



by Honeywell

# GFPS-9 Supplementary Notification Appliance Circuit Module Installation Manual

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## Section 1

# Introduction

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The GFPS-9 is a notification appliance circuit and auxiliary power expander that provides up to 9 amps of filtered, 24 volt power for powering notification appliances and auxiliary devices. The GFPS-9 provides its own AC power connection, battery charging circuit, and battery connections. Used with security and fire alarm control panels, the GFPS-9 enables you to connect and distribute power to many more devices than your panel may normally allow.

- **Input Configurations**

The GFPS-9 has two optically isolated signaling inputs that provide the signal connection from the main control panel to the GFPS-9 (see Section 3.2 for more details).

- **Output Configurations**

The GFPS-9 has four power-limited notification appliance circuits that can be configured in various combinations of Class A and Class B circuits (see Section 3.3 for details).

- **Auxiliary Power Configurations**

The GFPS-9 has a dedicated, power-limited, auxiliary output that can be configured in two different ways. The auxiliary output can either be non-resettable (always on), or configured to switch off during the AC power failure to conserve the battery standby power. When the auxiliary power is configured to switch off, there is a 30 second delay before the auxiliary power is turned off after the AC power fails (see Section 4.8.4 for details).

- **Form C Trouble Relay**

The GFPS-9 includes a general trouble relay that will de-energize for any trouble situation. (see Section 4.4.1 for details).

- **Earth Fault Detection**

The GFPS-9 monitors for earth faults to the system power or system ground. When detected, the system DE-energizes the trouble relay and the input supervision relays (see Section 5.2 for details).

- **ANSI Temporal Code**

The GFPS-9 provides two configuration options that will drive outputs with the ANSI temporal code if the inputs are on constantly (see Section 4.8.1 for details).

- **Supports Synchronized appliances**

The GFPS-9 provides configuration options that will eliminate the need for synchronized modules when using AMSECO, Faraday, Gentex, System Sensor, or Wheelock synchronization appliances.

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## Section 2

# UL Requirements

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When installed in accordance with NFPA 70 and NFPA 72 standards, the GFPS-9 can be connected to UL Listed devices.

The GFPS-9 is also listed to meet UL 864, UL 2572 and power limiting requirements.

The GFPS-9 is compatible with any UL listed control unit utilizing reverse polarity supervised notification appliance circuits, using 24 VDC regulated outputs.

## Section 3

# System Overview

### CAUTION

Each output circuit is rated at 3 amps. DO NOT OVERLOAD. Overloading a circuit will cause it to shut down (power limit). The circuit will automatically reset once you remove the overload condition.

## 3.1 Terminal Descriptions and Electrical Ratings

Terminal #	Description	Ratings
TB1		
1	AC (black--“hot”)	120 VAC 60 Hz, 3A
2	Earth Ground	
3	AC (white--“neutral”)	
TB2		
1	Auxiliary Power (-)	27.4 VDC 3.0 amps
2	Auxiliary Power (+)	
3	Notification 4 Output (-)	27.4 VDC 3.0 amps
4	Notification 4 Output (+)	
5	Notification 3 Output (-)	27.4 VDC 3.0 amps
6	Notification 3 Output (+)	
7	Notification 2 Output (-)	27.4 VDC 3.0 amps
8	Notification 2 Output (+)	
9	Notification 1 Output (-)	27.4 VDC 3.0 amps
10	Notification 1 Output (+)	
11	Normally Closed contact	2.5 A @ 250 VAC or 2.5 A @ 30 VDC
12	Common	
13	Normally Open contact	
14	Input 2	9 - 30 VDC
15	Input 2 (-)	
16	Input 2 (+)	
17	Input 1	9 - 30 VDC
18	Input 1 (-)	
19	Input 1 (+)	

Although each output is rated for 3 amps, the total current draw from the 4 outputs and the auxiliary power must not exceed 9 amps.

## 3.2 Signal Input Terminals

Terminals 14 through 19 are polarized signal input terminals. They provide the signaling connection from the

main panel to the GFPS-9. See Figure 4-2 for more details.

The main panel supervises its notification appliance circuits used for communicating with the GFPS-9 the same way it supervises ordinary notification appliance circuits. The signal inputs on the GFPS-9 monitor the polarity of the voltage coming from the main panel’s notification appliance circuits to determine when to operate the notification appliance circuits on the GFPS-9. The GFPS-9 emulates the trouble behavior of a normal notification appliance circuit by interrupting the EOL supervision current for internal or output trouble conditions on the GFPS-9.

Note that the GFPS-9 will accurately sense the polarity of the main panel’s notification appliance circuits to drive the outputs whether or not the supervision connection is intact. The following situations will disconnect the EOL supervision at the signal inputs and indicate a trouble condition:

- Low AC power
- Low Battery condition
- Earth ground fault to the system power or system ground
- Auxiliary output power-limited condition
- EOL supervision trouble or power-limited condition at an output

Trouble conditions will not necessarily occur for both inputs when the trouble is specific to a particular output. Only the signal input controlling the output circuit that is in trouble will indicate a trouble condition. Below are examples where both inputs do NOT indicate trouble for a trouble occurring at only one output circuit.

Example 1: If input 1 controls all four outputs, a fault on any output will cause input 1 to indicate trouble. The fault does not affect input 2.

Example 2: If input 1 controls outputs 1 and 2, and input 2 controls outputs 3 and 4, a fault condition on output 3 or 4 will cause input 2 to indicate trouble. The fault does not affect input 1.

**Note:** *Once the inputs are driven with forward polarity to activate the outputs, the main control panel will not be able to sense trouble conditions through its notification appliance circuit connected to the GFPS-9 input circuits. Use the GFPS-9 trouble relay when it is necessary to monitor trouble conditions and active alarm conditions at the same time.*

Section 6 explains the significance of each trouble condition in more detail.

### 3.3 Notification Appliance Circuit Terminals

Terminals 3 through 10 are the notification appliance circuit output terminals. Each of the four circuits are rated at 3 amps, although you can only draw a total of 9 amps from the GFPS-9. The GFPS-9 outputs are short-circuit protected (power limited) according to UL 864 standards. Overcurrent indicators are yellow LEDs. The output voltage can vary depending on the load and input voltage.

The four power-limited NAC outputs can be configured as follows:

- Four Class B circuits      •Faraday synchronized outputs
- Two Class A circuits      •Gentex synchronized outputs
- One Class A and two Class B circuits •System Sensor synchronized outputs
- Class B, ANSI temporal-coded circuits •Wheelock synchronization outputs
- AMSECO synchronized outputs

One or both GFPS-9 signal inputs control the NAC outputs, depending on the specific configuration setup. Possible configurations for the GFPS-9 are:

For Option:	These Inputs:	Control These Outputs:	As:
1	Input 1	All outputs	Class B circuits

<b>For Option:</b>	<b>These Inputs:</b>	<b>Control These Outputs:</b>	<b>As:</b>
2	Input 1 or Input 2	Outputs 1, 2, 3, and 4	Class B ANSI temporal- coded circuits
3	Input 1 Input 2	Outputs 1 and 2 Outputs 3 and 4	Class B circuits Class B circuits
4	Input 1 Input 2	Output 1 Outputs 2, 3, and 4	Class B circuits Class B circuits
5	Input 1	Outputs 1-2 and 3-4	Class A circuit pairs
6	Input 1 Input 2	Outputs 1 and 2 Outputs 3 and 4	Class B ANSI temporal-coded circuits Class B circuits
7	Input 1 Input 2	Outputs 1-2 Outputs 3-4	Class A circuit pair Class A circuit pair
8	Input 1 Input 2	Outputs 1-2 Outputs 3 and 4	Class A circuit pair Class B circuits
9	Input 1 (Strobe Control) Input 2 (Audio Control)	All outputs	Class A or Class B Faraday Sync. Output
10	Input 1 (Strobe Control) Input 2 (Audio Control)	All outputs	Class A or Class B Gentex Sync. Output
11	Input 1 (Strobe Control) Input 2 (Audio Control)	All outputs	Class A or Class B System Sensor Sync. Output
12	Input 1 (Strobe Control) Input 2 (Audio Control)	All outputs	Class A or Class B Wheelock Sync. Output
13	Input 1 (Strobe Control) Input 2 (Audio Control)	All outputs	Class A or Class B Amseco Sync. Output

You can select which input controls which output, and which inputs are Class A and Class B using the 7-position DIP switch on the printed circuit board. Section 4.8 for DIP switch settings.

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## Section 4 Installation

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Before installing the GFPS-9, the AC input must first be wired into the building's main electrical power through the TB1 terminals (see Figure 4-2). Shut off the electrical power to the GFPS-9, and then complete the general installation of the GFPS-9 using the information in this section.

### 4.1 Mounting

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Mount the GFPS-9 in locations that meet the following temperature and humidity requirements. Do not expose the panel to conditions outside these ranges. For use in indoor, dry environments.

Temperature	0° C-49° C (32° F-120° F)
Humidity	10%-93% at 30° C (86° F) noncondensing

When mounting on interior walls, use appropriate screw anchors in plaster. When mounting on concrete, especially when moisture is expected, first attach a piece of 3/4-inch plywood to the concrete surface. Attach the GFPS-9 to the plywood.

#### 4.1.1 Preventing Water Damage

Water damage to the fire system can be caused by moisture entering the cabinet through the conduits. Conduits that are installed to enter the top of the cabinet are most likely to cause water problems. Installers should take reasonable precautions to prevent water from entering the cabinet. Water damage is not covered under warranty.

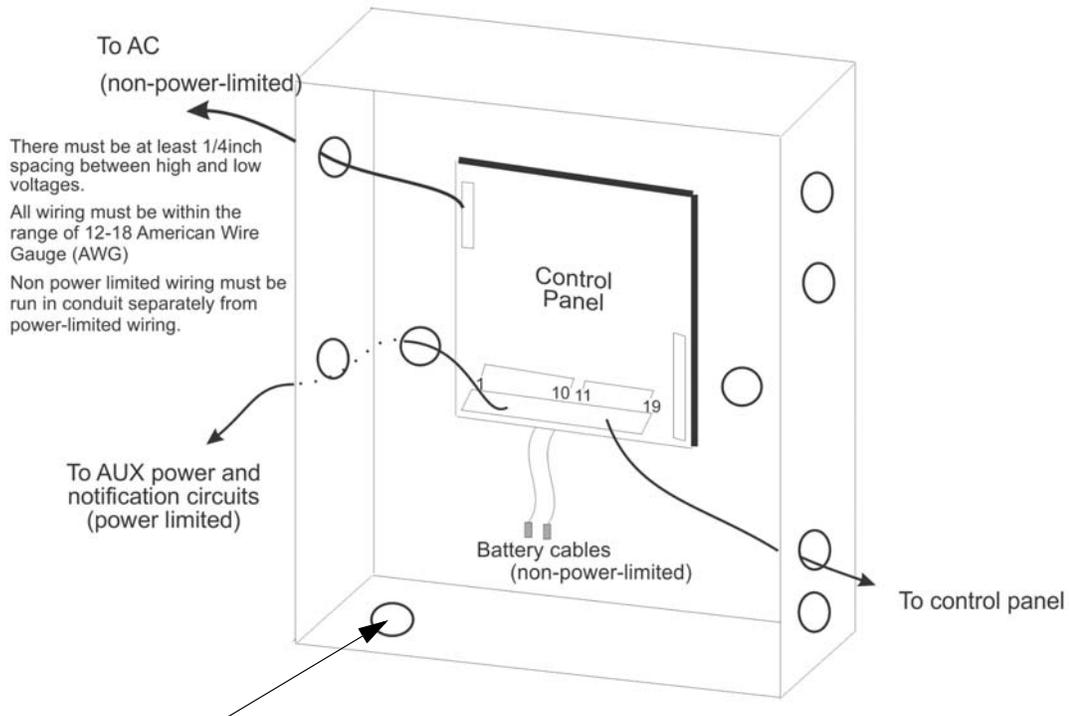
### 4.2 Wire Routing

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To avoid induced noise (transfer of electrical energy from one wire to another), keep input wiring isolated from high current output and power-limited wiring. Induced noise can interfere with telephone communication or even cause false alarms. Avoid pulling a single multiconductor cable for the entire system. Instead, separate high current input/output from low current. Separate power-limited from non-power-limited wiring. Non-power-limited wiring must be enclosed in conduit.

