



Harrington Signal HS-3100/3200 Fire Alarm Control Unit

Installation Manual

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1.0 Technical Information

1.1 Introduction

The HS-3100/3200 Fire Alarm Control Panel (FACP) is the heart of a sophisticated microprocessor based fire detection system. Meeting the demands of economy and capability, these modular panel offer support for one or two loops of up to 198 devices on each loop.

Optional modules mount directly to the chassis. Modules are available that provide additional NAC output circuits, function relay output circuits, annunciation, etc. This modular approach to system design virtually guarantees that as your needs -- and applicable local codes -- evolve, your FACP can change along with them.

Networking can be utilized to provide additional input circuits, visual zones, bell circuits and relays. Up to 254 units (FACPs and/or annunciators) can be connected to form the Class A Style 7 (DCLR) network loop.

Programming the HS3100/3200 has two components: Input circuit programming and special features, such as day/night mode, et cetera, are done from an externally generated database produced on a Windows based PC, while system parameters are programmed from the LCD and keypad.

This manual covers the installation of the HS3100 and HS-3200 Fire Alarm Control Panels. For Programming and Operating Instructions, please refer to the appropriate manuals.

1.2 Features

The HS-3100/3200 includes the following features:

- HS-3100: One (1) Addressable Input (SLC) circuit, Class A (Style 6) or Class B (Style 4).
- HS-3200: Two (2) Addressable Input (SLC) circuits, Class A (Style 6) or Class B (Style 4).
- Two (2) Notification Appliance Circuits (NAC), Class A (Style Z) or Class B (Style Y). Expandable to eight (8) NAC with optional module HSNC2 (groups of 2).
- Four (4) Programmable function relays, Form C. Expandable to sixteen (16) relays with optional module HSRL4 (groups of 4).
- Two (2) Auxiliary power outputs.
- Total 24V Power Supply: 2.6A, expandable to 8.2A.
- Integral battery charger.
- LCD/LED system status display, with optional LED zone display.
- Surface/flush mount cabinet with dead-front construction, capable of holding two 12Ah batteries with removable door for easy installation.
- Removable terminal blocks for easy wiring.
- Operating program and database can both be uploaded/downloaded by PC.

1.3 Codes & Standards

This fire alarm control panel meets the requirements of the following codes and standards:

- NFPA 72 - National Fire Alarm Code, 1999 Edition
- UL 864 Standard for Control Units for Fire Protective Signaling Systems
- ULC-S527 Standard for Control Units for Fire Alarm Systems
- Applicable Local and State Building Codes
- NFPA 70 - National Electric Code
- ULC-S524 Installation of Fire Alarm Systems

1.4 Applications & Services

This fire alarm control panel is listed for use in the following applications:

- Local with networking for UL (only) installations
- Auxiliary (Requires HSCTYB Reverse Polarity Municipal Box Module configured for Municipal Master Box Operation)
- Central Station reporting (using the optional HSDL Dual Line Dialer-Communicator)
- Remote Station reporting (Requires HSCTYB Reverse Polarity Municipal Box Module configured for Reverse Polarity Operation or HSDL Dialer)

And for the following types of service:

- M - Manual
- A - Automatic
- SS - Sprinkler Supervisory
- WF - Waterflow

1.5 General Installation Requirements

The information provided with this unit is intended as a guide. Installation of this equipment, optional system components, alarm initiating devices and notification appliances must follow the manufacturer's guidelines as contained in their respective installation documents, all applicable codes and the instructions of the Local Authority Having Jurisdiction.

Manufacturer's Documents

When installing the fire alarm control panel, refer to this manual. When installing optional system components refer to the installation documents included with those components. When installing compatible alarm initiating devices or notification appliances, refer to the installation documents included with those products.

Field Wiring

Field wiring recommendations in this document are intended as guidelines. All field wiring must be installed in accordance with the applicable national electrical codes, with all relevant local codes and standards, and the Local Authority Having Jurisdiction.

Compatible Devices

Use UL or ULC listed smoke detectors and notification devices that are compatible with the fire alarm control panel from the lists included in this manual.

1.6 System Verification

The complete fire alarm system must be verified for proper installation and operation when:

- The initial installation is ready for inspection by the Local Authority Having Jurisdiction;
- Any system component is added, changed or deleted;
- Any programming changes are made;
- System wiring has been altered or repaired;
- System failure due to the external influences such as lightning, water damage or extended power outages has occurred.

Standby Power

The fire alarm control panel uses sealed lead-acid rechargeable batteries as a secondary power source in the event of a main power failure. The required capacity of the standby batteries must be calculated using the charts and tables within this manual for the period as required by national or local codes and standards. Even though the calculation table within this manual includes a safety margin, lead-acid batteries commonly used for standby can have variable capacity as a result of age and ambient conditions. Periodic inspection for damage and the batteries' ability to support the attached equipment is highly recommended.

1.7 System Components

Basic System

A basic system consists of the Back Box, Main Board, Display Board and one transformer. Canadian versions also include an Eight Zone LED Module.

Back Box

The enclosure includes the back box, outer door, dead front door and hardware plate. It can be flush or surface mounted without requiring additional hardware.

Both the outer door and dead front doors are quickly removable using pin-hinges. The hardware plate holds the main printed circuit board and transformer(s). The enclosure holds two transformers, one communicator module (Dialer or City Connect) and up to three NAC or Relay expander modules.

Transformer

The FACP is shipped with a 120V/240V transformer.

The total NAC power can be increased by adding a second transformer of the same voltage. The expansion transformer is available as a separate order item under model number HS-XPS.



HS-XPS

Main Board

The HS-3100/3200 Main Board contains the system power supply, master CPU and memory, two Notification Appliance Circuits (NACs), four Auxiliary Function Relays, two Auxiliary power points, one or two Signal Line Circuits (SLCs), and communications ports for the Display Board and optional equipment.

The HS-3100 Main Board has one SLC for connecting System Sensor Addressable devices. The HS-3200 Main Board has 2 SLCs. Each SLC can support 198 total devices, 99 detectors/sensors and 99 control/monitor type devices.

Replacement Main Boards are available under the following PIDs:

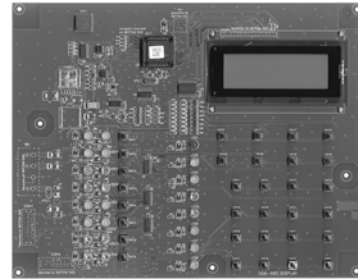
HS-3100 Main Board- RB-HS-3100

HS-3200 Main Board- RB-HS-3200



Display Board

The Display Board provides LED and LCD status annunciation, hotkeys, and keypads for message retrieval and programming. A replacement Display can be ordered under PID RB-HS-3201.

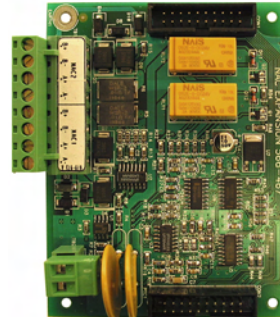


Optional (Internal) Components

NAC Expander Board - PID HS3NC2

The NAC Expander Board provides two additional NAC output circuits. A ribbon cable connects this module. Any combination of NAC and Relay expanders can be added (to a maximum of three modules total) within the basic enclosure.

