
Installation Guide



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1.0 Overview

The D7038 is a Remote Notification Appliance Circuit (NAC) Power Supply designed to add four additional NACs (NFPA 72 Class B, Style Y) to a Fire Alarm Control Panel (FACP).

The D7038 is supervised by the control panel. It consists of the controller board, backup batteries and enclosure.

1.1 Module Control

1.1.2 Option Bus Control

The D7038 can connect to the Option Bus of the DS7400 series and D7024 Fire Alarm Control Panel (FACP).

See Section 4.3 Option Bus Connections for information on software version and panel compatibility.

1.1.3 Conventional NAC Input Control

For conventional panels, the D7038 connects via the FACP's NAC outputs that conform to NFPA 72 Class B. Please refer to the control panels' compatibility information.

1.2 Pulsed Bell Operation

The D7038 can generate two pulsed bell patterns on command when connected via the option bus in addition to steady activation of the output. The patterns are Pulsed and NFPA Temporal.

- **Pulsed:** 60 PPM (.5 sec. on, .5 sec. off).
- **NFPA Temporal:** In compliance with ANSI standard S3.41: .5 sec on, .5 sec off, .5 sec on, .5 sec off, .5 sec on, 1.5 sec off, etc.

1.3 Power Management

The controlling section of the board has un-interruptible power. The bulk 27.4/24 volt output will not drop out for more than 3 seconds upon the loss of the AC Line voltage.

1.4 Low AC Line Detection

Sensing circuitry will detect a line input voltage below 96 VAC, then will switch from the primary AC Line voltage to battery backup.

1.5 Ground Fault Indication

The Option Bus and Polarity Reversal Inputs are electrically isolated from the local power supply and indicating circuits. The D7038 supervises itself for grounded field connections and indicates a fault condition if one is found.

1.6 Circuit Supervision

Each NAC is supervised for short circuit and open conditions using a 2.2 K ohm resistor at the end of the loop. Devices on these loops must have a blocking diode on their input so that the 2.2 K ohm EOL supervision resistor can be read when the polarity of the output is "backwards" when in the standby state. The devices will then activate when the polarity is switched to "forward" when in alarm.

1.7 Expander Supervision

A "watchdog" supervises the operation of the D7038 processor and attempts to restart it if it fails. If the processor fails to restart, or power fails entirely, the installer supplied EOL device will be disconnected from the input to report the trouble condition. If power is available, the Trouble LED will light if the processor fails to operate.

Specifications

2.0 Specifications

2.1 Enclosure

The enclosure is manufactured from 18 Ga. cold-rolled steel and measures 12.75 in. W x 14.75 in. H by 3.5 in. D (32.4 cm W x 37.5 cm H x 8.9 cm D). A keyed lock and mounting hardware is included.

2.2 Temperature

The storage and operating temperature is +32° to +120° F (0° to +49° C).

2.3 Power

- **Input Power:** 120 VAC (+10%/-15%), 60 Hz, 2.5 A
- **Brown-out Voltage:** 96 VAC
- **Battery:** 24 VDC, nominal (20.2 to 28.0 VDC range)
- **Battery Capacity:** 6.5 Ah - 38 Ah.
- **Output Voltage:** 27.4 VDC +/- 0.1 VDC @ 25° C (77° F) (Battery = 24.1 +/- 0.6 VDC @ 25° C (77° F))
- **Output Current:** 6.0 A
- **Load Regulation:** 400 mV
- **Line Regulation:** 200 mV
- **Ripple Voltage:** ≤ 250 mV pp
- **Standby Current Draw:** 150 mA

2.4 NAC Input

- **Compatible with NFPA 72 Class B NAC**
- **Non-polarized Input Voltage:** 9 to 30 VDC
- **Input to Output Response Time:** ≤ 50 ms
- **Minimum Impedance of source:** 1.7 K ohms

2.5 Option Bus Input

- **Interface Level:** 0 to 12 V.

2.6 NAC Outputs (x4)

- **NFPA 72 Class B, Style Y NAC.**
- **Standby Voltage:** -5.0 VDC
- **EOL Resistor:** 2.2 K ohms +/- 5% (Detection Systems P/N: 25899).
- **Output Voltage:** 24.1 or 27.4 VDC.
- **Rated Output Current (per output):** 1.5 A.
- **Maximum Output Current (per output):** 2.5 A.



IMPORTANT

The total current draw of all NAC outputs and the auxiliary output cannot exceed 6 A.

2.7 Auxiliary Output

- **Output Voltage:** 24.1 or 27.4 VDC.
- **Maximum Output Current:** 850 mA.