Wiring within the cabinet should be routed around the perimeter of the cabinet. It should not cross the printed circuit board where it could induce noise into the sensitive microelectronics or pick up unwanted RF noise from

the switching power supply circuit.



**Note:** The use of this knock out will reduce the number and/or size of batteries this cabinet can contain. Evaluation of space is important before using.

**Figure 4-1 Sample Wire Routing**

Ground fault and wire to wire short impedance to any terminal is 0 Ω.

## 4.3 Current Requirements (Standby and Alarm)

### 4.3.1 Current Drawn From Host Panel

Table 4-1 shows the GFPS-9 current draw requirements from the main control panel when the panel's notification appliance circuit is in alarm. The current draw from the main panel when it is supervising the GFPS-9 is the same current draw that would be present when the main panel supervises an ordinary notification appliance circuit.

**Table 4-1: Alarm Current Drawn From Main Control Panel**

	Panel Voltage	Current
Alarm Current (for typical voltages) drawn from main panel's notification appliance circuits.	12 VDC	6.5 mA
	24 VDC	One input circuit: 15 mA Both input circuits: 30 mA

### 4.3.2 Current Drawn from Battery

Batteries used with the GFPS-9 must not exceed 35AH. (33AH max. for FM (Factory Mutual) Installations). Batteries larger than 7 AH will not fit into the GFPS-9 cabinet and must be housed in the BC-1 Battery Cabinet.

See Section 4.7 for battery installation.

The following is the maximum current draw from the auxiliary power terminals for standby calculations. These currents assume 24 or 60 hours of standby time, followed by 5 minutes of maximum alarm current.

- 195 mA for 24 Hour Standby Current
- 39 mA for 60 Hours of Auxiliary Standby Current

The above numbers were calculated assuming the use of 7 AH batteries at 100% of rated capacity.

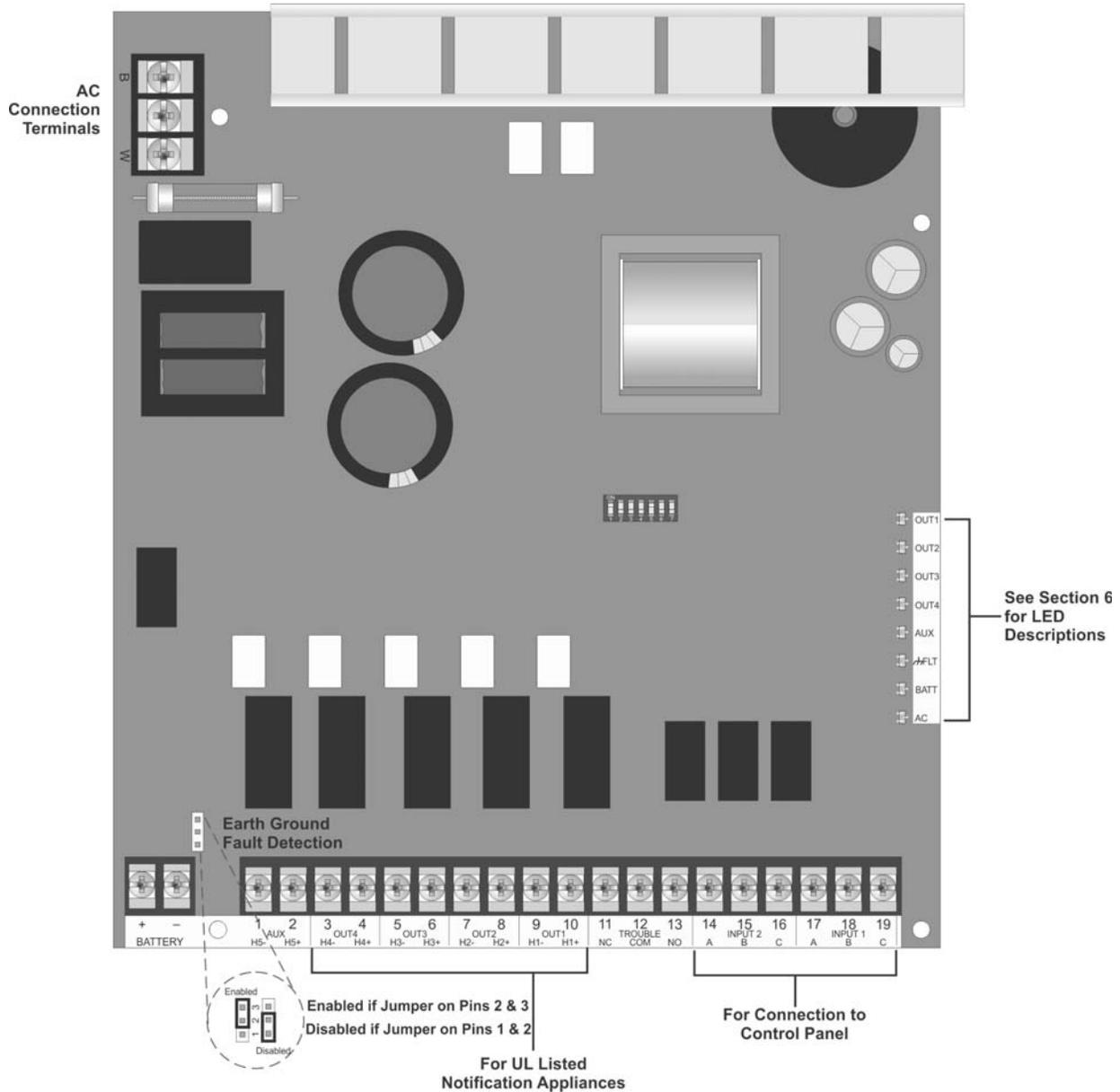
The total current of the GFPS-9, plus all items powered from it, must not exceed 9 A when the panel is in alarm. Use Table 4-2 to ensure that the current does not exceed 9 A and, that the desired amount of standby is possible for the battery intended for use with the GFPS-9.

**Table 4-2: Battery Calculation Worksheet**

Device		Number of Devices	Current per Device		Standby Current	Alarm Current	
For each device use this formula:		This column	X This column	=	Current per number of devices.		
GFPS-9 Distributed Power Module (Current draw from battery)		1	Standby:	75 mA	75 mA		
			Alarm:	205 mA		205 mA	
A	GFPS-9 Current				75 mA	205 mA	
Auxiliary Devices		Refer to device manual for current ratings.					
		Alarm/Standby	mA	mA	mA		
		Alarm/Standby	mA	mA	mA		
		Alarm/Standby	mA	mA	mA		
		Alarm/Standby	mA	mA	mA		
B	Auxiliary Device Current				mA	mA	
Notification appliances		Refer to device manual for current ratings.					
		Alarm:	mA	0 mA	mA		
		Alarm:	mA	0 mA	mA		
		Alarm:	mA	0 mA	mA		
		Alarm:	mA	0 mA	mA		
C	Notification Appliance Current				0 mA	mA	
D	Total current ratings of all devices in system (line A + line B + line C)				mA	mA	
E	Total current ratings converted to amperes (line D x .001):				A	A	
F	Number of standby hours (24 or 60 for NFPA 72, Chapter 1, 1-5.2.5). 24 Hrs. for NBC, section 3.2.7.8				H		
G	Multiply lines E and F. <b>Total standby AH</b>				AH		
H	Alarm sounding period in hours. In accordance with NBC and ULC. (For example, 5 minutes = .0833 hours.)					H	
I	Multiply lines E and H. <b>Total alarm AH</b>					AH	
J	Add lines G and I. <b>Total standby and alarm AH</b>				AH		
K	Multiply line J by 1.20. (20% extra insurance to meet desired performance) <b>Total ampere-hours required</b>				AH		

## 4.4 Connecting the GFPS-9 to a Control Panel

Figure 4-2 shows the general layout of the GFPS-9 PC board. This section also provides specific wiring details for accessories.



**Figure 4-2 The Model GFPS-9 PC Board Layout**

Consult the installation manual for specific wiring information for the control panel being used.

### 4.4.1 Common Trouble Relay

The GFPS-9 has a Form C trouble relay built into Terminals 11-13. The relay provides a normally open and a normally closed contact, both of which are rated at 2.5A. The trouble relay will deactivate under any trouble condition.

A typical application of the trouble relay is to connect the GFPS-9 normally closed (N.C.) contacts in series with the EOL supplied with the fire alarm control panel. This will cause a trouble on the fire alarm control panel when the GFPS-9 opens its trouble contacts.

**Note:** The N.C. contact is the contact that is closed when the GFPS-9 has power and there are no trouble conditions.

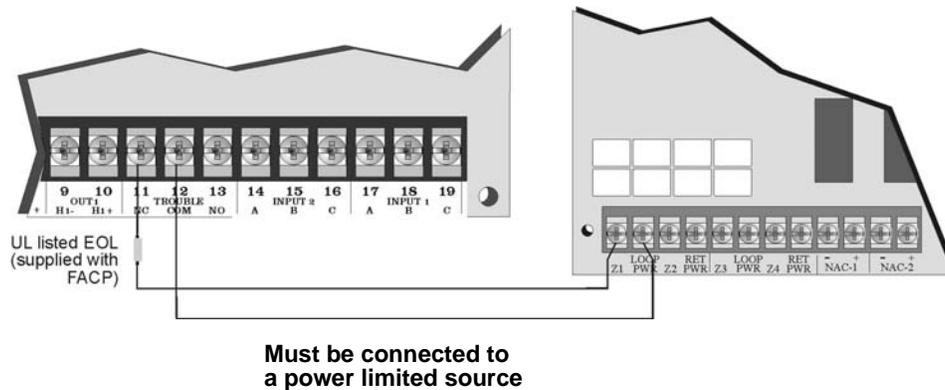


Figure 4-3 Trouble Relay Connection Example

## 4.5 Notification Appliance Wiring

**Note:** Not all devices can use the sync feature. Be sure to check Appendix A to ensure the device you have chosen will work with this feature.

### Important!

For all synchronization options, input 1 is the strobe input and input 2 is the audible input. The signals to input 1 and input 2 must be DC signals for the synchronization patterns to work properly. When it is desired to activate both strobes and audibles, input 1 and input 2 must be active. If it is desired to only activate strobes, then input 1 must be active and input 2 must be inactive. The audible can be deactivated and reactivated at any time by changing the signal at input 2 as long as input 1 remains active. If input 1 is not active, then input 2 is ignored.