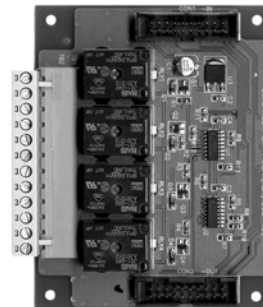
Refer to the *HS3NC2 NAC Expander Installation Instructions* for more information.



Relay Expander - PID HS3RL4

The Relay Expander provides four additional function relay output circuits. A ribbon cable connects this module. Any combination of NAC and Relay expanders can be added (to a maximum of three modules total) within the basic enclosure.

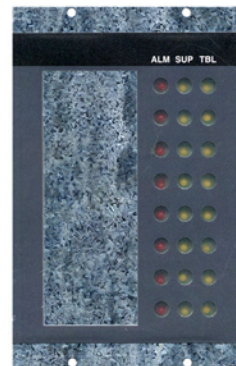
Refer to *HS3RL4 Relay Expander Installation Instructions* for more information.



Eight Zone LED Module - PID HS3LD8

The HSLD8 module provides eight zones of LED annunciation. The LED strips mount to the dead-front door and connect to the RB-HS-3201 display board. Up to three of these modules can be added to the RB-HS-3201.

Refer to the *HSLD8 Eight Zone Expansion Module Installation Instructions* for more information.



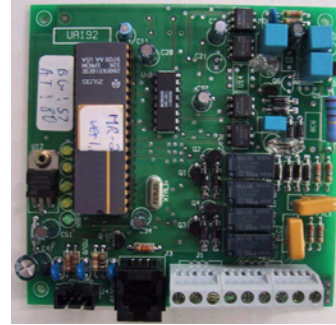
DACT Module - PID HS3DL

The optional Digital Alarm Communicator Transmitter (DACT) module is added to the system to provide Remote Station monitoring of system alarm, trouble, and supervisory conditions.

Use of the DACT module requires that two telephone lines be provided for connection to the DACT. Service must be arranged with a Central Station monitoring facility for Remote Station Service.

Refer to the *HS3DL Installation Instructions* for more information.

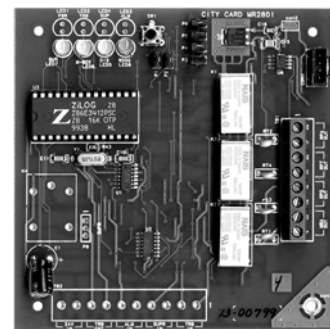
HS3DL not to be used for ULC applications.



Reverse Polarity Municipal Box - PID HSCTYB

The optional HSCTYB can be configured for remote Station (reverse polarity) or Municipal Master (local energy) service. The HSCTYB can transmit alarm, trouble, and supervisory conditions when configured for reverse polarity operation. Alarm condition only is reported when configured for Municipal Master operation.

Refer to the *HSCTYB Reverse Polarity Municipal Box (RPMB) Module Installation Instructions* for more information.



Compatible Products

HS-3644

The HS644 is a status annunciator with Liquid Crystal Display, general system status lights, and general function keys.

HS644 is not ULC Listed.

HS-3614

The MR-2614 is a status annunciator with LED zone display, general system status lights, and general function keys.



Note: Not to be used for ULC applications.

Testing Circuit Supervision

Use the following procedures in the table below to confirm that SLCs and NACs are supervising for opens, shorts, and grounds. The right column in this table shows the LEDs that illuminate when an open, short, or ground occurs on a specific circuit. AUX is supervised for shorts and earths only.

<p>Open (NACs) -- Remove the end-of-line and make circuit impedance infinite. Open (SLCs) -- Break the line anywhere in the loop.</p>	<p>NAC illuminates the Trouble LED and the NAC Trouble LED flashes SLC illuminates the Trouble LED</p>
<p>Short -- Apply a zero ohm jumper across the circuit.</p>	<p>SLC illuminates the Trouble LED NAC illuminates the Trouble LED and the NAC Trouble LED flashes AUX illuminates the Trouble LED</p>
<p>Earth Ground (NACs) -- Place a 10KΩ or smaller value resistor from the supervised wiring to Earth Ground. Earth Ground (SLCs) -- Place a 100Ω or smaller value resistor from the supervised wiring to Earth Ground.</p>	<p>If an Earth Ground occurs on any circuit the Fault and Trouble LEDs both illuminate</p>

2.0 Technical Specifications

2.1 Electrical Specifications

Table 1: AC Input

Circuit / Model / Item	Rating
Standard Primary AC Input 1	
HS-3100	120V, 60Hz, 1.03 A maximum 240V, 50Hz, 0.51A maximum
Optional Primary AC Input 2	
HS-3200	120V, 60Hz, 2.5 A maximum 240V, 50Hz, 1.26A maximum

Table 2: Battery Power (Use sealed lead acid batteries only!)

Circuit / Model / Item	Rating
Battery Charger	Current limited float charger
Float charge:	27.5 VDC
Charging current:	2.7A maximum (no auxiliary load), 1.7A nominal (0.5A on each AUX)
Maximum Battery Capacity	
Batteries larger than 12Ah require the use of a listed battery cabinet.	12Ah (max. internal to cabinet) 35Ah (Largest size battery that can be used, HS-378B, HS-378R External Battery Cabinet required)

a. Maximum current available to the battery charging circuit is limited by the power draw from additional devices. As the AUX power circuits are loaded, or additional modules are added, the amount of current available for charging batteries decreases.

b. Reference Appendix B for Battery Calculations and compatible batteries.

Table 3: Addressable Input (Signaling Line Circuit)

Circuit / Model / Item	Rating
Voltage	24Vdc nominal, 27.5Vdc maximum
Maximum loop length	Refer to “3.5 Maximum Wiring Length for Addressable Circuits” on page 20
Maximum loop current	450mA (momentary)
Maximum # of devices per loop	198 total (99 detector heads, 99 control/monitor modules)

Table 4: Notification Appliance Circuit Output Circuits

Circuit / Model / Item	Rating
HS-3100/3200 Mainboard and HSNC2 NAC Expander	Supervised and power limited
NAC1, NAC2*	24V full wave rectified DC, 2.0A maximum, power limited.
End-of-line resistor (EOLR) (for Class B wiring)	10kW, 1/4W, 5%
Maximum loop length	Refer to “3.6 Maximum Wiring Length for Bell Circuits” on page 20
NAC Current	1 HS-XPS NACs + AUX \leq 2.5A, 2 HS-XPS: 7A

:

Table 5: Function Relay Output Circuits

Circuit / Model / Item	Rating
HS-3100/3200 Mainboard and HSRL4 Relay Expander	
RELAY1, RELAY2, RELAY3, RELAY4	Form C contact, 2A, 30Vdc resistive, power limited source only.