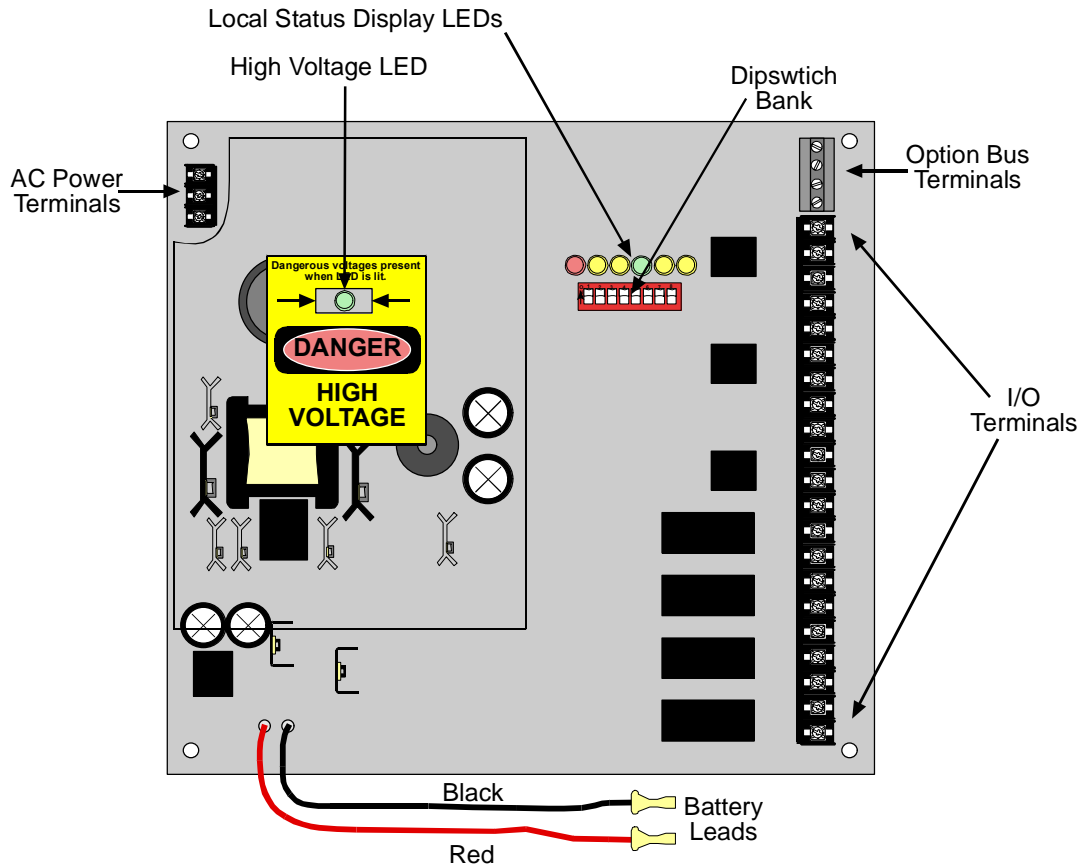
2.8 Trouble Relay Output

- **Contact Type:** Form "C"
- **Contact Rating:** 1.5 A, 32 VDC

3.0 Installing the D7038

The D7038 board and the enclosure are shipped together. The board, however, still needs to be mounted into the enclosure. Hardware for mounting the board to the enclosure is located in the hardware pack.

Figure 1: D7038 Remote NAC Power Supply Board



3.1 Enclosure Installation

- 1) Use the enclosure as a template and mark the top mounting holes on the mounting surface. Be sure there is enough clearance to open the door for maintenance.
- 2) Pre-start the mounting screws for these two holes. Slide the enclosure onto these mounting screws so that the screws move up into the thinner section of the holes. Tighten the screws.
- 3) Screw in the remaining two screws in either set of bottom mounting holes.
- 4) Knock out the desired wire entrances on the enclosure.

See Figure 2 for details.

Installation

3.2 D7038 Board Installation



The D7038 board is static-sensitive. Make sure you touch ground before handling the board. Doing so will discharge any static electricity in your body.

NO STATIC

Connect the ground wire.

