

Maple Armor

FW131

NAC Booster

Installation and Operation Manual

DOC-FW131-UM-R1.0

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

This product incorporates field-programmable software. 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.

Program feature or option	Permitted in UL 864? (Y/N)	Possible settings	Settings permitted in UL 864
Communication	Y	SLC CAN bus	SLC
Silenceable (NAC Silence)	Y	Silenceable, Nonsilenceable, Silenceable with 10 min resound, Canadian Residential	Silenceable, Nonsilenceable, Silenceable with 10 min resound
Bell Code	Y	Temporal 3 (MA) Temporal 4 (MA) 60 bpm (MA) Steady Continuous Gentex Temporal 3	Temporal 3 (MA) – for conventional appliances Continuous – for addressable appliances

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

This product incorporates field-programmable software. In order for the product to comply with the requirements in CAN/ULC-S527, Standard for Control Units for Fire Alarm Systems, certain programming features or options must be limited to specific values or not used at all as indicated below.

Program feature or option	Permitted in CAN/ULC-S527? (Y/N)	Possible settings	Settings permitted in CAN/ULC-S527
Communication	Y	SLC CAN bus	SLC
Silenceable (NAC Silence)	Y	Silenceable, Nonsilenceable, Silenceable with 10 min resound, Canadian Residential	Silenceable, Nonsilenceable, Silenceable with 10 min resound
Bell Code	Y	Temporal 3 (MA) Temporal 4 (MA)	Temporal 3 (MA) – for conventional appliances

		60 bpm (MA) Steady Continuous Gentex Temporal 3	Continuous – for addressable appliances
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Overview

The FW131 NAC Booster is used to provide Notification Appliance Circuit expansion support for additional horn and/or strobes. It also provides auxiliary power to support system accessories. Alarm current can be divided between eight outputs for powering NAC devices. Outputs can be independently programmed for Steady, Temporal 3, temporal 4, 60 bpm, as well as Continuous. There are 2 communication types – via SLC, and Pass Through. In addition, there are four common trouble output terminals [NC, C, NO] which are used to indicate general loop/system trouble.

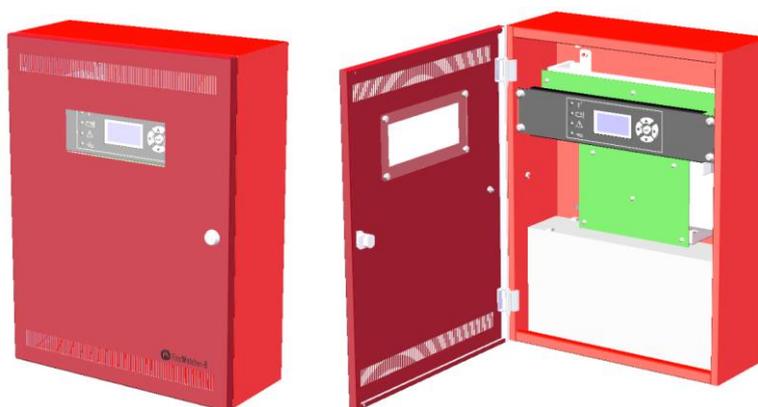


Figure 1 NAC Booster

Specifications and Features

The specifications and features of the FW131 NAC Booster are described in Table .

Table 1 FW131 NAC Booster Specifications

AC Input	120VAC/60Hz, 4.68A 240VAC/50Hz, 2.6A
Battery	Two 12V 40AH max in total Two 12V 18AH max in cabinet
Aux Output	Regulated 24VDC, resettable/non-resettable programmable, 1A max. Class E. 0.35 power factor
NAC Output	Class A or B. Use Maple Armor Model FW421 end-of-line resistor for Class B NAC wiring. <ul style="list-style-type: none"> ● Special application 10A in total (max 3A per NAC) for conventional appliances or ● Regulated 2A (on one NAC) plus special application 8A in total (max 3A per NAC) for conventional appliances or ● Special application 8A in total (max 3A per NAC) for addressable appliances or mixture of conventional appliances and addressable appliances.
Relay Output	4 NO (common) relay outputs (AC fail, battery fail, ground fault, general trouble), contact rating 1A @24Vdc. 0.35 power factor
Communication	SLC - Class A or B (DCLA & DCLB), take 2 - 9 addresses on SLC Pass Through - Class A & B, 2 inputs configurable
Configuration	128X32 LCD + 4 buttons
LED	4 (AC fail, battery fail, ground fault, general trouble)
Recommended Testing	6.6 k ohm for ground fault

impedence	10M ohm for open 0.1 ohm for short
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Synchronization is achieved on NAC Booster-basis when conventional notification appliances are employed, and on SLC/DCL-basis (from compatible FACP) when addressable notification appliances are employed. Synchronization is not intended between conventional and addressable notification appliances.

Below shows the compatible version for FACP model FW106, FW106C, FW106S, FW106SC.

Product/Module Description	Model Designation	Software version equal or later than
AMI, Advanced Machine Interface	FW201, FW201A, FW201B, FW201C, FW201D, FW201S, FW201SC	ami1.1.1.0_0.0.67
ALU, Addressable Loop Unit	FW327	V1.0.0.0_47.33.18
NOU, Notification Output Unit	FW337	V1.0.0.0_0.8.6

Below shows the compatible version for FACP model FW105 (not UL/ULC listed for the moment)

Product/Module Description	Model Designation	Software version equal or later than
AMI, Advanced Machine Interface	FW202	V1.0.0
ALU, Addressable Loop Unit	FW301	V1.0.0_47.33.4
NOU, Notification Output Unit	FW337	V1.0.0.1_0.0.4

System Components

AMI, model FW302-1

The AMI is the display unit of FW131, which integrates 1 LCD, 4 system status LEDs, 4 navigation buttons and 1 enter button. The keys are used for system programming. No operating control is available.



Figure 2 AMI
Table 2 Displays

LEDs	Color	Status	Functions
AC FAIL	Yellow	On	Indicates AC power is off
		Off	Indicates AC power is normal
BATTERY FAIL	Yellow	On	Indicates battery is off
		Off	Indicates battery is normal
TROUBLE	Yellow	On	Indicates trouble occurred in the system
		Off	No Trouble
GND FAULT	Yellow	On	Ground Trouble exists
		Off	No ground trouble

PSU (Power Supply Unit), model FW390N

- 120VAC, or 240VAC input selectable
- Provide power supply output to the system
- Terminals BAT+ and BAT- connect two lead-acid batteries (12VDC) in series.
- Maximum Charge Voltage: 27.8 VDC
- Maximum Charge Current: 5A. Sufficient battery charging capability is available to charge 40AH sealed lead-acid batteries within code requirements for up to 24 hours standby plus 30 minutes alarm plus 5 minutes alert.
- Use a microprocessor-controlled transfer circuit to switch power supply for the system to standby batteries when AC power is off or low.
- Communicate to the AMI to report fault conditions.



120VAC or 240VAC input is optional. A slide switch is used to fulfill this function. Please refer to Power Supply Wiring section for switch usage information.

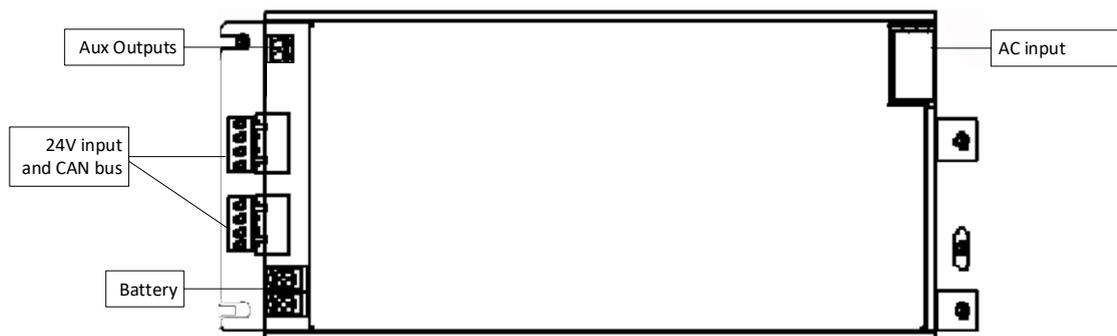


Figure 3 PSU

NBU (NAC Booster Board), model FW302

The main board unit includes 2 Pass Through Inputs, 1 SLC/DCL, 8 NACs, 4 Relays Outputs, and 1 CAN connector. No connections are to be made at CAN connector.

