E S L

INSTALLATION AND OPERATIONS MANUAL

ESL 2501
Fire Alarm Control Panel

ESL

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This manual does not cover, nor does it purport to cover, every detail that might pertain to the ESL 2501 Fire Alarm Control Panel; nor does it cover, or purport to cover, every possible contingency that might be encountered in connection with the installation, utilization, operation or maintenance of the ESL 2501 Fire Alarm Control Panel. This manual is intended only to advise the user of the intended use of the unit and the intended means by which it can be used to implement a fire alarm system design for commercial, institutional and residential applications. Consult Sentrol Technical Services at 1-800-648-7424 regarding any condition, question or concern not explicitly covered in this manual.

TABLE OF CHARTS, GRAPHICS AND SCHEMATICS

1.0
SYSTEM OVERVIEW

The ESL Model 2501 Fire Alarm Control Panel (FACP) is designed to provide a reliable and cost-effective means of implementing a fire alarm system compliant with the requirements of the National Fire Alarm Code for protected premises fire alarm systems in commercial, industrial, residential and institutional applications. The ESL Model 2501 Fire Alarm Control Panel is a modular system. In its simplest configuration, called the 2501 FACP, it consists of an enclosure, power supply and Basic Master Board (BMB). The 2501 provides all of the required basic system functions for alarm, fault (trouble) and supervisory monitoring, together with one initiating zone circuit and two notification appliance circuits. Its 7 amp, 24 VDC, system power supply provides ample current for most applications; with 1.5 amps available from each of the two integral notification appliance circuits, 1.0 amp available from the auxiliary power supply terminals (24 VDC, 0.5 amps 12 VDC in battery saver mode) and the remaining 3 amps, available as two additional notification appliance circuits, when a 2500 BELL Card is added to the system.

The unique modular design makes it easy to add features when they are needed. These include a remote interface keypad, remote annunciator, digital communicator, LEM/LRM, extra control relays, additional notification appliance circuits and additional initiating device circuits. Up to 24 Class B, Style B initiating device circuits can be added to the 2501 basic unit if needed. Furthermore, the ESL 2501 Fire Alarm Control Panel is equipped with a Remote Keypad Port. This allows the use of an optional ESL 2500 Keypad for enhanced user interface.

One enclosure is used for most system configurations. One cabinet can hold up to 3 expander modules, as well as the necessary standby batteries for either 24 or 60 hour operation. The three (3) expander modules provide up to twelve (12) Class B zones plus one (1) from the BMB for a total panel configuration of thirteen (13) Class B zones. To accommodate system configurations beyond 13 zones, a second enclosure can be installed. For larger installations, the panels can be networked using non-latching zones or the power booster option to provide maximum system flexibility.

The versatility of the ESL 2501 Fire Alarm Control Panel is further enhanced by its compatibility with the complete line of ESL smoke detectors, manual fire alarm stations and notification appliances. This allows the assembly of a complete fire alarm system from components produced by a single manufacturer with designed-in compatibility and reliability. See Appendix A for the list of UL Listed compatible devices.

1.1 FEATURES

- Expandable Modular Design: up to 25 Class B Zones
- Patented Direct On-line Power Supply provides regulated, filtered 24VDC at 7 amps output.
- Single zone panel can be used as 3 amp (NAC) power booster with 1 amp auxiliary power available for 24 V panels or 0.5 amp for 12 V panels.
- An additional bell card 2500-BELL can be used to provide two additional notification appliance circuits (1.5 amps each for 6.0 amps total and 1 amp auxiliary power).
- Panel network capability: Each zone input can connect to an independent panel.
- Approved for Sprinkler Supervisory and Waterflow Alarm.
- Functions are easily programmable through push-button switches on BMB or optional keypad.
- Battery saver mode allows smaller, less expensive batteries to meet 24 or 60 hour standby requirements.
- Optional Plug-in Two-line Dialer for Supervising Station reporting.
- Automatically senses and reports when ESL 521 series smoke detectors need cleaning over standard 2-wire zones.
- Built-in walk test and alarm verification by zone.
- All output circuits power-limited, except battery and relay output connections.
- Programmable notification appliance circuit output with a variety of cadences; Temporal 3, March Time, California March Time, Steady, Non-Silenceable Steady and Latching Non-Silenceable Steady.

1.2 PANEL EQUIPMENT

The flexibility of the ESL 2501 Fire Alarm Control Panel is derived from its modular design and the array of function modules available for integration into the 2501 basic unit. These modules are listed below.

Model Number	Description
2501	Single Zone Panel, 7 Amp Power Supply
2502-ZEM	2-Zone, Class B, Expander
2504-ZEM	4-Zone, Class B, Expander
2500-BELL	2 Additional Bell Circuits, 3 Amp Expander
2500-KPD	LCD Keypad
2500-ZRM2	2-Zone, Relay Module
2500-ZRM4	4-Zone, Relay Module
ZXPTR	Printer Interface Module
2500-BMB	Single Zone Panel, replacement circuit board
2500-SH	System Housing with Nameplates
2500-PS	7 Amp Power Supply, for replacement
2500-DAC	Full Featured Dual Line Dialer
2500-RA	Remote Annunciator
2500-RADVR	Remote Annunciator with Outputs
2500-LEM/LRM	Configurable Local Energy or Line Reversal Module

1.3 PANEL LISTINGS

The ESL 2501 Fire Alarm Control Panel is equipped with a "Battery Saving Switching Mechanism" U.S. Patent No.: 5,804,891. The 2501 (FACP) functions in accordance with the National Fire Alarm Code (NFPA 72) and the California State Fire Marshal (7165-1459:111) for the following:

Type of Signaling System	Type of Alarm Service	Type of Signal
Local (L)	A, M, WF, and SS	NC, California March Time, ANSI Temporal 3
Central/Remote Station (CS/RS) Protected Premises unit	A, M, WF, and SS	Digital Alarm Communicator (DAC)
Proprietary (P) Protected Premises Unit	A, M, WF, SS	NC, California March Time, ANSI Temporal 3
Household	A, M, WF, and SS	NC, California March Time, ANSI Temporal 3, and Digital Alarm Communicator (DAC)
Auxiliary	A, M, WF	NC

A = Automatic Detection (smoke detectors, heat detectors, etc.)
DAC = Digital Alarm Communicator
M = Manual Fire Alarm Box (Pull Stations)
NC = Non-Coded
SS = Sprinkler Supervisory
WF = Water Flow Alarm

Figure 1.3 Signaling System Table

NOTE: For standby current calculations, see *Appendix B Battery Calculation Worksheet.*

1.4 CUSTOMIZED PANELS

Your 2501 (FACP) may be custom built according to the number of zones desired. The following chart shows what equipment is needed for the desired number of zones.

Class B Zones Desired	Panel No. *2501	2 Zone Expansion Boards (2502-ZEM)	4 Zone Expansion Boards (2504-ZEM)	Over 13 zones, add add't panel housing p/n 2500-SH
1	1			
3	1	1		
5	1		1	
7	1	1	1	
9	1		2	
11	1	1	2	
13	1		3	
15	1	1	3	1
17	1		4	1
19	1	1	4	1
21	1		5	1
23	1	1	5	1
25	1		6	1

*** 2501 can also be used as a 3.0 amp (NAC) power booster (6.0 amps with 2500-BELL)**

Figure 1.4 Custom Panel Building Table

Additional enhancements may be added to the panel of your choice from the following:

- 2500-BELL Adds two more notification appliance circuits and allows use of the full 7 amps of 24 VDC power available with the 2501 (FACP).
- 2500-ZRM2 Adds SPDT relays (2) to 2502-ZEM
- 2500-ZRM4 Adds SPDT relays (4) to 2504-ZEM
- 2500-KPD Adds an LCD keypad to your 2501 (FACP)
- ZXPTR Adds a printer interface module
- 2500-RA Adds remote visible and audible annunciation, system status and zone status (4 RA's per system are allowed)
- 2500-RADVR Same as 2500-RA, except in addition, there is one active low output per zone intended to indicate alarm condition. These lines are not supervised.
- 2500-LEM/LRM Local Energy Module for connection to a listed master box. Can also be configured as a Line Reversal Module for connection to appropriate devices.
- 2500-DAC Dual Line Dialer with complete reporting capability for all 25 zones.

2.0
SYSTEM CONFIGURATIONS

2.1 2501 (FACP)

The basic version of the 2501 Fire Alarm Control Panel can be expanded to accommodate up to 25 Class B, Style B initiating device circuits. Figure 1.4 presents in tabular form the number of Expansion Boards of each type needed to attain a given number of initiating device circuits.

The 2501 (FACP) can be enhanced by adding two additional notification appliance circuits (NAC) with the 2500-BELL expansion card. This card adds two additional bell circuits and allows use of the full 7 amps of 24 VDC power available from the 2501 (FACP) power supply (6 amps are used for the notification appliance circuits (NAC), up to 1 amp is used for auxiliary power).

Further enhancement of the 2501 (FACP) is provided by the (2500-ZRM2) or (2500-ZRM4) zone follower relay cards. These add-on cards provide SPDT relays rated 30 VDC at 2 amps resistive in a zone follower configuration. These relay contacts are "dry" and, hence, unsupervised. They should only be used in conjunction with a supervised circuit or to control non-critical or "fail-safe" functions.

A printed copy of the events that occur in the 2501 (FACP) can be obtained by the addition of the ZXPTR printer interface module. The BMB and DAC function maps can be printed when this module is installed. This module allows a standard printer with a Centronics interface to be connected to the 2501 (FACP). Events will be printed as they occur or the entire event history can be printed at the user's discretion.

The 2500-KPD LCD keypad may be added to the 2501 (FACP) to program all the system functions and allow for on premises remote panel manipulation. Up to 3 supervised keypads and 1 unsupervised keypad may be added. The 2500-KPD LCD keypad gives you access to additional functionality of the 2501 (FACP). The keypad also allows access to the event history and programming and testing of other system peripherals. Access to all critical items are restricted by the use of passcodes to prevent access by non-authorized users.

For localities requiring remote annunciators, the 2500-RA and 2500-RADVR can be added. Up to four devices can be added. Each device is configurable for zones 1-13 or zones 14-25 and all devices are supervised. The device indicates the system status and the zone status on a zone by zone basis. In addition to these capabilities, the RADVR has low current (sinks up to 40mA) active low zone follower outputs. These outputs are intended to

interface with MPI-206 Accessory Relay Boards or similarly isolated devices for driving graphic displays as desired or where mandated by local authorities.

For localities that utilize Listed Master Boxes in a municipal system, the 2500-LEM/LRM can be installed. This device provides the required connectivity to the Listed Master Box. The connection is supervised and will automatically restore when the master box is reset. In addition, the module can be configured as a Line Reversal Module for applications that require this functionality. The connections are also supervised and auto-restore when the device or connections are returned to a normal state.

Another enhancement to the 2501 FACP is the 2500-DAC, Digital Alarm Communicator. This is a full featured DAC that reports all system events in the following selectable formats: Pulse - 20 baud extended, Pulse - 20 baud non-extended, Pulse - 40 baud extended, SIA, Contact ID, and Pager. The DAC is programmable with a 2500-KPD. Front panel programming is not supported. In addition to these report formats, the DAC accepts two supervised phone lines. For remote programming capabilities, contact Sentrol Technical Services at 1-800-800-2027.

2.2 POWER BOOST

With the adoption of the Americans with Disabilities Act (ADA) it has become necessary to provide equivalent fire alarm notification for those with hearing impairments. This requirement is usually addressed with visible notification appliances (strobe lights). Frequently, existing systems cannot provide sufficient current to operate all of the visible notification appliances necessary to comply with the ADA and a "power booster" is needed to provide additional notification appliance power. The base model 2501 can be connected to be an add-on power booster for any UL Listed fire alarm control panel including the 2501 (FACP). Power Booster terminals are a feature of the panel. The panel will act as a 3 amp (NAC) power booster with two notification appliance circuits. With the addition of the 2500-BELL to the base model, two more notification appliance circuits are added providing a 6 amp (NAC) power booster with four notification appliance circuits. See Figure 2.2 for Power Booster wiring.

In the power booster configuration, an alarm on the master fire alarm control panel will activate an alarm on the power booster fire alarm control panel. Interconnect wiring is supervised and will generate a system trouble on the master panel if the interconnect wiring is compromised. Any system trouble on the power boost panel will generate a bell and system trouble on the master panel. The interconnect loop will generate a bell and system trouble at the Master panel if the wiring should become compromised.

2.3 SYSTEM NETWORKING

If the facility to be protected requires more than 25 initiating device circuits in order to fulfill the owner/operator's fire protection objectives, ESL 2501 control panels can be connected together in what is commonly referred to as a "master-slave" configuration. One unit is designated the "master" and the other acts as the "slave". One initiating device circuit on the "master" unit is programmed as a non-latching initiating device circuit (See Section 5) and the wiring for this circuit is connected to the general alarm-operated and trouble-operated contacts of the "slave" unit BMB. This wiring connection is illustrated in Figures 2.3a and 2.3b. Any initiating device circuit of the "master" unit can be used to receive signals from the "slave" unit in this manner. When a detector initiates an alarm on an initiating device circuit of the "slave" unit, its alarm-operated contacts transfer and, hence, appear as a shorting contact initiating device alarm initiation at the "master" unit. The interconnection between the master and slave units is supervised and the End Of Line (EOL) resistor (provided) MUST BE INSTALLED, as shown. Refer to Figure 2.3a for installation wiring as a Master-Slave panel and Figure 2.3b for installation wiring with a ZEM.

The Master-Slave configuration may also be implemented with a power boost capability. This configuration is used in applications where a local networked system is desired. Refer to Figure 2.3c for the installation wiring. After the installation wiring is accomplished, the panel must be programmed as indicated on the wiring installation diagram (see Section 5). The Master-Slave configuration will now operate in the following manner. All zone inputs on the Master are dedicated for Slave panel operation. Program all bell outputs as required to meet your system design requirements. In the Zone Bell Definition Table for each Slave panel, program all Bells associated to Zone 1 only. In this configuration, an alarm condition on a Slave unit will communicate through its Alarm and Trouble dry contacts that the Slave is in alarm. The Master will signal through the Bell outputs that the system is in alarm and all system bell outputs (Slaves and Master) will activate. The only method to silence the system bells is to activate the Alarm Silence on the Master unit. This will result in the bells silencing on all panels. The Master will indicate on board its control board that the bells are silenced by illuminating the bell silenced LED. A Slave panel cannot be locally silenced.

The previous description covers all of the necessary wiring for a Master panel to supervise and report the conditions of up to 25 other Slave panels, allowing for very large system coverage and expansion when needed.

2.4 DOOR HOLDERS

The 2501 (FACP) is suitable for door holder applications. See Figure 2.4 for Door Holder Installation.

Battery saver mode is not allowed when using door holders. They are rated for 24 VDC operation only with the 2501 (FACP). The 2501 should be programmed (see Section 5) so that the common trouble contacts transfer on loss of AC only. This will release the door holders on loss of AC. The door holders will also release on alarm.

2.5 LOW BATTERY ANNUNCIATION

The 2501 (FACP) will automatically perform a battery check 15 seconds after power up. If the voltage of either battery is below 11.0 VDC, the 2501 (FACP) will illuminate the System Trouble and the No/Low Battery Trouble LEDs and sound the trouble sounder. When the voltage of either battery drops below 10.5 VDC, the 2501 (FACP) will log the condition to the event log. The 2501 (FACP) will not record a restoral unless both battery voltages return to a value above 11.0 VDC. After the initial power up battery test, the 2501 (FACP) will perform the same battery test every hour. If the batteries are disconnected after the power up battery test, the 2501 (FACP) will illuminate the System Trouble and No/Low Battery Trouble LEDs and sound the trouble sounder within 10 seconds.

The 2501 (FACP) will not perform a scheduled battery test while the notification appliances (NAC) are active. It will perform the battery test after the notification appliances become inactive.

To force a battery test, press the SYSTEM RESET push-button. The 2501 (FACP) will automatically perform a battery test 10 seconds later.

2.6 HIBERNATION MODE

No electronic or electrical system can be expected to operate properly if there is insufficient electrical power. For this reason the National Fire Alarm Code (NFPA 72) requires that fire alarm control panels have both a primary and secondary source of electrical power, usually a dedicated 110 VAC branch circuit and battery back-up. If the 110 VAC electrical power is lost AND the system has been operating on battery secondary power for an extended period of time, beyond that contemplated by the code, eventually the battery set will become depleted. Under these conditions the fire alarm control panel can no longer be expected to operate reliably. This will occur when the battery voltage is at 19.0 VDC. The panel will automatically log the event and then go into hibernation mode. While in hibernation, the 2501 (FACP) will not detect any alarms or other troubles and the notification appliances will not sound.

The 2501 (FACP) will indicate hibernation mode by flashing the yellow LOW/NO AC and LOW/NO BATT LEDs at one (1) second intervals, the SYSTEM TROUBLE LED will be illuminated, and the local sounder will emit the trouble sound.

The panel will automatically exit out of hibernation mode and return to normal operation when the Low/No AC condition is restored. After normal operating power has been restored, the panel will continue to indicate that it had been in hibernation by illuminating the SYSTEM TROUBLE LED and sounding the trouble sounder until a SYSTEM RESET is performed.

2.7 DRILL TEST

A drill test may be performed by providing a dry contact closure between the Drill Test terminal and the Negative terminal. The ESL 2501 will sound the NACs with the programmed cadences. The communicator will not be activated and the common alarm and trouble contacts are not activated. An event is not generated in the event log.

2.8 TROUBLE RESOUND TIME

The trouble sounder has a default resound interval of 15 minutes. It may be programmed to three additional values: 1, 4, or 24 hours. See Section 5.0 *Programming*.

2.9 COMM TEST

When the system uses a 2500-DAC Digital Alarm Communicator, an automatic comm test is performed every 24 hours as a minimum. The system can be programmed for a longer comm test interval if desired. The system automatically toggles between phones so that each phone line is tested at least once every 48 hours.

2.10 DUAL LRM OPERATION

For localities requiring dual Line Reversal Module applications, the 2501 FACP can be programmed to transmit separate supervisory and alarm signals. This is accomplished with the 2500-BELL expansion module. The FACP is programmed to operate the Bell expansion module as a dual LRM. Bell 3 will activate for a fire alarm and Bell 4 will activate for a supervisory alarm. For a Fire Alarm, the Bell 3 output circuit will reverse transmitting

the alarm signal to the connected device. All other System Alarm functions are as required. For a Supervisory Alarm, the Bell 4 output circuit will reverse transmitting a Supervisory Alarm to the connected device. All other Supervisory Alarm functions are as required. See Section 5 for programming information. See Figure 2.10 Dual LRM Installation Diagram for installation information. The connections are supervised and will result in a System and Bell 3 and/or Bell 4 Trouble if the lines are compromised. For system trouble transmission, the System Trouble dry contacts are available.

2.11 GROUND FAULT INDICATION OPERATION

The FACP is equipped with ground fault detection circuitry. If required, the ground fault detection circuitry may be disabled by programming the BMB. Refer to Section 5.0 *Programming* for assistance with programming this feature. The FACP will function normally in the presence of a ground fault. Some localities are required by local jurisdiction to annunciate this condition.

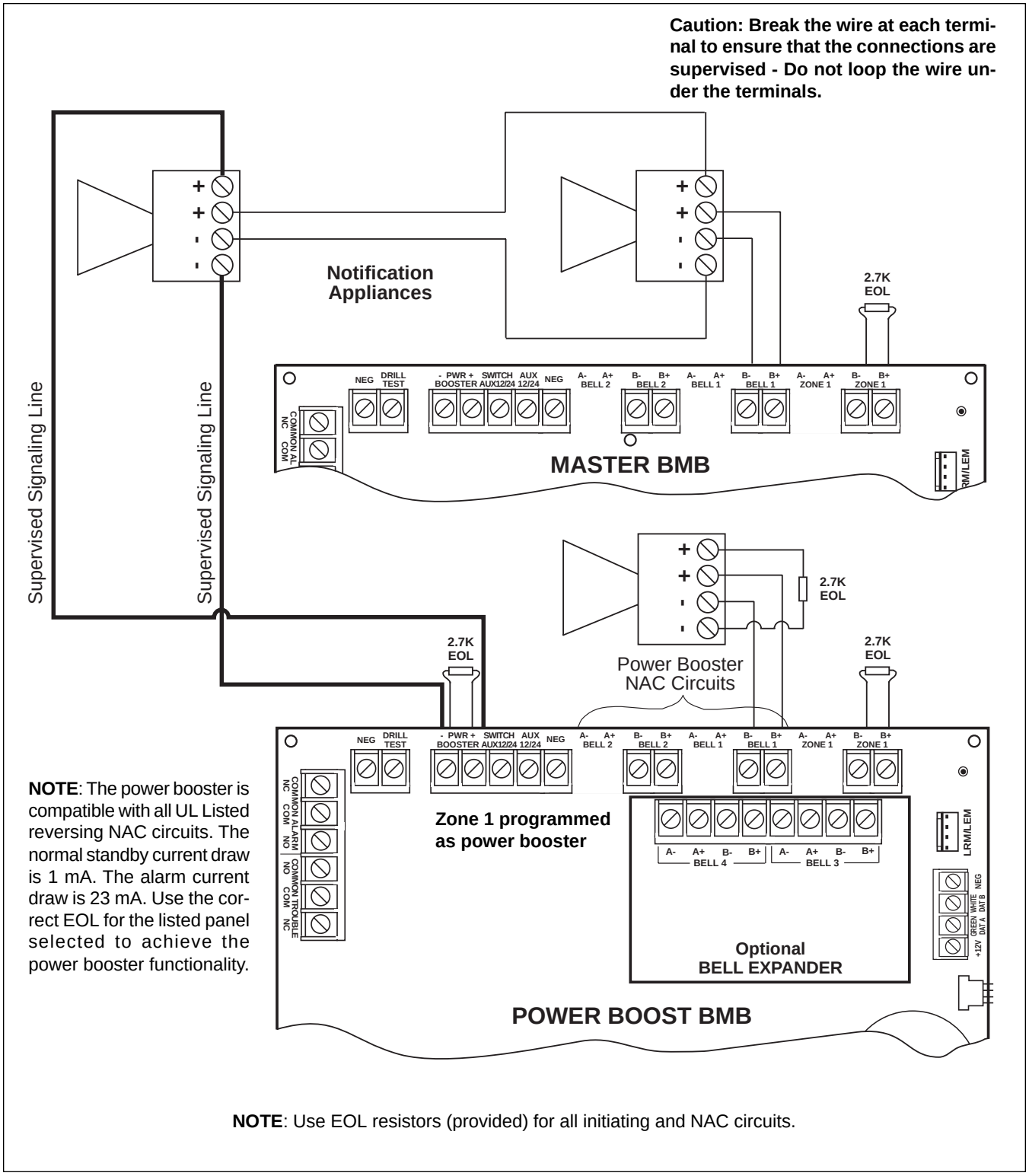
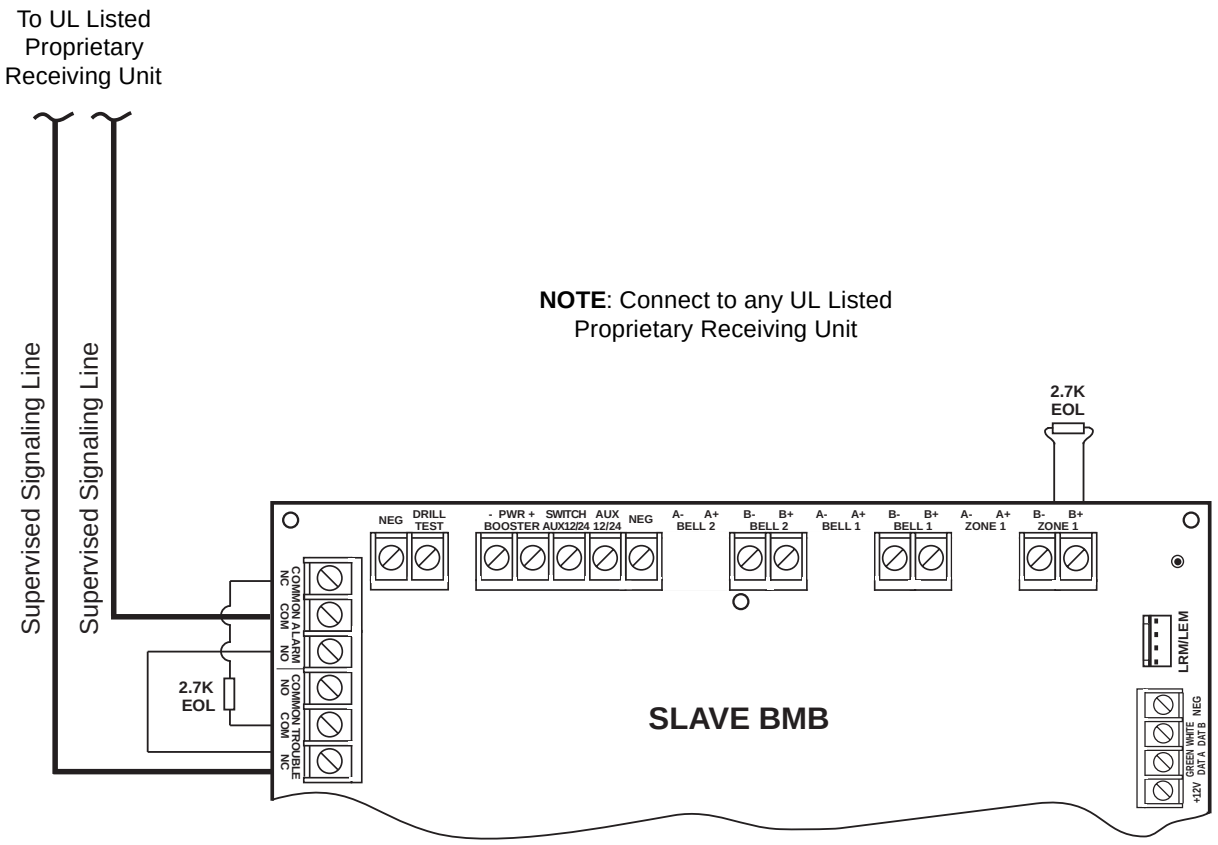


Figure 2.2 Power Boost Installation Diagram

Caution: Break the wire at each terminal to ensure that the connections are supervised - Do not loop the wire under the terminals.



NOTE: Connect to any UL Listed Proprietary Receiving Unit

NOTE: Use EOL resistors (provided) for all initiating and NAC circuits.

