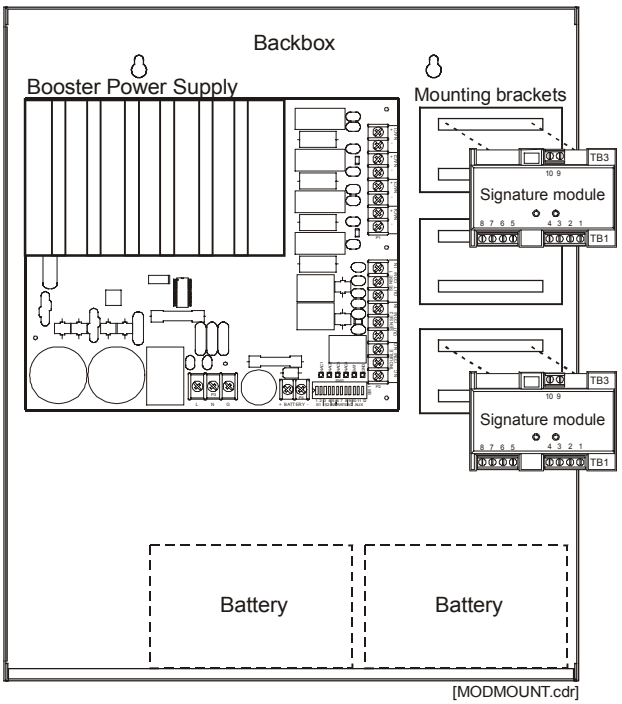


Mounting Signature Series modules

To mount Signature Series modules:

1. Remove the black bracket connected to the module.
2. Snap the module in one of the three provided brackets in the backbox.

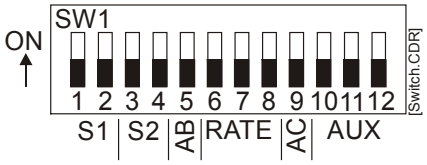
   Refer to the drawing below.



Configuring DIP switch setting options

DIP switch configuration

A 12-position DIP switch is used to configure NAC circuit options, AC power loss, auxiliary outputs, and Class A or B wiring. The following tables show the positions for each switch on the DIP switch for the various input, output, and panel configurations.



Sense 1 input
Switch SW1-1/2 (S1)

		Description	
SW1-1	**SW1-2**	**Class B**	**Class A**
OFF	OFF	Activates all NACs	Activates both NACs 1/2 and 3/4
ON	OFF	Activates NAC1 only	Activates NAC 1/2
OFF	ON	Activates NACs 1 & 2 only	Activates NAC 1/2
ON	ON	Activates NACs 1, 2 & 3 only	Activates both NACs 1/2 and 3/4

Sense 2 input
Switch SW1-3/4 (S2)

		Description	
SW1-3	**SW1-4**	**Class B**	**Class A**
OFF	OFF	Activates all NACs	Activates both NACs 1/2 and 3/4
ON	OFF	Activates NACs 2, 3, & 4 only	Activates NAC 3/4
OFF	ON	Activates NACs 3 & 4 only	Activates NAC 3/4
ON	ON	Activates NAC4 only	No NACs activated

Class A or B configuration
Switch SW1-5 (AB)

SW1-5	**Description**
ON	NACs Class A (JP1 and JP2 must be set to Class A)
OFF	NACs Class B (JP1 and JP2 must be set to Class B)

NAC output rate
Switch SW1-6/7/8 (RATE)

SW1-6	SW1-7	SW1-8	Description
OFF	OFF	OFF	All NACs follow sense input
ON	OFF	OFF	NAC1 is Temporal [3-3-3], all others follow sense input
OFF	ON	OFF	NAC1 & 2 are Temporal [3-3-3], all others follow sense input
ON	ON	OFF	NAC1, 2, & 3 are Temporal [3-3-3], NAC4 follow sense input
OFF	OFF	ON	All NACs are Temporal [3-3-3]
ON	OFF	ON	All NACs are 120 bpm
OFF	ON	ON	NAC1 & 2 are 120 bpm, NAC3 & 4 follow sense input
ON	ON	ON	NACs 1, 2, & 3 are 120 bpm, NAC4 follow sense input

AC power
Switch SW1-9 (AC)