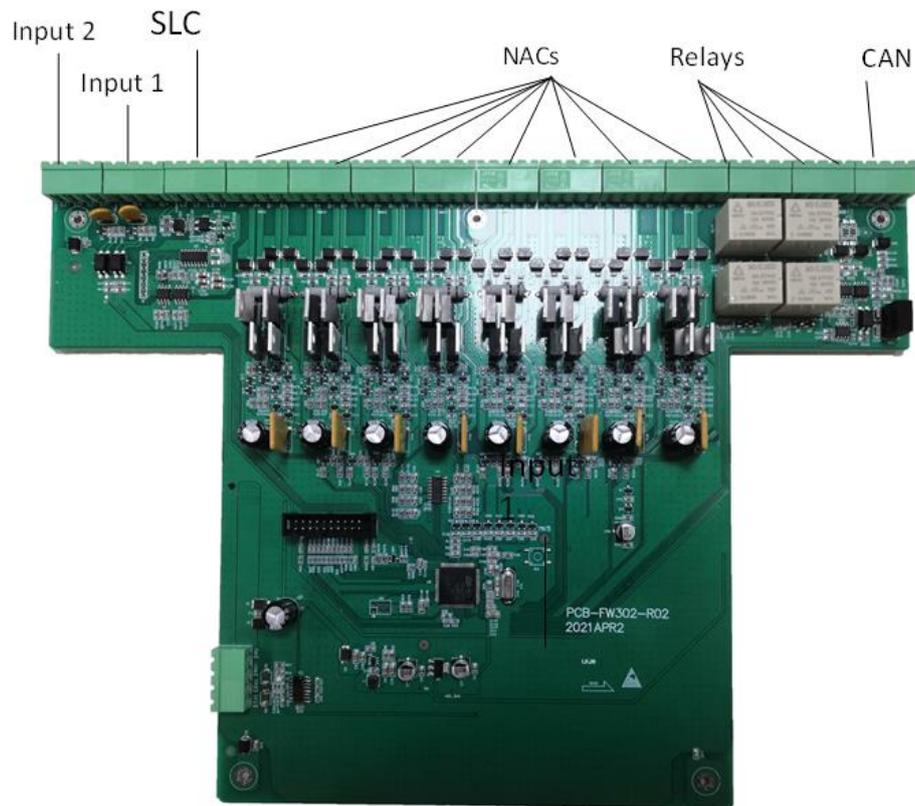


Figure 4 NBU

Enclosure model FW194

The enclosure size is shown as follows.

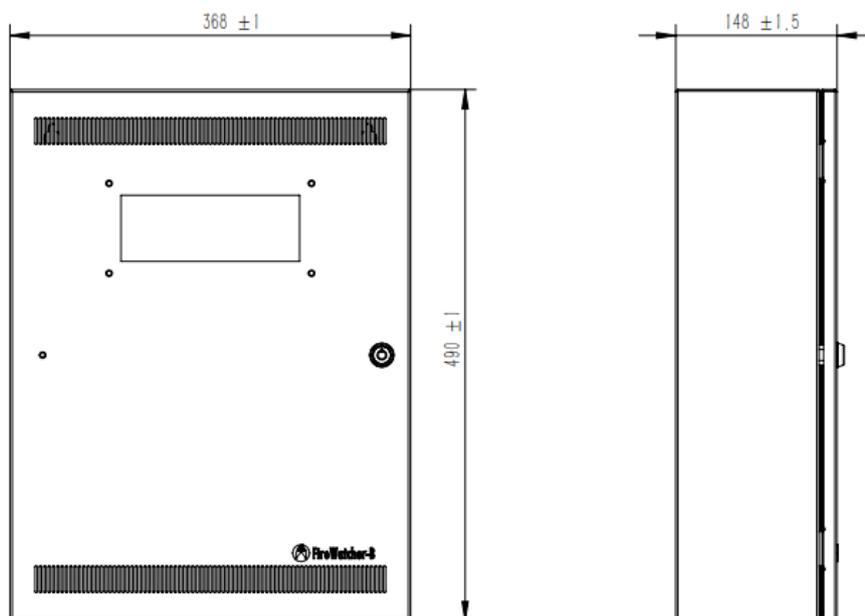


Figure 5 Enclosure

INSTALLATION

Before installing any electrical components, drill the holes as follows.

- Drill the hole on the position shown in Figure 7. The size of the holes shall be suitable for 1/2" or 3/4" conduit connection.
- Remove shavings and smooth sharp edges. The hole must be round and smooth.



Route all high voltage and non-power limited wiring together and away from power limited wiring. Refer to the Power Limiting section for more details.