Figure 2.3a Slave Panel Installation Diagram

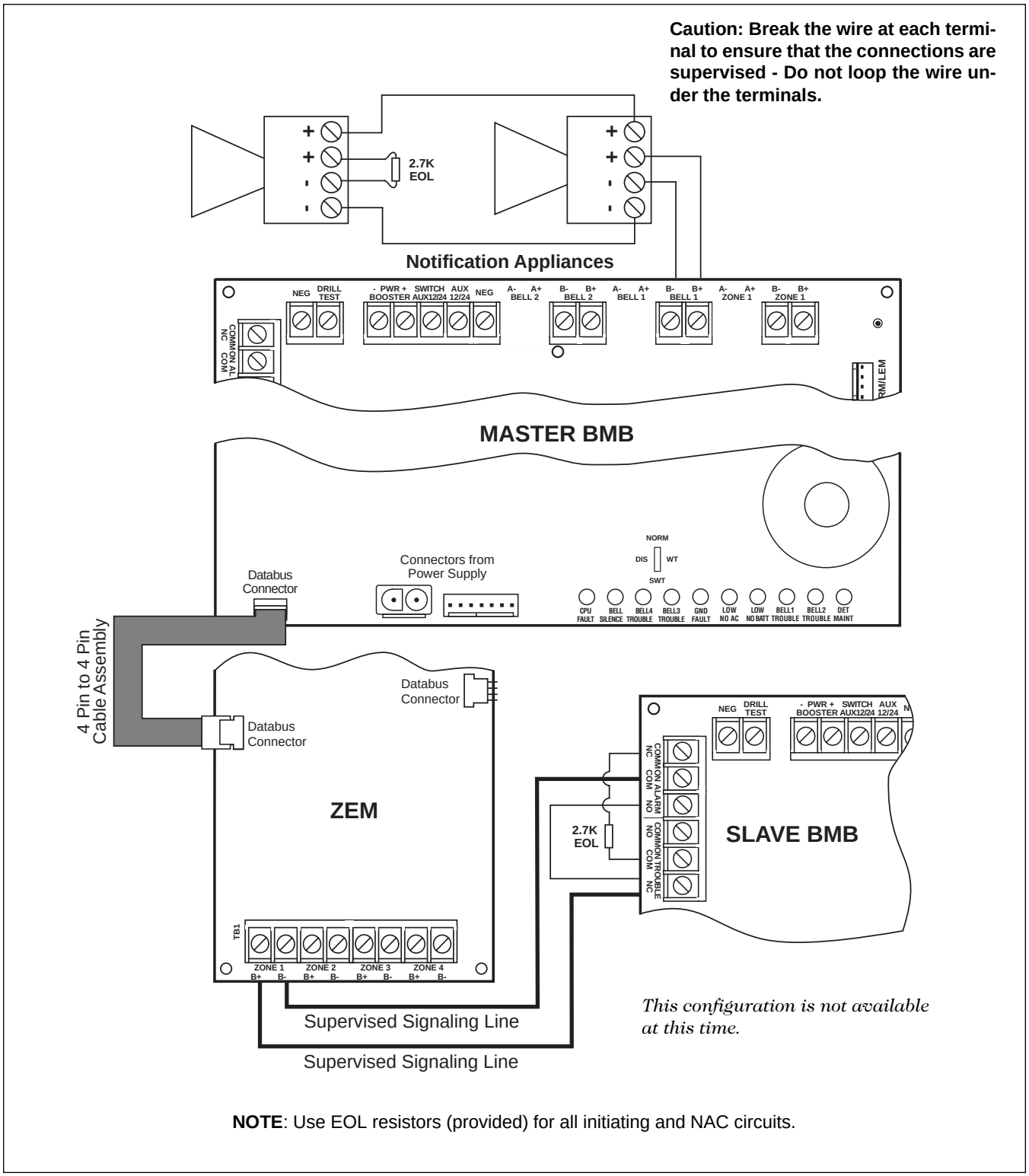
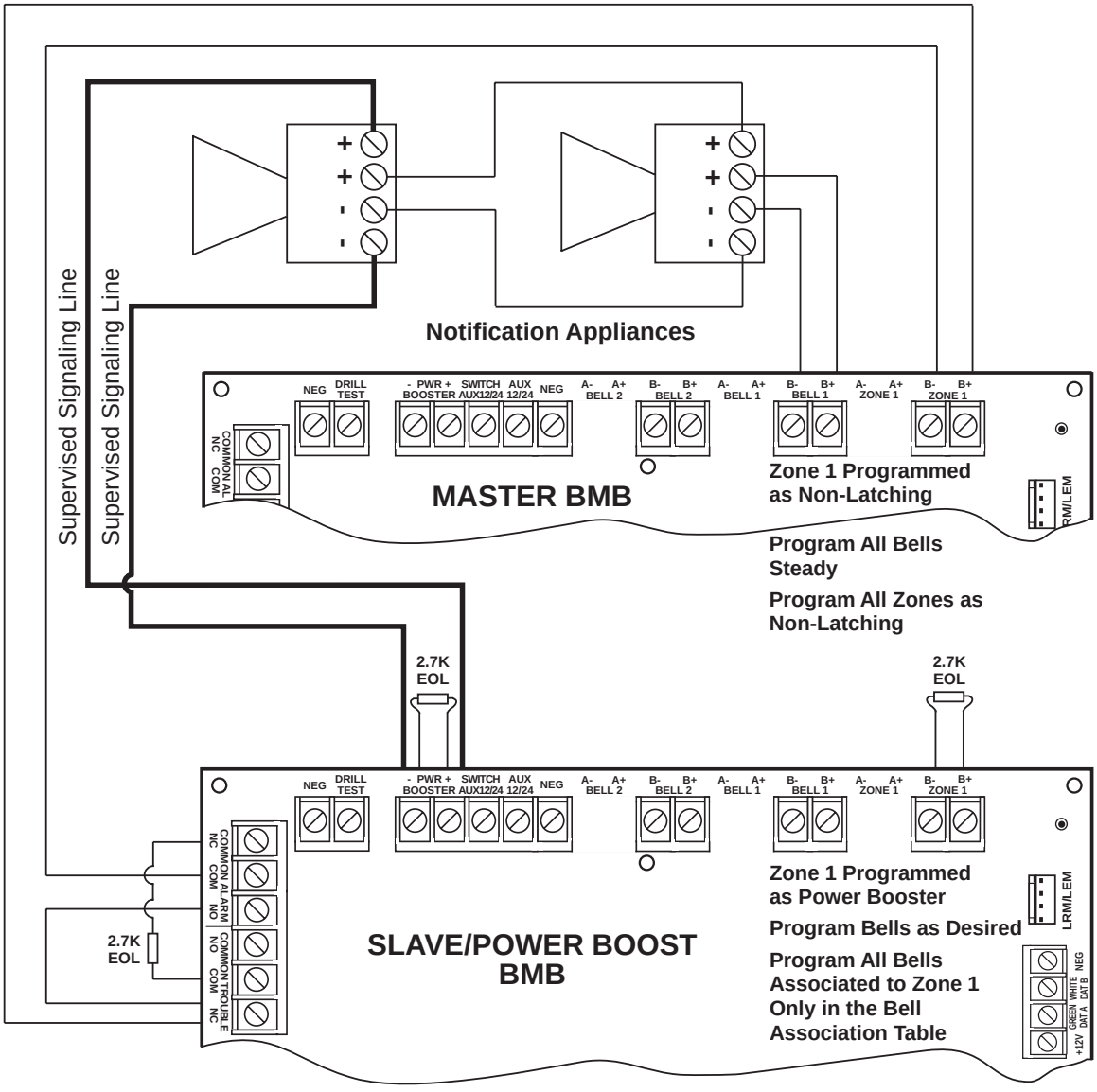


Figure 2.3b Slave Panel Installation with a ZEM Diagram

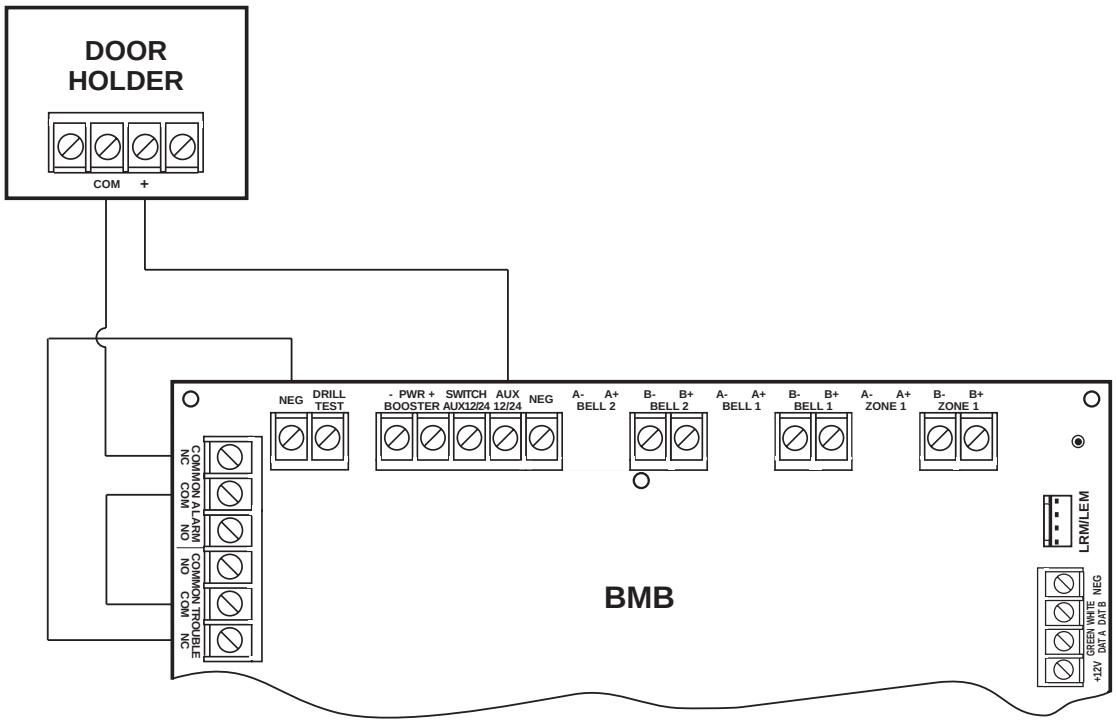
Caution: Break the wire at each terminal to ensure that the connections are supervised - Do not loop the wire under the terminals.



NOTE: Use EOL resistors (provided) for all initiating and NAC circuits.

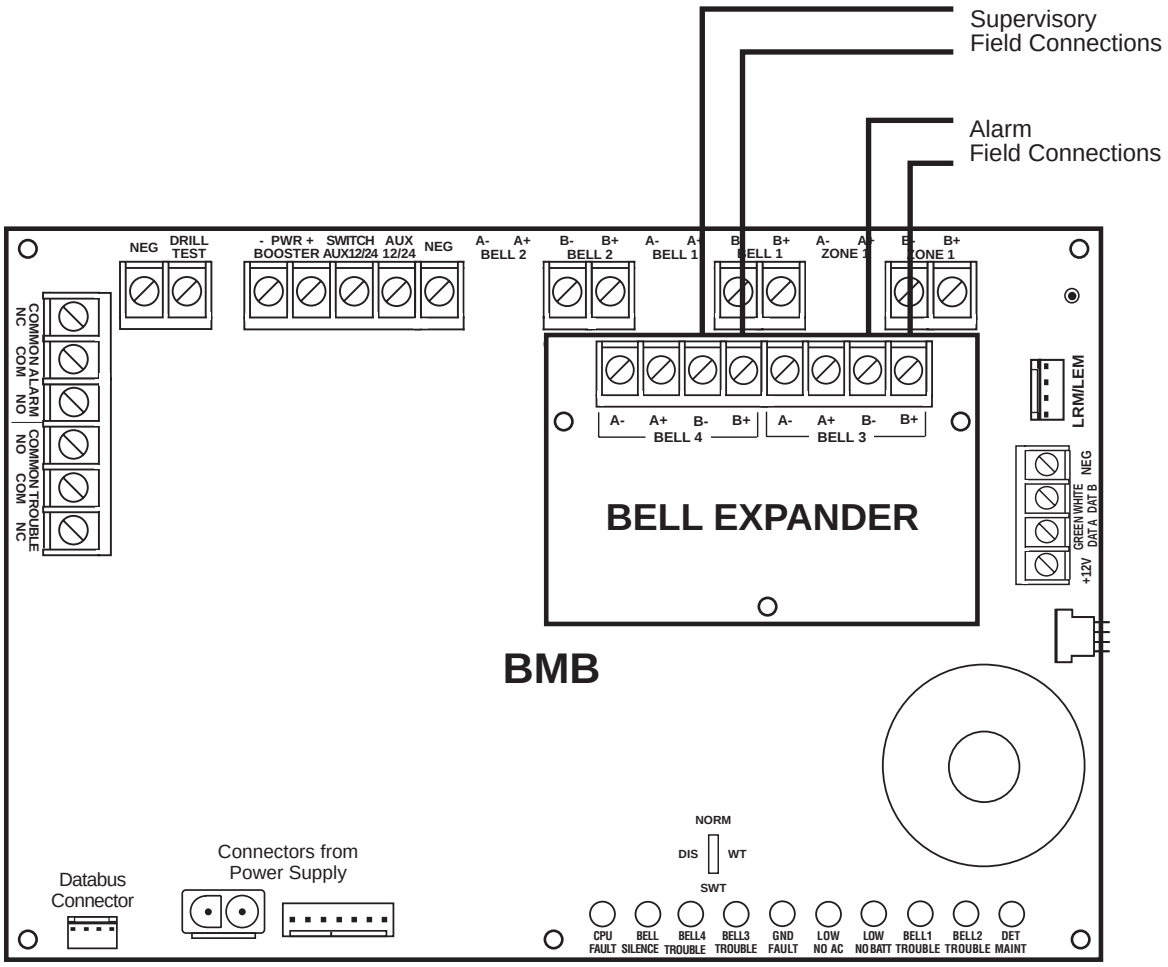
Figure 2.3c Slave Panel with Power Boost Installation Diagram

Caution: Break the wire at each terminal to ensure that the connections are supervised - Do not loop the wire under the terminals.



NOTE: Program common trouble contacts for open on loss of AC. See Section 5.0 *Programming*.
Battery saver mode not applicable for door holder use.

Figure 2.4 Door Holder Installation Diagram



This application is used for separate Fire Alarm and Supervisory Alarm reporting. See Section 5.0 *Programming*.

Program Communicator Type for Dual LRM.

NOTE: Use EOL resistors (provided) for all initiating and NAC circuits.

Figure 2.10 Dual LRM Installation Diagram

3.0
GENERAL SYSTEM INSTALLATION GUIDELINES

First and foremost, **CAREFULLY READ AND MAKE SURE YOU UNDERSTAND THE ENTIRE MANUAL BEFORE BEGINNING THE INSTALLATION**. The reliable performance of the fire alarm system is dependent upon proper system design, installation and maintenance.

Before installing the panel, a fire alarm system must be designed. The design of fire alarm systems is often regulated by the state or municipality through legislation requiring fire alarm system designers be certified or licensed. Make certain that the design and designer of the system comply with the relevant local laws, regulations and building codes and sub-codes.

The design of a fire alarm system requires a thorough evaluation of the fire hazards and risks inherent in the facility to be protected. The design of the fire alarm system must also reflect the explicit fire safety objectives of the owner/operator of the site. The design of the fire alarm system must comply with the minimum compliance requirements in the relevant local codes and regulations. These local codes and regulations usually, by reference, adopt the National Fire Alarm Code. Consequently, the fire alarm system design must also comply with the applicable edition of the National Fire Alarm Code, NFPA 72; available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101, tel: 1-800-344-3555. Also, if questions arise call Sentrol Technical Services at 1-800-800-2027.

The design of the system includes:

- The type, quantity and location of alarm initiating within the facility being protected.
- The type, quantity and location of alarm notification appliances, both audible and visible, within the facility being protected.
- The connections between the fire alarm system and other building systems such as the HVAC system, door closers, elevator controls and security systems.
- The programmed system response to alarm signals for each initiating device or notification appliance circuit.
- The type, size and installation method of the wiring conductors interconnecting system components.
- The type, size and installation method of the wiring conductors connecting the fire alarm system control unit to the primary power supply.
- The capacity of the fire alarm system secondary power supply (battery set).
- A dedicated, locked and labeled branch circuit (unswitched) for primary power supply.

All design criteria should be documented in the system design. Sentrol has provided a number of design aids in this manual. Figure 3.0, 2501 (FACP) Interconnect Diagram, identifies the intended use for each wiring terminal. Section 5 provides instructions for programming the FACP. Section 10 provides a review of the design of household fire warning systems. Appendix B provides a battery secondary power supply calculation worksheet. Additional design guidance is available from the local building code, local fire code and the National Fire Alarm Code, NFPA 72.

3.1 GENERAL INSTALLATION PROCEDURE

The ESL 2501 Fire Alarm Control Panel has been designed to be easy to install. Below we have outlined an installation procedure that will lead to timely completion of the installation and result in trouble-free operation.

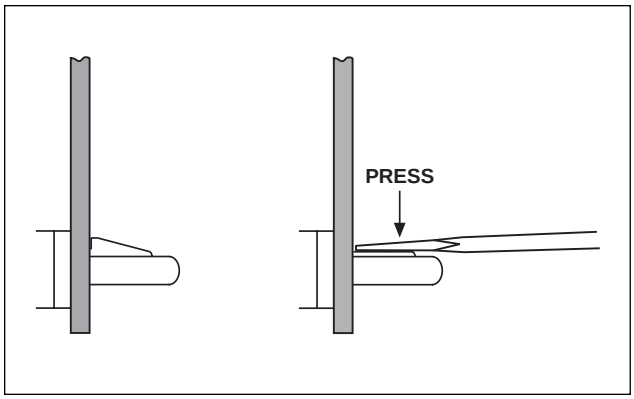
Step 1. Planning: Referring to Figure 3.0, ESL 2501 Fire Alarm Control Panel Interconnection Diagram, for specific guidance, prepare a carefully laid-out and complete wiring diagram of the entire system as designed. This drawing should show the point-to-point connections being made to all fire alarm system devices, including, but not limited to: smoke detectors, manual fire alarm boxes, fire alarm notification appliances (both visible and audible), sprinkler system supervisory devices, sprinkler system waterflow initiating devices and the connection to the off-premises fire alarm signal receiving station, if included in the system design. This wiring diagram should show the calculations used for computing the capacity of the battery secondary power supply according to the Battery Calculation Worksheet, provided in Appendix B. All drawings and calculations should be maintained as part of the permanent record of the fire alarm system installation. All power-limited connections must be made with component recognized energy limited cable.

Step 2. Equipment Inspection: Carefully unpack the system components and inspect for damage incurred in shipping. Immediately report any damage to the place of purchase for disposition.

Step 3. Mount Cabinet: Mount the cabinet in a clean, dry, vibration free area, where the temperature range does not exceed 0 to 49°C (32 to 120°F). Mount only in interior locations. Allow adequate space for 180 degree door swing and free access to all sides for conduit entry. Locate the top of the cabinet approximately six (6) feet above the floor, with the hinge mounting on the left. Mounting holes in the back of the cabinet are designed so the cabinet can be mounted without removing any control equipment. Mount the cabinet to the wall by first installing the top center mounting screw leaving enough space so the cabinet can be hooked over the screw head. Use screws or bolts no smaller than #10 or $^{3}/_{16}$ inches in diameter. For easier access, remove the door by gently lifting it from the hinges.

Step 4. Install Fire Alarm System Devices: Refer to the installation instructions provided with the compatible fire alarm system devices (smoke detectors, heat detectors, manual fire alarm boxes, audible notification appliances, visible notification appliances and other similar devices) and install these devices as permitted by their installation instructions. Note that the UL Listing of some devices permits their installation without a junction box if also permissible under the local building code. Also note that the installation of fire alarm systems is covered in Article 760 of the National Electrical Code (NEC), NFPA 70. Article 760 of the NEC stipulates the types of wire permissible for fire alarm installations employing conduit as well as those using Listed Fire Alarm Cable. The initiating device circuits and notification appliance circuits are power-limited circuits. Use an installation method permitted by Article 760 of the NEC to connect fire alarm devices to the fire alarm system control panel. Keep in mind that where ever conduit or cable enters a junction box or electrical enclosure it must be provided with a Listed bushing or connector, as appropriate. Refer to Section 4.1, *Detail Installation Guide*, for further information. DO NOT connect field wiring until after the fire alarm control unit has been properly checked.

Step 5. Physical Assembly Check: Verify that all boards are properly snapped into place over the locking clip. To add a board to the panel, firmly press the board onto the standoffs until the board snaps over the locking clip. To remove a board from the standoffs, press the locking clip in with needle-nose pliers or a flat head screwdriver (see Figure 3.1a).



Examine the installation of all modules, chassis, and subassemblies to insure proper mechanical and electrical connections and programming switches have been selected.

Step 6. Basic 2501 System Check: Prior to connecting field wiring to the unit, it is necessary to make certain that the 2501 is operating properly. This is achieved by performing the System Check.

Install the 2.7k Ω 5% End of Line (EOL) resistor (provided) to Zone 1, BELL 1 and BELL 2. Make sure all switches are in their normal positions. Connect the power supply cable assemblies between the BMB and power supply. Connect the AC flying leads to an unswitched 120 VAC 50/60 Hz power supply. See Figure 3.0, 2501 (FACP) Interconnect Diagram. Connect the red wire to the positive (+) spade lug of Battery 1 and the black wire to the negative (-) spade lug of Battery 1. Connect the red with white stripe wire to the positive (+) spade lug of Battery 2 and the black with white stripe wire to the negative spade lug of Battery 2. No fault indicator should be present. If faults are present, see the *Troubleshooting Guide* Section 9.0. System check is now complete.

NOTE: If new batteries with low terminal voltage are used, the Low/No battery LED may activate and the Trouble Sounder will sound. Silence the Trouble Sounder and charge the batteries. The Low Battery indicator will deactivate after the batteries are fully charged; no longer than 48 hours.

Step 7. Check Field Wiring: Check the integrity of all field wiring following directions defined in the *Field Wiring Checkout Procedures* found in Section 4.2. This check must be performed before connecting wiring to the system. Be certain all external wiring is correct (no opens, shorts, or grounds) and is terminated with the end-of-line devices provided.

Step 8. Connection of Field Wiring: Remove power from the system and connect the first circuit to the control unit. Restore power and verify that the circuit is working properly. If not, refer to Section 9, *Trouble-shooting Guide*, for specific steps for isolating and identifying the source of the problem. Repeat, connecting the field wiring one circuit at a time, as shown on the system wiring diagram created in Step 1. DO NOT MAKE ALL CONNECTIONS AT ONCE! Connecting one circuit at a time allows for the quick identification of wiring errors and prevents the possibility of a wiring error causing damage to the system electronics. During the connection process document any changes made in the system wiring on the system wiring diagram.

Step 9. Test System: An installation of a fire alarm system is NOT complete until the acceptance testing and system documentation is completed. Acceptance testing involves the actuation of all of the initiating devices and the verification that each device causes the appropriate response. The acceptance testing also includes the verification that each and every notification appliance is operational and operates when intended. Each function the system is intended to perform must be verified.

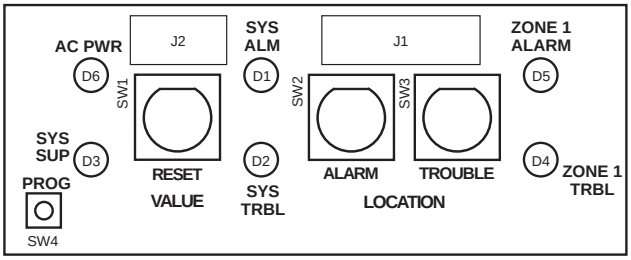
The documentation must include a completed Record of Completion form (Figure 1-7.2.1 in NFPA 72-1996) and a set of As-Built drawings that show exactly how the system is actually wired and the serial numbers of all devices used.

Refer to Section 6 and 7 of this manual for additional, more detailed information.

3.2 BMB OPERATION VERIFICATION

BMB DAUGHTER BOARD DESCRIPTION

The Daughter Board LEDs (D1 - D6) are used to indicate the status of the system and to program the BMB function map (see Chapter 5.0 *Programming*). See Figure 3.2a for push-button and LED locations. See Figure 3.2b for a description of the LEDs on the BMB Daughter Board.



LED	Description
AC PWR (D6)	Detects ample AC power. The LED will be lit.
SYS ALM (D1)	Used to indicate an alarm condition for any one of the 25 zones.
SYS TRBL (D2)	Used to indicate a trouble has occurred in the system. This trouble may be a zone trouble, BMB diagnostic trouble, or a communication problem with a peripheral.
SYS SUP (D3)	Used to indicate that one or more of the zones in alarm is a supervisory zone.
ZONE 1 TRBL (D4)	Used to indicate a trouble condition on the BMBs integral Zone 1.
ZONE 1 ALARM (D5)	Used to indicate an alarm condition on the BMBs integral Zone 1.

Figure 3.2b BMB Daughter Board LED Table

The large push-buttons are primarily used to handle alarm and trouble conditions in the system. The SYSTEM RESET push-button is used to reset any zones that are in an alarm condition. If the SYSTEM RESET push-button is pressed and no alarm condition has occurred, the BMB will perform a battery test within 15 seconds. This allows the installer to test the batteries without waiting for the standard battery test which is performed every hour. The ALARM SILENCE push-button is used to silence any audibles that have not been programmed as non-silenceable. If an alarm condition occurs after the audibles have been silenced, the audibles will sound again. The TROUBLE SILENCE push-button will silence all activated trouble conditions when pressed. If a trouble condition occurs after the trouble has been silenced, the local sounder will sound again. These three push-buttons are also used in programming mode (see Section 5.2, *System Programming*).

Located on the bottom of the Daughter Board is one small push-button labeled PROG. This push-button is used only for BMB function map programming (see Section 5.2, *System Programming*).

BMB MAIN BOARD LED DESCRIPTION

The BMB main board has 10 yellow LEDs that are used to indicate system troubles that are not zone related (see Figure 5.6, *LED Location Diagram for Programming Location and Programmed Value*). These LEDs are also used for function map programming (see Chapter 5.0, *Programming*).

NOTE: Not all system troubles are indicated on the 10 yellow LEDs located on the BMB main board. See Figure 3.2d for a list of system troubles that are indicated through the use of an ESL 2500 keypad.

System Trouble	Description
CPU Fault	Indicates that the BMB microprocessor is defective and the system is completely inactive.
BELL SILENCE	Indicates that a bell (NAC) has been silenced.
BELL 1, BELL 2, BELL 3, BELL 4 TROUBLE	Indicates that there is a short or open in the wiring or that the EOL is missing.
GND FAULT	Indicates an earth ground connection to the system. (see Section 6.3, *Ground Fault Test*).
LOW NO AC	Indicates the loss of AC power or that the AC voltage is not high enough to power the system.
LOW NO BATT	Indicates that the battery voltage is low or the batteries are missing. If the battery voltage drops far enough and there is no AC power, the system will go into hibernation mode. During hibernation mode, the BMB will flash LOW NO AC, LOW NO BATT, and AC PWR LEDs. If conditions permit, the panel will leave hibernation mode.
DET MAINT	Indicates when one of the smoke detectors in the system signals that it needs to be cleaned (see Section 5.5, *CleanMe Mode Programming*).

Figure 3.2c Additional System Troubles

Keypad System Trouble	Description
NO AC POWER	Indicates the loss of AC power or that the AC voltage is not high enough to power the system.
LOW BATTERY	Indicates that the battery voltage is low or the batteries are missing.
BELL	Indicates that there is a short or open in the wiring or that the EOL is missing.
GROUND FAULT	Indicates an earth ground connection to the system.
BELL SILENCE	Indicates that a bell (NAC) has been silenced.
DRILL TEST	Indicates that a drill test is being performed.
HIBERNATION	Indicates that the panel has gone into hibernation mode.
LEM/LRM	Indicates a problem with the LEM/LRM module.
TELCO	Indicates a problem with a 2500-DAC phone line.
EXPANDER	Indicates a missing ZEM module.
DAC	Indicates a problem with the 2500-DAC module.
KEYPAD	Indicates a missing supervised keypad.
RA	Indicates a missing supervised RA.
COMM	Indicates a 2500-DAC communication failure.
MEMORY	Indicates a function map memory failure with either the BMB or 2500-DAC. Enter programming mode to clear.

Figure 3.2d System Troubles Indicated by the ESL 2500 Keypad

3.3 ZEM ADDRESS SELECTION

Many facilities need more than one initiating device circuit in order to implement a design that complies with all of the code requirements. Additional initiating device circuits (up to 25 additional circuits before it is necessary to begin networking multiple control panels) are added by adding Zone Expander Modules (ZEMs) to the basic 2501 FACP. When this is done the ZEM must be programmed with an electronic "name" in order for the BMB computer to know which ZEM is initiating the alarm signal. The first added ZEM should be given address "1" by putting S1 in the ON position and S2, S3 and S4 in the OFF position. The next ZEM should be given the address "2", with S1 through S4 being positioned OFF-ON-OFF-OFF, respectively. Figure 3.3 shows the addressing for the ZEMs.

ZEM NUMBER	S1	S2	S3	S4
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF

Figure 3.3 ZEM Address Selection Chart

When using multiple 2502 Class B zone expansion modules, it will be necessary to leave some panel zones unused to ensure that the modules LED's line up with the correct zone identifiers on the front panel display. For example, if two 2502-ZEM's are used, zones 2 and 3 will be used, then 4 and 5 will be skipped, and zones 6 and 7 will be used for the second 2502-ZEM. Please call Sentrol Technical Services at 1-800-800-2027 with any questions.

NOTE: For best zone LED alignment results, do not use multiple two zone expansion modules (2502-ZEM) when a four zone module (2504-ZEM) can be used.

Only the combinations listed above are allowed. Any other combinations will not be recognized by the 2501 (FACP). If two (2) or more modules are set to the same address, the 2501 (FACP) will not recognize the incorrectly addressed modules.