Table 6: Power Outputs

Circuit / Model / Item	Rating
HS-3100/3200 Main board	
AUX (x2)	24Vdc, filtered, regulated and power limited, 500mA maximum rated current (each), 600mVpp ripple.

Table 7: Communications Ports

Port	Rating
RS-232-2 (EVAX)	Fixed baud rate 9600 bps; 6.01m (20ft) maximum distance
ANN (annunciator port)	Fixed baud rate 4800bps;(see HS-3644 or HS-3434 instructions for wiring distances)
CON4 (Dialer/City Module Port)	Fixed baud rate 4800bps
J1 (Service and serial printer port)	Fixed baud rate 9600bps; 6m (20ft) maximum distance

Table 8: Environmental Specifications

Condition	Rating
Operating Temperature	0°C – 49°C / 32°F – 120°F
Humidity	93% RH non-condensing

3.0 Installation

3.1 Unpacking the HS-3100 or HS-3200

The basic HS-3100/HS-3200 package includes the following components:

Backbox

Outer door including:

- Lock
- Display window

Inner dead-front door including:

- Display PCB
- Operating instruction insert
- Hotkey label insert
- Wiring label

Hardware backplate including:

- Main PCB
- Transformer
- Ribbon Cable for expansion modules
- Plastic Shield

Hardware pack including:

- 2 x NAC EOL resistors
- Door keys (taped to outside of cabinet)

Installation manual and operating manual

3.2 Mounting and Assembling the HS-3100/HS-3200

Note: All applicable codes and standards should be considered. Specific reference should be made to NFPA 72, or ULC-S524 and CEC Part 1 Section 32.

Surface and Flush Mounting

The HS-3100/3200 can be mounted in either flush or surface mount installations. Before installing the HS-3100/3200 Panel the following should be considered.

1. Determine a suitable location for mounting the FACP. Keep in mind that surrounding walls, fixtures, must not hinder access to internal components. etc.
2. Determine the size and location of conduit entrances. The Backbox provides various knockout locations, however should it be necessary to cut additional conduit entrances the electronics **must** be removed to avoid metal chip contamination. Reference the 'Remove Electronics' paragraph on the following page.

Note: Removing the inner door, outer door, and plate-mounted electronics is recommended in all HS-3100/3200 installations.

3. The enclosure must be mounted to provide a 135° (minimum) angle of rotation of the outer door to insure easy removal or assembly.
4. Mark placement of mounting hardware, drill holes and install plugs (if necessary).
5. Secure the FACP to the wall using hardware suitable to the wall construction. Support backbox in place while inserting hardware and ensure that the backbox is level and plumb before tightening.

Note: Please see the detailed diagram (Figure 1) for location of knockout and mounting holes.

Replacing the Outer Door

1. Unlock the Door with the key provided.
2. Detach the grounding strap (Qty: 2) from the backbox by removing the #6 flange nuts (Qty: 2) that are attached to the studs on the backbox. Reattach the #6 flange nuts (Qty: 2) to the studs to prevent them from getting lost or discarded.
3. Open the Door to approximately 135° and lift up to remove the outer door from the backbox, store door in a safe place.

Removing the HS-3100/3200 Electronics***A. Removing the Inner Door (Dead Front)***

1. Remove the #6 flange nuts (Qty: 2) that lock down the inner door. Reattach the #6 flange nuts (Qty: 2) to the studs to prevent them from getting lost or discarded.
2. Open the inner door and disconnect the display harness from either the Display Board or the Main Board.
3. Detach the grounding strap (Qty: 1) from the backbox by removing the #6 flange nut (Qty: 1) that is attached to the stud on the backbox. Reattach the #6 flange nut (Qty: 1) to the stud to prevent them from getting lost or discarded.
4. Open the inner door approximately 90° and lift up to remove the inner door, store door in a safe place.

B. Removing the Back Plate Electronics

1. Detach the harness from the Display Board.
2. Remove the #8 flange nuts (Qty: 4) from the studs on the backbox holding onto the back plate. Remove back Plate Electronic panel and store in a safe place. Reattach the #8 flange nuts to the studs to prevent them from getting lost or discarded.

