EST3
Installation and Service Manual

P/N 270380 • Rev 3.0 • 21OCT99

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DOCUMENT HISTORY

Date	Revision	Reason for change
17JUL96	1.0	Initial release
31MAR97	1.5	Revised: detector cleaning procedure; CAB & RCC Cabinets; download wiring; Compatibility info; Power supply specifications; 3-CPU wiring; System addressing; 3-IDC8/4 jumpers & wiring Added: power supply location information; 3-SSDC Filter Board; Humidity limits, Isolator limits.
14DEC98	2.0	Revised: 3-ASU & 3-RS485 specifications; Battery shelf data; Module current draw; 3-CPU1 network wiring Added: 3-AADC module; CDR-3 Zone Coder; Centralized audio components; Buffered RS-232 Communications Cable; PT-1S switch settings; 3-FIB information; 3-TAMP(5); RACCR Enclosure; SIGA-APS Power Supply; SIGA-AAxx Audio Amplifiers.
21OCT99	3.0	Incorporated changes concurrent with software release version 1.5. Revised structure to reduce duplicate information.

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Important information

Limitation of liability

This product has been designed to meet the requirements of NFPA Standard 72, 1996 Edition; Underwriters Laboratories, Inc., Standard 864, 7th Edition; and Underwriters Laboratories of Canada, Inc., Standard ULC S527. Installation in accordance with this manual, applicable codes, and the instructions of the Authority Having Jurisdiction is mandatory. EST shall not under any circumstances be liable for any incidental or consequential damages arising from loss of property or other damages or losses owing to the failure of EST products beyond the cost of repair or replacement of any defective products. EST reserves the right to make product improvements and change product specifications at any time.

While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, EST assumes no responsibility for errors or omissions.

FCC warning

This equipment can generate and radiate radio frequency energy. If this equipment is not installed in accordance with this manual, it may cause interference to radio communications. This equipment has been tested and found to comply within the limits for Class A computing devices pursuant to Subpart B of Part 15 of the FCC Rules. These rules are designed to provide reasonable protection against such interference when this equipment is operated in a commercial environment. Operation of this equipment is likely to cause interference, in which case the user at his own expense, will be required to take whatever measures may be required to correct the interference.

About this manual

This manual provides information on how to properly install, wire, and maintain the EST3 life safety system and related components.

Organization

Chapter 1 provides a descriptive overview of the components and subsystems that comprise a system

Chapter 2 provides installation information for system components and applications in addition to the instructions provided on individual component installation sheets.

Chapter 3 provides information and procedures necessary to perform initial system turn on and acceptance testing.

Chapter 4 provides a listing of required scheduled maintenance items and procedures.

Chapter 5 This chapter provides a comprehensive set of procedures and tables to aid certified technical personnel in servicing and troubleshooting the system.

Appendices A, B, and C provide additional supplementary information about the system and system components.

Safety information

Important safety admonishments are used throughout this manual to warn of possible hazards to persons or equipment.

WARNING: Warnings are used to indicate the presence of a hazard which will or may cause personal injury or death, or loss of service if safety instructions are not followed or if the hazard is not avoided.

Caution: Cautions are used to indicate the presence of a hazard which will or may cause damage to the equipment if safety instructions are not followed or if the hazard is not avoided.

The EST3 library

A family of documents and multi-media presentations supports the EST3 life safety system. A brief description of each document is provided below.

EST3 Installation Manual and Service Manual, *P/N 270380.* This manual provides complete information on how to install and service the EST3 hardware. This manual also includes installation information on selected Signature Series components.

EST3 Programming Manual, P/N 270381. This manual provides quick reference information for defining and labeling individual system components using the Systems Definition Utility (SDU), and for writing rules to govern system operation.

EST3 System Operations Manual, P/N 270382. This manual provides detailed information on how to operate the system and system components.

EST3 International Installation Supplement Manual, P/N 270925. This manual provides information specific to systems installed outside the United States and Canada.

EST3 Smoke Management Application Manual, P/N 270913. This manual provides information for designing, programming, and testing an EST3 smoke control system.

EST3 Users Self-Study Course, P/N 270684. This course contains a self-paced manual, and accompanying video. The course is designed for building personal, security guards, firefighters, and similar individuals that may be required to operate the system.

Signature Series Intelligent Smoke and Heat Detectors Applications Bulletin, *P/N 270145.* This manual provides additional applications information on the Signature series smoke and heat detector applications.

Signature Series Component Installation Manual, P/N 270497. This manual provides detailed mounting and wiring information for all Signature series devices.

Speaker Application Guide, P/N 85000-0033. This manual provides information on the placement and layout of speakers for fire alarm signaling and emergency voice communications.

Strobe Applications Guide*, P/N 85000-0049*. This manual provides information on the placement and layout of strobes for fire alarm signalings.

Related documentation

	National Fire Protection Association (NFPA) 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101
NFPA 70	National Electric Code
NFPA 72	National Fire Alarm Code
	Underwriters Laboratories Inc. (ULI) 333 Pfingsten Road Northbrook, IL 60062-2096
UL 38	Manually Actuated Signaling Boxes
UL217	Smoke Detectors, Single & Multiple Station
UL 228	Door Closers/Holders for Fire Protective Signaling Systems
UL 268	Smoke Detectors for Fire Protective Signaling Systems
UL 268A	Smoke Detectors for Duct Applications
UL 346	Waterflow Indicators for Fire Protective Signaling Systems
UL 464	Audible Signaling Appliances
UL 521	Heat Detectors for Fire Protective Signaling Systems
UL 864	Standard for Control Units for Fire Protective Signaling Systems
UL 1481	Power Supplies for Fire Protective Signaling Systems
UL 1638	Visual Signaling Appliances
UL 1971	Visual Signaling Appliances
	Underwriters Laboratories of Canada (ULC) 7 Crouse Road Scarborough, Ontario M1R 3A9
ULC S527	Standard for Control Units for Fire Alarm Systems
ULC S524	Standard for the Installation of Fire Alarm Systems
ULC S536	Standard for the Inspection and Testing of Fire Alarm Systems
ULC S537	Standard for the Verification of Fire Alarm Systems
PLUS	Requirements of state and local building codes. Requirements of the Authority Having Jurisdiction.

Chapter 1

System overview

Summary

This chapter provides a descriptive overview of the components and subsystems that comprise a system.

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System description

The EST3 is designed using modular hardware and software components to facilitate rapid configuration, installation, and testing. Most network components are provided as local rail modules (LRMs) that plug into the rail chassis assemblies. Rail chassis assemblies are available to meet most any application.

Rail modules are used for data processing, intrapanel communication of command/control data, response data, audio signal processing, and power distribution. Each rail module provides an interface to support a control/display module that can be mounted on the front of the module. Most field wiring is terminated using removable terminal strips for easy installation and servicing of modules.

Cabinets are available in a variety of sizes. The smallest (CAB5), in addition to the 3-CPU1 module and primary power supply module, supports 2 rail modules and 3 control/display modules. The largest, the CAB21 supports as many as 18 rail modules and 19 control/display modules.

An EST3 cabinet can be configured as a standalone fire alarm system or connected as part of a network which supports up to 64 cabinets on a peer-to-peer Class A or B token ring network. Below is a partial list of local rail modules that can be incorporated into a system:

- 3-CPU1 Central Processor module (one required for each panel)
- 3-LCD Display module
- Control/display modules
- 3-PPS/M Primary Power Supply module (one required for each panel)
- 3-BPS/M Booster Power Supply module
- 3-SSDC Signature Driver Controller module
- 3-AADC Analog Addressable Driver Controller module
- 3-IDC8/4 Initiating Device Circuit module
- 3-OPS Off-Premises Signaling module
- 3-ZAxx Zoned Amplifier modules

The audio and firefighter's telephone functions utilize a different hardware format, providing operator controls and storage for the microphone and telephone handset in a chassis configuration.

System features

Each cabinet in the system provides local control, display, all power supply and communication functions. Each cabinet can support the following:

- 10 addressable device circuits (Signature and Addressable Analog combined).
- 120 traditional input/output zones
- 456 LED annunciation points
- 342 input switches

In addition, the EST3 system has these global features:

- Firefighter's telephone
- Custom programmability and User-friendly front panel
- Class B (Style B), Initiating Device Circuits (IDC)
- Event reporting by alarm, trouble, supervisory, or monitor mode and message display routing
- Dead front construction
- Supports networking - up to 64 nodes may be connected in a regenerative Class A or Class B token ring
- Fast response time, less than 3 seconds from initial alarm to device activation on a fully loaded system over the network
- Flash memory on controller modules to facilitate quick firmware upgrades
- Two RS-232 external peripheral device ports
- Multiplexed 8-channel digital audio system
- Transient protected field wiring
- Class B (Style Y) or Class A notification appliance circuits
- Ground fault detection by panel, Signature data circuit, and Signature modules
- Switch mode power supply
- Copper network/audio communications
- Applications and firmware downloading over the network or from a single point
- Network wide control routing.
- Form C alarm, supervisory, and trouble relay contacts

Refer to the release notes for the latest information regarding specifications and capabilities.

Minimum system requirements

NFPA 72 System Classification	Required Control Equipment
Protected Premises (Local) (Chapter 3)	Cabinet w/ 3-CPU1 Central Processor module; 1 3-LCD operator interface, 1 3-PPS/M primary power supply w/batteries, appropriate initiating device circuits & notification appliance circuits.
Auxiliary (Chapter 4-7)	Add an 3-OPS off-premises signaling rail module to the protected premises system
Remote Station (Chapter 4-5)	Add an 3-OPS off-premises signaling rail module to the protected premises system
Proprietary Protected Premises (Chapter 4-4)	Add an 3-OPS off-premises signaling rail module to the protected premises system

System construction

The EST3 system is assembled in layers as shown in Figure 1-1. The cabinet (1) houses all the system components. A variety of cabinets are available for as few as 5 and as many as 21 modules. A CAB14 cabinet is illustrated in Figure 1-1.

Mounted directly to the cabinets are the rail chassis assemblies (2), of which there are three types: rail, audio, and audio with telephone. The most common chassis is the rail chassis, which provides mounting and electrical connections for the local rail modules (LRMs) (4). Mounted on the rear of the chassis are the cabinet power supplies (3).

The local rail modules (4) are the specialized cards that provide an interface between the 3-CPU1 and the field wiring. The front of any rail module can support a control/display module (5), providing customized operator controls and annunciators.

Completing the EST3 “CAB” series cabinet assembly are the inner (6) and outer (7) doors. The “RCC” cabinets use a single outer door.

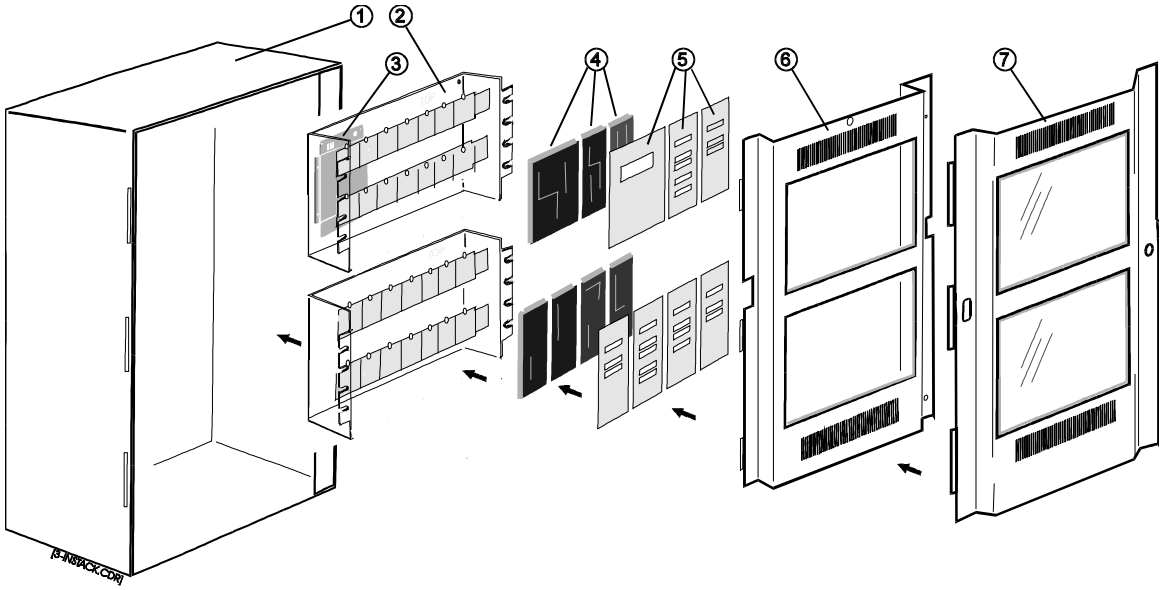


Figure 1-1: Exploded CAB series cabinet equipment installation

Audio subsystem functional description

The audio subsystem consists of a variety of signal sources, integral amplifiers, and sophisticated control software. The 3-ASU Audio Source Unit is available with the optional 3-FTCU Firefighter's Telephone Control Unit as the model 3-ASU/FT. The ASU/FT is the only audio equipment required at the fire command control center. Zoned audio amplifiers are distributed throughout the system and provide the de-multiplexing, switching, amplification and circuit supervision.

Network audio riser wiring

A digital network audio riser consisting of a single pair (Class B) or two pairs (Class A) of wires connect all amplifiers together. Since the digital signals are multiplexed, any of 8 independent audio sources can be directed to any amplifier connected to the network. All command and control signals for the audio system are distributed over the network data riser.

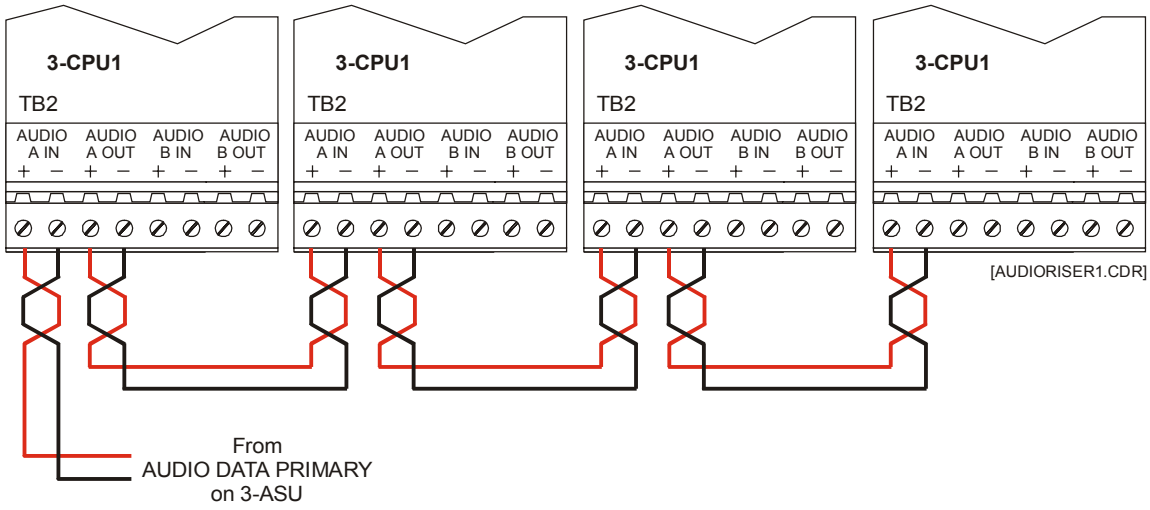


Figure 1-2: Class B network audio riser wiring

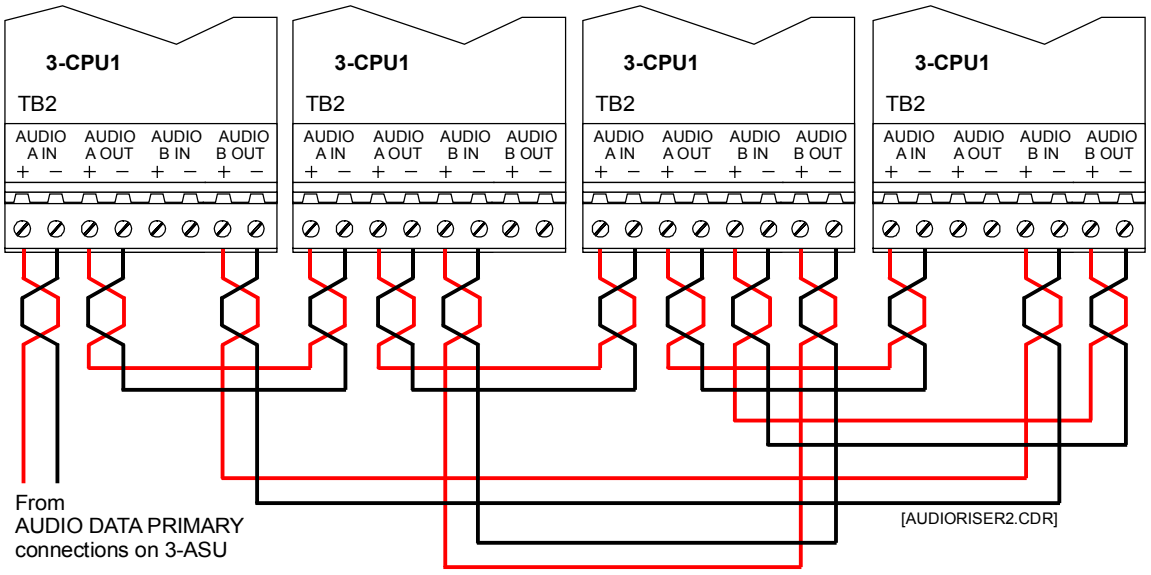


Figure 1-3: Class A network audio riser wiring

Amplifiers

Amplifiers are designed to feed a single audio zone and provide an integral 24 Vdc visual notification appliance circuit. Amplifier modules are available in 20-, 40-, and 90-watt versions, with each amplifier providing a single supervised Class B or A audio output circuit. The amplifier is configurable for either 25 Vrms or 70 Vrms output. An independent supervised Class B or Class A, 24 Vdc, 3.5 Amp notification appliance circuit (NAC) is also provided on the 20- and 40-watt amplifiers to drive notification appliances. In addition, automatic backup amplifiers can be added on a switched common backup configuration.

Each audio power amplifier has an integral demultiplexer, making the 8 audio channels available to the amplifier's input, as directed by the system programming. Each amplifier also contains circuitry that handles routine signal processing functions such as channel priority.

The amplifier's output is a dedicated, supervised, 25-, 70-Vrms speaker circuit, which covers one audio zone in the protected facility. Figure 1-4 is an example of an enclosure with four zone amplifiers and a backup amplifier. In response to an alarm, selected audio amplifiers have been connected to the required audio channels. Note that three different audio signals are being broadcast simultaneously.

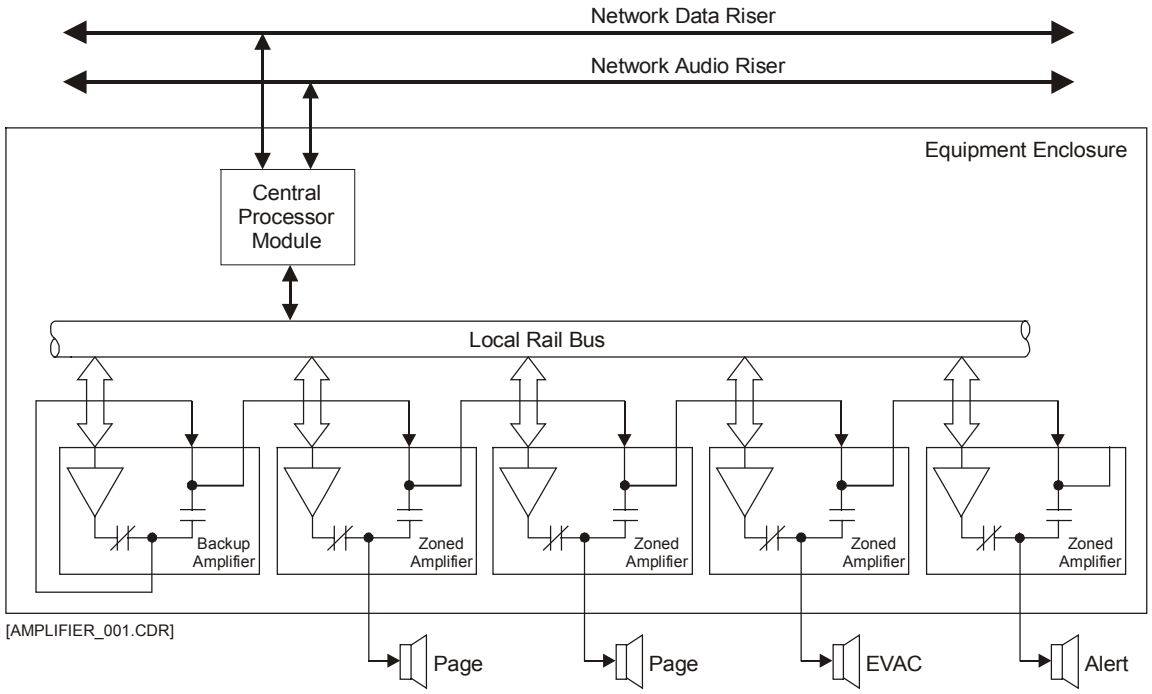


Figure 1-4: Normal amplifier operation

Possible fault condition	Amplifier operation
Amplifier loses communication with Central Processor module	If the panel is configured for standalone operation, the amplifier automatically switches to the EVAC channel and outputs its 1-kHz temporal tone when the panel detects an alarm. If the panel is not configured for standalone operation, the amplifier will not output any signal.
Panel loses communication with network data riser	Amplifier switches to the EVAC channel only in response to the local panel's programming but can only output the default EVAC message.
Panel loses communication with network audio riser	Amplifier switches to the EVAC channel in response to the system programming but can only output its 1-kHz temporal tone.

Backup Amplifiers

In the event of an amplifier failure (not a field wiring problem), the backup amplifier automatically replaces the failed amplifier, as shown in Figure 1-5.

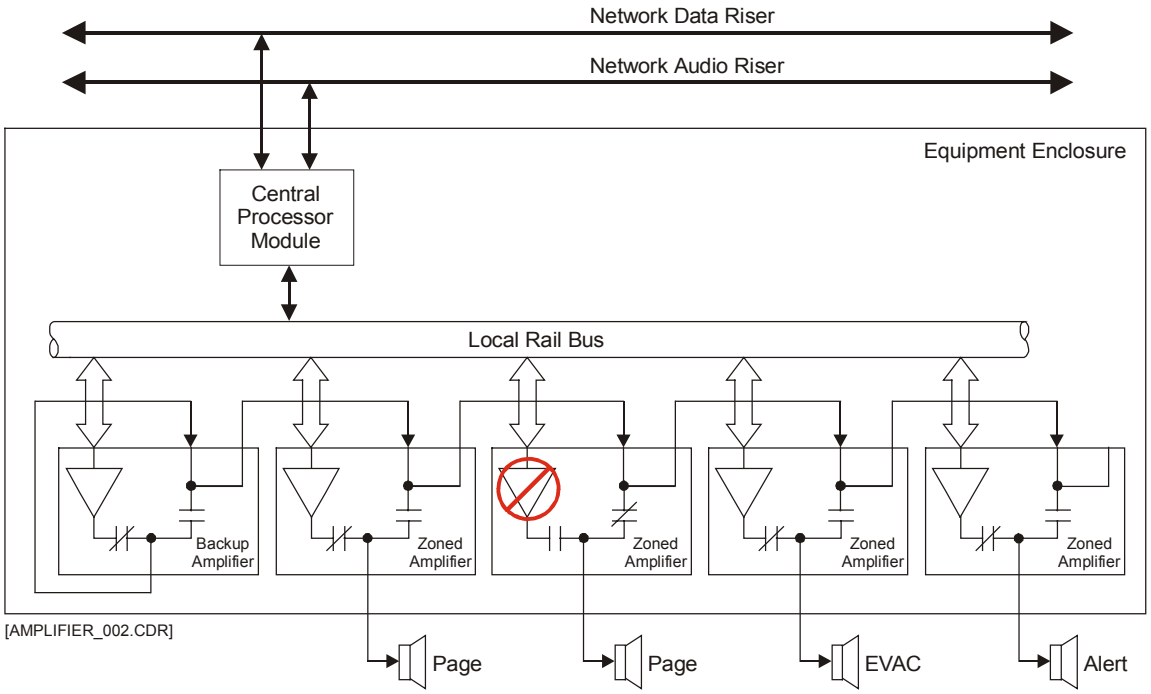


Figure 1-5: Single amplifier failure

Note: The backup amplifier will back up a failed amplifier if it was being used for Page, EVAC, or Alert. It will not back up an amplifier being used on an Auxiliary or General channel.

The amplifier failure caused the backup amplifier to automatically connect to the same audio source as the failed amplifier. The output of the backup amplifier replaced the output of the failed amplifier.

Note: The backup amplifier will not replace an amplifier that has detected a field wiring problem to prevent the amplifier from driving into a shorted circuit.

3-ASU Audio Source Unit

The 3-ASU is the source of the network audio riser. Available audio sources are local and remote voice PAGE functions, the firefighters telephone PAGE function, and an auxiliary audio input for non-emergency paging, etc. An integral tone generator database is provided for the EVAC, ALERT and other functions. Alternately, the 3-ASU's integral digital voice message playback unit can simultaneously provide up to 8 different prerecorded audio messages that may be assigned to any channel.

The multiplexer within the 3-ASU converts and compresses the real-time audio signal and converts it to a digital format. The output of the digital message playback unit and the integral tone generator database is already in the digital format. The 8 signal sources in digital format are then combined together as selected by the system designer using a multiplexer. This makes up the network audio riser signal.

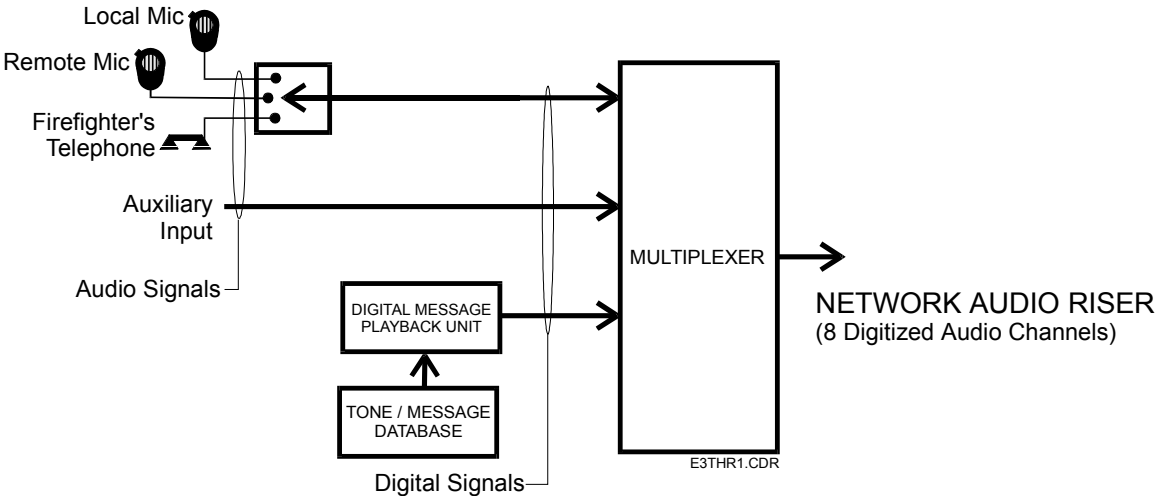


Figure 1-6: ASU Signal Flow

The amplifiers at the remote-panels extract the audio signals from the network riser, amplify it and send it to the speakers.

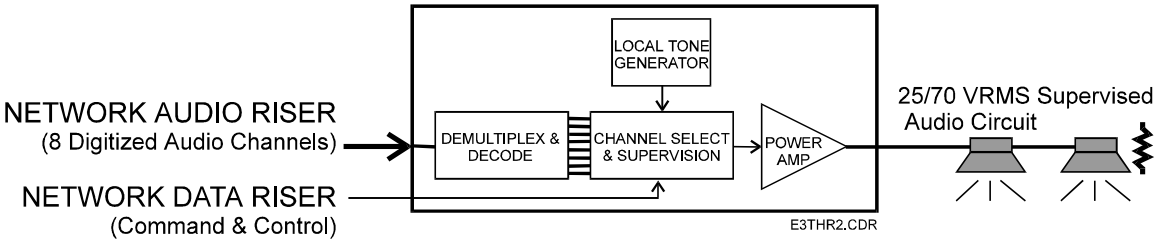


Figure 1-7: Amplifier Signal Flow

Audio Signal Priority

During system configuration, each of the eight available audio channels is assigned one of the five available attributes listed in Table 1-1. The Page, and Auxiliary attributes may only be assigned to a single channel. The General attribute may be assigned to up to four channels.

Table 1-1: Network Audio Channel Parameters

Channel Attribute	Priority
PAGE	1
EVAC	2
ALERT	3
AUXILIARY	4
GENERAL	5

Each channel attribute has a priority level associated with it. When more than one channel is commanded to source a given amplifier, the amplifier will connect to the source having the highest priority. The Page channel will only go active when the microphone push-to-talk switch is pressed.

Special audio source unit page modes

The front panel of the ASU offers four special page mode switches: All Call, EVAC, Alert, and All Call Minus. These switches provide instantaneous switching of the page signal to the most frequently contacted areas of the building. The special page modes do *not* require any source switching by the zoned audio amplifiers. When a special page mode switch is activated, the signal content of the eight outgoing audio channels is modified. Figure 1-8 illustrates this principle.

In the *normal page mode*, the eight audio signal sources are each connected to a separate audio channel, as represented by a ■ at the intersection of the signal source and the audio channel, shown at the lower left of Figure 1-8. Each audio channel is represented as a vertical line in this figure. The eight audio channels are actually multiplexed together and distributed over a common pair of wires called the network audio riser. The figure shows the system in the normal page mode, with the zoned audio amplifiers processing EVAC signals on the 1st and 3rd levels, a page signal on the 2nd level, and the alert signal on the 4th level.

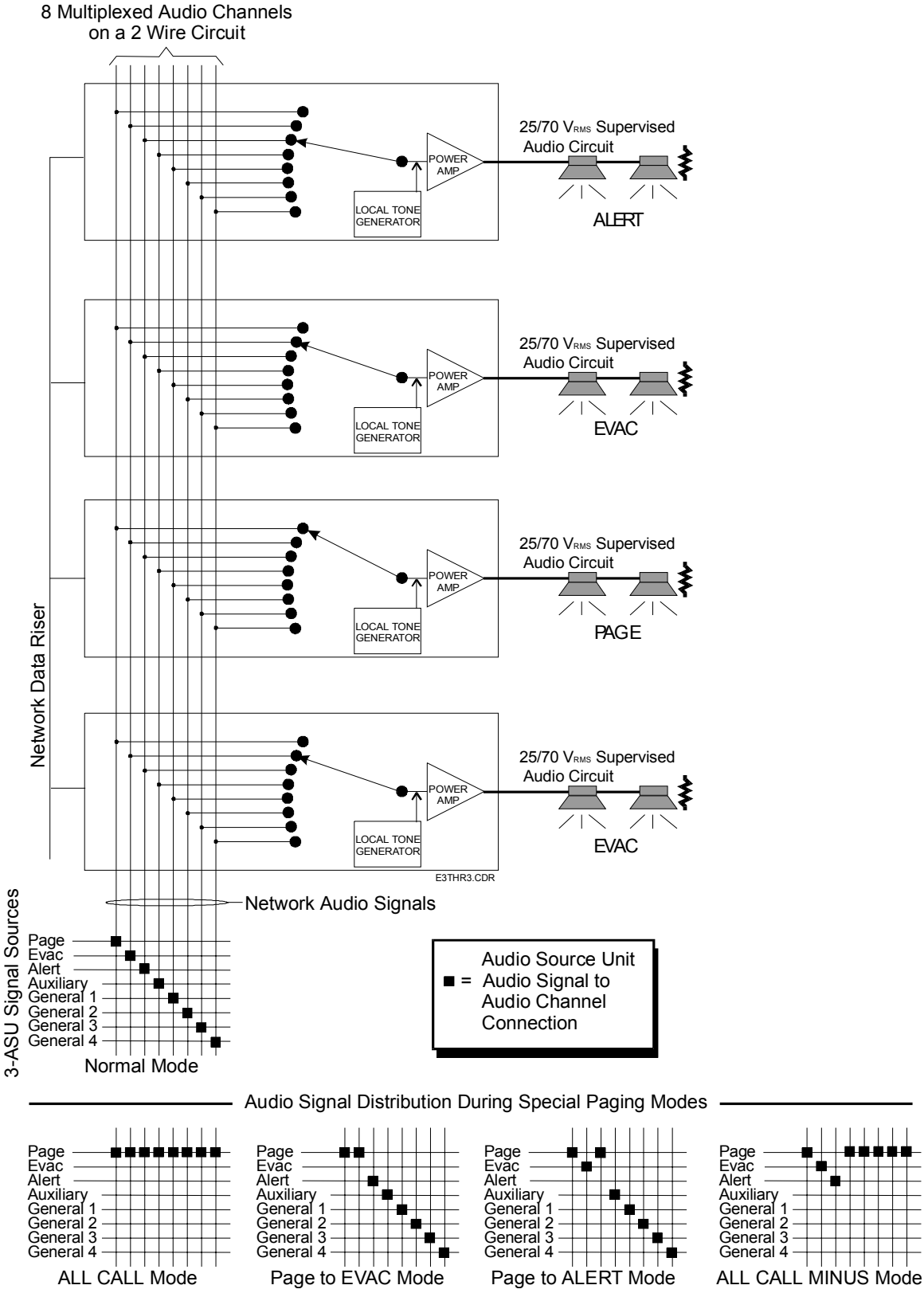


Figure 1-8: Audio Source Unit Special Page Mode Signal Flow

The *All Call* mode is used to send a page to the entire facility. When the All Call switch is activated, the Audio Source Unit is put into the all call mode. In this mode, the zoned audio amplifiers do not all transfer to the page channel. Rather, the Audio Source Unit redirects the page signal source to all the audio channels. Figure 1-8 shows the all call page source to audio channel connections in the lower left corner. Note that all channels receive the same signal. Any amplifier on the system, regardless of the audio channel selected, will receive the page. Any amplifiers that were previously idle will power up and receive the page.

The *Page to EVAC* mode is used to send a page to the areas automatically receiving the evacuation signal. Activating the EVAC switch causes the Audio Source Unit to enter the page to EVAC mode. In this mode, the zoned audio amplifiers connected to the EVAC channel do not transfer to the page channel. Rather, the Audio Source Unit redirects the page signal source to the EVAC channel. Figure 1-8 shows the page to EVAC mode page source to EVAC channel connections. The page and EVAC audio channels both receive the page signal. Any amplifier connected to either the page or EVAC audio channels will receive the page. The alert, auxiliary and general channels are connected to their respective signal sources, as in the normal mode.

The *Page to Alert* mode is used to send a page to the areas automatically receiving the alert signal. Activating the Alert switch causes the Audio Source Unit to enter the page to alert mode. In this mode, the zoned audio amplifiers connected to the alert channel do not transfer to the page channel. Rather, the Audio Source Unit redirects the page signal source to the alert channel. Figure 1-8 shows the page to alert mode page source to alert channel connections. The page and alert audio channels both receive the page signal. Any amplifier connected to either the page or alert audio channels will receive the page. Any amplifiers that were previously idle will power up and receive the page. The EVAC, auxiliary and general channels are connected to their respective signal sources, as in the normal mode.

The *All Call Minus* mode is used to send a page to all areas NOT automatically receiving the EVAC or alert signals. In high rise applications, all call minus is an effective way to quickly select stairwells. Activating the All Call Minus switch causes the Audio Source Unit to enter the all call minus mode. In this mode, the zoned audio amplifiers connected to the auxiliary and general channels do not transfer to the page channel. Rather, the Audio Source Unit redirects the page signal source to the auxiliary and four general channels. Figure 1-8 shows the all call

minus mode page source to auxiliary and general channel connections. The page, auxiliary and four general audio channels all receive the page signal. Any amplifier connected to the page, auxiliary or general audio channels will receive the page. The EVAC and alert channels are connected to their respective signal sources, as in the normal mode.

Automatic messaging

One of the features of the 3-ASU Audio Source Unit is the method used to monitor the integrity of the digital audio system. When an audio messaging system is configured, default audio messages are recorded for the Evacuation and Alert channels. The text of default messages should be generic in nature, and should not include location-specific instructions. When the system is in the normal condition, the 3-ASU continuously transmits default messages over the network audio riser. The zone amplifiers use the default messages to verify their operational integrity, as well as the integrity of the riser wiring.

When an alarm is detected, the evacuation and alert message channels are selected by the amplifiers in the appropriate areas in the facility, as directed by the system rules. If a specific evacuation message has been programmed to play in response to the alarm, it is sent out over the evacuation channel. Location specific evacuation messages contain information and instructions that should only be used for a specific alarm location. Should a second alarm from another location be received, the evacuation message playing as a result of the first alarm may not be appropriate for the second alarm.

Note: In the event of conflicting messaging instructions caused by multiple alarm events, the system will play the default evacuation message, whenever two or more different messages are requested at the same time on the evacuation channel.

Automatic message processing is illustrated in Figure 1-9. By reverting back to the generic default evacuation message in multiple alarm location scenarios, no one can be misdirected by the wrong message. Default messages also play during alarms when no location specific message has been requested.

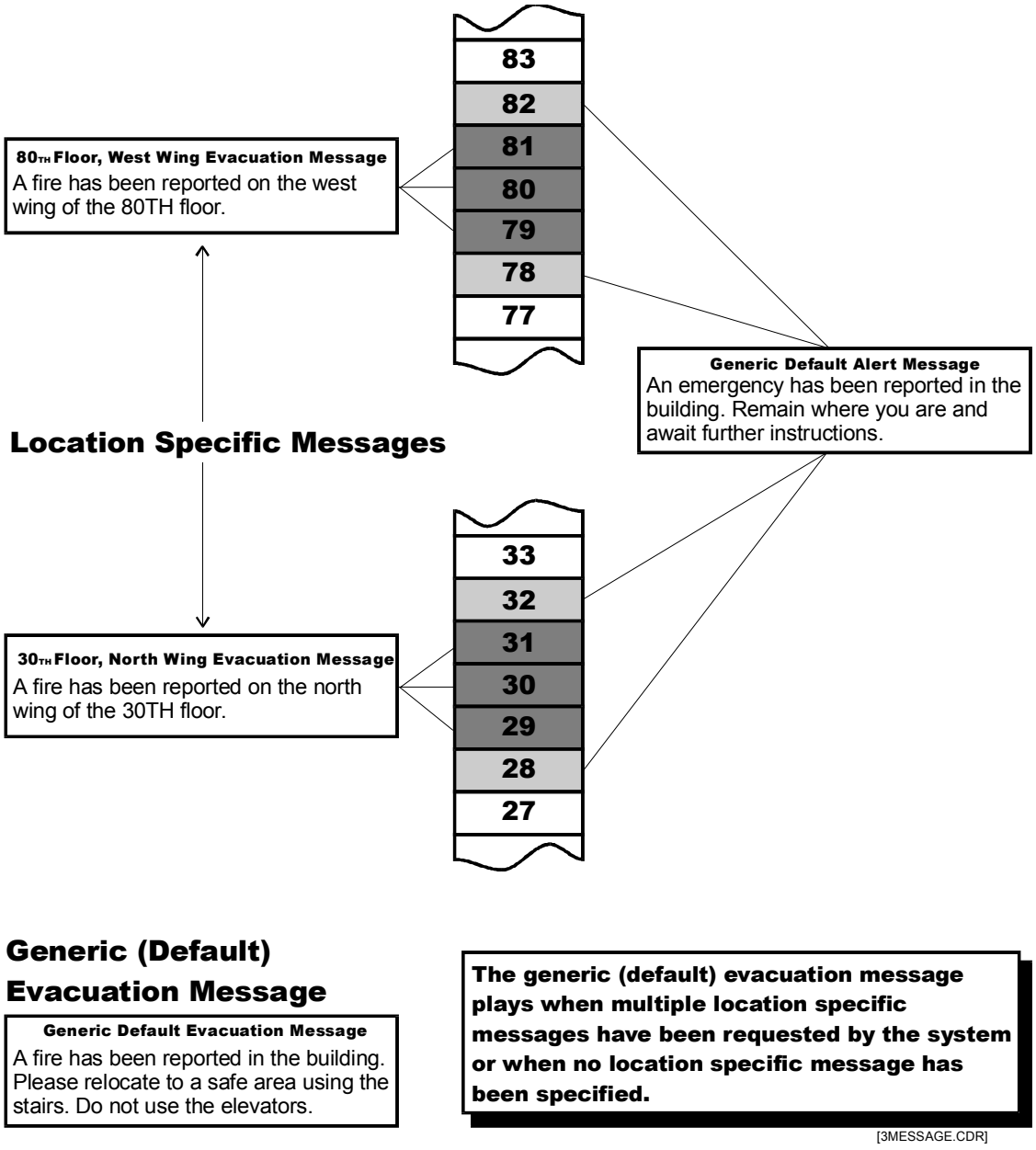


Figure 1-9: Automatic Message Processing

Firefighter's telephone

The 3-FTCU contains a master telephone handset that provides an analog telephone riser for totally independent 2-way communications between the fire command station and Firefighter's telephone stations/jack telephones installed at strategic locations throughout the protected facility.