3.4 ZONE FUNCTION JUMPERS

Every zone on the 2501 (FACP) has a zone function jumper that allows for easy testing. This jumper allows for four (4) settings:

Normal	NORM
Walk Test	WT
Silent Walk Test	SWT
Disconnect	DIS

During installation, set the zone function jumpers to the Normal (NORM) position, see Figure 3.4, Function Jumper diagram. (See Section 6.4 for instructions on testing the 2501 (FACP) with the zone function jumpers).

3.5 ADD-ON MODULES FOR EXPANDED CAPABILITIES

Functional modules are added to the basic 2501 FACP by snapping them onto the module mounting rails of the system enclosure. The modules obtain power and communicate via four conductor data bus cables installed between the BMB and the first module, from the first module to the second, etc., until all modules are connected to the data bus. The assembly of the ESL 2501 Fire Alarm Control Panel is illustrated in Figures 3.0, 3.1b, 3.1c, 3.4, 3.10 and 3.11 in this manual. A zone description card is supplied for each zone module, as shown in Figure 3.12, to identify each zone in terms relevant to the specific application.

The 2500 Keypad is installed where the owner/operator needs system interface and access. Interconnection between the FACP and the Keypad is by means of a four (4) conductor cable. The connection between the ESL 2501 Fire Alarm Control Panel and the ESL 2500 Keypad is illustrated in Figure 3.5b.

The 2500-RA and 2500-RADVR are installed where required by local jurisdiction or when the owner/operator needs remote system status and zone status. Interconnection between the FACP and the remote annunciators is by means of a four (4) conductor cable. The connection between the ESL2501 Fire Alarm Control Panel and the remote annunciators is illustrated in Figure 3.5c.

The 2500-LEM/LRM is installed where a municipal system is in place. Interconnection between the FACP and the LEM/LRM module is by means of a five (5) conductor cable. The connection between the ESL2501 Fire Alarm Control Panel and the LEM/LRM is illustrated in Figure 3.5d.

The ZXPTR Parallel Printer Interface Module allows the connection of a Centronics compatible printer to the ESL 2501 FACP (see Figure 3.5e). This provides the ability to print "real time" events, reprint past event history and print function maps. Refer to the ZXPTR Installation Instructions for information on operation and connection.

The following table provides guidelines for the installation of peripheral devices. These guidelines or the number of devices and the total length of databus cable must not be deviated from for proper operation. This table is valid for 18 AWG cable. Do not exceed 1000 Ft. in any one run of cable. Do not exceed 2000 Ft. of total cable length. An external supply may be required at lengths over 500 Ft. if more than one device is at the end of the cable run.

Total Data Cable Length	Max. Number of Peripherals at End
Up to 500 Ft	(7) Seven
1000 Ft	(7) Seven*
2000 Ft	(7) Seven*

* *Power Supply required at end of cable run.*

Figure 3.5a Peripheral Device Guidelines Table

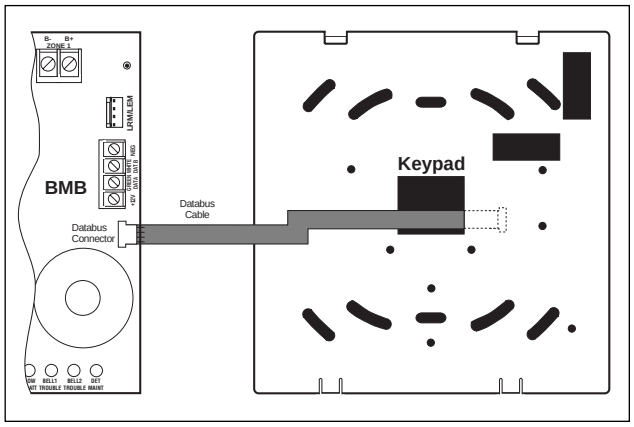


Figure 3.5b Connecting BMB to Keypad

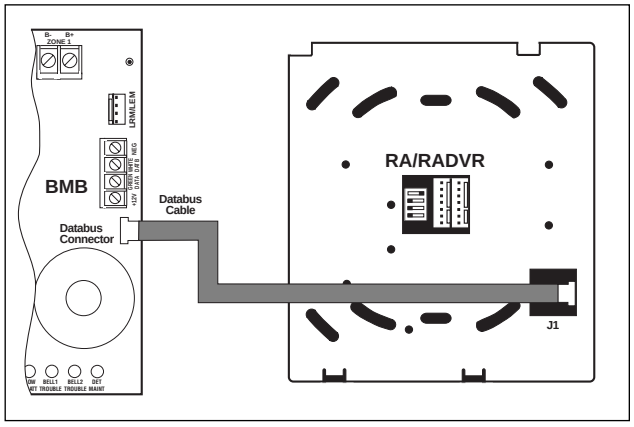


Figure 3.5c Connecting BMB to RA/RADVR

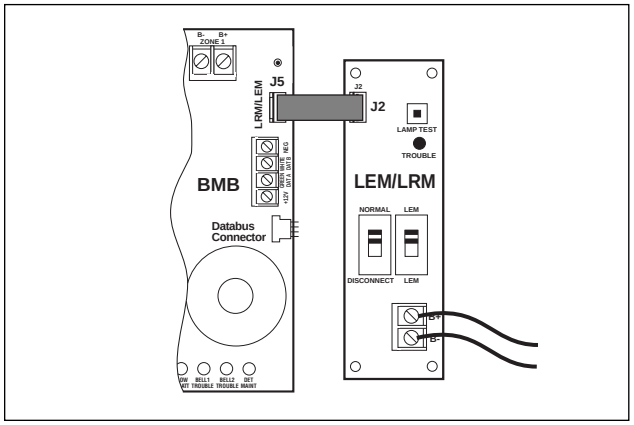
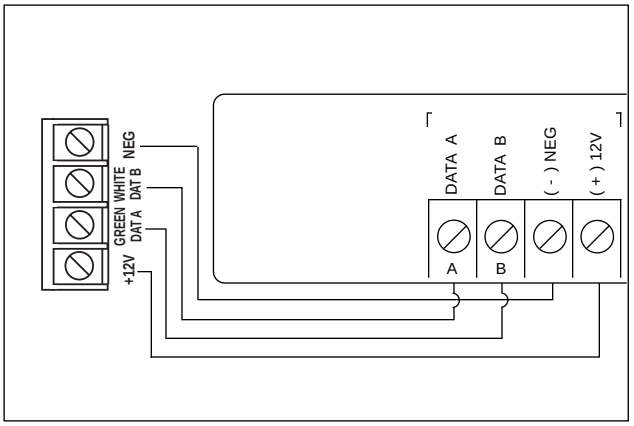


Figure 3.5d Connecting BMB to LEM/LRM



3.6 2500 KEYPAD ADDRESS SETTINGS

The keypad has a four position DIP switch on the circuit board to set the address and supervision. To change the keypad to unsupervised, move DIP switch 4 to the ON position. To change the address, the DIP switch setting must be positioned according to the figure below:

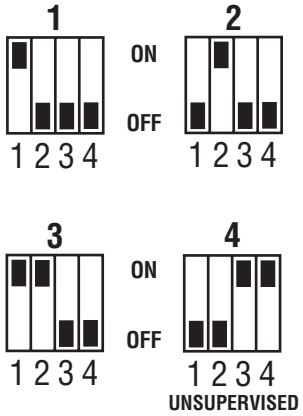


Figure 3.6 2500 Keypad Address Switch Settings

The 2501 (FACP) supports three supervised keypads at addresses 1 through 3 (Figure 3.6). More than one unsupervised keypad is allowed. All unsupervised keypads must be at address 4 with switch 4 turned ON (Figure 3.6).

3.7 2500-DAC

The DAC requires programming via a 2500-KPD keypad. Refer to Section 5.0 *Programming* for assistance with programming the DAC. A manual comm test switch is provided to perform system verification and testing. The on board status LEDs can be tested by performing a system lamp test from the front panel or the optional system keypad.

3.8 2500-RA AND 2500-RADVR

The RA and RADVR have dip switches for setting the address of the specific remote annunciator. Switch four (4) is used to set whether the RA displays zones 1 - 13 or zones 14 - 25. See the figure below for valid addresses. A lamp test can be performed by pressing and holding the local silence button for 3 seconds when the system status is normal.

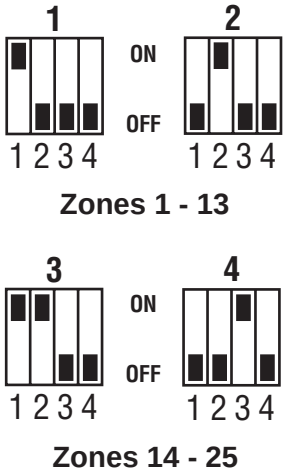


Figure 3.8 2500-RA/RADVR Address Switch Settings

The 2501 FACP supports four supervised remote annunciators at addresses 1 through 4.

3.9 2500-LEM/LRM

The LEM/LRM module has a slide switch that must be set to determine the functionality of the module. Set the switch accordingly. In addition, another slide switch must be set to the normal position for proper operation. This switch can also be set in the Disconnect position resulting in a system trouble. This prevents the 2501 FACP from triggering the device connected to the FACP during installation and testing. A lamp test switch is provided on the module to test the condition of the trouble LED.

ESL

A PRODUCT OF SENTROL

Sentrol Controls Group
1510 Tate Blvd. SE, Hickory, NC 28603
Sales: 800.547.2556 **Technical Service:** 800.800.2027

ESL 2501 Fire Alarm Control Panel

Type of system:
NFPA 72 - Central Station Signaling Systems (protected premises) with 2500-DAC
NFPA 72 - Local
NFPA 72 - Household fire warning system
NFPA 72 - Remote Station Signaling Systems (protected premises) with 2500-DAC
NFPA 72 - Proprietary Protected Premises Unit *

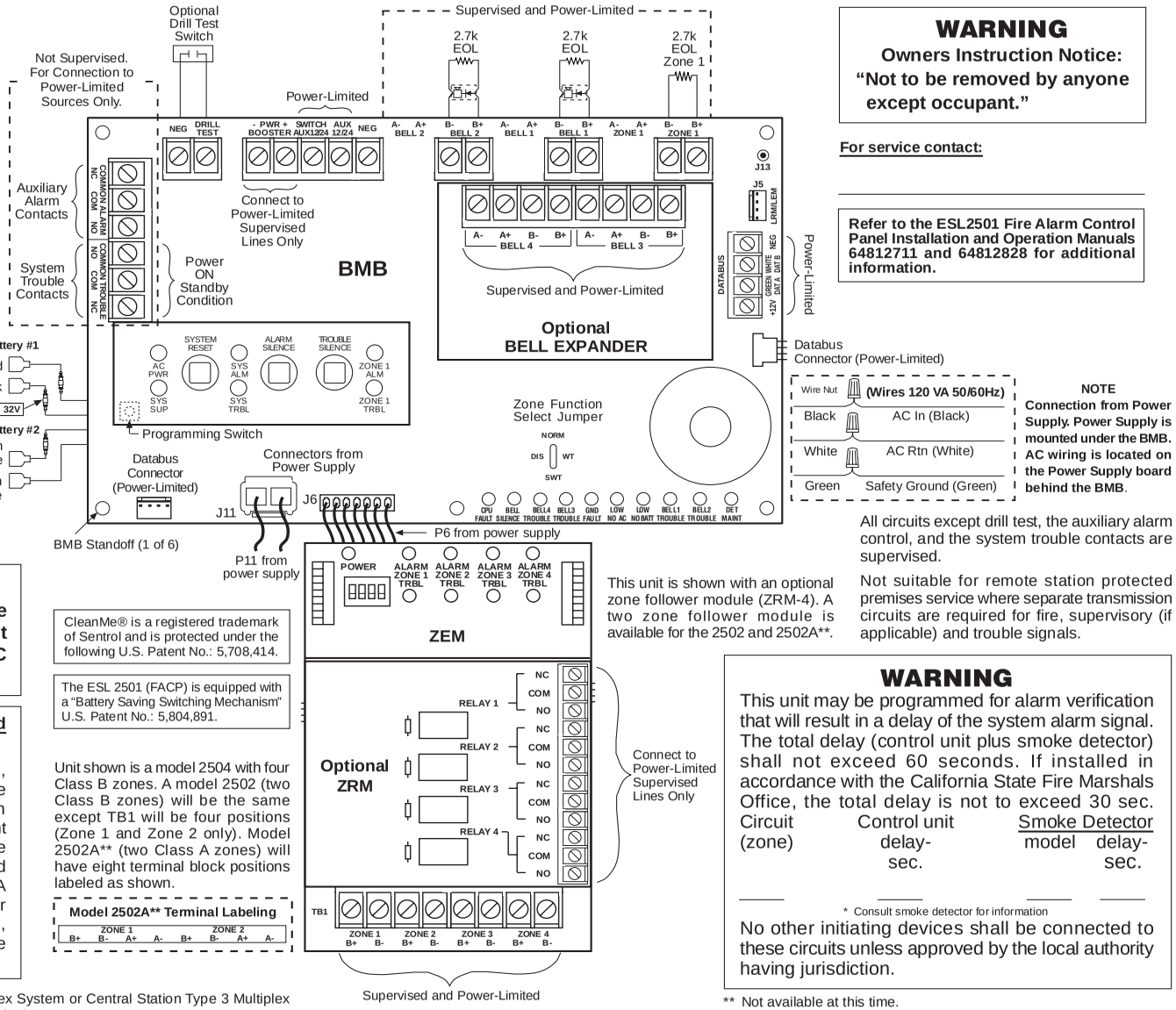
Type of signaling service:
Manual fire alarm, automatic fire alarm, elevator recall, waterflow alarm, supervisory fire alarm, (NFPA 72).

Type of signal:
Non-coded, DACT

Compatibility identifier:
C01 Initiating circuit resistance = 30 Ohm max.
C01A Initiating circuit resistance = 30 Ohm max.**

CSFM Number: 7165-1459:111

Initiating circuit shown Class B (Style B). Notification circuits shown Class B (Style Y). Optional notification circuits capable of Class A (Style Z). See installation instructions for more information.



BATTERIES

12V 17.2AH
See instruction manual part number 64812711

(+) battery leads fused at 15 Amp.

Note: The typical battery life is 3 to 5 years, depending on usage. When replacing batteries, always replace both batteries, even if only one appears dead. See manufacturer's specifications for the recommended batteries used. Recommended batteries are Yuasa-Exide models NP18-12B and NP7-12.

Spade Lugs to Battery #1
\+ Red
\- Black
Fuse Type: AGC 15 32V

Spade Lugs to Battery #2
\+ Red with White Stripe
\- Black with White Stripe

WARNING

Devices that operate over the full range of 8.5 to 33 VDC will draw more current when they are powered by 12 VDC versus 24 VDC.

The following applies to NFPA 72 household installations:

Testing - In a household fire warning system, test weekly. Disconnect the AC power source during testing. If after testing low battery condition exists, replace the batteries. This equipment should be installed in accordance with the National Fire Protection Association's standard 72 (NFPA, Batterymarch Park, Quincy, MA 02269). Printed information describing proper installation, operation, testing, maintenance, evacuation planning and repair service is to be provided with this equipment.

CleanMe® is a registered trademark of Sentrol and is protected under the following U.S. Patent No.: 5,708,414.

The ESL 2501 (FACP) is equipped with a "Battery Saving Switching Mechanism" U.S. Patent No.: 5,804,891.

Unit shown is a model 2504 with four Class B zones. A model 2502 (two Class B zones) will be the same except TB1 will be four positions (Zone 1 and Zone 2 only). Model 2502A** (two Class A zones) will have eight terminal block positions labeled as shown.

Model 2502A Terminal Labeling**

ZONE 1				ZONE 2			
B+	B-	A+	A-	B+	B-	A+	A-

This unit is shown with an optional zone follower module (ZRM-4). A two zone follower module is available for the 2502 and 2502A**.

WARNING

Owners Instruction Notice:
"Not to be removed by anyone except occupant."

For service contact:

Refer to the ESL2501 Fire Alarm Control Panel Installation and Operation Manuals 64812711 and 64812828 for additional information.

NOTE
Connection from Power Supply. Power Supply is mounted under the BMB. AC wiring is located on the Power Supply board behind the BMB.

All circuits except drill test, the auxiliary alarm control, and the system trouble contacts are supervised.

Not suitable for remote station protected premises service where separate transmission circuits are required for fire, supervisory (if applicable) and trouble signals.

WARNING

This unit may be programmed for alarm verification that will result in a delay of the system alarm signal. The total delay (control unit plus smoke detector) shall not exceed 60 seconds. If installed in accordance with the California State Fire Marshals Office, the total delay is not to exceed 30 sec.

Circuit (zone)	Control unit delay-sec.	Smoke Detector model	Smoke Detector delay-sec.

* Consult smoke detector for information

No other initiating devices shall be connected to these circuits unless approved by the local authority having jurisdiction.

* Suitable for installation as Style D Proprietary Multiplex System or Central Station Type 3 Multiplex System. Installation limits under jurisdiction of local authority.

** Not available at this time.

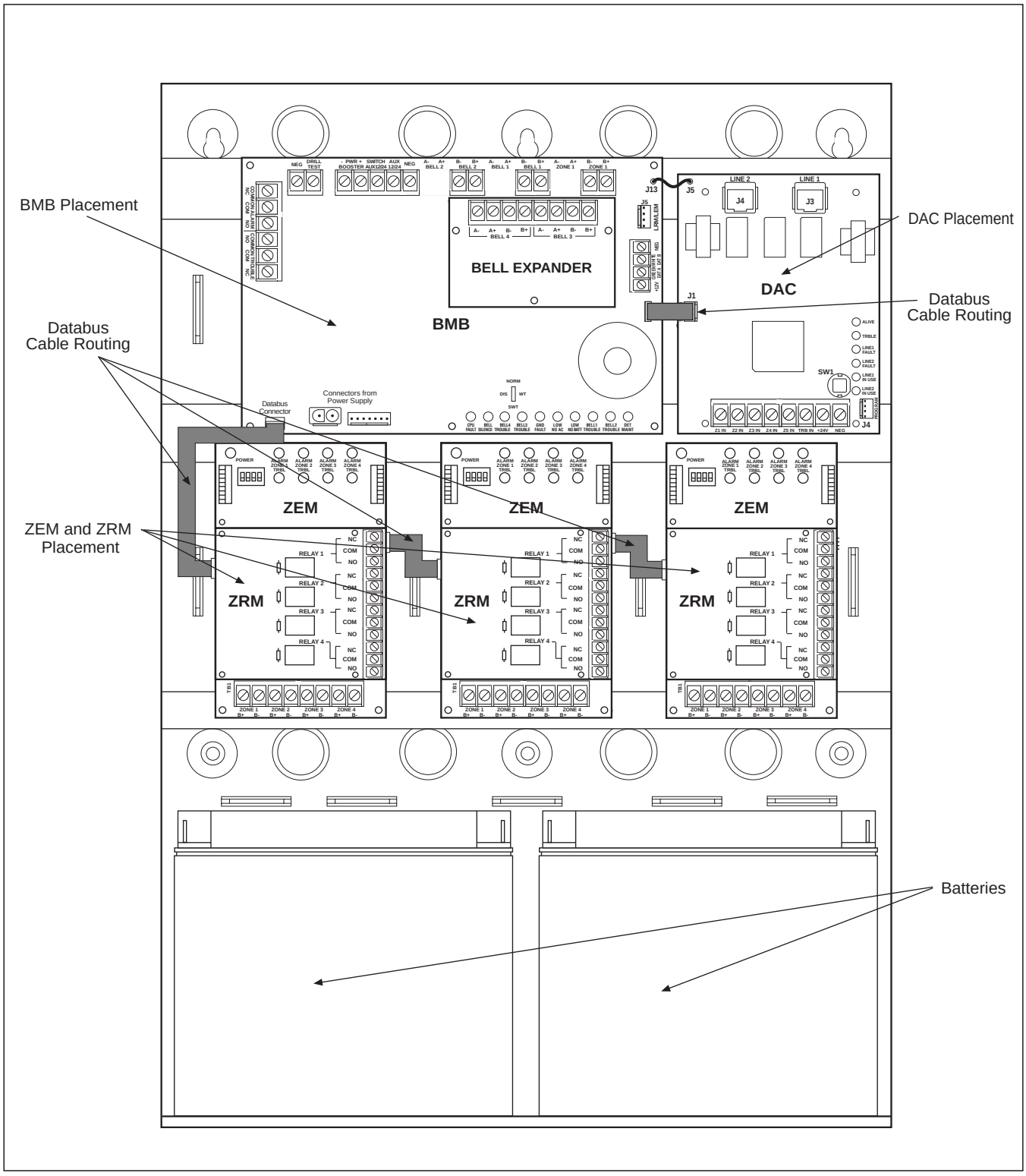


Figure 3.1b Internal Panel Configuration with DAC

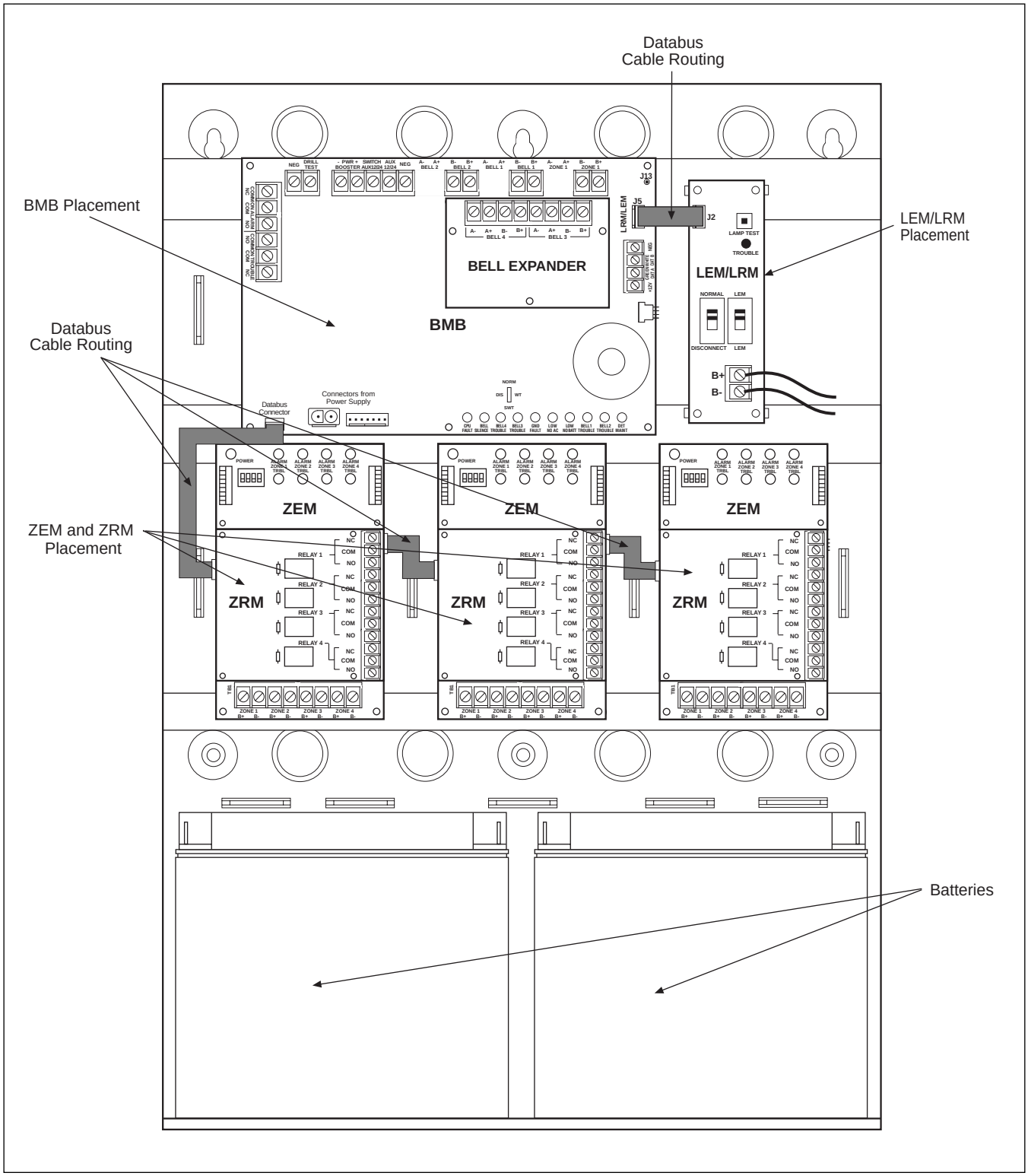
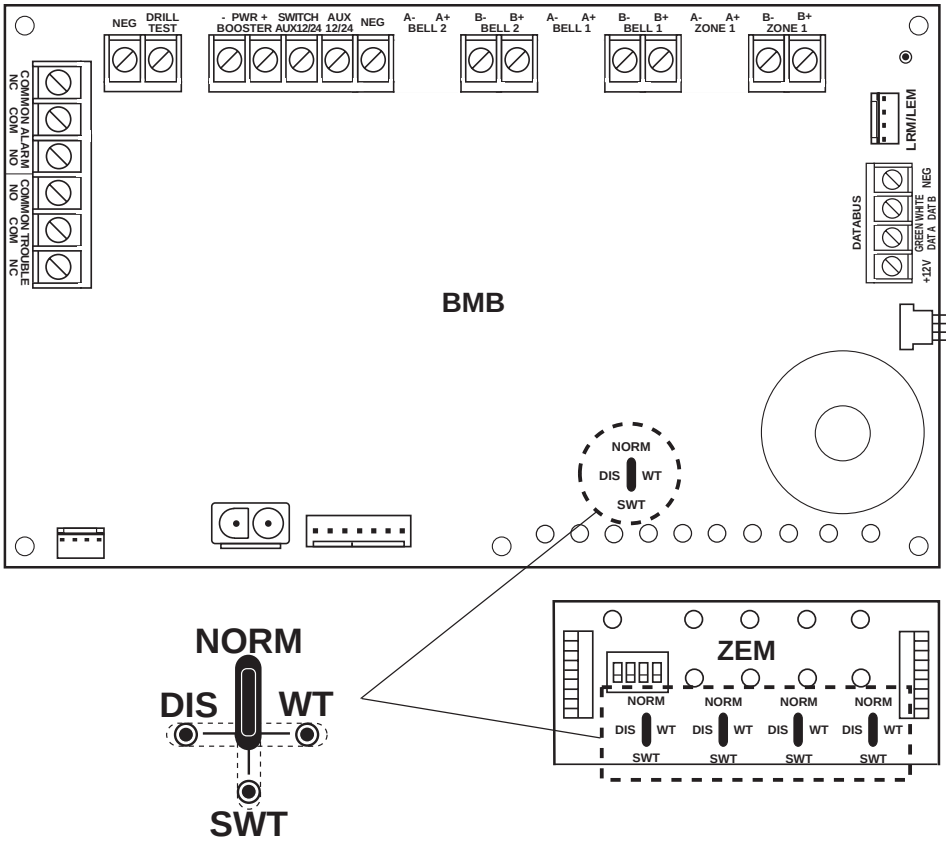