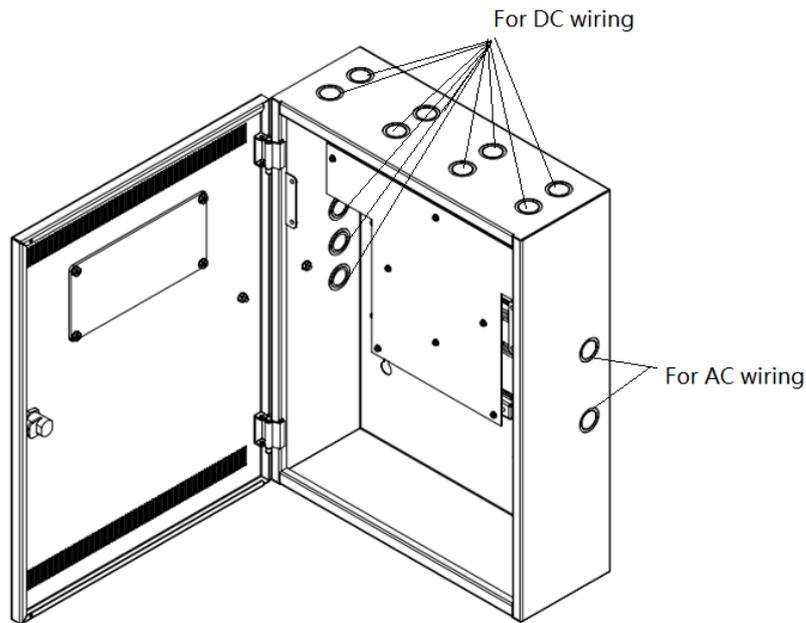


Figure 6 Hole Position

1. Mount the PCB fixed plate into the cabinet using screws provided.

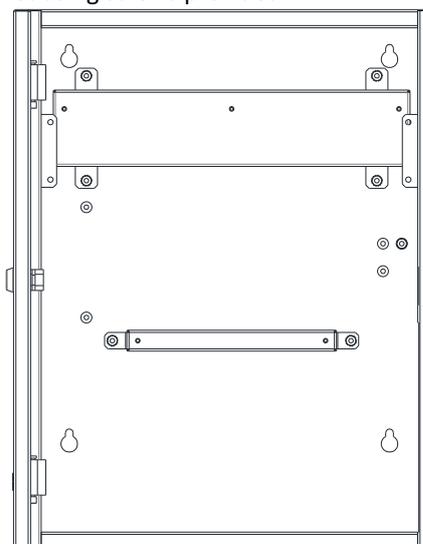


Figure 7 PCB fixed plate installation

2. Mount the PSU (power supply unit) into the cabinet.

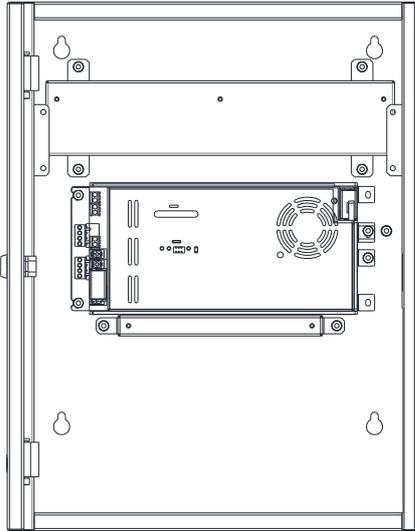


Figure 8 PSU installation

3. Mount the main board.

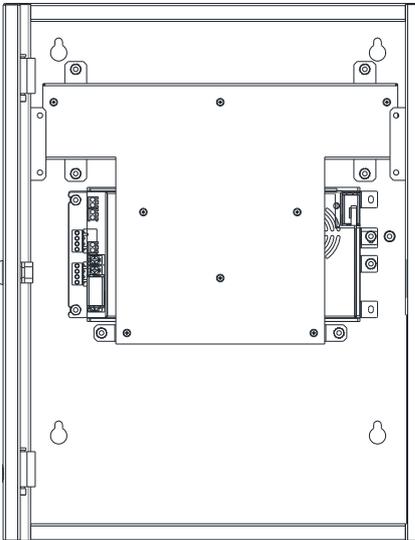


Figure 9 NBU installation

4. Mount the AMI onto cabinet.

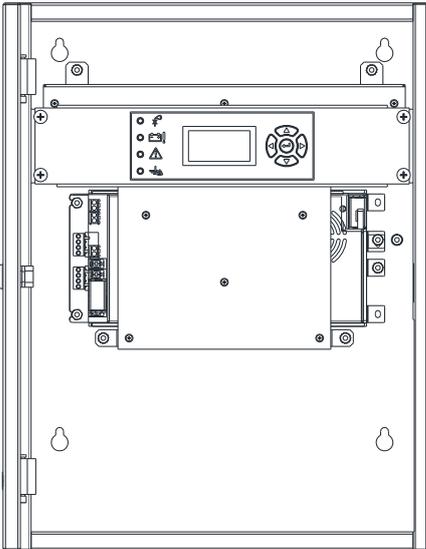


Figure 10 AMI installation

5. The FW131 cabinet can be surface-mounted or flush-mounted.

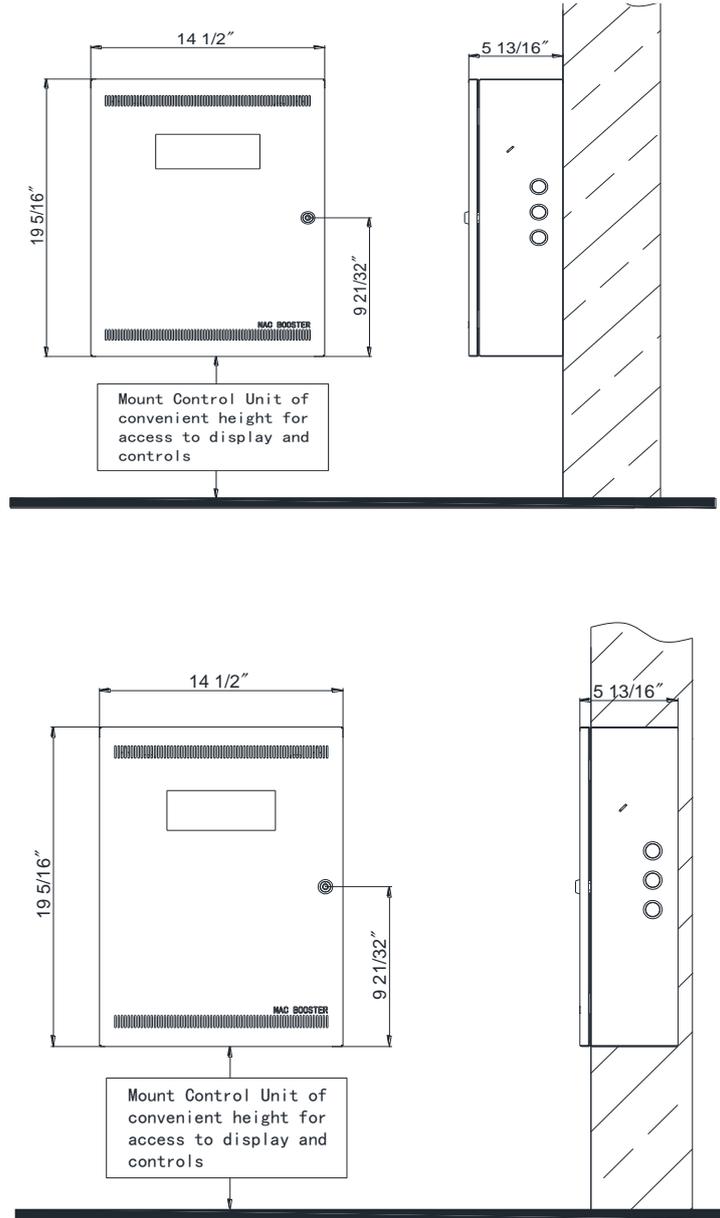


Figure 11 Mounting to walls

SYSTEM WIRING

There are two manners to connect between panels and NAC Boosters – via SLC/DCL and Pass Through. See below for the number of NAC Boosters that can be connected on FACP.

- Via SLC/DCL: The maximum NAC boosters can be connected on SLC/DCL is $252/2=126$. (One booster takes two SLC/DCL addresses: one by one of the NAC, one by AUX). All NAC circuits on one NAC Booster shall not serve more than one notification zone. Multiple NAC Boosters connected to one SLC/DCL and serving more than one notification zones shall be isolated by isolator modules (model FW851) to prevent a single fault on SLC/DCL to affect more than one notification zone.
- Pass Through: The maximum number of NAC Boosters can be connected via Pass Through depends on the communication current draw from NAC Booster. All NAC Boosters connected to the same FACP NAC circuit shall not serve more than one notification zone.

Before connecting the field wiring, check the wiring for opens, shorts, grounds, and stray voltages.

WARNING

Damage may result if a high-voltage insulation tester is used on wiring while connected to the control panel and field devices.

Terminate the field wiring to the main board in accordance with the diagrams in the SYSTEM WIRING section and in the system design documents.



All wiring must be in accordance with local codes, National Electrical Code, and Canadian Electrical Code, CSA C22.1 Safety Standard for Electrical Installations, Canadian Electrical Code, Part I, Section 32

Wiring Notes

Basic system wiring and detector locations must be in accordance with NFPA 72 and CAN/ULC-S524 or other applicable codes and instructions from the appropriate local authority having jurisdiction.

Devices that may be satisfactorily used with the control panel. Wire reference data are listed in

Appendix-A: Wire Selection Guide

Power Limiting

In accordance with NEC Article 760 and UL 864, all power limited fire protective signaling conductors must be located at least 1/4 inch (6.4 mm) away from all of the following wiring located within a control panel:

- Electric light
- Power
- Class 1 or non-power limited fire protective signaling conductors

To meet these requirements, the following guidelines **must be observed** when installing modules and wiring to this control panel.

When installing power limited field wiring, the installer must comply with NEC article 760, which states:

The fire alarm power-limited circuits are installed using Types FPL, FPLR, FPLP or permitted substitute cable, provided these power-limited cable conductors extending beyond the jacket are separated by a minimum of 0.25 in. (6.35 mm) or by a nonconductive sleeve or nonconductive barrier from all other conductors.

If energy limited cable or equivalent is not used within the FW131 enclosure, then the following guidelines do not apply. In that case, be sure to follow standard wiring practices.

Wiring Entering the Enclosure

- Non-Power Limited Wiring - Wiring entering the enclosure from the bottom left side and right side of the enclosure is considered non-power limited wiring. Wiring must be in the shortest route and must not overlap any other wiring.
- Power Limited Wiring - Wiring entering the enclosure from the upper left side of the enclosure or the right side is considered power limited. Wiring must be in the shortest route and must not overlap any other wiring.

Wiring Separation

All high voltage and non-power limited wiring must be separated from power limited wiring. A separation of at least 1/4 inch must be maintained with high voltage and non-power limited wiring running in separate conduit openings from power limited wiring.

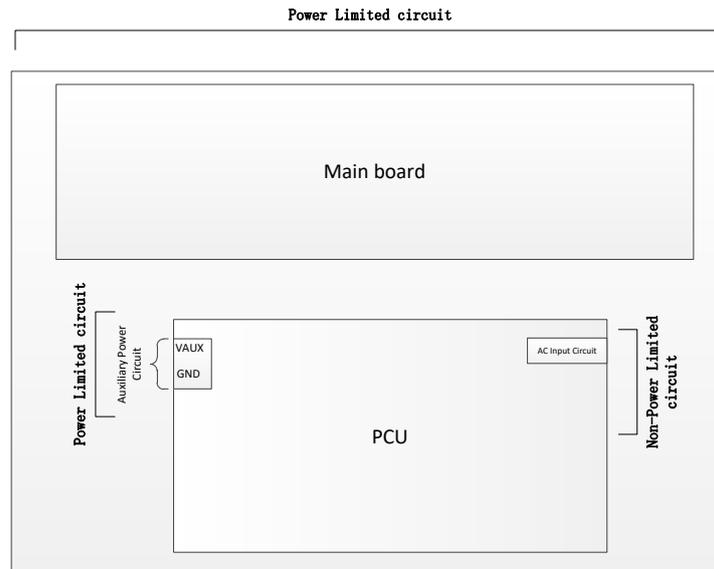


Figure 12 Wiring Terminals Location

Power Supply Wiring

AC Connection



Prior to installation, make sure the slide switch matches the rated voltage. Otherwise the PTU will be permanently damaged!