Taking a telephone off-hook or plugging into a telephone jack generates a visual and audible incoming call signal at the fire

command station. The individual originating the call hears a tone until the handset is connected to the system. The fire command station operator manually connects the incoming phone call to the phone riser to complete the call. Up to five (5) remote telephones may be connected to the riser simultaneously. The fire command center operator can also use the telephone circuit as a page source, permitting paging via the telephone system.

Digital network subsystem functional description

Network data riser wiring

The network data riser provides the communication path between each CPU module (3-CPUx or 3-ANNCPUx) installed in the system. Each CPU module has two bi-directional RS-485 ports (Network A and Network B) that are used to connect the network data riser wiring. Network B is isolated from ground and Network A is not.

The correct method for running the network data riser is to connect the isolated Network B port on one CPU module to the non-isolated Network A port on another. Any remote CPU modules connected to a local CPU module's Network B port is considered to be *downstream* from the local CPU module. Any remote CPU modules connected to a local CPU module's Network A port is considered *upstream* from the local CPU module.

Additionally, *next* and *previous* refer to the order in which remote CPU modules are electrically connected to a local CPU module. *Previous* refers to the remote CPU module whose isolated Network B port connects to the local CPU module's non-isolated Network A port. *Next* refers to the remote CPU module whose non-isolated Network A port connects to the local CPU module's isolated Network B port.

Note: Since the data traveling the network data riser is bi-directional, *out* and *in* references are used to direct wire connections.

Class B network data risers

In a Class B network, a break or short in the network data riser wiring divides the network into separate independent networks. Panels on the same side of the line fault will communicate with each other but not with panels across the line fault. Figure 1-10 shows the wiring for a Class B network.

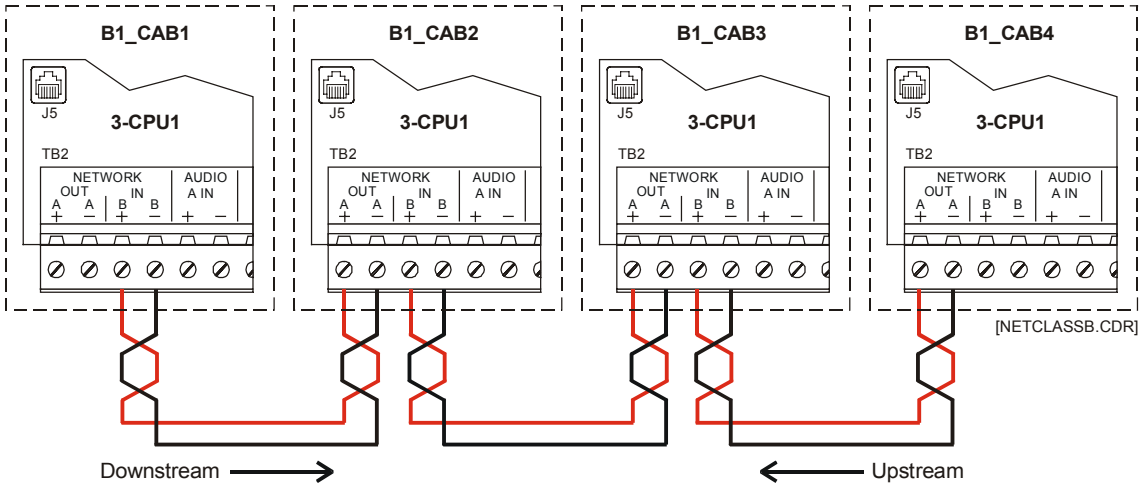


Figure 1-10: Class B network data riser wiring using copper wire

Note: As a matter of convention, a Class B network data riser should start at the CPU module that does not have wires connected to its Network A port.

When wiring a Class B network, give careful consideration as to the location of the service panel. The service panel provides a single point from which you can download files to all other panels on the network. For this function to work properly you must use the panel at the start of the network data riser as the service panel. See *Downloading data files* for more information.

Class A network data risers

In a Class A network, a single break or short in the network data riser wiring does not interrupt communications between panels. Figure 1-11 shows the wiring for a Class A network.

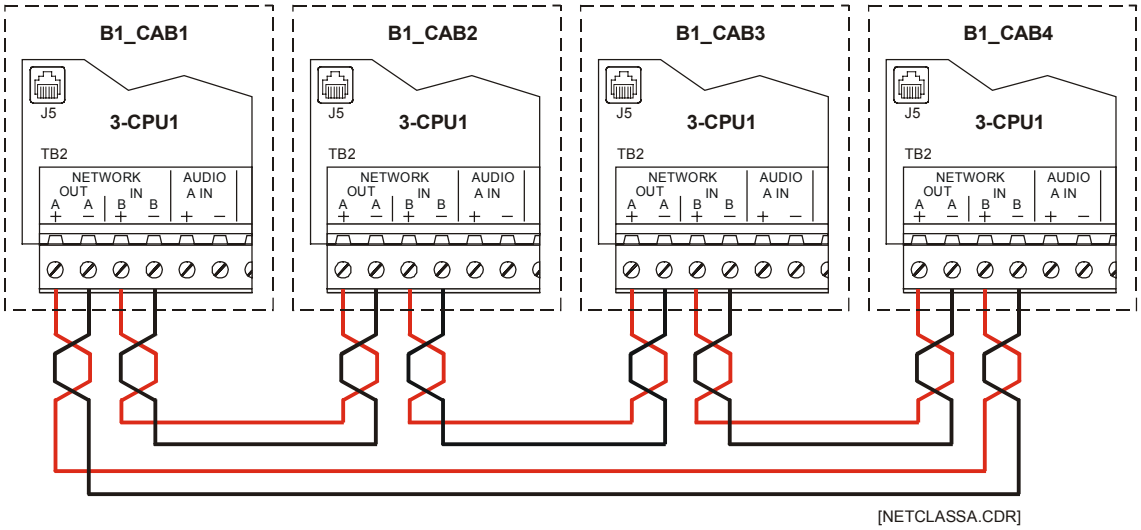


Figure 1-11: Typical Class A network data riser wiring using copper wire

Download connections

Each programmable rail module has a modular phone jack to use for downloading data directly from the SDU computer. The modular phone jack on any CPU module can also be used to download data to other programmable rail modules in the same panel over the rail bus, or to other panels over the network data riser.

In addition to the modular phone jack, the 3-CPU1 module has two serial communication ports that can be used to download data, provided both of these conditions are met:

- A 3-RS232 option card is installed
- The serial port used to download data is not configured for gateway or coder applications

Tip: To download data over the network without having to reconfigure the system, temporarily install a 3-RS232 option card on any 3-CPU1 module in the system and connect the SDU computer to serial port 1.

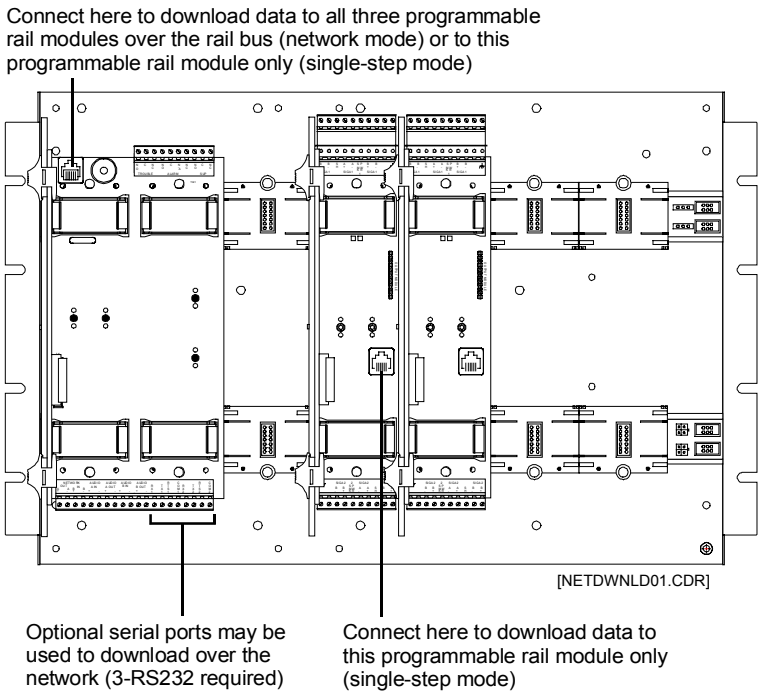


Figure 1-12: Potential connection points for downloading data

Downloading data files over the network

A CPU module's Network A port and its modular phone jack share an interrupt with the module's microprocessor. As such, the microprocessor disables the Network A port whenever you connect the SDU computer to the modular phone jack. Consequently, download options differ for Class A and Class B networks.

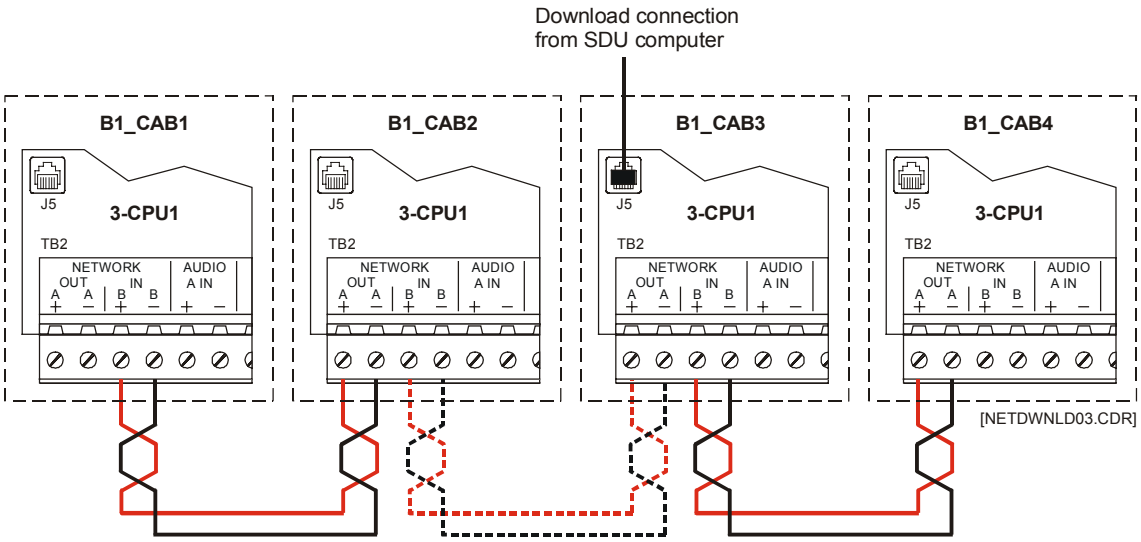


Figure 1-13: Impact of disabling Network A terminal connection on Class B networks during a download

Figure 1-13 shows how connecting the SDU computer to the modular phone jack affects downloading data over a Class B network. Connecting the SDU computer to the modular phone jack on the CPU module installed in panel B1_CAB3, disables that CPU module's Network A port. Downloading data to panels B1_CAB2 and B1_CAB1 from panel B1_CAB3 is no longer possible but downloading to B1_CAB4 still is.

Since the microprocessor only disables the Network A port, the CPU module that doesn't have a Network A port connection should be used as the service panel. It is the only panel that is capable of downloading to every panel on the network using the modular phone jack.

Note: Connecting the SDU computer to an optional serial communications port does not affect the Network A port. If a 3-RS232 option card is connected to the 3-CPU1, you can download data to any panel on a Class B network regardless of where the panel physically connects to the network data riser.

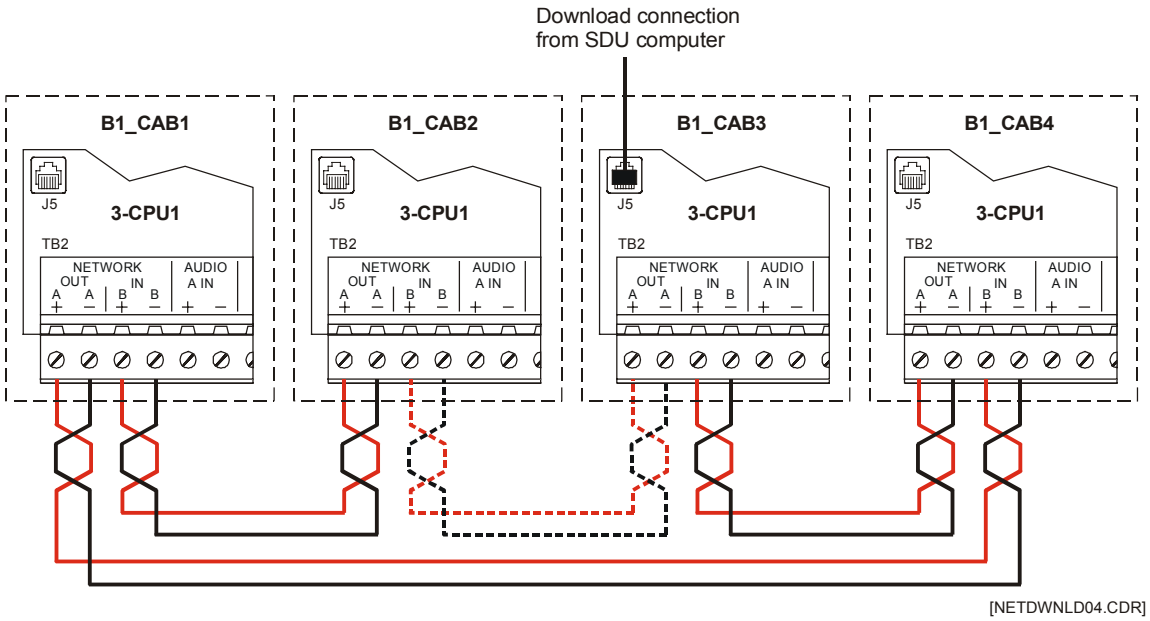


Figure 1-14: Impact of disabling Network A terminal connection on Class A networks during a download

On Class A networks however, see Figure 1-14, disabling the Network A port on panel B1_CAB3 does not prevent the other panels from receiving data through B1_CAB3's Network B port. Connecting the SDU computer to the modular phone jack does cause the panel to report a Network Class A Failure trouble. When the network data riser is configured for Class B, connecting to the panel modular phone jack causes the local CPU module to report a communications fault with every panel upstream of the local CPU module.

Tip: If you want to download data to every panel across the Class B network data riser, the download panel must be the first connection on the network data riser (the one with no connection on the Network A terminals.)

Signature series devices functional description

The Signature series family consists of intelligent smoke and heat detectors, bases, input/output modules, and ancillary devices. The EST3 network supports Signature series devices using the 3-SSDC Signature Driver Controller module. Up to 125 detectors and 125 modules can be connected to the Signature Data Circuit on the module.

The Signature series smoke and heat detectors contain their own microprocessors. This allows the devices to make alarm decisions based on the information gathered by the sensing elements incorporated in the device. Signature series detectors can be installed in any of three detector bases:

- The Standard Base provides wiring terminals for connection to a remote LED.
- The Relay Base provides a detector activated, pilot-duty dry contact relay used to control external appliances.
- The Isolator Base protects the Signature Data Circuit from wiring shorts.

Signature modules interface and support the operation of initiating devices, conventional 2-wire smoke and heat detectors, manual pull-stations, strobes, bells, etc. Signature series modules are also capable of monitoring and controlling fans and dampers in HVAC systems. The actual functions of each Signature module is determined by a personality code downloaded to the module through the System Definition Utility (SDU) program.

Signature series manual pull-stations (1-stage and 2-stage) feature an integral Signature module that monitors the station. One-stage stations are monitored by a single input module that sends an alarm signal to the loop controller when the station is activated. Two-stage stations are monitored by a dual input module which sends two independent alarm events to the control panel; one when the pull-switch is activated, and the second when the key switch is activated.

Alarm sensitivity setting

Alarm sensitivity refers to the primary threshold (expressed in percent smoke obscuration) at which the smoke detector will go into alarm. The alarm sensitivity setting for smoke detectors can be set to one of five sensitivity levels. When smoke detectors having both ionization and photoelectric elements are used, the sensitivity setting applies to both elements. Reduced sensitivity settings are used to reduce the occurrence of nuisance alarms. The alarm sensitivity setting may be individually set for each detector using the SDU program.

Alternate alarm sensitivity setting

Alternate alarm sensitivity refers to the secondary threshold (expressed in percent smoke obscuration) at which the smoke detector goes into alarm. The alternate alarm sensitivity setting for smoke detectors can be set to one of the same five sensitivity levels as the primary alarm. When smoke detectors having both ionization and photoelectric elements are used, the sensitivity setting applies to both elements. This feature permits increasing or reducing an individual detector's sensitivity at various times of the day, dependent upon, environmental conditions, occupancy, manufacturing processes, etc. Increased sensitivity is typically used when a facility is unoccupied. Reduced sensitivity is typically used to reduce the occurrence of nuisance alarms when occupancy or environmental conditions may create pre-alarm conditions. An alternate alarm sensitivity setting for each detector can be set using the SDU program.

Alarm verification

Upon receipt of the initial alarm signal from a verified detector, the EST3 panel issues a detector reset command. After a programmable reset/retard period, if the detector continues to generate an alarm during the fixed confirmation period, the alarm is considered valid and processed by the EST3 control panel. Alarm verification reduces the occurrence of nuisance alarms, as it provides a time frame in which the cause of the alarm can be investigated to determine whether an actual alarm condition exists. The alarm verification period can be increased or decreased through the SDU program, as limited by the listing agencies.

Alternate alarm verification

The alternate alarm verification feature operates the same way the alarm verification feature operates using a second, alternate, programmed reset/retard period.

Network applications and design considerations

This section deals with the initial layout of the network cabinets as well as application configurations for the basic network modules.

Network layout

The first task for the system designer is locating the equipment cabinets throughout the project. The objective when locating cabinets is to maximize the per cabinet coverage of the facility while minimizing hardware cost. The following general information should be used as a guide to designing the system.

The per cabinet coverage is, in some part, based upon the type of project being designed. In a high rise building installation that requires an audio emergency voice communication system, the problem becomes how many floors can be served by a single cabinet. In a campus style installation, there may be one or more cabinets per building, depending on building size.

Cabinet coverage

There are a number of factors that govern the area of a facility that can be covered by a single cabinet. These factors include:

- Cabinet capacity - Depending on the installed equipment, the largest backbox available can have 21 module spaces and 3 chassis spaces. Is this enough cabinet capacity to house the equipment required to cover the proposed area?
- Available current per cabinet - Does the proposed number of large current components (audio amplifiers and 24 VDC notification appliance circuits), in addition to the required module currents, exceed the available 28 amps per cabinet or 60-Ah battery capacity?
- Notification Appliance Circuit voltage drop - Does the distance to from the cabinet to the last strobe, horn, speaker, etc. exceed the acceptable limits?
- User interface requirements - Depending on the installed equipment, the largest backbox available can have 19 module displays installed. Will this provide enough capacity for the required control/display module functions?
- Distance between cabinets - Does the wiring length between any three cabinets exceed 5,000 ft. (1,524 m)?
- System capacity of 64 cabinets per network - Does the proposed system require more than 64 cabinets?

The other major factor that governs cabinet coverage is installation labor and material cost. For example, is it cheaper to

install a smaller cabinet and service the floor above and below the floor of installation, or install a larger cabinet with more equipment, and wire two floors above and two floors below the cabinet floor?

Feature/function domain

The EST3 life safety system utilizes peer-to-peer networking technology. No single cabinet is in control of the network. Peer-to-peer networking permits multiple control locations within a single network. The feature/function domain is defined as the group of cabinets that are affected when the feature or function is activated. A network cabinet may be a part of one or more groups. Multiple control locations are permitted for any group.

Three types of domains are available.

- Local - The feature/function affects only the cabinet on which the 3-LCD display is installed.
- Group - The feature/function affects a pre-defined group of cabinets on the network.
- Global - The feature/function affects all the cabinets on the network.

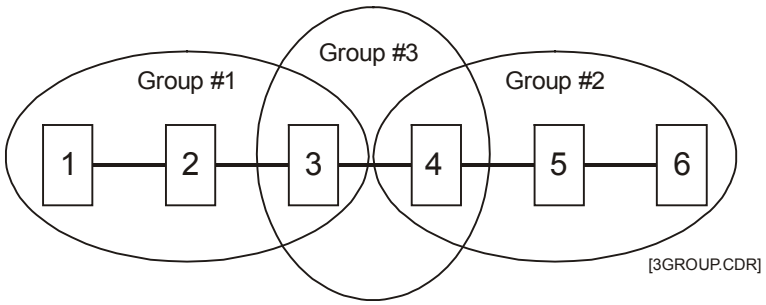


Figure 1-15: Sample domain consisting of three groups

Using the System Definition Utility (SDU) program, you can configure the system so that information from any cabinet can be selectively sent to any combination of other cabinets on the network.

Each cabinet may selectively transmit the following information to other cabinets on the network:

- Reset commands
- Alarm Silence commands
- Trouble Silence commands
- Drill commands
- Acknowledge commands

A cabinet can also be configured to receive state changes (Alarm, Supervisory, Trouble, Monitor, firefighter's telephone incoming calls), logicals, events, audio controls, etc., from a select group of cabinets.

Feature/function domains are associated with the cabinet providing the operator controls. In Figure 1-15, the feature/function domain for Cabinet 1, which has the operator controls for the first sub-net, is groups 1 and 3. The feature/function domain for Cabinet 6, which has the operator controls for the second sub-net is groups 2 and 3.

Two Sub-Networks, Operator Controls at Cabinets 1 and 6
Cabinets 3 and 4 Common to Both Sub-Networks

	Cabinet Transmitting Commands	Cabinet State	Reset Command	Alarm Silence Command	Trouble Silence Command	Drill Command	Acknowledge Command
		Commands					
Group 1	Cabinet 1	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4, 5, 6	1, 2, 3, 4
Group 1	Cabinet 2	1, 2, 3, 4	N/A	N/A	N/A	N/A	N/A
Group 3	Cabinet 3	1, 2, 3, 4, 5, 6	N/A	N/A	N/A	N/A	N/A
Group 3	Cabinet 4	1, 2, 3, 4, 5, 6	N/A	N/A	N/A	N/A	N/A
Group 2	Cabinet 5	3, 4, 5, 6	N/A	N/A	N/A	N/A	N/A
Group 2	Cabinet 6	3, 4, 5, 6	3, 4, 5, 6	3, 4, 5, 6	3, 4, 5, 6	1, 2, 3, 4, 5, 6	3, 4, 5, 6

[3DOMAIN1.CDR]

1,2,3,4,5,6 = Cabinets Receiving Command By Transmitting Cabinet
N/A = Not Applicable

Figure 1-16: Routed network commands for the domain illustrated in Figure 1-15

In Figure 1-16, the Cabinet 1 entry under the Cabinet State column indicates that Cabinet 1 should receive from cabinets 1, 2, 3, and 4 all information about changes of state. Because Cabinet 1 is the location of the operator controls it should send information about reset, alarm silence, trouble silence, drill, and acknowledgments to all the cabinets in the domain, which are cabinets 1, 2, 3, and 4. In this example, the drill command is common to both systems. Note, that the drill command is also sent to cabinets 5 and 6 by Cabinet 1.

The Cabinet 2 entry under the Cabinet State column indicates that Cabinet 2 receives its change of state information from cabinets 1, 2, 3, and 4. Because there are no operator controls located at cabinet 2, there is no need to send reset, alarm silence, trouble silence, drill, and acknowledgment information to other

cabinets. As an alternative, the table could show these commands sent to other cabinets, because they can never be issued due to the lack of a 3-LCD display module in the cabinet.

Cabinets 3 and 4 receive their change of state information from all cabinets on the network, as indicated in the cabinet state column. This is necessary as cabinets 3 and 4 are part of both domains. Again, there is no need to send reset, alarm silence, trouble silence, drill, and acknowledgment information to other cabinets from cabinets 3 and 4.

The Cabinet 5 entry under the Cabinet State column indicates that Cabinet 5 receives its change of state information from cabinets 3, 4, 5, and 6.

Cabinet 6 information indicates that Cabinet 6 should receive from cabinets 3, 4, 5, and 6 all information about changes of state. Because cabinet 6 is the location of the operator controls it should send information about reset, alarm silence, trouble silence, drill, and acknowledgments to cabinets 3, 4, 5, and 6, (all the cabinets in the domain.) In this example, the drill command is common to both systems. Note, that the drill command is also sent to cabinets 1 and 2 by Cabinet 6.

Audio application and design considerations

Amplifier selection

The EST3 system provides amplifiers with 20-, 40-, and 90-watt output ratings to meet any project requirement. Selection of the proper amplifiers requires an understanding of the amplifier characteristics and application related information that follows.

Audio zoning

The output of each amplifier usually covers a single audio zone, typically a floor of a high rise building. Using the appropriate Signature modules, the amplifier's output can be divided into several zones. The output circuit can be configured for either Class A or Class B wiring.

Output wattage

The output rating of an amplifier is determined by the speaker load it is required to drive, and any expansion or safety factor required. The speaker load is determined by adding up the value of all the wattage taps selected on each speaker connected to the amplifier. For a conservative approach, use the highest wattage tap available on each speaker. This insures there is enough head room to adjust speaker taps to compensate for any installation variables such as sound absorbing furniture, etc.

Output Voltage

Zoned amplifiers are available with either a 25 Vrms or 70 Vrms output. The 25 Vrms output amplifiers are primarily used in retrofit applications that previously had 25 Vrms speakers installed. 70 Vrms output amplifiers are recommended for new installations. The output circuits of a 70 Vrms amplifier can be run eight-times farther than a 25 Vrms amplifier, given the same load.

Note: If all the system wiring is required to be power limited, you may use any 20-, 40-, or 90-watt amplifier with either a 25 Vrms or 70 Vrms output.

Wiring considerations

Refer to Appendix B of this manual for wire distance calculations and other wiring considerations.

Backup amplifiers

Each cabinet can contain 1 zoned amplifier module to use to back up the remaining primary zoned amplifier modules installed in the same cabinet with the following restrictions:

- All the amplifiers must have the same output voltage rating.
- If the cabinet contains older amplifier modules (15- and 30-watt) and newer amplifier modules 20- and 40-watt), the amplifier used to back up the primary amplifier modules must be of the older type.

Note: In cases where older and newer zoned amplifiers exist in the same cabinet, the older modules should be replaced with newer modules for optimum results.

- The backup amplifier must have an output wattage rating equal to or greater than the largest primary amplifier it is backing up. If not, the output capacity of the speaker circuit is diminished proportionately.
- The wire used to wire the backup amplifier to the other amplifiers must be the same size or greater than that used to wire the speaker circuit.

Cabinet space

The 20- and 40-watt amplifiers each require one space on the rail assembly. The 90-watt amplifier requires two rail spaces.

The number of zoned amplifier modules that can be installed in a single cabinet is limited by the number of available rail spaces, the number of power supplies installed in the cabinet, and battery limits, if any.

Audio channels

The EST3 audio system provides eight (8) simultaneous channels for distribution of audio signals. The functions of four of these channels are fixed by the system. These four channels are referred to by their functions, i.e. Page, EVAC, Alert, and Auxiliary Input channels. The four remaining channels are referred to as general channels 1 to 4.

Under manual or automatic network control, each amplifier's input can be connected to either the Alert channel, the Evacuation (EVAC) channel, the Page channel, the Auxiliary Input channel, or one of four (4) general input channels. Should conflicting commands be issued to a single amplifier, the amplifier responds to the channel with the highest priority. The eight channels are prioritized as follows, with the Page channel having the highest priority

Page channel

Paging is a manual function. An operator is required to select a destination for the page, and then make an announcement. The Page channel is never automatically selected by the EST3 system.

The page channel always carries a live page signal, regardless of its source. There are four sources which can supply the paging signal: 1) the local 3-ASU microphone, 2) the remote microphone, 3) the firefighter's telephone system, and 4) the auxiliary audio input. These sources are automatically prioritized as shown in Table 1-2.

Table 1-2: Page priorities

Priority	Page signal source
1 (highest)	Local microphone
2	Firefighter's phone
3	Remote microphone
4 (lowest)	Auxiliary input

The page command is a non-latching function. When the page command ends, amplifiers automatically switch back to the source channel that was active (if any) prior to the page command.

Five types of page commands are available on the network. The first four page commands are available simply by pressing a single switch on the front of the 3-ASU. These are the paging functions most commonly used in an emergency situation.

1. The All Call command temporarily transfers all amplifiers to the Page channel while the page is active. All Call distributes the page signal to every amplifier in the system.
2. The Page to EVAC command temporarily transfers the Page signal to all amplifiers actively connected to the EVAC channel. All "EVAC" amplifiers then receive and distribute the Page signal.
3. The Page to Alert command temporarily transfers the Page signal to all amplifiers actively connected to the Alert channel. All Alert amplifiers then receive and distribute the page signal.
4. The All Call Minus command temporarily transfers the page signal to all amplifiers except those connected to the EVAC and Alert channels.
5. A Selective Page temporarily transfers the selected amplifiers to the Page channel while the page is activate, distributing the page signal only to selected audio zones (amplifiers). Audio zones are selected manually by the operator using the LED/Switch displays.

An example of how the page commands work is illustrated in Figure 1-17. This figure shows a nine story high rise building, with a fire on the 6th floor. The fire plan requires the evacuation signal to be sounded on the fire floor, floor above the fire, and floor below the fire. The alert signal is required to sounded in all other areas of the building except the stairwells. The first column (Fire Alarm) shows the automatic responses on the affected floors according to the fire plan.

		ASU Page Commands				
	Fire Alarm Signal	Page to Evac	Page to Alert	All Call Minus	All Call	Zoned Paging
Stairwells				*Page*	*Page*	
9TH Floor	Alert	Alert	*Page*	Alert	*Page*	Alert
8TH Floor	Alert	Alert	*Page*	Alert	*Page*	Alert
7TH Floor	Evac	*Page*	Evac	Evac	*Page*	Evac
Fire 6TH Floor	Evac	*Page*	Evac	Evac	*Page*	*Page*
5TH Floor	Evac	*Page*	Evac	Evac	*Page*	Evac
4TH Floor	Alert	Alert	*Page*	Alert	*Page*	Alert
3RD Floor	Alert	Alert	*Page*	Alert	*Page*	Alert
2ND Floor	Alert	Alert	*Page*	Alert	*Page*	Alert
1ST Floor	Alert	Alert	*Page*	Alert	*Page*	Alert

[PAGESEQ.CDR]

Figure 1-17: ASU Page Command Example

The Page to EVAC command replaces the EVAC signal with the Page signal, as shown in the figure's second column.

The third column shows the Page to Alert command response, all the Alert signals have been replaced by the Page signal.

The All Call Minus command directs the Page to the areas which are not receiving the EVAC or Alert signals, i.e. the stairwells. In the fourth column of Figure 1-17, the stairwells receive the Page signal when the All Call Minus command is used and do not automatically receive either the EVAC or Alert signals.

The All Call command directs the page signal to all areas of the building, as illustrated in the last column of Figure 1-17.

Any combination of floors and stairwells could be selected to receive the page by manually selecting the audio zones on the audio zone select control/display module. Notice that at no time does any area receiving a signal have its signal interrupted by any page command function.

Evacuation (EVAC) channel

The EVAC channel always carries a signal designed to notify the occupants they must leave the facility. The evacuation signal may take the form of a textual message, a variety of audio tones, or an audio tone modulated by the standard 3-3-3 evacuation pattern, or any combination of these signals.

The EVAC channel is pre-programmed, and activated by the system in response to an alarm. The EVAC signal is automatically sent to the areas that are in danger and require immediate evacuation.

The EVAC channel has priority over all channels signals except for the Page channel. The alarm silence function automatically silences the EVAC channel when an operator presses the Alarm Silence switch.

Alert channel

The Alert channel always carries a signal designed to notify the occupants that an emergency situation exists in the facility. Occupants hearing the alert signal are not in immediate danger, but should prepare to evacuate. In some installations, the alert signal advises occupants that persons evacuating the danger area will be entering the area for safety.

The Alert channel is pre-programmed, and activated by the system in response to an alarm. The Alert signal is automatically sent to areas that are not in immediate danger and do not require immediate evacuation.

The Alert channel has priority over all other channels except the Page and EVAC channels. The alarm silence function automatically silences the Alert channel when an operator presses the Alarm Silence switch.

General channel

The General channel is used to distribute special purpose signals to special areas in the facility. Typically these areas include elevator cabs, stairwells, and areas in less peril than those areas receiving the Alert signal.

The general channel signals can be pre-programmed in response to an alarm, or they may be manually activated.

General channels have a lower priority than the Alert channel. The alarm silence function does not automatically silence the Alert channel unless programmed to do so.

Auxiliary channel

The Auxiliary channel is provided to carry a low priority public address signal. The Auxiliary channel is supplied to the 3-ASU as a low level audio signal from an external source. The volume level of the auxiliary channel can be configured in the SDU program at 50% or 100% of the level used for the EVAC channel.

The Auxiliary Input channel is the lowest priority channel in the system and is overridden by all other channels. The alarm silence function does not automatically silence the Auxiliary channel unless programmed to do so.

Manual audio zone selection

If manual audio zone selection is required on the system, the appropriate control/display modules must be mounted on modules in the same cabinet as the Audio Source Unit. Typical configurations of control/display modules is shown in Figure 1-18. Exact operation of each display is dependent on system programming. Typical operation is described below.

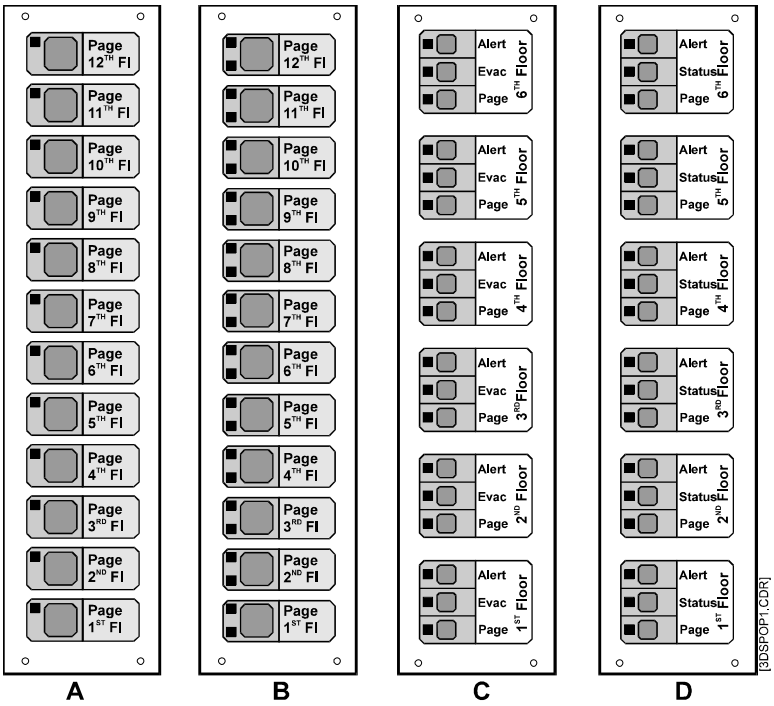


Figure 1-18: Audio zone selection displays

Display A is a model 3-12SG. Each floor switch provides audio zone selection for the Page signal, and the integral green LED indicates the audio zone is selected.

Display B is a model 3-12GY. Each floor switch provides Page audio zone selection. The green LED to the upper left of the switch indicates the audio zone is selected. The yellow LED to the lower left of the switch indicates audio circuit trouble.

Displays C and D are model 3-6/3Sxxx. The display C configuration permits manual selection of the Alert, EVAC, and Page signals by floor. This configuration is well suited for systems which do not sound signals through the entire facility during an alarm. Responsible authorities can then manually add EVAC and Alert signals to other floors of the facility. Display configuration D is used in facilities which sound the Alert signal in all areas not receiving the EVAC signal. This eliminates the need to switch the Alert signal. The middle switch is not used, the middle LED indicates amplifier status.

Messages

General

While there is no standardization on message content, messages must tell the occupant what is happening, why it is happening, and what actions they should take.

As a rule, each message should be repeated three times. If there is more than one language spoken in the area, the messages should be provided in each language.

A male voice has been demonstrated to be more authoritative than a female voice, and should be used where urgency is required. A female voice has been shown to initially gain the public's attention quicker than a male voice.

Alarm message format

The basic alarm message format consists of an alarm tone followed by an evacuation message repeated three times. The suggested alarm tone can take the form of a 1000 Hz tone modulated by the standard 3-3-3 evacuation pattern, a slow whoop, an electronic bell, a constant tone, or a constant tone modulated at a 120 pulse per minute rate. Please refer to the Authority Having Jurisdiction for specific requirements.

Typical Alarm Message text:

> Female Voice: "May I have your attention please. May I have your attention Please." Male Voice: "There has been a fire reported in the building." "Proceed to the nearest stairwell and exit the building." "Do not use the elevators." "Repeat, do not use the elevators."

Note: The EST3 amplifiers operate in a standalone mode should they lose communication with the Audio Source Unit. The alarm tone used in the alarm message should be the same tone used by the amplifier for stand alone alarm signaling.

Alert message format

The basic alert message consists of an alert tone followed by an advisory message. The suggested alert tone should be easily differentiated from the alarm tone and can take the form of a constant tone, or a constant tone modulated at a 20 pulse per minute rate. Please refer to the Authority Having Jurisdiction for specific requirements.

Typical Alert message text:

> Female Voice: "May I have your attention please. May I have your attention Please." Male Voice: "There has been an emergency reported in the building." "Your area is in no immediate danger." "People from other areas of the building may be entering your area." "Be prepared to leave the building if you hear the evacuation signal." "Repeat, you are in no immediate danger."

Informative messages

Informative messages are those special purpose signals to areas of the facility which may have special concerns during an emergency situation. Typically these areas include elevator cabs, stairwells, and areas in less peril than those areas receiving the Alert signal. Some sample informative messages appear below.

Elevator message text:

> Female Voice: “May I have your attention please. May I have your attention Please.” Male Voice: “There has been an emergency reported in the building.” “The building manager has directed the elevators to the lobby.” “Please exit the building when you reach the lobby.”

Stairwell message text:

> Female Voice: “Please continue down the stairs to your assigned re-entry floor or the lobby.” “Do not attempt to use the elevators.”

Do Not Enter message text:

> Male Voice: Do not enter this area.” “This is not an exit.” “An emergency has been reported in this section of the building.” “Please exit the building using a marked fire exit.”