Figure 3.1c Internal Panel Configuration with LEM/LRM



Function Jumper

Figure 3.4 Function Jumper Diagram

3.10 INSTALLING THE ZEM, BMB, AND DAC

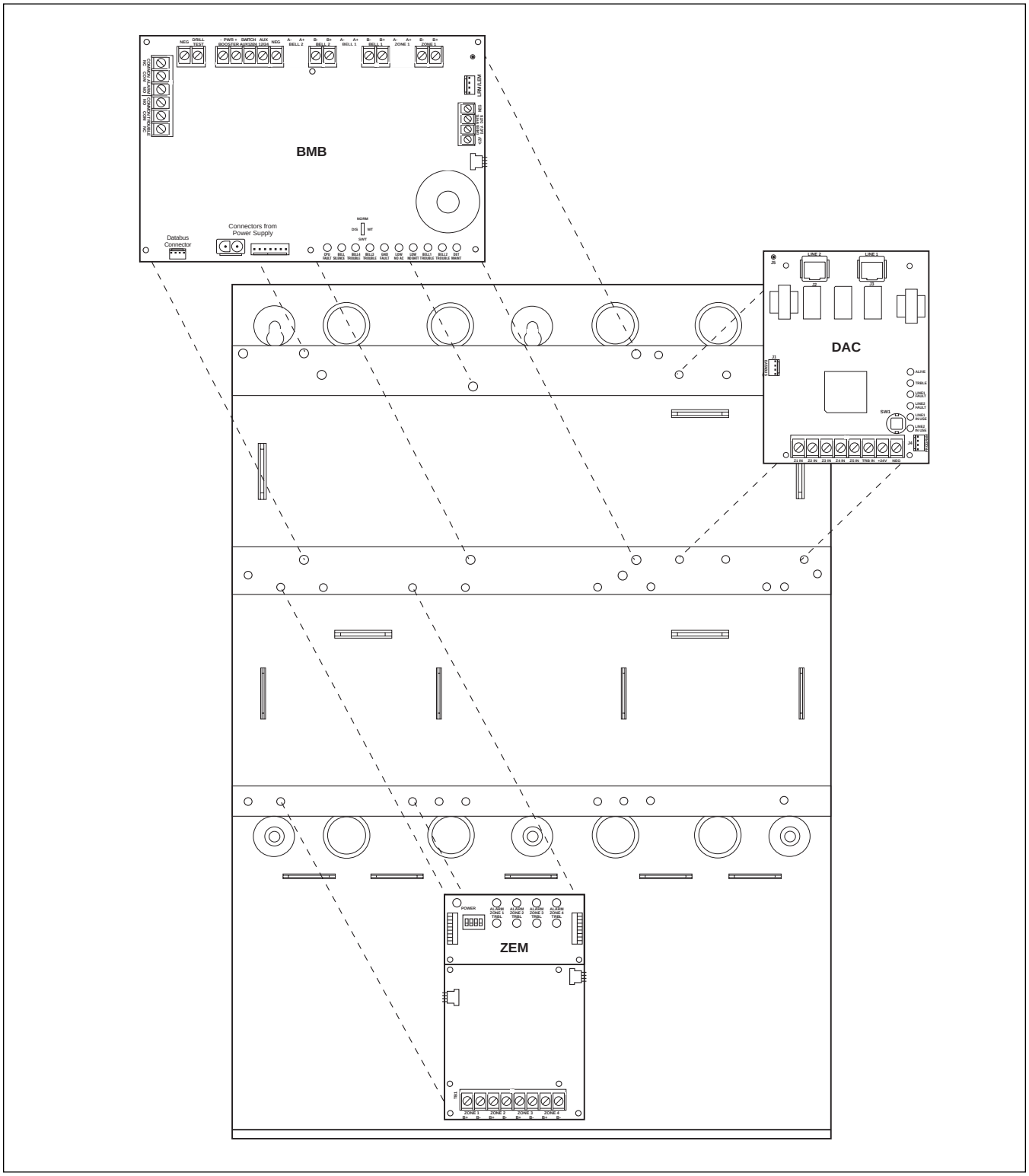


Figure 3.10 ZEM, BMB, and DAC Installation Diagram

3.11 INSTALLING THE BELL, ZRM AND LEM/LRM

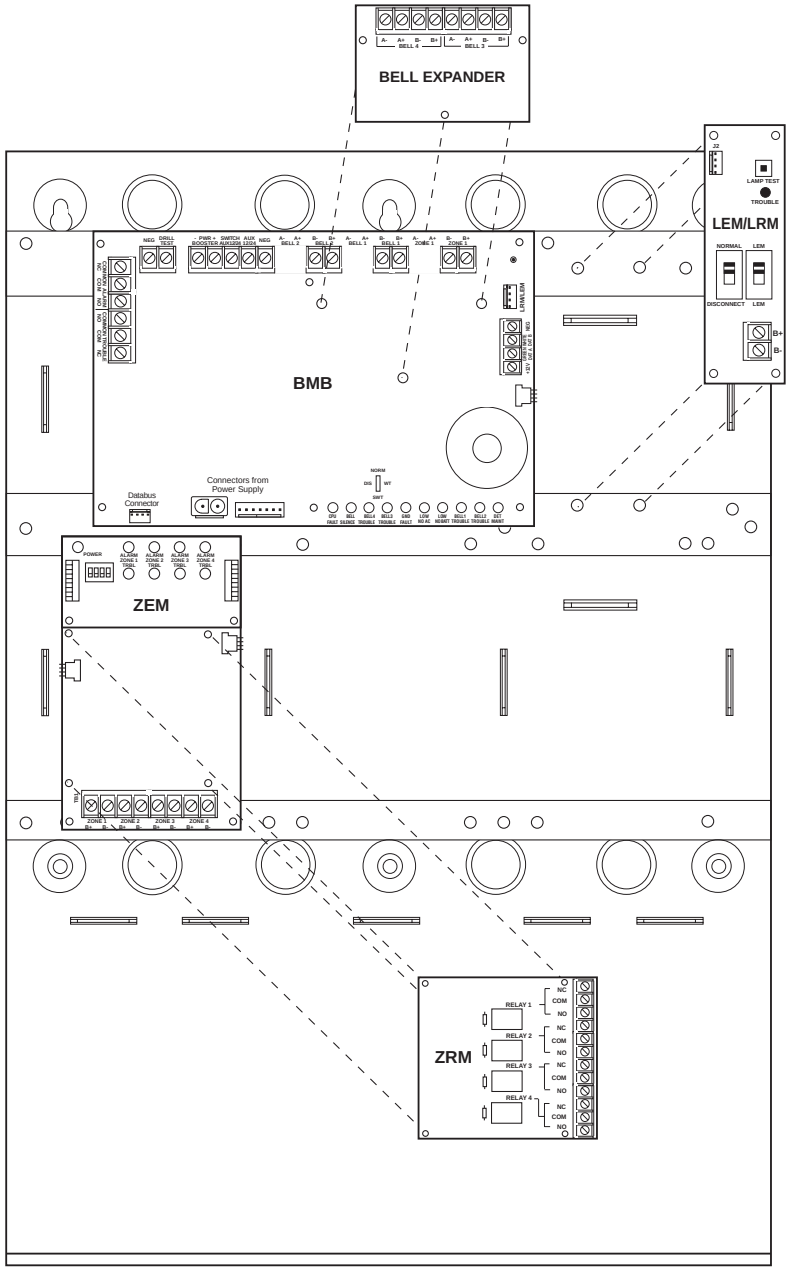


Figure 3.11 BELL, ZRM and LEM/LRM Installation Diagram

3.12 INSTALLING THE ZONE DESCRIPTION CARD

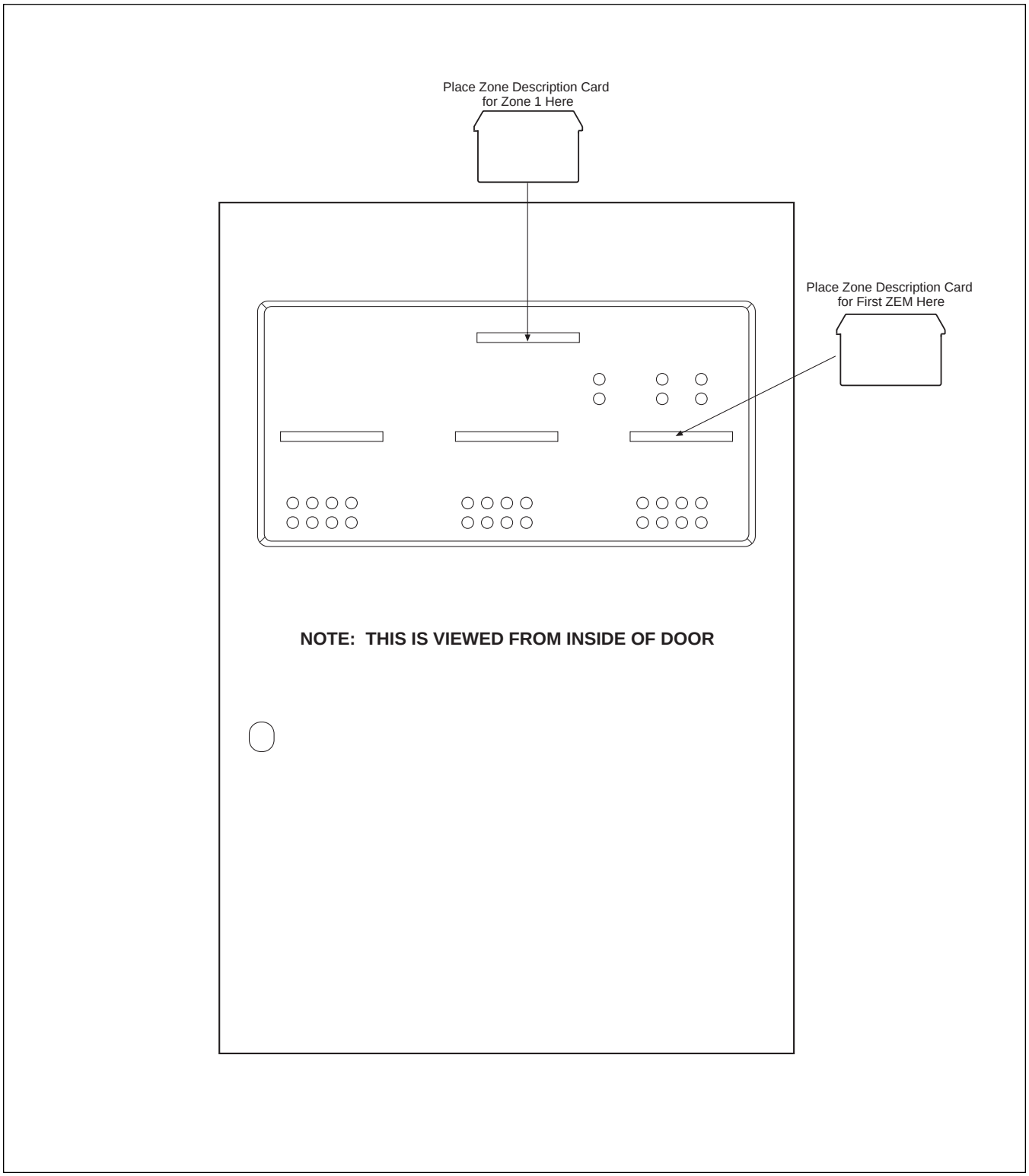


Figure 3.12 Zone Description Card Diagram

4.0
FIELD WIRING

Class B Wiring Diagram

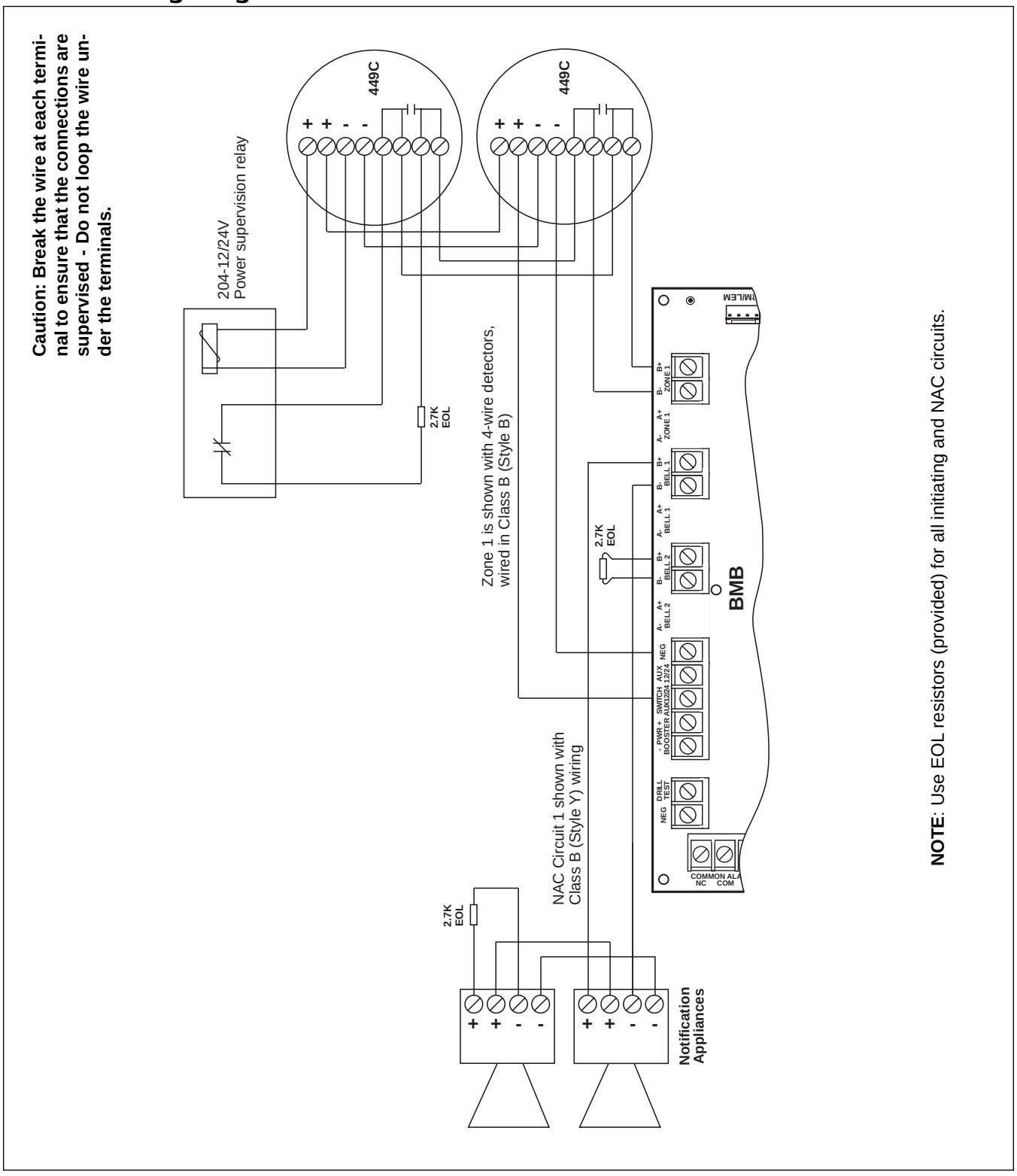


Figure 4.0a Class B System Installation Diagram without ZEM

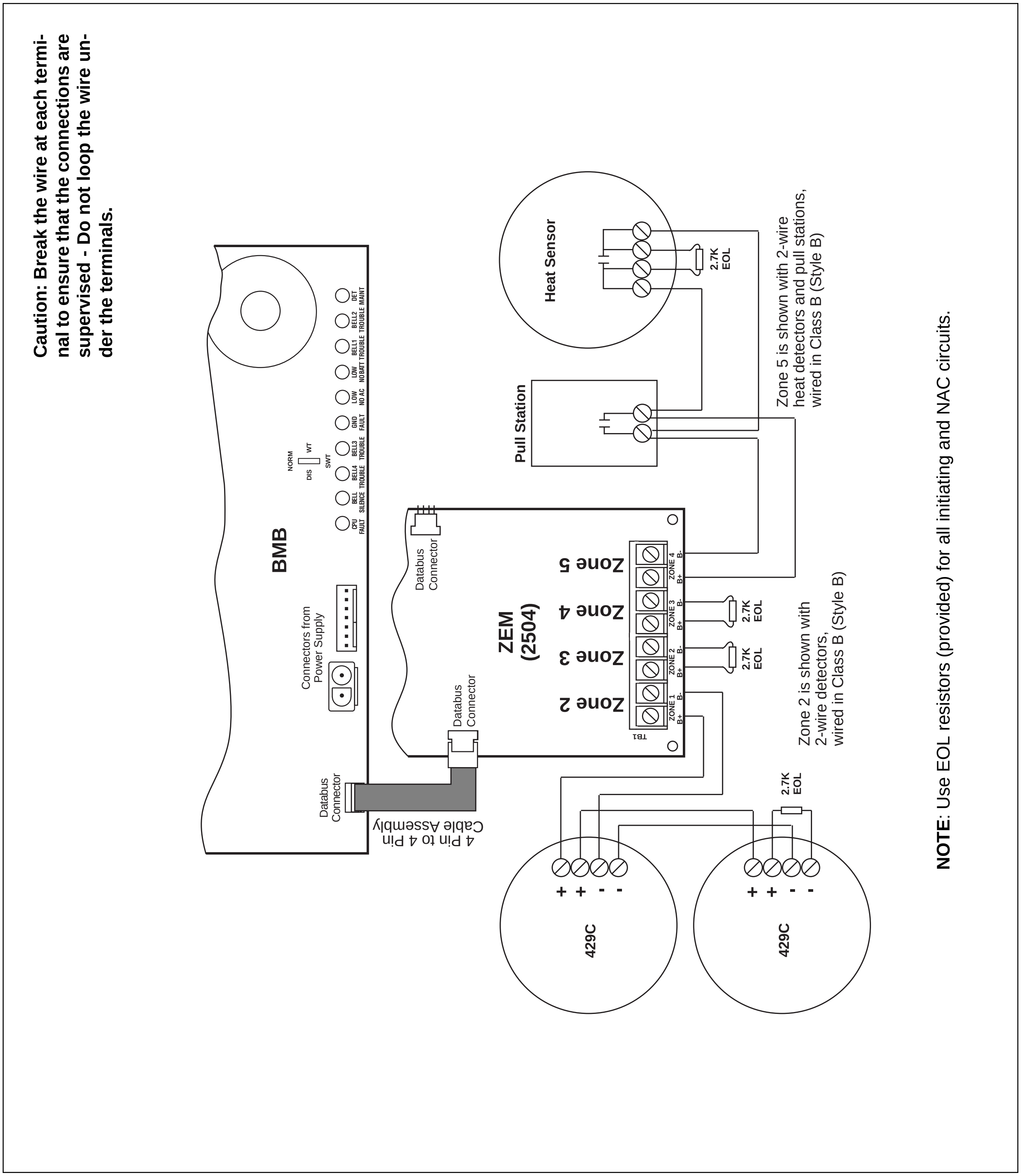


Figure 4.0b Class B System Installation Diagram with ZEM

4.1 DETAIL INSTALLATION GUIDE

The initiating device circuits and notification appliance circuits of the ESL 2501 Fire Alarm Control Panel are classified as power limited circuits. These circuits can be installed using any of the methods permitted by Article 760 of the National Electrical Code (NEC), NFPA 70-1996, for power limited fire alarm (PLFA) circuits. See 760-52 of NFPA 70-1996.

The following circuits are classified as non-power limited fire alarm (NPLFA) circuits:

- Wiring connected to "dry" TROUBLE relay contacts
- Wiring connected to "dry" ALARM relay contacts
- Wiring extending from the Digital Alarm Communicator (DAC) to the telephone system
- Wiring extending from "dry" Zone Relay contacts
- Wiring extending from the 2500-RADVR output connector

Non-power limited fire alarm system wiring may be installed using any of the methods permitted by Article 760 of the National Electrical Code (NEC), NFPA 70-1996, for non-power limited fire alarm (NPLFA) circuits. See 760-21to 760-31 of NFPA 70-1996.

The circuit conductors of a power limited fire alarm circuits must be separated from non-power limited fire alarm circuits and ordinary light and power circuits pursuant to the requirements of Article 760-54 of the NEC. Figures 4.1a and 4.1b show one method of routing conductors that can be used to comply with the required 1/4 inch separations.

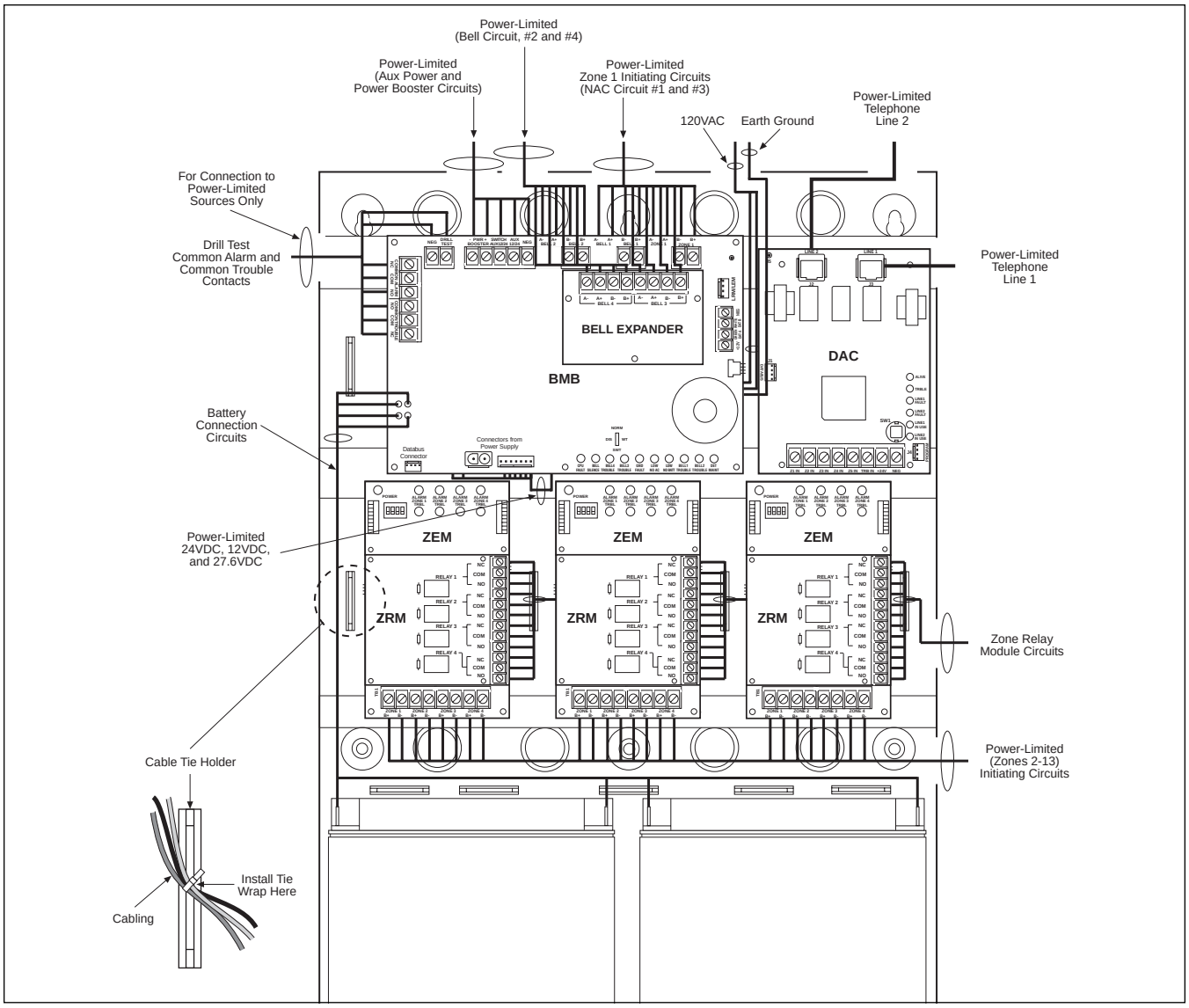


Figure 4.1a Power-Limited Routing with DAC

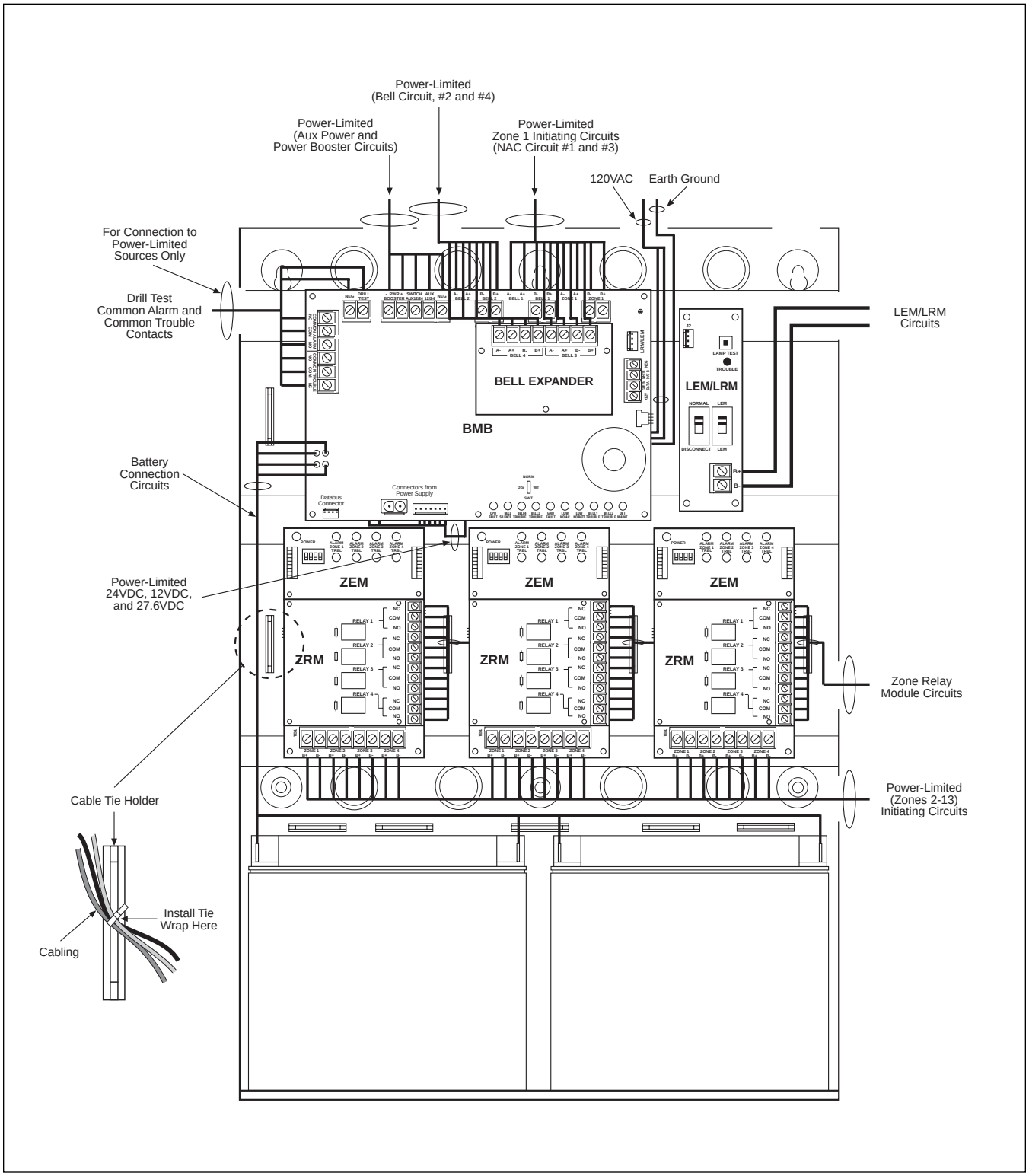


Figure 4.1b Power-Limited Routing with LEM/LRM

- **Verify wire sizes are adequate** for all notification and initiating circuits. The maximum allowable initiating zone resistance is 30 Ohms. See Figure 4.1c below:

Gauge	Ohms per 1000 Ft @ 20°C of single conductor copper wire
12	1.6
14	2.5
16	4.0
18	6.4
20	10
22	16

Figure 4.1c Wire Resistance Table

Many audible/visual notification appliances cannot tolerate more than a 20% voltage drop from the specified device voltages. See Figure 4.1d below to determine maximum distance for wire gauge used.

Total current device	Max. ft. of paired wire from B+ to EOL resistor load (Amps)			
	18AWG	16AWG	14AWG	12AWG
.100	1500	2500	4000	6200
.500	300	500	800	1290
1.000	150	250	400	620

Figure 4.1d Alarm Notification Appliance Circuit (NAC) Wire Size Table (Maximum voltage drop allowable: 2VDC)

- **Incoming AC voltage should be stable** at a nominal 120 Volts. This is especially important in new construction where incoming power may be high or unstable with temporary connections often causing large, inductive voltage spikes.
- **Ground the system properly**. All of the voltage transient suppression in the ESL 2501 Fire Alarm Control Panel is referenced to earth ground. It is important that the earth ground connection of the FACP be of the lowest possible impedance and that the possibility of voltage differences between the FACP ground and that of the telephone and public utility power systems be minimized. For this reason the ideal ground for the fire alarm panel is the "unified earth ground". A unified earth ground bonds together the ground rods for the power lines, telephone, and fire alarm control panel. See Figure 4.1e. This reduces the chance of step voltage blowout, a problem that may occur during lightning strikes. Refer to NEC Article 250 for proper grounding requirements.