SW1-9	Description
ON	AC power loss reporting delay is 6 hours
OFF	AC power loss is reported within 20 seconds

Auxiliary output setup
Switch SW1-10 (AUX)

SW1-10	Description
ON	NAC3 configured as an auxiliary output
OFF	NAC3 configured as NAC output circuit

Switch SW1-11 (AUX)

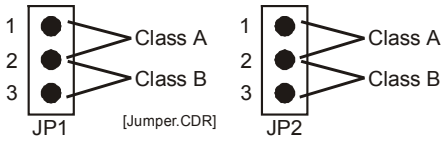
SW1-11	Description
ON	NAC4 configured as an auxiliary output
OFF	NAC4 configured as NAC output circuit

Switch SW1-12 (AUX)

SW1-12	Description
ON	Auxiliary outputs turn off 30 seconds after AC fail
OFF	Auxiliary outputs stay on after AC fail

Jumper configuration

JP1 and JP2 are used to select a Class A or Class B NAC wiring configuration. Both jumpers must be positioned to match the SW1-5 DIP switch selection (Class A or Class B).

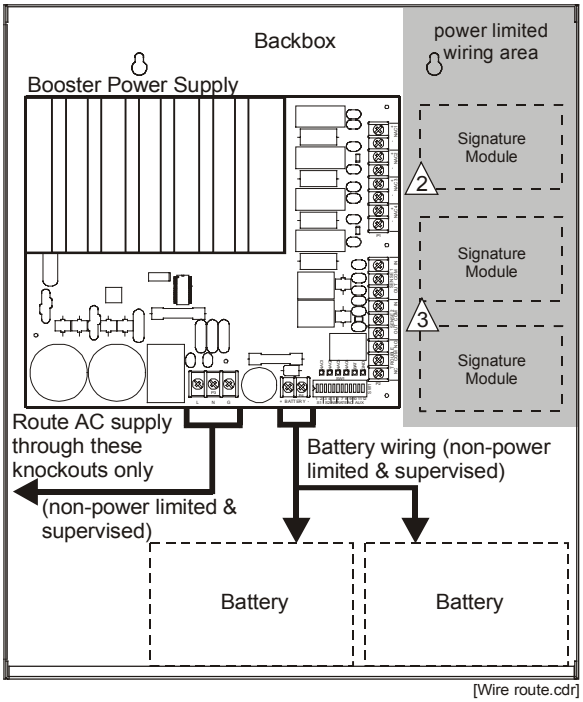


Wiring the Booster Power Supply

Wiring placement

To avoid noise, keep input wiring isolated from high current output and power limited wiring. Separate high current input/output from low current. Separate power limited from non-power limited wiring.

Wiring within the cabinet should be routed around the cabinet, not across the printed circuit board.



[Wire route.cdr]

Notes:

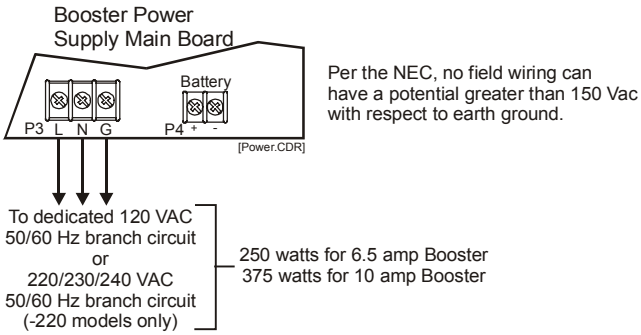
1. Maintain 1/4 in. (6 mm) spacing between power limited and non-power limited wiring or use type FPL, FPLR, or FPLP cable per NEC.

2. Power limited and supervised when *not* configured as auxiliary power. Non-supervised when configured as auxiliary power.