Message and tone storage

The pre-recorded messages and tone sequences are stored in a digital format in the 3-ASU Audio Source Unit internal memory. When the message and tone library exceeds two minutes in total length, a 3-ASUMX/32 Expansion Memory card must be installed in the 3-ASU. The 3-ASUXM/32 provides additional storage space for up to 32 minutes of messages.

Messages and tone sequences are created and downloaded directly into the Audio Source Unit using the SDU and a computer equipped with a compatible sound card.

Firefighter's telephone system application and design considerations

Five phone off-hook limit

The circuitry on the 3-FTCU Firefighter's Telephone Control Unit can support up to five telephones “off-hook” in addition to the master handset at the 3-FTCU at any one time. The flexibility of the EST3 system permits any number of phones to be wired on a single phone circuit, as long as they are not all used simultaneously. There are a number of different designs which can be used to insure that no more than five phones are active at any one time.

One phone per circuit

The advantages of installing a single firefighter’s telephone station or jack on a SIGA-CC1 Signature module (personality code 6) are numerous. The system provides complete control and annunciation phone/circuit. Installing a single phone on a circuit permits the operator to immediately identify the exact location of the calling party. Because the 3-FTCU will only permit 5 circuits to be connected simultaneously, the maximum number of off-hook handsets can never be exceeded. Should a branch telephone circuit be damaged during a fire, the fault will not affect other phone circuits. When there is only one phone per circuit, troubleshooting of faults is simplified.

The largest disadvantage of installing one phone per branch telephone circuit is cost. Each phone location requires a separate SIGA-CC1 module.

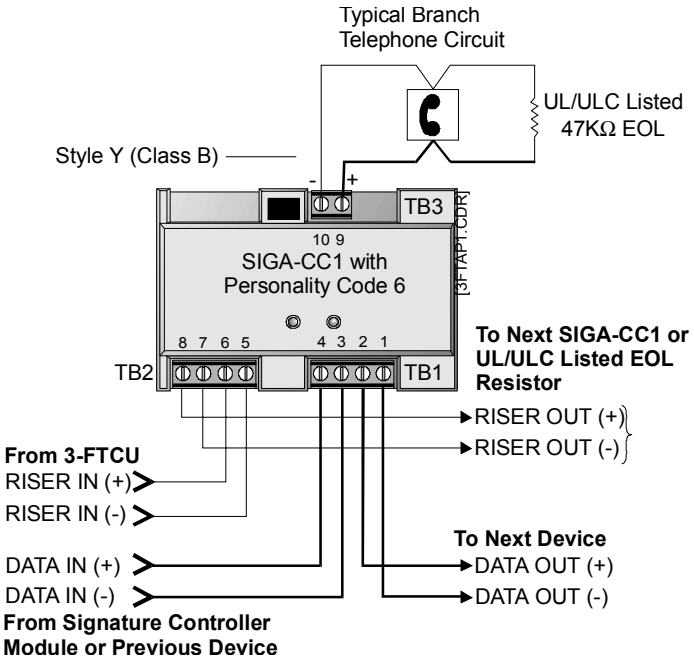


Figure 1-19: SIGA-CC1 with one phone installed

Five phones per circuit

Installing up to five phones per branch circuit is a realistic compromise between installing a single phone per circuit and more than five phones per circuit. In the rare instance that all five phones are off-hook and a need to communicate with a sixth remote phone arises, the 3-FTCU operator can temporarily disconnect the entire branch circuit. Then the second branch circuit can be connected to complete the conversation.

The advantages of installing up to five telephone stations or jacks on a SIGA-CC1 Signature module (personality code 6) are: a reasonable balance between cost and performance; and the system maintains the high quality voice circuit at all times because the maximum number of off-hook handsets can never be exceeded.

The main disadvantage of installing up to five phones per branch telephone circuit is that a circuit failure can render the entire branch circuit useless. Additionally, the location of the incoming caller is not precisely known, and troubleshooting is more difficult.

Limited number of portable telephone handsets

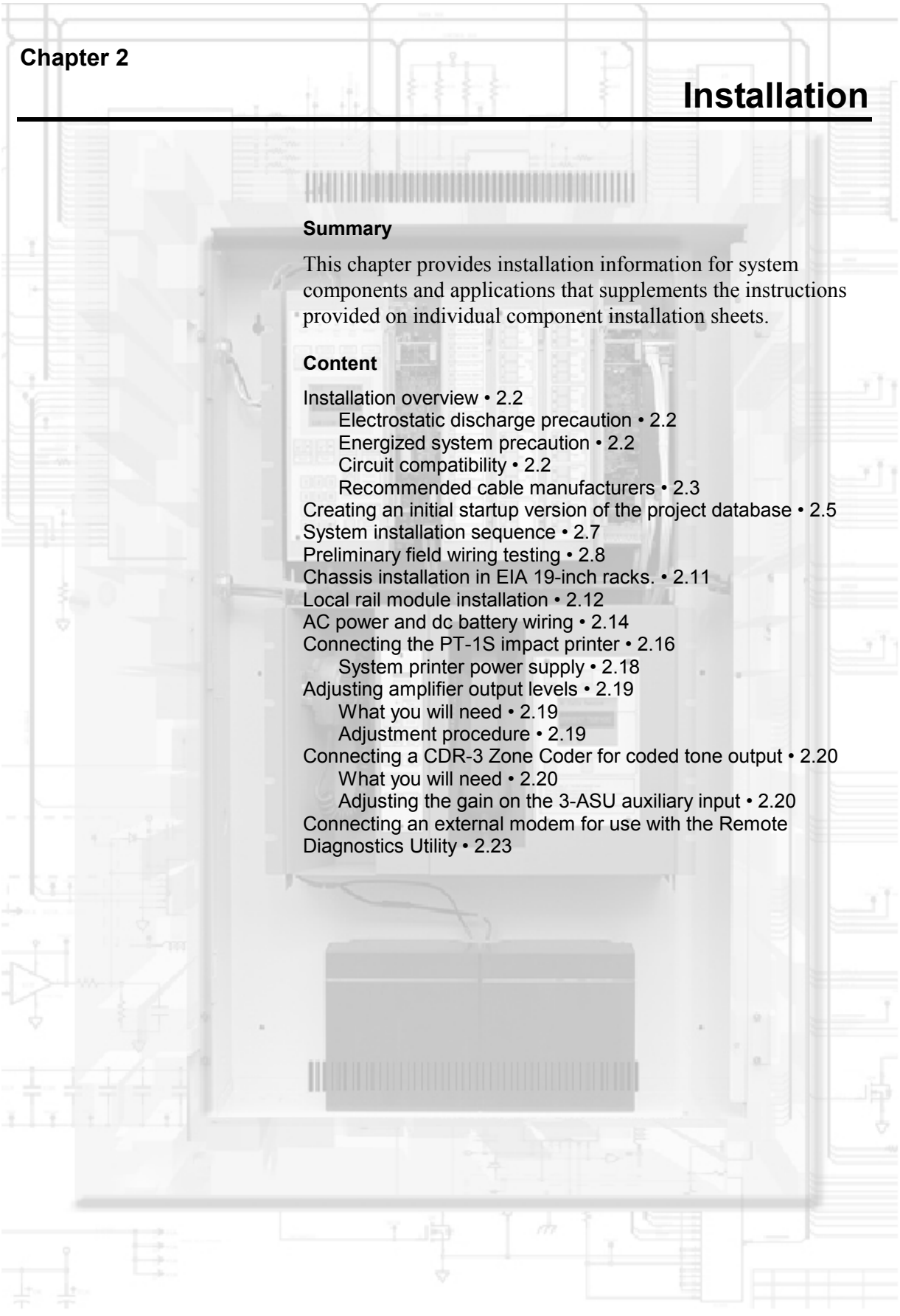
Another method of limiting the number of off-hook phones to five limits the number of available portable phones available to the fire department to five. The biggest advantage of this method

is low cost, as multiple remote telephone jacks can be installed on a single branch circuit.

The main disadvantage of this method are: that five phones may not be adequate to properly cover the facility; a circuit failure can render many of the phone jacks useless; the location of the incoming caller is not precisely known; and troubleshooting is more difficult.

Chapter 2

Installation



Summary

This chapter provides installation information for system components and applications that supplements the instructions provided on individual component installation sheets.

Content

Installation overview • 2.2
- Electrostatic discharge precaution • 2.2
- Energized system precaution • 2.2
- Circuit compatibility • 2.2
- Recommended cable manufacturers • 2.3

Creating an initial startup version of the project database • 2.5
System installation sequence • 2.7
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Chassis installation in EIA 19-inch racks. • 2.11
Local rail module installation • 2.12
AC power and dc battery wiring • 2.14
Connecting the PT-1S impact printer • 2.16
- System printer power supply • 2.18

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- Adjusting the gain on the 3-ASU auxiliary input • 2.20

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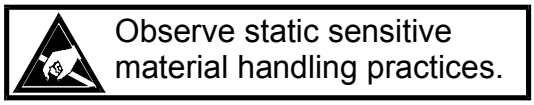
Installation overview

Electrostatic discharge precaution

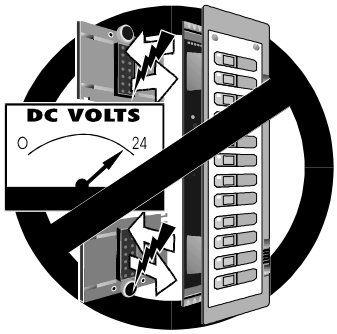


The components used in this system are sensitive to electrostatic discharge (ESD). When handling electronic assemblies, you must take precautions to avoid the build up of static charges on your body and on the equipment.

- Do not open the anti-static packaging until you are ready to install the electronics.
- Wear a grounded wrist strap to bleed off any static charge which may have built up on your body.

Energized system precaution

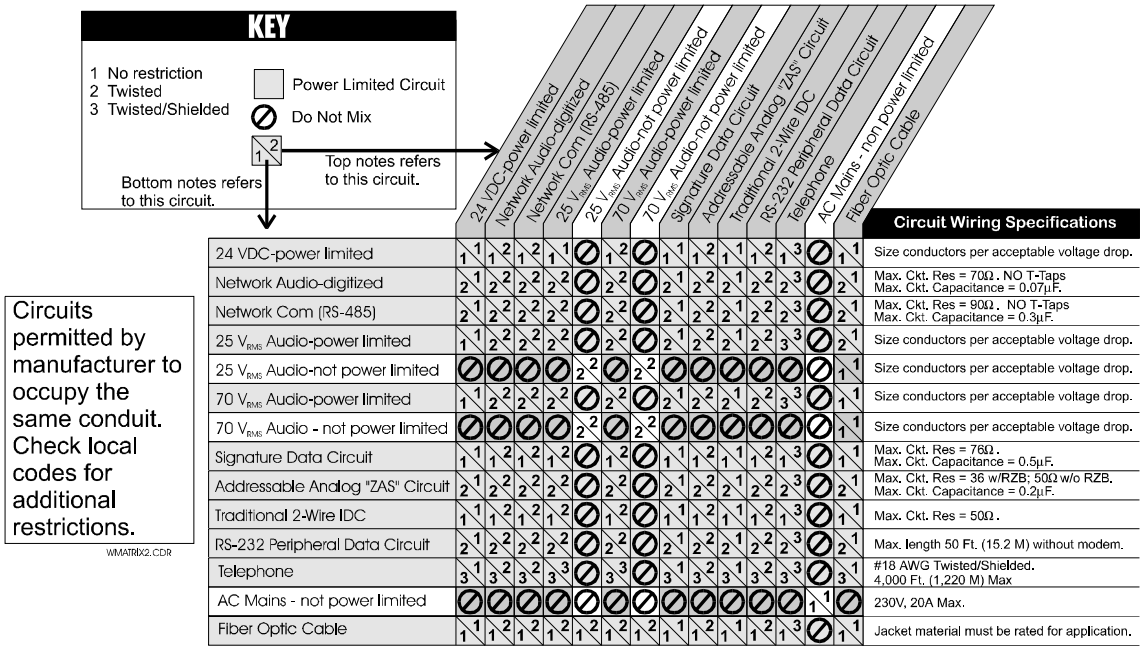
Caution: Never install or remove a module or cabinet component with power applied to the cabinet.



Circuit compatibility

The following circuit compatibility matrix indicates which circuit types may occupy the same conduit or be bundled together, where permitted by code.

CIRCUIT COMPATIBILITY MATRIX



Recommended cable manufacturers

Atlas Wire & Cable Corp.
133 S. Van Norman Road
Montebello, CA 90640
(213) 723-2401

West Penn Wire Corp.
2833 West Chestnut Street
P.O. Box 762
Washington, PA 15301
(412) 222-7060

Belden Wire & Cable Corp.
P.O. Box 1980
Richmond, IN 47375
(317) 983-5200

BSCC
233 Florence Street
Leominster, MA 01453
Phone: (508) 537-9138
Fax: (508) 537-8392

Remee Products, Inc.
186 North Main Street
Florida, NY 10921

Table 2-1: Recommended cable manufacturer's part numbers

		#14 (1.50 mm^2) Twisted Pair		#16 (1.00 mm^2) Twisted Pair		#18 (0.75 mm^2) Twisted Pair	
MFG	**Type**	**Unshielded**	**Shielded**	**Unshielded**	**Shielded**	**Unshielded**	**Shielded**
ATLAS	FPL	218-14-1-1TP	218-14-1-1STP	218-16-1-1STP	218-16-1-1STP	218-18-1-1TP	218-18-1-1STP
	FPLP	__	1762-14-1-2J	1761-16-1-2J	1762-16-1-2J	1761-18-1-2J	1762-18-1-2J
BELDEN	FPL	9580	9581	9572	9575	9571	9574
	FPLP	__	83752	__	__	__	__
BSCC	FPL	__	231402	__	241602	__	241802
	FPLP	341402	__	341602	351602	341802	351802
REMEE	FPLP	NY514UH	NY514SH	NY516UH	NY516SH	NY518UH	NY518SH
WEST PENN	FPL	994	995	990	991	D9780	D975
	FPLP	60993	60992	60991	60990	60980	60975

Creating an initial startup version of the project database

Creating an initial startup version of the project database is useful for:

- Assigning panel addresses when you bring up a system for the first time
- Verifying the correct installation of the rail modules and control/display modules
- Adjusting the gain on the 3-ASU and amplifier modules installed in a cabinet

Follow these suggestions when creating an initial startup version of the project database:

Only include the hardware configuration for each cabinet in the system. Do not include any device loops in the database. These should be installed after verifying the cabinet configuration. It is also not necessary to configure any rail modules.

The easiest way to create an initial startup version of the project database is to save the project under a different name using the Save As command. Save the project as a different version after you have defined the cabinet chassis configuration and added all the rail modules for all the cabinets in the system. Using this method eliminates doubling your workload by having to edit two databases as you add cabinets to the system.

If the cabinet contains amplifiers and a 3-ASU, include the following features in the initial startup version of the project database:

- A control/display module toggle switch that is programmed to send a 1 kHz tone to the amplifiers. Label the switch 1KHZ_TONE_ON and add the following rule to the rules file:

```
[AMPLIFIER_SETUP]
SW '1KHZ_TONE_ON':
   AMPON '*' TO 'Ch_Gen*',
   MSGON '1KHZ_TONE' TO ' Ch_Gen*;
```

- A message record in the 3-ASU database labeled 1KHZ_TONE. Import the *Steady tone at 1kHz.wav* file from the EST3 Fire Alarm Support Tools CD-ROM into this record.

Note: For firmware versions earlier than 1.5, copy the *Steady tone at 1kHz.wav* file from the \Library\Sounds\FCCA directory on the EST3 Fire Alarm Support Tools CD-ROM to a directory on your hard drive that doesn't contain any other files. You can import the file from this directory.

If a CDR-3 Zone Coder is installed and connected to the AUX input on a 3-ASU, include the following features in the initial startup version of the project database:

- A control/display module toggle switch that is programmed to turn on the amplifiers and select the Auxiliary channel. Label the switch AUX_INPUT_ADJUST and add the following rule to the rules file:

```
[3-ASU_AUX_INPUT_SETUP]
SW 'AUX_INPUT_ADJ':
   AMPON '*' TO 'Ch_Aux*';
```

System installation sequence

Follow the following general instructions when installing a panel as part of an EST3 system. Refer to the installation sheets that came with the product for specific instructions. A copy of the installation sheets can also be found at the back of this manual.

1. Install the equipment enclosure backbox at the required location and pull all the required conductors through the conduit into the backbox.
2. Verify the field wiring. Refer to Table 2-2.
3. Install the chassis assemblies that go into the panel.
4. Install the primary and booster power supplies.
5. Install all rail modules and control/display modules in their required locations.
7. Apply power to the panel. Refer to Chapter 3: Cabinet power-up procedure.
8. Download an initial start-up version of the CPU database, and clear panel troubles. See *Creating an initial startup version of the project database.*
9. Connect field wiring and clear any field wiring problems.
10. Download the final applications program. Refer to Chapter 3: System power-up and testing.
11. Verify proper operation. See Chapter 4: System power-up and testing - Detector, input module and output module initial and reacceptance testing.
12. Fill out the system's Certificate of Completion. Refer to Chapter 4: System power-up and testing - Record of Completion.

Preliminary field wiring testing

It is recommended that all circuits be tested before they are connected to the control equipment. Table 2-2 indicates the recommended tests and acceptable test results.

Note: Individual devices are not checked as part of these tests. All equipment installed on field circuits must be individually tested to insure proper operation when the system is operational.

Table 2-2: Field Wiring Tests

Circuit Type	Test
DC Notification Appliance Circuit	1) Measure the resistance between conductors. The circuit resistance should be infinite if no devices are installed on the circuit. The circuit resistance should be approximately 15 kΩ when the polarized notification appliances and the end-of-line resistor are correctly installed. 2) Reverse the meter leads. The circuit resistance between conductors should read approximately 10 Ω to 20 Ω. If the resistance reading is still approximately the same value when the meter leads are reversed, one or more polarized devices are installed incorrectly. 3) Measure the resistance between each conductor and earth ground. The resistance should be infinite.
Audio Notification Appliance Circuit	1) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are installed on the circuit. The circuit resistance should be approximately 15 kΩ when the polarized notification appliances and the end-of-line resistor are correctly installed. 2) Reverse the meter leads. The circuit resistance between conductors should still read approximately 15 kΩ. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.
Signature Data Circuits	1) With field wiring disconnected, verify the continuity of each conductor. Each conductor should measure less than 38 Ω. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are connected to the circuit. The circuit resistance between conductors should be between approximately 18 kΩ (250 devices) and 4.5 MΩ (1 device) when devices are installed. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.

Table 2-2: Field Wiring Tests

Circuit Type	Test
Addressable Analog Circuits	1) Verify the continuity of each conductor. Each conductor should measure less than 50 Ω. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are connected to the circuit. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.
Traditional Initiating Device Circuits	1) Verify the continuity of each conductor. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are connected to the circuit. The circuit resistance between conductors should be approximately 4.7 kΩ when devices are installed. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.
Telephone Riser Circuit	1) Verify the continuity of each conductor. Each conductor should measure between 0 and 25 Ω. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are installed on the circuit. The circuit resistance between conductors should be approximately 15 kΩ with SIGA-CC1 Single Input Signal Modules and the end-of-line resistor correctly installed. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.
RS-485 Communication Circuits	1) Verify the continuity of each conductor. Each conductor should measure between 0 and 50 Ω. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite if no devices are connected to the circuit. The circuit resistance between conductors should be approximately 50 Ω when devices are installed. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.

Table 2-2: Field Wiring Tests

Circuit Type	Test
RS-232 Communication Circuits	With both ends of the circuit disconnected: 1) Verify the continuity of each conductor. Each conductor should measure between 0 and 25 Ω. 2) Measure the resistance between conductors. The circuit resistance between conductors should be infinite. 3) Measure the resistance between each conductor and earth ground. The circuit resistance between a conductors and earth ground should be infinite.
Earth Ground	1) Measure the resistance between the earth ground terminal and a convenient water pipe or electrical conduit. The circuit resistance should be less than 0.1Ω

Chassis installation in EIA 19-inch racks.

Each 3-CHAS7 chassis or 3-ASU(/FT) Audio Source Unit requires 12 in (30.48 cm) of vertical rack space. 3/4 in (1.9 cm) blank plates are required at the top of the upper chassis and the bottom of the lower chassis. A 1-1/2 in (3.81 cm) blank plate is required between each chassis.

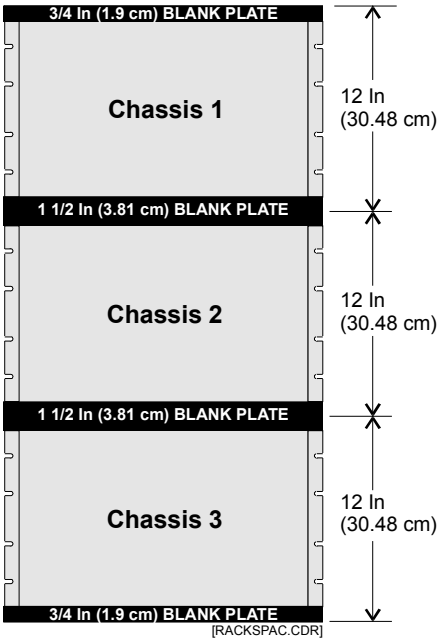
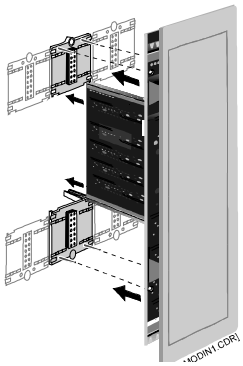


Figure 2-1: Rack-mounted chassis

Local rail module installation



Please refer to the installation sheet that came with the product for installation instructions.

Equipment locations within a chassis are referred to as rail slots. Figure 2-2 indicates the rail slot numbers for the various cabinet sizes available in the EST3 product line. The 3-CPU1 must always occupy rail slots 1 and 2. The primary power supply monitor module should occupy rail slot 3.

The 3-CPU1 Central Processor module must always occupy rail slots 1 and 2 in the 3-CHAS7 designated as rail chassis #1. The primary power supply monitor module must occupy rail slot 3.

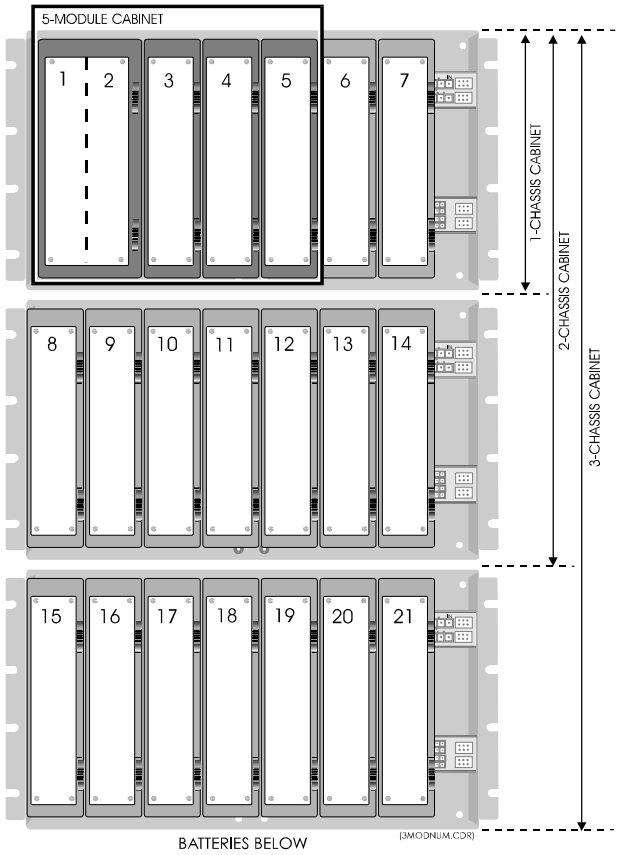


Figure 2-2: Local rail module slot identification

A 3-ASU Audio Source Unit occupies the first three slots on its chassis, and is identified using the lowest slot number of the three. When a Firefighters Telephone Control Unit is supplied as part of the 3-ASU/FT, the telephone control unit occupies the last four slots on the chassis, and is identified as the fourth slot number (11 or 18) on the chassis.

Connect the dc power cable (P/N 250187) to connector P2 on the power supply. For the 3-PPS Primary Power Supply, connect the 16-pin data ribbon cable (P/N 250188); (Booster = P/N

250189) to connector P3 on the power supply. For 3-BPS Booster Power Supplies, connect a 14-pin data ribbon cable (P/N 250189) to connector P3 on the power supply. Route both cables up through the rails for later connection to the power supply/booster monitor module.

- Install any local rail module option cards required by your application. Option cards should be firmly seated in their connectors, and then secured to the rail module by pressing the snap rivet fastener.
- If a control/display module is required by your application, place the display in the recess on the front of the module. Secure the display with the four supplied plastic rivets. Install the display ribbon cable (P/N 250186) between the display's connector and the module's display connector. If no display is required, insert the blank plate supplied with the module.
- Locate the required rail slot positions on the rail chassis. Remember, the module location must match the location entered in the System Definition Utility program.
- Position the module so that any option card(s) rests in the card guides slot. Push the module toward the rails, sliding the daughter card into the slot.
- When the four alignment pins match up with the guide holes in the the module, push the module in to firmly seat the module on the rail connectors.
- Push in the snap rivets to lock the module on to the rail.
- An LRM's plug in terminal strips may be removed to facilitate field wiring.
- Close the module display door. Latch the door by sliding the upper latch down and the lower latch up.

Note: If there are empty rail spaces in a cabinet, you should consider installing 3-LRMF blank modules to fill up the spaces.

AC power and dc battery wiring

Due to power-limited/nonpower-limited wiring separation requirements, it is easier to route and wire the nonpower-limited ac power and battery conductors before installing the LRMs in the rails. Nonpower-limited wiring should be routed to the chassis notches to the left and rear of the cabinet. Power-limited wiring should be routed to the right and front of the cabinet.

WARNING: Do not energize power until instructed to do so!

1. Connect the ac power source to TB1, line, neutral, and ground terminals on the 3-PPS/M Primary Power Supply Heat Sink and the 3-BPS/M Booster Power Supply Heat Sink(s). DO NOT ENERGIZE THE AC POWER SOURCE AT THIS TIME!
2. Connect the positive battery lead to TB2-1 and the negative battery lead to TB2-2. Each heat sink assembly must have its own pair of 12 AWG (2.5 mm^2) wires going to the battery. Do not connect the heat sinks assemblies together and run a common wire to the battery! DO NOT TERMINATE THE WIRES AT THE BATTERY AT THIS TIME.

WARNING: Do not connect batteries until instructed to do so!

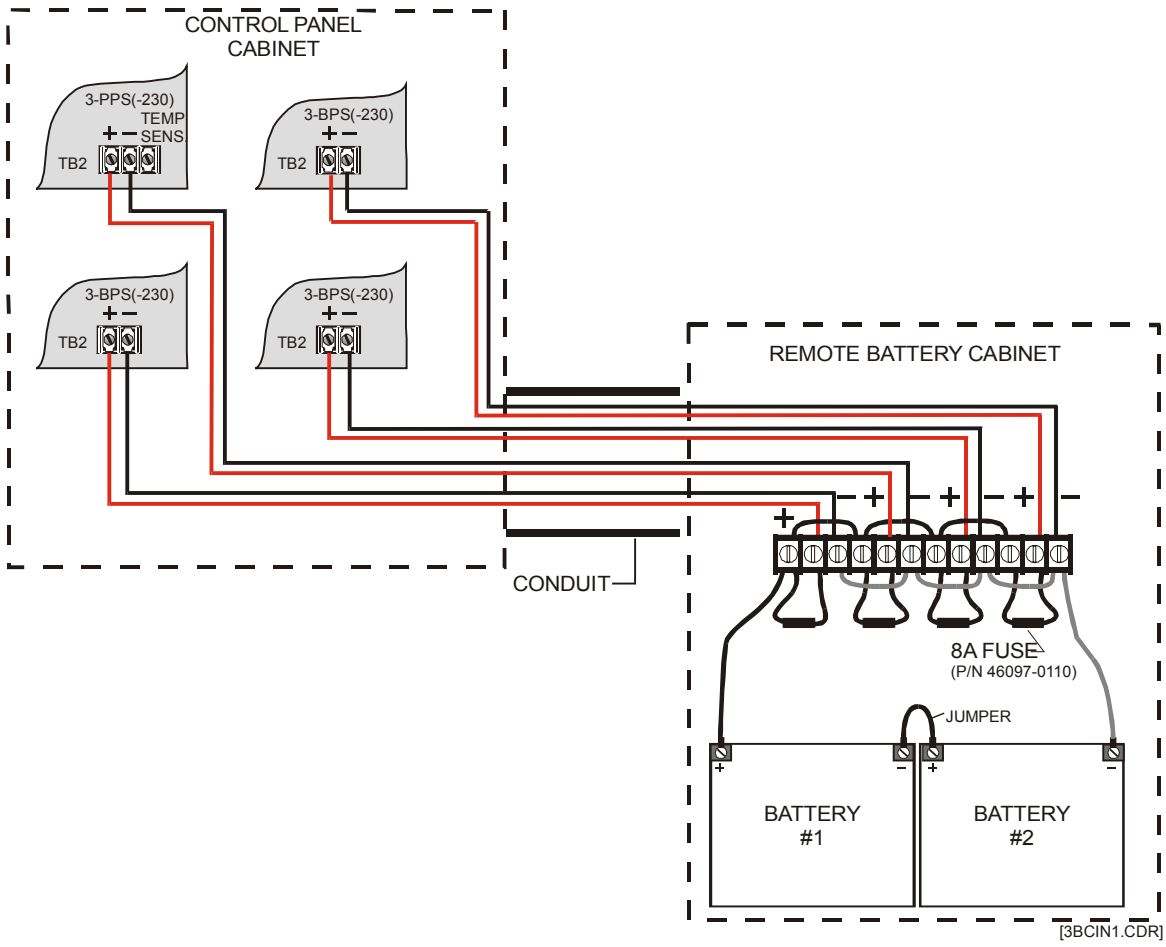
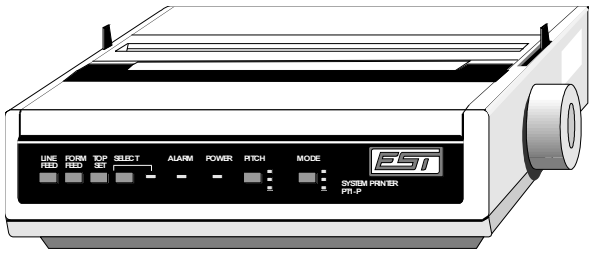


Figure 2-3: Remote battery cabinet wiring

Note: A minimum of a 10Ah battery must be used in all systems applications.

Connecting the PT-1S impact printer

The PT-1S impact printer can be connected to an EST3 panel to provide a hard copy printout of system status, active events, panel reports, etc. The PT-1S is a 80-character line width, freestanding printer that uses standard form feed paper.



[CPTISXCDR]

When connecting the PT-1S impact printer by itself:

- Configure the serial port as a Printer port type and set the baud rate for the printer's baud rate.
- Set printer switches SW1-1, -2, and -3 to OFF, ON, and ON, respectively (8 bits, no parity).

When connecting the PT-1S impact printer to a serial port that is shared with a CDR-3 Zone Coder:

- Configure the panel's serial port as a CDR-3/Printer port type and set the baud rate for the CDR-3's baud rate.
- Set printer switches SW1-1, -2, and -3 to OFF, OFF, and ON, respectively (8 bits, even parity). These are the factory settings.
- Set printer switches SW2-1, -2, and -3 to match the baud rate set on the CDR-3 zone coder.

PT-1S Printer Specifications

Dimensions (HWD)	3.2 in x 14.2 in x 10.8 in (8.13 cm x 36 cm x 27.4 cm)
Print Speed	232 Characters/Second
Baud Rates	110, 300, 600, 1200, 2400, 4800, 9600, 19200 bps.
Wiring	3 #18 AWG (0.75 mm^2)
Voltage	120 Vac @ 60 Hz
Standby Power	40 VA
Printing Power	120 VA

Switch DIPSW factory settings (located on main board)

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
OFF (English)	OFF (English)	OFF (English)	OFF (11-in form)	ON (11-in form)	OFF (auto LF off)	ON (8 bits)	OFF (enable front panel)

Switch SW1 factory settings (located on serial board)

Switch	Factory Setting	Description
SW1-1	OFF	ON: Odd parity OFF: Even parity
SW1-2	OFF	ON: No parity OFF: With parity
SW1-3	ON	ON: 8 bits OFF: 7 bits
SW1-4	OFF	ON: Ready/Busy protocol OFF: XON/XOFF protocol
SW1-5	ON	ON: Circuit test OFF: Monitor test
SW1-6	ON	ON: Print mode OFF: Test mode
SW1-7, -8	ON,ON	OFF,OFF: SSD Busy OFF,ON: SSD Busy ON,OFF: RTS Busy ON,ON: DTR Busy

Switch SW2 factory settings (located on serial board)

Switch	Factory Setting	Description
SW2-1, -2, -3	OFF,OFF,ON	OFF,OFF,OFF: 110 bps ON,OFF,OFF: 300 bps OFF,ON.OFF: 600 bps ON,ON,OFF: 1200 bps OFF,OFF,ON: 2400 bps ON,OFF,ON: 4800 bps OFF,ON,ON: 9600 bps ON,ON,ON: 19200 bps
SW2-4	OFF	ON: DSR active OFF: DSR inactive

Switch SW2 factory settings (located on serial board)

Switch	Factory Setting	Description
SW2-5	ON	ON: 32-byte buffer threshold OFF: 256-byte buffer threshold
SW2-6	ON	ON: 200ms busy signal OFF: 1s busy signal
SW1-7	OFF	ON: Space after power on OFF: Space after printer select
SW1-8	OFF	not used

System printer power supply

If your PT-1S system printer is required to operate during a brownout or ac power failure, install an uninterruptible power supply per Figure 2-4.

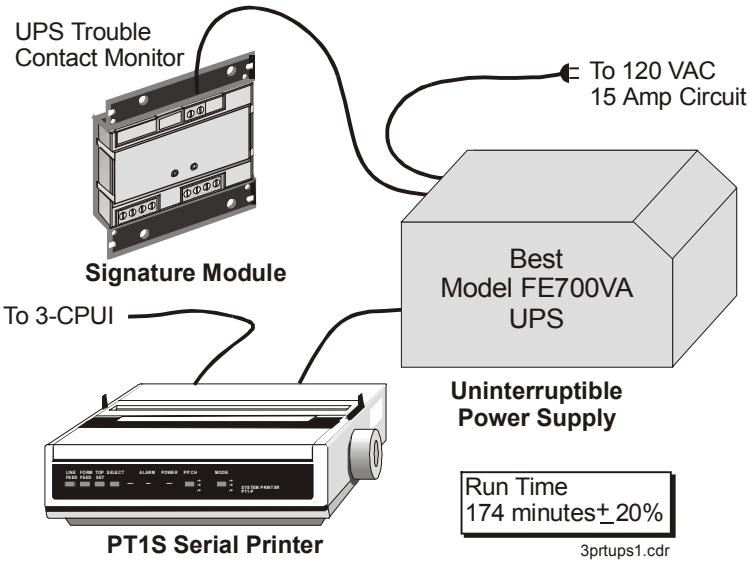


Figure 2-4: Printer uninterruptible power supply wiring

Adjusting amplifier output levels

What you will need

An initial startup version of the project database that contains a 1kHz tone and a switch programmed to turn the tone on. See *Creating an initial startup version of the project database.*

An RMS voltmeter (Fluke 83 or equivalent)

Adjustment procedure

1. Disconnect the field wiring to all the zoned amplifier modules in the cabinet.
2. Place an RMS meter across an amplifier's TB2 NAC/B+ and NAC/B- terminals.
3. Press the 1KHZ_TONE_ON switch.
4. Adjust the amplifier's gain pot until the RMS meter displays the configured output level (25 or 70 Vrms).
5. Connect the amplifier's field wiring.
6. Press the 1KHZ_TONE_ON switch again and verify the output level remains the same. Readjust the amplifier's gain pot if necessary.
7. Disconnect the amplifier's field wiring.
8. Repeat steps 2 through 6 for each amplifier in the cabinet.
9. Reconnect the field wiring for all the amplifiers in the cabinet.

Connecting a CDR-3 Zone Coder for coded tone output

The CDR-3 Zone coder can be connected to the 3-ASU's AUX input to provide a coded or march time tone to the audio system. Refer to Figure 2-5.

What you will need

An initial startup version of the project database that contains a switch programmed to turn the amplifiers onto the Auxiliary channel. See *Creating an initial startup version of the project database.*

An RMS voltmeter (Fluke 83 or equivalent)

Adjusting the gain on the 3-ASU auxiliary input

The 3-ASU auxiliary input gain adjustment is critical to the operation of this application. Before adjusting the 3-ASU, set each zoned amplifier module in the cabinet for their configured RMS output level. See *Adjusting amplifier output levels*.

To adjust the gain on the 3-ASU auxiliary input

1. Connect the coded tone output on the CDR-3 directly to the 3-ASU auxiliary input by bypassing the duration relay.
2. Set the 3-ASU auxiliary input gain pot to the mid-range position.
3. Determine which zoned amplifier module requires the highest gain adjustment (the module whose gain adjustment pot is turned the most counter-clockwise). Use this amplifier as the worst-case amplifier.
4. Disconnect the field wiring from all the amplifiers in the cabinet except for the worst-case amplifier. This is to prevent the CDR-3's supervisory tone from being broadcast throughout the premises.
5. Place an RMS meter across the worst-case amplifier's TB2 NAC/B+ and NAC/B- terminals.
6. Press the AUX_INPUT_ADJ switch. This places the coder's supervisory tone onto the Auxiliary channel. The supervisory tone occurs approximately every 5 seconds.
7. Adjust the 3-ASU's auxiliary input gain pot until the RMS meter displays the amplifier's configured output level (22-28 Vrms or 65-75 Vrms). Turning the pot clockwise increases the gain while counter-clockwise decreases the gain.
8. Press the AUX_INPUT_ADJ switch a second time to restore the input.

9. Reconnect the coded tone output of the CDR-3 back through the duration relay.
10. Reconnect the field wiring to the remaining amplifier modules.