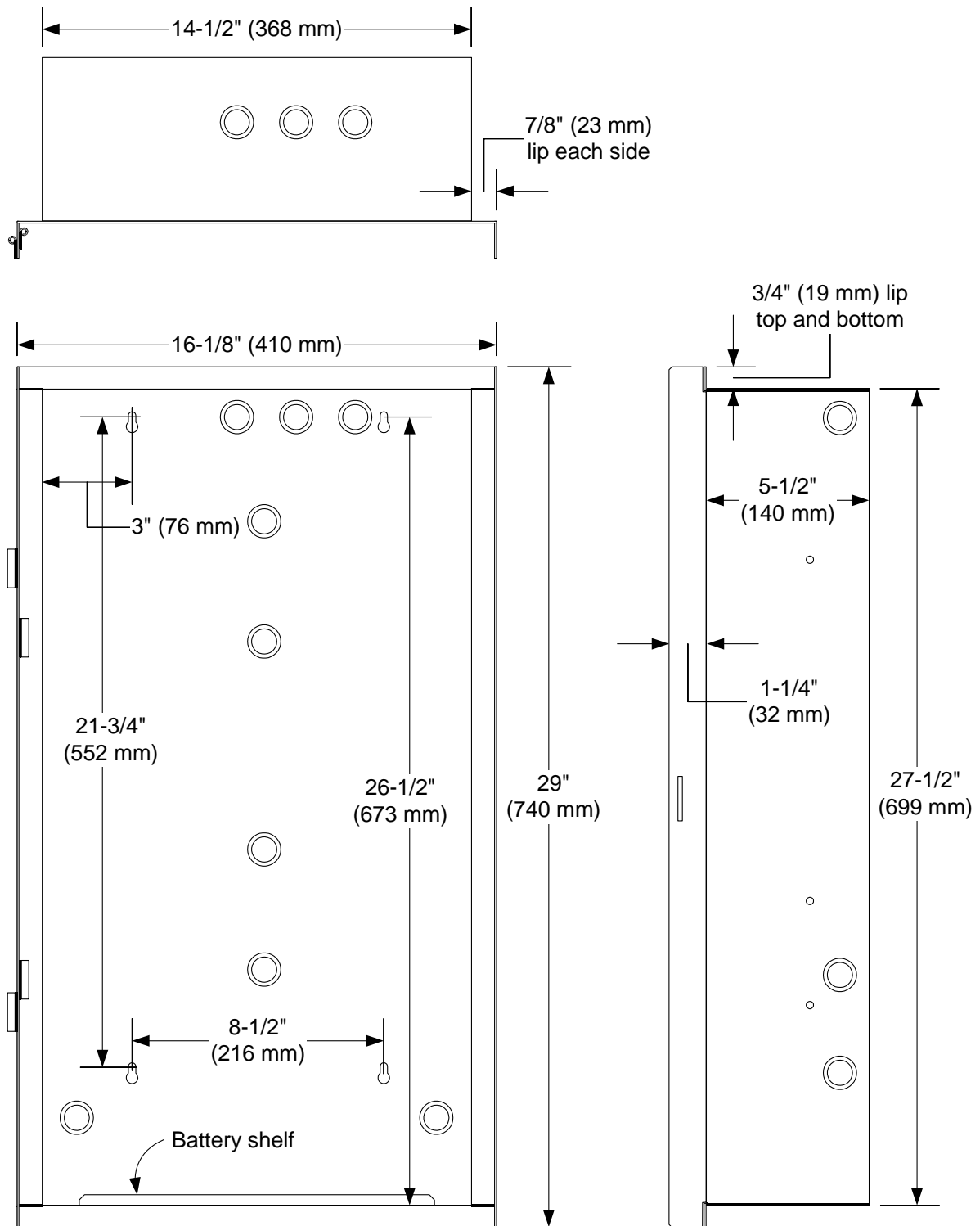


Figure 1: Knockouts and Mounting Holes

3.3 Internal Assembly

- Attach AC wiring to the AC Terminal Block (see Figure 4 on page 16). Attach green ground wire to ground screw on backplate.



Notes:

- Do not apply power to the unit until all doors, cables and wiring are installed and inspected.
- This AC circuit must be a separately fused 20A dedicated circuit. It is recommended that the breaker be locked in the OFF position during installation.
- Place the batteries in the bottom right of the back box or into the battery box. **DO NOT ATTACH BATTERIES UNTIL AFTER THE AC POWER HAS BEEN TURNED ON.**
- Attach conduit to the back box as required using knockouts provided. Attach field wiring to the system. The section below describes how each type of circuit is to be wired. Attach conduit to the back box as required using knockouts provided. It is recommended that input circuit wiring be physically separated from output circuit wiring.
- Have the Unit inspected before applying power. Correct and re-inspect any problems found.
- Turn on the AC power to Unit. If no problems occur other than Low Battery, attach the batteries to the wires provided, the black wire to the black (negative) terminal and the red wire to the red (positive) terminal. If the batteries need charging, the Low Battery condition will remain until they are charged.
- Figure 2 shows the areas of the cabinet in which power limited/non-power limited wiring may be routed. Note that the location labeled Option Card 1 is not for the City (HSCTYB). There is a location above Option Card 1 that is used for this card. Figure 3 shows the routing of power limited wiring to a city module.