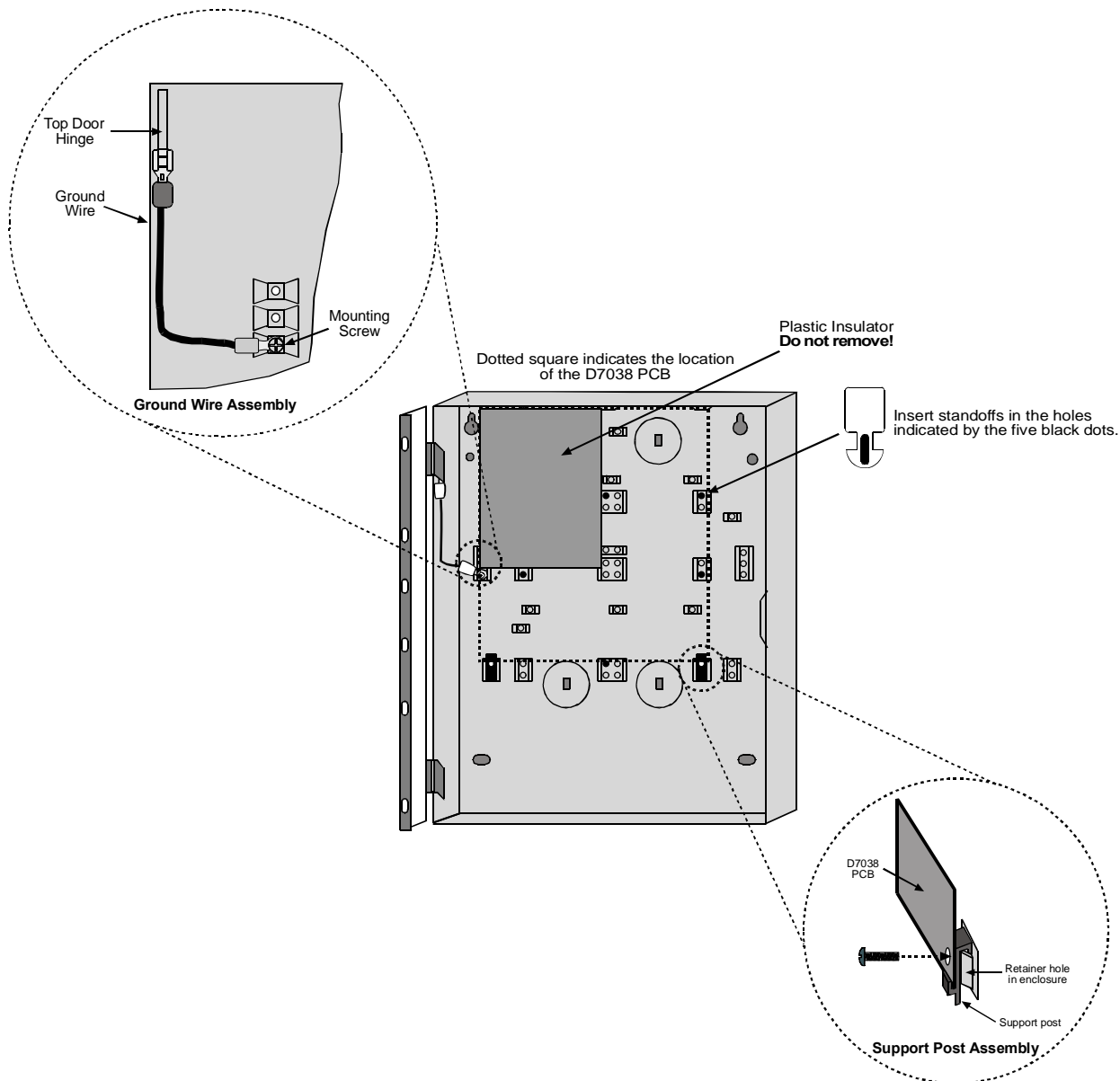
Insert the two support posts into the control retainer holes as shown in Figure 2.

Slide the top of the board into the retainer tabs (the slots under the top of the frame).

Once in the retainer tabs, the board will rest on the two support posts.

Secure the bottom of the board by screwing the two bottom corners through the support posts and through to the enclosure.

Figure 2: D7038 Enclosure and Board Installation



4.0 Wiring the D7038



All terminals are fully protected against ESD and lightning transients.

Use wire gauge based on Tables 1 and 2. The terminals can accommodate up to two 12 gauge (2.34 mm) wires.

Table 1: Wire Gauge Calculations

1. Guaranteed min. NAC voltage at full load.		23.5 volts
2. Largest value for all of the notification appliances' min. operating voltages.		
3. Max. wiring voltage drop.	<i>Subtract Line 2 from Line 1.</i>	
4. Total load for a given NAC.		
5. Max. allowable line resistance.	<i>Divide Line 3 by Line 4.</i>	
6. Total wiring run length.		
7. Total wire needed.	<i>Multiply Line 6 by Line 2.</i>	
8. Max. wire resistance per foot.	<i>Divide Line 5 by Line 7.</i>	
9. Choose a wire size with a resistance per foot less than Line 7.		

Table 2: Wire Gauge Table (based on solid wire)

AWG B&S Gauge	Ohms per Foot
12 (2.34 mm)	0.00158
14 (1.85 mm)	0.00253
16 (1.52 mm)	0.00402
18 (1.22 mm)	0.00639



NFPA 72 requires the use of #18 AWG (1.22 mm) or larger in fire applications.