  The ground connection to the ESL 2501 is made via the green wire of the FACP power supply. Using a Listed splice connector, secure a minimum 14 gauge solid ground wire to the green wire, the earth ground connection, on the control panel. Attach the earth ground wire to a bonded earth ground. Be sure to keep the wire runs short and avoid 90° or sharp turns. Bends must have a minimum radius of eight inches. The ground wires must be routed separately and toward the earth. Always use eight-foot copper clad ground rods. Never run parallel to metal without properly bonding to that metal.
- **Run initiating device circuit wires separately**. Most supervised circuits use voltage or current sensing initiating device methods that are very sensitive to induced voltages on the wiring. Therefore, under no circumstances run AC power, speaker, public address, intercom, or switch control wiring with inductive loads in the same conduit or the immediate vicinity of the control wiring.
- **Do not overlook adequate lightning protection**. Lightning damage commonly occurs from four sources:
  1. Through alarm loop wiring
  2. Through AC power inputs
  3. Through telephone connections (if used)
  4. Through earth ground or power ground connections.

The ESL 2501 uses state-of-the-art suppression techniques to minimize the potential for damage due to lightning via each of these routes. However, this does not obviate the need to ensure that proper lightning suppression equipment has been installed at the point where both the public utility power and telephone service enter the building. Refer to Article 250 of the NEC for these criteria.

There is no known protective device available which is capable of protecting equipment from damage caused by "direct hit" strikes of lightning due to extremely high energy released (10 million to 100 million Volts @ 10,000 to 30,000 Amps).

The effects of the electro-magnetic pulse (EMP) from a lightning strike can be minimized by avoiding running wiring long distances across the ceiling or roof of a building prone to lightning strike or along vertical structural steel members expected to conduct lightning currents. Lightning protection designed, installed and maintained in accordance with the requirements of NFPA 77 will minimize the effects of a lightning strike on the building structure as well as the fire alarm system.

Additional protection is suggested in areas subject to above average lightning activity or induced voltage spikes and fluctuations due to power line load switching.

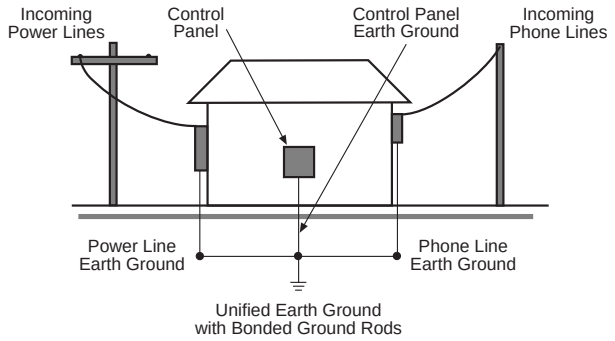


Figure 4.1e Unified Earth Ground

4.2 FIELD WIRING CHECKOUT PROCEDURES

NOTE: MAKE SURE THAT AC AND BATTERY POWER ARE DISCONNECTED BEFORE PROCEEDING.

1. Test all field wiring before connecting any equipment.

   A. Insure no unwanted voltages are present on circuit conductors and ground. They are a hazard and may prevent proper system operation.

   B. All wiring except those intentionally and permanently grounded must be tested for isolation from ground using an insulation testing device such as a "Megger".

NOTE: Caution must be exercised when using voltage generating test instruments such as a "Megger". Damage to equipment could result if the equipment is connected (wired) during wiring tests.

   C. All wiring, other than those intentionally connected together, must be tested for conductor-to-conductor isolation using an insulation testing device.

2. With each circuit pair short-circuited at the end of the circuit, measure circuit resistance with an Ohmmeter.

3. Perform testing as described previously after any addition, deletion, or mechanical or electrical damage to the system has occurred.

4.3 ALARM INITIATING DEVICES

This section describes how to field wire initiating devices such as smoke detectors, pull stations, heat detectors, and waterflow alarm devices. Each zone may be programmed individually; refer to *Programming*, Section 5.0. Refer to Figures 4.0a & 4.0b for Class B (Style B) wiring.

4.3.1 TWO-WIRE SMOKE DETECTORS

NOTE:

- Connect only two-wire smoke detectors UL Listed as compatible to the 2501 (FACP). Refer to Appendix A.
- Two-wire detectors receive their power directly from the zone terminals and transmit the alarm signal through the same wires. Be certain to observe polarity when installing detectors.
- Up to twenty (20) detectors may be wired to each zone. All initiating devices must be wired correctly for proper supervision with an end-of-line 2.7K Ω 1/2W resistor (provided) installed after the last device.
- Wiring the ESL 521 Series two-wire detector with automatic maintenance reporting is the same as wiring standard two-wire detectors and the CleanMe® signal is automatically monitored. Up to twenty (20) ESL 521 Series smoke detectors may be wired to each zone. Refer to the documentation included with the ESL 521 Series detector for additional installation instructions. Note that an ESL 505 module is not required for the 2501 (FACP) zones.

See Figures 4.0a & 4.0b for Class B (Style B) connection to the panel.

4.3.2 FOUR-WIRE SMOKE DETECTORS

NOTE:

- Four-wire detector power is supplied by "SWITCHED AUX 12/24". DO NOT exceed 1.0 Amp total between "SWITCHED AUX 12/24" AND "AUX 12/24". When in battery saver mode, do not exceed 0.5 amp total.
- Always supervise four-wire detector power with an end-of-line power supervisory device (ESL model 204-12/24 V) after the last unit.

See Figures 4.0a & 4.0b for Class B (Style B) connection to the panel.

NOTE: There are two important cautions that should be observed. First, if the detectors being used are equipped with integral Trouble (Fault) relay contacts these contacts must be wired such that the first Trouble (Fault) contact is beyond (further from the control panel) the last Alarm contact in the circuit. Second, the battery saver function drops the system operating power supply to 12 volts, DC Be certain that the detectors being used will operate at that potential. If the battery saver function is switched off the switched auxiliary power potential will remain at 24 volts.

4.3.3 SPRINKLER SYSTEM WATERFLOW AND SUPERVISORY DEVICES

Normally open contact type waterflow alarm devices may be connected, along with conventional manual alarm stations or heat detectors. All zones to which waterflow alarm devices are connected must be programmed so that the system alarm indicating devices cannot be silenced. See *Programming*, Section 5.0.

Supervisory signals for status reporting of waterflow control valves, supplies, etc. must be connected to a separate zone, and programmed for supervisory status. See *Programming*, Section 5.0.

4.4 ALARM NOTIFICATION APPLIANCES

Use only polarized UL Listed compatible notification appliances rated for 24 VDC (see list of devices in Appendix A). See Figures 4.0a & 4.0b for Class B (Style Y) connection to the panel.

The BMB provides two notification appliance circuits that may be expanded to four (two additional) with the ESL2500-BELL. Refer to Figure 4.0a for wiring indicating devices to the BMB.

NOTE: Maximum notification current is 1.5 Amps per notification appliance circuit; TOTAL OPERATING CURRENT CANNOT EXCEED 6.0 AMPS. Choose the correct wire size so that the maximum voltage drop of 2 VDC at furthest device on circuit is not exceeded. (see Figure 4.1c).

4.5 ZONE EXPANSION MODULE (ZEM) CONNECTION

The Zone Expansion Module (ZEM) allows for the addition of up to 24 initiating device circuits when the four circuit, Class B modules are used. Since there is one initiating device circuit integral with the BMB, this results in a total capacity of 25 initiating device circuits per ESL 2501 FACP. Refer to Figure 1.4, *Custom Panel Building Table* for the available ZEM add-on configurations. The ESL2501 Fire Alarm System enclosure can accommodate three (3) ZEMs. When the 2501 is configured with additional ZEMs they are housed in an additional enclosure, part number 2500-SH.

4.5.1 ESL 2502-ZEM AND ESL 2504-ZEM

The ESL 2502-ZEM is a two zone Class B expander module and the ESL 2504-ZEM is a four zone Class B expander module. Refer to Section 3.5, *Installing the ZEM, BMB, and DAC* for correct installation of the ZEM card. Connect the left most databus connector on the ZEM to the databus connector on the BMB or to the right most databus connector on a previously installed ZEM using the provided six inch 4 pin to 4 pin cable assembly. Assure that all unused zones are terminated with a 2.7KΩ 5% end-of-line resistor (provided). See Figures 4.0a & 4.0b for Class B (Style B) wiring. For zone type selection see *System Programming*, Section 5.2.

When using multiple 2502 Class B zone expansion modules, it will be necessary to leave some panel zones unused to ensure that the modules LED's line up with the correct zone identifiers on the front panel display. For example, if two 2502-ZEM's are used, zones 2 and 3 will be used, then 4 and 5 will be skipped, and zones 6 and 7 will be used for the second 2502-ZEM. Please call Sentrol Technical Services at 1-800-800-2027 with any questions.

NOTE: For best zone LED alignment results, do not use multiple two zone expansion modules (2502-ZEM) when a four zone module (2504-ZEM) can be used.

4.6 SUPPLEMENTARY CONTACTS CONNECTION

This section describes how to wire Supplementary Alarm and Trouble Contacts and the optional Zone Relay Modules.

NOTE: Supplementary Alarm and Trouble Contacts are for power-limited applications only. (See Section 4.1, *Installation Recommendations/Precautions*).

4.6.1 SUPPLEMENTARY ALARM CONTACTS

Dry, Form "C" contacts are provided for controlling supplementary alarm functions from the BMB. Contacts are rated 2A @ 30 VDC resistive. The terminals are Common Alarm NC, COM, and NO. Contacts transfer in alarm.

4.6.2 SUPPLEMENTARY TROUBLE CONTACTS

Dry, Form "C" contacts are provided for controlling supplementary trouble (fault) functions from the BMB. Contacts are rated 2A @ 30 VDC resistive. The terminals are Common Trouble NC, COM, and NO. The trouble relay is normally energized and will de-energize if AC and/or battery power or any other system trouble occurs.

For use with door holders, the supplementary trouble contacts are programmable for transfer on loss of AC only. Additionally, if the system is programmed for use with a 2500-DAC, the contacts are automatically programmed so that they will not transfer on loss of AC only. The batteries must also be low. This provides the required delayed reporting at loss of AC. See Section 5.0 *Programming*.

4.6.3 ZONE RELAY MODULE (ZRM) (OPTIONAL)

The Zone Relay Module (ZRM) is a zone follower and each relay follows its corresponding zone on a Zone Expansion Module (ZEM). Zone 1 on the BMB does not have a corresponding Zone Relay Module and will only trigger the Common Alarm relay. The ZRM's plug directly into the ZEM's and only require wiring the terminals labeled NO, COM, and NC. Each relay has dry, Form "C" contacts rated 2A @ 30 VDC resistive.

NOTE: Circuits connected to a ZRM must be power-limited.

4.7 CONNECTION TO SUPERVISING STATION FIRE ALARM SYSTEMS

The ESL 2501 FACP is designed to permit transmission of fire alarm signals from the protected premises to a Supervising Station Fire Alarm Panel at a Central Station or Remote Supervising Station by means of an add-on module that utilizes Digital Alarm Communicator (DAC) technology, the 2500-DAC.

4.7.1 CONNECTING THE 2500-DAC

The 2500-DAC, Digital Alarm Communicator, is installed in a dedicated location, adjacent to the BMB of the ESL 2501 Fire Alarm Control Panel. It provides for the connection of both the primary and stand-by telephone lines via the standard telco connectors. Figure 4.7.1 illustrates the wiring required to provide signaling to a Supervising Station Fire Alarm System from a single ESL 2501 FACP.

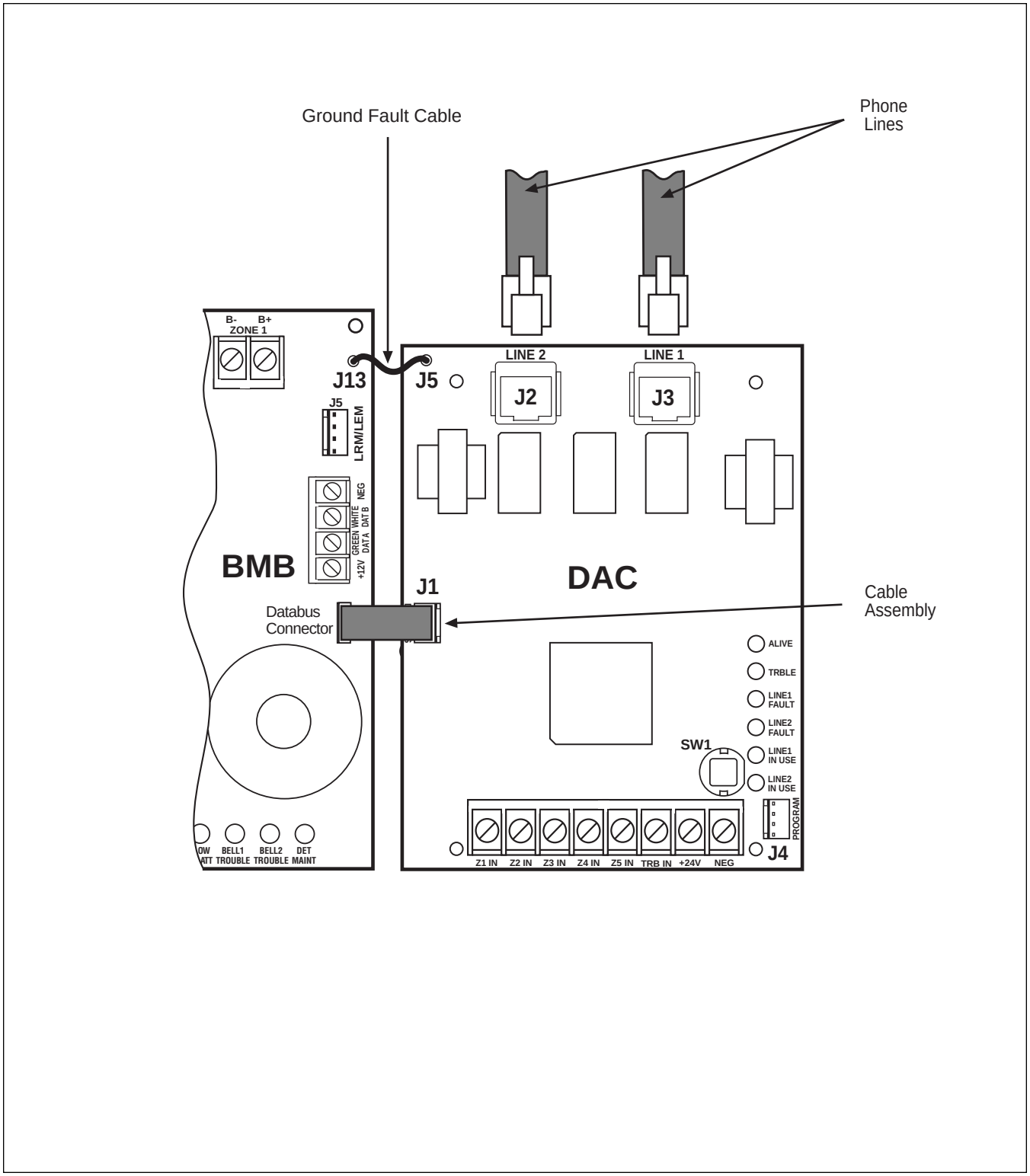


Figure 4.7.1 2500-DAC Installation Diagram

5.0 PROGRAMMING

5.1 INTRODUCTION

At the heart of the ESL 2501 Fire Alarm Control Panel is a microcomputer that controls all system functions and the response of the system to incoming signals. A portion of the microcomputer program is a function map that serves two purposes. First it tells the microcomputer what types of modules are installed, ensuring the correct response when a signal is generated by a given module. Second, it controls how the system will respond to a given in-coming signal condition. Items that can be programmed are: types of zone inputs, bell-zone associations, bell cadence definitions, battery saver mode, AC frequency (60Hz or 50Hz), zone expanders installed, communicator type, number of supervised keypads, keypad ability to silence the panel, time of day, communicator information, zone names, and passcodes.

The programming buttons and indicators allow the installer to modify the most commonly used items in the function map. A keypad allows modification of all items in the function map (with the appropriate passcode. See the keypad manual for more details). Section 5.6, *Programming Matrix* indicates which items are only programmable from the keypad.

When programming the function map from the panel, flip the daughter board's overlay over to facilitate programming (see Figure 5.1b). All button and LED references in the programming sections refer to the ON-BOARD PROGRAMMING INTERFACE side of the overlay. Also, install the PROGRAMMING LOCATION LEDS guide on the Basic Master Board (BMB).

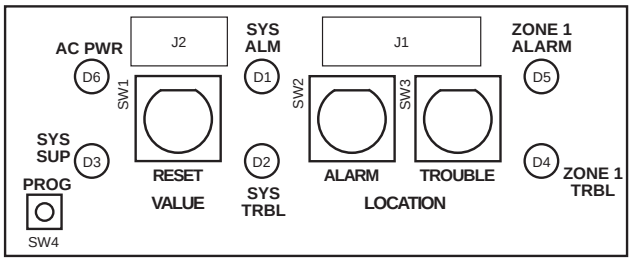


Figure 5.1a BMB Daughter Board Layout

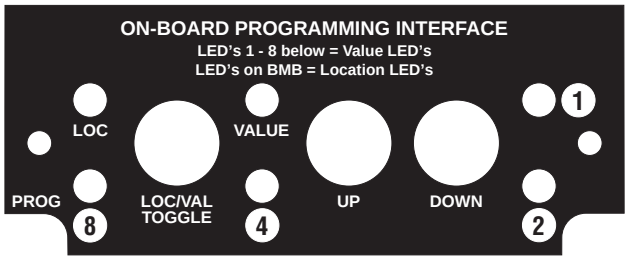


Figure 5.1b On-Board Programming Interface (Daughter Board Overlay turned over)

5.1.1 PROGRAMMING INDICATORS

The 2501 (FACP) has 16 LEDs that are used for displaying the system status. Of these, 13 are used for displaying information while in the front panel programming mode. The Location (LOC) green LED (located on the daughter board) starts flashing when the programming mode is entered. It is used to indicate that the UP/DOWN buttons will affect the programming location number. The VALUE red LED (located on the daughter board) flashes to indicate that the UP/DOWN buttons affect the location's value. The 1 and 2 red LEDs, 4 and 8 yellow LEDs (located on the daughter board) display the programmed value of the current location in the programming mode.

The 64, 32, 16, 8, 4, 2, and 1 yellow LEDs (located on the BMB in the lower right-hand corner) display the current programming location in the programming mode. A location LED overlay is included in the accessories envelope included with each panel.

5.1.2 PROGRAMMING BUTTONS

The Basic Master Board (BMB) has 1 push-button (PROG) to activate and terminate the system programming mode, 1 push-button (LOC/VAL) to switch between location and value, and 2 push-buttons (UP, DOWN) to increment or decrement the location/value (see Figure 5.1a).

5.2 SYSTEM PROGRAMMING

The Basic Master Board (BMB) automatically recognizes when a Zone Expander Module (ZEM) is added to the panel and programs the module automatically based upon the module's address. If two or more modules are set to the same address, the 2501 (FACP) will indicate trouble communicating with the modules and will not be able to indicate alarms or troubles correctly. Likewise, if a ZEM module is removed without changing the function map to inform the panel that it is not installed, the panel will indicate trouble communicating with the module.

To program the panel using the Basic Master Board (BMB):

1. Flip the daughter board's overlay over so it displays the side marked ON-BOARD PROGRAMMING INTERFACE. Install the PROGRAMMING LOCATION LEDS overlay on the Basic Master Board (BMB). If desired, place the location LED overlay on the LEDs.

2. Push and hold the PROG button until the LOC LED begins flashing (approximately 5 seconds). When the system goes into programming mode, it displays Location 1 and the current value.

3. Press the LOC/VAL button to switch between location and value. When the LOC LED is flashing, pressing the UP or DOWN buttons will increment or decrement the location displayed. When the VALUE LED is flashing, pressing the UP or DOWN buttons will increment or decrement the value of the selected location. (See Section 5.6, *Programming Matrix*, for programmable values of each location). By pushing and holding the UP or DOWN button, you may quickly scroll through the location/value numbers.

4. To exit out of programming mode, press and hold the PROG button until the LOC or VALUE LEDs stop flashing (approximately 5 seconds).

5. To save any value changes made, move to a new location. The changes to the current location is not saved if the system times out (10 minutes without a button press) or if programming mode is exited by using the PROG button. All changes made to other locations are saved, only the current location changes are not saved.

The Panel automatically exits out of programming mode if no activity occurs for 10 minutes. If an alarm occurs during programming, the panel automatically exits out of programming.

To program the function map with a keypad, see the *ESL 2500 Keypad Instruction Manual* 64812808.

See Section 5.6, *Programming Matrix* for the programming locations and default values.

NOTE: While in the programming mode, all other indicating devices will operate as normal. If a zone goes into alarm while you are in the programming mode, the alarm sounds and the panel automatically exits out of programming mode.

5.3 TIME & DATE PROGRAMMING

The time and date are programmed through Basic Master Board programming. The date format must be entered as m/dd/yyyy. The time must be set in military time format, 24:00 hours. (See programming example below.)

See Section 5.6, *Programming Matrix* for the time and date programming locations and default values.

EXAMPLE: To set the date to October 9, 1997 and the time to 5:35 pm

	LOCATION							VALUE			
	64	32	16	8	4	2	1	8	4	2	1
Month (10)	●	○	●	○	○	○	○	●	○	●	○
1st Digit of Day (0_)	●	○	●	○	○	○	●	○	○	○	○
2nd Digit of Day (_9)	●	○	●	○	○	●	○	●	○	○	●
1st Digit of Year (1_ _ _)	●	○	●	○	○	●	●	○	○	○	●
2nd Digit of Year (_9_ _)	●	○	●	○	●	○	○	●	○	○	●
3rd Digit of Year (_ _9_)	●	○	●	○	●	○	●	●	○	○	●
4th Digit of Year (_ _ _7)	●	○	●	○	●	●	○	○	●	●	●
1st Digit of Hour (1_)	●	○	●	○	●	●	●	○	○	○	●
2nd Digit of Hour (_7)	●	○	●	●	○	○	○	○	●	●	●
1st Digit of Minute (3_)	●	○	●	●	○	○	●	○	○	●	●
2nd Digit of Minute (_ 5)	●	○	●	●	○	●	○	○	●	○	●

For example, the month is contained at location 80. The location is indicated by the LEDs that are lit from the table above, 64 + 16 = 80. The value is indicated by the LEDs that are lit; 8 + 2 = 10 or October.

Figure 5.3 Time & Date Programming Example

NOTE: If an invalid date is entered, the 2501 (FACP) changes the incorrect value to the closest valid value before saving changes. There is no visible or audible indication given if an incorrect value is entered during time and date programming.

5.4 BATTERY SAVER PROGRAMMING

The 2501 (FACP) implements a programmable feature called the battery saver mode. The purpose of this mode is to allow the panel to utilize smaller, less expensive batteries while still meeting standby requirements. This mode is selected by programming the panel for battery saver mode (see Section 5.2 *System Programming* and Section 5.6 *Programming Matrix*). After selection of this feature the operation is completely transparent to the user.

The operation of the panel when battery saver mode is selected is as follows. The panel will automatically switch the batteries into parallel upon loss of AC or a low AC condition. The connection of these batteries in parallel effectively doubles the standby capacity of the batteries. The batteries will remain in this condition until AC is restored or the level is sufficient to restore normal operation.

While the panel is in standby on the secondary source (batteries in parallel), the panel continues to operate normally. If an alarm occurs, the panel automatically switches the batteries back to a series configuration. This provides the 24 VDC alarm voltage for the indicating (NACs).

NOTE: The AUX 12/24 and SWITCHED AUX 12/24 are always 12 VDC if battery saver mode is selected and 24 VDC if battery saver mode is not selected. The proper battery calculations must be performed based on the battery saver mode selection (see Appendix B). ESL manufactures a complete line of 12V devices including 12V door holders and smoke detectors.

5.5 CLEANME® MODE PROGRAMMING

The 2501 (FACP) supports a unique feature implemented by the ESL 521 series Two-Wire CleanMe® Smoke Detector. This feature allows the control panel to receive a signal from the 521 series detector, notifying the control panel that the detector has drifted outside of its UL Listed sensitivity range or has a hardware fault problem. The CleanMe® signal enables the installer to receive a warning signal at the panel and the Supervising Station if the system is monitored. This gives the installer time to clean the detector by replacing the optical chamber with a new one thereby reducing unwarranted alarms. There is no action required to implement this feature. The control panel automatically recognizes the signal if present and will turn on the detector maintenance LED and annunciate a system trouble. If a DAC is present, the Supervising Station, if monitored, will be notified.