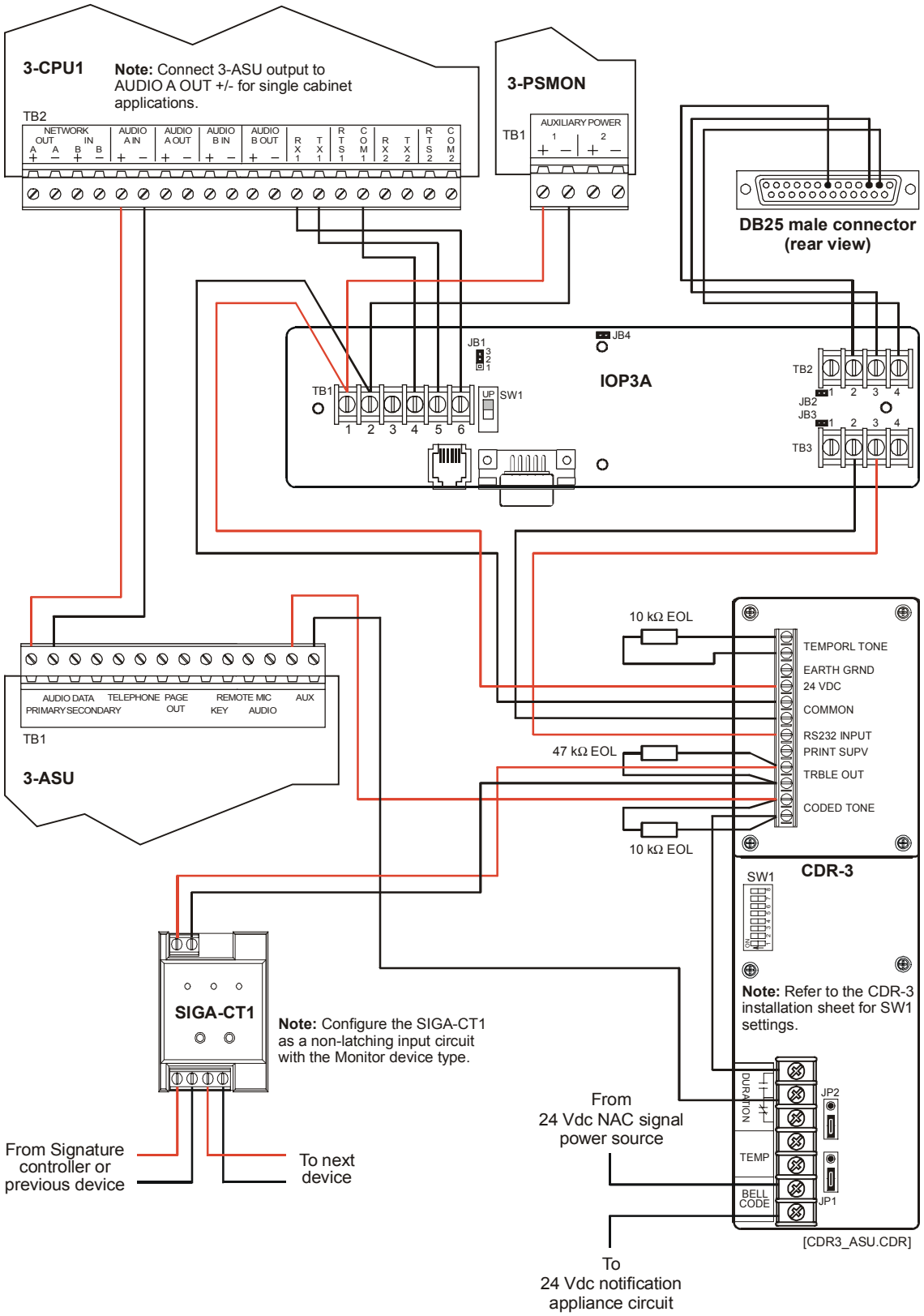


Figure 2-5: Application wiring diagram

Connecting an external modem for use with the Remote Diagnostics Utility

Using the Remote Diagnostics Utility requires that you connect an external modem to a 3-CPU1 equipped with a 3-RS232 option card.

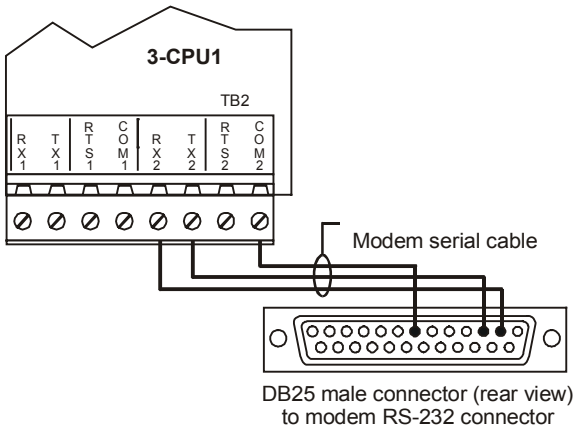
Some applications may require that the modem be permanently mounted. The following is a suggested method for mounting a modem connected to the 3-CPU1. First you will need to obtain the following parts

- MFCA accessory enclosure
- SIGA-MP1 mounting plate
- 2 cable ties long enough to go around the modem and through the slots on the SIGA-MP1

To mount the modem:

1. Mount the MFCA enclosure back box at an acceptable location within reach of the panel. Refer to Figure 2-6.
2. Secure the modem to the SIGA-MP1 with the 2 cable ties.
3. Screw the SIGA-MP1 to the MFCA enclosure back box.
4. Connect all modem wiring. Refer to the technical documentation that came with the modem for wiring connections.

   Note: RS-232 wiring must maintain a 1/4-in minimum separation between nonpower-limited wiring.
5. Screw the MFCA cover to the back box.
6. Attach the modem RS-232 wires to the 3-CPU1 serial port terminals. The serial port must be configured for Remote Diagnostics in the project database. See below.



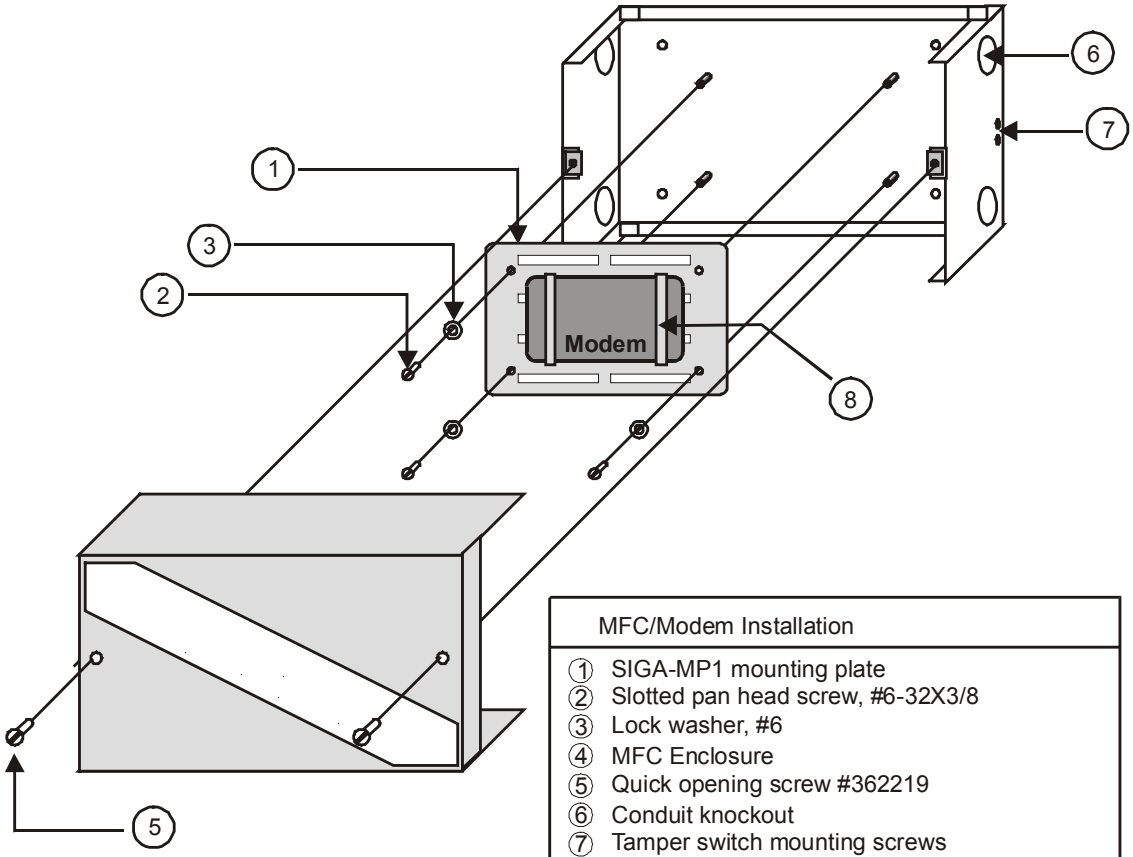


Figure 2-6: Suggested modem installation using MFCA and SIGA-MP1

Chapter 3

System power up and testing

Summary

This chapter provides information and procedures necessary to perform initial system turn on and acceptance testing.

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Cabinet power-up procedure

Initial turn on

1. Energize ac power at 3-PPS/M (-230) Power Supply and the 3-BPS/M (-230) Booster Power Supplies.
2. Connect batteries to the 3-PPS/M (-230) Power Supply and the 3-BPS/M (-230) Booster Power Supplies.

   While the 3-CPU1's microprocessor is initializing, the front panel CPU Fail LED will light and the internal panel buzzer will sound until the processor is functioning normally.
3. Connect the download cable assembly between the SDU computer and 3-CPU1 connector J5.
4. Using the SDU, download the CPU database into the panel controller. Refer to the next section, "Download Errors" should error messages be displayed on the 3-LCD display.
5. If an Audio Source Unit is part of the system, its database must be downloaded in addition to the network configuration database. Use J1 on the 3-ASU(/FT) to download the audio database.
6. Clear up any network communications faults between cabinets.
7. If any Signature controller modules are installed as part of the system, their individual databases must be downloaded separately into the modules. You will need to restart the network for these changes to be effective.
8. Correct all the circuit faults.
9. Test the system as described in the next section.

Runtime and system errors

Introduction

There are two major categories of errors which can occur when configuring a database for the network. The System Definition Utility program is used to set up the contents of each cabinet. Once all the cabinets have been defined, devices labeled, and rules written, all this information is cross checked against itself. This process is called compiling the program. If there are incorrectly written rules, unreferenced input or output devices or other problems with the design, the compiler will generate a list of errors. These errors must be corrected using the SDU.

When the data has been properly compiled, the data is in a form that the 3-CPU1 memory can receive. Sending this information to the memory of the various 3-CPU1s making up the network is called downloading. If an error occurs during the download process, it is referred to as a runtime error.

Runtime errors

There are a number of reasons that errors may occur when downloading data into the 3-CPU1 controllers. Initially, certain “errors” are to be expected, as the network database is loaded in steps. Until all portions of the database are properly entered into memory, errors will be generated. During initial system configuration, this is to be expected. Most of these errors will resolve themselves as the system configuration progresses.

A second source of download errors is a mismatch between the cabinet configuration in the SDU and the actual hardware installation. The most common cause for this error is typically due to the installation of a local rail module in the wrong rail position. Another common cause is the installation of the wrong type module in the rail. Misidentification of an entire cabinet can also cause this type of error.

A third source of download error can occur after the cabinets have been initially downloaded. After the initial downloads, all subsequent downloads can be done using the network data circuit. The third type of error is primarily caused by communications problems between cabinets.

Table 3-1: Download Errors

Error Message	Possible Cause
Unable to perform operation	General error. Restart 3-CPU1
Busy signal	System currently busy. Wait, then re-try
Password Invalid	Incorrect or invalid password entered
Size parameter trouble	Check download connections and SDU settings, then re-try
Storage media trouble	Problem with memory components. Swap module and re-try.
Checksum error in packet	Check download connections and SDU settings, then re-try
Device type error	Conflict between SDU download setting and connected device type
Parcel #	Check download connections and SDU settings, then re-try
Inaccessible panel	SDU program can not “see” the panel. Check network wiring
Session in progress	System is busy. Wait, then re-try
Write protect	Write protect switch on 3-ASUMX is on
Erase program trouble	Check download connections and SDU settings, then re-try
Block number	Check download connections and SDU settings, then re-try
Version mismatch	Firmware downloaded does not agree with version setting

Note: If you are experiencing frequent problems downloading to a 3-CPU, low signal levels from the SDU computer may be the cause. The Buffered RS-232 Communications Cable, P/N SDU-CBL, may be used to correct signal level problems. Do not use this cable with the 3-CPU1.

System error identification

The 3-CPU1 does not send data to the SDU program. Except for problems with the communications between the 3-CPU1 and the PC running the SDU program, the majority of problems with the runtime process are annunciated on the 3-LCD display. Refer to *Chapter 5: Service and Troubleshooting* for system error codes and their possible causes.

Initial and re-acceptance test procedure

Introduction

Once the system has been wired, programmed, and the circuit faults corrected, all installed components should be tested *as a system*, to insure proper operation.

The initial system check is designed to verify that all components of the system are installed and operating as designed. Verifying that the system was designed and installed according to specifications requires all aspects of the system to be exercised and the results verified. Where test results differ from those expected, corrective action must be taken.

Before commencing testing, notify all areas where the alarm sounds and off-premises locations that receive alarm and trouble transmissions that testing is in progress.

Records of all testing and maintenance shall be kept on the protected premises for a period of at least five (5) years.

Required Tools:

- Slotted screwdriver, insulated
- Digital multimeter
- 12" (30.5 cm) jumper lead with alligator clips
- Panel door key

A complete check of installed field wiring and devices should be made at regular intervals, in accordance with NFPA 72 and ULC 524 requirements. These requirements are covered in the chapter on preventive maintenance.

Control and emergency communications equipment initial and re-acceptance testing

The procedures listed in the following sections should be performed on the equipment installed in each cabinet connected to the system. These procedures are designed to test the hardware and its installation. The applications programming will be tested later.

Note: The network configuration information must be downloaded into the network and Audio Source Unit, using the *System Definition Utility* (SDU) program, before starting testing.

Primary power supplies

1. Verify that all components are installed using accepted workmanship standards.
2. Verify adequate separation between power-limited and nonpower-limited wiring. Refer to NFPA 70, article 760, of the National Electrical Code.
3. Verify that the installed batteries are the proper capacity for the application.
4. With the batteries disconnected, verify that the supply's full alarm load can be sustained by the power supply without the batteries connected.
5. With the batteries connected, disconnect the ac source and verify that a power supply trouble is annunciated, and that the supply's full alarm load can be sustained by the batteries.
6. Verify that the battery charger properly charges the batteries connected to both the primary and booster power supplies to 80% capacity within 24 hours.

Booster power supplies

1. Verify that all components are installed using accepted workmanship standards.
2. Verify adequate separation between power-limited and nonpower-limited wiring.
3. Verify that the installed batteries are the proper capacity for the application.
4. With the batteries *disconnected*, verify that the supply's full alarm load can be sustained by the power supply without the batteries connected.

5. With the batteries connected, disconnect the ac source and verify that a power supply trouble is annunciated, and that the supply's full alarm load can be sustained by the batteries.

3-CPU1 with 3-LCD display

1. Verify the module is properly seated in all four rail connectors and secured with the four snap rivets. Verify that removable terminal strips TB1 and TB2 are firmly seated.
2. Verify that all components are installed using accepted workmanship standards.
3. Verify that the correct date and time are displayed on the LCD display, and the Power LED is on.
4. Simultaneously press the Alarm Silence and Panel Silence switches to activate the lamp test function. Verify all lamps operated.
5. Initiate a fire alarm and verify the following: the alarm LED flashes, the Alarm relay transfers, the correct device message appears at the top of the LCD window, the active point counter increments, the event sequence indicates a "1", the active Alarm events counter at the bottom of the display indicates A001, the event type indicates fire alarm, and the local panel buzzer sounds.

   Press the Alarm Silence switch and verify that the required notification appliances are silenced and the Alarm Silence LED lights.

   Press the Panel Silence switch to verify that the panel buzzer silences and the Panel Silence LED lights.

   Press the Alarm queue switch and verify that the Alarm LED lights steady.

   Press the Details switch and verify that the alarm device's message, if any, is displayed. If a printer is connected to the 3-CPU1, verify that all specified information appears on the printer.
6. Initiate a second fire alarm and verify that: it appears at the bottom of the LCD window, the active point counter changes, the event sequence indicates a "2", the active Alarm events counter at the bottom of the display indicates A002, the event type indicates fire alarm, the Alarm LED re-flashes, the local panel buzzer re-sounds, and the *first* Alarm message remains at the top of the LCD display. Press the Alarm queue switch and verify that the Alarm LED lights steady.

7. Initiate a third fire alarm and verify that: its message appears at the bottom of the LCD window, the active point counter changes, the event sequence indicates a “3”, the active Alarm events counter at the bottom of the display indicates A003, the event type indicates fire alarm, and the local panel buzzer re-sounds, and the first alarm message remains at the top of the LCD display. Press the Alarm queue switch and verify that the Alarm LED lights steady.
8. Use the previous and next message switches to verify that you can scroll through all three messages in the alarm queue, as indicated by the event sequence window.
9. Press the Reset switch. Verify that all initiating devices reset and that all panel indicators clear except the power LED.

10a. Initiate an active Monitor condition and verify that: the Monitor LED flashes, the correct active Monitor device message appears in the top and bottom windows of the LCD, the active point counter changes, the event sequence indicates a “1”, the active Monitor events counter at the bottom of the display indicates M001, and the event type indicates Monitor. Press the Monitor queue switch and verify that the Monitor LED lights steady. Initiate a second active Monitor condition and verify that the first Monitor message remains at the top of the LCD window, that the second Monitor event message appears at the bottom of the display, the active point counter changes, the event sequence indicates a “2”, the active Monitor events counter at the bottom of the display indicates M002.

10b. Initiate an active Trouble condition and verify that: the Trouble LED flashes, the correct active Trouble device message appears in the top and bottom windows of the LCD, the local panel buzzer sounds, the Trouble relay transfers, the active point counter changes, the event sequence indicates a “1”, the active Trouble events counter at the bottom of the display indicates T001, and the event type indicates Trouble. Press the Trouble queue switch and verify that the Trouble LED lights steady. Press the Panel Silence switch to verify the panel buzzer silences and the Panel Silenced LED lights. Initiate a second active Trouble condition and verify that the first Trouble message remains at the top of the LCD window, that the second Trouble event message appears at the bottom of the display, the active point counter changes, the event sequence indicates a “2”, the active Trouble events counter at the bottom of the display indicates T002.

10c. Initiate an active Supervisory condition and verify that the Supervisory LED flashes, the correct active Supervisory device message appears in the top and bottom windows of the LCD, the local panel buzzer sounds, the Supervisory relay transfers, the active point counter changes, the event sequence indicates a “1”, the active Supervisory events counter at the bottom of the display indicates S001 and the event type indicates Supervisory. Press the Supervisory queue switch and verify that the Supervisory LED lights steady. Press the Panel Silence switch to verify the panel buzzer silences and the Panel Silenced LED lights. Initiate a second active Supervisory condition and verify that the first Supervisory message remains at the top of the LCD window, that the second Supervisory event message appears at the bottom of the display, the active point counter changes, the event sequence indicates a “2”, the active Supervisory events counter at the bottom of the display indicates S002.

10d. Initiate an active fire Alarm, verify that alarm LED flashes, the correct fire alarm message appears in the top and bottom windows of the LCD the active point counter changes, the event sequence indicates a “1”, the active fire alarm events counter at the bottom of the display indicates A001 and the event type indicates fire alarm. Press the Alarm queue switch and verify that the Alarm LED lights steady. Press the Panel Silence switch to verify the panel buzzer silences and the Panel Silenced LED lights. Initiate a second fire Alarm condition and verify that the first fire Alarm message remains at the top of the LCD window, that the second fire Alarm event message appears at the bottom of the display, the active point counter changes, the event sequence indicates a “2”, the active fire alarm events counter at the bottom of the display indicates A002.

11. Press the Reset switch and verify that all devices reset and the panel returns to the normal condition.

3-RS232 card installed in 3-CPU1

1. Verify the card is properly seated in its connector and secured with the snap rivet.
2. Verify that the baud rate of the peripheral device connected to the port matches the port setting as set using the SDU program.
3. Check the printer operation by initiating an active condition on the system or generating a system report via the keypad.

3-RS485 card installed in 3-CPU1, Class B configuration

1. Verify the card is properly seated in its connector and secured with the snap rivet.
2. Starting with the network in the normal condition, use the status command to verify all connected cabinets are communicating over the network.
3. Disconnect the network data communications wiring (TB2-17/18 & 19/20) from the cabinet with the primary 3-LCD display, and verify that all the other system cabinets connected to the network appear in the trouble queue.

3-RS485 card installed in 3-CPU1, Class A configuration

1. Verify the card is properly seated in its connector and secured with the snap rivet.
2. Starting with the network in the normal condition, use the status command to verify all connected cabinets are communicating over the network.
3. Disconnect the network data communications wiring (TB2-17/18 & 19/20) from the cabinet with the primary 3-LCD display and verify that a Class A network communications fault is annunciated. Repeat step 2 to verify that all connected cabinets still communicate over the network.

3-IDC8/4 Initiating Device Circuit module

1. Familiarize yourself with the circuit configuration of the individual module to be tested. Remember, modules of the same type can be configured differently.
2. For circuits configured as initiating device circuits (IDCs), activate the circuit by shorting the circuit's two terminals. Verify that the appropriate message appears in the proper message queue. Disconnect the circuit or EOL resistor. Verify that a Trouble message appears in the Trouble message queue.
3. For circuits configured as Notification Device Circuits (NACs), turn on the circuit by activating an IDC programmed to turn on the NAC, or use the activate output device command via the keypad. Verify that the circuit activates properly. Restore the circuit. Disconnect the circuit or EOL resistor. Verify that a Trouble message appears in the Trouble message queue.

3-SSDC Signature Driver Controller module

1. Verify that the module is properly seated in both rail connectors and secured with the two snap rivets. Verify that removable terminal strips TB1 and TB2 are firmly seated.
2. Verify the wiring to all Signature devices.
3. Map the SDC circuit by reading the device data; adjusting, modifying, and accepting devices as required; writing the information back to the devices; and re-reading the device data.
4. With no map errors displayed, put an input device on the circuit in the active mode, and verify the appropriate message is displayed on the 3-LCD Display. Put the input device in the Trouble mode and verify that the correct Trouble message is displayed.

Note: Individual device testing will be done later.

3-AADC Addressable Analog Driver Controller module

1. Verify that the module is properly seated in both rail connectors and secured with the two snap rivets. Verify that removable terminal strip TB1 is firmly seated.
2. Verify the wiring to all addressable analog devices.
3. Read the addressable analog circuit device data; adjusting, modifying, and accepting devices as required; writing the information back to the addressable analog module.
4. With no errors displayed, put an input device on the circuit in the active mode, and verify the appropriate message is displayed on the 3-LCD Display. Put the input device in the Trouble mode and verify that the correct Trouble message is displayed.

Note: Individual device testing will be done later.

3-OPS Off-premises Signaling module

1. Verify that the module is properly seated in both rail connectors and secured with the two snap rivets. Verify that removable terminal strip TB1 is firmly seated.
2. Familiarize yourself with the configuration of the module to be tested.
3. If the module is connected to a municipal box or central station, advise the appropriate parties that testing is in progress.

4a. Local Energy Municipal Box (City-Tie) configuration: With the municipal box connected between TB1-2 and TB1-3, open the circuit. (Note: You can temporarily substitute a 15Ω, 2W resistor for the municipal box.) Verify that the module Trouble activates and the appropriate Trouble message appears in the Trouble message queue. Reconnect the circuit and initiate an active fire alarm. You should measure 20 to 25 volts between TB1-3 (+) and TB1-4 (-). Press the panel Reset switch, and wait for the system to reset. Verify receipt of the alarm at the municipal receiving station.

Note: If you activate the municipal box, it will indicate Trouble until rewound.

4b. Single Reverse Polarity Circuit (Old Style) configuration: Verify that 20 to 25 volts appears between TB1-5 (+) and TB1-6 (-), paying attention to polarity. Create a Trouble condition on the panel. Verify that 0 volts appears between TB1-5 (+) and TB1-6 (-). Verify that the module's Trouble relay activates, the appropriate Trouble message appears in the Trouble message queue, and that the receiving station receives the Trouble indication. Open the circuit wired between TB1-5 and TB1-6. Verify that the receiving station receives the Trouble indication.

Initiate an active fire alarm. You should measure 20 to 25 volts between TB1-5 (-) and TB1-6 (+), paying attention to the polarity change. Verify receipt of the alarm at the municipal receiving station.

4c. Three Reverse Polarity Circuit (New Style) configuration: Verify that 20 to 25 volts appears between TB1-5 (+) & TB1-6 (-), between TB1-7 (+) & TB1-8 (-), between TB1-9 (+) & TB1-10 (-), paying attention to polarity. Create a Trouble condition on the panel. Verify that 20 to 25 volts appears between TB1-8 (+) and TB1-8 (-). Verify that the module's Trouble relay activates, the appropriate Trouble message appears in the Trouble message queue, and that the receiving station receives the *Trouble* indication. Open the circuit wired between TB1-5 and TB1-6. Verify that the receiving station receives a *circuit fault* indication. Open the circuit wired between TB1-7 and TB1-8. Verify that the receiving station receives a *circuit fault* indication. Open the circuit wired between TB1-9 and TB1-10. Verify that the module's Trouble relay activates and the appropriate Trouble message appears in the Trouble message queue, and that the receiving station receives a *circuit fault* indication.

Initiate an active fire alarm. You should measure 20 to 25 volts between TB1-5 (-) and TB1-6 (+), paying attention to

the polarity change. Verify receipt of the alarm at the municipal receiving station.

Initiate an active Supervisory condition. You should measure 20 to 25 volts between TB1-9 (-) and TB1-10 (+), paying attention to the polarity change. Verify receipt of the Supervisory condition at the municipal receiving station.

3-ASU Audio Source Unit

1. Verify that the 3-ASU is installed using accepted workmanship standards.
2. The audio sub-system messages and configuration information must be downloaded into the Audio Source Unit, using the System Definition Utility (SDU) program, before starting testing. Verify that the 3-ASUMX expansion card, if used, is firmly seated in its connector.
3. Verify the wiring to all devices.
4. Starting with the network in the normal condition, use the Status command to verify all amplifiers are communicating over the network.
5. Disconnect the network audio communications wiring (TB1-1/2) from the 3-ASU, and verify that all the audio amplifiers connected to the network appear in the Trouble queue. Restore the connection.
6. If a supervised remote microphone is used, disconnect the remote mic wiring (TB1-11 & TB1-12) from the 3-ASU. Verify a remote microphone trouble is annunciated.
7. Press the All Call switch on the front of the 3-ASU. Verify the All Call LED next to the switch lights. Remove the microphone from its bracket, press the Push-To-Talk (PTT) switch. Verify that that the pre-announcement tone (if configured) sounds, followed by the Ready to Page LED lighting. Speak into the microphone and verify that the Page Level Meter is operational, and the message is being transmitted over all speakers.

3-FTCU Firefighter's Telephone Unit

1. Verify that the 3-FTCU is installed using accepted workmanship standards.
2. Verify the wiring to all devices. SIGA-CC1's should be set to personality code 6.
3. Verify that the 3-FTCU display indicates: "0 Calls Pending" and "Unit: OK".

4. Take the master handset off-hook. Verify that the display indicates: “Handset off hook.” Replace the master handset on-hook.

5. Take a firefighter’s telephone off-hook (plug a phone in a phone jack). Verify that the incoming call buzzer sounds, the display indicates “1 Calls Pending”, the location of the incoming call is displayed in reversed text, and “0 calls connected” is shown on the display. Silence the buzzer by pressing the ACK switch. Press the Connect switch. Verify that the display indicates: “0 calls pending”, “1 calls connected”, and the location of the connected call is displayed in reversed text. Converse over the phone connection to verify clear, noise free communications.

   Take a second firefighter’s telephone *on a different circuit* off-hook. Verify that the incoming call buzzer sounds, the display indicates “1 Calls Pending”, the location of the incoming call is displayed in reversed text, and “1 calls connected” is shown in the display. Silence the buzzer by pressing the ACK switch. Press the Connect switch. Verify that the display indicates: “0 calls pending”, “2 calls connected”, the location of the second connected call is displayed in reversed text, the location of the first call is displayed in normal text below the second call location. Converse over the phone connection to verify clear, noise free communications.

   Press the Review Connected switch, moving the reversed text to the first call’s location message. Without hanging up the first telephone, press the Disconnect switch. Verify the display indicates: 1 Calls Pending”, the location of the call being disconnected is displayed in reversed text at the top of the screen, and “1 calls connected” is shown in the display. Hang up the first telephone. Verify that the display indicates: “0 Calls Pending” and “1 calls connected”.

6. Repeat Step 5, connecting five (5) phones simultaneously, and verify acceptable voice quality.

7. Press the All Call and Page by Phone switches on the 3-ASU Audio Source Unit. When the Ready to Page LED lights *steady*, speak into the telephone still connected, and verify that the telephone’s audio is distributed throughout the facility. Press the Disconnect switch on the 3-FTCU, and hang up the master and remote phones.

8a. *Class A telephone riser configuration*: Disconnect the telephone riser wiring (TB1-2 & TB1-2) or (TB1-3 & TB1-4) from the 3-FTCU, and verify that a riser trouble message appears in the Trouble queue. Take a firefighter’s telephone off-hook (plug a phone in a phone jack). Verify

that the incoming call buzzer sounds, the display indicates "1 Calls Pending", the location of the incoming call is displayed in reversed text, and "0 calls connected" is shown in the display. Restore the connection.

8b. *Class B telephone riser configuration*: Disconnect the telephone riser wiring (TB1-1 & TB1-2) from the 3-FTCU, and verify that a riser trouble message appears in the Trouble queue. Restore the connection.

9. Disconnect each phone station/jack station, and verify that a Trouble message appears in the Trouble queue. Restore the connections.

3-ZAxx Audio Amplifiers

1. Verify that the module is properly seated in both rail connectors and secured with the two snap rivets. Verify that removable terminal strips are firmly seated.
2. Verify that the 3-ASU is installed using accepted workmanship standards.
3. If wired with a backup amplifier, verify that the backup amplifier's wattage is equal to or greater than the wattage of any primary amplifier it can replace. If mixing 15-, and 30-watt amplifiers with 20-, and 40-watt amplifier modules, make sure the back up amplifier is 15 or 30 watts, whichever is required.
4. Verify that the EVAC and Page signals are available at the speakers
5. Create an amplifier fault. Verify backup amplifier substitution.
6. *Class B amp output configuration*: Disconnect the module's audio output wiring (TB2-7 & TB2-8) from the 3-ZAxx, and verify that the appropriate amplifier Trouble message appears in the Trouble queue. Restore the connection.
7. *Class B supplementary NAC output configuration* (3-ZA20 & 3-ZA40 only): Disconnect the module's supplementary notification appliance circuit wiring (TB2-3 & TB2-4) from the 3-ZAxx, and verify that the appropriate Trouble message appears in the Trouble queue. Restore the connection. Short the module's supplementary notification appliance circuit wiring (TB2-3 & TB2-4) from the 3-ZAxx, and verify that the appropriate Trouble message appears in the Trouble queue. Remove the short.

Control/display modules

1. Verify that the display(s) are properly seated in the module and secured with the four snap rivets. Verify that the ribbon cable between the display and its host module is firmly seated on both ends.
2. Perform a lamp test by pressing the Alarm Silence and Panel Silence switches simultaneously
3. Perform a functional switch test

Amplifier transfer panel (ATP)

1. Disconnect power amplifier output. Verify amplifier/riser trouble annunciated on panel. Restore connection.
2. Initiate an All Call page. Verify that audio is available on all power amplifier outputs.
3. If back up amplifiers provided, create an amplifier failure and verify backup amp operates properly.
4. Disconnect ac power from amplifier rack. Initiate an All Call page. Verify that audio is available on all power amplifier outputs.

Detector, input module, and output module initial and re-acceptance testing

The procedures listed in this section should be performed on the detectors, input modules, output modules, and related accessories connected to each cabinet. These procedures are designed to test the devices and the network applications programming.

Note: The network configuration, Signature Control module information must be downloaded into the network and Audio Source Unit, using the System Definition Utility (SDU) program, before starting testing.

Every circuit connected to the EST3 system should be visited, and manually activated during the installation process to verify that:

1. The installed location meets proper engineering practices.
2. The location annunciated by the system agrees with the physical location of the device.
3. That the activated device initiates the correct system response.

Duct detectors should be tested to verify that minimum/maximum airflow requirements are met.

Signature Series detectors and bases on a 3-SSDC module circuit

1. Verify that all components are installed using accepted workmanship standards.
2. Individually activate each detector. Verify that the appropriate Alarm and location message is displayed on the 3-LCD display. Verify that the detector initiates the appropriate system responses. If the detector is installed in a relay base, verify that the base's relay function operates correctly. If the detector is installed in an isolator base, verify that the base isolates the required circuit segments.

Caution: Do not use magnets to test Signature series detectors. Doing so may damage the detector electronics. Instead, use an approved testing agent (e.g. canned smoke.)

3. Duct mounted detectors should be tested using an air velocity test kit (6263, 6263-SG) to verify that minimum/maximum airflow requirements are met.

4. Remove the detector from its base. Verify that the appropriate Trouble and location message is displayed on the 3-LCD display.
5. After all detectors have been individually inspected, run a Sensitivity report, using the Reports command.

Addressable analog detectors on a 3-AADC Module circuit

1. Verify that all components are installed using accepted workmanship standards.
2. Individually activate each detector. Verify that the appropriate Alarm and location message is displayed on the 3-LCD display. Verify that the detector initiates the appropriate system responses.
3. Duct mounted detectors should be tested to verify that minimum/maximum airflow requirements are met.
4. Remove the detector from its base. Verify that the appropriate Trouble and location message is displayed on the 3-LCD display.
5. After all detectors have been individually inspected, run a Sensitivity report, using the Reports command.

Traditional 2-wire smoke detectors connected to 3-IDC8/4 modules

1. Verify that all components are installed using accepted workmanship standards.
2. Individually activate each detector. Verify that the appropriate Alarm and location message is displayed on the 3-LCD display. Verify the detector circuit initiates the appropriate system responses.
3. Duct mounted detectors should be tested to verify that minimum/maximum airflow requirements are met.
4. Remove the detector from its base. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Conventional 2-wire smoke detectors connected to SIGA-UM modules

1. Verify that all components are installed using accepted workmanship standards.
2. Verify that jumper JP1 on each SIGA-UM module is set to position 1/2.

3. Individually activate each detector. Verify that the appropriate Alarm and location message is displayed on the 3-LCD display. Verify the SIGA-UM initiates the appropriate system responses.
4. Duct mounted detectors should be tested to verify that minimum/maximum airflow requirements are met.
5. Remove the detector from its base. Verify that the appropriate SIGA-UM Trouble and location message is displayed on the 3-LCD display.

Signature series input modules

1. Verify that all components are installed using accepted workmanship standards.
2. Individually activate each initiation device. Verify that the appropriate circuit type and location message is displayed on the 3-LCD display. Verify that the circuit initiates the appropriate system responses.
3. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Signature series output modules

1. Verify that all components are installed using accepted workmanship standards.
2. Using the Activate Output command, individually activate each output. Verify that the device responds appropriately.
3. For supervised output circuits, open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.
4. If the output is activated by one or more system inputs, activate these inputs and verify the output function operates appropriately.

Initiating device initial and re-acceptance testing

The procedures listed in the following sections should be performed on the initiating devices connected to the system, in conjunction with the procedures in *Detector, input module, and output module initial and re-acceptance testing*. These procedures are designed to test the initiating devices and the network applications programming.

Manual stations

1. Visual inspection
2. Activate mechanism
3. Verify that the appropriate circuit type and device location message is displayed on the 3-LCD display. Verify the device initiates the appropriate system responses.
4. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Nonrestorable heat detectors

1. Visual inspection
2. Test mechanically and/or electrically
3. Verify that the appropriate circuit type and device location message is displayed on the 3-LCD display. Verify the device initiates the appropriate system responses.
4. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Restorable heat detectors

1. Visual inspection
2. Activate detector
3. Verify that the appropriate circuit type and device location message is displayed on the 3-LCD display. Verify the device initiates the appropriate system responses.
4. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Waterflow switches

1. Visual inspection

2. Activate sprinkler test valve. (Refer to Sprinkler system test procedure.)
3. Verify that the appropriate circuit type and device location message is displayed on the 3-LCD display. Verify the device initiates the appropriate system responses.
4. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Notification appliance initial and re-acceptance testing

The procedures listed in the following sections should be performed on the notification appliances connected to the system, in conjunction with the procedures in *Detector, input module, and output module initial and re-acceptance testing*. These procedures are designed to test the notification appliances and the network applications programming.

Visual Devices

1. Visual Inspection
2. Activate the circuit. Verify all indicating appliances operating properly.
3. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Speakers

1. Visual Inspection
2. Activate the circuit. Verify all indicating appliances operating properly.
3. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Bells/Horns

1. Visual Inspection
2. Activate the circuit. Verify all indicating appliances operating properly.
3. Open up the circuit. Verify that the appropriate circuit Trouble and location message is displayed on the 3-LCD display.

Certificate of completion

When the system has been tested and found to operate satisfactorily, make a copy and fill out the Record of Completion on the following pages, and mount it near the fire alarm panel or give it to the building representative.

Fire Alarm System Record of Completion

Protected Property

Name: _____

Address: _____

_____

Representative: _____

Phone: _____

Authority Having Jurisdiction: _____

Address: _____

_____

Phone: _____

Record of System Installation

This system has been installed in accordance with the NFPA standards listed below, was inspected by _____ on _____, and includes the devices listed below, and has been in service since _____ .

___ NFPA 72, Ch. 1 3 4 5 6 7 (circle all that apply)
___ NFPA 70, *National Electrical Code*, Article 760
___ Manufacturer's Instructions ___ Other (specify): _____

Record of System Operation

All operational features and functions of this system were tested by _____on _____ and found to be operating properly and in accordance with the requirements of:

___ NFPA 72, Ch. 1 3 4 5 6 7 circle all that apply)
___ NFPA 70, *National Electrical Code*, Article 760
___ Manufacturer's Instructions ___ Other (specify): _____
Signed: _____ Dated: _____ Organization: _____

System Software

System Firmware
Installed Revision: _____ Checksum: _____ Date: _____

Application Programming
Initial Program Installation: _____ Date: _____
Revisions & Reasons: _____ Date: _____
_____ Date: _____
_____ Date: _____
Programmed by (name): _____
Date of Programmer's Latest Factory Certification: _____
Data Entry Program Revision Used _____

Maintenance

Frequency of routine tests and inspections, if other than in accordance with the referenced NFPA standards: _____

_____

_____

System deviations from the referenced standards are: _____

_____

_____

_____
(signed) for Central Station or Alarm Service Company (title) (date)

_____
(signed) for representative of the authority having jurisdiction (title) (date)

[EST3ROC1.CDR]

Record of Completion

Initiating Devices and Circuits

(indicate quantity)

____ Manual Stations

Automatic Devices

____ Smoke Detectors: ____ Ion ____ Photo

____ Duct Detectors: ____ Ion ____ Photo

____ Waterflow Switches:

____ Other (list): _____

Combination Detectors (circle active sensors)

____ Ion/Photo/Heat

____ Ion/Photo/Heat

Supervisory Devices and Circuits

(indicate quantity)

____ Compulsory Guard's Tour comprised of _____ transmitter stations and _____ intermdediate stations.

Sprinkler System

____ Valve supervisory devices

____ Building temperature points

____ Site water temperature points

____ Site water supply level points:

Electric Fire Pump

____ Fire pump power

____ Fire pump running

____ Phase reversal

Engine Driven Fire Pump

____ Selector in auto position

____ Control panel trouble

____ Transfer switches

____ Engine running

Other Supervisory Function(s) (specify)

____ _____

_____

_____

Notification Appliances & Circuits

Notification Appliance Circuits _____

Type and quantity of installed Notification Appliances

____ Bells ____ inch

____ Speakers

____ Horns

____ Other: _____

____ Local Annunciator

____ Visual Signals Type: _____

____ with audible

____ without audible

Signaling Line Circuits

Quantity and Style of connected SLCs, per NFPA 72, Table 3-6.1

____ Quantity ____ Style

System & Service

___ **NFPA 72, Ch. 3 - Local**

If alarm transmitted off premise, location(s) received: _____

___ **NFPA 72, Ch. 3 - Emergency Voice Alarm Service**

Voice/alarm channels: _____ Single: _____ Multiple: _____

Installed speakers: _____ # speakers per zone: _____

Telephones/jacks installed: _____

___ **NFPA 72, Ch. 4 - Auxiliary**

Type of connection:

Local Energy: _____ Shunt: _____ Parallel Telephone: _____

Location/Phone # for receipt of signals: _____

___ **NFPA 72, Ch. 4 - Remote Station**

Alarm: _____

Supervisory: _____

___ **NFPA 72, Ch. 4 - Proprietary**

If alarms retransmitted off premise, location & phone of receiving organization:

Method of alarm retransmission: _____

___ **NFPA 72, Ch. 4 - Central Station**

Prime Contractor: _____

Central Station Location: _____

Method of transmission of alarms to central station:

____ McCulloh ____ One-Way Radio ____ Digital Alarm Communicator

____ Multiplex ____ Two-Way Radio ____ Others: _____

Method of transmission of alarms to public fire service comunications center:

1. _____ 2. _____

Power Supplies

Primary (main)

Nominal Voltage: _____

Current Rating: _____

Overcurrent protection:

Type: _____

Current rating: _____

Location: _____

Secondery (standby)

____ Storage battery

Amp-Hour rating: _____

Calculated for _____ hours of system operation.