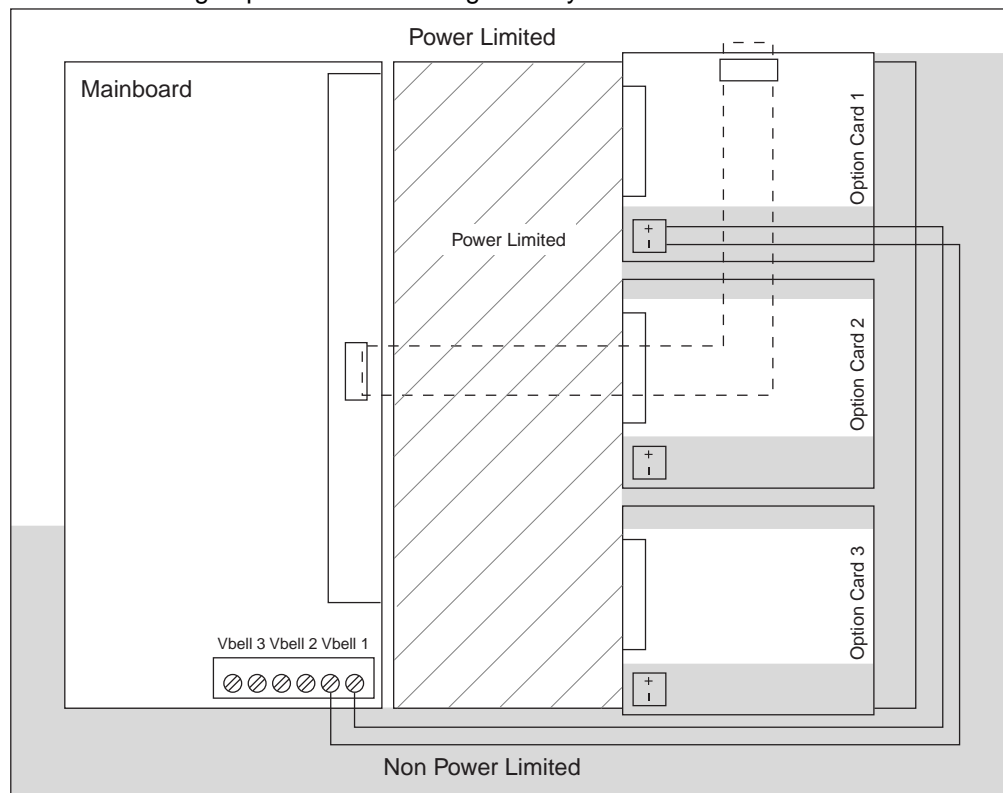


Figure 2: Power Limited Wiring Diagram

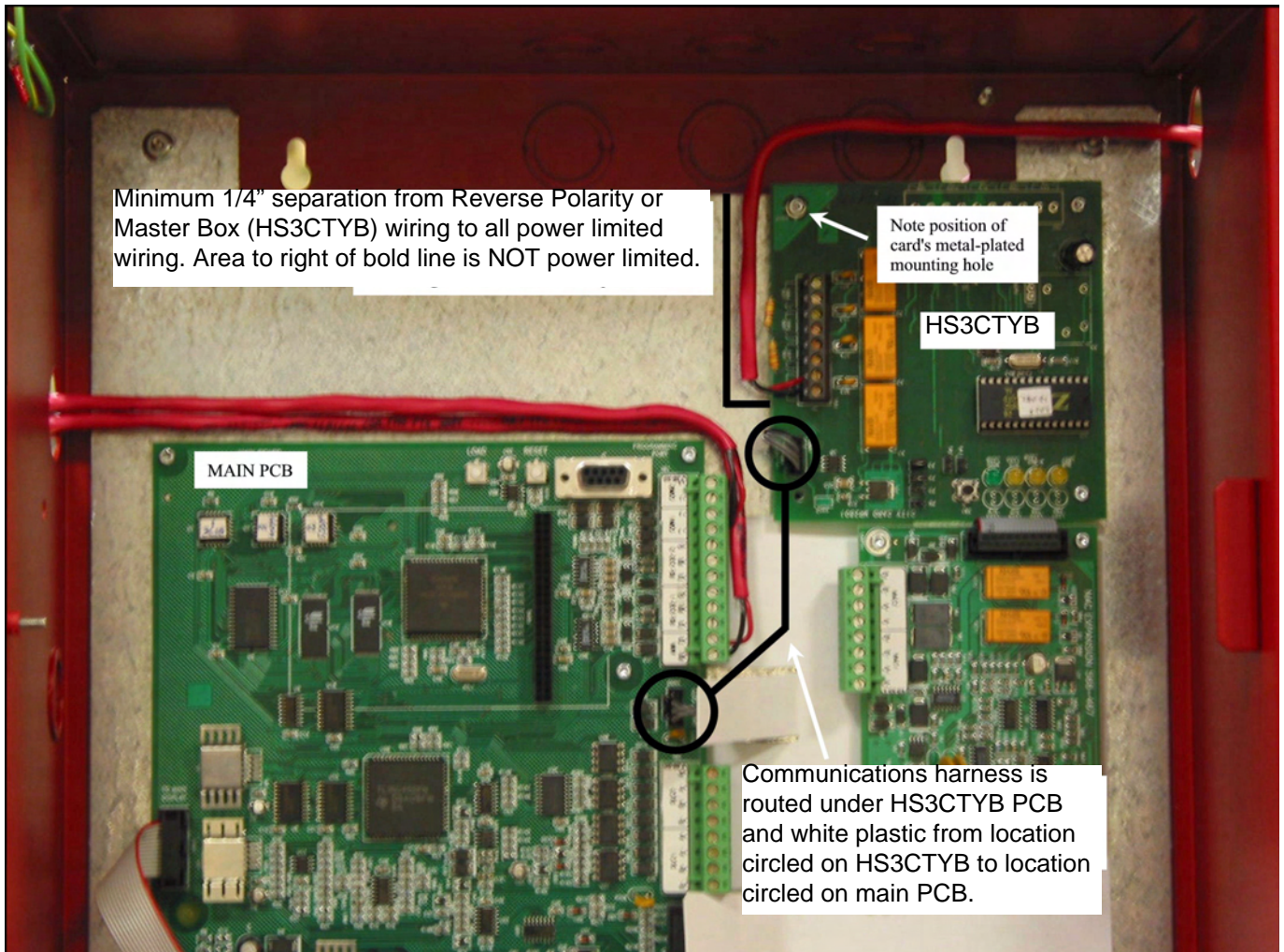


Figure 3: Power Limited Wiring, City Module

3.4 Wiring

Power Connections

The Main Control Unit requires an AC power supply. This supply is connected as shown below:

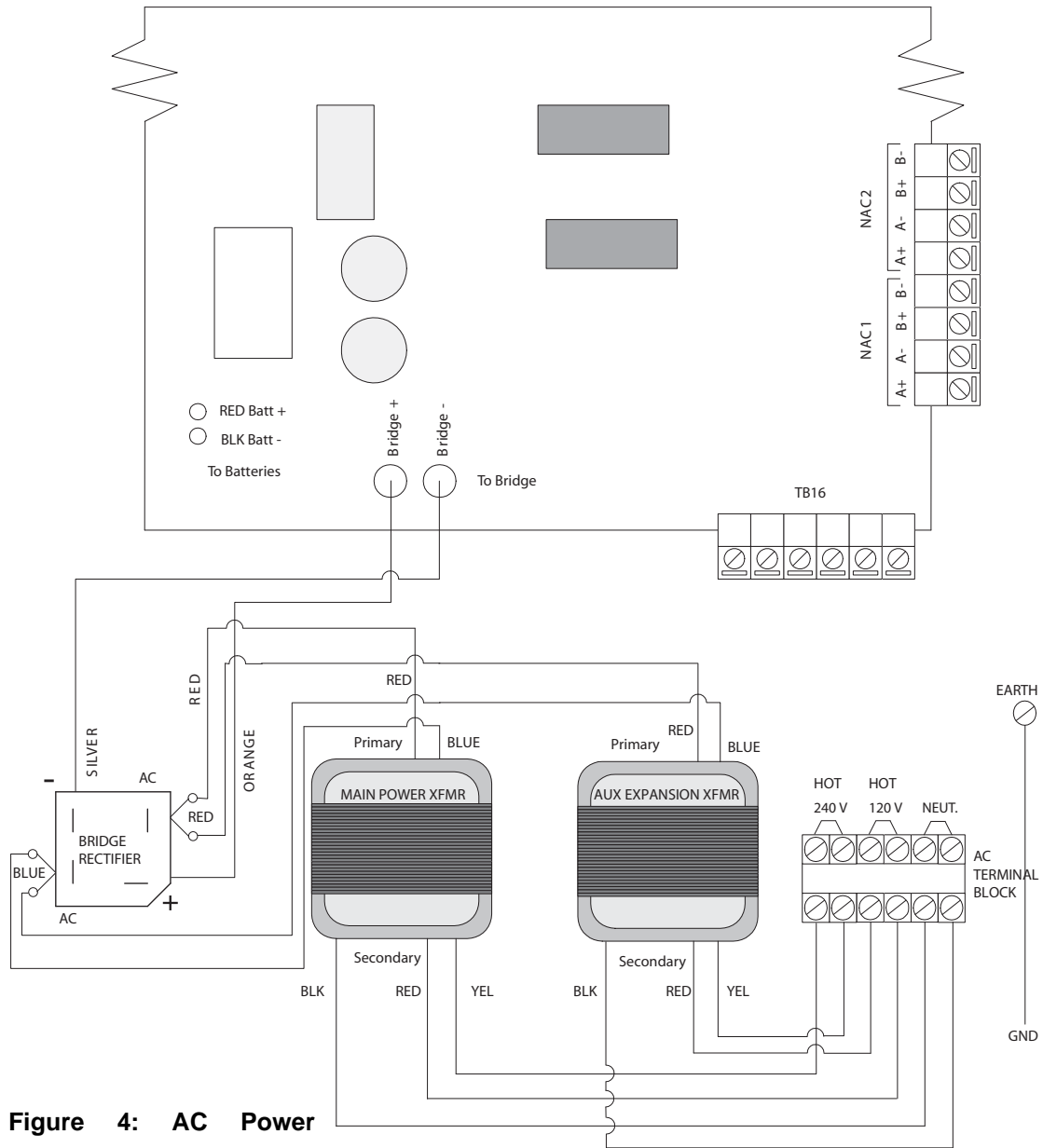


Figure 4: AC Power

The batteries forming the Battery Pack are wired in series. The Battery Pack attaches to the two wires coming from the Power Supply Board, the black wire to the black (negative) terminal and the red wire to the red (positive) terminal.

Note: Main and Auxiliary transformer are model number: HS-XPS

The internal batteries are not used when an external battery box is used. The wires for connecting the power supply board to the batteries are supplied with the panel if a battery box is ordered at the same time.



Warning: Never connect or disconnect the batteries while the AC power is off.