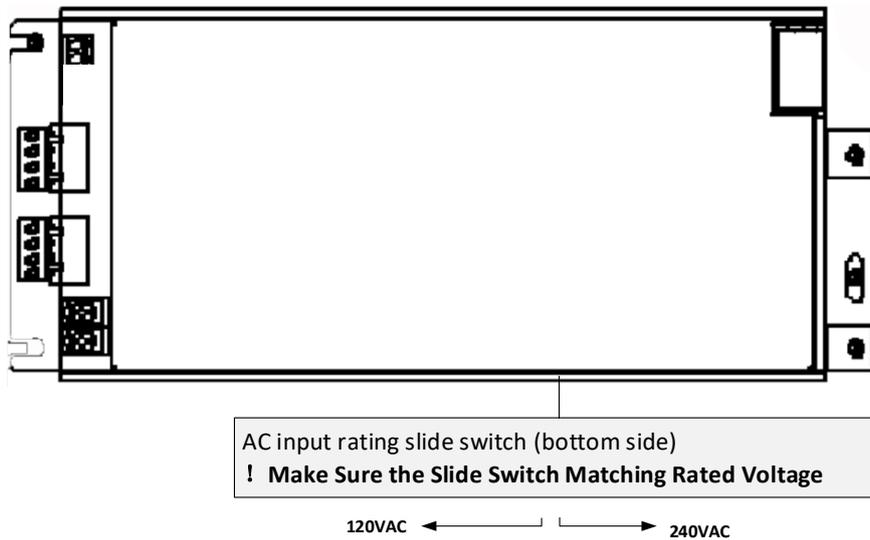


Figure 13 AC input rating setting

Wire the AC supply to the power supply on the back of the enclosure. The supply should originate from a dedicated 15A branch circuit. It should be provided with a breaker or other means of isolation that must be colored red.



Dangerous voltages will be present on the terminal block and on other components surrounding it when the AC supply is turned on. Do not touch.

Connect the ground cable to the earth stud on the enclosure back box.

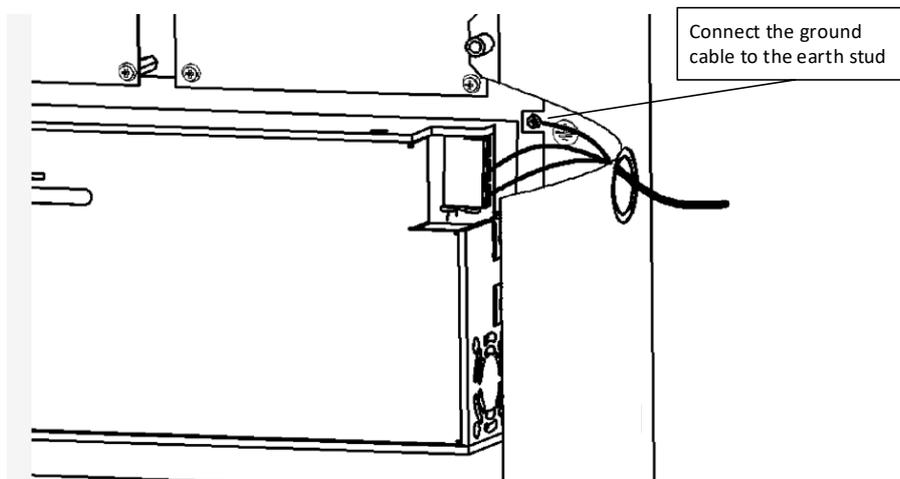


Figure 14 Ground Wiring

Battery Connection

Batteries must be replaced when they fail to provide the required standby and alarm power or after 4 years, whichever happens first. These batteries must be checked for performance at least twice a year or more often, if local requirements dictate

WARNING

Improper battery connections or shorting battery terminals may damage the system and/or the batteries and may cause personal injuries.

The control panel battery charge capacity is up to 40AH. Use 12V batteries of the same AH rating. Determine the correct AH rating as per your current load calculation (see Appendix-B: Battery Calculations). Wire batteries in series to produce a 24-volt equivalent. Do not parallel batteries to increase the AH rating.

Note: The maximum battery can be located in the FW194 cabinet is 18 AH. Batteries larger than 18 AH shall be installed in any external UL/ULC listed battery box, using a nipple connection.

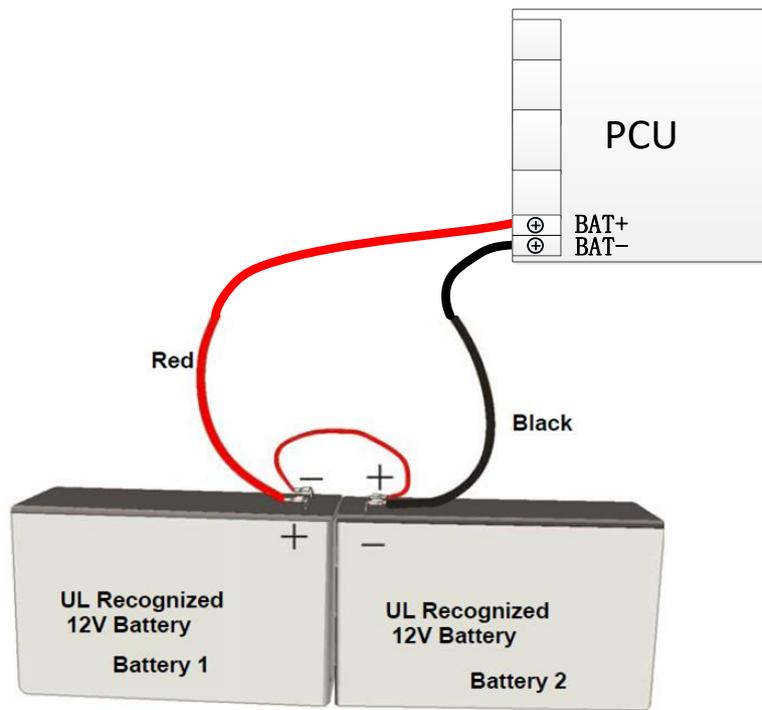


Figure 15 Battery Connection

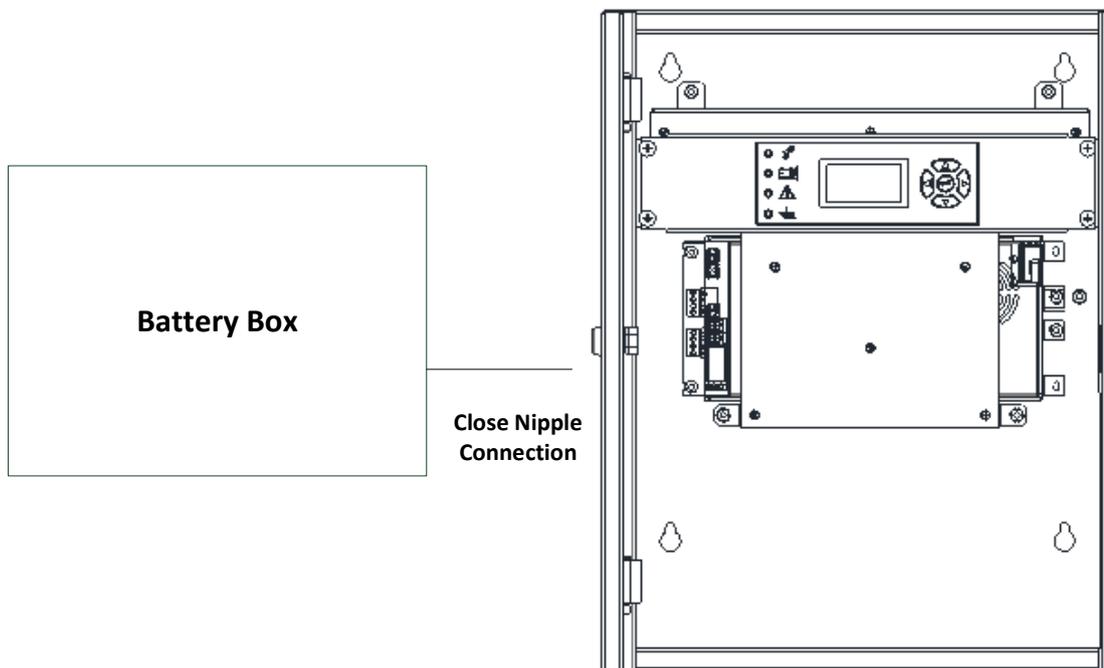


Figure 16 Close Nipple Connection

Field Input Wiring

Via SLC/DCL

Note: In SLC/DCL mode, trouble relays connection is not required.