4.1 AC Power Connections



Disconnect all power (AC and battery) before servicing the D7038. Wait until the High Voltage LED is off before handling any connections.

AC Power runs to the L1 (120 VAC), GND and L2 (Neutral) terminals.

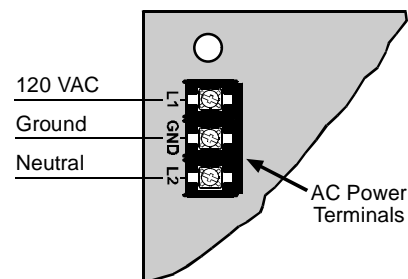
102 VAC to 132 VAC with 6 A capacity should feed the local power supply. The output voltage will be a filtered 27.4 VDC (500 mV ripple max.) under all conditions.

The D7038 supports surge currents up to 8 A for several seconds. Devices with large inrush currents will not cause a power supply shutdown. When the D7038 is overloaded, it will reduce the output voltage to the point where approximately 8 A will flow.

A trouble condition will be registered, but not indicated, if AC power falls below 102 V for over 5 seconds. A programmable time delay (see Section 5.3 AC Fail Time Delay) allows the indication of AC Failure to be delayed by 1, 6, 12, or 24 hours. The default is 6 hours.

See Figure 3 for wiring details.

Figure 3: AC Power Connections



Wiring

4.2 Battery Connections (24 VDC Only)

The backup battery plugs into the terminal marked B+/B- at the lower left corner of the board (see Figure 4). The D7038 requires two backup batteries in series.