### 4.5.1 Class A Supervised Wiring

Figure 4-4 shows how to wire for Class A input and output supervision. Use in/out wiring methods for proper supervision. (Refer to Appendix A for notification appliances compatible with the GFPS-9.)

#### Class A Output Notification Circuits

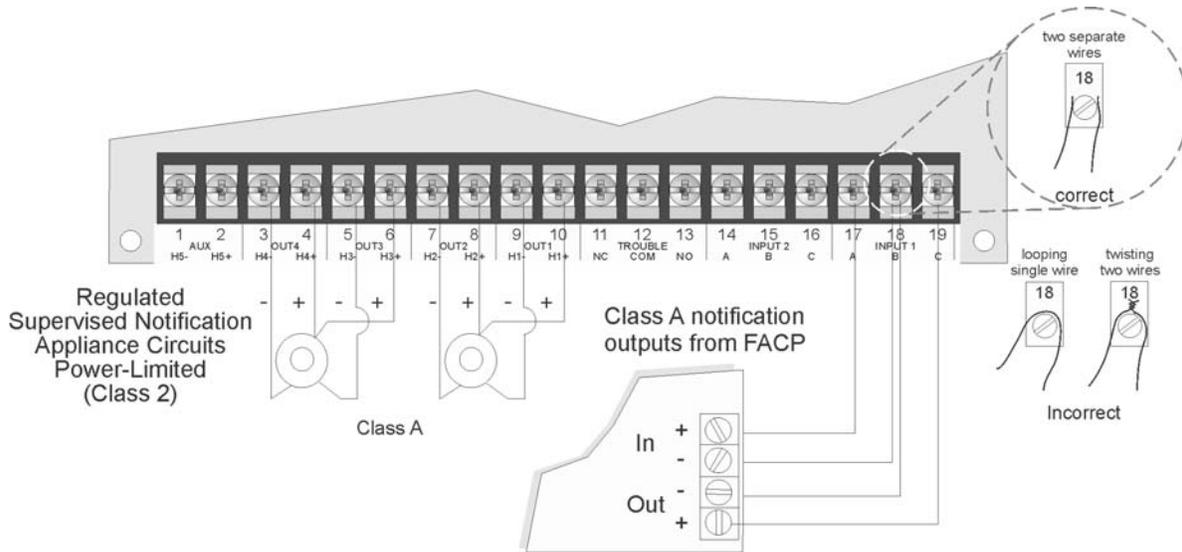
The configuration shown in Figure 4-4 shows two, 3 A devices wired as Class A. When using the outputs as Class A circuits, loop the wiring back to the corresponding circuit pair. For Class A wiring, no external EOL is necessary since it is built into the GFPS-9 board.

#### Class A Supervised Input Circuits

The configuration shown in Figure 4-4 shows Class A supervised wiring from a fire alarm control panel to the GFPS-9 board. Pay close attention to the polarities when wiring a panel to the GFPS-9 and follow these requirements:

- When wiring to Terminal 18 on the GFPS-9, you must use two separate wires. Do not loop a single wire or

twist two conductors together.



For system supervision of terminals 15 and 18, do not use looped wire under the terminals. Break the wire run to provide supervision of connections.

**Figure 4-4 Class A Supervised Input/Output Connections**

## 4.5.2 Class B Supervised Wiring

Figure 4-5 shows how to wire for Class B input and output supervision. Use in/out wiring methods for proper supervision (Refer to the Appendix for notification appliances approved for use with the GFPS-9.)

### Class B Output Notification Circuits

Figure 4-5 shows four, 1.5 A devices wired as Class B.

Place a 4.7k ohm EOL resistor (provided) at the end of each circuit to enable supervision when using all outputs as Class B notification appliance circuits. The 4.7k EOLs must be wired to the terminals whether or not you are using all output terminals.

## Class B Supervised Input Circuits

Figure 4-5 shows Class B supervised wiring from a fire alarm control panel to the GFPS-9.

Use an EOL resistor as shown to enable notification appliance circuit input supervision. Some panels use EOLs that have a different value from the 4.7k ohm EOL resistor used by the GFPS-9. In this case, the EOL must be UL listed for the fire alarm control panel (not the GFPS-9).

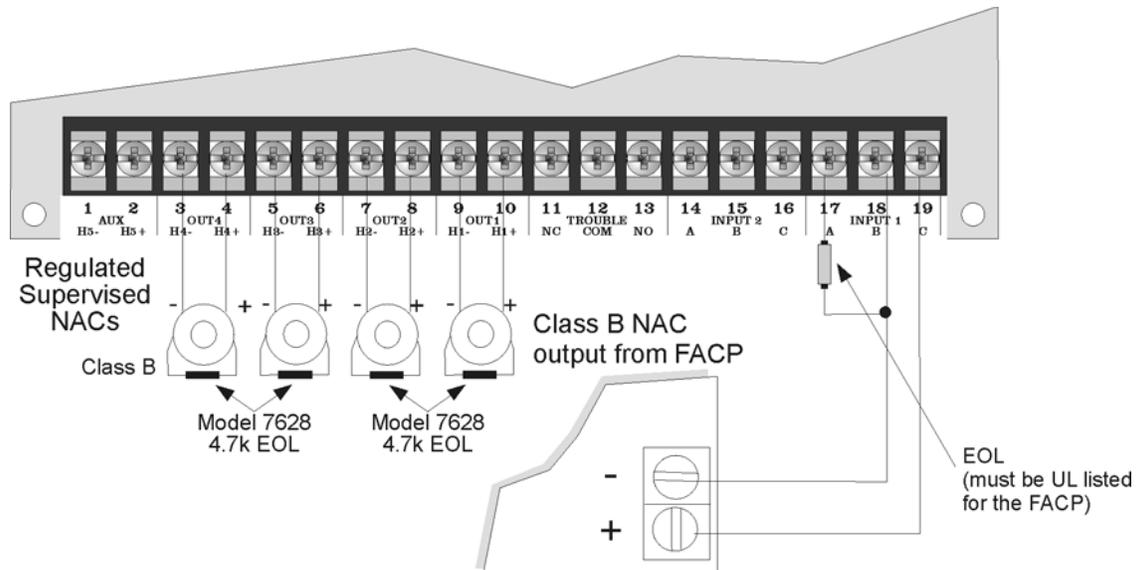


Figure 4-5 Class B Supervised Input/Output Connections

## 4.6 Ground Fault Detection Enable/Disable Jumper

In some cases the ground fault detection feature on the GFPS-9 may interfere with the ground fault detection feature of the main control panel in the system. To disable the ground fault detection feature on the GFPS-9, place the jumper block on J1, across Pins 1 and 2 (see Figure 4-2).

## 4.7 Battery Connection

Use two 12 VDC, 7 AH gel cell batteries inside the GFPS-9 cabinet. For batteries larger than 7 AH (not to exceed 35 AH) use the BC-1 Battery Cabinet. It is recommended that you replace the batteries every five years. The following steps and diagram explain how to connect the batteries.

1. Connect the black wire from the Battery – terminal to the negative (–) side of Battery #2.
2. Connect the jumper wire provided (PN 140694) from the positive (+) side of Battery #2 to the negative side of Battery #1.

3. Connect the red wire from the Battery + terminal to the positive (+) side of battery #1.

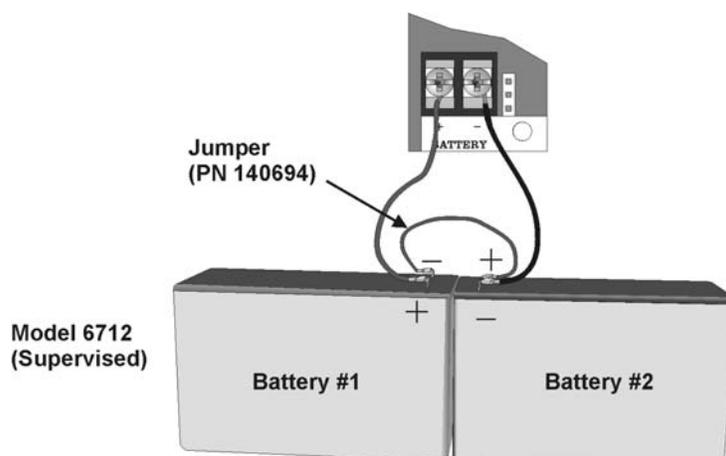


Figure 4-6 Battery Connection

## 4.8 DIP Switch Settings

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A 7-position DIP switch on the GFPS-9 board allows you to select the following:

- How long the GFPS-9 will wait before indicating a loss of AC.
- Which input (Input 1 or Input 2) will control the NACs.
- Which NACs to wire as Class A and Class B.
- Auxiliary power state.
- Which NACs to operate as steady, ANSI temporal, or sync. outputs

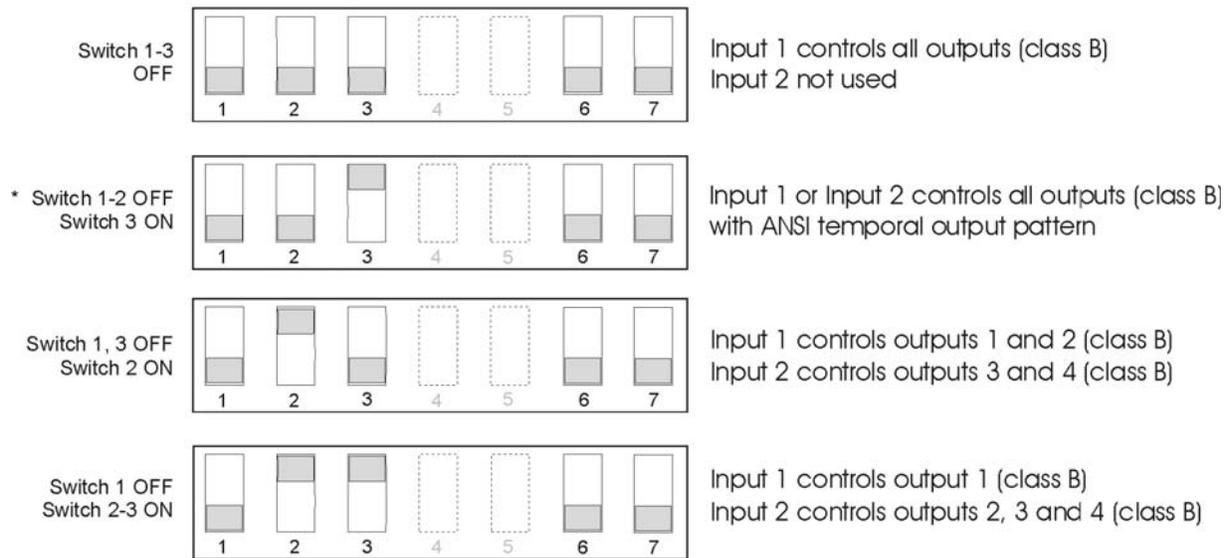
Refer to Figure 4-2 for the location of the DIP switch on the GFPS-9 board.

### 4.8.1 Selecting the Standard Input/Output Configurations

Figure 4-7 and Figure 4-8 show the position of each switch for the non-synchronized input and output configurations. The position of Switches 4 and 5 does not affect the relationship of inputs to outputs.