Conventional appliances - Class A

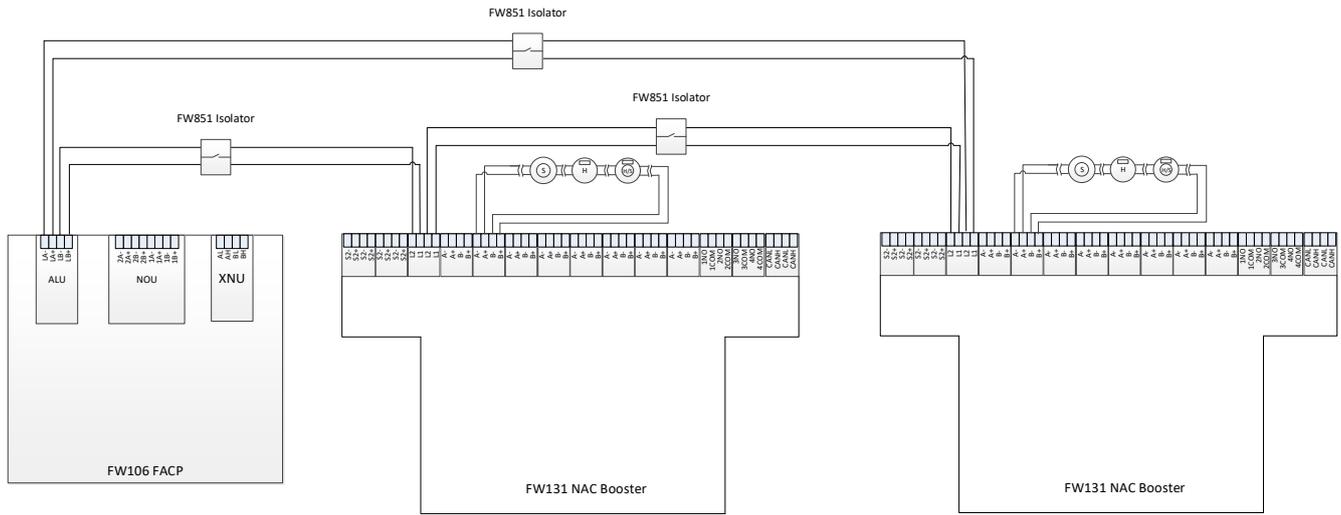
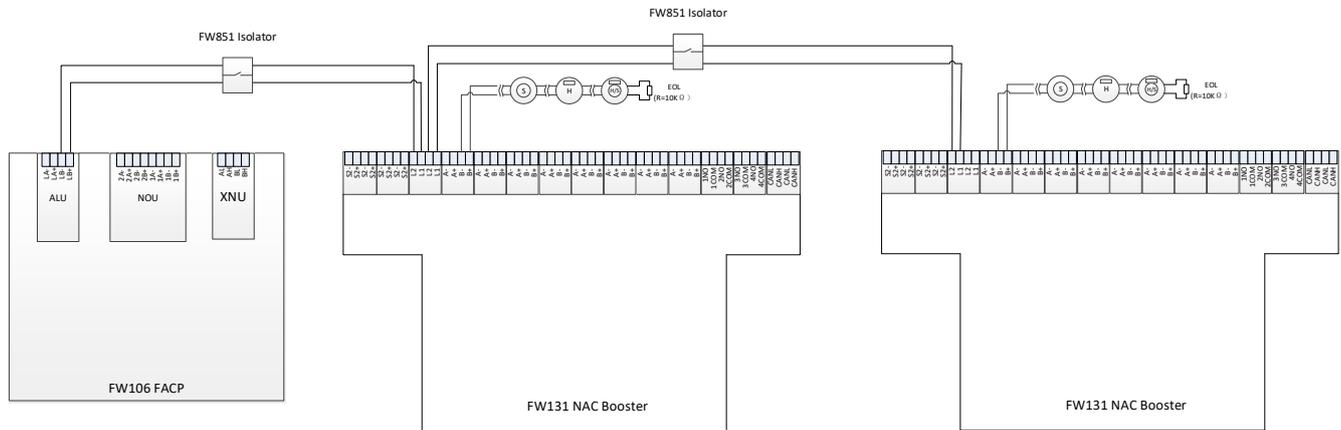


Figure 17 via SLC/DCL – Conventional appliances – Class A

Conventional appliances - Class B



Addressable appliances – Class A

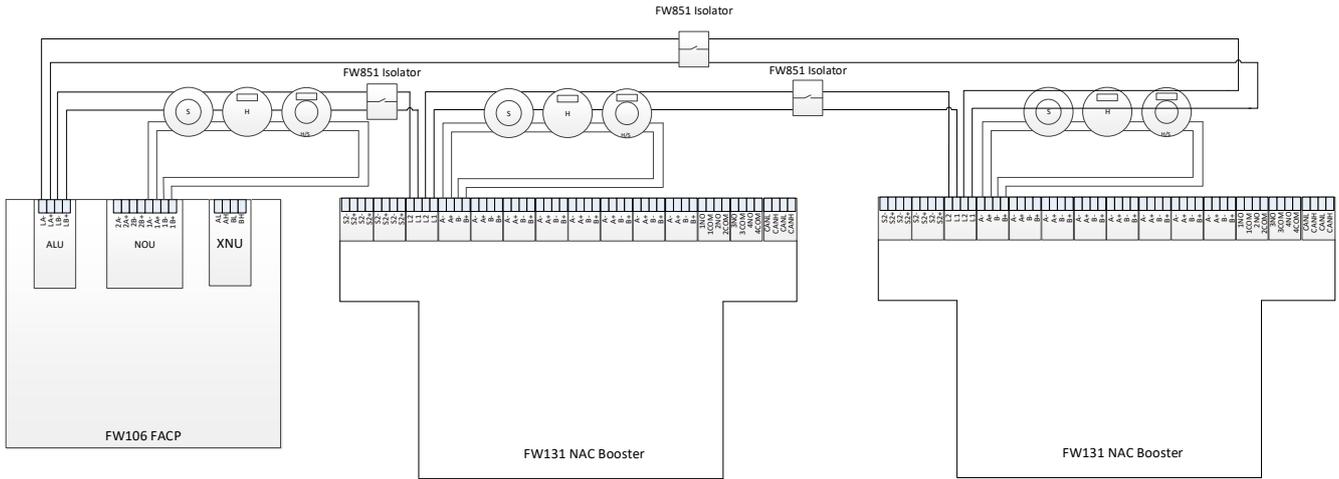


Figure 19 via SLC/DCL – Addressable appliances - Class A

Addressable appliances – Class B

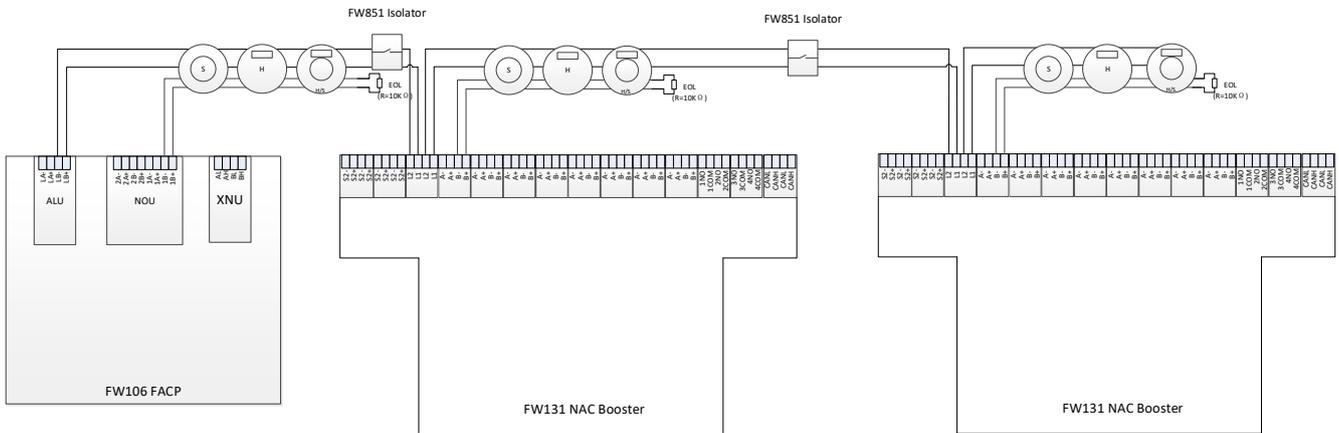


Figure 20 via SLC/DCL – Addressable appliances - Class B

Pass Through

Note: Pass Through mode requires connection of trouble relays with FACP. Refer to Figure 26 for the wiring details.