3. Source must be power limited. Source determines supervision.

4. When using larger batteries, make sure to position the battery terminals towards the door.

AC power wiring

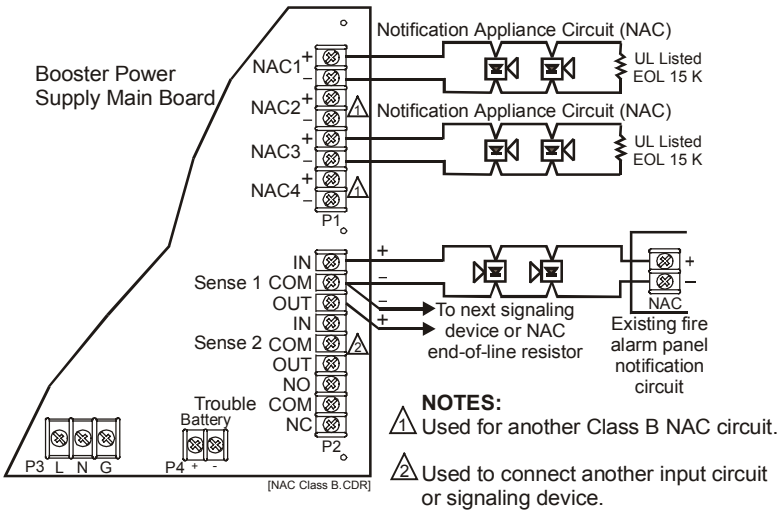


NAC Class B wiring

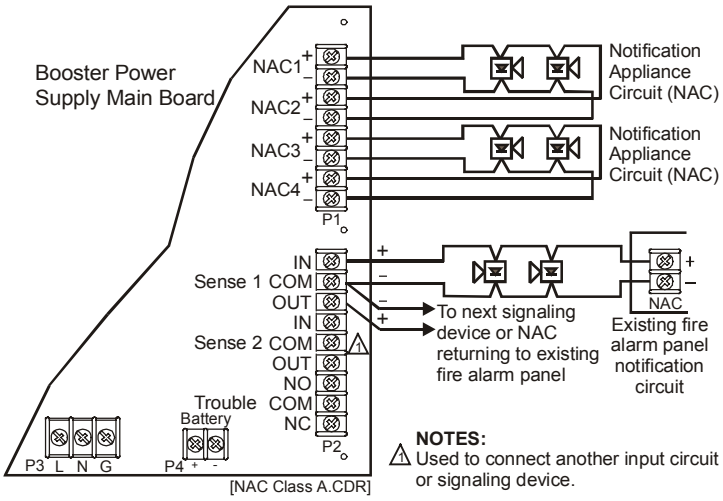
Note 1: A trouble on the Booster will be sensed on the existing fire panels NAC circuit causing an NAC trouble on that panel.

In an alarm condition, the Booster will allow NAC current to move downstream to devices connected to the existing fire panel's NAC circuit.

Note 2: Refer to the connected fire alarm control panel's documentation for more details on making NAC wiring connections.

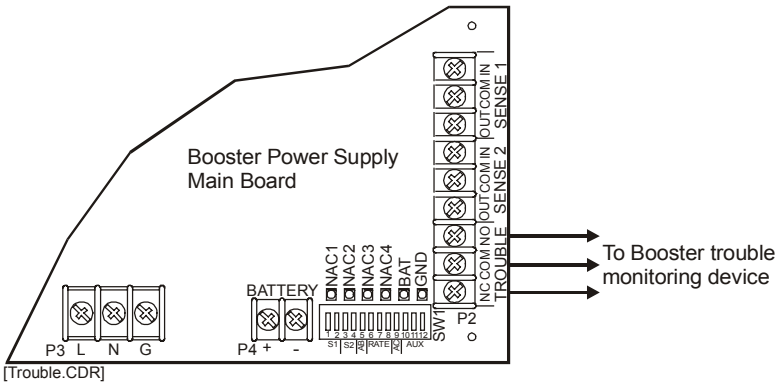


NAC Class A wiring



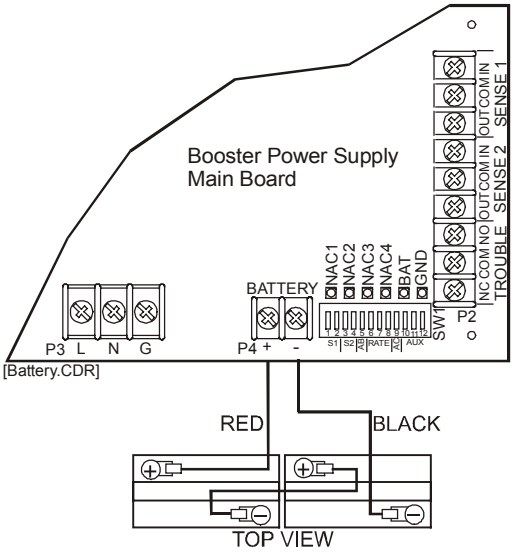
Trouble relay wiring

The Booster Power Supply has a Form C trouble relay that provides a normally open and normally closed contact. The trouble relay will deactivate under any trouble condition. A 16-second delay is used on the trouble relay for AC fail and brownout troubles.