____ Dedicated generator

Location of fuel supply: _____

Emergency or standby system used to backup primary supply

____ Emergency system described in NFPA 70, Article 700

____ Legally required standby system described in NFPA 70, Article 701

____ Optional standby system described in NFPA 70, Article 702, meeting the performance requirements of Article 700 or 701

[EST3ROC2.CDR]

LOCATION: _____

Installed by:

_____

_____

_____

Per NFPA Standard

- ❑ 72, Ch 3 - Local
- ❑ 72, Ch.4 - Auxiliary
- ❑ 72, Ch.4 - Remote Station
- ❑ 72, Ch.4 - Proprietary
- ❑ 72, Ch.4 - Central Station

Dated _____

For Service Contact:

_____

_____

_____

_____

Inspected By:

_____

_____

_____

Date: _____

Power Supply:

Primary _____
Location _____
Fuses _____
Secondary _____
Type _____
Specs _____

OPERATING INSTRUCTIONS

FIRE ALARM CONTROL PANEL

NORMAL CONDITION: POWER LED (GREEN) ON, ALL OTHER LEDs OFF.

ALARM CONDITION: SYSTEM ALARM LED (RED). ALARM LOCATION AND ZONE SHOWN IN DISPLAY. USE REVIEW ALARM QUEUE SWITCH TO VIEW ADDITIONAL ALARMS. INTERNAL BUZZER PULSING.

1. TO SILENCE AUDIBLE DEVICES: PRESS THE "ALARM SILENCE" SWITCH. AUDIBLE SIGNALS WILL TURN OFF. NEW ALARMS RE-SOUND AUDIBLE SIGNALS. TO RE-SOUND AUDIBLE SIGNALS, PRESS THE "ALARM SILENCE" SWITCH A SECOND TIME.

2. TO RESET SYSTEM: PRESS "RESET" SWITCH (AFTER INVESTIGATING ALARM CONDITION).

SUPERVISORY CONDITION: SUPERVISORY LED (YELLOW), INTERNAL BUZZER ON. SUPERVISORY CONDITION, LOCATION, AND ZONE SHOWN IN DISPLAY. USE REVIEW SUPERVISORY QUEUE BUTTON TO VIEW ADDITIONAL LOCATIONS. INTERNAL BUZZER PULSING.

1. TO SILENCE BUZZER: PRESS "PANEL SILENCE" BUTTON. INVESTIGATE CAUSE.

2. TO CLEAR SYSTEM: PRESS THE "RESET" SWITCH.

MONITOR CONDITION: MONITOR LED (YELLOW) ON IN NON ALARM. MONITOR CONDITION AND LOCATION SHOWN IN DISPLAY ONLY IN ALARM. USE REVIEW MONITOR QUEUE BUTTON TO VIEW ADDITIONAL LOCATIONS.

1. TO CLEAR SYSTEM: SYSTEM CLEARS AUTOMATICALLY ON RESTORATION OF MONITOR CONDITION.

TROUBLE CONDITION: SYSTEM TROUBLE LED (YELLOW) ON, INTERNAL BUZZER PULSING.TROUBLE LOCATION AND ZONE SHOWN IN DISPLAY. USE REVIEW TROUBLE QUEUE BUTTON TO VIEW ADDITIONAL LOCATIONS.

1. TO SILENCE BUZZER: PRESS "LOCAL SILENCE" SWITCH. INVESTIGATE CAUSE OF TROUBLE.

2. TO CLEAR SYSTEM: SYSTEM CLEAR AUTOMATICALLY ON CORRECTION OF TROUBLE CONDITION.

FIRE DRILL: NOTIFY FIRE DEPARTMENT OF TEST.

1. TO DRILL AND SOUND ALL AUDIBLE DEVICES: PRESS DRILL BUTTON. ALL AUDIBLE/VISIBLE SIGNALS OPERATE. PRESS DRILL A SECOND TIME OR ALARM SILENCE TO END DRILL.

FOR ADDITIONAL INFORMATION, REFER TO MANUAL P/N 270382

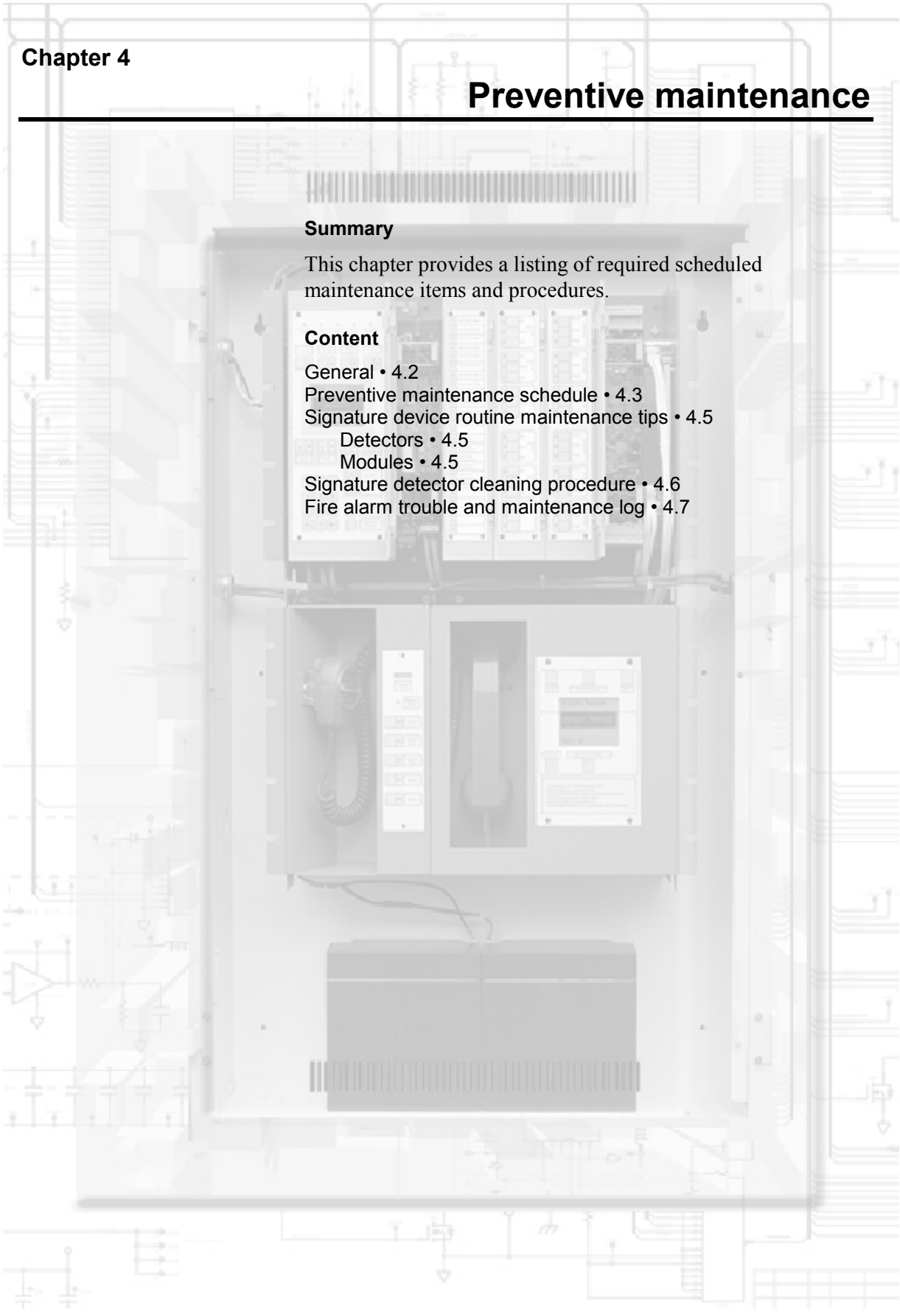
THESE INSTRUCTIONS TO BE FRAMED AND MOUNTED ADJACENT TO CONTROL PANEL.

P/N 270411 REV. 1.0

[270411.CDR]

Chapter 4

Preventive maintenance



Summary

This chapter provides a listing of required scheduled maintenance items and procedures.

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General • 4.2
Preventive maintenance schedule • 4.3
Signature device routine maintenance tips • 4.5
    Detectors • 4.5
    Modules • 4.5
Signature detector cleaning procedure • 4.6
Fire alarm trouble and maintenance log • 4.7

General

Before commencing testing, notify all areas where the alarm sounds and off premise locations that receive alarm and trouble transmissions that testing is in progress.

Records of all testing and maintenance shall be kept on the protected premises for a period of at least five (5) years.

Required Tools:
- Slotted Screwdriver, Insulated
- Digital multimeter
- 1.1 kΩ 1W resistor
- 12" (30.5 cm) jumper lead with alligator clips
- Panel Door Key

A complete check of installed field wiring and devices should be made at regular intervals, in accordance with NFPA 72 and ULC 524 requirements. This includes testing all alarm and supervisory alarm initiating devices and circuits, and any off premise connections.

Panel operation should be verified in the alarm, supervisory, and trouble modes.

To ensure that the panel can be powered when primary power is lost, the batteries should be periodically inspected, tested, and replaced (as a minimum) every 4 years.

Preventive maintenance schedule

Preventive maintenance schedule

Component	Testing Interval	Test Procedure
Manual Stations	Semi-annually	1. Visual inspection 2. Put zone in Test mode 3. Activate mechanism 4. Verify proper IDC zone response
Non-Restorable Heat Detectors	Semi-annually	1. Visual inspection 2. Put zone in Test mode 3. Test mechanically and/or electrically 4. Verify proper IDC zone response
Restorable Heat Detectors	Semi-annually	1. Visual Inspection 2. Put zone in Test mode 3. Activate at least one detector on each IDC. Within five years all detectors on each IDC shall be tested.
Smoke Detectors	Annually	1. Visual inspection 2. Put zone in test mode 3. Conduct a Functional test to verify proper IDC zone response 4. Check sensitivity 5. Clean as required
Waterflow Switches	2 Months	1. Put zone in Test mode 2. Activate sprinkler test valve. Refer to Sprinkler system test procedure.
All Initiating Device Circuits	Annually	1. Enter Test mode 2. Activate IDC zone. Appropriate NACs should activate & zone information should be annunciated. 3. Restore device and reset zone 4. Open the IDC field wiring. Trouble should be annunciated. 5. Reset and lock panel at conclusion of all testing
Remote Annunciators	Annually	1. Verify all indicators operating properly.
Notification Appliances	Annually	1. Visual Inspection 2. Put panel in Alarm, Drill, or Test mode. Verify that all indicating appliances are operating properly
Panel LEDs & Trouble Buzzer	Annually	1. Illuminate all LEDs by pressing the Panel Silence and Trouble Silence switches at the same time 2. Reset and lock panel at conclusion of all testing
Panel Primary Power	Acceptance and Re-acceptance tests	1. Remove Primary AC power 2. Verify panel operates from battery 3. Verify panel goes into trouble (6 second delay) 4. Restore AC power at end of test 5. Reset and lock panel at conclusion of all testing

Preventive maintenance schedule

Component	Testing Interval	Test Procedure
Panel Secondary Power	Acceptance and Re-acceptance tests	1. Remove primary ac power 2. Measure standby and alarm currents, and compare with battery calculations to verify adequate battery capacity. 3. Test under full load for 5 minutes 4. Measure battery voltage under full load (20.4 to 27.3 VDC) 5. Restore ac power at end of test 6. Reset and lock panel at conclusion of all testing
Panel Trouble Signals	Annually	1. Verify operation of system Trouble LED and trouble buzzer 2. Reset and lock panel at conclusion of all testing
Supervisory Signal Initiating Devices	Semi-annually	1. Put zone in Test mode 2. Operate valve 3. Test pressure, temperature, and water level sensors per the sprinkler system test procedure
Auxiliary System Off-Premise Fire Alarm Signal Transmission	Monthly	1. Coordinate test with receiving location 2. Verify receipt of all transmitted signals 3. Reset and lock panel at conclusion of all testing
Remote System Off-Premise Waterflow Signal Transmission	Every 2 Months	1. Coordinate test with receiving location 2. Verify receipt of all transmitted signals 3. Reset and lock panel at conclusion of all testing

Signature device routine maintenance tips

Detectors

When removing one detector at a time, wait 1 minute after replacing the first detector before removing the next detector. This gives the system time to recognize and re-map the first detector before generating a trouble condition caused by removing the second detector.

Modules

Signature modules should be visually inspected to insure the physical installation is secure. Functional testing of the module's function should be done on a regular basis, as required by the AHJ.

Signature detector cleaning procedure

Signature detectors may be cleaned using a conventional vacuum cleaner with the detector cleaning tool (P/N SIGA-ST) installed on the end of the suction hose (nominal 1.5 in. [3.8 cm] ID) extension tubes. The tool creates a high velocity vortex scrubbing action around the detector, removing loose dust and debris which is subsequently drawn into the vacuum.

Note: In order to avoid false alarms, disable the detector being cleaned before using the detector cleaning tool.

1. Disable the detector to prevent false alarms.
2. Use the conventional vacuum cleaner brush attachment to remove any visible cobwebs etc. from the immediate area of the detector.
3. Connect the detector cleaning tool to the suction hose.
4. Place the detector cleaning tool over the detector head for approximately 10 seconds.
5. After the detector has been cleaned, Restore it to proper operation.
6. Check the detector's sensitivity to verify the effectiveness of the cleaning.

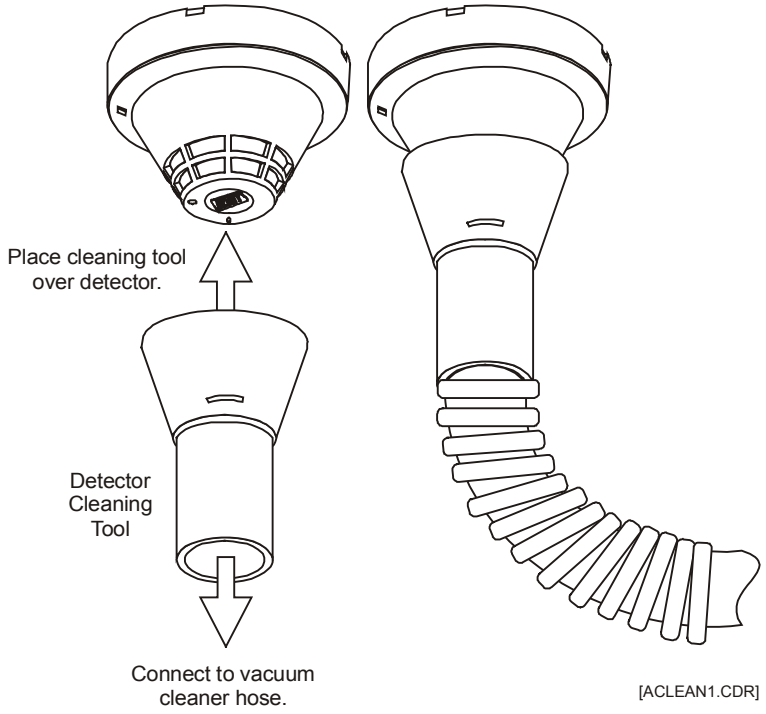

Figure 4-1: Detector Cleaning Tool

Fire alarm trouble and maintenance log

Date	Time	Event	Initial

Chapter 5

Service and troubleshooting

Summary

This chapter provides a comprehensive set of procedures and tables to aid certified technical personnel in servicing and troubleshooting the system.

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- Problem classification • 5.3
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- Removing or replacing circuit modules • 5.4
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Overview

Maintenance philosophy

The EST3 life safety system consists of modular assemblies utilizing surface mount technology (SMT) for easy installation and maintenance. SMT provides high reliability but prohibits component-level field repairs. For these and other reasons, the maintenance philosophy consists of fault isolating to the circuit card assembly, removing the defective circuit card, and then replacing it with a spare.

Service and repair of EST3 system components centers around the following assumptions:

1. Qualified technicians possessing a complete understanding of the system hardware and functions will perform maintenance.
2. Only certified maintenance technicians will service the equipment.
3. Maintenance technicians will have a ready available supply of replacement parts.

Problem classification

Problems with the system can generally be classified into two categories: hardware/firmware problems and applications programming problems. Many times hardware problems are identified by the system itself. Application programming problems are typically suspected when an incorrect response happens, or when a response fails to happen or happens at the wrong time.

Handling static-sensitive circuit modules

Many of the circuit modules use components that are sensitive to static electricity. To reduce the possibility of damaging these components, take the following precautions when handling:

1. Use only approved grounding straps that are equipped with a 1 MΩ resistive path to earth ground.
2. Always keep circuit modules in their protective antistatic packaging. Remove only for inspection or installation.
3. Always hold circuit modules by the sides. Avoid touching component leads and connector pins.

Removing or replacing circuit modules

When removing or replacing circuit modules, always remember to:

1. First disconnect the battery then remove ac power. Removing or replacing circuit modules when power is applied will damage the equipment.
2. Avoid applying excessive force to the snap-rivet fasteners that lock the plug-in modules in place. If needed, use the extraction tool provided in the hardware kit.

Recommended spares list

As a general guideline, 10% of the quantity installed or a minimum of 1 each of the following installed equipment should be available as spare:

- Power supply
- Local rail modules
- Amplifiers (if no backup installed in system)
- Printer ribbon

As a general guideline, 10% of the quantity installed or a minimum of 3 each of the following installed equipment should be available as spare:

- Monitor modules
- Control modules
- Heat detectors
- Ionization smoke detectors
- Photoelectric smoke detectors
- Base, detector
- Duct detector filter kits
- Breakglass replacement for pull stations
- Breakglass replacement for warden stations
- Horn, bell, strobe, and speaker

System batteries should be replaced at recommended intervals. Stocking of spare batteries is not recommended because of shelf-life limitations.

Hardware problems

Identification

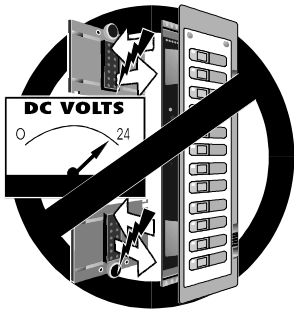
Hardware problems are typically identified by an intermittent or total failure of a device.

Isolation

Hardware problems may be categorized as problems within an equipment cabinet, and problems with field wiring and devices.

The quickest way to locate a hardware problem is by selectively isolating portions of the system and observing the results of the isolation. By selectively isolating smaller and smaller portions of the system, hardware faults can usually be isolated. The suspect component may then be replaced with a known good component, and the results again observed.

Substituting hardware



Caution: Never install or remove a module while power is applied to the cabinet.

The local rail modules in the EST3 system are microprocessor based. The Signature driver controller module, 3-CPU1 Central Processor module, 3-AADC Addressable Analog Device Controller module, and 3-ASU Audio Source Unit all have "flash" memory, which is used to store the operating firmware. The flash memory is empty when the module is shipped from the factory. When the configuration database is downloaded into the cabinet, each component using flash memory receives specific information. This information includes the module's location in the system and its configuration.

Note: Because the content of each module is specific to its cabinet location, do not substitute 3-SSDC, 3-CPU1, 3-AADC, or 3-ASU modules without downloading the new cabinet configuration database.

If you are substituting a Signature driver controller module, you must also download the specific Signature circuit information into the module's memory. If you are substituting a 3-AADC driver controller module, you must also download its specific circuit configuration into its database. If you are substituting 3-ASU modules, you must also download the audio message database directly into the 3-ASU.

Rail module substitution and replacement rules

Rule 1: Modules must be replaced with modules of the same model number.

Rule 2: LED/Switch Displays must be replaced with LED/Switch Displays of the same model number.

Rule 3: Substitute modules MUST have an IDENTICAL LED/Switch Display installed as the module it replaces.

Rule 4: Substitute modules should be installed in the same rail location as the module it is replacing.

Adding hardware

When hardware is added to a cabinet, a portion of the network configuration database must also be changed. The extent of the changes depends on the rule relationships between the added component and the balance of the network. Revised copies of the database must then be downloaded using the SDU program.

Downloading problems

If you are experiencing frequent downloading problems, low signal level from the download computer may be the cause. The Buffered RS-232 Communications Cable, Catalog No. SDU-CBL, may be used to correct signal level problems.

Note: Do not use the buffered RS-232 communications cable with a 3-CPU1.

Modules

Rail signals

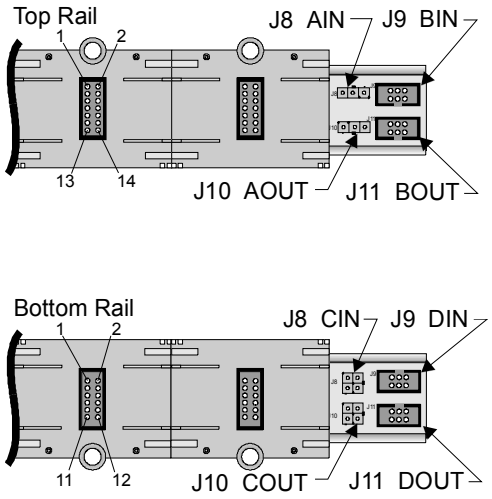
The figure below shows the signals normally present on a pair of chassis rails.

Note: The panel controller and the power supply monitor module must be installed in order to measure the voltages indicated.

Top Rail	
Pin	Function
1 - 2	+6.25 VDC
3	+Sense
4	-Sense
5	-Audio Data
6	+Audio Data
7	-Rail Data
8	+Rail Data
9 - 10	Not Used
11 - 14	Common

Bottom Rail	
Pin	Function
1 - 4	+24 VDC
5	All Fail
6 - 9	Not Used
10 - 12	Ground

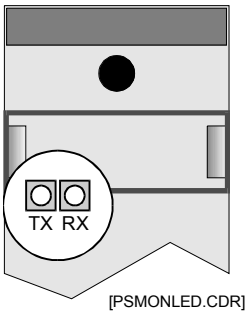
[3RAILSIG.CDR]



The dc voltages can be checked with a digital meter. Data signals on pins 7 and 8 of the top rail can be verified by looking at the Rx and Tx LEDs on any module installed on the rail.

3-PPS/M primary power supply

The transmit (TX) and receive (RX) LEDs on the Primary Power Supply Monitor Module should flicker, indicating normal two way communications activity with the 3-CPU1.



[PSMONLED.CDR]

If the 3-PPS/M Primary Power Supply is used in conjunction with one or more 3-BPS/M Booster Power Supplies, there is interaction between the supplies. Under most conditions, a defective power supply will be identified by the system, and

annunciated as a trouble. The system may continue to operate nearly normally, as the battery connected to the faulty supply will automatically be switched into the circuit, as the load demands.

Table 5-1: Nominal primary and booster power supply voltages

Test Point	Voltage
Rail Power	25 - 26.4 Vdc w/AC power on
Auxiliary Power	25 - 26.4 Vdc w/AC power on
Battery	27.3 V (battery under charge @ 25 °C)

Table 5-2: Primary power supply/monitor module troubleshooting

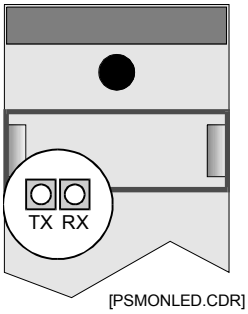
Problem	Possible Cause
Supply will not operate from ac line	1. AC line fuse F2 (3.15A slow blow) open 2. Rectified DC fuse F3 (3.15A slow blow) open
RX or TX LED OFF No communications between 3-PSMON and 3-CPU1	1. Defective or poor connection on ribbon cable between 3-PSMON and 3-PPS 2. 3-PSMON Defective 3. 3-PPS Defective
Auxiliary & Rail voltage low	1. Excessive load causing supply to fold back 2. Power Cable between 3-PSMON and 3-PPS loose or defective 3. Booster Supply failure causing primary supply to fold back
Batteries will not charge	1. System in alarm mode 2. Fuse F1 (8A) on 3-PPS open 3. 30 to 60 Ah battery installed, 10 to 29 Ah battery specified in SDU 4. Battery shorted 5. Battery not wired to power supplies correctly (only wired to BPS/M)

Table 5-2: Primary power supply/monitor module troubleshooting

Problem	Possible Cause
System will not operate on batteries	1. Battery voltage below 18 Vdc. (system automatically turns off when batteries too low to properly operate system) 2. Fuse F1 (8A) on 3-PPS open 3. Batteries connected before ac power energized 4. Battery temperature too high 5. Defective batteries

3-BPS/M Booster power supply

The transmit (TX) and receive (RX) LEDs on the Booster Power Supply Monitor Module should flicker, indicating normal two way communications activity with the 3-CPU1.



The booster power supply voltages are indicated in Table 5-1. Table 5-3 lists common problems with the booster power supply and booster monitor module.

Table 5-3: Booster power supply/monitor module troubleshooting

Problem	Possible Cause
Supply will not operate from ac line	1. AC line fuse F2 (3.15A slow blow) open 2. Rectified DC fuse F3 (3.15A slow blow) open
RX or TX LED OFF No communications between 3-BPSMON and 3-CPU1	1. Defective or poor connection on ribbon cable between 3-BPSMON and 3-BPS 2. 3-BPSMON defective 3. 3-BPS defective

Table 5-3: Booster power supply/monitor module troubleshooting

Problem	Possible Cause
Auxiliary & Rail voltage low	1. Excessive load causing supply to fold back 2. Power Cable between 3-BPSMON and 3-BPS loose or defective 3. Booster Supply failure causing primary supply to fold back
System will not operate on batteries	1. Battery voltage below 18 Vdc. (system automatically turns off when batteries too low to properly operate system) 2. Fuse F1 (8A) on 3-BPS open 3. Batteries connected before ac power energized 4. Battery temperature too high 5. Defective batteries

SIGA-APS Auxiliary power supply

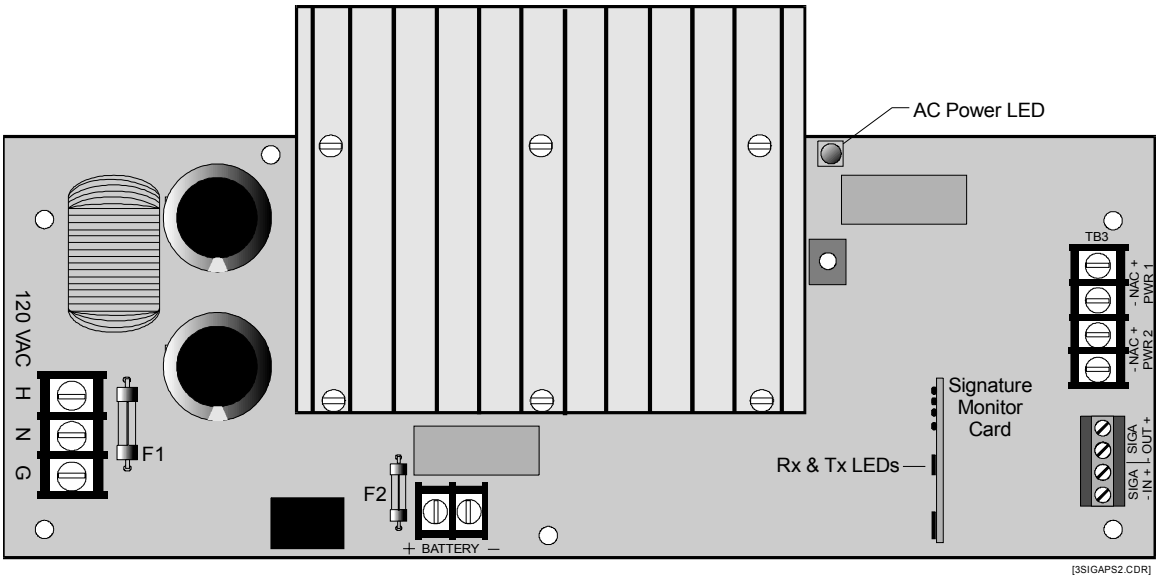


Figure 5-1: SIGA-APS Auxiliary Power Supply

Table 5-4: Nominal auxiliary primary power supply voltages

Test Point	Voltage
Signal Power	24 Vdc nominal with ac power on
Battery	26.8 V (battery under trickle charge)

Table 5-5: SIGA-APS trouble conditions

Address	Status	Description
Low (1ST Zone)	Open	AC Failure / Battery Loss
High (2ND Zone)	Open	NAC short / internal fault / ground fault

Table 5-6: Auxiliary power supply troubleshooting

Problem	Possible Cause	
No Signature communications	1	Defective or poor connection on Signature Data Circuit
(Com LED does not flash)	2	Does not appear as supervisory SIGA-CT2 in database
AC power OFF	1	No ac power to unit
Signal power voltage low	1	Excessive load causing supply to fold back (3.2 A max)
Batteries will not charge	1	Fuse F2 (7 Amps) open,
	2	Installed battery greater than 10 Ah capacity
System will not operate on batteries	1	Batteries low (system automatically turns off when batteries too low to properly operate system)
	2	Fuse F2 open
System ground fault	1	Internal or field wiring in contact with earth ground

3-CPU1 Central Processor module

The 3-CPU1 controls all the communications and processing of information for modules located in its cabinet. Token ring network communications between CPU modules in other cabinets is also processed by the 3-CPU1. Network communications is RS-485 when the 3-RS485 card is installed in 3-CPU1 connector J2, and fiber optic when the 3-FIB module is connected to J2 of the 3-CPU1.

Network and Audio Data Circuits

Figure 5-2 and Table 5-7 shows the location and normal state of the communications status LEDs on the 3-CPU1 module.

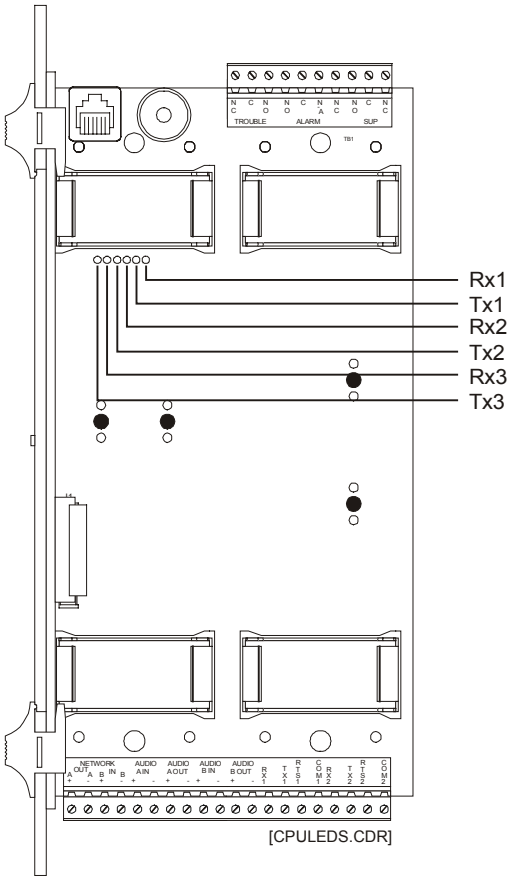


Figure 5-2: 3-CPU1 module

Table 5-7: 3-CPU1 LED indications

LED	Normal State	Description
RX1	Flicker	Local Rail Receive Activity
TX1	Flicker	Local Rail Transmit Activity
RX2	Flicker	Network Data Ch A Receive Activity
TX2	Flicker	Network Data Ch A Transmit Activity
RX3	Flicker	Network Data Ch B Receive Activity
TX3	Flicker	Network Data Ch B Transmit Activity

EST3 network wiring alternates between channel A and channel B, as shown in Figure 5-3.

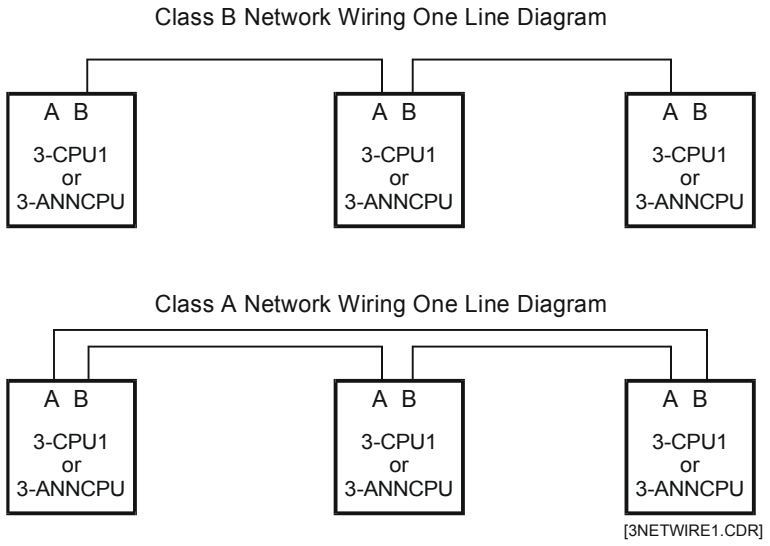


Figure 5-3: Network Wiring One Line Diagram

RX1 and TX1 should flicker continuously, indicating normal two-way CPU module to rail module communication activity.

When multiple CPU modules are networked together using Class B wiring, RX2, TX2, RX3, and TX3 on all panels except the first and last should flicker continuously, indicating normal two-way network communications activity on both data channels.

When multiple CPU modules are networked together using Class A wiring, RX2, TX2, RX3, and TX3 should flicker continuously, indicating normal two way network communications activity on data channels A, and B.

The network and audio riser data circuits are isolated at each CPU module. This prevents a shorted data circuit from interrupting communications on the entire circuit. Figure 5-4 shows typical Class B network data circuit.

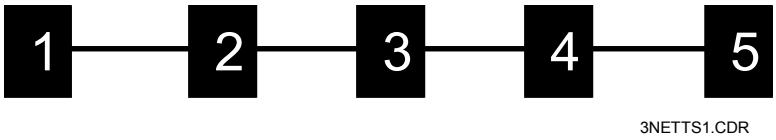


Figure 5-4: Class B Network Data Circuit

When trying to isolate trouble on a network or audio data circuit, remember that both shorted and open circuit segments will interrupt communications between two CPU modules.

Figure 5-5 shows an open or short circuit fault between cabinets 3 and 4.

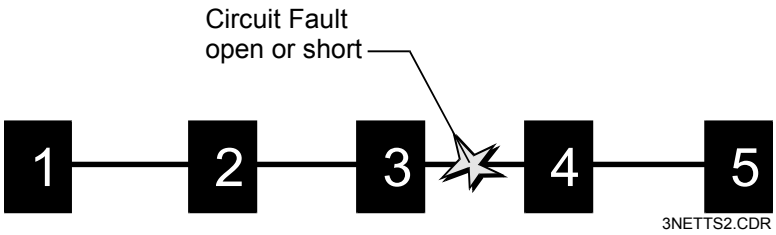


Figure 5-5: Network Data Circuit Fault

Either an open or shorted circuit will interrupt communications between cabinets 3 and 4. The token ring network will reconfigure and operate as two independent sub-networks, one consisting of cabinets 1, 2, and 3; the second consisting of cabinets 4 and 5.

Due to the isolation between cabinets, during a ground fault condition, the number of potential circuits to be investigated is limited to those originating from a single cabinet.

Table 5-8: 3-CPU1 troubleshooting

Problem	Possible Cause
RX1 or TX1 Off	1. 3-CPU1 not firmly seated in rail connectors 2. 3-CPU1 failure
RX2, TX2 and/or RX3, TX3 Off	1. (+) and (-) wires reversed. 2. Circuit not properly terminated 3. Network A and Network B circuits crossed 4. Improper wire installed 5 Ground fault 6. 3-RS485 card loose
RS-232 port (J5) inoperative	1. TX & RX wires reversed 2. 3-CPU1 and peripheral device baud rate mismatched 3. PC improperly configured
Ancillary RS-232 port (TB2-1 to 4 or TB2-5 to 8) inoperative	1. TX & RX wires reversed. 2. 3-CPU1 and peripheral device baud rate mismatched 3. Peripheral device off-line or improperly configured
RS-485 port (TB2 17 to 20) inoperative	1. (+) and (-) wires reversed. 2. 3-RS485 card not seated properly 3. Network A and Network B circuits crossed 4. Improper wire
Power LED off, no characters on display, switches inoperative	1. No power to panel. 2. Ribbon cable between 3-LCD and 3-CPU1 loose or defective. 3. 3-CPU1 defective 4 3-LCD defective 5. 3-CPU1 not configured in SDU for 3-LCD
All Module LEDs and switches inoperative AND host module working correctly.	1. Ribbon cable between display and 3-CPU1 module loose or defective 2. Display not configured in SDU 3. Display defective
Switch activation does not perform the required function.	1 Display not defined in SDU database 2. Domain not configured correctly.

3-FIB/A fiber optic interface

Note: If network communications must be maintained when the node is powered down for service, connect a 12V battery to J2 on the fiber optic interface card.

The LEDs on the 3-FIB/A interface board adjacent to the fiber optic indicate circuit activity.

Test Jumpers

Jumper JP1 is used to put the module in test mode. In the test mode, the "OUT" ports transmit a constant signal, which can be used to measure cable loss.

Table 5-9: 3-FIB troubleshooting

Symptom	Possible Causes
No LED activity on any fiber optic port	1. Ribbon cable between interface and electronics card loose, Improperly installed, or broken. 2. Electronics card not properly seated in J2 of 3-CPU1.
No LED activity on "IN" fiber optic port	1. Incorrect cable connected to port.
Steady on LED on "IN" fiber optic port	1. Jumper JP1 left in test position.

3-SSDC Signature controller modue

Please refer to Signature Component Troubleshooting Chapter for complete information on Signature related troubleshooting.

Control/display modules

The information in this section applies to the following models of control/display modules:

3-12/1RY	3-2RY	3-12/2RY
3-12SG	3-12SR	3-12SY
3-12/SIGY	3-12/S1RY	3-12/AS2Y
3-24G	3-24R	3-24Y
3-6/3S3L	3-6/3S1G2Y	3-6/S1GYR

The control/display modules operate independently of the host module on which they are installed. The displays do use the host module's electronics to communicate with the 3-CPU1.

The Lamp Test function (pressing Panel Silence & Alarm Silence Switches simultaneously) will quickly isolate hardware problems from programming problems with any display.