Figure 4: Battery Connections Inside D7038 Enclosure

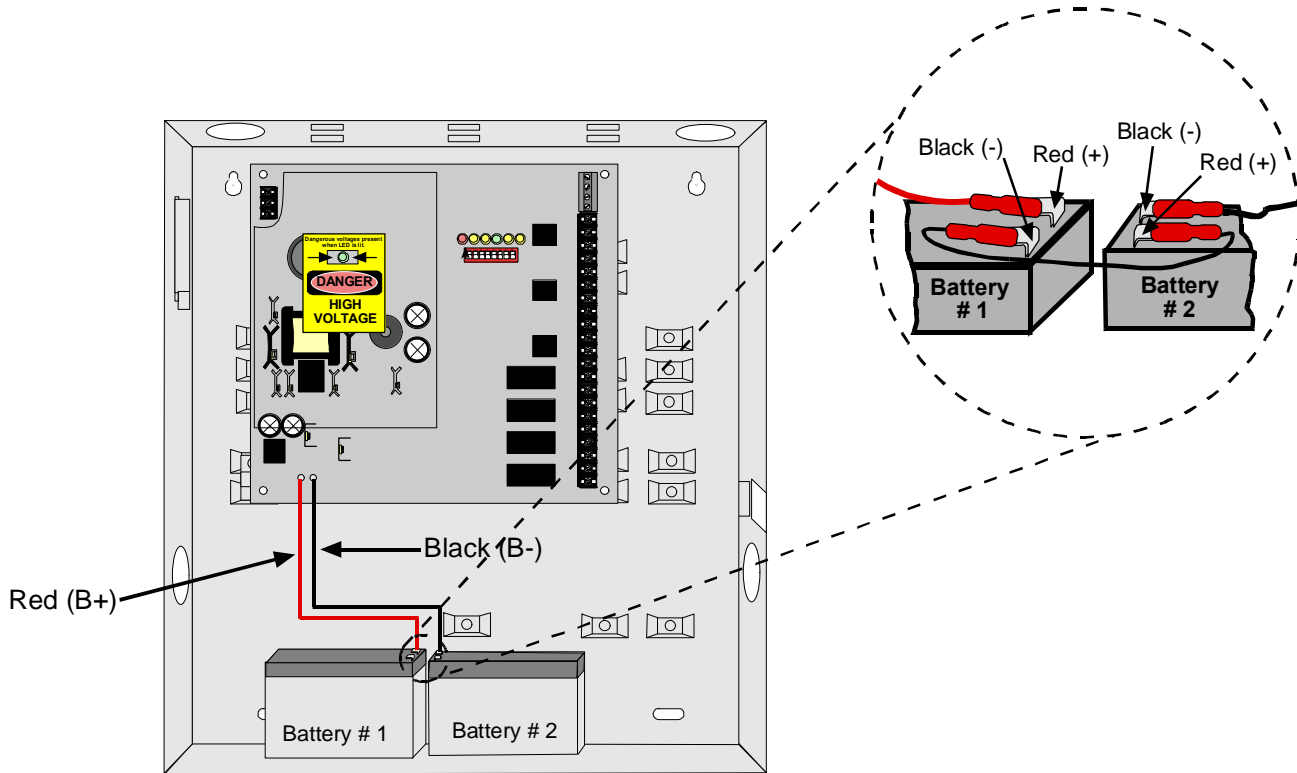
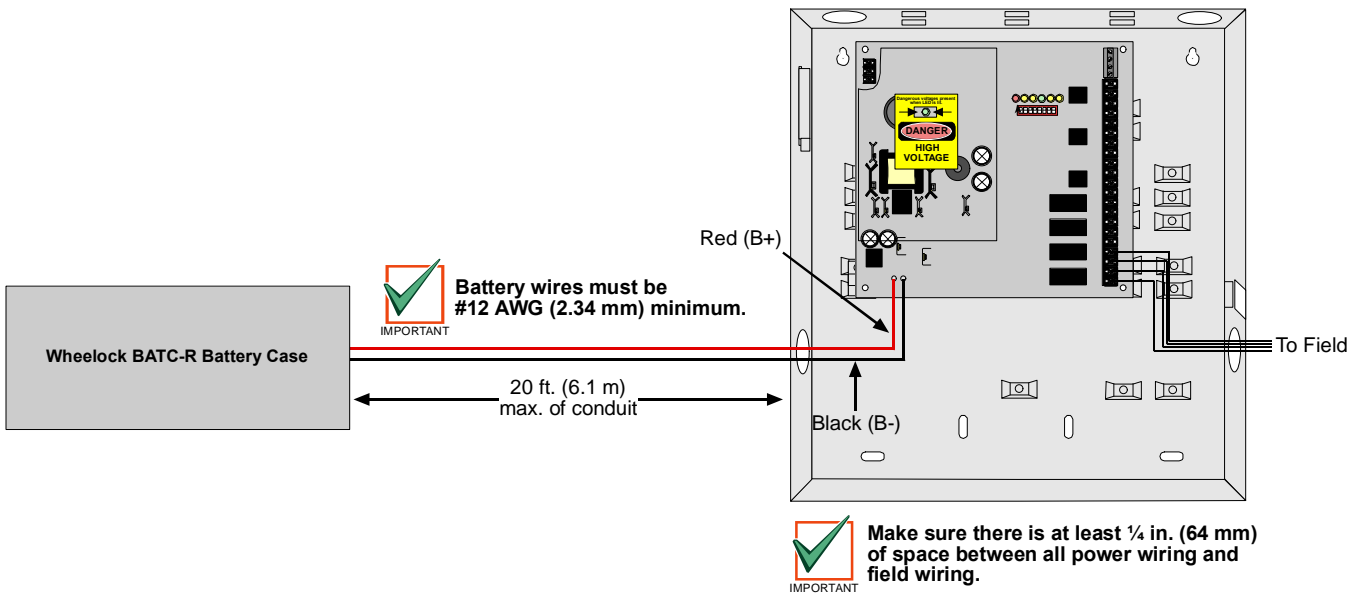


Figure 5: Battery Connections Using an External Battery Case



To determine the standby battery requirements, refer to Table 3:

Table 3: Standby Time Calculation

Device	Quantity	Standby Current per Device	Total Standby Current per Device (Quantity x Standby Current per Device)	Alarm Current per Device	Total Alarm Current per Device (Quantity x Alarm Current per Device)
D7038 Remote NAC Power Supply	1	150 mA	150 mA	0	0
		Grand Total Standby Current		Grand Total Alarm Current	

The required battery size to support the system can be calculated using the format shown in Table 4, or Tables 5 and 6 can be used to estimate the required battery size.

Table 4: Calculating the Required Battery Size

Grand Total Standby Current (in amps):	CS	
Total Hours of Standby Required (usually 24 or 60):	HS	
Total Standby Capacity (multiply CS x HS):	$TS = CS \times HS$	

Grand Total Alarm Current (in amps):	CA	
Divide by 0.6:	$\div 0.6$	
Total Hours of Alarm Time Required (usually 0.083 or 0.25):	HA	
Total Alarm Capacity (multiply CA x HA):	$TA = AC \times HA$	

Total Alarm Capacity Required (add TA + TS):	$TC = TA + TS$	
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Required Capacity with 20% Derating ($TC \times 0.8$):	$C = TC \times 0.8$	
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Table 5: Standby Load Battery Size (in amp-hours)