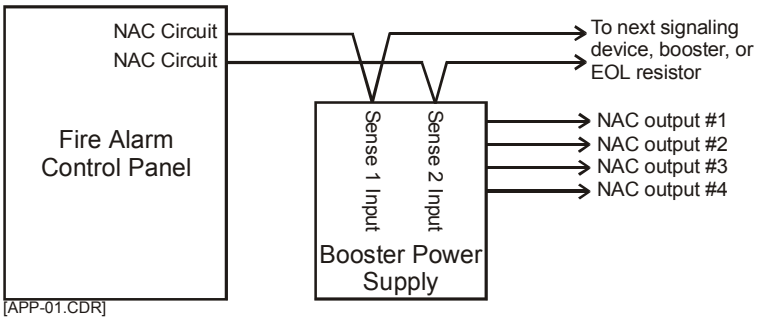
Battery wiring

Two backup batteries are required with the Booster Power Supply. Use 12 Vdc, up to 10 AH batteries. Batteries should be replaced every five years. The diagram below depicts proper battery wiring.

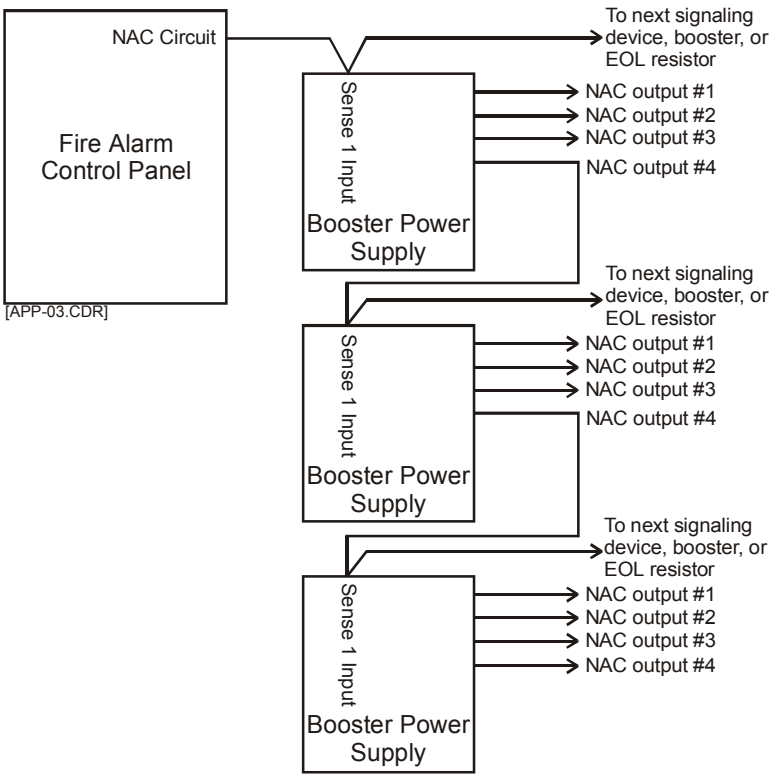


Applications

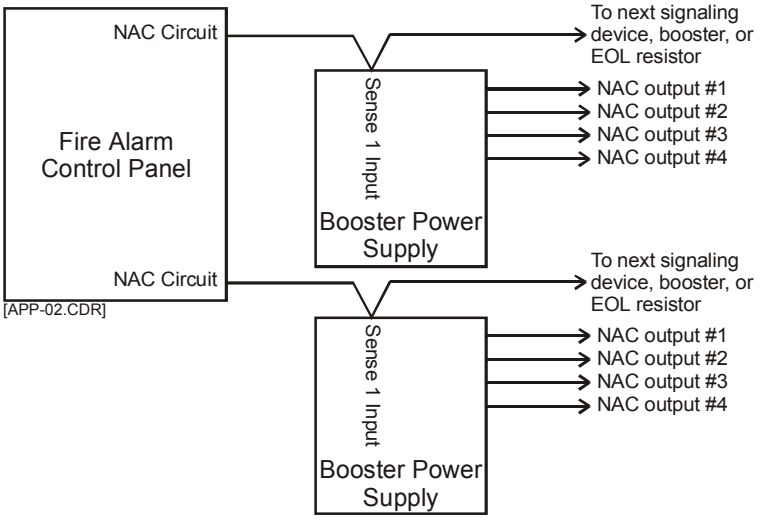
NAC circuit power applications



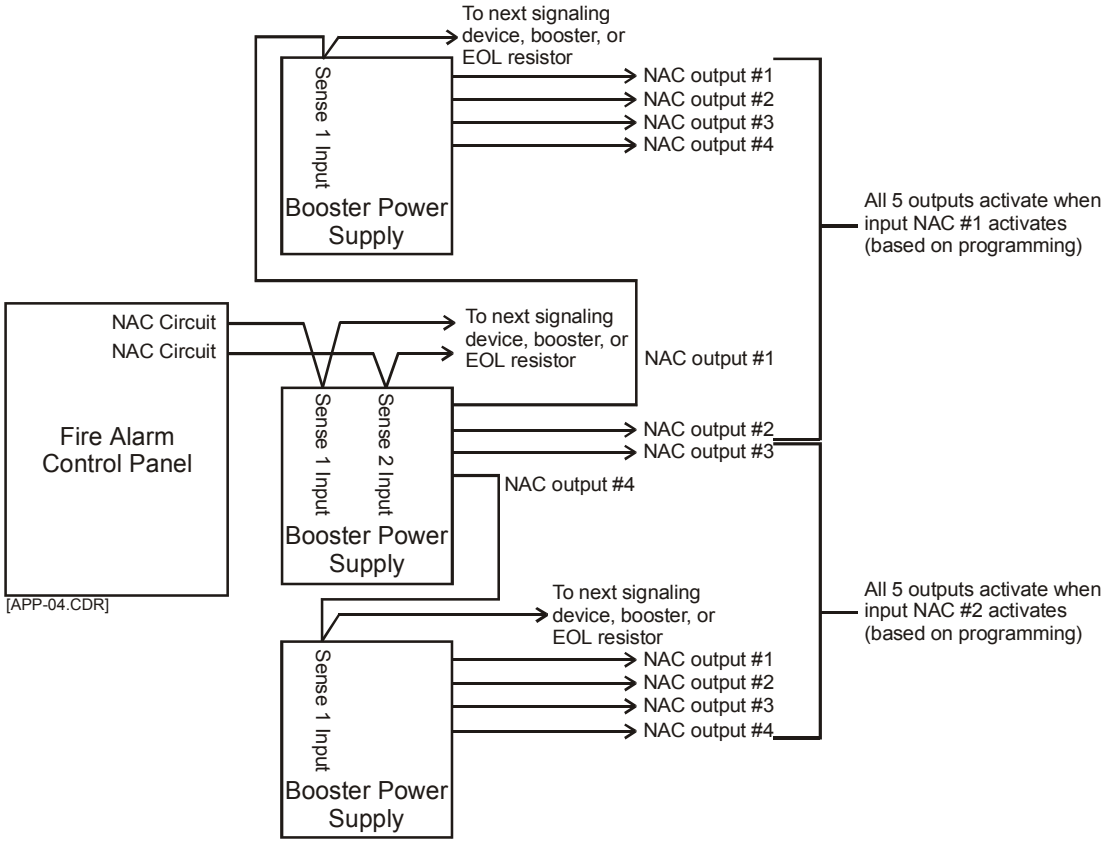
Inputs activate NAC outputs based on programming