Table 5-10: Control/display module troubleshooting

Problem	Possible Cause
Module LEDs and switches inoperative AND host module inoperative	1. No power to panel 2. Ribbon cable between display and host module loose or defective 3. Display defective 4. Host module defective
All module LEDs and switches inoperative AND host module working correctly	1. Ribbon cable between display and host module loose or defective 2. Display not configured in SDU 3. Display defective
LEDs respond incorrectly	1. Display not defined in SDU database 2. LED misidentified in SDU database 3. Rule governing LED operation not correctly written
Switch activation does not perform the required function	1. Display not defined in SDU database 2. Switch misidentified in SDU database 3. Rule governing switch operation not correctly written

Audio amplifier modules

Table 5-11: 3-ZAxx zoned audio amplifier module troubleshooting

Problem	Possible Cause
Audio output level too low	1. Jumpers set for 25 Vrms when connected to a 70 Vrms circuit 2. Gain adjusted too low 3. Input level to ASU too low
No or extremely low audio output	1. Fuse blown 2. Gain set too low
Audio level too high	1. Jumper set for 70 Vrms when connected to 25 Vrms circuit 2. Gain adjusted too high 3. Input level to ASU too high
Amplifier current limiting	1. Audio circuit overloaded 2. Input level to ASU too high

Table 5-11: 3-ZAxx zoned audio amplifier module troubleshooting

Problem	Possible Cause
Incorrect amplifier version reported to 3-CPU1 module	1. Jumpers installed incorrectly

3-OPS Off-premises signal module

Table 5-12: 3-OPS off-premises signal module troubleshooting

Problem	Possible Cause
Module in trouble	1. Master box circuit open or not reset 2. Reverse polarity circuit open 3. 3.6 kΩ EOL resistor not installed on unused circuits
Remote receiver indicates circuit trouble and does not receive alarm	1. Circuit polarity reversed 2. Circuit open 3. Excessive circuit resistance 4. Incompatible receiver 5. Defective module
Remote receiver does NOT indicate circuit trouble and does not receive alarm	1. 3-OPS Not activated by panel (SDU database) 2. Incompatible receiver 3. Defective module

3-IDC8/4 Initiating device circuit module

Table 5-13: 3-IDC8/4 initiating device circuit module troubleshooting

Problem	Possible Cause
Module in trouble	1. 4.7 kΩ EOL resistor not installed on unused IDC circuits 2. 15 kΩ EOL resistor not installed on unused NAC circuits 3. No communication with 3-CPU1 module 4. Module not defined in SDU database. 5. Field wiring connector not plugged into module

Table 5-13: 3-IDC8/4 initiating device circuit module troubleshooting

Problem	Possible Cause
NAC output not working	1. Jumpers installed incorrectly 2. External source configured but not connected 3. Circuit folding back due to overload. 4. Circuit “Silenced” 5. Circuit shorted 6. Polarized device defective or reversed on circuit
IDC circuit not working	1. Incompatible 2-wire smoke detectors 2. Excessive wiring resistance or capacitance

3-LDSM display support module

Table 5-14: 3-LDSM display support module troubleshooting

Problem	Possible Cause
All Module LEDs and switches inoperative AND host module working correctly	1. Ribbon cable between display and 3-LDSM module loose or defective 2. Module not configured in SDU 3. Display not configured in SDU 4. Display defective

Audio components

3-ASU Audio Source Unit

Table 5-15: 3-ASU Audio Source Unit Troubleshooting

Problem	Possible Cause
Unit does not respond. No network Rx or Tx LED activity	1. Power or data connectors loose or connected wrong on Rail Chassis Interface Card 2. Ribbon cable between Rail Chassis Interface Card and 3-ASU (and 3-FTCU, if installed) loose or defective 3. Ribbon cable between 3-ASU main board and cover loose or defective
No “all call” page audio output from network amplifiers and low level page output terminals	1. Defective microphone 2. Page inhibit timer set too long 3. Defective 3-ASU 4. Ribbon cable between 3-ASU main board and cover loose or defective 5. Defective amplifier
No “all call” page audio output from network amplifiers, output available at low level page output terminals	1. Network audio data riser open, shorted, or incorrectly wired 2. Network data riser open, shorted, or incorrectly wired 3. TB2 on the 3-CPU1 loose or incorrectly wired 4. 3-ASU not properly configured in SDU database 5. Amplifiers not properly installed or defective
Page audio distorted	1. Speaking too loud into microphone. Speak such that the last green LED on the page level meter only flickers occasionally 2. Gain of individual amplifiers set too high
Auxiliary Input volume level too low	1. Adjust Aux input gain control on ASU 2. Auxiliary input wiring open or shorted
Auxiliary Input volume level too high	1. Adjust Aux input gain control on ASU
Recorded messages not working properly	1. 3-ASUMX memory not firmly seated in connector 2. Audio database not correctly downloaded into 3-ASU 3. Incorrect message label referenced.
Wrong messages going to wrong floors	1. Amplifier and message labels and rules incorrect or mislabeled

Table 5-15: 3-ASU Audio Source Unit Troubleshooting

Problem	Possible Cause
Telephone Page inoperative	1. Wiring between 3-ASU and 3-FTCU open, shorted, or incorrectly wired
Remote Microphone trouble	1. Wrong or missing EOL resistor on mic key input 2. No supervisory tone on DC current on remote mic audio output

3-FTCU Firefighters Telephone Control Unit

Table 5-16: 3-FTCU (3-ASU/FT) Firefighters Telephone Control Unit Troubleshooting

Problem	Possible Cause
Unit does not respond No Rx or Tx LED activity	1. Power or data connectors loose or connected wrong on Rail Chassis Interface Card 2. Ribbon cable between Rail Chassis Interface Card and 3-FTCU loose or defective 3. Ribbon cable between 3-FTCU main board and cover loose or defective 4. Defective 3-FTCU
Signature modules do not switch telephones correctly	1. Network data riser open, shorted, or wired incorrectly 2. TB2 on the 3-CPU1 loose or wired incorrectly 3. Defective 3-FTCU 4. Signature module has incorrect label, personality code, or device type 5. Defective Signature module
Low telephone volume level	1. More than five handsets active at one time 2. Phone riser open, shorted, or wired incorrectly 3. Connector TB1 on 3-FTCU loose 4. Defective telephone
Call displayed by LCD doesn't match connected call	1. Signature module incorrectly labeled in rule 2. Signature module misidentified or installed in wrong location

SIGA-AA30 Audio Amplifier
SIGA-AA50 Audio Amplifier

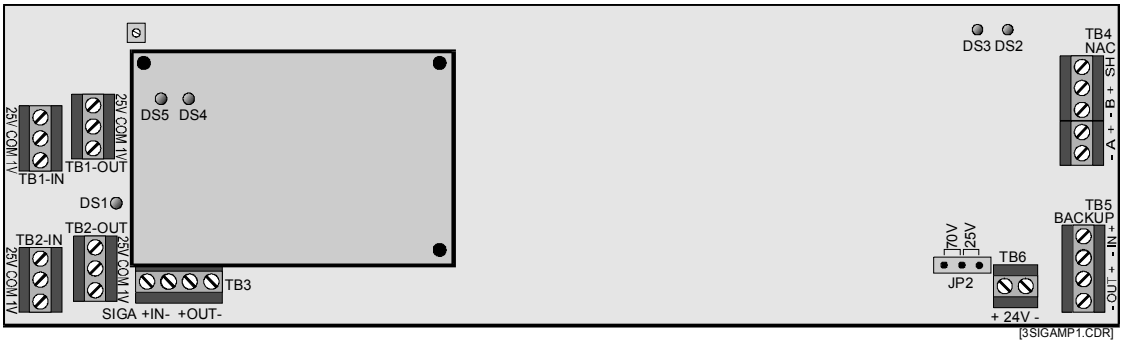


Table 5-17: SIGA-AAxx LED Indications

LED	Color	Description
DS1	Yellow	Power Amp Enabled
DS2	Yellow	Backup Mode
DS3	Green	Amplifier Active
DS4 (daughter board)	Green (flashing)	Normal
DS5 (daughter board)	Red (flashing)	Active Condition

Gain Adjustment

With the amplifier connected to the speaker load, use the gain adjust potentiometer (R116) to get a 25 Vrms or 70 Vrms signal (depending on JP2 setting) with a 1Vrms 1 kHz tone at the amplifier input. If a oscilloscope is used to adjust levels, use the following peak-to-peak voltage levels:

- 25 Vrms = $71V_{PP}$
- 70 Vrms = 200 V_{PP}

Note: The amplifier must be connected to a load to properly adjust the gain. In the event the actual speaker circuit can not be used, a dummy load must be fabricated according to Table 5-18. The wattage rating of the dummy load must exceed the output power rating of the amplifier.

Table 5-18: Amplifier Dummy Load Values

Output Power	25 Vrms Output	70 Vrms Output
30 Watts	20.8Ω @ 30W	167Ω @ 30W
50 Watts	12.5Ω @ 50W	100Ω @ 50W

To maintain dc supervision and keep the amplifier out of trouble while adjusting the gain, connect a 47 kΩ EOL resistor across the NAC B output (TB4-2 & TB4-3), then connect the dummy load to the NAC A Output terminals (TB4-4 and TB4-5).

Caution: Do not operate the amplifier with both the speaker circuit and the dummy load connected.

Table 5-19: SIGA-AAxx Audio Amplifier Troubleshooting

Problem	Possible Cause
No output	1. 24 VDC power or input signal missing 2. Output circuits wired incorrectly 3. Daughter board not firmly seated in connector 4. Module defined incorrectly in database 5. In backup mode with backup amplifier/wiring problem 6. Branch circuit control modules inoperative/mis-programmed
Backup 1 kHz Tone sounding	1. Input wiring incorrect or missing 2. Low or no audio input
Low Output	1. 70 Vrms speakers with 25 Vrms jumper setting 2. Too many SIGA-CC1/2s installed causing amplifier to shut down. 3. Gain (R116) setting too low.

Pseudo point descriptions

Table 5-20: System pseudo points

Address	Label	Source	Functional description
0001	Startup Response	3-CPU1	Changes to the active state when the panel is energized or an operator initiates a Restart from the 3-LCD module.
0002	First Alarm Response	3-CPU1	Changes to the active state when the first point on a panel or any panel in the same network routing group changes to the alarm state.
0003	First Supervisory Response	3-CPU1	Changes to the active state when the first point on a panel or any panel in the same network routing group changes to the supervisory state.
0004	First Trouble Response	3-CPU1	Changes to the active state when the first point on a panel or any panel in the same network routing group changes to the trouble state.
0005	First Monitor Response	3-CPU1	Changes to the active state when the first point on a panel or any panel in the same network routing group changes to the monitor state.
0006	Evacuation Response	3-CPU1	Changes to the active state when an operator presses a switch that executes the Evacuation command.
0007	Drill Response	3-CPU1	Pseudo point that changes to the active state when an operator presses a switch that executes the Drill command.
0008	AllCall Response	3-CPU1	Changes to the active state when an operator presses the All Call or All Call Minus switch on the 3-ASU.
0009	Alarm Silence Response	3-CPU1	Changes to the active state when an operator presses a switch that executes the AlarmSilence command.
0010	Two Stage Timer Expiration	3-CPU1	Changes to the active state when a panel's two-stage alarm timer expires.
0011	Reset Active	3-CPU1	Changes to the active state when an operator presses a switch that executes the Reset command.

Table 5-20: System pseudo points

Address	Label	Source	Functional description
0012	Reset Phase 1	3-CPU1	Changes to the active state when the first phase of the 3-phase reset cycle starts.
0013	Reset Phase 2	3-CPU1	Changes to the active state when the second phase of the 3-phase reset cycle starts.
0014	Reset Phase 3	3-CPU1	Changes to the active state when the third phase of the 3-phase reset cycle starts.
0015	First Disable Response	3-CPU1	Changes to the active state when the first point on a panel or any panel in the same network routing group changes to the disable state.
0016	Fail Safe Event	3-CPU1	Changes to the active state when a device asserts the rail alarm-not line and the CPU module has not registered an alarm event.
0017	Service Group Active	3-CPU1	Changes to the active state when an operator enables a Service Group from the 3-LCD module.
0018	Two Stage Timer Active	3-CPU1	Changes to the active state when a panel's two-stage alarm timer starts.
0019	Loop Controller Reset Extension	3-CPU1	Changes to the active state when a loop controller stays in the reset mode longer than expected.
0020	Service Device Supervision	3-CPU1	Changes to the active state when an operator cancels a Service Group test while a circuit under test remained active.
0021	User Trouble	3-CPU1	Changes to the active state when an operator forces a trouble into the system. Not implemented at this time.
0022	Ext Database Incompatibility	3-CPU1	Changes to the active state when a different database in one or more network nodes
0023	Reboot Fault	3-CPU1	Changes to the active state when the CPU module is interrupted unexpectedly.

Table 5-20: System pseudo points

Address	Label	Source	Functional description
0101–0164	Comm Fail xx	3-CPU1	Changes to the active state when the CPU is unable communicate with the networked CPU module in cabinet xx.
0200–0222	Task xx Watchdog Violation	3-CPU1	Changes to the active state when task xx fails to execute properly.
0261–0279	Configuration Mismatch Card xx.	3-CPU1	Changes to the active state when the card in slot xx can not perform the programmed advance feature (currently only degraded mode).
0281–0299	DB Out Of Sync with CPU Card xx	3-CPU1	Changes to the active state when the Signature controller module in rail slot xx reports an actual and expected data mismatch.

Table 5-21: LocalAlarm pseudo points

Address	Label	Source	Description
0676	Unprogrammed Device	3-AADC	Device not defined in SDU database is in alarm or trouble state
0676	Unprogrammed Device Data Card 1	3-DSDC	Device not defined in SDU database is in alarm or trouble state
0686	Unprogrammed Device Data Card 2	3-DSDC	Device not defined in SDU database is in alarm or trouble state

Table 5-22: LocalTrouble pseudo points

Address	Label	Source	Description
0600	Annunciator Supervision	General	Control/display module faulty or missing or not properly configured
0601	Class A Failure	3-CPU1	Fault or break in Class A network data riser connection
0601	Rail Module Communications Fault	General	Cabinet local rail communications failure
0602	Ground Fault Detection	3-CPU1	Any cabinet component or field wiring
0603	Audio Supervision	3-CPU1	Audio data circuit open or shorted
0604	Internal Fault	General	3-CPU1 Hardware failure
0604	RAM Fault or Stack Fault	3-AADC	RAM/Stack (memory) fails its interval check
0605	Database Supervision	General	Database corrupt
0605	DB Suprvision Audio Default Tone	3-ASU	No message present, problem erasing flash, message space fails internal checks
0606	Code Supervision	General	Executable program corrupt
0607	Auxiliary Port One	3-CPU1	Port 1 serial communications circuit open or shorted
0607	Data Card Fault	3-AADC	N/A
0607	Data Card Fault 1	3-DSDC	N/A
0608	Auxiliary Port Two	3-CPU1	Port 2 serial communications circuit open or shorted
0608	Data Card Fault 2	3-DSDC	N/A

Table 5-22: LocalTrouble pseudo points

Address	Label	Source	Description
0609	Panel in Download Mode	3-CPU1	Panel out of service. In mode to accept download data
0609	Configuration Fault	General	1. Module(s) in wrong slot 2. Incorrect display on module
0610	Network Audio Circuit A Fault	3-CPU1	Loss of signal on primary audio connection
0610	Rail Vltg Out of Spec	3-PS/M	1. Rail voltage >30 Vdc or <24 Vdc 2. Excessive rail current load 3. Faulty or misadjusted 3-PPS/3-BPS
0611	Network Audio Circuit B Fault	3-CPU1	Loss of signal on secondary audio connection
0611	Rail Vltg Blw Batt	3-PS/M	Excessive rail current load
0612	Heat Sink Too Hot	3-PS/M	1. Enclosure vents clogged 2. Heat sink not fastened properly
0613	Lo Batt Cut Off	3-PS/M	Battery voltage below 19.5 Vdc when on battery backup
0614	AC Brownout	3-PS/M	AC line voltage below 96 Vac for 3-PPS or 196 Vac for 3-PPS/230
0615	Batt Trbl	3-PS/M	1. Battery wiring open 2. Battery voltage below 24 Vdc 3. Battery internal resistance too high (load test failure)
0616	Aux Pwr Ovld Ckt 2	3-PS/M	1. Excessive load 2. Circuit shorted
0617	Pwr Supply Fail	3-PS/M	1. Cables between power supply and monitor module loose or missing 2. Defective power supply or monitor module
0618	Aux Pwr Ovld Ckt 1	3-PS/M	1. Excessive load 2. Circuit shorted

Table 5-22: LocalTrouble pseudo points

Address	Label	Source	Description
0619	Drvr Pwr Supply Fail	3-PS/M	1. Cables between power supply and monitor module loose or missing 2. Defective power supply or monitor module
0620	Demux Audio Input	3-ZAxx	Digitized audio data missing
0621	Amp Overcurrent	3-ZAxx	1. Circuit shorted 2. Speaker wattage tap setting exceeds output rating of amplifier 3. 70 Vrms jumper setting used with 25 Vrms speakers..
0622	Primary Audio Output DC	3-ZAxx	1. Open DC NAC circuit, missing or wrong value EOL resistor 2. Shorted DC NAC circuit
0623	Primary Audio Output Analog	3-ZAxx	1. Open Audio NAC circuit, missing or wrong value EOL resistor 2. Shorted Audio NAC circuit 3. Output voltage jumper set wrong
0624	Backup Audio Output Analog	3-ZAxx	1. Open Audio NAC circuit, missing or wrong value EOL resistor 2. Shorted Audio NAC circuit 3. Output voltage jumper set wrong
0625	Amplifier Daughter Board	3-ZAxx	Defective board
0626	Fuse Supervision	3-ZAxx	Open fuse in amplifier
0627	PAL Supervision	3-ZAxx	Bad PAL chip. Replace amplifier.
0629	Request Backup	3-ZAxx	N/A
0630	Riser Supervision	3-FTCU	1. Open circuit, missing or wrong value EOL resistor 2. Shorted circuit
0631	User Interface	3-FTCU	Ribbon cable between display and main PC board loose or missing.
0632	Master Phone Supervision	3-FTCU	Master handset internal wiring fault

Table 5-22: LocalTrouble pseudo points

Address	Label	Source	Description
0633	Handset Off Hook	3-FTCU	Hook switch defective
0640	Jumper Fault	3-OPS	Jumpers incorrectly set
0641	AtoD Converter Failure	3-OPS	Internal module failure
0642	City Tie Open	3-OPS	N/A
0652	Input Supervision Trbls	3-ASU	Defective microphone or connections
0653	Phone Page Time Out	3-ASU	Phone page switch has been activated for a period which exceeds the time limit set via SDU program
0654	Audio Hardware Mismatch	3-ASU	Mismatch between 3-ASUMX specified via SDU program and that installed in the 3-ASU
0655	RAM Diagnostic Failure	3-ASU	Memory failure in 3-ASU
0656	Audio Default Failure	3-ASU	1. 3-ASUMX memory card missing 2. Audio database does not exist
0658	Audio Interface Failure	3-ASU	3-ASU hardware fault
0659	Audio Class Supervision	3-ASU	One riser open/shorted
0670	In Bootloader	3-AADC	PC connected to card attempting download
0670	In Bootloader	3-DSDC	PC connected to card attempting download
0671	Line Opened or Shorted	3-AADC	Wiring Fault
0671	Line Opened or Shorted Data Card 1	3-DSDC	Wiring Fault
0672	Map Fault Data Card 1	3-DSDC	1. Mismatch between actual data and expected data 2. Defective wiring 3. Defective device
0677	Grnd Fault	3-AADC	Wiring Fault
0677	Grnd Fault Data Card 1	3-DSDC	Wiring Fault
0678	Reconstct Line	3-AADC	N/A
0679	Smoke Power Current Limit	3-AADC	N/A
0679	Smoke Power Current Limit Card 1	3-DSDC	N/A
0680	Internal Failure	3-LDSM	N/A

Table 5-22: LocalTrouble pseudo points

Address	Label	Source	Description
0681	Line Opened or Shorted Data Card 2	3-DSDC	Wiring Fault
0682	Map Fault Data Card 2	3-DSDC	1. Mismatch between actual data and expected data 2. Defective wiring 3. Defective device
0687	Grnd Fault Data Card 2	3-DSDC	Wiring Fault
0689	Smoke Power Current Limit Card 2	3-DSDC	Defective module
0690	Configuration Mismatch Slot 1	3-DSDC	N/A

Table 5-23: LocalMonitor pseudo points

Address	Label	Source	Description
0650	All_Call_Active	3-ASU	Changes to the active state when an operator presses the All Call switch
0651	Mic_Key_Active	3-ASU	Changes to the active state when an operator presses the push-to-talk switch on the paging microphone.
0673	Mapping In Progress Data Card 1	3-DSDC	N/A
0674	Mapping Disbld Data Card 1	3-DSDC	Mapping manually disabled
0675	Device Maint Alert	3-AADC	N/A
0675	Device Maint Alert Data Card 1	3-DSDC	Dirty detector on loop 1
0678	Reconstct Line Data Card 1	3-DSDC	N/A
0683	Mapping In Progress Data Card 2	3-DSDC	N/A
0684	Mapping Disbld Data Card 2	3-DSDC	Mapping manually disabled
0685	Device Maint Alert Data Card 2	3-DSDC	Dirty detector on loop 2
0688	Reconstct Line Data Card 2	3-DSDC	N/A

Table 5-24: LocalRelay pseudo points

Address	Label	Source	Description
0002	Amplifier_Backup	3-ZAxx	Changes to the active state when the amplifier's input relay selects the back up amplifier input as its signal source.
0003	Channel_1_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 1.
0004	Channel_2_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 2.
0005	Channel_3_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 3.
0006	Channel_4_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 4.
0007	Channel_5_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 5.
0008	Channel_6_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 6.
0009	Channel_7_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 7.
0010	Channel_8_Relay_Confirmation	3-ZAxx	Changes to the active state when the amplifier's input relay selects channel 8.
0011	Page_Select	3-ZAxx	Changes to the active state when the amplifier's input relay selects the Page channel.

Signature data circuit (SDC) operation

The advanced features of the Signature controller module perform a number of advanced operations. These operations are not always apparent from the panel controller. Table 5-25 lists a number of SDC conditions and describes the circuit's operation.

Table 5-25: SDC Operation

Condition	Operation
Remove a detector, then re-install the same detector in the same base.	1. The system displays a trouble with the detector's label/address when the detector is removed. 2. The system restores completely when the detector is re-installed in its original base.
Remove a module or pull station, then re-install the same device in the same location.	1. The system displays a trouble with the module's label/address when the device is disconnected. 2. The panel restores completely when the device is re-installed in its original location.
Remove a detector, then re-install a different detector of the same type in the same base.	1. The system displays a trouble with the detector's label/address when the detector is removed 2. When the new detector is installed, the Signature controller module re-maps the circuit, replacing the S/N of the old detector with the S/N of the new detector. All the old detector's sensitivity & verification settings are transferred to the new detector. The system will return to normal when mapping is finished.
Remove a module or pull station, then re-install a different device of the same type in the same location. (SIGA-UM replacement modules must have jumper JP1 set in the same position as the original module.)	1. The system displays a trouble with the device's label/address when the device is disconnected. 2. When the new device is installed, the Signature controller module re-maps the circuit, replacing the S/N of the old device with the S/N of the new device. If the devices are modules (not pull stations), the old module's personality codes are transferred to the new module. The panel will return to normal when mapping is finished.
Remove a detector, then re-install a different type detector in the same base.	1. The system displays a trouble with the detector's label/address when the detector is removed. 2. When the new detector is installed, the Signature controller module re-maps the circuit, replacing the S/N of the old detector with the S/N of the new detector. All the old detector's sensitivity & verification settings (when applicable) are transferred to the new detector. The new detector will be operational, however the panel will be in trouble, indicating a device type mis-match. The System Definition Utility program must be used to re-assign the device type to get the system out of trouble.

Table 5-25: SDC Operation

Condition	Operation
Remove a module or pull station, then re-install a different type module or pull station in the same location.	1. The system displays a trouble at the device's label/address when the device is removed. 2. When the new device is installed, the Signature controller module re-maps the circuit, replacing the S/N of the old device with the S/N of the new device. The new module is NOT operational. The panel will be in trouble, indicating a device type mis-match. System Definition Utility program must be used to re-assign the device type to get the panel out of trouble. 3. If a single address module is replaced with a dual address module or vice versa, a map fault will be generated by the address count mismatch.

Basic Signature data circuit troubleshooting

Isolating Circuit and Device Problems

The process of isolating a problem on a Signature data circuit is similar to that used on a conventional fire alarm Initiating Device Circuit (IDC). An accurate and complete wiring diagram of the data circuit installation is the best trouble shooting aid available. When used in conjunction with the information provided by the control panel, you should be able to easily isolate open conditions or defective devices. The data circuit shown in Figure 5-6 will be used to illustrate basic troubleshooting techniques.

When troubleshooting Class A circuits, disconnect the circuit from the return (SIGA/A) terminals, and temporarily jumper both SIGA/A terminals to the respective SIGA/B terminals. Then troubleshoot the circuit as a Class B circuit.

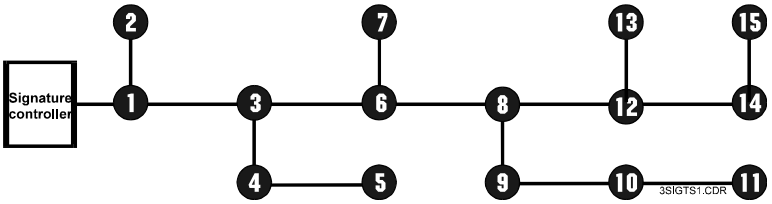


Figure 5-6: Normal circuit topology

Open circuit conditions

On a circuit with an open fault, the Signature modules will be communicating with devices up to the break. The 3-LCD Display module will indicate a trouble condition on all devices beyond the break. This is illustrated in Figure 5-7 where devices 1 through 7 continue to operate while devices 8 through 15 report device troubles.

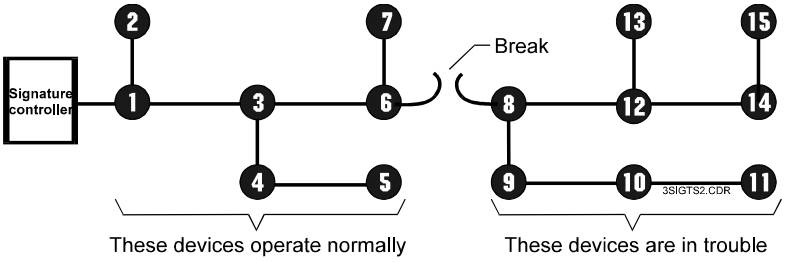


Figure 5-7**:** Break in circuit between devices 6 and 8

Referring again to Figure 5-7, a wire break or intermittent connection between devices 6 and 8 is the most probable cause of the failure. Other possible but unlikely causes with the same

symptoms include device failure of only devices 9 -15; and devices 9-15 not loaded in the Signature module's database or not properly configured using the Signature portion of the data entry program.

Short circuit conditions

Short circuit conditions require selective isolation of portions of the data circuit to systematically narrow down the fault's location. A shorted circuit will typically show a trouble condition on all devices, as illustrated in Figure 5-8.

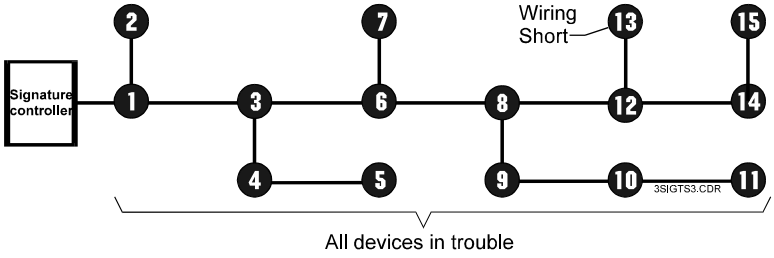


Figure 5-8: Wiring Short On device 13

To isolate the short, open the circuit at a location that will disconnect approximately 50% of the installed devices, as shown in Figure 5-9.

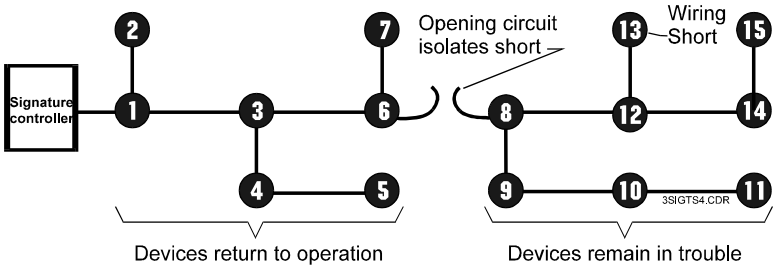


Figure 5-9: Isolating circuit short

If some of the devices restore in Figure 5-9, the short is located on the portion of the circuit that has been disconnected. If no devices restore when the circuit is opened, the short has been isolated to the first 50% of the circuit.

Re-connect the previously isolated portion of the circuit, and open the circuit at a new location. If during the first open circuit test some devices restored, open the circuit at a location "electrically further" from the Signature controller module and repeat the test. If during the first open circuit test no devices restored, open the circuit at a location "electrically closer" to the module, and repeat the test. Continue to increase or decrease the number of devices on the opened circuit leg until you eventually

isolate the single device or wire segment that is causing the problem.

Ground fault conditions

Ground fault conditions require selective isolation of portions of the data circuit to systematically narrow down the fault's location. A circuit with a ground fault (approximately 10 kΩ or less to ground) will cause the 3-LCD display to light the Ground Fault LED. Ground fault conditions can occur on the data circuit, the 24 VDC smoke power circuit or the input circuits to Signature series modules. The general location of a ground fault can be determined using the 3-LCD status command and Table 5-26 below.

Table 5-26: Ground fault Indications

3-LCD	Ground Fault Location
Ground Fault LED ON No Device Trouble	1. Signature data circuit 2. 24 VDC Smoke Power circuit
Ground Fault LED ON Device PPCCDDDD Trouble	1. Positive leg of input circuit of device PPCCDDDD

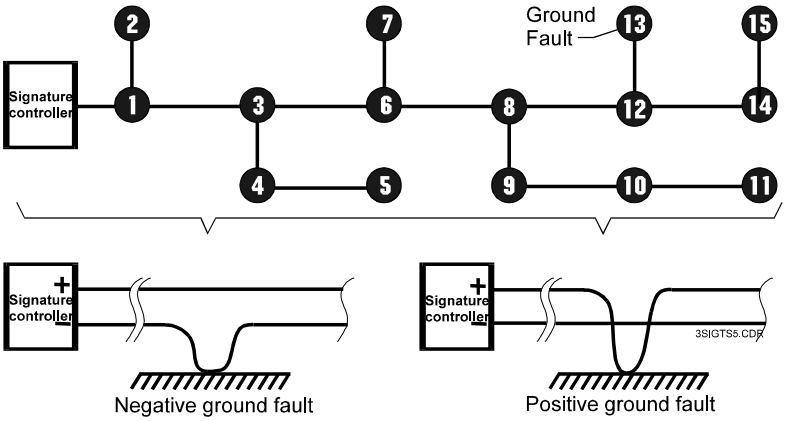


Figure 5-10: Signature data circuit ground faults

To isolate the ground fault, open the suspect circuit (both conductors) at a location that will disconnect approximately 50% of the installed devices. Figure 5-11 illustrates the technique on a data circuit. A similar technique is used on smoke power or module input circuits to isolate ground faults.

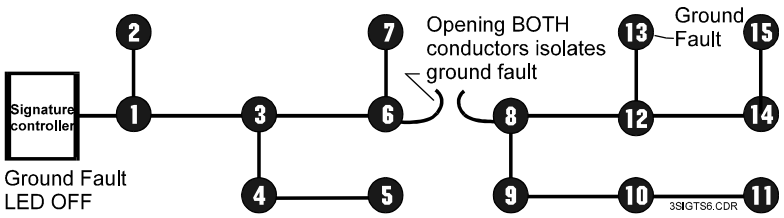


Figure 5-11: Ground fault isolation

If the 3-LCD Ground Fault LED goes out, the ground fault is located on the portion of the circuit that has been disconnected.

If the 3-LCD Ground Fault LED remains on and no devices restore, the short has been isolated to the first 50% of the circuit.

Re-connect the previously isolated portion of the circuit, and open the circuit at a new location. If during the first open circuit test the Ground Fault LED went off, open the circuit at a location "electrically further" from the Signature controller module, and repeat the test. If during the first open circuit test the Ground Fault LED remained on, open the circuit at a location "electrically closer" to the 3-SSDC, and repeat the test. Continue to increase or decrease the number of devices on the opened circuit leg and you will eventually isolate a single device or wire segment that is causing the problem.

Note: The ground fault detection circuitry requires approximately 30 to 40 seconds to respond when the fault is removed.

The panel performs a ground fault test for 2 seconds at 40-second intervals. If the system is working properly, the voltage between earth ground and logic negative should be between 12.3 Vdc and 16.8 Vdc during the 2-second test. The system reports a ground fault when the voltages are less than 12.3 and more than 16.8. In a non-faulted system, the voltage outside the 2-second test period may float randomly, but if the system is faulted the voltage is likely to be a fixed value such as 3 or 19.

Substituting "known good" Signature series devices

When substituting a "known good" detector or module in place of a suspect device, one of two scenarios can take place. If the substitute device is the identical model as the suspect device, the system will accept it with no further action required by the operator. When the substituted device is installed, the system will go into trouble. When the quantity of devices defined on the circuit is reached, the system will automatically re-map the circuit, store the revised information, and return to normal. This

process may take a few minutes. The following section illustrates this process.

Detectors

When one or more devices are removed from a Signature Data Circuit for servicing, as shown in Figure 5-12, the panel will display a trouble condition for each device. If the System Definition Utility program (SDU) were connected to the panel, the DSDC Status screen would also indicate a trouble condition and the need to re-map.

Note: If the detector is removed from an isolator base, the isolator will transfer.

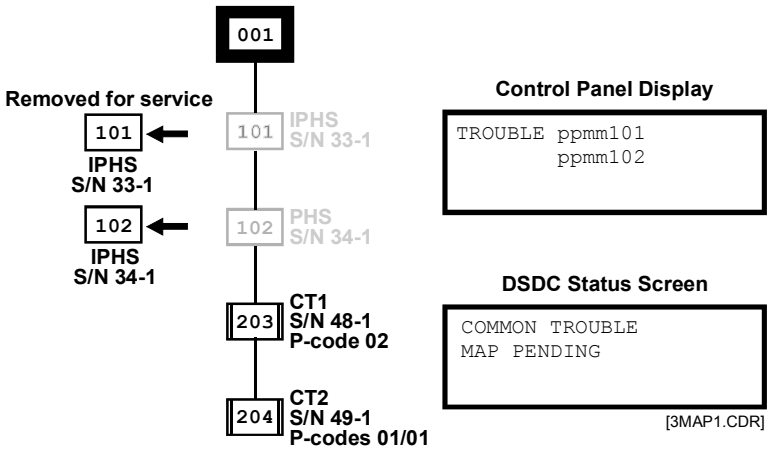


Figure 5-12: Detectors removed for service

If these devices are returned to their original locations, as shown in Figure 5-13, the map supervision function recognizes the detectors have been returned as originally installed (and mapped), and takes no additional action.

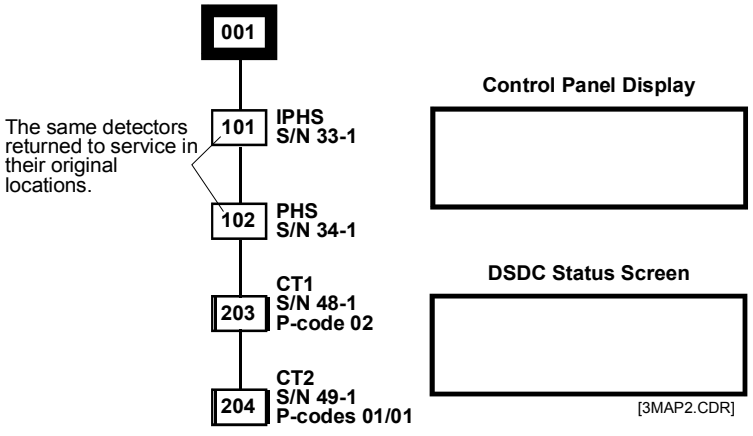


Figure 5-13: Detectors returned to service in original locations

If the devices are returned to the Signature Data Circuit but are not returned to their original locations, the map supervision function recognizes that previously mapped serial numbers occupy new map locations. Once the mapping supervision function has recognized the need to re-map the circuit, the panel is put in the “map pending” state. Once in the map pending state, the panel will automatically re-map the circuit when the quantity of devices re-installed on the circuit is equal to or greater than the quantity of devices defined in the original map. If the panel was connected to a computer running the SDU Program, the DSDC status function would indicate “map pending”.

In Figure 5-14, The PHS (S/N 34-1) originally installed at address 102 has been installed in the location originally occupied by the IPHS (S/N 33-1).

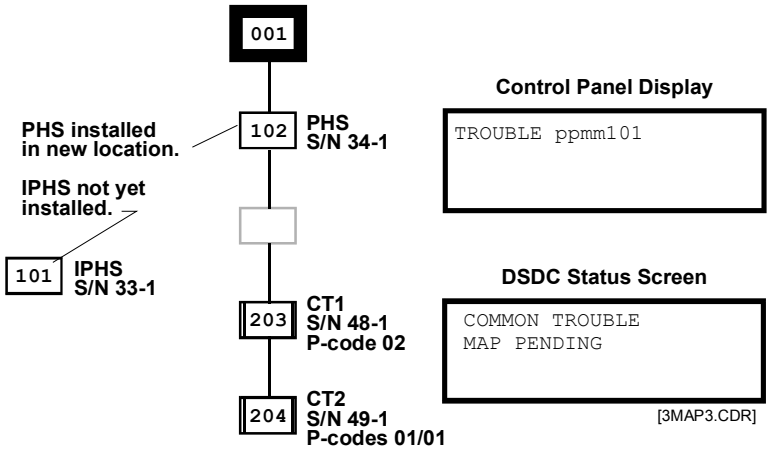


Figure 5-14: Partially restored circuit

Until all devices are re-installed on the circuit and the circuit is automatically re-mapped, the original S/N to panel address correlation is still valid. Examination of Figure 5-14 shows that the device address moves with the detector until the circuit is re-mapped. In this example, relocating the PHS detector temporarily relocated address 102. Until all devices are installed and the circuit re-mapped, testing a relocated detector will cause the panel to respond as though the detector was still installed in its original location.

During mapping, all devices remain operational and are capable of initiating an alarm. Figure 5-15 shows that both the IPHS and the PHS retain their old S/N to address correlations while the circuit is mapping. Mapping activity is indicated on the front panel display and the DSDC Status screen, if the data entry computer is connected.

Once mapped, the mapping supervision function will automatically correlate a panel address to a specific map location until manually changed using the data entry program.

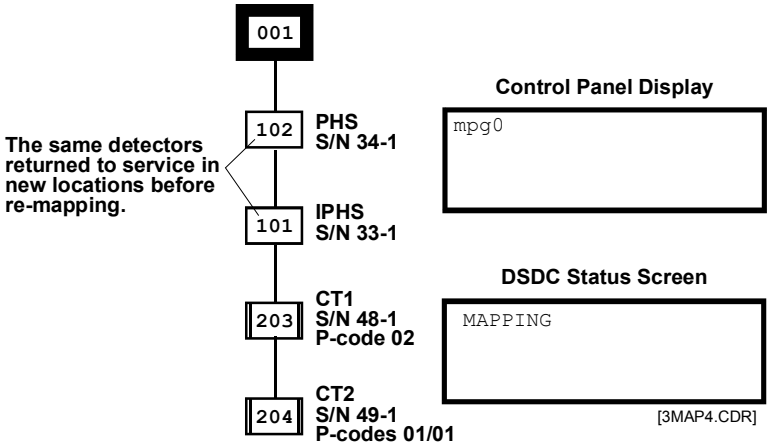


Figure 5-15: Detectors returned to new locations during re-mapping

Figure 5-16 shows the resultant map after re-mapping. Note that the new S/N to panel address correlations have been made, the IPHS is now correlated with address 102 and the PHS is correlated with address 101. The relocated devices will now respond as programmed for the original address location.

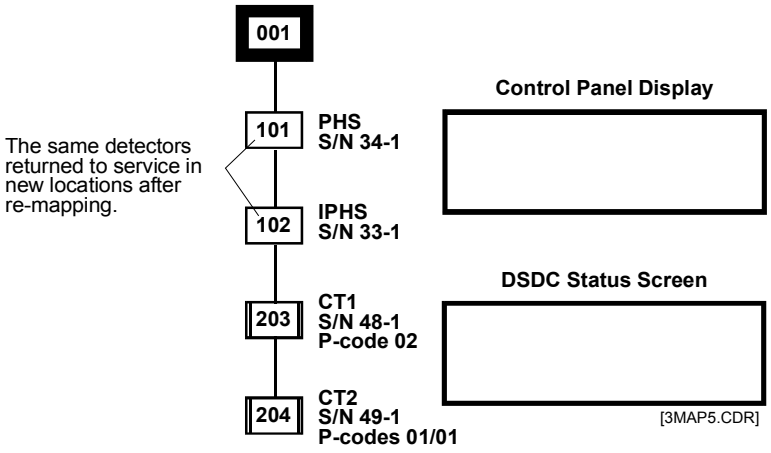


Figure 5-16: Final map

When a factory-new detector replaces an in-service detector, until mapped, the new detector is operational with a default address of 00. When the circuit is re-mapped, the new detector will be given the address assigned to its map location. If a factory-new detector is added over and above the expected number of devices on the circuit, it will be operational with a

default address of 00, however the panel will be in trouble as the "actual map" contains one more device than the "expected map."