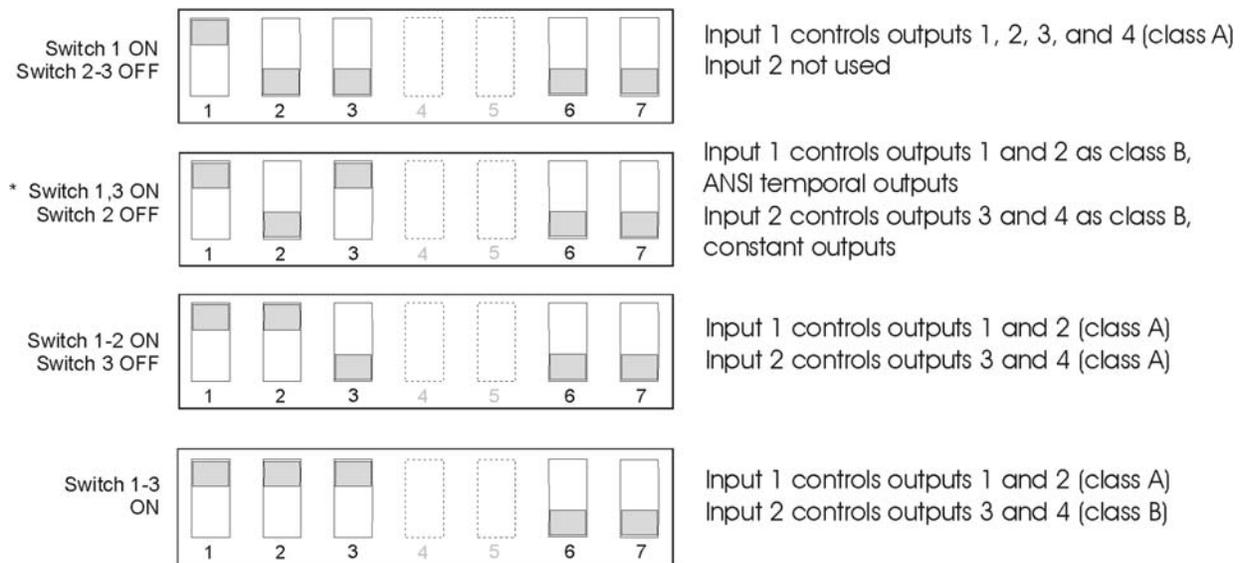
**Note:** The GFPS-9 checks switches 1, 2, 3, and 6 only when powering up the GFPS-9. If you change these switch settings,

you must remove both the AC power and the battery to make the GFPS-9 recognize the new settings.



\* See the following information about ANSI temporal-coded outputs

**Figure 4-7 Setting DIP Switches 1-3**



\* See the following information about ANSI temporal-coded outputs

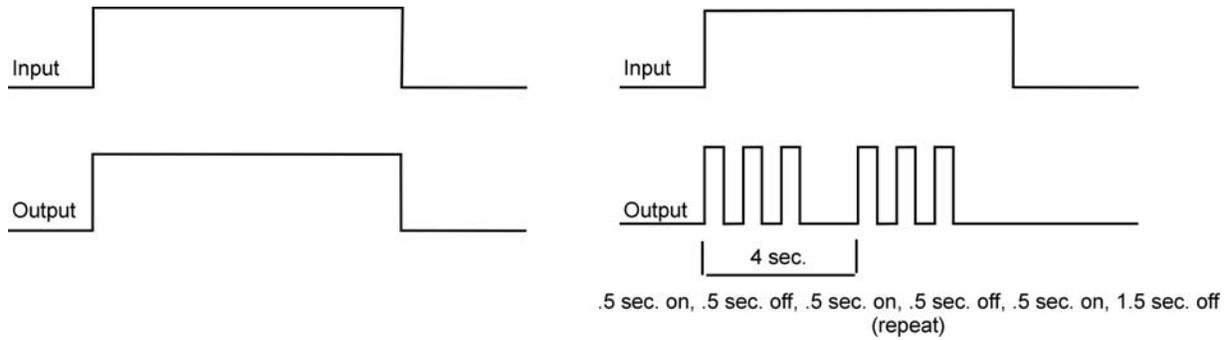
**Figure 4-8 Setting DIP Switches 1-3 (Continued)**

**Note:** For 100 mS input signal debounce with no synchronization DIP switches 6 and 7 must be turned On.

#### 4.8.1.1 Input/Output Configurations That Select ANSI Temporal-Coded Outputs

The DIP switch settings marked with an asterisk (\*) in Figure 4-7 and Figure 4-8 are designed to produce ANSI temporal-coded outputs from a constant input. The figures shown below compare the output patterns of

configurations before and after the addition of this feature.



**Standard GFPS-9 Input to Output Relationship**

**Input/Output Relationship for ANSI Temporal-coded Options**

With this new feature, a steady signal can produce the pattern shown above for panels not previously able to do so.

**Note:** The GFPS-9 can also produce temporal patterns if the inputs are non-ANSI temporal configurations.

### 4.8.2 Selecting Synchronized Output Configurations

The following sections describe how to configure the GFPS-9 as a synchronization power expander for Amseco, Faraday, Gentex, System Sensor, or Wheelock synchronized horn/strobe appliances.

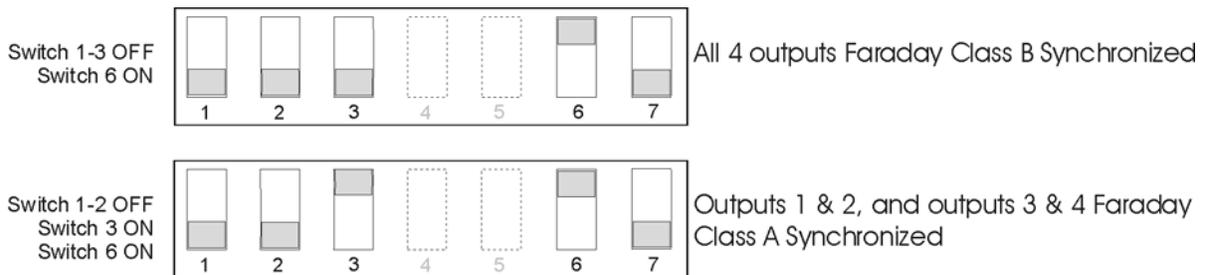
**Note:** In order for the synchronization feature to operate properly, make sure you have set the DIP switches for the proper manufacturer. See Sections 4.8.2.1, 4.8.2.2, or 4.8.2.3.

**Important!**

For all synchronization options, input 1 is the strobe input and input 2 is the audible input. The signals to input 1 and input 2 must be DC signals for the synchronization patterns to work properly. When it is desired to activate both strobes and audibles, input 1 and input 2 must be active. If it is desired to only activate strobes, then input 1 must be active and input 2 must be inactive. The audible can be deactivated and reactivated at any time by changing the signal at input 2 as long as input 1 remains active. If input 1 is not active, then input 2 is ignored.

#### 4.8.2.1 Selecting Synchronized Faraday Configurations

To select the input/outputs for Faraday synchronized appliances, set the DIP switches as shown in Figure 4-9.



**Figure 4-9 Faraday Synchronized Configurations**

### 4.8.2.2 Selecting Synchronized Gentex Configurations

To select the input/outputs for Gentex synchronized appliances, set the DIP switches as shown in Figure 4-10.

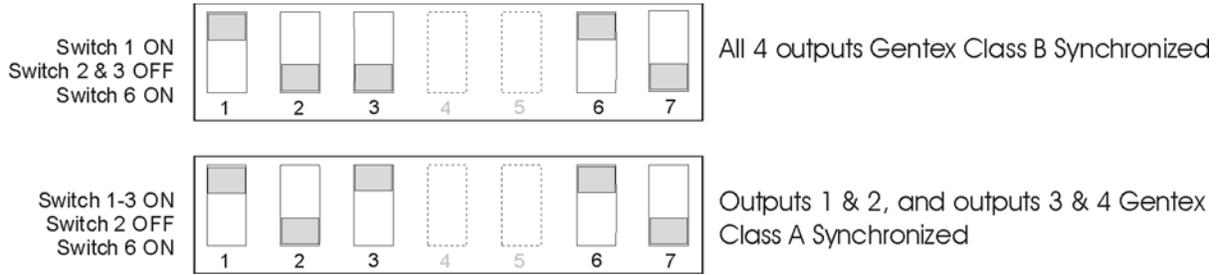


Figure 4-10 Gentex Synchronized Configurations

### 4.8.2.3 Selecting Synchronized System Sensor Configurations

To select the input/outputs for System Sensor synchronized appliances, set the DIP switches as shown in Figure 4-11.

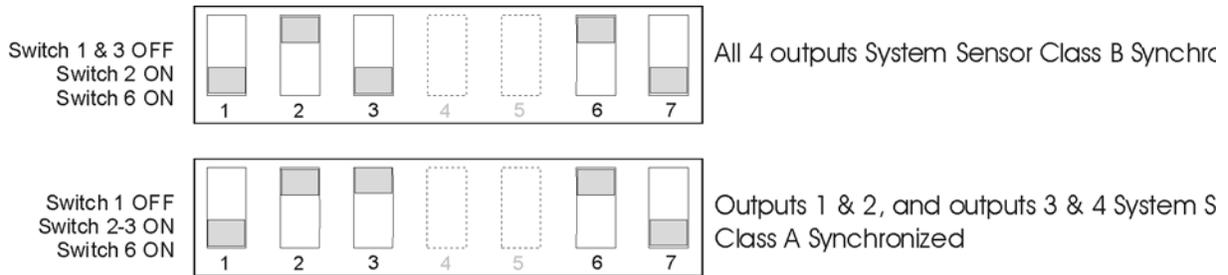


Figure 4-11 System Sensor Synchronized Configurations

### 4.8.2.4 Selecting Synchronized Wheelock Configurations

To select the input/outputs for Wheelock synchronized appliances, set the DIP switches as shown in Figure 4-12.

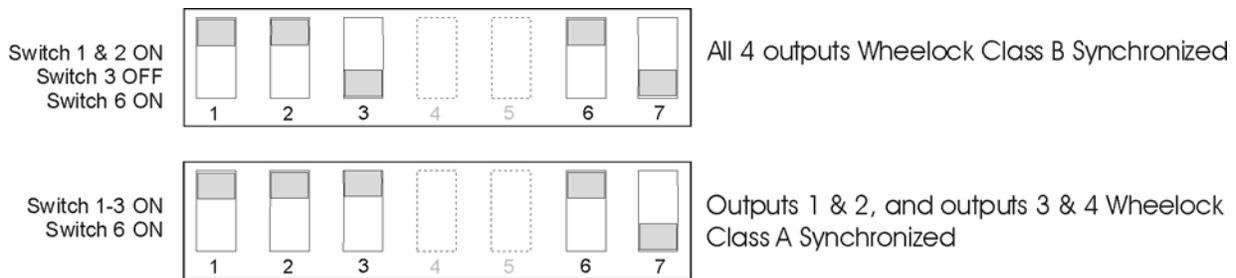


Figure 4-12 Wheelock Synchronized Configurations

### 4.8.2.5 Selecting Synchronized AMSECO Configurations

To select the input/outputs for AMSECO synchronized appliances, set the DIP switches as shown in Figure 4-13.