One fire alarm control panel activating three Boosters in series



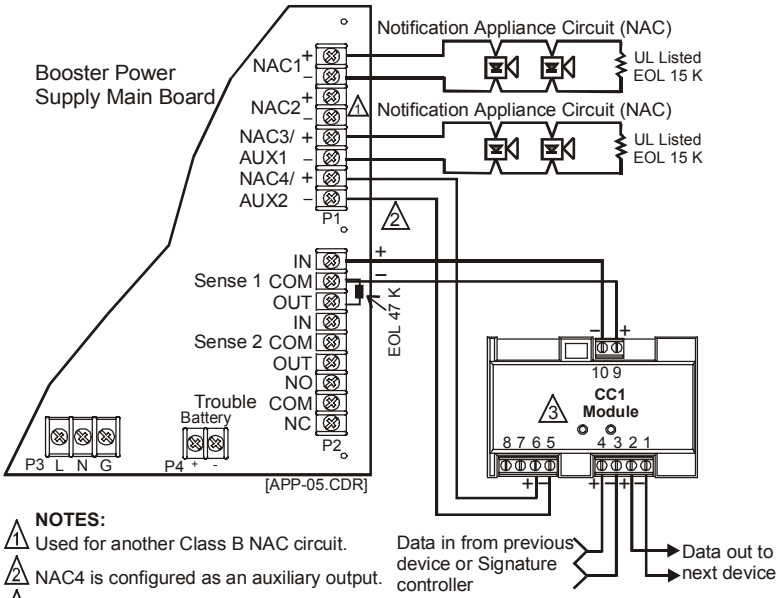
One fire alarm control panel activating two Boosters



Each fire alarm control panel NAC activates five output circuits

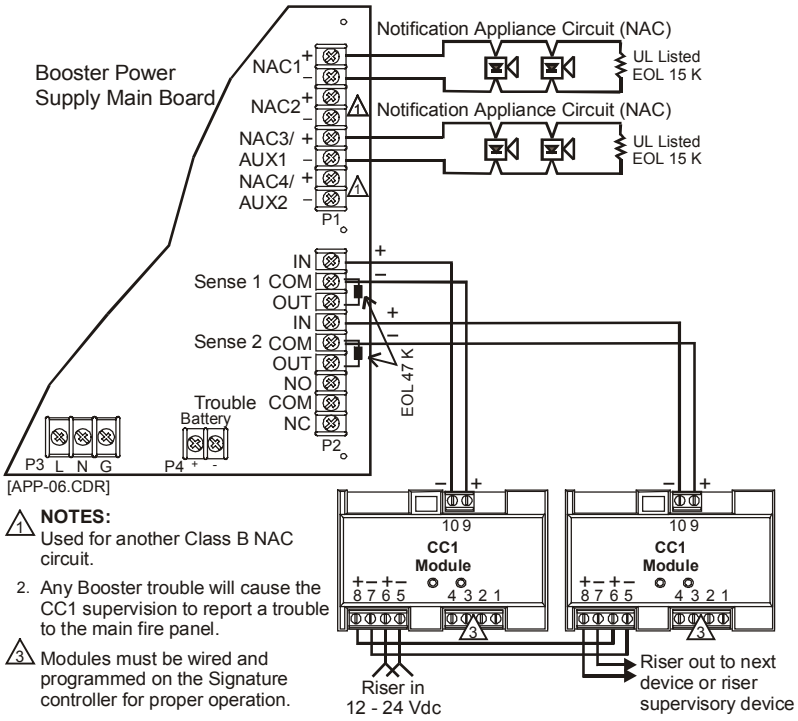
NAC applications using Signature Series modules

Note: These applications show Signature Series CC1 module connections. However, other Signature Series signal modules can be used. A maximum of 10 modules are allowed per NAC. The maximum total for parallel EOL's is 4.7 K.