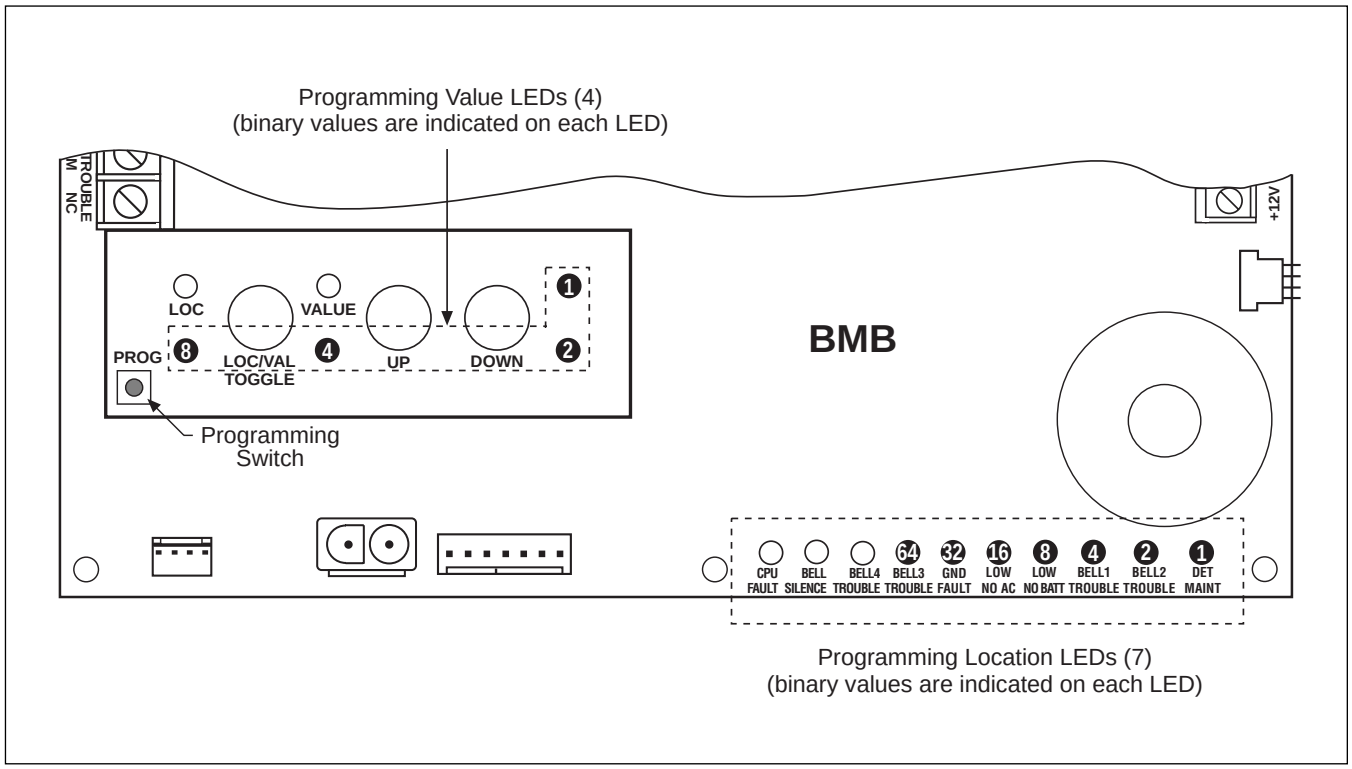


Figure 5.6 LED Location Diagram for Programming Location and Programmed Value

5.6 BMB PROGRAMMING MATRIX

Programming Locations										Programmed Value					
Loc	Description	Default	64	32	16	8	4	2	1	Value	Description	8	4	2	1
Zone Definitions															
1	Zone 1	0	○	○	○	○	○	○	●						
2	Zone 2	0	○	○	○	○	○	●	○						
3	Zone 3	0	○	○	○	○	○	●	●						
4	Zone 4	0	○	○	○	○	●	○	○						
5	Zone 5	0	○	○	○	○	●	○	●						
6	Zone 6	0	○	○	○	○	●	●	○						
7	Zone 7	0	○	○	○	○	●	●	●						
8	Zone 8	0	○	○	○	●	○	○	○	0	Normal Fire	○	○	○	○
9	Zone 9	0	○	○	○	●	○	○	●	1	Water Flow	○	○	○	●
10	Zone 10	0	○	○	○	●	○	●	○	2	Fire Supervisory	○	○	●	○
11	Zone 11	0	○	○	○	●	○	●	●	3	Non-Latching	○	○	●	●
12	Zone 12	0	○	○	○	●	●	○	○	4	Verified Fire	○	●	○	○
13	Zone 13	0	○	○	○	●	●	○	●	5	Power Boost (Zone 1 only)	○	●	○	●
14	Zone 14	0	○	○	○	●	●	●	○						
15	Zone 15	0	○	○	○	●	●	●	●						
16	Zone 16	0	○	○	●	○	○	○	○						
17	Zone 17	0	○	○	●	○	○	○	●						
18	Zone 18	0	○	○	●	○	○	●	○						
19	Zone 19	0	○	○	●	○	○	●	●						
20	Zone 20	0	○	○	●	○	●	○	○						
21	Zone 21	0	○	○	●	○	●	○	●						
22	Zone 22	0	○	○	●	○	●	●	○						
23	Zone 23	0	○	○	●	○	●	●	●						
24	Zone 24	0	○	○	●	●	○	○	○						
25	Zone 25	0	○	○	●	●	○	○	●						
Zone Bell Association															
26	Zone 1	15	○	○	●	●	○	●	○						
27	Zone 2	15	○	○	●	●	○	●	●	0	None	○	○	○	○
28	Zone 3	15	○	○	●	●	●	○	○	1	Bell 1	○	○	○	●
29	Zone 4	15	○	○	●	●	●	○	●	2	Bell 2	○	○	●	○
30	Zone 5	15	○	○	●	●	●	●	○	4	Bell 3	○	●	○	○
31	Zone 6	15	○	○	●	●	●	●	●	8	Bell 4	●	○	○	○
32	Zone 7	15	○	●	○	○	○	○	○						
33	Zone 8	15	○	●	○	○	○	○	●						
34	Zone 9	15	○	●	○	○	○	●	○						
35	Zone 10	15	○	●	○	○	○	●	●						
36	Zone 11	15	○	●	○	○	●	○	○						
37	Zone 12	15	○	●	○	○	●	○	●						
38	Zone 13	15	○	●	○	○	●	●	○						
39	Zone 14	15	○	●	○	○	●	●	●						

For multiple bells, add together.
ex: Bells 1 & 2 (1 + 2 = 3)

Programming Locations										Programmed Value					
Loc	Description	Default	64	32	16	8	4	2	1	Value	Description	8	4	2	1
Zone Bell Association (cont.)															
40	Zone 15	15	○	●	○	●	○	○	○						
41	Zone 16	15	○	●	○	●	○	○	●						
42	Zone 17	15	○	●	○	●	○	●	○						
43	Zone 18	15	○	●	○	●	○	●	●						
44	Zone 19	15	○	●	○	●	●	○	○						
45	Zone 20	15	○	●	○	●	●	○	●						
46	Zone 21	15	○	●	○	●	●	●	○						
47	Zone 22	15	○	●	○	●	●	●	●						
48	Zone 23	15	○	●	●	○	○	○	○						
49	Zone 24	15	○	●	●	○	○	○	●						
50	Zone 25	15	○	●	●	○	○	●	○						
Notification Appliance Circuit Definition										0	Not Used	○	○	○	○
										1	Temporal Code 3	○	○	○	●
										2	March Time	○	○	●	○
51	Bell 1 Definition	1	○	●	●	○	○	●	●	3	California March	○	○	●	●
52	Bell 2 Definition	1	○	●	●	○	●	○	○	4	Steady	○	●	○	○
53	Bell 3 Definition	0	○	●	●	○	●	○	●	5	Non-Silenceable Steady	○	●	○	●
54	Bell 4 Definition	0	○	●	●	○	●	●	○	6	Latching Non-Silenceable Steady	○	●	●	○
Battery Saver Mode												○	○	○	○
55	Batt Saver Mode	0	○	●	●	○	●	●	●			○	○	○	●
AC Cycles										0	60 Hz Operation	○	○	○	○
56	AC Sync	0	○	●	●	●	○	○	○	1	50 Hz Operation	○	○	○	●
Zone Expander Module Definition															
57	Expander 1	1	○	●	●	●	○	○	●						
58	Expander 2	1	○	●	●	●	○	●	○						
59	Expander 3	1	○	●	●	●	○	●	●	0	Not Installed	○	○	○	○
60	Expander 4	1	○	●	●	●	●	○	○	1	ZEM	○	○	○	●
61	Expander 5	1	○	●	●	●	●	○	●						
62	Expander 6	1	○	●	●	●	●	●	○						
Communicator Type										0	Not Installed	○	○	○	○
										1	2500-DAC	○	○	○	●
										2	LEM	○	○	●	○
63	Communicator Type	0	○	●	●	●	●	●	●	3	LRM	○	○	●	●
										4	Dual LRM	○	●	○	○

Programming Locations										Programmed Value					
Loc	**Description**	**Default**	**64**	**32**	**16**	**8**	**4**	**2**	**1**	**Value**	**Description**	**8**	**4**	**2**	**1**
Common Trouble Relay															
64	Function	0	●	○	○	○	○	○	○	0	Normal	○	○	○	○
										1	AC Loss Only	○	○	○	●
Trouble Resound Time															
65	Resound Time	1	●	○	○	○	○	○	●	1	15 Minutes	○	○	○	●
										2	1 Hour	○	○	●	○
										3	4 Hours	○	○	●	●
										4	24 Hours	○	●	○	○
Supervised Keypads															
66	Keypads	0	●	○	○	○	○	●	○	0	None	○	○	○	○
										1	Keypad 1	○	○	○	●
										2	Keypad 2	○	○	●	○
										4	Keypad 3	○	●	○	○
											For multiple keypads, add together. *ex*: Keypads 1 & 2 (1 + 2 = 3)				
Remote Annunciators															
67	RAs	0	●	○	○	○	○	●	●	0	None	○	○	○	○
										1	RA 1	○	○	○	●
										2	RA 2	○	○	●	○
										4	RA 3	○	●	○	○
										8	RA 4	●	○	○	○
											For multiple RAs, add together. *ex*: RAs 1 & 2 (1 + 2 = 3)				
Keypad Silence and Reset															
68	Silence & Reset	1	●	○	○	○	●	○	○	0	Disable	○	○	○	○
										1	Enable	○	○	○	●
Ground Fault Detection															
69	Ground Fault Detection	0	●	○	○	○	●	○	●	0	Disable	○	○	○	○
										1	Enable	○	○	○	●
Reserved															
70	Reserved	0	●	○	○	○	●	●	○						
71	Reserved	0	●	○	○	○	●	●	●						
72	Reserved	0	●	○	○	●	○	○	○						
73	Reserved	0	●	○	○	●	○	○	●						
74	Reserved	0	●	○	○	●	○	●	○						
75	Reserved	0	●	○	○	●	○	●	●						
76	Reserved	0	●	○	○	●	●	○	○						
77	Reserved	0	●	○	○	●	●	○	●						
78	Reserved	0	●	○	○	●	●	●	○						
79	Reserved	0	●	○	○	●	●	●	●	0		○	○	○	○

Programming Locations										Programmed Value					
Loc	Description	Default	64	32	16	8	4	2	1	Value	Description	8	4	2	1
Date Programming										0		○	○	○	○
										1		○	○	○	●
80	Month (**m**/dd/yyyy)	1	●	○	●	○	○	○	○	2		○	○	●	○
81	1st Digit of Day (m/**d**d/yyyy)	0	●	○	●	○	○	○	●	3		○	○	●	●
82	2nd Digit of Day (m/d**d**/yyyy)	1	●	○	●	○	○	●	○	4		○	●	○	○
83	1st Digit of Year (m/dd/**y**yyy)	1	●	○	●	○	○	●	●	5		○	●	○	●
84	2nd Digit of Year (m/dd/y**y**yy)	9	●	○	●	○	●	○	○	6		○	●	●	○
85	3rd Digit of Year (m/dd/yy**y**y)	9	●	○	●	○	●	○	●	7		○	●	●	●
86	4th Digit of Year (m/dd/yyy**y**)	7	●	○	●	○	●	●	○	8		●	○	○	○
										9		●	○	○	●
										10		●	○	●	○
										11		●	○	●	●
										12		●	●	○	○
Time Programming										0		○	○	○	○
										1		○	○	○	●
87	1st Digit of Hour (**H**H:MM)	0	●	○	●	○	●	●	●	2		○	○	●	○
88	2nd Digit of Hour (H**H**:MM)	0	●	○	●	●	○	○	○	3		○	○	●	●
89	1st Digit of Minute (HH:**M**M)	0	●	○	●	●	○	○	●	4		○	●	○	○
90	2nd Digit of Minute (HH:M**M**)	0	●	○	●	●	○	●	○	5		○	●	○	●
										6		○	●	●	○
										7		○	●	●	●
										8		●	○	○	○
										9		●	○	○	●

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
Communications				
91	Auto Comm Test on Power-up	0	0 1	Disabled Enabled
92	Auto Comm Test Hour	0	0 - 23	
93	Auto Comm Test Minute	0	0 - 59	
94	Days Between Auto Comm Tests	0	0 1 - 255	Disable Auto Comm Test Number of Days
95 96 97 98 99	Reserved Reserved Reserved Reserved Reserved	0 0 0 0 0	0 0 0 0 0	
100 101 102 103	Zone Alarm Report Sequence Zone Trouble Report Sequence System Trouble Report Sequence System Event Report Sequence	3 3 3 3	0 1 2 3 4 5 6 7 8 9 10 11	No Report Account 1 Account 2 Account 1, then 2 if 1 fails Account 2, then 1 if 2 fails Account 1 and 2 Account 3 Account 3 and 1 Account 3 and 2 Account 3 and 1, then 2 if 1 fails Account 3 and 2, then 1 if 2 fails Account 3 and 1 and 2
104 - 109	Account Number 1	000000H	000000H - FFFFFFH	(0H - FH per digit)
110 - 115	Account Number 2	000000H	000000H - FFFFFFH	(0H - FH per digit)
116 - 121	Account Number 3	000000H	000000H - FFFFFFH	(0H - FH per digit)
ZRM Override				
122	Zone 1, ZRM 1	0		
123	Zone 1, ZRM 2	0		
124	Zone 1, ZRM 3	0		
125	Zone 1, ZRM 4	0		
126	Zone 1, ZRM 5	0		
127	Zone 1, ZRM 6	0	0 1 2 4 8 For Multiple relays, add together. *ex*: Relays 1 & 3 (1 + 4 = 5)	No Overrides Override Relay 1 Override Relay 2 Override Relay 3 Override Relay 4
128	Zone 2, ZRM 1	0		
129	Zone 2, ZRM 2	0		
130	Zone 2, ZRM 3	0		
131	Zone 2, ZRM 4	0		
132	Zone 2, ZRM 5	0		
133	Zone 2, ZRM 6	0		
134	Zone 3, ZRM 1	0		
135	Zone 3. ZRM 2	0		
136	Zone 3, ZRM 3	0		
137	Zone 3, ZRM 4	0		
138	Zone 3, ZRM 5	0		
139	Zone 3, ZRM 6	0		
140	Zone 4, ZRM 1	0		
141	Zone 4, ZRM 2	0		
142	Zone 4, ZRM 3	0		
143	Zone 4, ZRM 4	0		
144	Zone 4, ZRM 5	0		
145	Zone 4, ZRM 6	0		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
ZRM Override (cont.)				
146	Zone 5, ZRM 1	0		
147	Zone 5, ZRM 2	0		
148	Zone 5, ZRM 3	0		
149	Zone 5, ZRM 4	0		
150	Zone 5, ZRM 5	0		
151	Zone 5, ZRM 6	0		
152	Zone 6, ZRM 1	0		
153	Zone 6, ZRM 2	0		
154	Zone 6, ZRM 3	0		
155	Zone 6, ZRM 4	0		
156	Zone 6, ZRM 5	0		
157	Zone 6, ZRM 6	0		
158	Zone 7, ZRM 1	0		
159	Zone 7. ZRM 2	0		
160	Zone 7, ZRM 3	0		
161	Zone 7, ZRM 4	0		
162	Zone 7, ZRM 5	0		
163	Zone 7, ZRM 6	0	0	No Overrides
164	Zone 8, ZRM 1	0	1	Override Relay 1
165	Zone 8, ZRM 2	0		
166	Zone 8, ZRM 3	0	2	Override Relay 2
167	Zone 8, ZRM 4	0		
168	Zone 8, ZRM 5	0	4	Override Relay 3
169	Zone 8, ZRM 6	0		
170	Zone 9, ZRM 1	0	8	Override Relay 4
171	Zone 9, ZRM 2	0		
172	Zone 9, ZRM 3	0		
173	Zone 9, ZRM 4	0		
174	Zone 9, ZRM 5	0		
175	Zone 9, ZRM 6	0		
176	Zone 10, ZRM 1	0		
177	Zone 10, ZRM 2	0		
178	Zone 10, ZRM 3	0		
179	Zone 10, ZRM 4	0		
180	Zone 10, ZRM 5	0		
181	Zone 10, ZRM 6	0		
182	Zone 11, ZRM 1	0		
183	Zone 11, ZRM 2	0		
184	Zone 11, ZRM 3	0		
185	Zone 11, ZRM 4	0		
186	Zone 11, ZRM 5	0		
187	Zone 11, ZRM 6	0		
188	Zone 12, ZRM 1	0		
189	Zone 12. ZRM 2	0		
190	Zone 12, ZRM 3	0		
191	Zone 12, ZRM 4	0		
192	Zone 12, ZRM 5	0		
193	Zone 12, ZRM 6	0		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
ZRM Override (cont.)				
194	Zone 13, ZRM 1	0		
195	Zone 13, ZRM 2	0		
196	Zone 13, ZRM 3	0		
197	Zone 13, ZRM 4	0		
198	Zone 13, ZRM 5	0		
199	Zone 13, ZRM 6	0		
200	Zone 14, ZRM 1	0		
201	Zone 14, ZRM 2	0		
202	Zone 14, ZRM 3	0		
203	Zone 14, ZRM 4	0		
204	Zone 14, ZRM 5	0		
205	Zone 14, ZRM 6	0		
206	Zone 15, ZRM 1	0		
207	Zone 15, ZRM 2	0		
208	Zone 15, ZRM 3	0		
209	Zone 15, ZRM 4	0		
210	Zone 15, ZRM 5	0		
211	Zone 15, ZRM 6	0		
212	Zone 16, ZRM 1	0	0	No Overrides
213	Zone 16. ZRM 2	0	1	Override Relay 1
214	Zone 16, ZRM 3	0		
215	Zone 16, ZRM 4	0	2	Override Relay 2
216	Zone 16, ZRM 5	0		
217	Zone 16, ZRM 6	0	4	Override Relay 3
218	Zone 17, ZRM 1	0		
219	Zone 17, ZRM 2	0	8	Override Relay 4
220	Zone 17, ZRM 3	0		
221	Zone 17, ZRM 4	0		
222	Zone 17, ZRM 5	0		
223	Zone 17, ZRM 6	0		
224	Zone 18, ZRM 1	0		
225	Zone 18, ZRM 2	0		
226	Zone 18, ZRM 3	0		
227	Zone 18, ZRM 4	0		
228	Zone 18, ZRM 5	0		
229	Zone 18, ZRM 6	0		
230	Zone 19, ZRM 1	0		
231	Zone 19, ZRM 2	0		
232	Zone 19, ZRM 3	0		
233	Zone 19, ZRM 4	0		
234	Zone 19, ZRM 5	0		
235	Zone 19, ZRM 6	0		
236	Zone 20, ZRM 1	0		
237	Zone 20, ZRM 2	0		
238	Zone 20, ZRM 3	0		
239	Zone 20, ZRM 4	0		
240	Zone 20, ZRM 5	0		
241	Zone 20, ZRM 6	0		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
ZRM Override (cont.)				
242	Zone 21, ZRM 1	0		
243	Zone 21. ZRM 2	0		
244	Zone 21, ZRM 3	0		
245	Zone 21, ZRM 4	0		
246	Zone 21, ZRM 5	0		
247	Zone 21, ZRM 6	0		
248	Zone 22, ZRM 1	0		
249	Zone 22, ZRM 2	0		
250	Zone 22, ZRM 3	0		
251	Zone 22, ZRM 4	0		
252	Zone 22, ZRM 5	0	0	No Overrides
253	Zone 22, ZRM 6	0	1	Override Relay 1
254	Zone 23, ZRM 1	0		
255	Zone 23, ZRM 2	0	2	Override Relay 2
256	Zone 23, ZRM 3	0		
257	Zone 23, ZRM 4	0	4	Override Relay 3
258	Zone 23, ZRM 5	0		
259	Zone 23, ZRM 6	0	8	Override Relay 4
260	Zone 24, ZRM 1	0		
261	Zone 24, ZRM 2	0		
262	Zone 24, ZRM 3	0		
263	Zone 24, ZRM 4	0		
264	Zone 24, ZRM 5	0		
265	Zone 24, ZRM 6	0		
266	Zone 25, ZRM 1	0		
267	Zone 25, ZRM 2	0		
268	Zone 25, ZRM 3	0		
269	Zone 25, ZRM 4	0		
270	Zone 25, ZRM 5	0		
271	Zone 25, ZRM 6	0		
Pulse Report Codes				
272	Zone 1 Alarm	31h		
273	Zone 2 Alarm	32h		
274	Zone 3 Alarm	33h		
275	Zone 4 Alarm	34h		
276	Zone 5 Alarm	35h		
277	Zone 6 Alarm	36h		
278	Zone 7 Alarm	37h		
279	Zone 8 Alarm	38h	00H - FFH	00H - Not Reported
280	Zone 9 Alarm	39h		
281	Zone 10 Alarm	3Ah		
282	Zone 11 Alarm	3Bh		
283	Zone 12 Alarm	3Ch		
284	Zone 13 Alarm	3Dh		
285	Zone 14 Alarm	3Eh		
286	Zone 15 Alarm	3Fh		
287	Zone 16 Alarm	61h		
288	Zone 17 Alarm	62h		
289	Zone 18 Alarm	63h		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
Pulse Report Codes (cont.)				
290	Zone 19 Alarm	64h		
291	Zone 20 Alarm	65h		
292	Zone 21 Alarm	66h	00H - FFH	00H - Not Reported
293	Zone 22 Alarm	67h		
294	Zone 23 Alarm	68h		
295	Zone 24 Alarm	69h		
296	Zone 25 Alarm	6Ah		
297	Zone 1 Trouble	F3h		
298	Zone 2 Trouble	F3h		
299	Zone 3 Trouble	F3h		
300	Zone 4 Trouble	F3h		
301	Zone 5 Trouble	F3h		
302	Zone 6 Trouble	F3h		
303	Zone 7 Trouble	F3h		
304	Zone 8 Trouble	F3h		
305	Zone 9 Trouble	F3h		
306	Zone 10 Trouble	F3h		
307	Zone 11 Trouble	F3h		
308	Zone 12 Trouble	F3h	00H - FFH	00H - Not Reported
309	Zone 13 Trouble	F3h		
310	Zone 14 Trouble	F3h		
311	Zone 15 Trouble	F3h		
312	Zone 16 Trouble	F6h		
313	Zone 17 Trouble	F6h		
314	Zone 18 Trouble	F6h		
315	Zone 19 Trouble	F6h		
316	Zone 20 Trouble	F6h		
317	Zone 21 Trouble	F6h		
318	Zone 22 Trouble	F6h		
319	Zone 23 Trouble	F6h		
320	Zone 24 Trouble	F6h		
321	Zone 25 Trouble	F6h		
322	Zone 1 Restoral	E3h		
323	Zone 2 Restoral	E3h		
324	Zone 3 Restoral	E3h		
325	Zone 4 Restoral	E3h		
326	Zone 5 Restoral	E3h		
327	Zone 6 Restoral	E3h		
328	Zone 7 Restoral	E3h		
329	Zone 8 Restoral	E3h	00H - FFH	00H - Not Reported
330	Zone 9 Restoral	E3h		
331	Zone 10 Restoral	E3h		
332	Zone 11 Restoral	E3h		
333	Zone 12 Restoral	E3h		
334	Zone 13 Restoral	E3h		
335	Zone 14 Restoral	E3h		
336	Zone 15 Restoral	E3h		
337	Zone 16 Restoral	E6h		
338	Zone 17 Restoral	E6h		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
339	Zone 18 Restoral	E6h	00H - FFH	00H - Not Reported
340	Zone 19 Restoral	E6h		
341	Zone 20 Restoral	E6h		
342	Zone 21 Restoral	E6h		
343	Zone 22 Restoral	E6h		
344	Zone 23 Restoral	E6h		
345	Zone 24 Restoral	E6h		
346	Zone 25 Restoral	E6h		
347	Ground Fault	00h	00H - FFH	00H - Not Reported
348	Ground Fault Restoral	00h		
349	AC Fail	FAh	00H - FFH	00H - Not Reported
350	AC Fail Restoral	EAh		
351	Low Battery	F9h	00H - FFH	00H - Not Reported
352	Low Battery Restoral	E9h		
353	Hibernation	00h	00H - FFH	00H - Not Reported
354	Hibernation Restoral	00h		
355	BMB Memory Fail	00h	00H - FFH	00H - Not Reported
356	BMB Memory Fail Restoral	00h		
357	DAC Memory Fail	00h	00H - FFH	00H - Not Reported
358	DAC Memory Restoral	00h		
359	Keypad Lockout	00h	00H - FFH	00H - Not Reported
360	Keypad Missing	00h	00H - FFH	00H - Not Reported
361	Keypad Missing Restoral	00h		
362	DAC Missing	00h	00H - FFH	00H - Not Reported
363	DAC Missing Restoral	00h		
364	Expander Missing	00h	00H - FFH	00H - Not Reported
365	Expander Missing Restoral	00h		
366	RA Missing	00h	00H - FFH	00H - Not Reported
367	RA Missing	00h		
368	LEM/LRM Trouble	00h	00H - FFH	00H - Not Reported
369	LEM/LRM Trouble Restoral	00h		
370	Bell Trouble	00h	00H - FFH	00H - Not Reported
371	Bell Trouble Restoral	00h		
372	Telco Trouble	00h	00H - FFH	00H - Not Reported
373	Telco Trouble Restoral	00h		
374	Communications Trouble	00h	00H - FFH	00H - Not Reported
375	Communications Trouble Restoral	00h		

The Following Locations Are Only Accessible With a Keypad				
Loc	**Description**	**Default**	**Value**	**Description**
376	Comm Test Trouble	00h	00H - FFH	00H - Not Reported
377	Comm Test Trouble Restoral	00h		
378	System Startup	00h	00H - FFH	00H - Not Reported
379	Local Program Begin	00h	00H - FFH	00H - Not Reported
380	Local Program End	00h		
381	Event Log Reset	00h	00H - FFH	00H - Not Reported
382	RPM Begin	00h	00H - FFH	00H - Not Reported
383	RPM End	00h		
384	RPM Denied	00h	00H - FFH	00H - Not Reported
385	RPM Aborted	00h		
386	Auto Comm Test Normal	00h	00H - FFH	00H - Not Reported
387	Auto Comm Test Abnormal	00h		
388	Manual Comm Test	10h	00H - FFH	00H - Not Reported

5.6.1 DAC PROGRAMMING MATRIX

Programming Locations			Programmed Value	
Loc	**Description**	**Default**	**Value**	**Description**
1	Enable RPM	1	0 1	Disabled Enabled
2	Auto Answer Rings	5	0 15	Number of Rings Before Answer
3	Second Call Bypass Time (Sec)	40	0 255	The amount of time for the answering machine bypass time window. This allows the remote programmer to bypass an answering machine by making two calls to the premises. The first call must ring three times or less and not be answered. The answering machine bypass time window starts ten seconds after the last ring of the first call. If the first ring of the second call occurs within the answering machine bypass time window, the panel answers the second call on the first ring. Remote Programming must be enabled.
4	Disable Call Waiting	0	0 1	Not Disabled Disabled
5	Seconds Between Attempts	1	0 255	Time in Seconds Between Call Attempts When Reporting
6	Telco Lines to be Monitored	3	0 1 2 3	None Line 1 Line 2 Both Lines
7	Telco L1 On Hook Time (Sec)	2	1 15	
8	Telco L2 On Hook Time (Sec)	2	1 15	
9	Telco L1 Off Hook Time (Sec)	3	1 15	
10	Telco L2 Off Hook Time (Sec)	3	1 15	
11	Telco Line 1 Dialer Type	1	0 1 2	US Pulse Touchtone Foreign Pulse
12	Telco Line 2 Dialer Type	1	0 1 2	US Pulse Touchtone Foreign Pulse
13	Telco N1 Dial Attempt	5	1 10	Maximum Dial Attempts on Phone Number 1
14	Telco N2 Dial Attempt	5	1 10	Maximum Dial Attempts on Phone Number 2
15	Telco N3 Dial Attempt	5	1 10	Maximum Dial Attempts on Phone Number 3
16	Telco N1 Reporting Format	0	0 1 2 3 4 5	Pulsed 20 baud, non-extended Pulsed 20 baud, extended Pulsed 40 baud, extended SIA Contact ID Pager

Programming Locations			Programmed Value	
Loc	**Description**	**Default**	**Value**	**Description**
17	Telco N2 Reporting Format	0	0 1 2 3 4 5	Pulsed 20 baud, non-extended Pulsed 20 baud, extended Pulsed 40 baud, extended SIA Contact ID Pager
18	Telco N3 Reporting Format	0	0 1 2 3 4 5	Pulsed 20 baud, non-extended Pulsed 20 baud, extended Pulsed 40 baud, extended SIA Contact ID Pager
19-50	Telephone Number 1	all F's	0 - F	
51-82	Telephone Number 2	all F's	0 - F	
83-114	Telephone Number 3	all F's	0 - F	
115-146	RPM Number	all F's	0 - F	
DAC 1500 Mode FM				
147	Current Time - Hour	0	0 24	Set DAC Clock
148	Current Time - Minute	0	0 59	Set DAC Clock
149	Comm Test Time - Hour	12	0 24	Set Time for Auto Comm Test
150	Comm Test Time - Minute	0	0 59	Set Time for Auto Comm Test
151-154	Account Code 1	0	0 F	
155-158	Account Code 2	0	0 F	
159-166	Pulse Report Codes		0 FF 00 E0 F6 E6 F7 E7 08 FA	 Zone Alarm Zone Restore System Trouble System Trouble Res. Tel. Line Trouble Tel. Line Trouble Res. Auto Comm Test Abnormal Comm Test

5.7 FUNCTION MAP DESCRIPTION

Zone Definition - This defines what type of devices are connected to a zone and how the zone will respond when one or more of the devices signals an alarm condition.

Zone Bell Association - This associates a NAC or group of NACs to be activated when the specified zone is in alarm.

Notification Appliance Circuit Definition - Defines the cadence a NAC will use when activated. Setting the cadence to Not Used will also deactivate supervision of the NAC.

Battery Saver Mode - If set to On, the batteries will be put into parallel mode to conserve power. This only happens when AC has failed and no NACs are active.

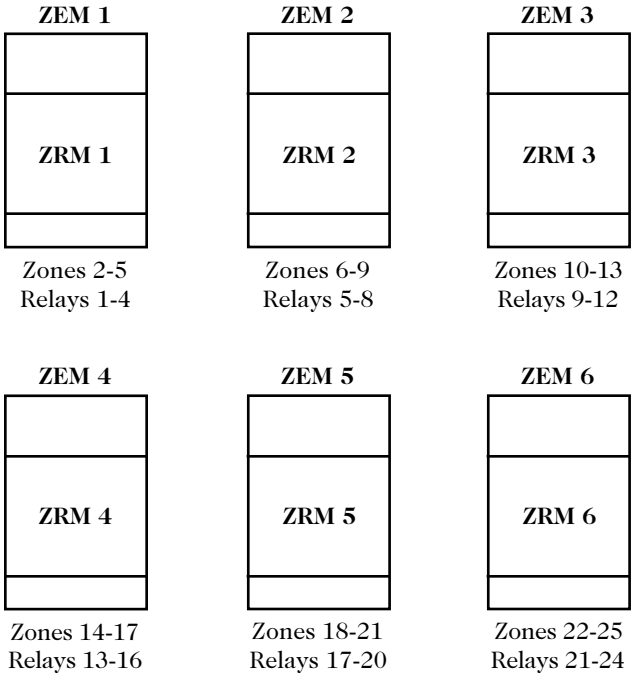
AC Cycles - Specifies the frequency of the supplied AC power to be used for time-keeping.