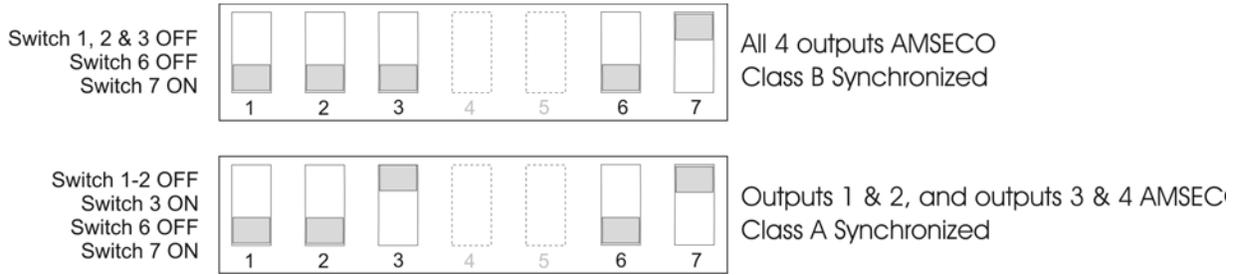


Figure 4-13 AMSECO Synchronized Configurations

### 4.8.3 Setting the Loss of AC Delay

Normal selection for reporting loss of AC is 3 hours.

The ON position is for test purposes only and the normal position for Switch 4 is OFF. For testing the Low AC reporting, you can temporarily turn Switch 4 ON without removing power.

**Note:** Remember to turn the switch OFF when testing is complete.

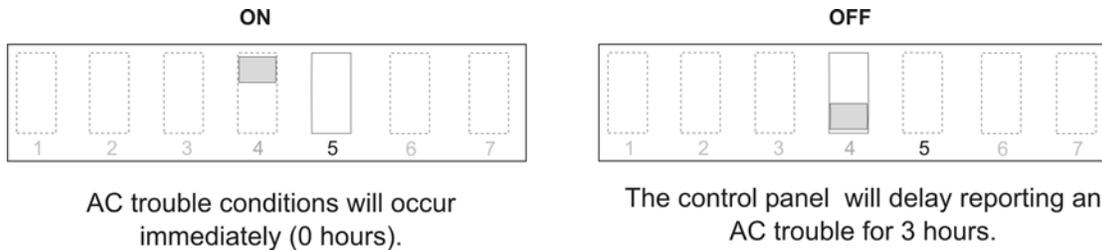


Figure 4-14 Setting DIP Switch 4

### 4.8.4 Setting the Auxiliary Output

Switch 5 on the DIP switch determines how the auxiliary power operates on the GFPS-9.

The GFPS-9 checks Switch 5 only when powering up the GFPS-9. If you change this switch, you must remove both the AC power and the battery to force the GFPS-9 to recognize the new switch setting.

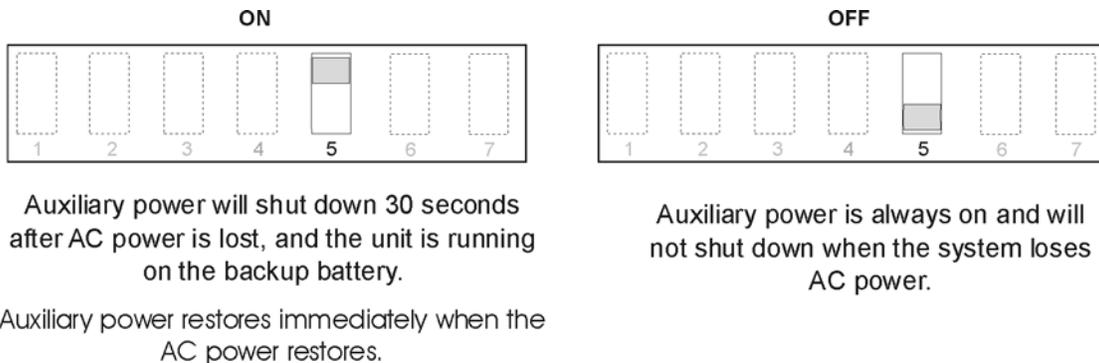


Figure 4-15 Setting DIP Switch 5

## Section 5 Sample Applications

The drawings in this section show various GFPS-9 configurations, including “daisy-chaining”.

### 5.1 Notification Power Applications

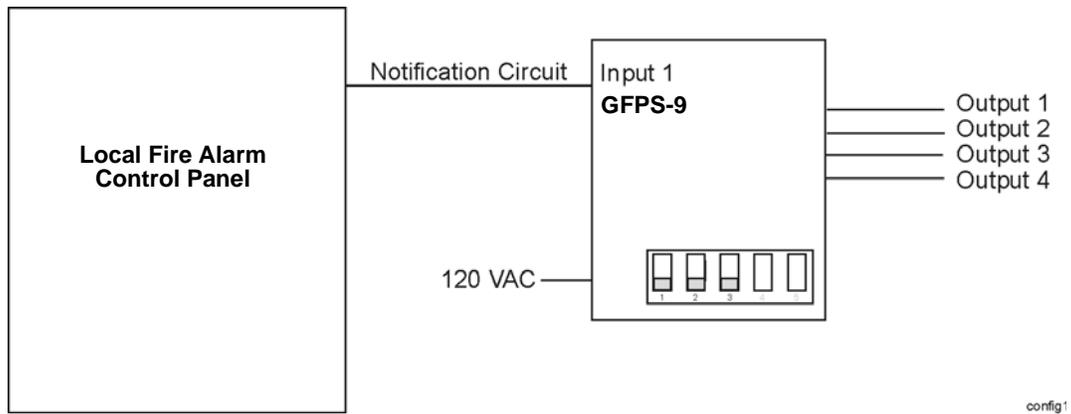


Figure 5-1 Input 1 Activates All Four Outputs

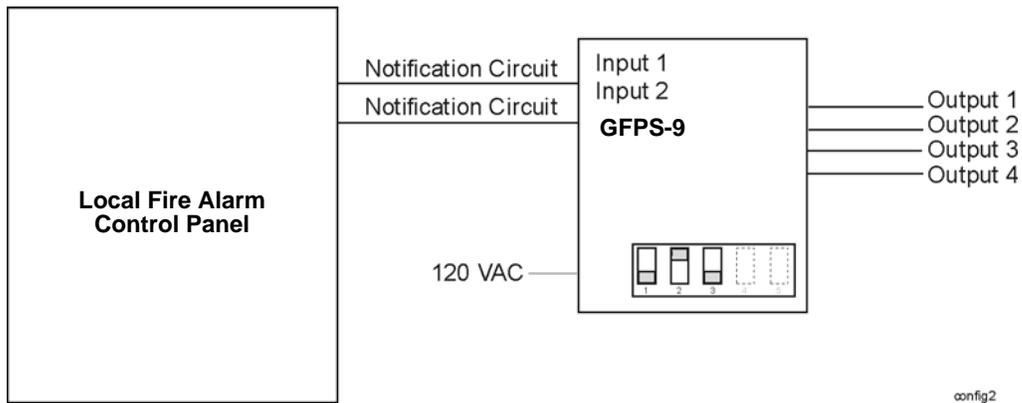
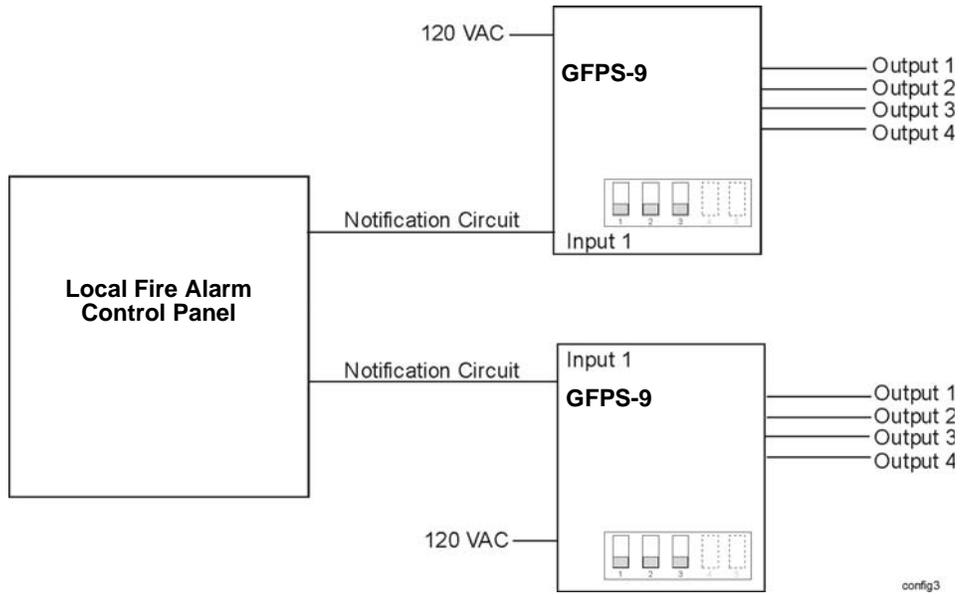
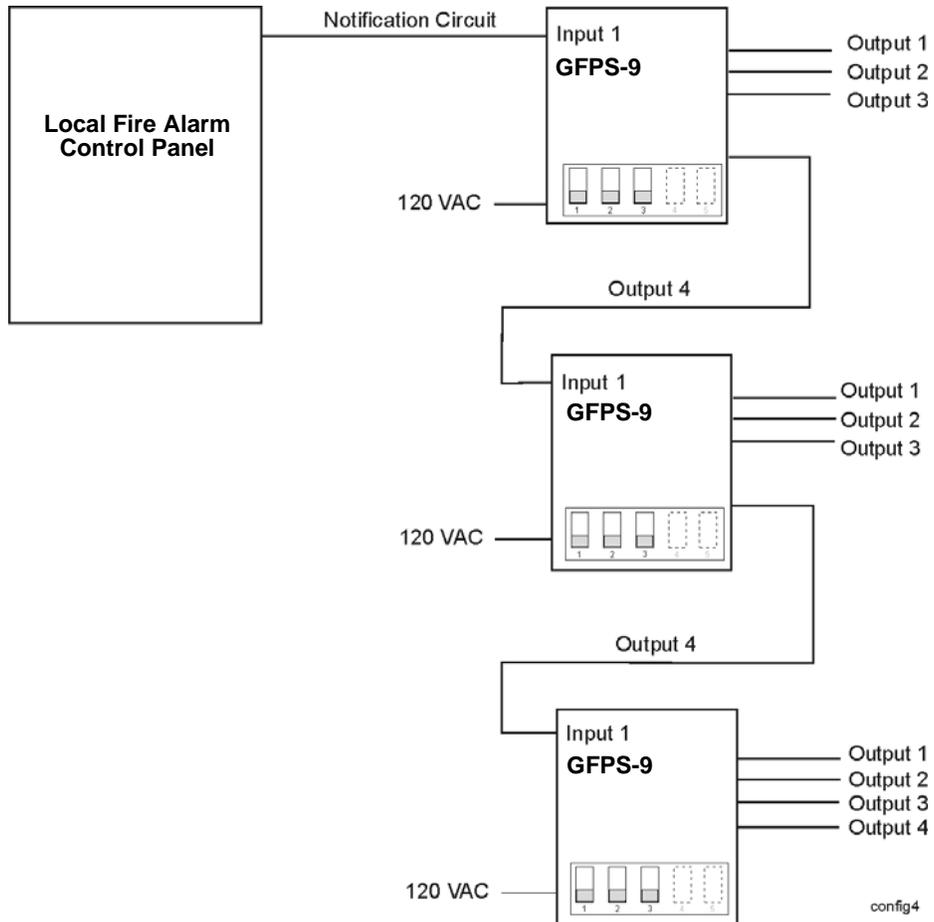