External Battery Cabinet Wiring

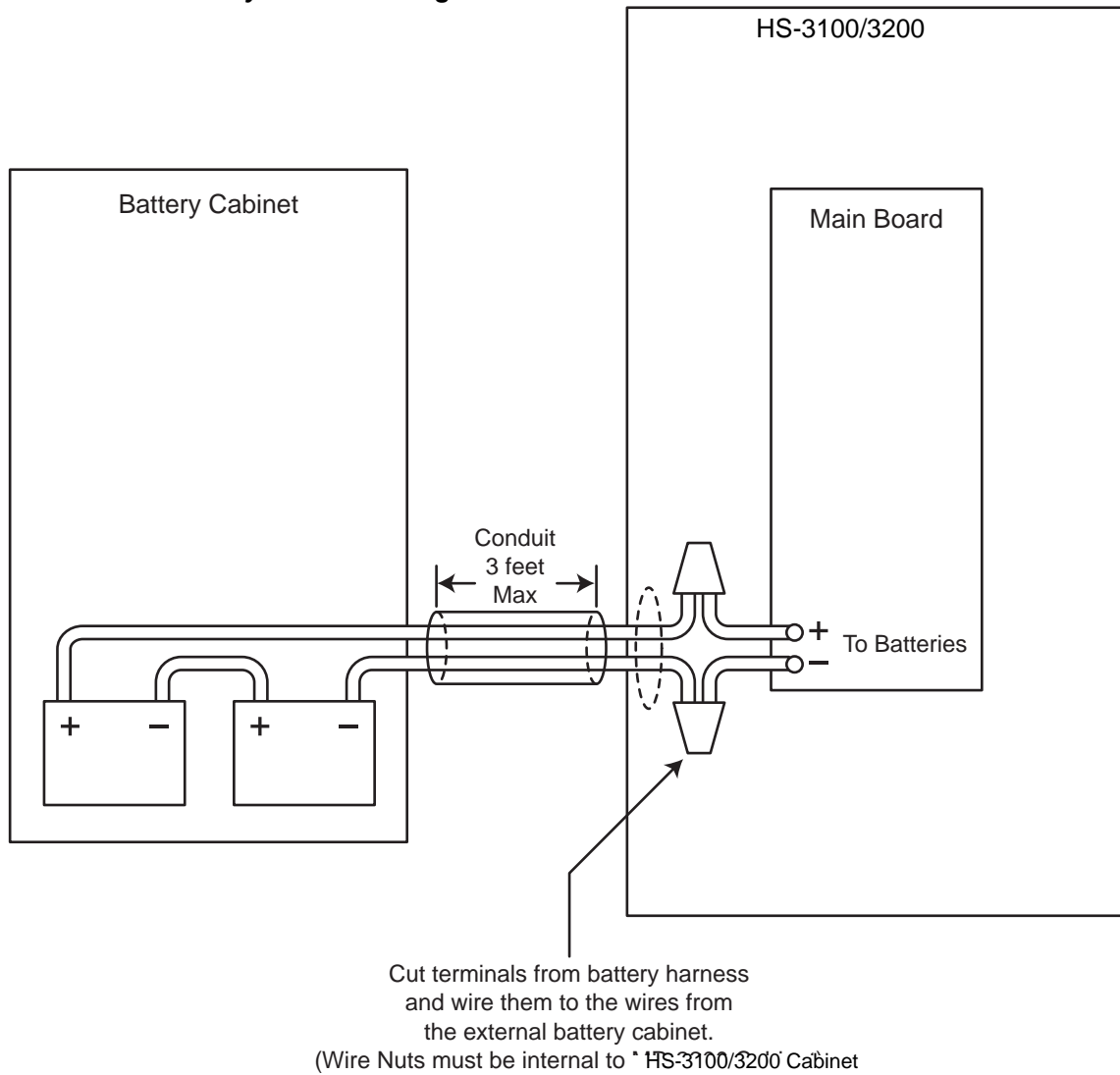


Figure 5: External Battery Cabinet Wiring

Addressable Circuit Connections

Addressable Class B (Style 4) Circuit

This is a 2-wire supervised Class B (Style 4) communications circuit using addressable devices. Wire capacitance and resistance will affect the allowable wire length. The recommended wiring is twisted unshielded pair. Consult Harrington's Applications Department for specific requirements. Maximum wire lengths are up to 10,000 ft (see Appendix). Devices will be connected as indicated in the diagram below. Use only approved devices.

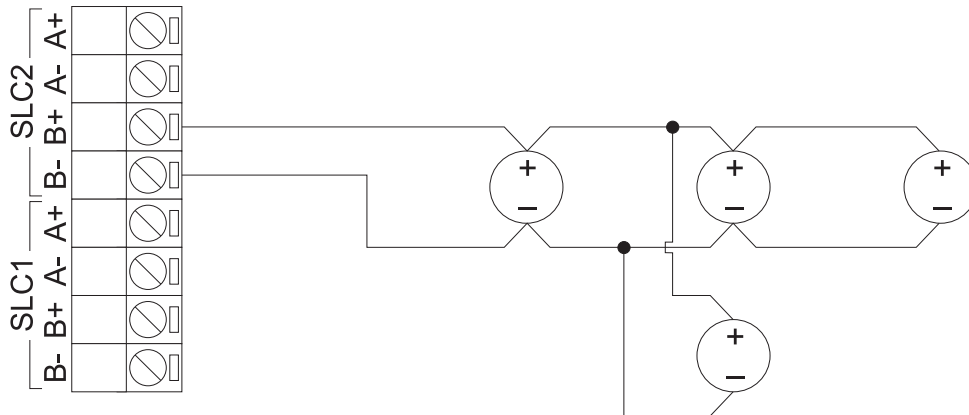


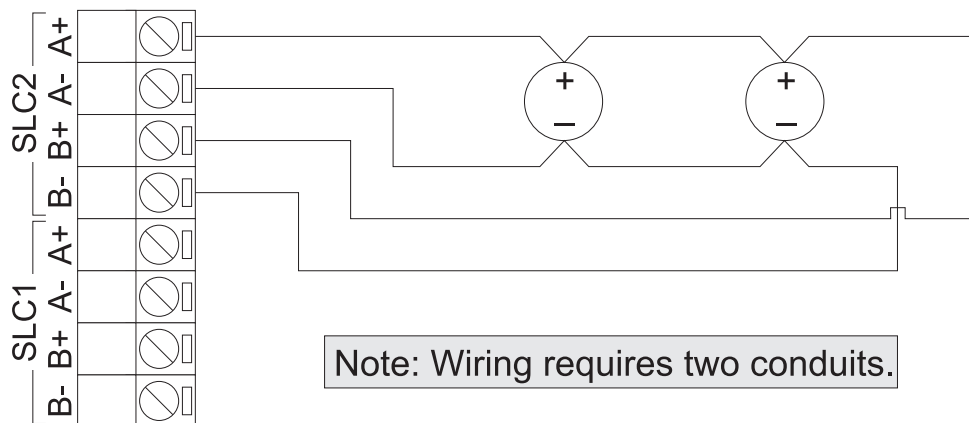
Figure 6: Class B Wiring

Note: T-taps may NOT be allowed by the authority having jurisdiction. Refer to NFPA 72 and ULC-S524.

Addressable Class A (Style 6) Circuit

This is a 4-wire supervised Class A (Style 6) communications circuit using addressable devices. The recommended wiring is twisted unshielded pair. Wire capacitance and resistance will affect the allowable wire length. Consult Harrington's Applications Department for specific requirements. Maximum wire lengths are up to 10,000 ft (see Appendix). Devices will be connected as indicated in the diagram below. Use only approved devices. Return wiring must be in a separate conduit.