Conventional appliances - Class A

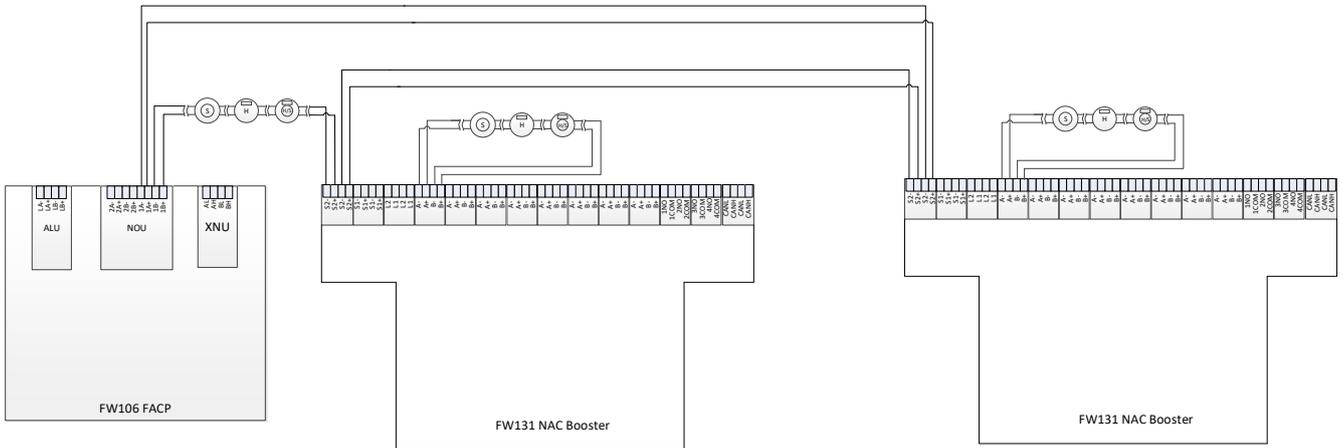


Figure 21 Pass Through – Conventional appliances - Class A

Conventional appliances - Class B

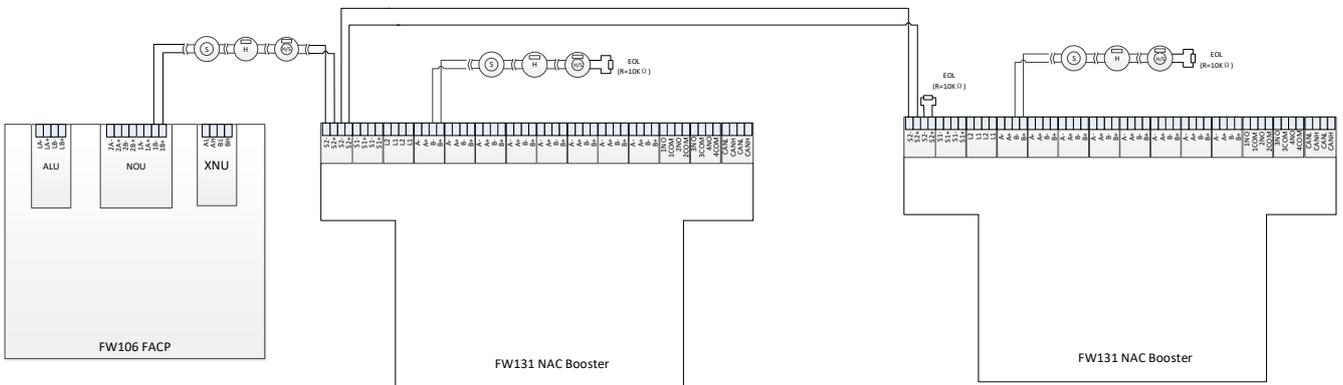


Figure 22 Pass Through – Conventional appliances - Class B

Addressable appliances – Class A

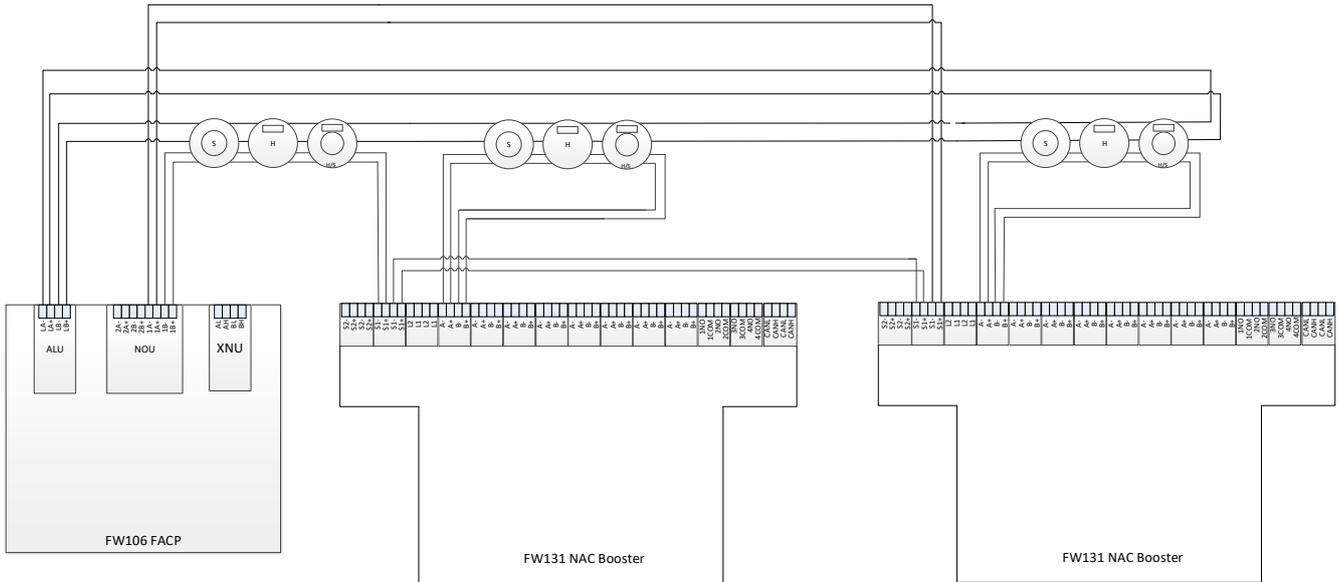


Figure 23 Pass Through – Addressable appliances - Class A

Addressable appliances – Class B

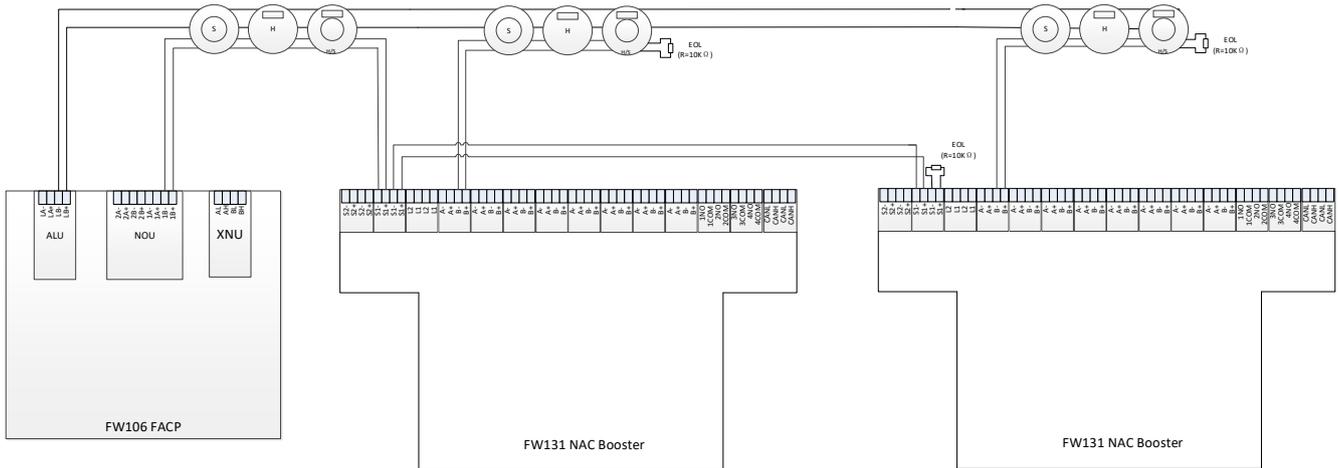


Figure 24 Pass Through – Addressable appliances - Class B

Relay Output Circuit Wiring

One main board supports 4 NO dry contact relays.