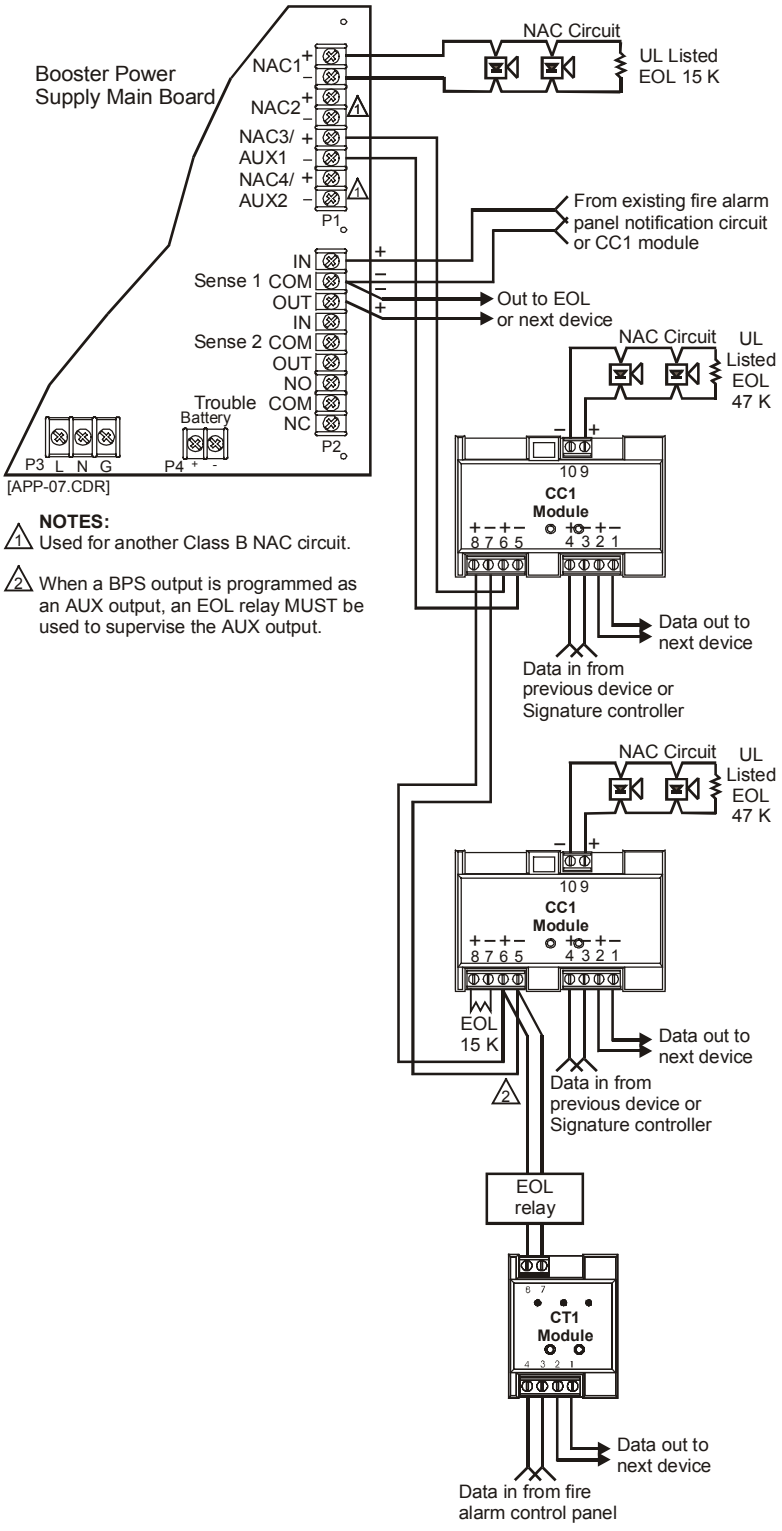
NOTES:

1. Used for another Class B NAC circuit.
2. NAC4 is configured as an auxiliary output.
3. CC1 wiring must be within 3 feet of the Booster wiring and in conduit or mounted within the Booster's enclosure.
4. Any Booster trouble will cause the CC1 supervision to report a trouble to the main fire panel.



NOTES:

1. Used for another Class B NAC circuit.
2. Any Booster trouble will cause the CC1 supervision to report a trouble to the main fire panel.
3. Modules must be wired and programmed on the Signature controller for proper operation.


Booster Power
Supply Main Board
NAC1
NAC2
NAC3/
AUX1
NAC4/
AUX2
P1
IN
Sense 1 COM
OUT
IN
Sense 2 COM
OUT
NO
Trouble COM
NC
P2
Battery
P3 L N G
P4 + -
[APP-07.CDR]
NAC Circuit
UL Listed
EOL 15 K
From existing fire alarm
panel notification circuit
or CC1 module
Out to EOL
or next device
NAC Circuit
UL
Listed
EOL
47 K
CC1
Module
10 9
8 7 6 5
4 3 2 1
Data out to
next device
Data in from
previous device or
Signature controller
NAC Circuit
UL
Listed
EOL
47 K
CC1
Module
EOL
15 K
Data out to
next device
Data in from
previous device or
Signature controller
EOL
relay
CT1
Module
Data out to
next device
Data in from fire
alarm control panel
NOTES:
Used for another Class B NAC circuit.
When a BPS output is programmed as
an AUX output, an EOL relay MUST be
used to supervise the AUX output.