Modules

When a module is replaced with another module of the same type, upon automatic re-mapping, the replacement module will be assigned the personality code of the module originally installed at that map location. If a module is replaced with a module of a different type one of three things can happen.

If a single address module, i.e. CT1, or CC1, is replaced with a different type of single input module, the circuit will re-map all devices; however the new device type will not operate, due to incompatible personality codes. A map fault will be generated because the actual device differs from the expected device. The data entry program must be used to accept the new device type and clear the map fault.

Notes

- Factory programmed devices, i.e. pull stations and MM1 modules can not be replaced with a CT1.
- For mapping purposes, all manual pull stations are given the PULL device type regardless of their model number.

If a dual address module replaces a single address module, the panel will attempt to re-map all devices, however the circuit will not be successfully re-mapped. A map fault will be generated because the actual device differs from the expected device, and the dual address module will not operate. The data entry program must be used to accept the new device type and clear the map fault.

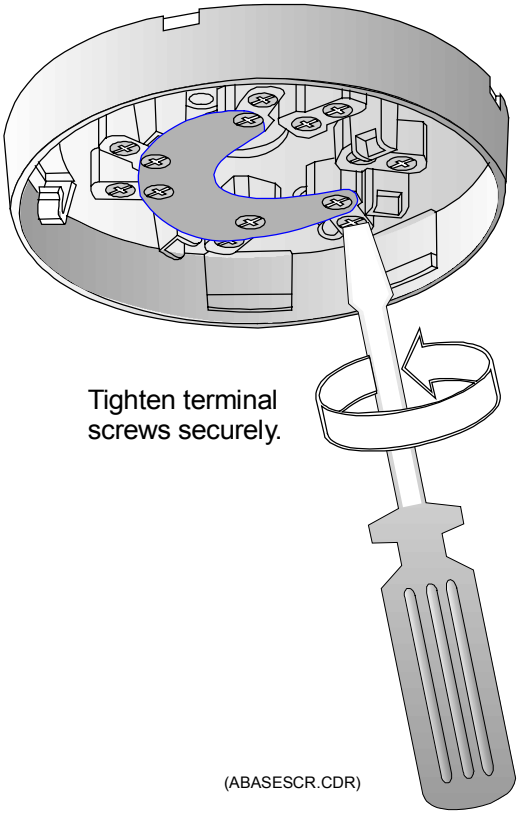
If a dual address module is replaced with a single address module, the panel will never attempt to re-map all devices because the panel does not see enough devices (one address less) to automatically re-map the circuit. The panel remains in the map pending mode and will not re-map. If the panel could be forced to re-map all devices, the circuit would still not be successfully re-mapped, because the actual device count differs from the expected device count. The panel will be in trouble with a map fault. The SDU program must be used to accept the new device type and clear the map fault.

Device type replacement

If a different Signature device model is substituted for the suspect device, when the device count is correct, the Signature controller module will automatically re-map the circuit. A trouble will occur at the address of the suspect device as the result of a map fault, because the known good device's parameters differ from those of the suspect device that was

removed from the circuit. You must accept the parameters, which may be changed later, of the known good device to remove the map fault.

Note: Signature series devices require a solid connection at their terminals. If a wire can be wiggled, it will be subject to contact resistance variations due to temperature changes, resulting in an intermittent connection, which will affect communications between the Signature devices and the control module. Use the proper size screwdriver and tighten all connections securely.



3-SSDC Signature controller module

Substituting Signature controller modules

When substituting a "known good" Signature controller module in place of a suspect rail module, you must download the system configuration and Signature data circuit information into the 3-CPU1 module. This operation requires a PC and the SDU Program.

The Signature controller module actually has two separate memories. The first memory contains the firmware that makes the module operate. If there is a problem with the firmware, or if an upgrade has been issued, the new firmware is downloaded into the module. When upgrading the module firmware (code), you do not need to download the "Bootstrap" data unless specifically instructed to do so.

The SDC configuration information is stored in the module's second memory. If you suspect that the module itself is bad, you must download the configuration information for the circuit that will be connected to the substitute module.

Note: The database must be converted before it can be downloaded into the Signature controller.

Table 5-27: Signature controller module troubleshooting

Problem	Possible Cause
Signature Data Circuit Open	1. Circuit incorrectly wired or connector loose 2. Defective detector or isolator base 3. Broken conductor 4. Device not installed on circuit 5. Device not entered into SDU databases
Signature Data Circuit Shorted	1. Circuit incorrectly wired (often crossed wires on a device base) 2. Defective detector, detector base, or module 3. Nicked insulation between conductors
Signature Data Circuit Ground Fault	1. Pinched wire between device and electrical box 2. Nicked wire insulation

Mapping errors

Table 5-28 provides basic information on mapping errors. For detailed information on identifying and locating mapping errors, refer to the SSDC Diagnostic and Status sections found later in this chapter.

Table 5-28: Mapping errors

Fault	Possible Causes
Mapping Error	1. A discrepancy between the internal map and the devices installed on the Data Circuit (serial #, personality code, or device type) 2. Device ID entered incorrectly into SDU database 3. More than 124 “T-taps” on a data circuit 4. Excessive circuit resistance 5. Excessive circuit capacitance
System continues to re-map data circuit	1. An intermittent connection causing one or more devices to loose then re-establish communications with the Signature controller module 2. A defective device or detector base
Device Type Error	1. There is a discrepancy between the device type recorded on the internal map and the device installed on the Data Circuit

Device troubleshooting

Each Signature series device has a red and green LED. Their functions are indicated in Table 5-29. These LEDs are useful when trying to determine the communications and alarm/active status of Signature devices.

Table 5-29: Signature device LEDs

LED	Device Status
Green flashing	Normal communications
Red flashing	Alarm/Active (either input of dual input modules)
Red & Green steady	Standalone Alarm/Active (either input of dual input modules)

Table 5-30 lists common troubles and possible causes for Signature Series modules. For detailed information on identifying and locating Signature device problems, refer to the Signature Diagnostic Tools Section found later in this chapter.

Table 5-30: Signature module troubleshooting matrix (x = applicable for module)

Note: Table also applies to equivalent M–series components and products that emulate these module types

CC1	CC2	CR	CRR	CT1	CT2	MM1	UM	WTM	Possible Causes
Module not responding correctly									
x	x	x	x	x	x	x	x	x	Module installed in wrong location or improperly addressed
x	x	x	x	x	x	x	x	x	Module not entered into Signature database
x	x			x	x		x		Incorrect personality code loaded into module
					x		x		Personality code for *unused* portion of module not set at 0 (P-codes 1, 2, 3, 4, 8, 13, 14, 16, & 18)
							x		Jumper JP1 set incorrectly (P-code 8)
							x		24 VDC for smoke power low or missing (P-codes 3, 14, 18, 20, & 21)
					x		x	x	Inputs 1 & 2 swapped (P-codes 1, 2, 3, & 4)
	x								Signal sources 1 & 2 swapped (P-code 7)
x	x	x		x	x	x	x	x	Ground Fault on data circuit or (-) side of input/output circuit
Module in trouble on Signature controller module									
x			x	x	x	x	x	x	Module missing or incorrectly wired on Signature data circuit.
x			x	x	x	x	x	x	Mapping error. Module not loaded into Signature database
x				x	x	x	x	x	Ground Fault on input or output circuit
x	x						x		Output circuit open, shorted, incorrectly wired, polarized device installed in reverse, incorrect or missing EOL resistor
				x	x	x	x	x	Missing or incorrect EOL resistor (P-codes 1, 2, 3, 4, 13, 14, 16, 18, 20, 21)
							x		24 VDC for smoke power low or missing (P-codes 13, 14, 18, 20, & 21)
Module incorrectly in alarm/active on Signature controller module									
				x	x	x	x	x	Initiating device circuit shorted or initiating device incorrectly installed
				x	x	x	x	x	Incorrect EOL resistor value (too low)

Table 5-31: Signature detector troubleshooting

Symptom	Possible Causes
Detector not responding correctly	1. Detector installed in wrong location or improperly addressed. 2. Detector not entered in system database. 3. Incorrect device response in database.
Detector in trouble on 3-CPU1	1. Detector missing or incorrectly wired on Signature data circuit. 2. Mapping error. Detector not loaded into control module database. 3. Ground Fault on Signature Data circuit 4. Internal detector fault. Refer to Advanced Techniques Section.
Detector incorrectly in alarm on control panel.	1. Detector extremely dirty. 2. Ionization detector installed in area of extremely high airflow. 3. Detector installed in area of high ambient smoke. 4. Defective detector.

Signature diagnostic tools

The SDU Signature diagnostic tools are designed to assist the installing technician in isolating and correcting faults with the Signature Data Circuit (SDC), detectors and modules. The troubleshooting techniques described in the basic Signature troubleshooting section should be tried before using these tools.

Using Signature diagnostics

Signature Diagnostic Tools are accessed through "Tools" on the main menu bar.

To access the Signature diagnostic tools, Click on Tools on the main menu bar, then click on Signature Series diagnostics.

Signature device circuit selection

The Signature diagnostic tools affect only to the SDC circuit that is specified in the drop down list boxes at the top of the DSDC Diagnostics window, as shown in Figure 5-17.

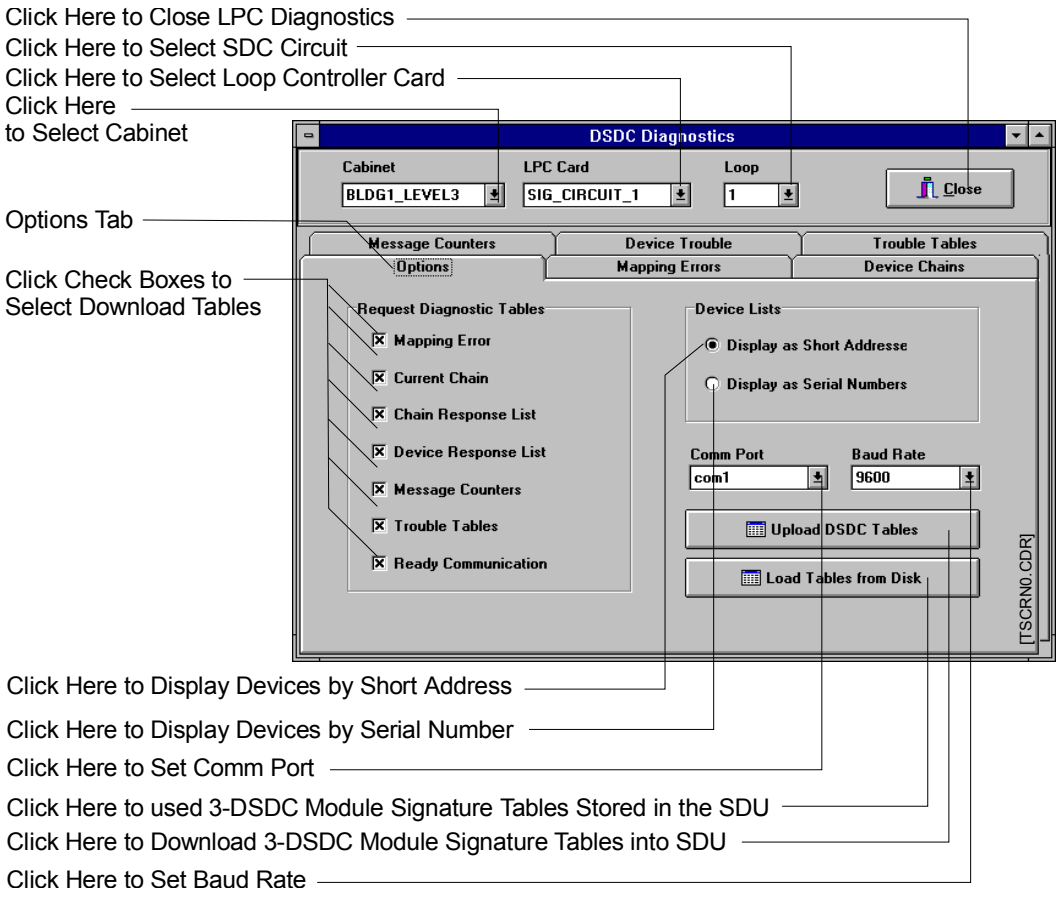


Figure 5-17: Options Screen

Select the cabinet that houses the Signature controller module with the trouble condition, using the Cabinet drop-down list.

Select the label of the Signature controller module with the trouble condition.

Select the loop (Signature Data circuit) on the module having the trouble condition, using the loop (SDC) drop down list.

COM Port and Baud Rate

To use the Signature Diagnostic tools, the information from the faulty Signature Data Circuit/device must first be read (uploaded) into the System Definition Utility (SDU) program. Use the COM Port and Baud Rate drop down lists to set the COM port parameters on the SDU computer that is to be used during uploading. The suggested baud rate is 19200.

You must upload Signature data from the Signature controller module into the SDU program before you can use the Signature Diagnostic tools.

Upload

To upload the Signature data from the Signature controller module into the SDU program, click on the Download DSDC Tables button. When the Signature data has been downloaded from the Signature controller module, it is stored as part of the project. The Signature data can be recalled without being connected to the module by using the Load Tables from Disk button.

Serial Number / Short Address

The devices listed in the diagnostic tables can be displayed by serial number or short address. You can mix short address and serial number displays using the Requested Diagnostic Table check boxes and the Device Lists radio buttons in combination.

Signature diagnostic sequence

Table 5-32 lists the suggested sequence when using the Signature Diagnostic tools to isolate problems on a Signature Data Circuit and problems with individual Signature devices.

Table 5-32: Signature Troubleshooting Tool Sequence

SDC Circuit Faults	Signature Device Faults
1. Mapping Errors	1. Device Tables
2. Device Chains	2. Trouble Tables
3. Message Counters	

Displaying mapping errors

Mapping errors are those problems which prevent the system from generating a successful Signature Data Circuit map. To

display errors generated during the mapping process, click on the Mapping Errors tab. The Mapping Errors text box lists the eight (8) most recent mapping errors. The Total Errors field lists the total number of mapping errors which have been identified. Clicking on an error in the list highlights the error, and displays the appropriate troubleshooting tip in the lower Troubleshooting Tips text box.

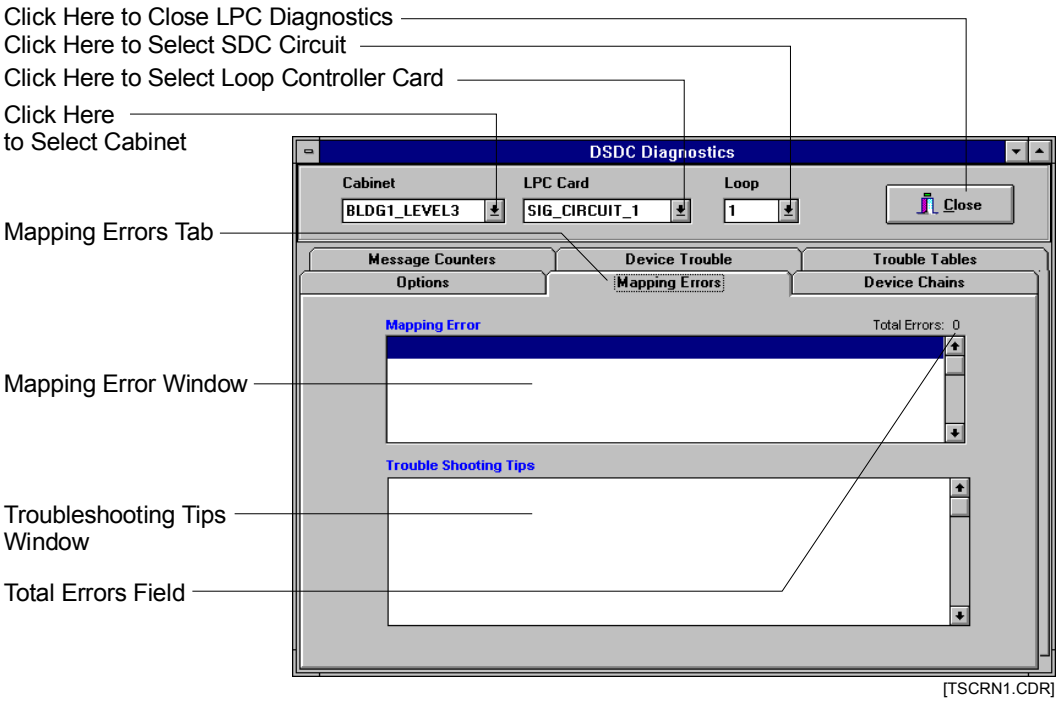


Figure 5-18: Mapping Errors Screen

Table 5-33: Mapping error messages

Message	Suggested corrective action
The mapping command failed because the sensor did not draw current or it was not possible to obtain stable mapping data from the SDC.	Indicative of faulty wiring on the circuit, or a faulty device. 1. Verify correct wiring. 2. Verify operational devices. 3. Review the Chain Response List. 4. Review the Device Response List.
While mapping a chain from a device back to the Signature controller module, the chain was built with “holes” in it.	Indicative of devices not operating consistently. 1. View the Chain and Device Response Lists to see a list of the devices that are present in the chain being processed. 2. Compare the serial numbers in the above lists with the actual wiring to identify a conflict.
The map tables are inconsistent.	1. Upload the current map. 2. Compare current map with expected map. 3. Write the map back to the Signature controller module.

Table 5-33: Mapping error messages

Message	Suggested corrective action
The actual SDC map does not match the stored expected map.	1. Upload the current map. 2. Compare current map with expected map. 3. Write the map back to the Signature controller module
Setting the Address in the device failed.	1. Review the Serial Number or Short Address, if missing replace the device. 2. Persistent problem is indicative of a wiring fault.
Map supervision failure. The map in use has invalid data. This error initiates an automatic reconstruction of the map.	1. Please wait for automatic map reconstruction to complete before continuing.
Mapping supervision detected a *change on* the SDC. A rebuild of the map was scheduled.	1. Please wait for automatic map reconstruction to complete before continuing.
Mapping supervision detected that the device address or the short address of the device being supervised has changed. A rebuild of the map was scheduled.	1. Please wait for automatic map reconstruction to complete before continuing.
The mapping command failed**,** the sensor did not draw current or it was not possible to obtain stable mapping data from the SDC. A rebuild of the map was scheduled.	1. Please wait for the automatic map reconstruction to complete before continuing.
Mapping was aborted by an external event, such a new start on a device. A rebuild of the map was scheduled.	1. Please wait for the automatic map reconstruction to complete before continuing.
Mapping supervision detected that the Device Type of the Device being supervised has changed. A Map Fault was flagged.	1. Replace the device. 2. Correct the Signature controller module programming.
Mapping was aborted because there is short or open on the SDC wiring.	1. An open or short on a Class A circuit. 2. A short across the entire Class B circuit. 3. A Reset may be needed to restart mapping.
Unable to recreate current map at panel startup. The panel will re-map to reconstruct the map.	1. Please wait for the automatic map reconstruction to complete before continuing.
Assignment of a short address to a device failed. This could lead to duplicate short addresses and mapping failures.	1. View the Chain and Device Response Lists to see a list of the devices that are present in the chain being processed and identify the failed device. 2. Replace the device. 3. Persistent problem is indicative of a wiring fault.
Mapping has been disabled.	1. Enable mapping.
While mapping a chain from a device back to the Signature controller module, the chain appears to have 2 devices at the same location in the chain.	1. Indicative of faulty wiring on the circuit, or a faulty device. 1. Review the Chain and Device Response lists to identify the conflict.
More than 125 End of Line devices have been found on the SDC.	1. Correct the wiring. 2. Re-map the circuit.
While mapping a chain of from a device back to the Signature controller module the chain was found to have a device present past the end of the chain. This would indicate that a device (or devices) is not responding properly to the mapping commands.	1. Click on the Device Chains tab to see a list of the devices that are present in the chain being processed. 2. Compare the serial numbers/short addresses with the actual wiring to identify the problem.
Mapping has detected a difference between the	This is indicative of devices not communicating properly.

Table 5-33: Mapping error messages

Message	Suggested corrective action
device at the end of line and the devices in its chain.	1. Click on the Communications List tab to see a list of the devices that are communicating. 2. Compare the serial numbers/short Addresses with the actual wiring to identify the conflict.

Displaying device chain errors

A chain is a list of devices connected between the Signature controller module and a device being interrogated during circuit mapping. The chains and sub-chains created during the mapping process evolve into the circuit map.

Should a circuit fail to map properly, further insight into the problem may be gained by investigating the devices making up individual chains and sub-chains.

To display a chain generated during the failed mapping process, click on the Device Chains tab. Four categories of device chains are listed. Each list displays the short address or serial number of the devices in the chain. The total number of entries in each list is indicated at the bottom of the list. To determine the position of a specific Signature device in the chain, click on the small data entry box at the top of each column and enter the device's short address or serial number. The position field at the bottom of the column will indicate the selected device's chain position and the cursor will move over that device entry in the main list.

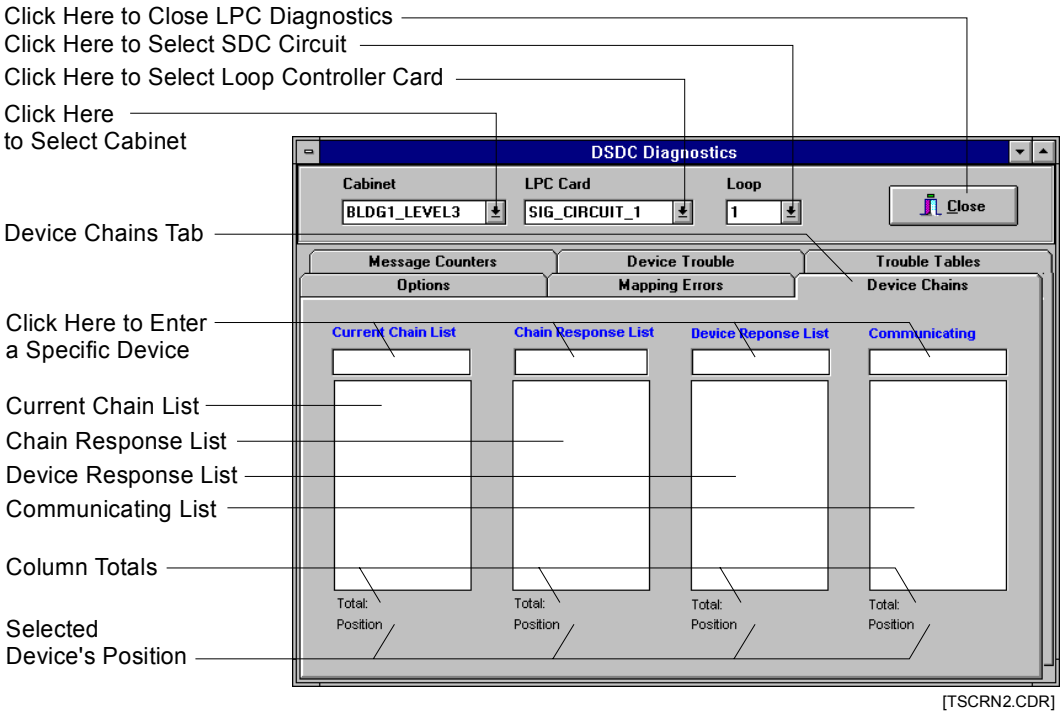


Figure 5-19: Device Chains Screen

Current chain list

The Current Chain List displays the sequence of Signature devices in the chain or sub-chain that was being created when the mapping failure occurred.

Chain response list

The Chain Response List displays the sequence of Signature devices in the *main chain*, when the mapping failure occurred.

Device response list

The Device Response List displays the sequence of Signature devices in a *sub-chain* that was being created when the mapping failure occurred.

Communicating list

The Communicating List displays a list of all Signature devices seen by the Signature controller module.

Using the chain lists

An element in the displayed chain caused the map fault. Examine the chain and look for gaps within the short address or serial number lists of a chain or sub-chain.

- Gaps in the list indicate areas which were not successfully mapped. A gap within the chain does not mean that the missing device has a problem, only that that device was not successfully mapped.
- Compare the Chain and Device response lists. All the devices on the Device Response list should also appear on the Chain Response list.
- Look for duplicate short addresses or serial numbers on the same list.

Failure of a device to successfully map may be the result of a problem with another device, or wiring in a chain or sub-chain not directly connected to the unmapped device. Although the missing or duplicate devices are not always the cause of map failure, good troubleshooting technique suggests that these devices be examined for defects, wiring errors, and duplicate entries in the SDU program, etc.

Displaying message counters

During normal operation, the Signature controller module issues numerous communication messages to the Signature devices on its' SDCs. The message counters indicate how many times a communications message has been issued and the number of successful return messages.

To display the message counters, click on the Message Counters tab.

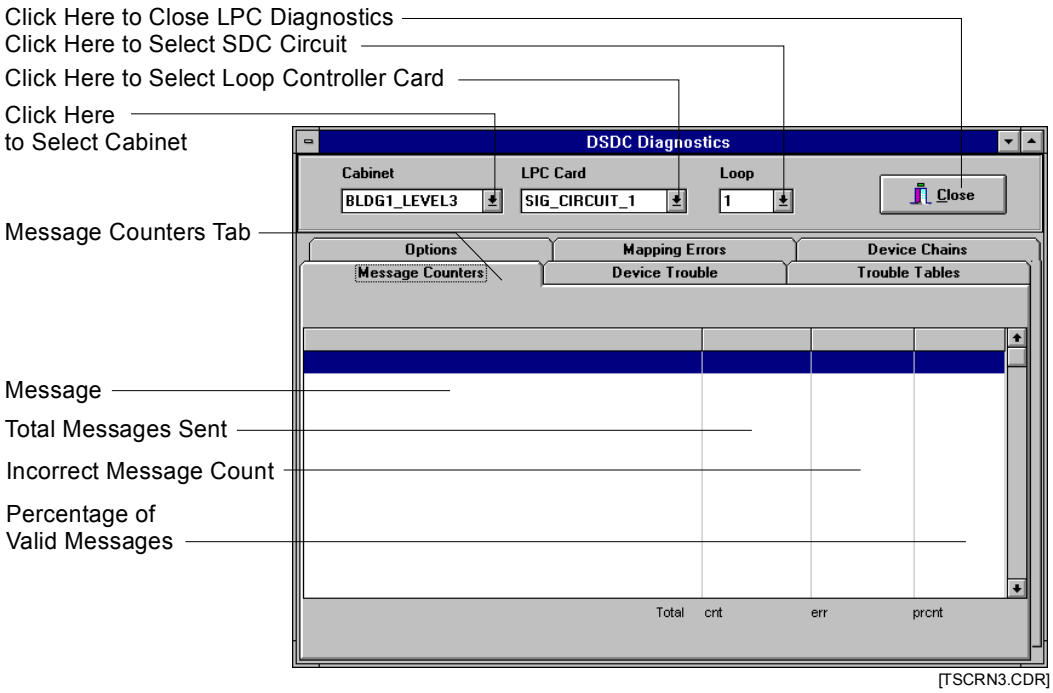


Figure 5-20: Message Counters Screen

The message command appears in the left column, followed by the number of times it has been issued, the number of errors received after the message was issued, and the percentage of correct responses. During normal operation, the percentage of messages received correctly should exceed 99%.

Intermittent device or wiring problems are indicated by a low successful message rate. If successful message rates are tracked over time, one can generate base line information for each circuit. From the base line information, any changes from the norm can be quickly identified, and preventive measures taken, before a communications problem develops. Table 5-34 lists the messages sent and received by the Signature driver controller module.

Table 5-34: Signature controller module Internal Messages

Query End Of Line	Query Relay Status	Find New Start
Query Isolator	Ground Fault Check	Find New Active
Query Status	Query Device Mask	Find New Unused2
Pulse Visible LED	Query Group Mask	Find New Unused3
Query Map Result	Module PFX	Reset Device
Query Alarm Status	Query Ready Comm	Enable Device
Query PreAlarm Status	Find Serial Number	Disable Device
Query Normal Status	Find New Alarm	Start Device
Query Trouble Status	Find New PreAlarm	Enable Visible LED
Query New Start Status	Find New Normal	Disable Visible LED
Query Active Status	Find New Trouble	Enable External Output
Disable External Output	Assign All Address	3-SDC Processor Status Query
Open Line Isolator	Relay Control	3-SDC Enable Loop
Close Line Isolator	Read Software Version	3-SDC Disable Loop
Reset Device Status	Read Device Status	3-SDC Line Initialization Complete
Move EEPROM to RAM	Read Sensor Values	3-SDC Send a Device Msg.
Assign Short Address	Read Specific Trouble	3-SDC Get a Device Reply
Assign Group Address	Read Value From RAM	3-SDC Configure Loop
Enter Service Mode	Send Value to Visible LED	3-SDC Query Current Configuration
Select Sensors	Query New Status	3-SDC Send Signal Rate
Write Value to RAM	3-SDC Command Initiate Reset	3-SDC Query Signal Status
Write Value to EEPROM	3-SDC Command Initiate Restart	

Displaying device trouble

Each Signature device is equipped with a 32-bit trouble register. Should a device's trouble bit be set *at any time in the device's history*, the device and the nature of the trouble will appear in the Latching Troubles By Device Address window. Clicking on the device will reveal a list of the trouble conditions affecting that device. Click on the device a second time to remove the trouble listing.

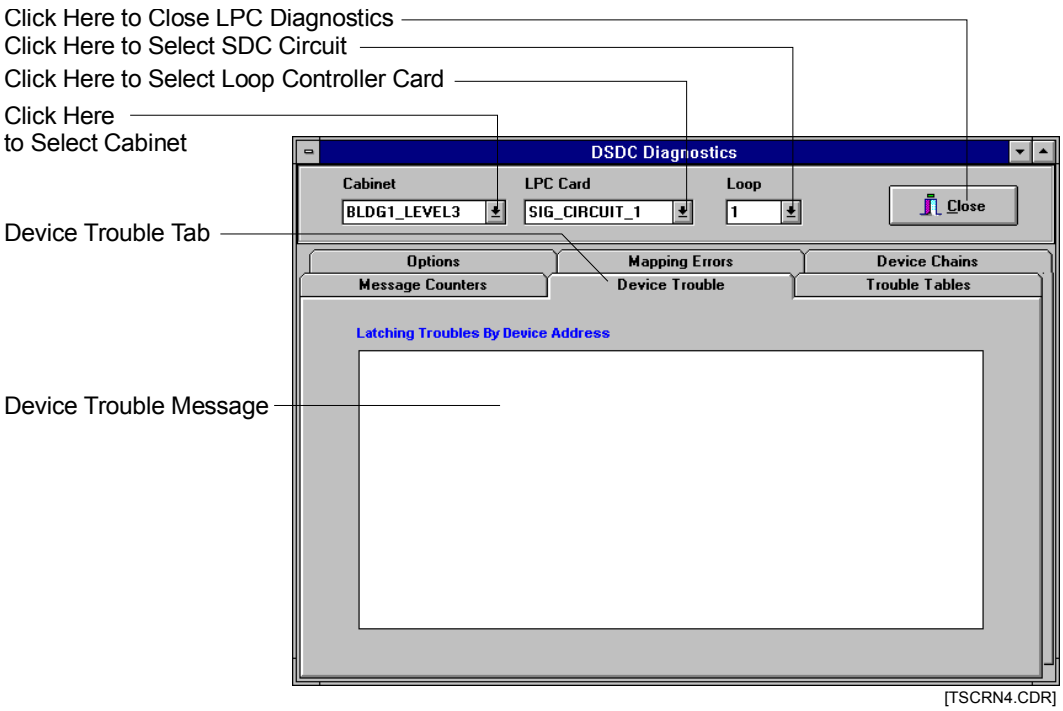


Figure 5-21: Device Trouble Screen

Table 5-35 below lists the Signature *Detector* trouble messages, and possible causes and solutions. Table 5-36 lists the Signature *Module* trouble messages, and possible causes and solutions.

Table 5-35: Signature Detector Trouble Messages

Trouble Message	Possible Cause	Possible Solution
External Device Line Short	Defective Detector	Replace Detector
External Device Line Open	Defective Detector	Replace Detector
Error XMIT Light	Detector Dirty	Clean detector
Device switched to short after isolator relay operated	Short on Signature data circuit	Locate and remove cause of short.
ESK Value Too Low	1. Dirty Detector 2. Bad Ion Chamber	1. Clean Detector 2. Replace Detector
ESK Slope Too High	1. Dirty Detector 2. Bad Ion Chamber	1. Clean Detector 2. Replace Detector
ESK Slope Too Low	1. Dirty Detector 2. Bad Ion Chamber	1. Clean Detector 2. Replace Detector
Quiescent Too Large	Devices on the Signature data circuit are drawing too much current during the mapping process.	Place a short or low resistance shunt across the data circuit.

Table 5-35: Signature Detector Trouble Messages

Trouble Message	Possible Cause	Possible Solution
Quiescent Too Small	Devices on the Signature data circuit are not drawing enough current during the mapping process.	Check the device wiring or replace the device.
Short on Relay Base	Bad Relay Base	Replace Relay Base
External or Isolator Relay Failure to Switch	Bad Base	Replace Base
External or Isolator Relay Switched	1. Bad Relay Base 2. External Electrical Noise	1. Replace Relay Base 2. Remove/Shield Noise Source
“O” Value Too Small	Bad Base	Replace Base
Ion Rate-of-Rise Too High	Bad Ion Chamber	Replace Detector
Ion Quiescent Too High	Dirty Detector	Clean Detector
Ion Quiescent Too Low	Dirty Detector	Clean Detector
Ion Value Too Low	Defective Detector	Replace Detector
Thermal Value Too High	Bad Base	Replace Base
Thermal Value Too Low	Bad Base	Replace Base
A/D Converter Fault	Defective A/D converter	Replace Detector
EEPROM Checksum Error	Bad EEPROM	Replace Detector
EEPROM Write Time-out	Bad EEPROM	Replace Detector
Unknown Device Type	Bad EEPROM	Replace Detector
EEPROM Write Verify Fault	Bad EEPROM	Replace Detector
Ambient Light Too High	1. Dirty Detector 2. Outside light reaching detector chamber	1. Clean Detector 2. Eliminate light source
Photo Quiescent Too High	Dirty Detector	Clean Detector
Photo Quiescent Too Low	Dirty Detector	Clean Detector
Photo Value Too High	Bad Base	Replace Base

Table 5-36: Signature Module Trouble Messages

Trouble Message	Possible Cause	Possible Solution
Open data Circuit	See Table 5-30	See Table 5-30
Shorted data Circuit	See Table 5-30	See Table 5-30
Relay switched	Relay toggled from actual state	Manually reset relay Replace Module
Data circuit ground fault	See Table 5-30	See Table 5-30
Vector Current Too Large	Devices on the Signature data circuit are drawing too much current during the mapping procedure.	Short or low resistance shunt on Signature data circuit
Vector Current Too Small	Devices on the Signature data circuit are not drawing enough current during the mapping procedure.	Excessive circuit resistance Defective base Defective wiring
EEPROM Not Initialized	EEPROM not properly programmed	Replace module
EEPROM Write Time-out	Bad EEPROM	Replace module
A/D Time-out	Defective A/D converter	Replace module
EEPROM Write Verify Fault	Defective EEPROM	Replace module
Line Monitor Trouble	Signature data circuit voltage low	Check Signature data circuit
Class A Trouble	Open/shorted input or output circuit	Check input/output circuit wiring
3rd Wire Trouble	Voltage on the wire supplying 24 Vdc smoke power to SIGA-UM is out of range.	Check power supply output Check wiring
RAM Not Programmed	Bad RAM	Replace Module

Displaying trouble tables

You must be actively connected to the network via download cable to display the Trouble Tables.

The Trouble Tables display eight categories of *active* device trouble. Each list displays the short address or serial number of the devices experiencing that trouble condition. The total number of devices in each list is indicated at the bottom of the list.

The active troubles displayed in the Trouble Tables should be compared with a device's trouble history displayed in the Display Device Trouble lists, to determine any possible trouble pattern.

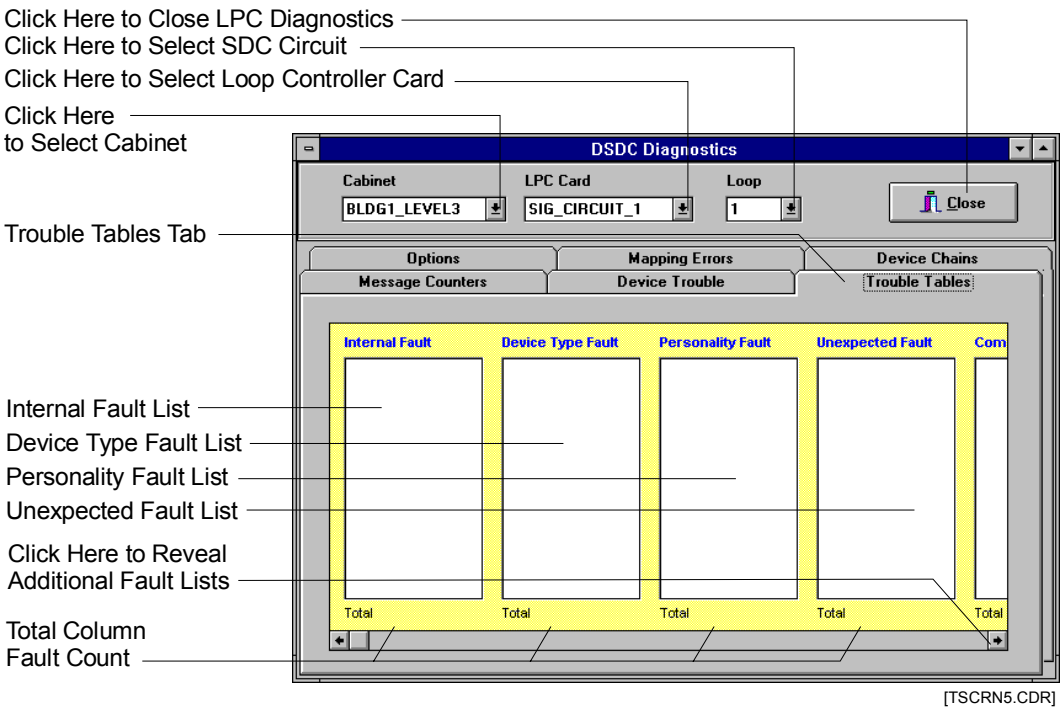


Figure 5-22: Trouble Tables Screen

Internal fault

The Internal Fault List indicates an internal problem with a Signature Device or Module. Refer to the Displaying Device Trouble section to determine the specific cause.

Device type fault

The Device Type Fault List indicates that the device type entered in the SDU does not agree with the device type installed on the SDC.

Personality fault / Sensitivity fault

The Personality Fault List indicates that the personality code (p-code) of a Signature module entered in the SDU does not agree with the p-code of the module actually installed on the circuit. The Sensitivity Fault List indicates that the sensitivity of a Signature detector entered in the SDU does not agree with the sensitivity of the detector actually installed on the circuit.

Personality and sensitivity faults should be corrected by the system, and these faults should clear automatically.

Unexpected fault

The Unexpected Fault List displays the serial number of devices which appear on the actual circuit, but which were not listed in the SDU program.

Communications fault

The Communications Fault List indicates those Signature devices which are not communicating with the Signature controller module.