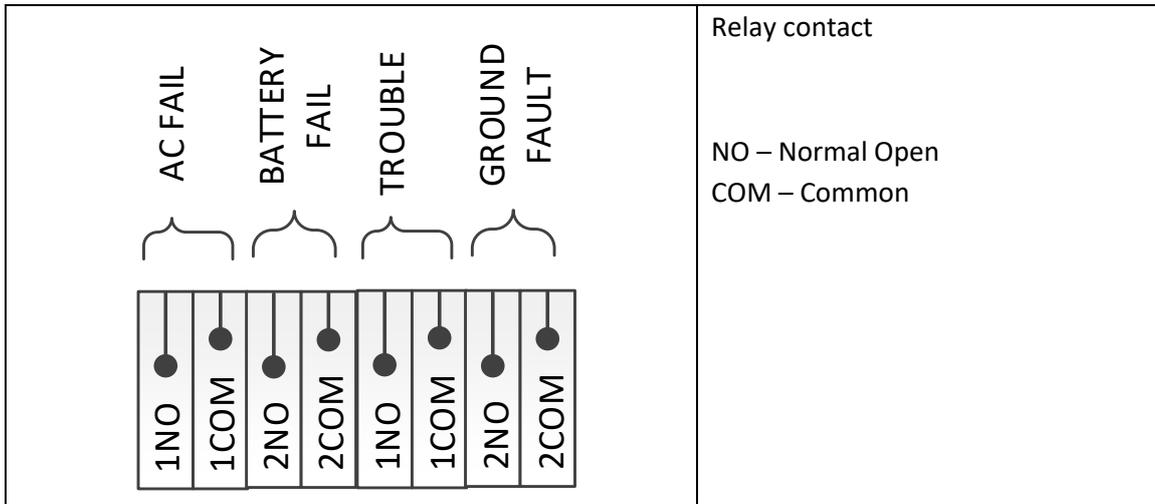


Figure 25 Relay Output Circuit Wiring

Wire each relay to FACP using input modules. The Input module shall be programmed as trouble input.

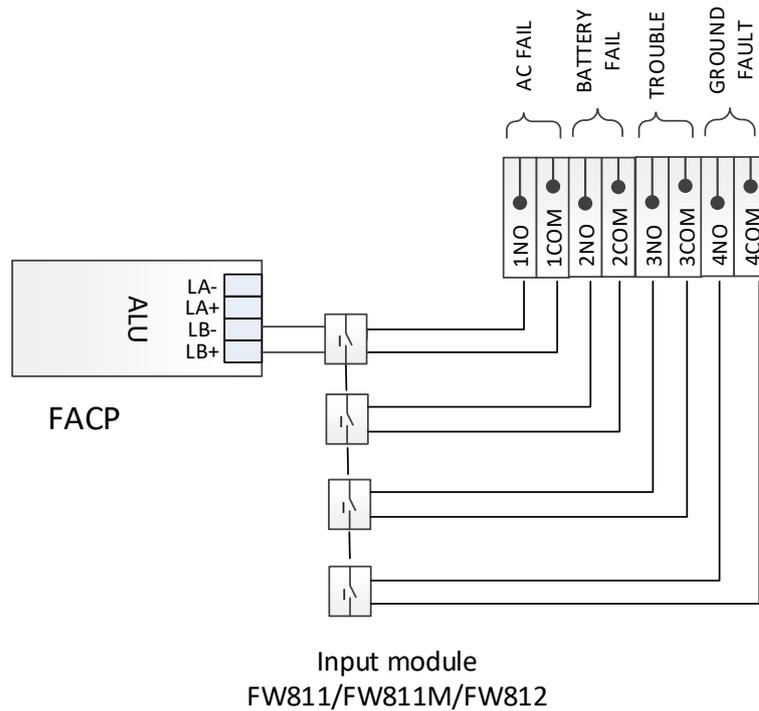


Figure 26 Relay terminal connection for Pass Through

Auxiliary Power Output Wiring

The Power-supply and Charging Unit provide auxiliary power output connection. This power output can be configured as resettable or non-resettable. The resettable terminal interrupts the power for 6 seconds after a reset condition. Aux power is designated as Class E. When powering an Output module model FW821 it is

designated as Class B.

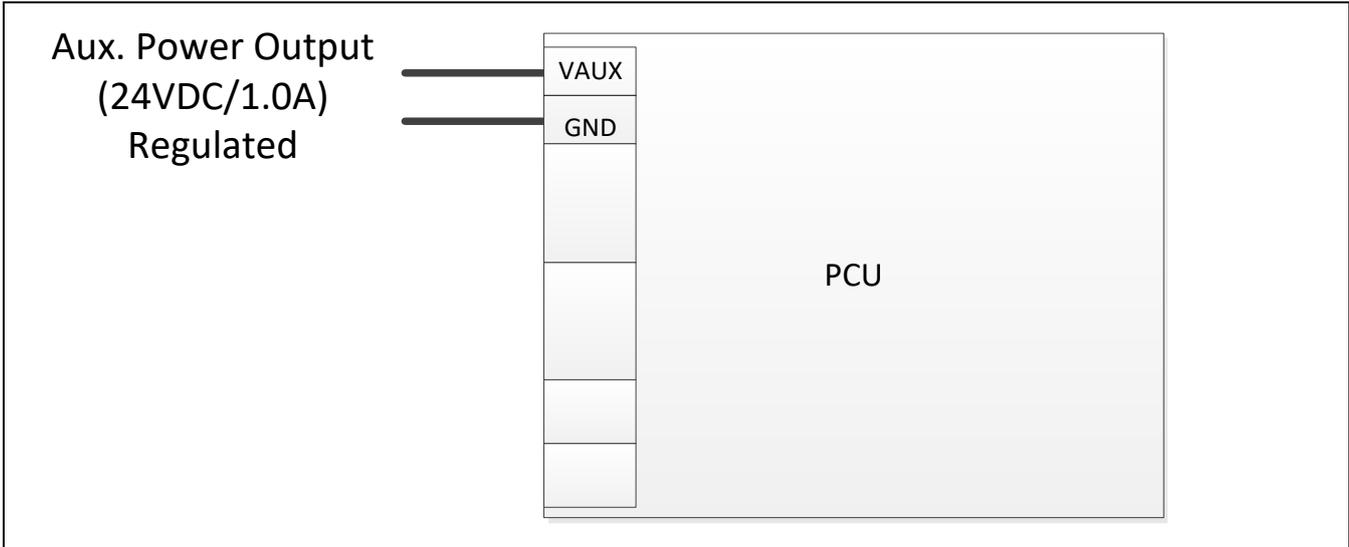


Figure 27 Auxiliary Power Output Wiring

OPERATION

Even though this NAC Booster was made to last for the expected life of the fire alarm system, parts can fail at any time. Therefore, a regular test program should be followed to make sure each part of the system is tested in a frequency as indicated in Chapter 14 of NFPA 72, and CAN/ULC-S536, or more often if dictated by Authority Having Jurisdiction (AHJ), and documented as per Chapter 7 of NFPA 72 and CAN/UL-S536. Malfunctioning units must be replaced or repaired immediately by factory authorized service personnel.

LCD configuration

Press down button 4 times to access the configuration page 'followed by the "enter" button'.