Figure 5-2 Input 1 Activates NACs 1 and 2; Input 2 Activates NACs 3 and 4

**Note:** When multiple power supplies are used with one control unit they will not sync with each other



**Figure 5-3 One Control Activating Two GFPS-9s**



**Figure 5-4 One Control Activating Three GFPS-9s in Series**

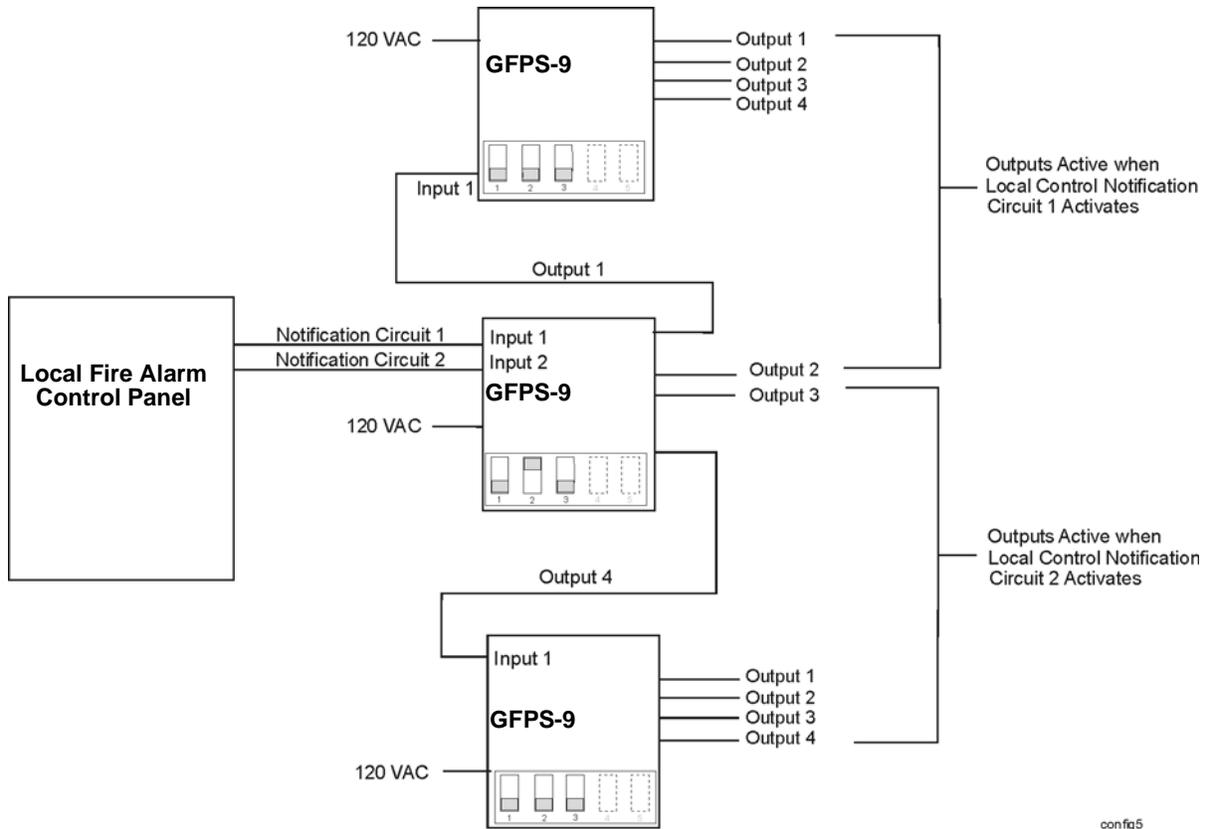


Figure 5-5 Each Control NAC Activates Five Output NACs

## 5.2 Non-Resettable Power Application

The GFPS-9 provides a dedicated 3 A auxiliary power output that you can select as non-resettable (output is always on). See Section 4.8.4 for setting the auxiliary power. If you need more than 3 A, wire the inputs as shown in Figure 5-6.

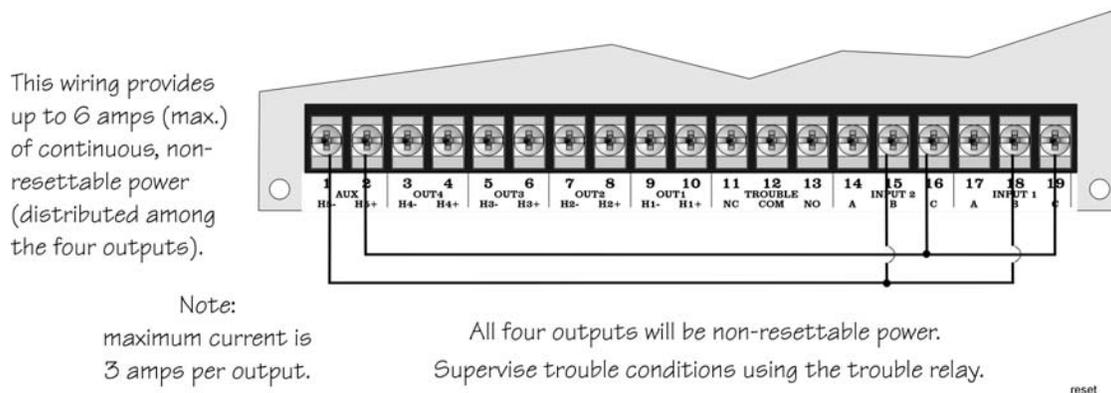


Figure 5-6 Auxiliary Output Wiring for Non-Resettable Power

## 5.3 Door Holder Application

In a typical door holder application, the door holder power must be interrupted to close all fire doors under the following conditions:

- Any active alarm condition.
- AC power failure (to conserve battery power).

To close the fire doors in these situations, wire an N.C. programmable relay from the FACP in series with the auxiliary power to the door holders as shown in Figure 5-7.

The circuit shown in Figure 5-7 will provide up to 3 amps of door holder power. (See Section 5.2 if you need more than 3 amps of auxiliary power.) The power in this example is released when AC power is off for 30 seconds or more, or when the relay from the fire alarm control panel becomes open. You would have to use the equivalent of a programmable relay from a fire alarm control panel that is programmed to open under alarm conditions. See Section 4.8.4 for selecting auxiliary power options.

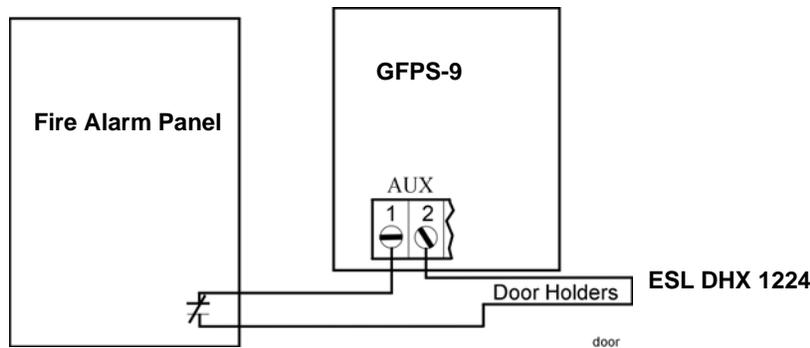


Figure 5-7 Door Holder Wiring Example

## Section 6 Troubleshooting

Light-emitting diodes (LEDs) indicate fault conditions. This section describes the LED states.

### 6.1 LEDs

The eight LEDs indicate a fault in one of the circuits (either NACs 1 through 4, auxiliary power, earth fault, low AC, or battery). A fault in the LED's corresponding circuit will light the LED (labeled on the board). Their functions are as follows:

LED	Color	Description
OUT1	Yellow	When ON, output circuit 1 is in trouble or in an overcurrent state.
OUT2	Yellow	When ON, output circuit 2 is in trouble or in an overcurrent state.
OUT3	Yellow	When ON, output circuit 3 is in trouble or in an overcurrent state.
OUT4	Yellow	When ON, output circuit 4 is in trouble or in an overcurrent state.
AUX	Yellow	When ON, the auxiliary power output is in an overcurrent state.
FLT	Yellow	When ON, an earth ground fault on the unit exists.

LED	Color	Description
BATT	Yellow	When ON, a low battery condition exists.
AC	Green	When OFF, there is no AC power to the unit. Under normal conditions, this LED is ON to indicate the presence of AC power.

See Figure 4-2 for locations of LEDs.

## 6.2 Trouble Conditions

Trouble Condition	What Happens
Low AC (AC input voltage is low or off for 6 hours or longer.)	Input 1 and Input 2 supervision circuits open after a 6 hour delay. The green AC LED turns off as soon as low AC or loss of AC occurs (does not wait 6 hours). The trouble relay is de-energized after a 6 hour delay. The trouble restores within 1 minute of the AC voltage restoring to a normal level.
Low Battery (Battery voltage is less than 21.4 VDC.)	Input 1 and Input 2 supervision circuits open. The yellow "BATT" LED lights. The trouble relay is de-energized. The trouble restores when battery voltage is greater than 22.4 VDC.
Earth Ground Fault (The earth terminal is connected to one of the positive or negative terminals on the output or auxiliary output circuits.)	Input 1 and Input 2 supervision circuits open. The yellow "FLT" LED lights. The trouble relay is de-energized. The trouble restores when the fault between the earth ground and one of the output circuit terminals is removed.
Power Limit At AUX (Current draw at the auxiliary power terminals is exceeding 3.0 amps.)	Power disconnects at the AUX terminal. Input 1 and Input 2 supervision circuits open. The yellow "AUX" LED lights. The trouble relay is de-energized. The trouble restores when the overcurrent condition no longer exists. When a circuit goes into a power limited state, it will reverse the polarity of the voltage at the terminals and verify the load. If it is more than 1k ohms, the power limit will self-restore. This does not automatically occur for some devices typically connected to auxiliary power. Power limit conditions do not restore in reverse polarity monitoring if the devices are not polarized (for example, some door holder devices). To allow automatic restores for power-limited auxiliary circuits, it is recommended that all non-polarized devices be polarized using a diode in series with each device.
Power-limited OUTPUT (Current draw at an output terminal is exceeding 3.0 amps.)	Power at the OUTPUT is disconnected. Input 1 and Input 2 supervision circuits open. The corresponding yellow LED lights. The trouble relay is de-energized. The trouble restores when the overcurrent condition no longer exists.
EOL supervision trouble (Equivalent resistance of the EOL resistor is outside the range 2k - 10k.)	Input 1 and Input 2 supervision circuits open. Corresponding yellow LED lights. The trouble relay is de-energized. Trouble restores if an EOL within (2k-10k) appears at the output terminals.

**Note:** While Input 1 & 2 are activated, Input 1 & 2 will not open to indicate a trouble or supervisory condition. Once the circuit is deactivated it will open to indicate a trouble or supervisory condition.

## 6.3 Earth Fault Resistance

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Table 6-1 lists the earth fault resistance detection for each applicable terminal on the FACP.