Battery calculation worksheet

Auxiliary devices **Note:** Only add auxiliary current if SW1-12 is OFF. (Auxiliary output stays on after AC power failure.				
Device type	**Quantity**	**Auxiliary current (mA)**	**Total / device**	
Total Aux.				A (mA)

NAC devices **Note:** Use strobe 20.4 V current rating for calculations.				
Device type	**Qty**	**Alarm current (mA)**	**Total alarm**	
Total NAC Alarm Current				B (mA)

Supervisory Current Calculation

Supervisory current	70 + A (if SW1-12 = OFF)	=		(mA)
Supervisory Hours	(i.e. 24,60)	X		(Hr)
Supervisory battery required (mAHr)		=		C (mAHr)

Alarm Current Calculation

Alarm Minutes	(i.e. 5 min.)	=		D (min)
Alarm Hours	(D/60)	=		E (Hr)
Alarm current	190 + A (if SW1-12 = OFF) + B	=		(mA)
Alarm Hours		X		E (Hr)
Alarm battery required (mAHr)		=		F (mAHr)

Total Battery Requirement

Total Amp-Hour Battery Size	$\frac{[(1.11 \times C) + (2 \times F)]}{1000}$	=		10 AH Max.

24 Vdc Notification Appliance Circuit (NAC) specifications

Note: No "T" tapping permitted.

Typical cable pair resistances

Wire size	Resistance per 1,000 feet
12 AWG	3.5 Ω
14 AWG	5.2 Ω
16 AWG	8.0 Ω
18 AWG	13.0 Ω

The NAC cable must be a minimum 18 gauge. Distance limits are determined using the maximum allowable circuit resistance and cable manufacturer's specifications. Restrictions apply when calculating the wire size for the NACs:

1. Minimum supply voltage available is 18.9 V.
2. Minimum required circuit voltage at any NAC is 17 Vdc.
3. Maximum alarm current required for all NACs.

Using Ohm's law, the NAC current requirement, and a voltage drop of 1.9 volts (18.9 - 17), the maximum allowable NAC resistance is determined as follows:

$$R_{max} = \frac{V_{drop}}{I_{max}}$$

R_{max} = Maximum allowable NAC resistance
I_{max} = Maximum NAC current requirement
V_{drop} = Maximum allowable voltage drop from power supply to NAC

Using this formula, the maximum permissible circuit resistance for a loaded (2.5 A) circuit is 0.76 Ω as follows:

$$0.76\ \Omega = \frac{1.9\ V}{2.5\ A}$$

Using the Load vs. Distance table, the maximum allowable length (D) of any listed wire gauge pair is determined as follows:

$$D = \frac{R_{max}}{R_{/1000'PAIR}} \times 1000$$

D = Distance in feet
R_{max} =Maximum allowable wire resistance
$R_{/1000'\ PAIR}$ = wire resistance per 1000' pair

Using this formula, the maximum length of a loaded (2.5 A) NAC using a pair of 14 AWG wires is:

$$146.1' = \frac{0.76}{5.2} \times 1000$$

146 feet is the maximum length of a loaded (2.5 A) NAC branch circuit using a pair of 14 AWG wires.

Quick reference table (load vs distance NAC circuit (1.9 volt drop)

Load current	Maximum distance to last appliance, in feet (meters)			
	12 AWG	**14 AWG**	**16 AWG**	**18 AWG**
0.1 A	5,428 (1656)	3,654 (1114)	2,375 (724)	1,461 (446)
0.25 A	2,171 (662)	1,461 (446)	950 (290)	585 (178)
0.50 A	1,086 (331)	731 (223)	475 (145)	292 (89)
0.75 A	714 (218)	487 (148)	312 (95)	192 (58)
1.0 A	543 (165)	365 (111)	237 (72)	146 (44)
1.5 A	360 (110)	243 (74)	157 (48)	97 (29)
2.0 A	271 (83)	183 (56)	119 (36)	73 (22)
2.5 A	217 (66)	146 (44)	95 (29)	58 (18)
3.0 A	180 (55)	122 (37)	79 (24)	48 (15)