	Capacity Required for 24 Hours	Capacity Required for 48 Hours	Capacity Required for 60 Hours	Capacity Required for 72 Hours	Capacity Required for 80 Hours
Grand Total Standby Current					
100 - 200 mA	5.8	6.7	14.4	17.3	19.2
201 - 300 mA	8.6	10.1	21.6	25.9	28.8
301 - 400 mA	11.5	13.4	28.8	34.6	38.4
401 - 500 mA	14.4	16.8	36.0	X	X
501 - 600 mA	17.3	20.2	X	X	X
601 - 700 mA	20.2	23.5	X	X	X
701 - 800 mA	23.0	26.9	X	X	X
801 - 900 mA	25.9	30.2	X	X	X
901 - 1000 mA	28.8	33.6	X	X	X
1001 - 1100 mA	31.7	37.0	X	X	X
1101 - 1200 mA	34.6	X	X	X	X

Table 6: Alarm Load Battery Size (in amp-hours)

	Capacity Required for 5 minutes	Capacity Required for 10 minutes	Capacity Required for 15 minutes	Capacity Required for 30 minutes	Capacity Required for 45 minutes
Grand Total Standby Current					
250 - 500 mA	0.1	0.1	0.2	0.3	0.5
501 - 999 mA	0.1	0.2	0.3	0.6	0.9
1.0 - 1.5 A	0.2	0.3	0.5	0.9	1.4
2.6 - 2.0 A	0.2	0.4	0.6	1.2	1.8
2.1 - 2.5 A	0.3	0.5	0.8	1.5	2.3
2.6 - 3.0 A	0.3	0.6	0.9	1.8	2.7
3.1 - 3.5 A	0.4	0.7	1.1	2.1	3.2
3.6 - 4.0 A	0.4	0.8	1.2	2.4	3.6
4.1 - 4.5 A	0.5	0.9	1.4	2.7	4.1
4.6 - 5.0 A	0.5	1.0	1.5	3.0	4.5
5.1 - 5.5 A	0.6	1.1	1.7	3.3	5.0
5.6 - 6.0 A	0.6	1.2	1.8	3.6	5.4

For batteries larger than 7.0AH, the addition of Wheelock's BATC-R Battery Case will be necessary to hold the batteries. Connections between the batteries in the Wheelock BATC-R Battery Case and the control panel need to be in conduit and no more than 20 ft. (6.1 m) from the control panel. All power wiring must exit from the left side of the D7038 enclosure.

Battery wires must be #12 AWG (2.34 mm).

The D7038 will provide a regulated output voltage of 24.1VDC (500mV ripple max.) when operating from the standby batteries under all conditions, including when the batteries are nearly depleted.

A low battery condition will be reported when the battery voltage drops below 20.4V for the pair.

The D7038 will fully charge depleted 6.5AH batteries with 48 hours.

A disconnected battery will be indicated within one minute.

4.3 Option Bus Connections

The option bus (if used) runs to the terminals labeled TX, RX, RTN and +12 V (see Figure 6).

The Option Bus connection can be used with Detection Systems DS9400 and Radionics D7024 FACP with firmware revision 2.0 (or later). The D7038 will be considered a new option module type that can indicate specific trouble conditions back to the control panel, such as AC, battery, etc.

The D7038 can also be used with Detection Systems DS7400 panels. Here, the D7038 will work by emulating a DS7488 Octal Relay Module. All troubles are indicated as "octal relay module fault" only.

See Section 5.0, "D7038 DIP Switch and Option Settings" to set the D7038's address for use with the Option Bus.

4.4 NAC Input Connections

There are two inputs that can be used with 12 or 24 volt polarity reversal outputs from a conventional panel that conform to NFPA 72, Class B (used instead of the option bus connection). Please refer to the control panels' compatibility information.

Polarity reversal on Input 1 will activate NAC Outputs 1 and 2; Input 2 will activate NAC Outputs 3 and 4. DIP switch settings will allow NAC Input 1 to control all four outputs (see Section 5.0, "D7038 DIP Switch and Option Settings").

If the control panel detects a trouble condition on either set of outputs, the appropriate EOL device will be disconnected from the reversal loop. These inputs are electrically isolated from the controlling section of the board.

The D7038 can be placed anywhere on a FACP's NAC circuit.

See Figure 7 for wiring details.

Connect either the D7038's Option Bus or NAC Input terminals to the FACP. Do not connect both.

4.5 Trouble Relay Connections

The trouble relay provides one set of Form "C" contacts for connection of an appliance of choice. It can be wired in series with the Auxiliary Output to provide power to the appliance.

The relay will be activated by the controlling section of the board to indicate a fault condition. See Figure 8 for wiring details.