Zone Expander Module Definition - Specifies if a zone expander is installed.

Communicator Type - Specifies the type of communicator installed.

5.7.1 ZRM OVERRIDE

Normally, the relays on a ZRM are configured as alarm followers for the corresponding zones on the ZEM that the ZRM is installed. Programming zones to override a ZRM's relays allows the installer to program the BMB to have a more sophisticated relay control rather than wiring numerous relays in parallel or serial. If no zones are programmed to override a particular ZRM relay, that relay will act as a zone follower for its associated zone. The BMB can trip multiple relays based on one zone input (relays 1, 6, 22 can activate when zone 1 goes into alarm by setting location 122 to 1, location 123 to 2, and location 127 to 2). The BMB can also have multiple zones trip the same relay (zones 3, 12, 25 can activate relay 3 when any of the three go into alarm by setting location 134 to 4, location 188 to 4, and location 266 to 4). The BMB can also be programmed for a combination of both (zones 1, 2, 3 can activate relay 1, 3 and zones 4, 5, 6 can activate relay 6, 7 by setting location 122 to 5, location 128 to 5, location 134 to 5, location 140 to 6, location 146 to 6, and location 152 to 6). One use for this ability is to have all fire zones activate relay 1 and all supervisory zones activate relay 6. All fire zones would have their associated ZRM override for ZRM 1 set to the value 1. All supervisory zones would have their associated ZRM override for ZRM 2 set to the value 2.



6.0
INITIAL ACCEPTANCE TESTING

Following the installation of all of the system components and the programming of the FACP, a complete, 100% acceptance test must be performed and the results documented. A permanent record of the initial acceptance tests must be made and retained with the system documentation. Refer to Chapter 7 of NFPA 72-1996, the National Fire Alarm Code.

Upon the completion of the Initial Acceptance Test, restore all circuits and system components to their design condition. Install the 2501 FACP Operating Instructions, Appendix C, in an easily accessible and readable location adjacent to the FACP. Advise the owner/operator of the site and the monitoring firm that the system is now "on-line".

6.1 ALARM ZONE TESTING

SETUP

1. Connect the control to a primary power source (110 to 120 VAC).
2. Connect the Zone One (Alarm initiating) input to Normally Open switches or Sensors. This connection must be in parallel to the 2.7k Ohm 5% end-of-line (EOL) resistor (provided). (Trouble with the circuit may occur if the resistor is connected in series).
3. Connect the EOL, 2.7k Ohm 5% resistor (provided), to each of the Bell circuits. A Trouble Indication will occur if the EOL is not connected.
4. Connect (observe polarity) an audible device into BELL 1 & BELL 2 terminals. This connection is in parallel to the EOL .
5. Connect the 4-wire bus connector between the BMB and each ZEM that is to be coupled into the system.
6. Each ZEM must have an EOL, 2.7k Ohm 5% resistor (provided), for each zone connected in order to prevent a trouble condition.
7. Connect the batteries, minimum of two 12 Volt 7 Ah sealed lead acid batteries. Failure to connect a battery will result in a trouble condition.

TESTING AND SYSTEM RESPONSE

Visually observe the LEDs located on the Basic Master Board (BMB) to verify that no troubles, alarms, or supervisory conditions exist. If a condition is detected, check the zone LEDs to identify if the problem is zone or system related. Correct the problem and then press the SYSTEM RESET button to reset the panel and clear the condition.

If an alarm condition occurs and the sounder is on, either the SYSTEM RESET or the ALARM SILENCE push-button may be pressed. If the SYSTEM RESET push-button is pressed first, the local sounder will deactivate, the bells will silence and the system LEDs will extinguish. All zones in alarm will be reset. If the ALARM SILENCE push-button is pressed first, the proper system and zone LEDs and the trouble sounder will become active. If the SYSTEM RESET push-button is pressed after the alarm is silenced, the zone(s) that went into alarm will be reset.

NOTE: The 2501 (FACP) uses three (3) different types of tones to distinguish between an alarm, a trouble, and a supervisory trouble. The output tones for the Sounder will be as follows:

- Alarm tone will have a steady tone
- Trouble tone will have a pulsing tone
- Supervisory tone will have a rapid pulsing tone

A. PROGRAM ZONE 1 AS NORMAL FIRE, "0", WITH A CLASS "B" TYPE CONFIGURATION:

TEST 1 - ZONE 1 SHORTED

1. Place a short across Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The system will go into alarm
   - The polarity of the voltage at BELL 1 and BELL 2 will reverse and pulse a Temporal 3 cadence
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Sounder will sound an alarm tone
2. Press the **ALARM SILENCE** button
   - The output at BELL 1 and BELL 2 will stop
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will change to a trouble tone
3. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is off
5. Press the **SYSTEM RESET** button
   - All LEDs are off

TEST 2 - ZONE 1 OPEN

1. Create an open circuit on Zone 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The system will go into trouble
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
3. Replace the EOL connection to Zone 1's terminal
   - The Trouble LED is off
   - The Zone 1 Trouble LED is off

B. ZONE 1 PROGRAMMED WATERFLOW, "1".

TEST 1 - ZONE 1 SHORTED

1. Create a short on Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The system will go into alarm
   - The polarity of the voltage at BELL 1 and BELL 2 will reverse and pulse a Temporal 3 cadence
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Sounder will sound an alarm tone
2. Press the **ALARM SILENCE** button
   - The output at BELL 1 and BELL 2 will stop
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will change to a trouble tone
3. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - All LEDs are off

TEST 2 - ZONE 1 OPEN

1. Create an open circuit on Zone 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The system will go into trouble
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
3. Replace the EOL connection to Zone 1's terminal
   - The Trouble LED is off
   - The Zone 1 Trouble LED is off

C. PROGRAM ZONE 1 AS A FIRE SUPERVISORY, "2".

TEST 1 - ZONE 1 SHORTED

1. Create a short on Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The system will go into Fire Supervisory
   - The Sounder will sound a supervisory tone
   - The Fire Supervisory LED is lit
   - The Zone 1 Alarm LED is lit
2. Press the **ALARM SILENCE** button
   - The Fire Supervisory LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will change to a trouble tone
3. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Fire Supervisory LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - All LEDs are off

TEST 2 - ZONE 1 OPEN

1. Violate Zone 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The system will go into trouble
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit

3. Replace the EOL connection to Zone 1's terminal
   - The Trouble LED is off
   - The Zone 1 Trouble LED is off

D. PROGRAM ZONE 1 AS NON-LATCHING, "3"

TEST 1 - ZONE 1 SHORTED

1. Create a short on Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The system will go into alarm
   - The polarity of the voltage at BELL 1 and BELL 2 will reverse and pulse a Temporal 3 cadence
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Sounder will sound an alarm tone
2. Press the **ALARM SILENCE** button
   - The output at BELL 1 and BELL 2 will stop
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will change to a trouble tone
3. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - All LEDs are off

TEST 2 - ZONE 1 OPEN

1. Create an open circuit on Zone 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The system will go into trouble
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
3. Replace the EOL connection to Zone 1's terminal
   - The Trouble LED is off
   - The Zone 1 Trouble LED is off

E. PROGRAM ZONE 1 AS ALARM VERIFICATION, "4"

TEST 1 - ZONE 1 SHORTED

1. Create a short on Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The system will go into alarm within 5 seconds
   - The polarity of the voltage at BELL 1 and BELL 2 will reverse and pulse a Temporal 3 cadence
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Sounder will sound an alarm tone
2. Press the **ALARM SILENCE** button
   - The output at BELL 1 and BELL 2 will stop
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will change to a trouble tone
3. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - The Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is off
5. Press the **SYSTEM RESET** button
   - All LEDs are off

TEST 2 - ZONE 1 OPEN

1. Create an open circuit on Zone 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The system will go into trouble
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The Trouble LED is lit
   - The Zone 1 Trouble LED is lit
3. Replace the EOL connection to Zone 1's terminal
   - The Trouble LED is off
   - The Zone 1 Trouble LED is off

NOTE: Repeat tests A through D for zones 2 through 25 and verify system response.

6.2 NOTIFICATION APPLIANCE CIRCUIT TESTING

There are two (2) Notification Appliance Circuits (NACs) for audible and visible notification appliances integral on the BMB. Consistent with the new requirements of the National Fire Alarm Code - 1996 the default setting for the BELL 1 / BELL 2 circuit is the Temporal 3 Code 3 (ANSI S3.41, Standard Emergency Evacuation Signal). The BELL 3 / BELL 4 circuit default setting is "not used". If visible notification appliances are needed for ADA compliance they can be connected to this circuit once it has been reprogrammed for either steady or non-silencable operation. Other signal options are available, as required by 3-7.1(b) of NFPA 72-1996, for when the planned action in response to a fire emergency is not evacuation but relocation, or where the Authority Having Jurisdiction requires some other signal.

BELL CADENCE TESTING

1. BELL 1 and BELL 2 activate when an alarm occurs during testing.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Temporal 3 output.
   - Remove the short and press **SYSTEM RESET**.
2. Set BELL 3 and BELL 4 to activate using the Temporal 3 code.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Temporal 3 output.
   - Remove the short and press **SYSTEM RESET**.
3. Set BELL 1 through BELL 4 to activate using the Standard Marchtime Code.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Standard March Time Code output.
   - Remove the short and press **SYSTEM RESET**.
4. Set BELL 1 through BELL 4 to activate using the California Marchtime Code (10 sec ON, 5 sec OFF).
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the California March Time Code output.
   - Remove the short and press **SYSTEM RESET**.
5. Set BELL 1 through BELL 4 to STEADY.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Steady output.
   - Remove the short and press **SYSTEM RESET**.
6. Set BELL 1 through BELL 4 to NON-SILENCEABLE STEADY.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Steady output.
   - Press Alarm Silence and verify that the bells do not silence.
   - Remove the short and press SYSTEM Reset.
7. Set Bell 1 through Bell 4 to Latching Non-Silenceable Steady and Zone 1 to Non-Latching.
   - Connect an audible device or digital multimeter to the outputs for verification.
   - Violate Zone 1 by shorting the EOL at the terminals and verify the Steady output.
   - Press ALARM SILENCE and verify that the bells do not silence.
   - Remove the short and verify that the bells remain active.
   - Press SYSTEM RESET.

NOTE: Set BELL 1 through 4 to the appropriate cadence before performing Bell Line Testing.

BELL LINE TESTING

TEST 1 - BELL 1 OUTPUT SHORTED

1. Create a short circuit on BELL 1 on the BMB by placing a short across the EOL at the terminals.
   - The BELL 1 Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The BELL 1 Trouble LED is lit
   - The System Trouble LED is lit
3. Remove the short from Zone 1's terminals
   - The BELL 1 Trouble LED is off
   - The System Trouble LED is off

TEST 2 - BELL 1 OUTPUT OPEN

1. Create an open circuit on BELL 1 on the BMB by disconnecting one side of the EOL at the terminals.
   - The BELL 1 Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The BELL 1 Trouble LED is lit
   - The System Trouble LED is lit
3. Reconnect the EOL to Zone 1's terminals
   - The BELL 1 Trouble LED is off
   - The System Trouble LED is off

NOTE: Repeat Tests 1 and 2 for all four BELL outputs and verify system response

6.3 GROUND FAULT TEST

1. Connect a 1 meter long, 18 gauge wire between a terminal and the earth ground point
   - The GRD FAULT LED on the BMB is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
   - The GRD FAULT LED on the BMB is lit
   - The System Trouble LED is lit
3. Remove the ground wire from the terminal
   - The GRD FAULT LED on the BMB is off
   - The System Trouble LED is off

NOTE: Repeat above test for all terminals except common alarm and common trouble (unless they are connected to supervised lines) and verify system response.

6.4 SYSTEM TESTING USING TEST MODES

A. WALK TEST MODE TESTING

PROGRAM ZONE 1 AS NORMAL ("0")

1. Place Zone 1 function jumper in walk test mode.
   - The system will go into trouble
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
3. Violate Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The Alarm LED will light for 5 seconds
   - The Zone 1 Alarm LED will light for 5 seconds
   - The polarity of the voltage at BELL 1 and BELL 2 will reverse and pulse a Temporal 3 cadence for 2 seconds
4. The system will automatically reset to allow for the next device or zone to be tested.

NOTE: Repeat above test for Waterflow ("1"), Fire Supervisory ("2"), Non-Latching ("3"), and Alarm Verification ("4"). Under Supervisory, the bells do not ring. However, the sounder will sound for 5 seconds and shut off with the LEDs.

B. SILENT WALK TEST MODE TESTING

TEST 1 - PROGRAM ZONE 1 AS NORMAL ("0")

1. Place Zone 1 function jumper in silent walk test mode.
   - The system will go into trouble
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
3. Violate Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The System Alarm LED is lit for 5 seconds
   - The Zone 1 Alarm LED is lit for 5 seconds
4. Remove the short across Zone 1 terminal
5. The system will automatically reset to allow for the next device or zone to be tested

NOTE: Repeat above test for Alarm Verification ("4").

TEST 2 - PROGRAM ZONE 1 AS NON-LATCHING ("3")

1. Place Zone 1 function jumper in silent walk test mode.
   - The system will go into trouble
   - The Zone Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
3. Violate Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The System Alarm LED is lit
   - The Zone 1 Alarm LED is lit
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - The System Alarm LED is off
   - The Zone 1 Alarm LED is off
   - The Zone Trouble LED is lit
   - The System Trouble LED is lit
5. Press the **SYSTEM RESET** button
   - All LEDs are off

NOTE: Repeat above test for Waterflow ("1") and Fire Supervisory ("2"). Please note that under Supervisory, the Supervisory Alarm LED is lit instead of the System Alarm LED.

C. DISCONNECT MODE TESTING

TEST 1 - PROGRAM ZONE 1 AS NORMAL ("0")

1. Place Zone 1 function jumper in disconnect test mode.
   - The system will go into trouble
   - The Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
3. Violate Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The Zone 1 Alarm LED is lit
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - The Zone 1 Alarm LED is lit
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
5. Press the **SYSTEM RESET** button
   - All LEDs are off

NOTE: Repeat above test for Alarm Verification ("4").

TEST 2 - PROGRAM ZONE 1 AS WATERFLOW ("1")

1. Place Zone 1 function jumper in disconnect test mode.
   - The system will go into trouble
   - The Trouble LED is lit
   - The System Trouble LED is lit
   - The Sounder will sound a trouble tone
2. Press the **TROUBLE SILENCE** button
   - The Sounder will turn off
3. Violate Zone 1 on the BMB by placing a short across the EOL at the terminals.
   - The Zone 1 Alarm LED is lit
   - The Zone 1 Trouble LED is lit
   - The System Trouble LED is lit
4. Remove the short across Zone 1 terminal
   - The Zone 1 Alarm LED is off
   - The Trouble LED is lit
   - The System Trouble LED is lit
5. Press the **SYSTEM RESET** button
   - All LEDs are off

NOTE: Repeat above test for Fire Supervisory ("2") and Non-Latching (3).

6.5 REMOTE KEYPAD CHECK-OUT

Verify that the Keypad has been properly installed and connected to the 2501 FACP. Verify that the Keypad password is properly programmed. Activate initiating devices and verify that the proper designations are displayed at the Keypad. Try silencing alarm signals without the password and with an incorrect password and verify that alarm signals continue. Repeat with the correct password and verify that the signals silence. Use each operator function from the Keypad and verify that all functions operate.

To perform a lamp test of the keypad, access Lamp Test from the Main Menu. During lamp test, all dots on the display and all lightable keys will turn on as well as the keypad's sounder for 5 seconds. See the keypad manual for specific instructions on how to access the Lamp Test.

6.6 BMB LAMP TEST

To test the lamps on the BMB, the ZEM's and any other peripherals located in the can, the system must not have an alarm or trouble condition. Press and hold both the ALARM SILENCE and TROUBLE SILENCE keys. All the LEDs will illuminate as long as both keys are pressed and an alarm or trouble does not occur.

6.7 DIGITAL ALARM COMMUNICATOR CHECK-OUT

Verify that the DAC has been properly installed and connected to the 2501 FACP. Connect the proper telephone lines to the DAC. Verify that the DAC is programmed correctly. Initiate a manual comm test by pressing the Comm Test push-button located on the DAC. Verify that a manual Comm Test report was received. Additional testing can be performed as required. To perform a lamp test, see Section 6.6 Lamp Test.

6.8 LEM/LRM CHECK-OUT

Verify that the LEM/LRM has been properly installed and connected to the 2501 FACP. Connect the signaling lines to the proper device type. Verify that the FACP is programmed correctly. Initiate the proper alarm (Fire or Supervisory). Verify that the signal is received by the connected device. To perform a lamp test, push the "push to test" push-button on the LEM/LRM module. The LED should remain activated until the push-button is released.

7.0
INSPECTION AND TESTING

No piece of equipment can be expected to operate reliably without regular maintenance. The ESL 2501 Fire Alarm Control Panel is designed to provide years of reliable performance. Nevertheless, like all other building systems it must be maintained properly. The appropriate inspection and testing requirements differ depending upon whether the 2501 FACP is being used for household fire warning or in a commercial, architectural, institutional or non-household residential application. Household fire warning systems are inspected and tested in accordance with NFPA 72-1996, Chapter 2 (see Section 10). All other systems are inspected and tested in accordance with NFPA 72-1996, Chapter 7.

Inspect and test the fire alarm system in accordance with the inspection and test procedures and schedules established by the local AHJ or presented in Chapter 7 NFPA 72-1996. Prior to commencing the inspection and test of a fire alarm system make certain that:

- The owner/operator has advised the facility occupants and that a fire watch has been established
- The public fire service has been notified
- The off-premises supervising station fire alarm system operator has been advised and that an alternate means for reporting a fire has been established

Document all inspection and testing. Some fire alarm system components do not have to be tested at each scheduled inspection. Keep track of which devices are tested to ensure that different devices are tested at the subsequent inspection.

Subsequent to the completion of the inspection and testing of the system make certain that the occupant, public fire service and supervising station fire alarm system operator are advised that the system has been placed back "on-line" and to treat all subsequent alarms as indications of a fire in progress.

7.1 MAINTENANCE

The 2501 (FACP) is relatively maintenance free, other than performing regular testing to make sure all the systems are operating properly. Batteries require special attention.

7.1.1 BATTERIES

The 2501 (FACP) uses two sealed lead-acid batteries as the secondary power source. The batteries must be replaced if the Low Battery LED remains on for more than 48 hours (meaning one or more of the battery cells are dead or the batteries will not hold a charge). If the batteries are dead, they must be replaced with batteries of the same voltage and capacity rating, with a maximum of 12 V, 17.2 Ah. Assure that any battery used allows a minimum clearance of 1/4" from its terminals to any non-power-limited circuit, including the system cabinet.

NOTE: When replacing batteries, always replace *both* batteries - even if only one appears dead. The typical battery life is 3 to 5 years, depending on usage. See manufacturer's specifications for particular battery used.

8.0
PRECAUTIONS AND WARNINGS

The equipment described in this manual is Listed by Underwriters Laboratories, Inc., for use in fire alarm signaling systems, only when installed in accordance with this manual and the National Fire Protection Association's National Fire Alarm Code (NFPA 72); the National Electrical Code (NFPA 70); the Life Safety Code (NFPA 101); and the local Authority Having Jurisdiction (AHJ). The installer must be familiar with and understand all applicable codes before beginning installation.

To ensure proper operation of this equipment:

- **DO NOT** deviate from any installation instructions contained in this manual.
- **DO NOT** assume any installation details not shown in this manual.
- **DO NOT** alter any mechanical or electrical features of the equipment supplied.
- **BE FAMILIAR** with the building code, fire prevention code, and/or other Authority Having Jurisdiction (AHJ) in the locale of the installation.

IT IS THE RESPONSIBILITY OF THE INSTALLER TO ENSURE THAT THE WIRING AND DEVICES INSTALLED IN THE SYSTEM MEET CURRENT NATIONAL ELECTRICAL CODE, NFPA STANDARDS, STATE AND LOCAL BUILDING CODE REQUIREMENTS.

WARNING: Under abnormal conditions, AC line voltages may be present on any terminal. Touching any component could be hazardous and result in loss of life. A short circuit can result in arcing that could cause the ejection of molten metal, causing injuries to testing personnel.

To minimize this possibility, only qualified technicians familiar with electrical hazards should perform these procedures. Safety glasses should be worn by such personnel, and instruments used for voltage measurement should be designed for the purpose and should be in good mechanical and working order.

If any application or installation information is not understood, or is not covered herein, please contact Sentrol Technical Services at 1-800-800-2027.

9.0
TROUBLESHOOTING

This section provides a quick reference troubleshooting guide for the 2501 (FACP). This guide will aide in diagnosing and locating most system faults quickly and efficiently. If you cannot resolve the fault with the assistance of this guide, call Sentrol Technical Services at 1-800-800-2027.

Troubleshooting Guide

Trouble Indicators	Possible Cause	Corrective Action
Zone 1 - 25 trouble LED System trouble LED Trouble sounder slow intermittent	End-of-line resistor value incorrect or missing	Meter circuit to verify proper resistance
	Loss of power to power supervision relay	Meter voltage on circuit
	Polarity reversal relay wired incorrectly	Check circuit diagram to confirm wiring
	Loose connection or broken wire	Check for opens in circuit
	Disconnect/Walktest function jumper not in normal position	Put Disconnect/Walktest function jumper in normal position
	Faulty water flow switch	Repair or replace water flow switch
	Initiating device missing from circuit	Check for any devices that may have been removed from the initiating circuit
	"Class B" wires connected to wrong terminals	Make sure wires are connected to "Class B" terminals
	Incompatible two wire detector	Check UL compatibility listing to verify the detector is listed for use with the panel it is connected to
	Overcurrent or lightning damage	Check for burn marks or other signs of overcurrent damage. Return to factory for service. Replace board if traces are damaged.
Supervisory trouble LED Rapid trouble beep Zone alarm LED	Zone supervisory device tripped	Check initiating device on zone
System trouble LED Zone trouble LED Rapid trouble beep	Open in zone circuit	Check zone for broken wires or opens in circuit
	Disconnect/Walktest function jumper not in normal position	Put Disconnect/Walktest function jumper in normal position
Low/No AC power System trouble LED Trouble sounder slow intermittent	Loss of AC (line voltage)	If line voltage is too low, upgrade or move to new circuit
	Low AC power Less than 94 VAC input to power supply - no load Less than 102 VAC with maximum load	Check for loose or broken connections If power supply has no output, replace unit Return to factory for service
Low/No battery LED System trouble LED Trouble sounder slow intermittent	Battery low Less than 24 VDC	Replace batteries
	Battery missing or less than 20 VDC	Replace batteries
	Open in battery harness	If there is an open or break in the battery harness, repair it or replace it
Ground fault LED System trouble LED Trouble sounder slow intermittent	Ground on any circuit, other than supplementary alarm or trouble contacts	Remove one wire at a time until ground fault LED and system trouble LED goes out. Repair circuit causing fault condition.
Indicating trouble LED System trouble LED	End-of-line resistor value incorrect or missing	Meter circuit to verify proper resistance
	Polarity reversed in circuit	Check circuit diagram to confirm wiring and polarity
	Loose connection or broken wire	Check for opens in circuit
	Indicating device missing from circuit	Check for any devices that may have been removed from the indicating circuit
	Style "Z" wires crossed in circuit	Make sure polarity is observed completely through circuit
	Style "Y" wires connected to wrong terminals	Make sure wires are connected to Style "Y" terminals
	Overcurrent or lightning damage	Check for burn marks or other signs of overcurrent damage. Return to factory for service. Replace board if traces are damaged.
System trouble LED Trouble sounder slow intermittent (with no other indicators)	Bad ZEM connection	Check data bus connections
	ZEM malfunction	Check for signs of damage to the BMB or ZEM.
	BMB malfunction	Return to factory for service or replace boards.

Figure 9.0 Troubleshooting Guide

10.0
HOUSEHOLD FIRE WARNING SYSTEMS

A properly designed household fire warning system, implemented with the ESL 2501 Fire Alarm Control Panel, is intended to provide enhanced life-safety for the occupants in the event of a fire. It is intended to provide a warning sufficiently early in the development of a fire to enable the occupants to escape before conditions become life-threatening. Once the warning has been provided the occupants must still escape. Consequently, in order to derive the intended benefit from the household fire warning system, the household must have a pre-arranged fire escape plan. A fire escape plan includes at least two escape routes from all sleeping areas as well as a pre-planned meeting place outside the building. The intent of this system is not to preserve property but to facilitate timely escape of the occupants.

Since it takes precious time for smoke to travel from a fire to a smoke detector, the highest level of life safety is attained when a smoke detector is installed in each room. If fewer detectors are used the smoke must travel further before encountering a smoke detector. A fire warning system with fewer detectors responds more slowly, allowing the fire to grow larger before the occupants are warned of its existence. This translates to substantially lower levels of life-safety.

10.1 INSTALLATION

This system should be installed in accordance with Chapter 2 of the National Fire Alarm Code 72-1996. A copy of this Standard may be purchased from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10.2 DETECTOR LOCATION

The minimum level of protection requires one smoke detector between each bedroom area and the rest of the house and on each additional story, including the basement but excluding any crawl spaces and unfinished attics. In new construction, a smoke detector also shall be installed in each sleeping room. Detectors should be located at the top of each stairway leading to an occupied area.

In addition, it is recommended that heat or smoke detection be located in the following areas if they are separated by a door from the areas protected by the required smoke detectors: living room, dining room, attic, utility room, basement, furnace room, garage, and hallways.

10.3 NOTIFICATION APPLIANCE LOCATION

If smoke detectors have been used that do not contain an integral signaling device with a minimum output of 85 dBA at 10 feet, a separate notification appliance must be installed adjacent to each sleeping area. In new construction, where a smoke detector is also required in each sleeping room, all detectors must be arranged so that the signaling devices in all detectors operate whenever any single smoke detector unit is activated.

In addition, it is recommended that additional signaling devices be installed on each level and on the outside of the premises. Check local codes before installing an outside device to assure they are permitted or if a timed cutoff is required.

10.4 ESCAPE PLAN

1. Have at least two (2) possible escape routes from each room of the house.
2. Before opening any door check for heat or smoke. NEVER OPEN A DOOR THAT IS HOT TO THE TOUCH.
3. If there is no alternative escape path available and there is smoke in you escape path, crawl with your head as close to the floor as possible. You can use a wet cloth over your mouth and nose to reduce the amount of smoke you inhale as you escape.
4. Have a prearranged meeting place outside the house.
5. Call the FIRE DEPARTMENT from outside the house as soon as possible.
6. NEVER re-enter a burning building.
7. Practice your escape plan and meeting place with ALL family members.

10.5 HOUSEHOLD FIRE WARNING SYSTEM MAINTENANCE

All automatic systems need regular maintenance in order to provide continued performance and the Household Fire Warning System needs regular maintenance as well. The head of the household should test the fire warning system at least monthly to verify that it is in working order. If the system is monitored by an off-premises monitoring firm, it is important to call the monitoring company before the test of the system to ensure that the test is not misconstrued to be a fire alarm. It is also necessary to call the monitoring firm after the test to ensure that alarms are not misconstrued to be tests. Any deviation from “normal working” noticed by the building occupants should be quickly corrected by a qualified, professional

fire alarm system service contractor. In addition to the tests by the head of the household, the owner should arrange for a complete inspection and test of the entire system by a qualified, professional fire alarm system service contractor annually.