**Table 6-1: Earth Fault Resistance Values by Terminal**

Function	Terminal Number	Terminal Label		Value (in kohms)
Auxiliary Devices	1	H5-	AUX	0
	2	H5+		0
Notification Appliance Circuit 4	3	H4-	OUT4	0
	4	H4+		0
Notification Appliance Circuit 3	5	H3-	OUT3	0
	6	H3+		0
Notification Appliance Circuit 2	7	H2-	OUT2	0
	8	H2+		0
Notification Appliance Circuit 1	9	H1-	OUT1	0
	10	H1+		0

## 6.4 Removing and Replacing the Control Panel

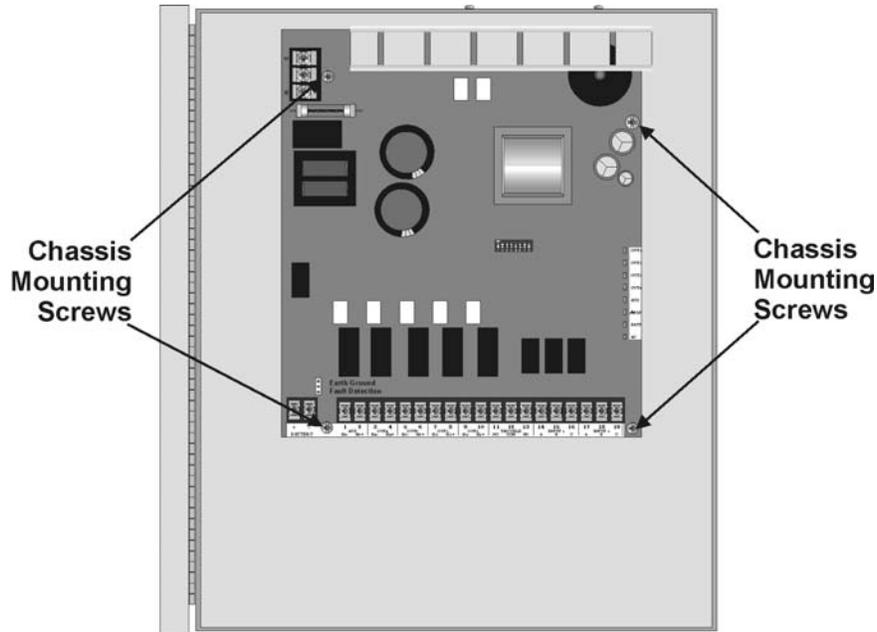
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This section provides instruction on how to remove and replace the control panel if it is determined that the control panel needs to be repaired or replaced.

### 6.4.1 Removing the Control Panel

Follow these step to properly remove the control panel:

1. Remove the two heat sink screws. The heat sink screws are located on the top of the cabinet. See Figure 6-1.



**Figure 6-1 Mounting Screw Locations**

2. Remove the four chassis mounting screws. See Figure 6-1 for chassis screw locations.
3. Carefully remove the control panel.

## 6.4.2 Replacing the Control Panel

Follow these steps to replace the control panel:

**Note:** Use a grounding strap when working with static sensitive components.

1. Align the control panel with the chassis mounting stand-offs. See Figure 6-1.
2. Insert the four chassis mounting screws (see Figure 6-1). Do not over tighten the chassis mounting screws.
3. Insert the two heat sink screws (see Figure 6-1). Do not over tighten the heat sink screws.

**Note:** The heat sink screws must be installed for proper heat dispersion of the power module's power supply.

# Appendix A

## UL Listed Notification Appliances

For proper operation, you must use polarized devices with a Model 7628 4.7k ohm EOL resistor on each circuit. All supervised notification appliances used with the GFPS-9 must be polarized.

**Note:** Not all devices can use the Sync feature, be sure to check Table A-1 to ensure the device you have chosen will work with this feature. Synchronization is UL listed for multi-circuit operation.

### A.1 Notification Appliances

Table A-1 below lists notification appliances compatible with the GFPS-9. Appliances which can be synchronized indicate the type of sync available in the columns marked Audio and/or Visual.

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type
AMSECO	SH24W-153075	x	x	Horn/Strobe
	SAD24-153075		x	Strobe
	SAD24-75110		x	Strobe
	SL24W-75110		x	Strobe
	SL24C-3075110		x	Strobe
	SLB24-75		x	Strobe
	RSD24-153075		x	Strobe
	RSD24-75110		x	Strobe
	SH24W-75110	x	x	Horn/Strobe
	SH24W-3075110	x	x	Horn/Strobe
	SHB24-75	x	x	Horn/Strobe
	SCM24W-153075	x		Chimes/Strobe
	SCM24W-75110	x		Chimes/Strobe
	SCM24C-3075110	x		Chimes/Strobe
	SCM24C-177	x		Chimes/Strobe
	H24W	x		Horn
	H24R	x		Horn

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type
Faraday	446	x		Vibrating Bell
	476	x		Vibrating Bell
	477	x		Single Stroke Bell
	2700 -M, -R, -T, -Y, -Z		x	Strobe
	2701 Series		x	Strobe
	2705 Series		x	Strobe
	2820	x	x	Sync Temporal Horn/Strobe
	2821	x	x	Sync Temporal Horn/Strobe
	2824	x	x	Horn Strobe
	5333	x		Multi-Tone Horn)
	5336	x	x	Multi-Tone Horn/Strobe
	5337	x	x	Multi-Tone Horn/Strobe
	5338	x	x	Multi-Tone Horn/Strobe
	5343	x	x	Single Tone Horn/Strobe
	5346	x	x	Electronic Horn with Strobe
	5347	x	x	Electronic Horn with Strobe
	5348	x	x	Single Tone Horn/Strobe
	5373	x	x	8-Tone Horn/Strobe
	6321	x	x	Sync Mini Horn/Strobe
	6322	x	x	Mini Horn/Sync Strobe
6380			x	8-Tone Electronic Signal/Strobe
5376	x	x		8-Tone Horn/Strobe
5377	x	x		8-Tone Horn/Strobe

Table A-1: Compatible Notification Appliances

Manufacturer	Model	Audio	Visual	Type
Faraday (cont.)	5378	x	x	8-Tone Horn/Strobe
	5383	x	x	8-Tone Horn/Strobe with Sync Strobe
	5386	x	x	8-Tone Horn/Strobe with Sync Strobe
	5387		x	8-Tone Horn/Strobe with Sync Strobe
	5388		x	8-Tone Horn/Strobe with Sync Strobe
	5508		x	Single Gang Sync Strobe
	5509		x	Strobe
	5510		x	Strobe
	5511		x	Strobe
	5512		x	Strobe
	5516		x	Strobe
	5517		x	Strobe
	5518		x	Strobe
	5519		x	Strobe
	5521		x	4" Square Sync Strobe
	5522		x	4" Square Sync Strobe
	6120	x		Horn
	6140	x		Horn
	6223	x		Horn
	6226	x	x	Horn/Strobe
	6227	x	x	Horn/Strobe
	6228	x	x	Horn/Strobe
	6243	x		Electron-Mechanical Horn
	6244	x		Electron-Mechanical Horn
	6245	x		Electron-Mechanical Horn
	6246	x	x	Electron-Mechanical Horn/Strobe
	6247	x	x	Electron-Mechanical Horn/Strobe
	6248	x	x	Electron-Mechanical Horn/Strobe
	6300	x		Mini-Horn
	6301	x		Mini-Horn
	6302	x		Mini-Horn
	6310	x	x	Mini-Horn/Strobe
	6311	x	x	Mini-Horn/Strobe
	6312	x	x	Mini-Horn/Strobe
6314 Series -M, -R, -T, -Y, -Z		x	Strobe	
6320	x	x	Sync Mini Horn/Strobe	

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type	
FCI	S2415-FC		x	Strobe	
	S241575-FC		x	Strobe	
	S2430-FC		x	Strobe	
	130-3117C	x		Mini Horn	
	130-3147C	x		Mini Horn	
	BLV-6	x		Vibrating Bell	
	BLV-10	x		Vibrating Bell	
FCI (cont.)	BLVCH	x		Vibrating Chime	
	H12/24-FC	x		Horn	
	H12/24W-FC	x		Horn	
	H12/24K-FC	x		Horn	
	HC12/24-FC	x		Horn	
	HC12/24W-FC	x		Horn	
	HC12/24K-FC	x		Horn	
	P2415-FC	x	x	Horn/Strobe	
	P2415W-FC	x	x	Horn/Strobe	
	P2415K-FC	x	x	Horn/Strobe	
	P241575-FC	x	x	Horn/Strobe	
	P241575W-FC	x	x	Horn/Strobe	
	P241575F-FC	x	x	Horn/Strobe	
	P241575K-FC	x	x	Horn/Strobe	
	P2430-FC	x	x	Horn/Strobe	
	P2430W-FC	x	x	Horn/Strobe	
	P2430K-FC	x	x	Horn/Strobe	
	P2475-FC	x	x	Horn/Strobe	
	P2475W-FC	x	x	Horn/Strobe	
	P2475K-FC	x	x	Horn/Strobe	
	P24110-FC	x	x	Horn/Strobe	
	P24110W-FC	x	x	Horn/Strobe	
	P24110K-FC	x	x	Horn/Strobe	
	S2430W-FC		x	Strobe	
	S2430K-FC		x	Strobe	
	S2475-FC		x	Strobe	
	S2475W-FC		x	Strobe	
	S2475K-FC		x	Strobe	
	S24110-FC		x	Strobe	
	S24110W-FC		x	Strobe	
	S24110K-FC		x	Strobe	
	Federal Signal	450	x		Horn
		VALS	x	x	Horn/Strobe

Table A-1: Compatible Notification Appliances

Manufacturer	Model	Audio	Visual	Type
Gentex	GEC-24-15	x	x	Horn/Strobe
	GEC-24-30	x	x	Horn/Strobe
	GEC-24-60	x	x	Horn/Strobe
	GEC-24-75	x	x	Horn/Strobe
	GEC-24-177	x	x	Horn/Strobe
	GEC-24-110	x	x	Horn/Strobe
	GEC-24-15/75	x	x	Horn/Strobe
	GX91	x		MiniHorn Steady Tone
	GX93	x		MiniHorn Temporal Tone
Gentex (cont.)	HG124	x		Horn
	HS24-15	x	x	Horn/Strobe
	HS24-30	x	x	Horn/Strobe
	HS24-60	x	x	Horn/Strobe
	HS24-75	x	x	Horn/Strobe
	HS24-110	x	x	Horn/Strobe
	HS24-1575	x	x	Horn/Strobe
	GCC24	x	x	Multi Candella Horn/Strobe Ceiling Mount
	GCCR24		x	Multi Candella Horn/Strobe Ceiling Mount
	GCS24		x	Multi Candella Strobe Ceiling Mount
	GCSR24		x	Multi Candella Strobe Ceiling Mount
	GEGR-24	x	x	Multi Candella Horn/Strobe
	GES24-15		x	Strobe
	GES24-30		x	Strobe
	GES24-60		x	Strobe
	GES24-75		x	Strobe
	GES24-110		x	Strobe
	GES24-15/75		x	Strobe
	GES24-177		x	Strobe
	GES3-24		x	Multi Candella Strobe
	GESR-24		x	Multi Candella Strobe
	GEH-24	x		Horn
	ST24-30		x	Strobe
	ST24-60		x	Strobe
	ST24-75		x	Strobe
	ST24-110		x	Strobe
	ST24-1575		x	Strobe
	WGEC24-75W	x	x	Weatherproof Horn/Strobe
	WGES24-75W		x	Weatherproof Strobe
	WGMS-24-X	x	x	Horn/Strobe