LCD configuration			
System Conf.	Local Addr.	SLC CAN Bus	Select "SLC" for both SLC and Pass Through mode. "CAN Bus" is reserved for future use. After selecting SLC, assign addresses for each NAC and for the aux output. The valid address will be 001 – 252.
PSU	Aux Conf.	Non-Resettable	Keep Aux power on when resetting.
		Resettable	Cut off Aux power for a period when resetting.
NAC1 ~ 8 (Set independently)	Topology	Class A	
		Class B	Use Maple Armor Model FW421 EOLR.
	Communication	SLC	Select "SLC" for SLC mode. Select "Input 1" or "Input 2" for Pass Through mode.
		Input 1	
		Input 2	
	Bell Code	Temporal 3 (MA)	required setting for conventional notification appliances.
		Temporal 4 (MA)	For future use
		60 bpm (MA)	For future use
		Steady	For future use
		Continuous	required setting for addressable notification appliances.
		Temporal 3	For future use
		Gentex	For future use
	Silenceable	Silenceable	
		Nonsilenceable	
10min Resound			
Canadian Resi.		This feature is not permitted by UL/ULC.	
Version			
Attribute			

Note: Edit label of NAC from Model FW106 series FACP being used with NAC booster to indicate the information of NAC booster connected so that status of NAC Booster can be identified from Model FW106 series FACP. See DOC-FW106-PM for details.

LEDs Operation

AC fail	Yellow	Steady ON	Indicates AC power was not connected or in low voltage
		OFF	Indicates AC is in normal status
Battery fail	Yellow	Steady ON	Indicates AC power was not connected or in low voltage
		OFF	Indicates AC is in normal status
TROUBLE	Yellow	Steady ON	Indicates that there are trouble events and all of them have been acknowledged.
		OFF	Indicates that there is no trouble event in the system.
GROUND FAULT	Yellow	Steady ON	Indicates that there are Ground Fault events in the system.
		OFF	Indicates that there is no Ground Fault event in the system.

Appliances for Notification Appliance Circuits

Table 3 Maximum Numbers of NA

Model No.	Description	Maximum number per NAC
FW961R/FW961W	Horn/Strobe Light	22
FW971R/FW971W	Horn	165
FW981R/FW981W	Strobe Light	24
FW962R / FW962W	Multi-candela Horn Strobe	49
FW982R / FW982W	Multi-candela Strobe	49
FW972M (R/W)	Mini Horn	165
FW963AR/FW963AW	Addressable Horn/Strobe Light	45
FW973AR/FW973AW	Addressable Horn	49
FW983AR/FW983AW	Addressable Strobe Light	50

Appendix-A: Wire Selection Guide

SLC/DCL Wire Selection Guide

Maximum Loop Current = 100mA@NSB, 220mA@Alarm

Maximum Loop Capacitance = 0.1uF

Table 4 Addressable Loop Wiring

Wire Gauge		Maximum Wiring Run to Last Device					
(AWG)	Wire Resistance (ohms/km)	Maximum current 90mA		Maximum current 150mA		Maximum current 220mA	
		ft	m	ft	m	ft	m
		12	5.31	15099	4603	9060	2762
13	6.69	11985	3654	7191	2192	4903	1495
14	8.45	9488	2893	5693	1736	3882	1183
15	10.6	7564	2306	4538	1384	3094	943
16	13.5	5939	1811	3563	1086	2430	741
17	16.3	4919	1500	2951	900	2012	613
18	21.4	3747	1142	2248	685	1533	467

NAC Wire Selection Guide

Table 5 NAC Wiring Table

Total Signal Load	Maximum Wiring Run to Last Device								Maximum Line Resistance
	AWG12		AWG14		AWG16		AWG18		
Amperes	ft	m	ft	m	ft	m	ft	m	Ohms
0.3	4530	1381	2847	868	1782	543	1124	343	7.33
0.6	2265	691	1423	434	891	272	562	171	3.67
0.9	1510	460	949	289	594	181	375	114	2.44
1.2	1132	345	712	217	445	136	281	86	1.83
1.5	906	276	569	174	356	109	225	69	1.47
2	679	207	427	130	267	81	169	51	1.10



Maximum voltage drop can't exceed 2V (for regulated circuit and special application circuit).

Appendix-B: Battery Calculations

Total System Currents Calculations

Table 6 System Currents Calculation

IMPORTANT NOTICE							
The main AC branch circuit connection for Fire Alarm Control Unit must provide a dedicated continuous power without provision of any disconnect devices. Use #12 AWG wire with 600 volts insulation and proper over-current circuit protection that complies with the local codes. For specifications, refer to the Specifications and Features section.							
Functional Unit's Currents (All currents are in ampere)							
Model Number	Description	Qty		Standby	Total Standby	Alarm	Total Alarm
FW390N	PSU	1	×	0.160		0.160	
FW302	MFU	1	×	0.086		0.086	
FW302-1	LCD	1	×	0.0063		0.0063	
NAC Devices Currents (All currents are in ampere)							
The total currents of each loop must <= 3A							
FW962R/FW962W (@130 cd setting)	Multi-candela Horn Strobe (@130 cd setting)		×	0.0000045		0.164	
FW962R/FW962W (@105 cd setting)	Multi-candela Horn Strobe (@105 cd setting)		×	0.0000045		0.126	
FW962R/FW962W (@85 cd setting)	Multi-candela Horn Strobe (@85 cd setting)		×	0.0000045		0.085	
FW962R/FW962W (@50 cd setting)	Multi-candela Horn Strobe (@50 cd setting)		×	0.0000045		0.055	
FW962R/FW962W (@35 cd setting)	Multi-candela Horn Strobe (@35 cd setting)		×	0.0000045		0.047	
FW962R/FW962W (@20 cd setting)	Multi-candela Horn Strobe (@20 cd setting)		×	0.0000045		0.030	
FW982R/FW982W (@130 cd setting)	Multi-candela Strobe (@130 cd setting)		×	0.0000045		0.156	

FW982R/FW982W (@105 cd setting)	Multi-candela Strobe (@105 cd setting)		×	0.0000045		0.119	
FW982R/FW982W (@85 cd setting)	Multi-candela Strobe (@85 cd setting)		×	0.0000045		0.080	
FW982R/FW982W (@50 cd setting)	Multi-candela Strobe (@50 cd setting)		×	0.0000045		0.049	
FW982R/FW982W (@35 cd setting)	Multi-candela Strobe (@35 cd setting)		×	0.0000045		0.043	
FW982R/FW982W (@20 cd setting)	Multi-candela Strobe (@20 cd setting)		×	0.0000045		0.028	
FW972MR/FW972 MW(@ low setting)	Mini Horn		x	0		0.008	
FW972MR/FW972 MW(@ medium setting)	Mini Horn		x	0		0.008	
FW972MR/FW972 MW(@ high setting)	Mini Horn		x	0		0.015	
FW963A(R/W) (@177 cd)	Addressable Horn Strobe			0		0.218	
FW963A(R/W) (@130 cd)	Addressable Horn Strobe			0		0.164	
FW963A(R/W) (@100cd)	Addressable Horn Strobe			0		0.129	
FW963A(R/W) (@75 cd)	Addressable Horn Strobe			0		0.098	
FW963A(R/W) (@45 cd)	Addressable Horn Strobe			0		0.07	

FW963A(R/W) (@15 cd)	Addressable Horn Strobe		0		0.055	
FW973A(R/W)	Addressable Horn		0		0.048	
FW983A(R/W) (@177 cd)	Addressable Strobe		0		0.21	
FW983A(R/W) (@130 cd)	Addressable Strobe		0		0.145	
FW983A(R/W) (@100cd)	Addressable Strobe		0		0.114	
FW983A(R/W) (@75 cd)	Addressable Strobe		0		0.084	
FW983A(R/W) (@45 cd)	Addressable Strobe		0		0.055	
FW983A(R/W) (@15 cd)	Addressable Strobe		0		0.04	
Miscellaneous (All currents are in ampere)						
	EOL		×	0.00082		0.00082
Auxiliary Power Supply				Standby		Alarm
Total Currents					Standby	Alarm

Battery Capacity

Table 1 Battery Calculation

Total Standby Current (from above)	Hours of Standby Required per UL864 Standard	AH for Standby
A	x 24 Hours	=

Total Alarm Current (from above)	5 Minutes of Alarm Operation per UL864 Standard, 30 Minutes of Alarm	AH for Alarm
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	Operation per ULC-S527 and 5 Minutes of Alert for Two-stage.	
A	x 0.09 Hours(For UL compliance)	=
A	x 0.6 Hours(For ULC compliance)	=

A.H. for Standby	A.H. for Alarm	Calculated A.H.	De-rating Factor	A.H. Required Battery Capacity
	+	=	X 1.25	=



Maximum available battery space:

Length: 8.07 in., width: 6.61in., height: 7.87 in.

Maximum battery capacity: 40AH

Notes:

Use of alternative batteries may result in failure of the panel to meet agency and regulatory requirements and may result in shortened battery life. Batteries should be tested regularly and replaced at least every four years. If the Battery Trouble indicator activates, the required service should be performed by an authorized agent.

Maple Armor

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