Figure 6: Wiring the Option Bus

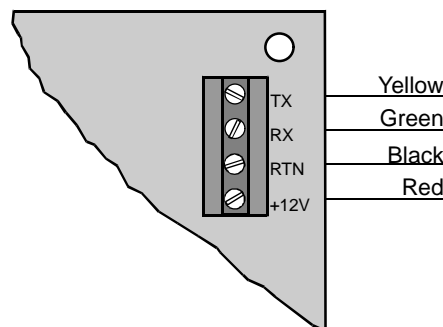
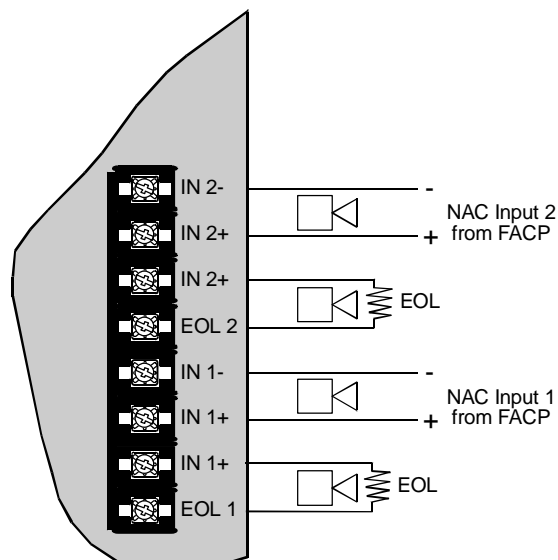
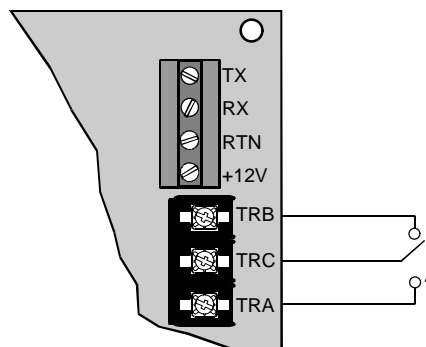


Figure 7: Wiring the NAC Inputs



The EOL resistor value is dependent on the conventional panel.

Figure 8: Wiring the Trouble Relay



Settings

4.6 Auxiliary Output Connections

The auxiliary output provides a continuous, unsupervised 24 V output to power external devices. It is rated at 0.85 A. It can be wired in series with the trouble relay to provide power to the associated appliance.

A short circuit on this output will not affect the operation of the D7038 in any way. See Figure 9 for wiring details.

4.7 NAC Output Connections

Four outputs, consisting of two Form C relays, switch the load to the 24 volt bus. Each output sources up to 2.5 Amps, limited by an overall 6 Amp capacity.

Overload protection will interrupt the circuit within 5 seconds given an overload of 8 Amps total. When de-energized, the relay will switch a monitoring circuit across the output to verify EOL termination, allowing reporting of an open or shorted output condition. See Figure 10 for wiring details. Refer to Section 2.6 for EOL part number.



Reverse polarity connections of some notification appliances may not be detected by the D7038 NAC supervision. Make sure that the notification appliances are connected properly and tested before installation is completed.

5.0 D7038 DIP Switch and Option Settings

The following options must be set with the DIP switches:

- Option Bus Address
- NAC Input Variable
- AC Failure Time Delay

See Figure 1 for the location of the DIP switch bank on the D7038 board.

See Figure 11 for proper DIP switch positioning.

See Table 7 for DIP switch settings.