Note: Install wiring in compliance with NFPA 72.



Note: Wiring requires two conduits.

Figure 7: Class A Circuit

Notification Appliance Circuit Connections

Class B (Style Y) NAC

This is a 2-wire Class B (Style Y) supervised signaling (notification appliance) circuit. Devices and the 10k ohm end-of-line resistor will be connected as indicated in the figure below. Maximum wire lengths are shown in the Appendix. Use only approved devices.

Note: The appliances must incorporate a steering diode or other means of providing activation with the alarm state and no current with the supervision state.

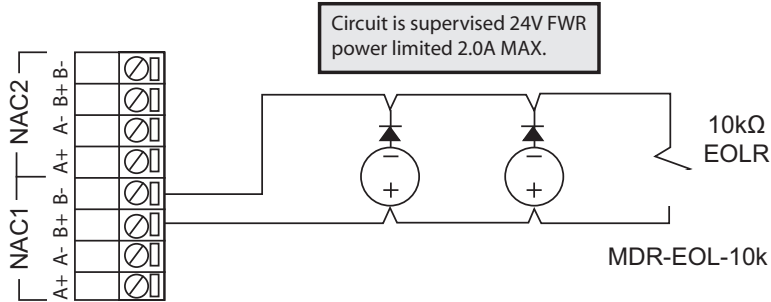


Figure 8: Class B NAC Wiring

Class A (Style Z) Bell Circuit

This is a 4-wire Style Z (Class A) supervised signaling (notification appliance) circuit. Devices will be connected as indicated in the diagram below. Maximum wire lengths are shown in the Appendix. Distances noted therein account for the total length of wire, from the panel to furthest device and back to the panel. Use only approved devices. Return wiring must be in a separate conduit. The EOL is on the board for Class A applications.

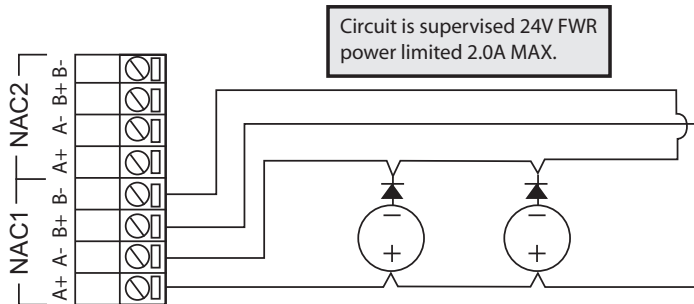


Figure 9: Class A NAC Wiring

Function Relay Circuit Connections

Form C programmable relays can only be connected to a Power Limited source limited to 2A @ 30VDC. They have a power factor of 0.35.

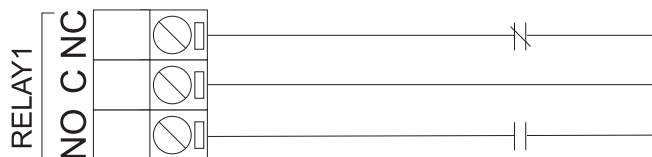
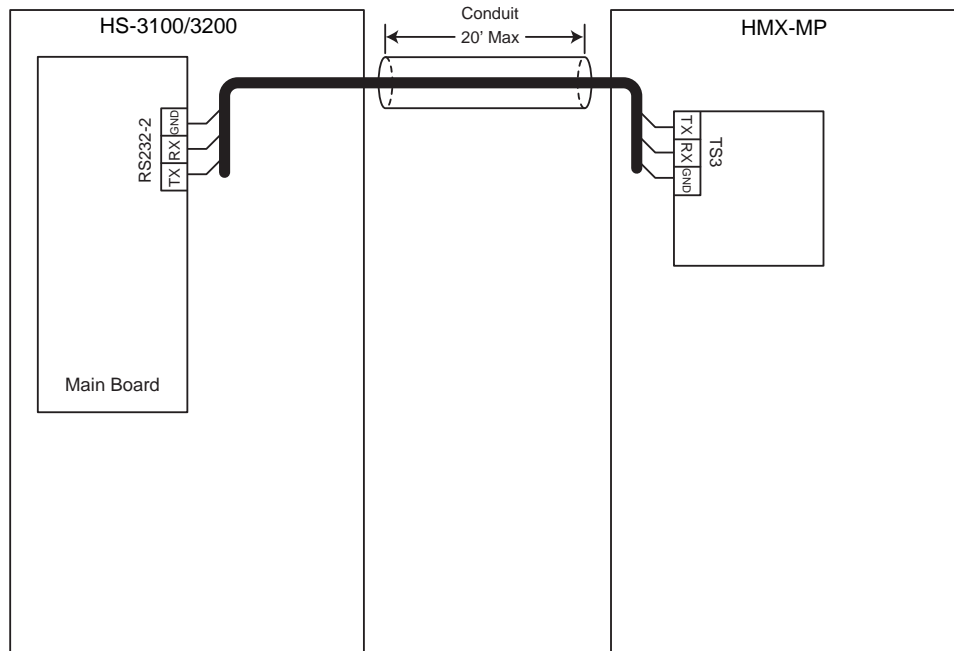


Figure 10: Function Relay Wiring

EVAX System Wiring



3.5 Maximum Wiring Length for Addressable Circuits

Gauge	Belden No.	Maximum Distance
18	9571	975m (3200 ft)
16	9572	1400m (4600 ft)
14	9580	2435m (8000 ft)
12	9582	3045m (10000 ft)

Note: Distances noted in this table account for the total length of wire, from the panel to furthest device and back to the panel.

3.6 Maximum Wiring Length for Bell Circuits

Max R	Max I	12AWG		14AWG		16AWG		18AWG	
		m	ft	m	ft	m	ft	m	ft
8.00	0.25	768	2519	483	1584	304	996	191	627
4.00	0.5	384	1259	241	792	152	498	95	313
2.67	0.75	256	840	161	528	101	332	64	209
2.00	1	192	630	121	396	76	249	48	157
1.60	1.25	154	504	97	317	61	199	38	125
1.33	1.5	128	420	80	264	51	166	32	104
1.14	1.75	110	360	69	226	43	142	27	90
1.00	2	96	315	60	198	38	125	24	78

Note: Distances noted in this table account for the total length of wire, from the panel to furthest device and back to the panel.