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type
System Sensor	CHR	x		Chime
	CHW	x		Chime
	CHSR	x	x	2-Wire Chime/Strobe
	CHSW	x	x	2-Wire Chime/Strobe
	HR	x	x	Horn
	HW		x	Horn
	HRK		x	Horn
	HWL		x	Horn WHT Wall 4x4
	HRL		x	Horn Red Wall 4x4
	HGRL		x	Horn Red Wall 2x4
	HGWL		x	Horn WHT Wall 2x4
	CHWL	x		Chime WHT Wall 4x4
	CHRL	x		Chime Red Wall 4x4
	CHSRL	x	x	Chime/Strobe Red Wall 4x4
	CHSWL	x	x	Chime/Strobe WHT Wall 4x4
	CHSCRL	x	x	Chime/Strobe Red Ceil 4x4
	CHSCWL	x	x	Chime/Strobe WHT Ceil 4x4
	P2R	x	x	2-Wire Horn/Strobe
	P2R-P	x	x	2-Wire Horn/Strobe
	PC2R	x	x	2-Wire Horn/Strobe
	PC2R-P	x	x	2-Wire Horn/Strobe
	P2RH	x	x	2-Wire Horn/Strobe High Candela
	P2RH-P	x	x	2-Wire Horn/Strobe High Candela
	PC2RH	x	x	2-Wire Horn/Strobe High Candela
	PC2RH-P	x	x	2-Wire Horn/Strobe High Candela
	P2W	x	x	2-Wire Horn/Strobe
	P2W-P	x	x	2-Wire Horn/Strobe
	PC2W	x	x	2-Wire Horn/Strobe
	PC2W-P	x	x	2-Wire Horn/Strobe
	P2WH	x	x	2-Wire Horn/Strobe High Candela
	P2WH-P	x	x	2-Wire Horn/Strobe High Candela
	PC2WH	x	x	2-Wire Horn/Strobe High Candela
	PC2WH-P	x	x	2-Wire Horn/Strobe High Candela
	P2RK	x	x	2-Wire Horn/Strobe
	PC2RK	x	x	2-Wire Horn/Strobe
	P2RHK	x	x	2-Wire Horn/Strobe High Candela
	PC2RHK	x	x	2-Wire Horn/Strobe High Candela
	P4R	x	x	4-Wire Horn/Strobe
	PC4R	x	x	4-Wire Horn/Strobe
	P4RH	x	x	4-Wire Horn/Strobe High Candela

Table A-1: Compatible Notification Appliances

Manufacturer	Model	Audio	Visual	Type
System Sensor (cont.)	P4W	x	x	4-Wire Horn/Strobe
	PC4W	x	x	4-Wire Horn/Strobe
	P4WH	x	x	4-Wire Horn/Strobe High Candela
	PC4WH	x	x	4-Wire Horn/Strobe High Candela
	P4RK	x	x	4-Wire Horn/Strobe
	PC4RK	x	x	4-Wire Horn/Strobe
	P4RHK	x	x	4-Wire Horn/Strobe High Candela
	PC4RHK	x	x	4-Wire Horn/Strobe High Candela
	PC4RH	x	x	4-Wire Horn/Strobe High Candela
	P2RL, P2RL-P, P2RL-SP*	x	x	Horn/Strobe 2W Red Wall 4x4
	P2WL, P2WL-P, P2WL-SP*	x	x	Horn/Strobe 2W WHT Wall 4x4
	PC2RL	x	x	Horn/Strobe 2W Red Ceil 4x4
	PC2WL	x	x	Horn/Strobe 2W WHT Ceil 4x4
	P2GRL	x	x	Horn/Strobe 2W Red Wall 2x4
	P2GWL	x	x	Horn/Strobe 2W WHT Wall 2x4
	P4RL	x	x	Horn/Strobe 4W Red Wall 4X4
	P4WL	x	x	Horn/Strobe 4W WHT Wall 4X4
	PC4RL	x	x	Horn/Strobe 4W Red Ceil 4X4
	PC4WL	x	x	Horn/Strobe 4W WHT Ceil 4X4
	SR		x	Strobe
	SR-P		x	Strobe
	SCR		x	Strobe
	SCR-P		x	Strobe
	SRH		x	Strobe High Candela
	SRH-P		x	Strobe High Candela
	SCRH		x	Strobe High Candela
	SCRH-P		x	Strobe High Candela
	SW		x	Strobe
	SW-P		x	Strobe
	SCW		x	Strobe
	SCW-P		x	Strobe
	SWH		x	Strobe High Candela
	SWH-P		x	Strobe High Candela
	SCWH		x	Strobe High Candela
	SCWH-P		x	Strobe High Candela
	SRK		x	Strobe
	SCRK		x	Strobe
	SRHK		x	Strobe High Candela

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type
System Sensor (cont.)	SCRHK		x	Strobe High Candela
	SRL, SRL-P, SRL-SP*		x	Strobe Red Wall 4x4
	SWL, SWL-P, SWL-ALERT SWL-CLR-ALERT*		x	Strobe White Wall 4x4
	SCRL		x	Strobe Red Ceil 4x4
	SCWL		x	Strobe White Ceil 4x4
	SCWL-CLR-ALERT		x	Strobe WHT Ceil CLR Lens 4x4
	SGRL		x	Strobe Red Wall 2x4
	SGWL		x	Strobe White Wall 2x4
	P2RH-LF	x	x	2-Wire Low Frequency Sounder Strobe
	P2WH-LF	x	x	2-Wire Low Frequency Sounder Strobe
	HR-LF	x		Low Frequency Sounder
	HW-LF	x		Low Frequency Sounder
* P=Plain, ALERT=Pad Printing ALERT, SP=Fuego				
Wheelock	AH-12	x		Horn
	AH-24	x		Horn
	AH-12WP	x		Horn Weatherproof
	AH-24WP	x		Horn Weatherproof
	AMT-241575W	x	x	Multi-Tone Horn Strobe
	AMT-24MCW		x	Mutli-Tone Horn Strobe
	AMT-241575W-NYC	x	x	Multi-Tone Horn Strobe
	AMT-12/24	x		Multi-tone Horn
	AMT-12/24 NYC	x		Multi-tone Horn
	AS-121575W		x	Horn/Strobe
	NH-12/24	x	x	Horn
	AS-241575W	x	x	Horn/Strobe
	AS-24MCC	x	x	Horn/Strobe
	AS-24MCCH	x	x	Horn/Strobe
	AS-24MCW	x	x	Horn/Strobe
	AS-24MCWH	x	x	Horn/Strobe
	ASWP-2475W	x	x	Horn/Strobe Weatherproof
	ASWP-2475C	x	x	Horn/Strobe Weatherproof
	ASWP-24MCWH	x	x	Horn/Strobe
	ASWP-24MCCH	x	x	Horn/Strobe
	CH-70	x		Chime
	CH-90	x		Chime
	CH70-241575W		x	Chime/Strobe
	CH70-24MCW		x	Chime/Strobe
	CH70-24MCWH		x	Chime/Strobe
	CH90-24MCC		x	Chime/Strobe
CH90-24MCCH		x	Chime/Strobe	

Table A-1: Compatible Notification Appliances

Manufacturer	Model	Audio	Visual	Type
Wheelock (cont.)	HS-24	x		Horn
	HS4-241575W	x	x	Horn/Strobe
	HS4-24MCW	x	x	Horn/Strobe
	HS4-24MCWH	x	x	Horn/Strobe
	HS4-24MCC	x	x	Horn/Strobe
	MIZ-24S	x	x	Mini Horn Strobe
	MT-121575W		x	MultitoneHorn Strobe
	MT-241575W	x	x	Multitone Horn Strobe
	MT-24MCW		x	Multitone Horn Strobe
	MTWP-2475W		x	Multitone Horn Strobe
	MTWP-2475C		x	Multitone Horn Strobe
	MTG-121575W	x	x	Multitone Horn Strobe
	MTR-121575W	x	x	Multitone Horn Strobe
	MTWPA-2475W	x	x	Multitone Horn Strobe
	MTWPB-2475W	x	x	Multitone Horn Strobe
	MTWPG-2475W	x	x	Multitone Horn Strobe
	MTWPR-2475W	x	x	Multitone Horn Strobe
	MTWPA-24MCCH	x	x	Multitone Horn Strobe
	ZNH	x		Horn
	NS-121575W	x	x	Horn/Strobe
	NS-241575W	x	x	Horn/Strobe
	NS-24MCW	x	x	Horn/Strobe
	NS-24MCC	x	x	Horn/Strobe
	NS-24MCCH	x	x	Horn/Strobe
	ZNS-MCW	x	x	Horn/Strobe
	ZNS-MCWH	x	x	Horn/Strobe
	ZNS-24MCC	x	x	Horn/Strobe
	ZNS-24MCCH	x	x	Horn/Strobe
	RSS-121575W		x	Strobe
	RSS-241575W		x	Strobe
	RSS-24MCC		x	Strobe
	RSS-24MCCR		x	Strobe
	RSS-24MCCH		x	Strobe
	RSS-24MCCHR		x	Strobe
	RSS-24MCW		x	Strobe
	RSS-24MCWH		x	Strobe
	RSSP-121575W		x	Strobe
	RSSP-241575W		x	Strobe
	RSSR-2415W		x	Strobe
	RSSR-2415C		x	Strobe

**Table A-1: Compatible Notification Appliances**

Manufacturer	Model	Audio	Visual	Type
Wheelock (cont.)	RSSR-2475W		x	Strobe
	RSSR-2475C		x	Strobe
	RSSR-24110C		x	Strobe
	RSSA-24110W		x	Strobe
	RSSB-24110W		x	Strobe
	RSSG-24110W		x	Strobe
	RSSR-24110W		x	Strobe
	RSSA-24MCC		x	Multi-Cd Strobe
	RSSB-24MCC		x	Multi-Cd Strobe
	RSSG-24MCC		x	Multi-Cd Strobe
	RSSR-24MCC		x	Multi-Cd Strobe
	RSSWPA-2475W		x	Strobe Weatherproof
	RSSWPA-24MCCH		x	Strobe Weatherproof
	RSSWPG-24MCCH		x	Strobe Weatherproof
	RSSWPR-24MCCH		x	Strobe Weatherproof
	RSSWP-2475W		x	Strobe Weatherproof
	RSSWP-2475C		x	Strobe Weatherproof
	RSSWP-24MCWH		x	Strobe Weatherproof
	ZRS-MCWH		x	Strobe
	ZRS-24MCC		x	Strobe
	ZRS-24MCCH		x	Strobe
	MB-G6-24	x		Motor Bell
	MB-G10-24	x		Motor Bell
	MB-G6-12	x		Motor Bell
	MB-G10-12	x		Motor Bell
	MIZ-24-R	x		Mini-Horn
	MT-12/24-R	x	x	Multitone Horn
	MT4-12/2z	x	x	Multitone Horn
	ZRS-MCW		x	Strobe
	MTWPR-24MCCH	x	x	Multitone Horn Strobe
	NH-12/24R	x		Horn
	HSR		x	Horn/Strobe
	HSW		x	Horn/Strobe
	STR		x	Strobe
STW		x	Strobe	
HNR		x	Horn	
HNW		x	Horn	

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