Figure 9: Wiring the Auxiliary Outputs

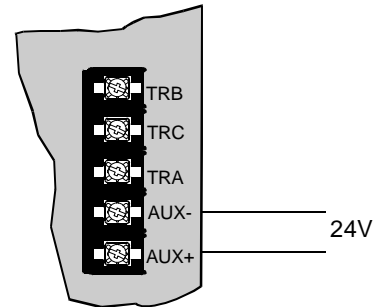


Figure 10: Wiring the NAC Outputs

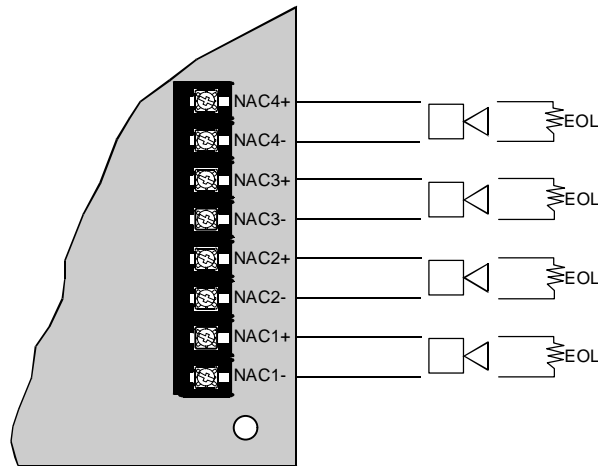


Figure 11: D7038 DIP Switch Orientation

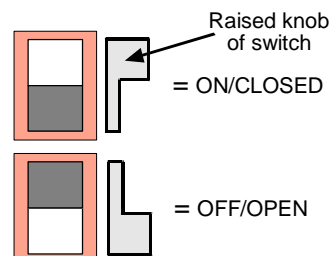


Table 7: D7038 DIP Switch Settings

Option Settings	DIP Switches							
	1	2	3	5	6	7	8	
Option Bus Address 1	-	-	-	On/Closed	Off/Open	Off/Open	Off/Open	
Option Bus Address 2	-	-	-	Off/Open	On/Closed	Off/Open	Off/Open	
Option Bus Address 3	-	-	-	On/Closed	On/Closed	Off/Open	Off/Open	
Option Bus Address 4	-	-	-	Off/Open	Off/Open	On/Closed	Off/Open	
Option Bus Address 5	-	-	-	On/Closed	Off/Open	On/Closed	Off/Open	
Option Bus Address 6	-	-	-	Off/Open	On/Closed	On/Closed	Off/Open	
Option Bus Address 7	-	-	-	On/Closed	On/Closed	On/Closed	Off/Open	
Option Bus Address 8	-	-	-	Off/Open	Off/Open	Off/Open	On/Closed	
Option Bus Address 9	-	-	-	On/Closed	Off/Open	Off/Open	On/Closed	
Option Bus Address 10	-	-	-	Off/Open	On/Closed	Off/Open	On/Closed	
Option Bus Address 11	-	-	-	On/Closed	On/Closed	Off/Open	On/Closed	
Option Bus Address 12	-	-	-	Off/Open	Off/Open	On/Closed	On/Closed	
Option Bus Address 13	-	-	-	On/Closed	Off/Open	On/Closed	On/Closed	
Option Bus Address 14	-	-	-	Off/Open	On/Closed	On/Closed	On/Closed	
Option Bus Address 15	-	-	-	On/Closed	On/Closed	On/Closed	On/Closed	
NAC Input Variable	On/Closed	-	-	-	-	-	-	
AC Fail Time Delay (6 Hour Default)	-	Off/Open	Off/Open	-	-	-	-	
AC Fail Time Delay (1 Hour)	-	On/Closed	Off/Open	-	-	-	-	
AC Fail Time Delay (12 Hour)	-	Off/Open	On/Closed	-	-	-	-	
AC Fail Time Delay (24 Hour)	-	On/Closed	On/Closed	-	-	-	-	

5.1 Option Bus Address



IMPORTANT

To activate a new address, remove the AC and battery power from the D7038. Restore power once it has been removed. The new address will become active once power has been restored to the D7038.

If using the Option Bus connection, the D7038 needs to have its own address (1 to 15). Use switches 5 through 8. Refer to Figure 11 for proper DIP switch positioning.

5.2 NAC Input Variable

Instead of having Input 1 drive NAC Output 1 and 2 and Input 2 drive NAC Output 3 and 4, Input 1 can be set to drive all four outputs. Set DIP Switch 1 to the ON/CLOSED position to select this option.

5.3 AC Fail Time Delay

A trouble condition will be registered, but not indicated, to the panel if the AC falls below 102V for over 5 seconds. A programmable time delay allows the indication of AC Failure to be delayed by 1, 6, 12, or 24 hours. The default value is 6 hours.

Use DIP switches 2 and 3 for these settings.

6.0 D7038 Local Status Display

The D7038 Local Status Display LEDs indicate the following conditions:

- High Voltage (HFLT)
- Output Active (OUT)
- NAC Short (SHRT)
- Low Battery (LBAT)
- Ground Fault (GFLT)
- AC OK (ACOK)
- Loop Trouble (TBL)



WARNING

There are two warning labels indicating that the D7038 is a high voltage device. It should not be serviced until the High Voltage LED is off and power is removed (both AC and battery).

See Table 8 for the functions of the Local Status Display LEDs.

Table 8: Local Status Display LED Functions

LED	Function
High Voltage	Warns of dangerous voltages when lit.
Output Active	Indicates one of the NACs (1-4) is currently active.
NAC Short	Indicates that there is a short on one of the 4 NAC outputs.
Low Battery	Indicates that there is a missing or dead battery.
Ground Fault	Indicates that the NAC output wiring has been improperly connected to an external source or ground.
AC OK	Indicates that the input is OK and that the power supply is running from the AC line.
Loop Trouble	Indicates that one, or both, NAC Input EOL device has been disconnected due to one or more of the following faults: faulty AC power (after a delay); low battery fault; ground fault; NAC Output fault (EOL shorted, EOL open, NAC overcurrent).