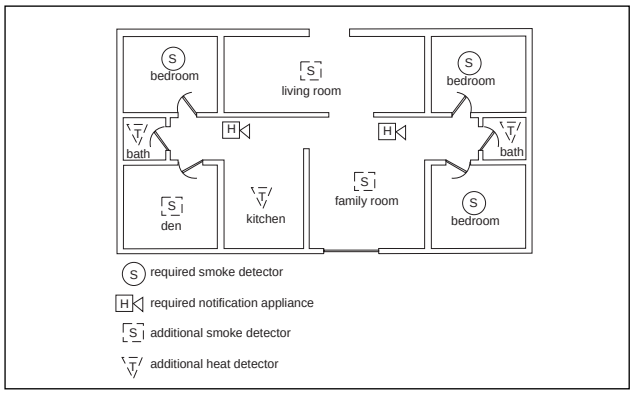


Figure 10.0a Detector Location - 3 Sleeping Areas

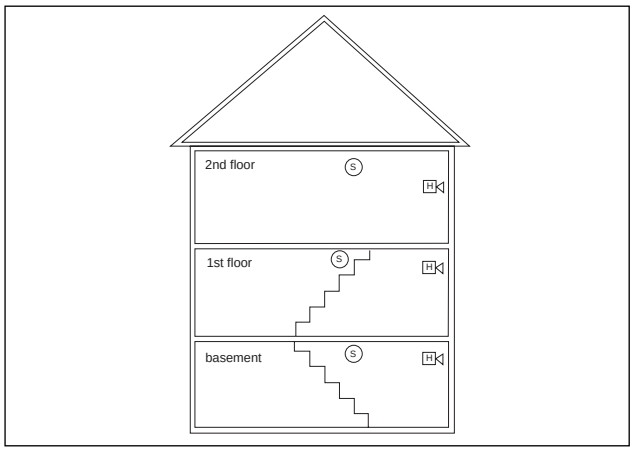


Figure 10.0b Detector Location - Per Floor

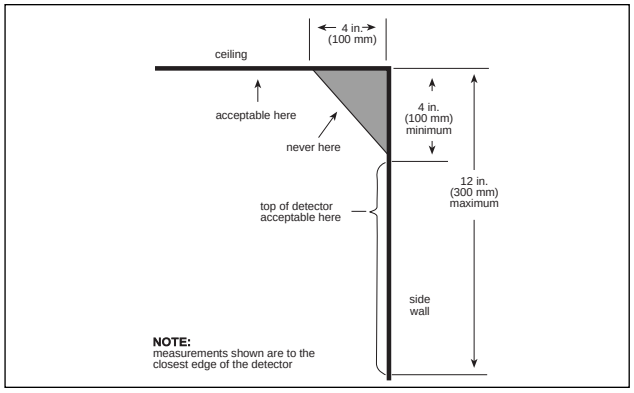


Figure 10.0c Detector Location - Ceiling/Wall Mount

11.0
PANEL SPECIFICATIONS

11.1 GENERAL

Operating Temperature: ..... 0 to 49°C (32 to 120°F)
Housing
Type ..... Steel with hinged/removable, locking door
Size ..... 14.72 in x 21.80 in x 5.20 in
..... (55.37 cm x 37.39 cm x 13.20 cm)
Finish ..... Red enamel
Weight ..... 16.0 lbs

11.2 2500-BMB - BASIC MASTER BOARD

A. POWER

Input Power ..... 110 - 120 VAC
Standby Power ..... 24 VDC
Auxiliary Power Output ..... 24 VDC, 1.0 A max.
..... 26.4 VDC max. - no load

NOTE: Auxiliary power output supply is shared with power for indicating circuit. Consider total requirement.
(I_{aux} + $I_{IND\ \#1}$ + $I_{IND\ \#2}$ + $I_{IND\ \#3}$ + $I_{IND\ \#4}$ = 7.0A)

Optional Standby Battery 24 Volts
Battery Charger Rate ..... 800 mA max.
Battery Charge Voltage ..... 28.4 V max.

B. ALARM INITIATING CIRCUITS

Number of Circuits ..... One - Model 2501
Type ..... Class B, Latched (Style B)
End-of-Line Resistance ..... 2.7k Ohm, ½W
Loop Powered Device Current ..... 5.0 mA
Maximum Current ..... 248 mA
Maximum Voltage ..... 13.9 Volts
Normal Circuit Voltage ..... 12.0 Volts
Minimum Voltage ..... 9.6 Volts
Maximum Ripple Voltage ..... 500 mV AC
Max Line Resistance ..... 30 Ohms (Compat. Ident. C01)
..... 30 Ohms (Compatibility, Identifier C01A)*

* *Not available at this time.*

C. NOTIFICATION APPLIANCE CIRCUITS

Number of Circuits ..... Two Class B (Style Y)
Maximum Current per Circuit ..... 1.5 Amperes
Maximum Total Current ..... 6.0 Amperes
Output Voltage ..... 24 VDC Nominal
..... less than 1.0 V p-p AC ripple
End-of-Line Resistance ..... 2.7k Ohms, ½W

D. SUPPLEMENTARY ALARM/TROUBLE CONTACTS

System Trouble ..... 2.0 A @ 30 VDC resistive
System Alarm ..... 2.0 A @ 30 VDC resistive

E. SOUNDER OUTPUT

Alarm ..... Constant Output
Fault ..... ~0.25 sec on: 2.5 sec off
Supervisory ..... ~0.25 sec on: 0.25 sec off

11.3 2500-ZEM - ZONE EXPANDER MODULE

A. INITIATING CIRCUITS

Number of Circuits ..... Four - Class B Model 2504
..... Two - Class B Model 2502
Type ..... Class B, latched (Style B)
End-of-Line Resistance ..... 2.7k Ohms, ½W
Loop Powered Device Current ..... 5 mA
Maximum Current ..... 248 mA
Maximum Voltage ..... 13.9 Volts
Normal Circuit Voltage ..... 12.0 Volts
Minimum Voltage ..... 9.6 Volts
Maximum Ripple Voltage ..... 500 mVAC
Max Line Resistance ..... 30 Ohms (Compat. Ident. C01
..... 30 Ohms (Compatibility Identifier (C01A)*

* *Not available at this time.*

11.4 2500-ZRM - ZONE RELAY MODULE

Number of Circuits ..... Two - ZRM2
..... Four - ZRM4
Contact Ratings ..... 5 A @ 12 VDC, 120 VAC resistive
..... 2 A @ 30 VDC, 240 VAC resistive

11.5 2500-BELL - BELL EXPANDER MODULE

A. NOTIFICATION APPLIANCE CIRCUITS

Number of Circuits ..... Two Class B (Style Y)
Maximum Current per Circuit ..... 1.5 Amperes
Maximum Total Current ..... 6.0 Amperes
Output Voltage ..... 24 VDC Nominal
..... less than 1.0 V p-p AC ripple
End-of-Line Resistance ..... 2.7k Ohms, ½W

11.6 POWER BOOSTER

Normal Standby Current ..... 1.0 mA
Alarm Current ..... 23 mA
Normal Circuit Voltage ..... 24 V Nominal
End-of-Line Resistance ..... 2.7k Ohms, ½W *

* *The EOL is dependent upon the UL Listed reversing NAC circuit that is used to signal the power booster. Use the correct EOL for the UL Listed panel that is connected to the power boost terminals.*

11.7 2500-LEM/LRM

A. LEM

Normal Standby Voltage ..... 0.5 VDC
Output Voltage (in Alarm) ..... 24 VDC Nominal
Alarm Current ..... 110 mA (1.5 A peak)
Standby Current ..... 6.5 mA

B. LRM

Normal Standby Voltage ..... 7.8 VDC
Output Voltage (in Alarm) ..... 24 VDC Nominal
Alarm Current ..... 9.15 mA (12 mA peak)
Standby Current ..... 2.8 mA
End-of-Line Resistance ..... 2.7k Ohms, ½W

11.8 2500-RA

Number of Zones ..... 13 Alarm, 13 Trouble
Standby Current ..... 50 mA ± 5%
Alarm Current ..... 160 mA max

11.9 2500-RADVR

Number of Zones ..... 13 Alarm, 13 Trouble
Standby Current ..... 50 mA ± 5%
Alarm Current ..... 160 mA max
Active Low Output (in Alarm) ..... -40 mA
Output (in Standby) ..... 1.35 mA

11.10 2500-DAC

Standby Current ..... 88 ± 7 mA
Alarm Current ..... 138 mA max

APPENDIX A
COMPATIBLE EQUIPMENT

The equipment listed here is compatible with the 2501 (FACP). USE ONLY UL LISTED COMPATIBLE EQUIPMENT WITH THE 2501 (FACP) SERIES TO ASSURE PROPER OPERATION. Should you have any questions about compatibility, call Sentrol Technical Services: 1-800-800-2027.

INITIATING DEVICES

ESL Model	Suffix Letters
103-20	Single action SPST manual fire alarm station
103-21	Single action DPST manual fire alarm station
103-22	Dual action SPST manual fire alarm station
103-22S	Dual action SPST manual fire alarm station NY stripe
103-23	Dual action DPST manual fire alarm station
103-24	Dual action, pre-signal DPST manual fire alarm station
103-31	Single action SPST with key reset
103-32	Single action DPST with key reset
103-42	Dual action SPST with key reset
103-60	Weatherproof, single action SPST with key reset manual fire alarm station
103-80	Explosion-proof dual action DPDT with key reset
104-13	135º fixed temp rate of rise, single circuit heat detector
104-14	194º fixed temp rate of rise, single circuit heat detector
104-15	135º fixed temp, single circuit heat detector
104-16	194º fixed temp, single circuit heat detector

Figure A.1 UL Listed Non-Coded Manual Alarm Stations and Heat Detectors

The following ESL Four-Wire Smoke Detectors are UL Listed and voltage compatible with the 2501 (FACP):

ESL Model Series	Suffix Letters
445	C, CT, CR, CRT, CS, CST, CSR, CSRT, and CSH
449	C, CT, CRT, CST, CSRT, CSRH, CSST, CSSTE and CTE
741 with 702E, 702U base	U
742 with 702E, 702U base	U
204-12/24V EOL Power Supervision Device	

Figure A.2 UL Listed Four-Wire Smoke Detectors (Any of these Four-Wire detectors can be mixed and matched on a system).

Detector Series	Detector Models	Maximum Line Resistance (Ohms)	Control Unit Compatibility Identifier	Detector Compatibility Identifier	Number per Circuit	Base Compatibility Identifier
ESL 400	429C, 429CT	30	C01	S10A	20	N/A
	429CRT, 429CST, 429CSST*	30	C01A	S11A	20	N/A
ESL 500	521B, 521BXT	30	C01	S09A or S10A	20	N/A
ESL 600	611U, 611UD, 611UT	30	C01	S10	40	N/A
(Use 600 Series Bases)	612, 612UD, 613U5	30	C01	S10	40	N/A
	601U (base)	N/A	N/A	N/A	N/A	S00
	602U (base)	N/A	N/A	N/A	N/A	S03
ESL 609 Duct Detectors	611UD, 612UD	30	C01	S10	20	N/A
	609U10 (base)	N/A	N/A	N/A	20	S00
	609U11 (base)	N/A	N/A	N/A	20	S02
ESL 709 Duct Detectors	709-DW-21 (721UD)	30	C01	S10A	20	S10A
	709-DW-31(731UD)*	30	C01	S11A	20	S11A
ESL 700	711U, 711UT, 712U	30	C01	S10A	20	N/A
(Use 700 Series Bases)	721U, 721UD, 712UT,	30	C01	S10A	20	N/A
	722U, 713-5U, 713-6U	30	C01	S10A	20	N/A
	701E, 701U (bases)	N/A	N/A	N/A	N/A	S00
	702E, 702U (bases)	N/A	N/A	N/A	N/A	S00
	731U, 731UD, 732U*	30	C01A	S11A	20	N/A
	702RE, 702RU (bases)	N/A	N/A	N/A	N/A	S00

Figure A.3 Two-Wire Smoke Detector Compatibility (any of these Two-Wire Smoke Detectors may be mixed and matched on the system.)

** Not available at this time.*

NOTIFICATION APPLIANCES

The following devices are UL Listed notification appliances and signaling devices for use with the 2501 (FACP).

ESL Model Series	Description
106-06, 106-10	Vibrating Bell
107-81, 107-82, 107-85, 107-86, 107-87	Horn
108-81, 108-82, 108-83, 108-84, 108-85, 108-86, 108-87, 108-88	Strobes
109-81, 109-82, 109-83, 109-84, 109-85, 109-86, 109-87, 109-88, 109-89, 109-90, 109-91, 109-92, 109-93, 109-94, 109-95	Horn Strobes
110-81, 110-82, 110-83, 110-84	Speakers
111-81, 111-82, 111-83, 111-84, 111-85, 111-86	Speakers Strobes
AU-360-M1, AU-360-M2, AU-360-M1-DMR, AU-360-E, AU-380-M1, AU-380-M2, AU-380-M1-DMR, AU-380-E,	Voice Evacuation Communication Panel AU-DMR11, AU-562-2
2500-DAC	Digital Alarm Communicator Transmitter

Figure A.4 2501 (FACP) Compatible Indicating Devices (All Indicating Devices 24 VDC)

Ordering Information	Description
DHR-1224C	12 or 24 V DC/AC, recess mount, chrome, with 3" extension rod
DHR-1224B	12 or 24 V DC/AC, recess mount, brass, with 3" extension rod
DHR-24120C	24 or 120 V DC/AC, recess mount, chrome, with 3" extension rod
DHR-24120B	24 or 120 V DC/AC, recess mount, brass, with 3" extension rod
DHF-1224C	12 or 24 V DC/AC, semi-flush mount, chrome
DHF-1224B	12 or 24 V DC/AC, semi-flush mount, brass
DHF-24120C	24 or 120 V DC/AC, semi-flush mount, chrome
DHF-24120B	24 or 120 V DC/AC, semi-flush mount, brass
DHS-1224C	12 or 24 V DC/AC, surface mount, chrome
DHS-1224B	12 or 24 V DC/AC, surface mount, brass
DHS-24120C	24 or 120 V DC/AC, surface mount, chrome
DHS-24120B	24 or 120 V DC/AC, surface mount, brass
Extension Rods	
DH-ER1C	1" chrome
DH-ER1B	1" brass
DH-ER3C	3" chrome
DH-ER3B	3" brass
Accessories	
DHW	Extension rod wrenches
DH-BP	Back Plate (Chrome or Brass)
DH-ARMC	Door holder, armature assembly, chrome
DH-ARMB	Door holder, armature assembly, brass

Figure A.5 Ordering Information Table

EXAMPLE:
DHF-24210-B

DH = Door Holder
24120 = Model/Voltage
F = Flush
S = Surface Mount
R = Recess Mount
C = Chrome Plating
B = Brass Plating

NOTE: These door holders may only be used in the 24 VDC configuration. The Aux terminals may be used to supply power. Battery saver mode is not acceptable when connecting door holders to the ESL 2501.

APPENDIX B BATTERY CALCULATION WORKSHEET

2501 (FACP) STANDBY BATTERY POWER WORKSHEET

2501 (FACP) Component	Number of Devices	Standby Current per Device	Total Standby Current	Alarm Current per Device	Total Alarm Current
2500 BMB (includes Zone 1)	N/A	135 mA	135 mA	200 mA	335 mA
Notification Appliance Circuit #1		6 mA*	mA	mA	mA (1500 mA max)
Notification Appliance Circuit #2		6 mA*	mA	mA	mA (1500 mA max)
Auxiliary System Power		mA	mA	mA	mA (1000 mA max)
Zone Expander (Model 2504) 4 Class B Zones		40 mA	mA	840 mA with all zones violated	mA
Zone Expander (Model 2502) 2 Class B Zones		30 mA	mA	830 mA with all zones violated	mA
Relay Follower Module (Model 2500-ZRM2) 2 Relay Zone Follower		0 mA	0 mA	30 mA with both zones violated (15 mA per zone)	mA
Relay Follower Module (Model 2500-ZRM4) 4 Relay Zone Follower		0 mA	0 mA	60 mA with all zones violated (15 mA per zone)	mA
Bell Expander Module (NAC) #3 (Model 2500-BELL)		6 mA*	mA	mA	mA (1500 mA max)
Bell Expander Module (NAC) #3 (Model 2500-BELL)		6 mA*	mA	mA	mA (1500 mA max)
Printer Interface Module (Model ZXPTR) Centronics Printer Interface		50 mA		55 mA	mA
Keypad/Remote Annunciator (Model 2500-KPD) Keypad, Programming Device, and/or Remote Annunciator		25 mA**		50 mA**	mA
Remote Annunciator (Model 2500-RA)		53 mA		168 mA	
Remote Annunciator (Model-RADVR)		53 mA		168 mA	
Digital Alarm Communicator (Model 2500-DAC)		95 mA		138 mA	
Local Energy Module (Model 2500-LEM/LRM)		30 mA		144 mA (1.8 A peak)	
Line Reversal Module (Model 2500-LEM/LRM)		26 mA		54 mA (56 mA peak)	
Total Current Requirements					

* supervision current only

** standby and alarm current for the keypad is 100 mA for 4 minutes after each keypress or after initiating an alarm or trouble condition

Figure B.1 Battery Calculation Worksheet

BATTERY CAPACITY

The following steps should be used to determine the correct battery capacities for your system.

1. First you must determine the exact configuration of your system from the as built drawings generated during the installation process.
2. Determine the number of notification appliances and the standby current for each notification appliance on each notification appliance circuit. Complete the appropriate entries on the worksheet.
3. Determine the number of devices and the standby current for each device attached to the Auxiliary power terminals on the Basic Master Board. Complete the appropriate entries on the worksheet.
4. From the as built drawings, determine the number of each type of expansion module (Zone Expander Module, Relay Follower Module, Bell Expander Module, Printer Interface Module, Keypad and Remote Annuciator) on the system and complete the appropriate entries on the worksheet.
5. Total the rows across the worksheet and total the Total Standby Current and Total Alarm Current columns to arrive at the Total Standby Current Requirements and Total Alarm Current Requirements for your system.
6. Transfer the Total Standby Current Requirements to the TOTAL STANDBY CURRENT entry and perform the indicated mathematical operation. This provides you with the Standby Amp-hours your system requires. The REQUIRED # OF HOURS IN STANDBY varies by locale. Check with the proper Authority Having Jurisdiction to determine your requirements.
7. Transfer the Total Alarm Current Requirements to the TOTAL ALARM CURRENT entry and perform the indicated mathematical operation. This provides you with the Alarm Amp-hours your system requires. The REQUIRED # OF MINUTES IN ALARM varies by locale. Check with the proper Authority Having Jurisdiction to determine your requirements.
8. Carry the calculated values to the proper entries to arrive at the Minimum Battery Power Required for your system.
9. Due to the natural aging effects on batteries due to time, temperature, cycles and the level of discharge during cycles, a de-rating factor is applied to help predict the battery capacity more closely. Please consult the appropriate manufacturer data sheets for the appropriate de-rating factor to apply and then perform the indicated mathematical operation. The final result is the Total Standby Battery Capacity required.

NOTE: This system always requires two batteries. The calculations performed indicate the Amp-Hour rating that each battery must carry. Do not mix batteries of different capacities.

_____ mA X .001 Amp/mA X _____ hours = _____ Ah **Standby Amp - hours**

TOTAL STANDBY CURRENT	CONVERSION FACTOR	REQUIRED # OF HOURS IN STANDBY

_____mA X .001 Amp/mA X _____minutes x .0167 hour/min = _____Ah **Alarm Amp - hours**

TOTAL ALARM CURRENT	CONVERSION FACTOR	REQUIRED # OF MINUTES IN ALARM	CONVERSION FACTOR

Standby Amp - hours + Alarm Amp - hours = Minimum Battery Power Required

_____ + _____ = _____ Ah

Minimum Battery Power Required	x	Battery Capacity Derating Coefficient	=	Total Standby Battery Required (17.2 Ah Maximum)
_____	x	_____	=	_____ Ah

The following table lists the maximum continuous loads that can be supported by the two 7 Ah or two 17.2 Ah batteries. If the total standby current exceeds those listed in the table, you do not meet 24 hour standby requirements. Notice that the Battery Saver Mode doubles the amount of current available to the load. This allows for the use of smaller batteries and the system still meets the 24 hour standby requirements. Other battery sizes are possible, but two 17.2 Ah batteries are the maximum battery size supported. If your standby time is different, the above calculations can be used to calculate the Total Standby Battery Power Required. If the answer exceeds the battery size you have chosen, then appropriate batteries must be installed or the system configuration must be adjusted to meet the battery power requirements.

Required Batteries	Maximum Continuous Load for 24/60 hour Standby			
	Normal Mode		Battery Saver Mode	
	24 hour	60 hour	24 hour	60 hour
Two 7.0 Ah	240mA	100mA	480mA	200mA
Two 17.2 Ah	500mA	200mA	1000mA	400mA

BATTERY CALCULATION WORKSHEET EXAMPLE

2501 (FACP) STANDBY BATTERY POWER WORKSHEET

EXAMPLE: Battery Calculation System will be one of the 2501, and two each of the Model 2504-ZEMs, 4-wire smoke detectors on Zone 1 and 2 with power supervision relays, 2-wire smoke detectors on Zone 3 through 9, Model 2500-ZRM4 relay follower modules for zones 2 through 9, Bells on Notification Appliance Circuit (NAC) #1 and Strobes on Notification Appliance Circuit (NAC) #2.

2501 (FACP) Component	Number of Devices	Standby Current per Device	Total Standby Current	Alarm Current per Device	Total Alarm Current
2500 BMB (includes Zone 1)	N/A	135 mA	135 mA	200 mA	335 mA
Notification Appliance Circuit #1	2 Bells	6 mA*	6 mA	70 mA	140 mA (1500 mA max)
Notification Appliance Circuit #2	2 Strobes	6 mA*	6 mA	180 mA	360 mA (1500 mA max)
Auxiliary System Power	2 Supervisory Relays	mA	56 mA	mA	56 mA (1000 mA max)
Zone Expander (Model 2504) 4 Class B Zones	2	40 mA	80 mA	840 mA with all zones violated	480 mA
Zone Expander (Model 2502) 2 Class B Zones		30 mA	mA	830 mA with all zones violated	mA
Relay Follower Module (Model 2500-ZRM2) 2 Relay Zone Follower		0 mA	0 mA	30 mA with both zones violated (15 mA per zone)	mA
Relay Follower Module (Model 2500-ZRM4) 4 Relay Zone Follower	2	0 mA	0 mA	60 mA with all zones violated (15 mA per zone)	120 mA
Bell Expander Module (NAC) #3 (Model 2500-BELL)		6 mA*	mA	mA	mA (1500 mA max)
Bell Expander Module (NAC) #3 (Model 2500-BELL)		6 mA*	mA	mA	mA (1500 mA max)
Printer Interface Module (Model ZXPTR) Centronics Printer Interface		50 mA		55 mA	mA
Keypad/Remote Annunciator (Model 2500-KPD) Keypad, Programming Device, and/or Remote Annunciator		25 mA		50 mA	mA
Remote Annunciator (Model 2500-RA)		53 mA		168 mA	
Remote Annunciator (Model-RADVR)		53 mA		168 mA	
Digital Alarm Communicator (Model 2500-DAC)		95 mA		138 mA	
Local Energy Module (Model 2500-LEM/LRM)		30 mA		144 mA (1.8 A peak)	
Line Reversal Module (Model 2500-LEM/LRM		26 mA		54 mA (56 mA peak)	
Total Current Requirements			**283 mA**		**1491 mA**

* supervision current only

283 mA X .001 Amp/mA X 24 hours = 6.792 Ah **Standby Amp - hours**

TOTAL STANDBY CURRENT | CONVERSION FACTOR | REQUIRED # OF HOURS IN STANDBY

1491 mA X .001 Amp/mA X 15 minutes x .0167 hour/min = .373 Ah **Alarm Amp - hours**

TOTAL ALARM CURRENT | CONVERSION FACTOR | REQUIRED # OF MINUTES IN ALARM | CONVERSION FACTOR

Standby Amp - hours + Alarm Amp - hours = Minimum Battery Power Required

6.792 + .373 = 7.165 Ah

Minimum Battery Power Required x Battery Capacity Derating Coefficient = Total Standby Battery Required (17.2 Ah Maximum)

7.165 x 1.15 = 8.24 Ah

The following table lists the maximum continuous loads that can be supported by the two 7 Ah or two 17.2 Ah batteries. If the total standby current exceeds those listed in the table, you do not meet 24 hour standby requirements. Notice that the Battery Saver Mode doubles the amount of current available to the load. This allows for the use of smaller batteries and the system still meets the 24 hour standby requirements. Other battery sizes are possible, but two 17.2 Ah batteries are the maximum battery size supported. If your standby time is different, the above calculations can be used to calculate the Total Standby Battery Power Required. If the answer exceeds the battery size you have chosen, then appropriate batteries must be installed or the system configuration must be adjusted to meet the battery power requirements.

Required Batteries	Maximum Continuous Load for 24/60 hour Standby			
	Normal Mode		Battery Saver Mode	
	24 hour	60 hour	24 hour	60 hour
Two 7.0 Ah	240mA	100mA	480mA	200mA
Two 17.2 Ah	500mA	200mA	1000mA	400mA

In this example, the two 7 Ah batteries in Normal Mode would not be sufficient to meet the 24 hour standby based on the 283 mA of continuous standby current required. However, if Battery Saver Mode is used, two 7 Ah batteries are sufficient. If the Battery Saver Mode is used, the power supervision relays must be rated for 12 VDC operation. This results from the decision to use Battery Saver Mode. Battery Saver Mode selects the Auxiliary terminals to be 12 VDC output instead of 24 VDC output.

NOTES

APPENDIX C

2501 (FACP) OPERATING INSTRUCTIONS

Refer to the ESL 2501 Fire Alarm Control Panel Installation Manual for more information, Part # 64812711.

NORMAL STANDBY CONDITION
- •Green "AC POWER" LED "ON"
- •All other LEDs "OFF"
- •All switches in "NORMAL" position

ALARM CONDITION
- •Red local zone alarm LED "ON"
- •Integral sounder sounds a steady signal
- •Common alarm relay contacts transfer and latch
- •Indicating circuits turn "ON"

ALARM DISCONNECT SWITCH OPERATED (PRIOR TO ALARM CONDITION) ***For Maintenance Use Only***
- •Disconnects local zone alarm from common alarm relay
- •Disconnects local zone alarm from the alarm indicating circuits
- •Red local zone alarm LED turns "ON"
- •Alarm signal from any other zone is NOT affected

ALARM DISCONNECT SWITCH OPERATED (AFTER ALARM CONDITION) ***For Maintenance Use Only***
- •Alarm indicating circuits are turned "OFF"
- •Red local zone alarm LED remains "ON"
- •Alarm signal from any other zone is NOT affected

RESET SWITCH OPERATED
- •Initiating circuit power removed (smoke detectors reset)
- •Indicating circuits turn "OFF"
- •Integral sounder turns "OFF"
- •Common alarm relay is reset
- •System restored to normal unless initiating devices are NOT reset

TROUBLE CONDITION
- •Yellow system trouble LED is "ON"
- •Yellow local zone LED is "ON"
- •Integral sounder sounds a slow intermittent signal
- •System common trouble relay contacts transfer

TROUBLE SILENCE SWITCH OPERATED
- •Integral sounder is "OFF" when system trouble is present
- •System common trouble relay contacts not affected
- •Will NOT silence supervisory alarm, supervisory trouble or system alarm signals

SUPERVISORY ALARM SIGNAL
- •Integral sounder sounds a fast intermittent signal
- •Red local zone alarm LED is "ON"
- •Indicating circuits are NOT activated
- •Red supervisory LED is "ON"

SUPERVISORY TROUBLE SIGNAL
- •Integral sounder sounds a fast intermittent signal
- •Yellow local zone trouble LED is "ON"
- •System common trouble relay contacts transfer
- •Yellow supervisory LED is "ON"

REMOTE TEST (FIRE DRILL)
- •Indicating circuits turn "ON"
- •Integral sounder sounds a slow intermittent signal
- •Common alarm relay contacts do NOT transfer
- •Keying the test switch will pulse the indicating circuits

The following applies to Household Fire Warning Systems only:

TESTING – In a Household Fire Warning System, Test Monthly. Disconnect the AC power source during testing. If, after testing, a low battery condition exists, replace the batteries.

"This equipment should be installed in accordance with the National Fire Protection Association's Standard 72 (NFPA, Batterymarch Park, Quincy, MA 02269). Printed information describing proper installation, operation, testing, maintenance, evacuation planning and repair service is to be provided with this equipment."

WARNING:
Owner's instruction notice: "Not to be removed by anyone except occupant."

FOR SERVICE CONTACT:

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Remove this page, frame and mount adjacent to control unit.

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SENTROL

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