4.0 Appendix A: Compatible Addressable Devices

Table 9: System Sensor Compatible Addressable Devices

Model	Description	Typical Current Draw μ A
1251	Ionization type smoke detector	300
1251B	Ionization type smoke detector	300
2251	Photoelectric type smoke detector	300
2251B	Photoelectric type smoke detector	360
2251T	Photoelectric type smoke detector w/ thermal element	300
2251TB	Photoelectric type smoke detector w/ thermal element	360
2251TM	Acclimate Photo-Thermal Detector	300
2251TMB	Acclimate Photo-Thermal Detector	360
5251P	Thermal detector	200
5251B	Thermal detector	300
5251RP	Thermal detector w/ rate of rise	200
5251RB	Thermal detector w/ rate of rise	300
5251H	High Temperature Thermal detector	300
IM-10	10 Input Monitor Module	3.50 mA
CR-6	6 Relay Control Module	1.45 mA
SC-6	6 Supervised Control Module	2.25 mA
CZ-6	6 Zone Conventional Interface Module	2.00 mA
M500DM	Dual Input Monitor Module	300
M500M	Monitor module, Classes A/B initiating	300
M501M	Mini Monitor module, Class B initiating	300
M502M	Monitor Module for 2- wire smoke detectors Classes A/B initiating	200
M500S	Control module	300
M500R	Relay Module	300
M500X	Fault isolator module	450

5.0 Appendix B: Battery Calculations & Compatible Batteries

5.1 Battery Calculation Worksheet

1. Enter the number of each installed module type in the 'Quantity' column next to the appropriate module description.
2. For each quantity entry, multiply the value in the 'Quantity' column by the value in the 'Standby' column and enter the value in the 'Total Standby' column.
3. For each quantity entry, multiply the value in the 'Quantity' column by the value in the 'Alarm' column and enter the value in the 'Total Alarm' column.
4. Add all the values in the 'Total Standby' column and put the answer in the 'Total Standby' box marked A.
5. Add all the values in the 'Total Alarm' column and put the answer in the 'Total Alarm' box marked B.
6. Enter the required standby time (hours) in box C, and the total alarm time (minutes) in the alarm time box D.
7. Substitute the values from boxes A through D in the battery calculation formula and the result is the recommended minimum battery capacity in amp-hours.

Worksheet found on following page.

Device Type	Device Qty.	Standby Current	Total Standby	Alarm Current	Total Alarm
HS-3200 mainboard w/ LCD display & primary power supply	1 x	110mA	110mA	175mA	175mA

Optional Internal Components	HS3NC2 NAC output extender	x	10mA	_____ mA	65mA	_____ mA
	HS3RL4 function relay o/p extender	x	5mA	_____ mA	17mA*	_____ mA
	HS3LD8 8-zone LED annunciator	x	5mA	_____ mA	15mA**	_____ mA
	HS3DL dual line DACT	x	40mA	40mA	65mA	65mA
	HS3CTYB polarity reversal / municipal tie	x	20mA	20mA	_____ mA***	_____ mA***

Addressable Inputs	Smoke detectors	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A
	Smoke detectors	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A
	Thermal detectors	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A
	Monitor modules	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A
	Control modules	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A
	Fault isolator modules	x	_____ μ A	_____ μ A	_____ μ A	_____ μ A

See Appendix C for details on compatible addressable devices and their respective current draw.

Audible Notification Appliances (mA)	<input type="text"/>	x	<input type="text"/>	<input type="text"/>	<input type="text"/>
Visual Notification Appliances (mA)	<input type="text"/>	x	<input type="text"/>	<input type="text"/>	<input type="text"/>
AUX Power Load****	<input type="text"/>		<input type="text"/>	<input type="text"/>	<input type="text"/>
TOTAL (A):	<input type="text"/>		<input type="text"/>	TOTAL (B):	<input type="text"/>

See next page for battery selection calculations.

Notes:

- * Each relay, when active, will draw 17mA. The alarm current will depend on how many relays are programmed to activate on alarm.
- ** Represents three (3) devices in alarm. For each additional device, add 5mA.
- *** Alarm current depends on module configuration. Please refer to HSCTYB installation Instructions for further detail.
- **** If HS-3644 and HS-3434 are powered from AUX:
 HS-3434 - 20mA Stby, 115mA Alarm (max)
 HS-3644 - 30mA Stby, 70mA Alarm (max)

Add above currents for each annunciator or fiber optic modem, (i.e.) if 2 are present then multiply above by 2.

5.2 Battery Selection Calculations

- From previous calculations, locate total Standby Current (**A**) and convert to **amperes**. **A** = _____
(Note: amperes = mA ÷ 1000; μA ÷ 1,000,000; examples: 250 mA = 0.25 A; 1500 μA = 0.0015 A)
- Identify Standby Time (**C**), in **hours**. **C** = _____ (typically 4, 24, 48, or 60 hr)
- From previous calculations, locate total Alarm Current (**B**) in **amperes**. **B** = _____
- Identify Alarm Time (**D**) in **minutes**. **D** = _____ (typically 5, 10, or 15 min)
- Using the values in Steps 1-4, perform an Initial Battery Calculation per the following:
 $(A \times C) + (0.0167 \times B \times D) =$ _____ Ah (Ah = ampere hours)
- Select a battery size LARGER than the number from the Initial Battery Calculation from the following list of SOTA batteries using the 20 Hour Rating value:

Part Number	20 Hour Rating	C/20 (Amps)	Part Number	20 Hour Rating	C/20 (Amps)
HS-12V4.5AH	4.5 Ah	0.225	HS-12V18AH	18 Ah	0.9
HS-12V7.2AH	7.2 Ah	0.36	HS-12V26AH	26 Ah	1.3
HS-12V12AH	12 Ah	0.6	HS-12V35AH	35 Ah	1.75

If either the Standby Current or the Alarm Current is greater than the C/20 current for the initial battery size selected, a discharge factor must be applied per the following table (use the 20 hr value for 24 hr standby):

Discharge Time		Discharge Factor	Discharge Time		Discharge Factor	Discharge Time		Discharge Factor
0.083 hr	5 min	3.85	2 hr	1.43	8 hr	1.10	14 hr	1.03
0.166 hr	10 min	2.78	3 hr	1.30	9 hr	1.09	16 hr	1.02
0.249 hr	15 min	2.27	4 hr	1.22	10 hr	1.08	18 hr	1.01
0.332 hr	20 min	2.08	5 hr	1.18	11 hr	1.06	20 hr	1.00
0.5 hr	30 min	1.96	6 hr	1.14	12 hr	1.05	48 hr	1.00
1 hr	60 min	1.67	7 hr	1.11	13 hr	1.04	60 hr	1.00

Standby Discharge Factor (**SDF**) = _____ Alarm Discharge Factor (**ADF**) = _____

- Minimum Required Battery Capacity Calculation. (to account for battery aging, a 1.17 multiplier is included)

Minimum battery capacity in Ah =

$$1.17 \times [(A \times C \times SDF) + (0.0167 \times B \times D \times ADF)] = \underline{\hspace{2cm}}$$

- If the battery size initially selected is smaller than the result of step 9 above, repeat the calculations using a larger battery size.

6.0 Appendix C: Compatible Synchronized Notification Appliances

Manufacturer	Appliance Module	Candela	# of Appliances
Mircom	FHS-210-110	75	18
Secutron	MRA-24 WW	15	24
System Sensor	P12224MC	15	30
Wheelock	NS-24 MCW-FW	15	38
Amseco	SH24W-75110	75	18
Gentex	GEC3-24WW	15	24



Harrington Signal Inc.
2519 4th Avenue
Moline, IL 61265