Open fault

The Open Fault List indicates those Signature modules with an open on their input or output circuits (all p-codes except 8.)

Ground fault

The Ground Fault List indicates those Signature modules with a ground fault on their input or output circuits (all p-codes except 8.)

Short fault

North American marketplaces: The Short Fault List indicates those Signature modules with a short on their supervised output circuits (p-codes 5, 7, 15, 16.)

European marketplace: The Short Fault List indicates those Signature modules with a short on their supervised input circuits (p-codes 1, 2, 3, 4, 9, 10, 11, 12, 13, 14, 20, 21) and those Signature modules with a short on their supervised output circuits (p-codes 5, 7, 15, 16.)

Brand fault

Incorrect brand of Signature devices installed on SDC.

DSDC status

Introduction

The DSDC status function is used to determine the *real-time* status of a Signature Data Circuit (SDC). This function is useful in isolating and correcting faults on an SDC. The DSDC status function is useful in conjunction with the download and DSDC diagnostic functions.

Setting up the System Definition Utility program

In order to use the DSDC Status function, the computer running the SDU program must be connected to the 3-SSDC. The appropriate communications port must be connected to the modular phone jack on the Signature controller module or on the CPU module.

Com port and baud rate settings can be made directly from the DSDC Status window. The default baud rate is 9600 baud.

Using DSDC status

To access the DSDC Status function, click on Tools on the main menu bar, then click on Signature Status.

Select the SDC to be monitored by using the Cabinet, SSDC, and Loop drop down lists.

The Delay drop down box sets the interval at which the status screens receives updated information from the Signature controller module. The default value is 3 seconds. Increasing the delay time permits the module to process more information between reports to the SDU, thus decreasing the overall time it takes to generate a full status report.

To start the DSDC Status function, click on the Start Status Button. Should the Confirm window appear after a short delay, the SDU computer is not communicating with the 3-SSDC.

Verify the module address, download wiring, COM port, and baud rate are set correctly and click on the retry button. If communications fail when connected to the module via the 3-CPU1, try connecting directly to the modular phone jack on the Signature controller module.

Displaying the Current SDC status

Click on the Current Status Tab at the bottom of the window to display an annunciator panel showing the real-time status of the connected SDC. Refer to Table 5-37 to interpret the indicators.

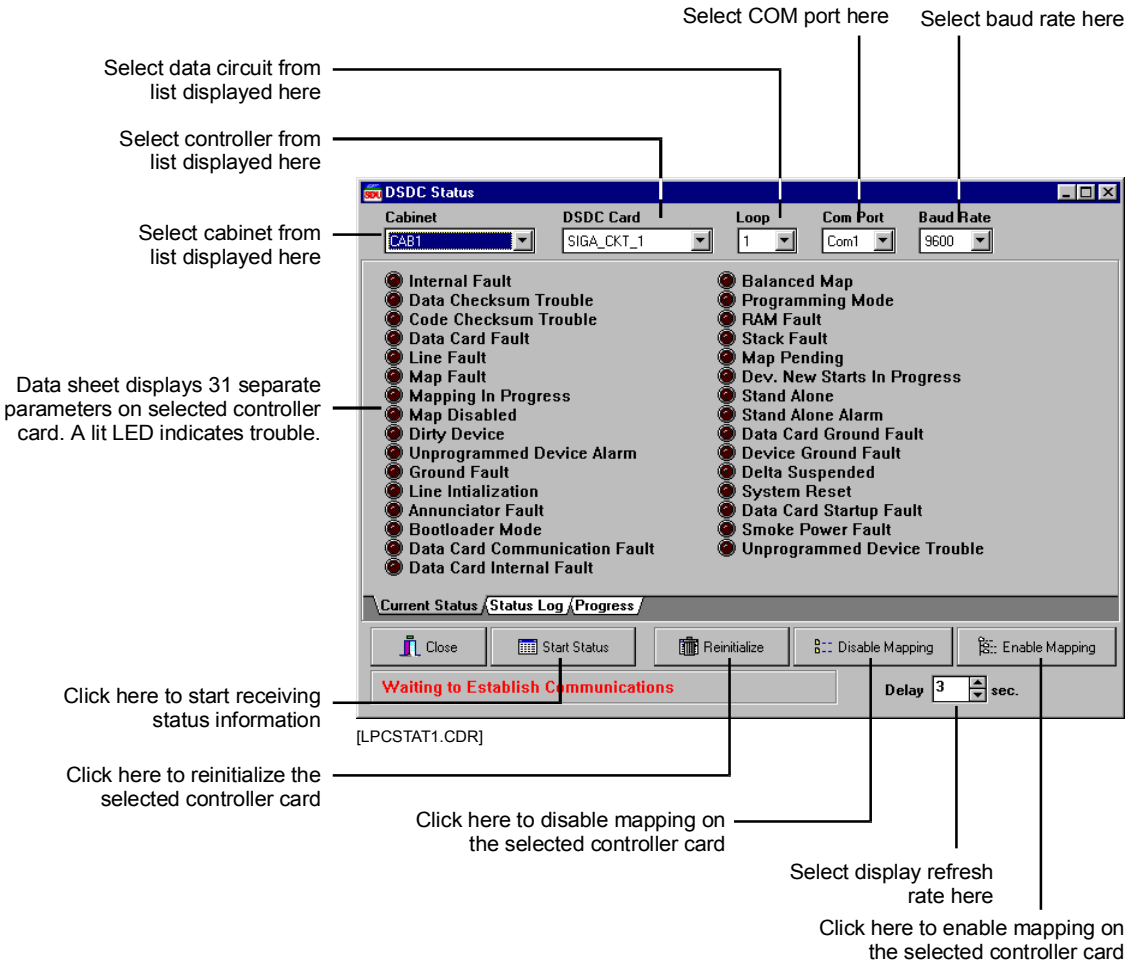


Table 5-37: Current Status Parameters

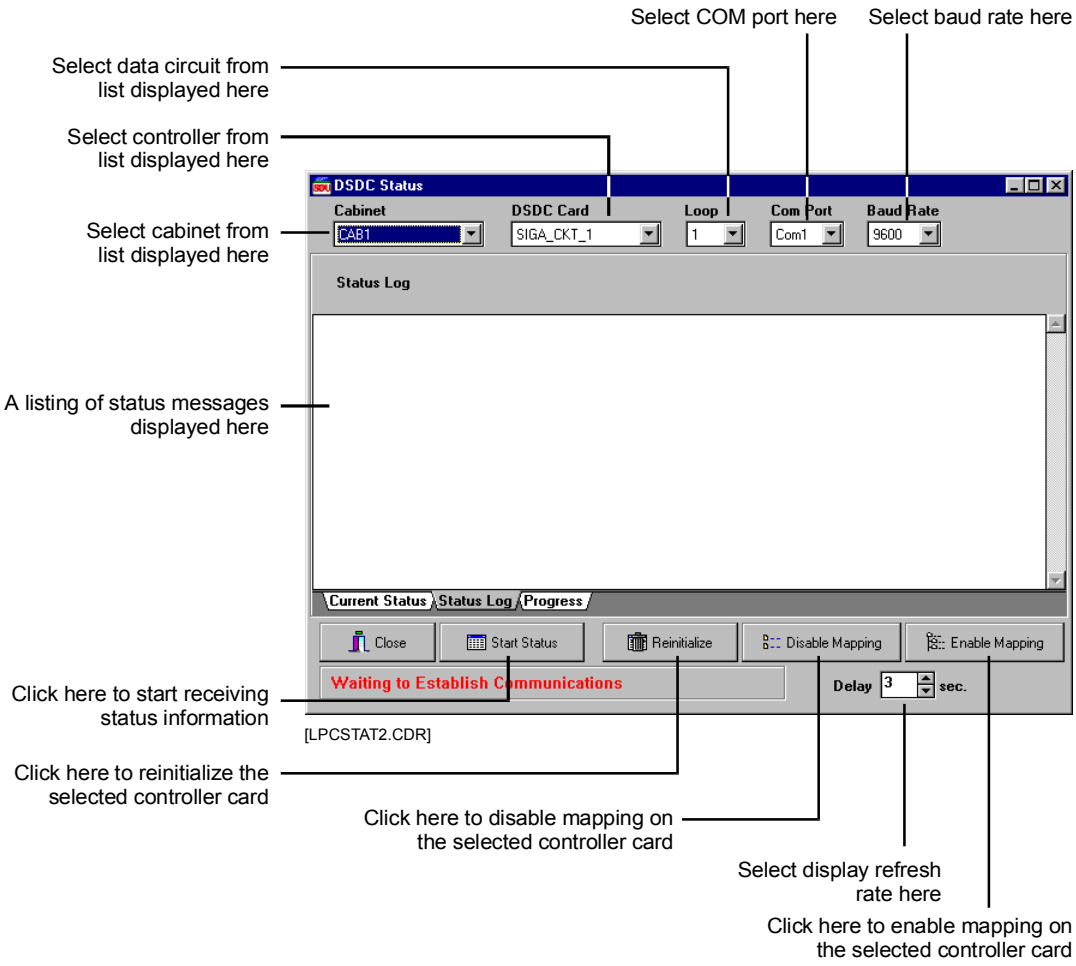
Indicator	Function
Internal Fault	Signature controller module hardware problem
Data Checksum Trouble	Configuration data bad
I/F Fault	3-SDC Card hardware problem
Line Fault	SDC open or shorted
Map Fault	Memory contents differ from actual SDC device conditions.
Mapping in Progress	The Signature controller module is currently mapping the SDC
Map disabled	The mapping process has been manually turned off

Table 5-37: Current Status Parameters

Indicator	Function
Dirty Device	A dirty smoke detector has been identified
Unconfigured Alarm	The module has detected an alarm on a device which is not in its database
Line Initialization	SDC power on phase, devices not supervised
Serial Table Full	Indicates when data controller card needs to be reinitialized
I/F Communications Fault	Signature controller module to 3-SDC communication problem
I/F Internal Fault	3-SDC card hardware problem
Balanced Map	Two or more device strings appear identical to the system.
Programming Mode	Signature controller module in upload/download mode
RAM Fault	Internal memory problem
Stack Fault	Internal program error
Map Pending	Ready to map SDC when SDC conditions warrant
Dev. New Starts in Progress	The Signature controller module is processing a new SIGA device start up
Stand Alone	The SDC is in the stand alone mode
Stand Alone Alarm	The module has detected an alarm while in the stand alone mode
Ground Fault	The SDC wiring has low resistance continuity to ground
Device Ground Fault	A SIGA module IDC/NAC has low resistance continuity to ground
Delta suspended	Module in reset phase. No changes reported by Signature controller module

Displaying a log of current SDC status events

Click on the Status Log Tab at the bottom of the window to display a chronological list of the events which occurred on the SDC after the Start Status Button was activated.

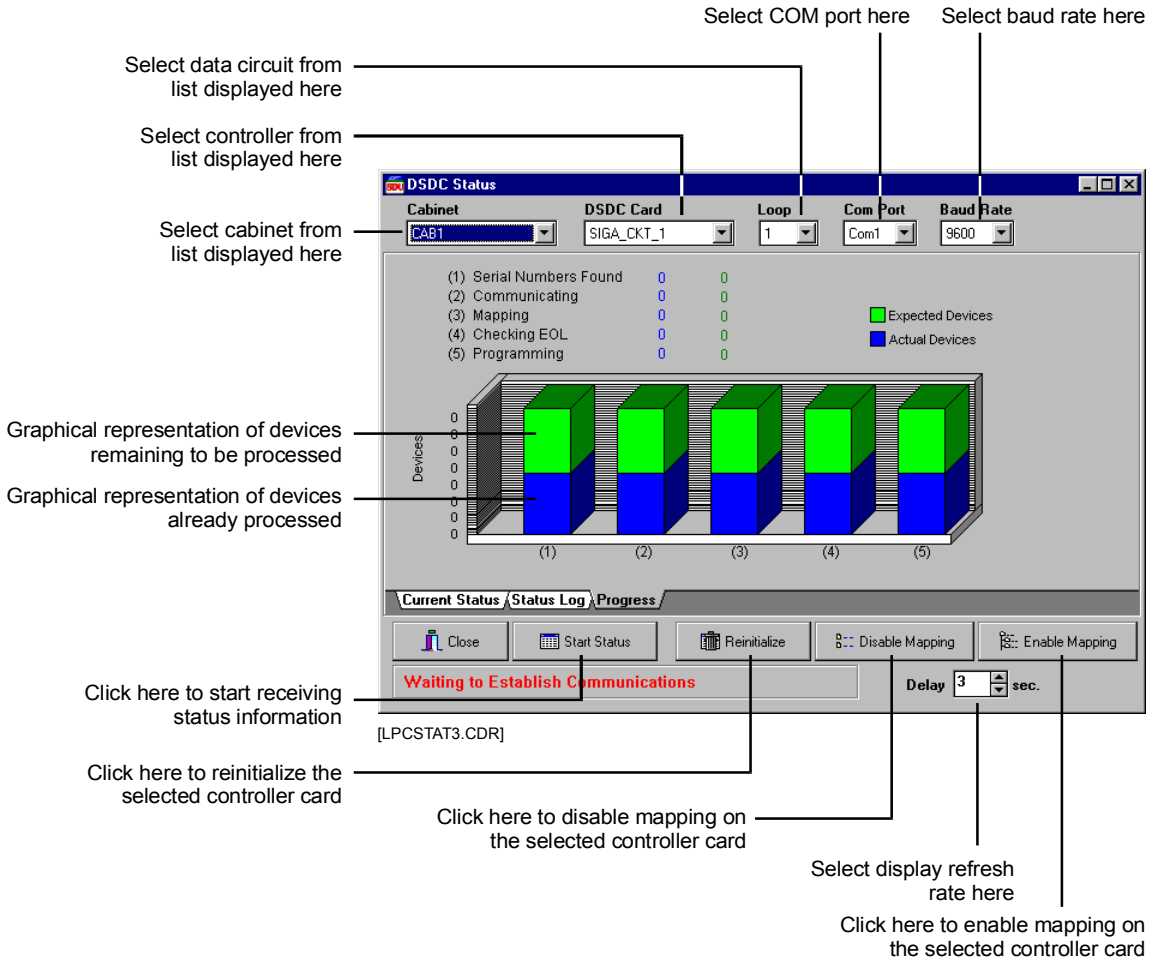


Displaying the SDC in-process progress chart

Click on the Progress Tab at the bottom of the window to display a graphical presentation of the five major processes which take place during SDC configuration:

- Finding device serial numbers
- Communicating with individual devices
- Mapping the devices
- Verifying the End Of Line (EOL) status of a device
- Programming parameters into a device's memory

This display is useful in determining an overall picture of SDC configuration activity.



Analog device network addressing

An addressable analog device's network address is composed of three elements:

- The cabinet number
- The 3-AADC module's *logical address* (rail module address)
- The device address.

This is the format in which specific devices are identified by the network. All network generated reports will use this address format to refer to a specific device. Reports generated by the SDU program will include this information as well as the device label.

The device address indicates the device type, as indicated in Table 5-38.

Table 5-38: Addressable analog device addressing

Address	Device Type
0001 - 0099	Detector
0101 - 0199	Module
0600 - 0699	Trouble Codes

Addressable analog diagnostic tools

The SDUs addressable analog diagnostic tools are designed to assist in isolating and correcting faults with addressable analog circuits, detectors, and modules.

System definition utility

The quickest method for isolating most common problems is with the Systems Definition Utility (SDU) diagnostic tools.

1. Connect the SDU to the system in the usual manner, and open the appropriate project.

Note: If the actual project is not available create a phantom project with an empty 3-AADC circuit and connect directly to the module in question.

2. Select menu: Tools\System Sensor\Diagnostics
3. On the Options tab: deselect "Message Counters," as they not usually needed, and take time to upload. "Trouble Tables," "Ready Communications," and "Display as Device Addresses"should be selected.
4. Click on: "Upload AADC Tables."
5. Select the "Status Tables" tab when the table upload is complete.

Addressable analog diagnostic table interpretation

Each table lists the addresses for the modules and sensors reporting the associated condition with a total at the bottom. When displayed as Device Addresses, sensor addresses correspond with the rotary switch setting, and modules are reported as 100 plus the rotary switch setting, as shown in Table 5-38. Multiple faults will make the process more difficult but the addresses noted in the fault tables make an excellent starting point

Table 5-39: Addressable Analog Diagnostic Table Interpretation

Table Name	Description	Possible Causes
Communicating Devices	Lists sensor and module addresses talking to the 3-AADC.	**NOTE:** Total number of communicating devices should equal number of installed devices. If total is low, see Communication Fault table for missing/not connected device(s). If total is high, see Unexpected Fault table for extra device(s) installed on circuit.

Table 5-39: Addressable Analog Diagnostic Table Interpretation

Table Name	Description	Possible Causes
Internal Fault	Devices reporting an internal failure	Replace device
Device Type Fault	The wrong type of device for the current configuration.	Photo detector installed for ion detector Ion detector installed for photo detector Monitor module installed for control module Control module installed for monitor module Addresses of two devices has been transposed.
Unexpected Fault	A device reporting at an unconfigured address. All unconfigured address locations are polled at startup after which these locations will be polled in less than 10 minute intervals.	If Communicating Devices total is OK, and Communications Fault is reported, the Unexpected Fault device should be set to the address listed as a Communications fault.
Duplicate Device Fault	Two or more devices have the same address.	If total number of communicating devices is OK, the duplicate device is set at the same address as a configured device. If Communicating Devices total is short, and Communications Fault is reported, the device in the Communication fault table is addressed at the location shown in the Duplicate Device table.
Communication Fault	Missing device.	Wiring error or device not installed If Communicating Devices table short by one and Duplicate Device fault exists, then address shown in Comm Fault table is addressed at location shown in Duplicate Device table. OR If Communicating Devices table OK and Unexpected Fault exists, then the Unexpected Fault device should be set to the address shown in the Communications Fault table.
Open Fault	Module field wiring is open.	Circuit incorrectly wired or connector loose Defective detector or isolator base Broken conductor Device not installed on circuit Device not entered into SDU databases

Table 5-39: Addressable Analog Diagnostic Table Interpretation

Table Name	Description	Possible Causes
Short Fault	Module field wiring is shorted.	Circuit incorrectly wired Defective detector, detector base, or module Nicked insulation between conductors
Compatibility Fault	Incorrect brand of device installed, replace device.	SIGA, GSX ,or XLS brand devices intermixed on circuit.

Problem solving hints

Addressing faults

Most addressing faults are quickly located because the wrong address gives a clue as to the fault location. For example module 164 is duplicated while module 174 is missing. The device at location 174 probably has its tens digit addressing switch off by one position.

Duplicate device faults are harder to locate, e.g. the carpenter put up a partition hiding sensor 53, then the electrician noticed it was missing and spliced in a new base and now there are two sensors at address 53.

To identify devices with duplicate addresses, remove one of the suspected duplicate sensors. The duplicate fault should clear within 30 seconds if the sensor removed is a duplicate. Disconnect half of the circuit, allow a minute or so for the circuit to stabilize and the faults to report. Upload the “Ready Communications” diagnostics table only. The remaining duplicate sensor, 53, should still appear, as if it is physically connected between the circuit controller and the wiring break. Continue to add and/or remove segments of the circuit in gradual increments repeating the diagnostics upload until the physical location of the problem detector is located.

Intermittent communications and wiring faults

Included in the tools available for use with the addressable analog circuit are diagnostic Message Counters. These software counters indicate the number of communications between each device and the 3-AADC controller, beginning with the last controller restart. Each device also has an error count associated with it. The error count indicates the number of times communications have failed between each device and the 3-AADC controller. Examining the number of messages sent to a device and comparing this number to that of a neighboring device of the same type can be used to help isolate problems.

To use the counters effectively, one needs to know how these counters are affected by various circuit states. Devices are re-polled for a number of reasons: startup, changes in state such as alarm and trouble. Pull stations are polled much more frequently than detectors or modules. A communications failure will also cause effected devices to be polled more often than those not experiencing the failure.

- Devices with high message counts but few errors may be pull stations or devices that change state regularly such as monitor modules.
- Devices that have increased error counts and only marginally increased message counts may indicate wiring or device problems.
- Devices with low message counts and an equal number of errors are non-existent devices.
- All 198 addressed are polled occasionally to identify any devices that may have been installed and not configured.

If the message and error counts are confused because of the length of time the circuit has been running, restarting the panel will cause a restart of the circuit and the zero the counters. The circuit may have to run for a twenty minutes or more before a trend in messages shows up. Locating intermittent faults may require extended operating periods.

3-AADC Addressable Analog Driver Controller

Substituting 3-AADC local rail modules

When substituting a "known good" 3-AADC rail module in place of a suspect rail module, you must download the system configuration and Addressable Analog circuit data circuit information into the 3-CPU1 module. This operation requires a PC and the SDU Program.

The 3-AADC actually has two separate memories. The first memory contains the firmware that makes the module operate. If there is a problem with the firmware, or if an upgrade has been issued, the new firmware is downloaded into the module using the 3-AADC Code tab, which is found in the Version Control (Code) function of the Tools, Download menu. When upgrading the module firmware (code), you do NOT need to download the "Bootstrap" data unless specifically instructed to do so.

The SDC configuration information is stored in the module's second memory. If you suspect that the module itself is bad, you must download the configuration information for the circuit that will be connected to the substitute module, using the 3-AADC Database tab, which is found in the Version Control (Database) function of the Tools, Download menu.

Connect the PC to the 3-CPU1 RS-232 connector J5

Table 5-40: 3-AADC Local Rail Module Troubleshooting

Problem	Possible Cause
Analog Circuit Open	1. Circuit incorrectly wired or connector loose 2. Defective detector or isolator base 3. Broken conductor 4. Device not installed on circuit 5. Device not entered into SDU databases
Analog Circuit Shorted	1. Circuit incorrectly wired 2. Defective detector, detector base, or module 3. Nicked insulation between conductors
Analog Circuit Ground Fault	1. Pinched wire between device and electrical box 2. Nicked wire insulation

Addressable analog device troubleshooting

Each addressable analog device has an integral Red LED. The function of this LED is indicated in Table 5-41. The LED is useful when trying to determine the communications and alarm/active status of a device.

Table 5-41: Addressable Analog Device LEDs

LED	Device Status
Flashing Red	Polling device
Steady Red	Alarm/Active

Table 5-42 lists common troubles and possible causes for addressable analog modules.

For detailed information on identifying and locating these errors, use the SDU program's Addressable Analog Diagnostic Tools. Information about these tools appears later in this chapter.

Table 5-42: Addressable Analog Module Troubleshooting Matrix (x = Applicable - = Not Applicable)

M500MF	M501MF	M500CF	M500XF	Possible Causes
Module Not Responding Correctly				
x	x	x	x	Module installed in wrong location or improperly addressed
x	x	x	x	Module not entered into 3-AADC module database
-	-	x	-	“Break-off” Tab set incorrectly
x	x	x	x	Ground Fault on data circuit or (-) side of input/output circuit
Module in Trouble on 3-AADC Module				
x	x	x	x	Module missing or incorrectly wired on circuit.
x	x	x	x	ID error. Module not loaded into 3-AADC module database
x	x	x	x	Ground Fault on input or output circuit
-	-	x	x	Output circuit open, shorted, incorrectly wired, polarized device installed in reverse, incorrect or missing EOL resistor
x	x	x	x	Missing or incorrect EOL resistor
Module Incorrectly in alarm/active on 3-CPU1/3-LCD Module				
x	x	-	-	Initiating Device Circuit shorted or initiating device incorrectly installed
x	x	-	-	Incorrect EOL resistor value (too low)

Table 5-43: Addressable analog detector troubleshooting

Symptom	Possible Causes
Detector not responding correctly	1. Detector installed in wrong location or improperly addressed 2. Detector not entered into system database 3. Incorrect device response in database
Detector in trouble on 3-CPU1/3-LCD	1. Detector missing or incorrectly wired on circuit 2. ID error. Detector not loaded into 3-AADC module database 3. Ground Fault on circuit 4. Internal detector fault.

Table 5-43: Addressable analog detector troubleshooting

Symptom	Possible Causes
Detector incorrectly in alarm on 3-CPU1/3-LCD	1. Detector extremely dirty 2. Ionization detector Installed in area of extremely high airflow 3. Detector installed in area of high ambient smoke 4. Defective detector

For detailed information on identifying and locating device problems, refer to the Addressable Analog Diagnostic Tools Section, which follows.

Wiring problems

There are three basic causes of wire-related erratic Addressable Analog circuit operation:

Excessive wiring resistance

Rarely is excessive wiring resistance the sole cause of Addressable Analog circuit problems. For any length of cable, the amount of resistance and capacitance per foot doesn't change and the Addressable Analog circuit capacitance limits are usually reached before the resistance limits. The digital signal operates between 0 and 24 VDC. Excessive circuit resistance causes the signal to shrink from a maximum of 23 VDC to a lower voltage, for example 20 VDC. The 3-volt drop in the wiring is due to wire resistance.

To measure Addressable Analog circuit voltage drop, use an oscilloscope to measure the peak voltage at the Addressable Analog module and at each analog/addressable device. If the voltage difference is greater than 2 VDC, the resistance in the wire run is excessive. Too much resistance in the Addressable Analog wire run is typically caused by small wire size or a bad connection.

If the wire size is too small for the run length, the only remedies are to replace the wire with a larger size, or install additional Addressable Analog modules, dividing the circuit into acceptable lengths. Breaks or bad connections in the Addressable Analog circuit wiring can be identified by comparing the calculated circuit resistance value (described earlier) with the measured circuit resistance value. The measured wiring circuit resistance should not be different from the calculated circuit resistance by much more than a few ohms.

Excessive wiring capacitance

The second cause of erratic Addressable Analog circuit operation is too much capacitance in the Addressable Analog circuit wiring. Capacitance distorts the digital signal. As wiring capacitance increases, the square edges of the digital waveform start to curve. Excessive wiring capacitance causes the waveform to curve beyond the point where a device can recognize the waveform and respond when polled.

Wiring capacitance also effects the turn-on current spike. If the turn on current spike is not present in the digital sequence, there is a high probability the analog/addressable device's communication will not be understood by the Addressable Analog communication module.

Addressable Analog circuit capacitance problems are typically caused by long wire runs, ground faults on the Addressable Analog circuit, improper T-taps, or improper shielding.

If shielded wire is used, the shield must be treated as a third conductor. It must be free of all ground faults and have continuity throughout. If the wire capacitance is too large for the run length, the only remedies are to replace the wire with a cable having a lower capacitance per foot or install additional Addressable Analog modules, dividing the circuit into acceptable lengths.

Ground faults

Eliminating ground faults on the Addressable Analog circuit reduces the amount of capacitance on the Addressable Analog wiring.

Verify the Addressable Analog circuit is free of ground faults.

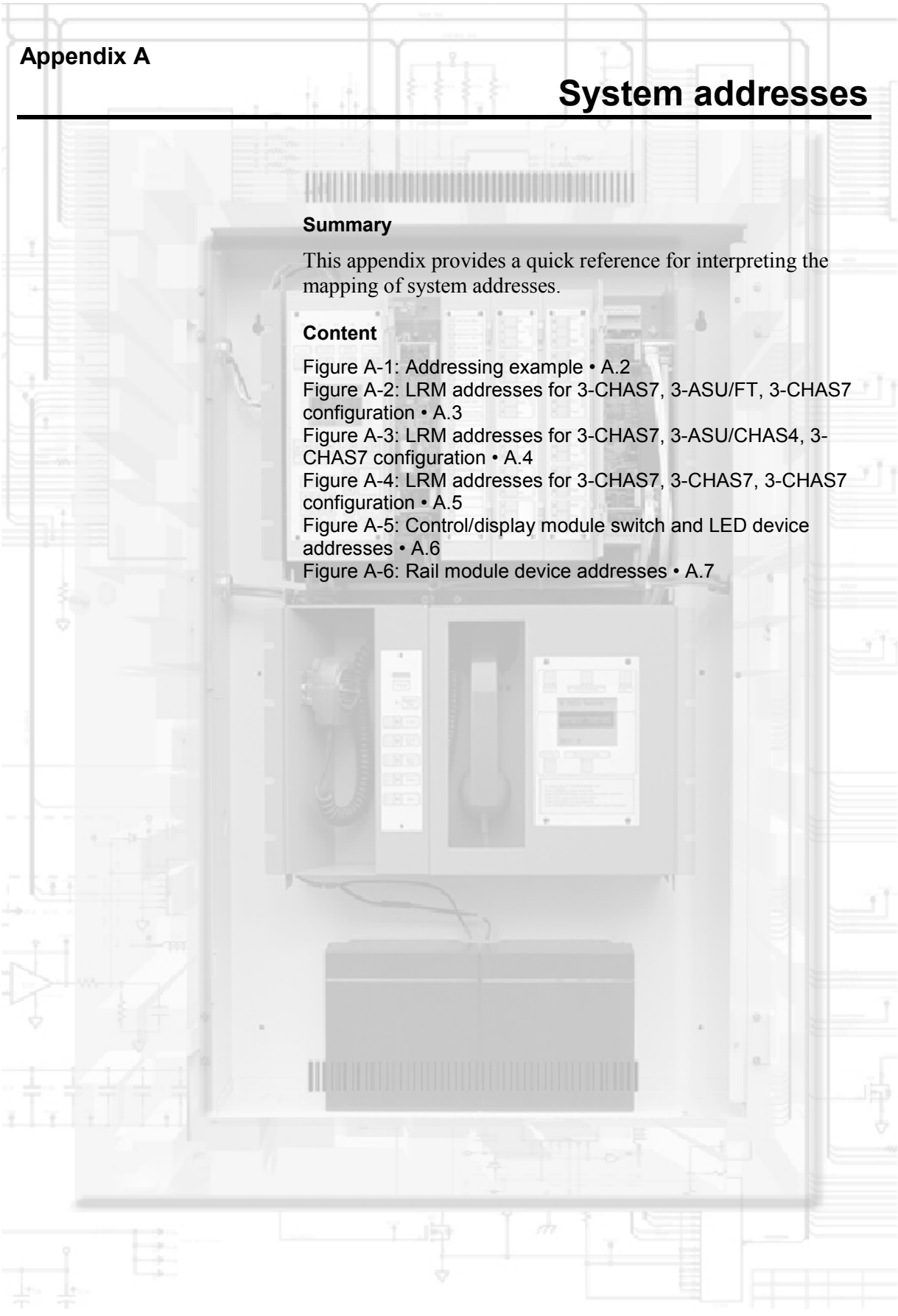
Correcting addressable analog circuit wiring problems

If the Addressable Analog circuit is wired with improper T-taps or excessive capacitance, corrective measures include:

- Designing the Addressable Analog circuit properly and re-pulling the wire
- Balancing the circuit. Balancing the circuit can help in some cases but is not a substitute for proper wiring practice. If circuit balancing is required, call Technical Services for additional information.

Appendix A

System addresses



Summary

This appendix provides a quick reference for interpreting the mapping of system addresses.

Content

Figure A-1: Addressing example • A.2
Figure A-2: LRM addresses for 3-CHAS7, 3-ASU/FT, 3-CHAS7 configuration • A.3
Figure A-3: LRM addresses for 3-CHAS7, 3-ASU/CHAS4, 3-CHAS7 configuration • A.4
Figure A-4: LRM addresses for 3-CHAS7, 3-CHAS7, 3-CHAS7 configuration • A.5
Figure A-5: Control/display module switch and LED device addresses • A.6
Figure A-6: Rail module device addresses • A.7

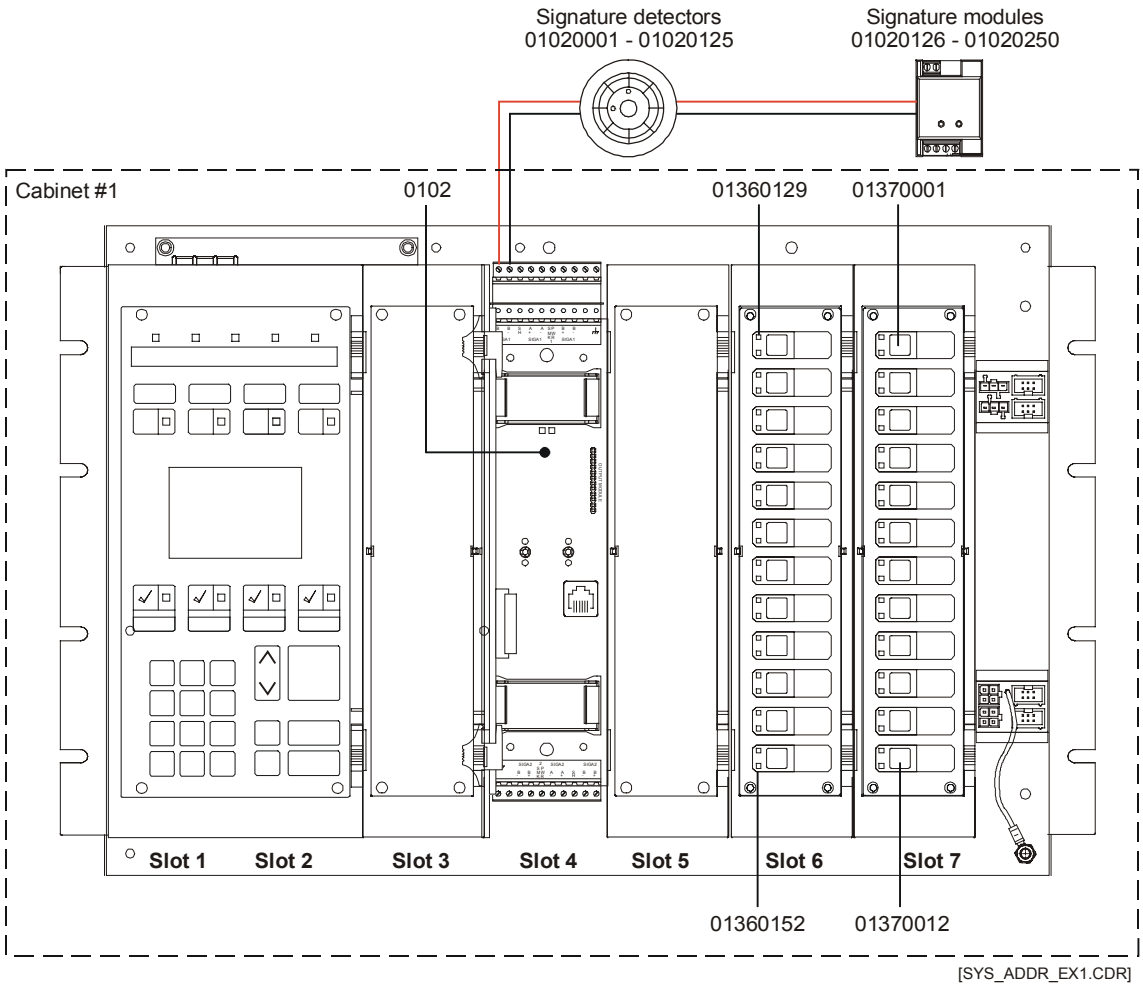


Figure A-1: Addressing example

Tip: To determine a local panel's cabinet number, use the 3-LCD command menu to get the status on all the active points on the panel. When prompted for a panel number, enter 00. The panel returns the startup response point's logical address. The first two numbers of the logical address is the cabinet number.

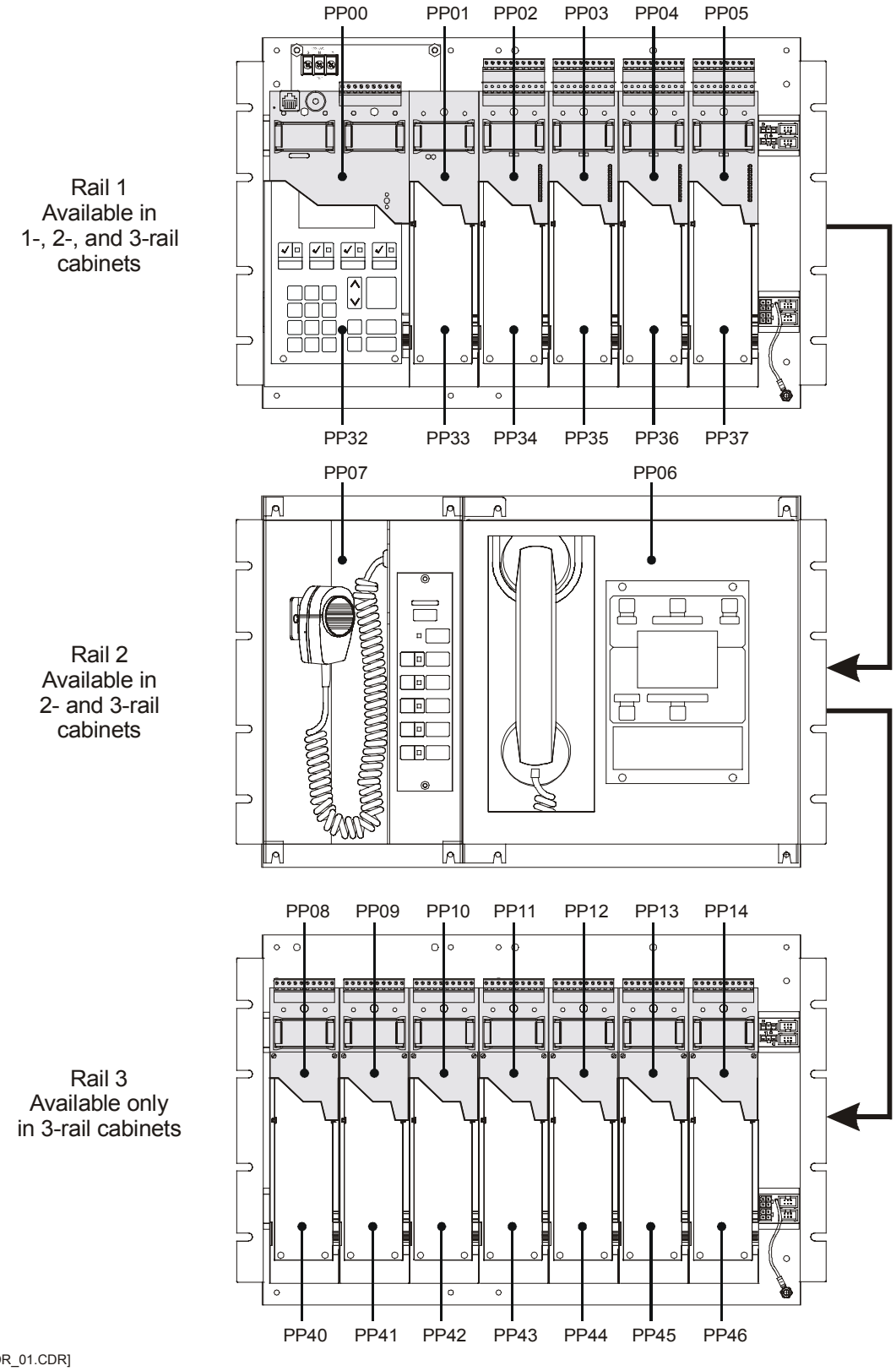
The system derives the addresses it assigns from the panel's cabinet number and the LRM's location within the panel (see Figure A-1). The basic address format is PPCCDDDD, where:

PP is the panel's cabinet number. The cabinet number is assigned when the installer downloads the CPU database into the panel.

CC is the LRM's slot address. The cabinet number and the slot address make up the LRM's logical address.

DDDD is the device's point address. The LRM's logical address and device's point address make up the device or circuit's logical address.

Figure A-2, Figure A-3, and Figure A-4 shows the logical addresses that the system assigns to LRMs based on the panel configurations. Figure A-5 shows the device logical addresses that the system assigns the control/display modules. Figure A-6 shows the device logical addresses that the system assigns to various rail modules.



[LRM_ADDR_01.CDR]

Figure A-2: LRM addresses for 3-CHAS7, 3-ASU/FT, 3-CHAS7 configuration

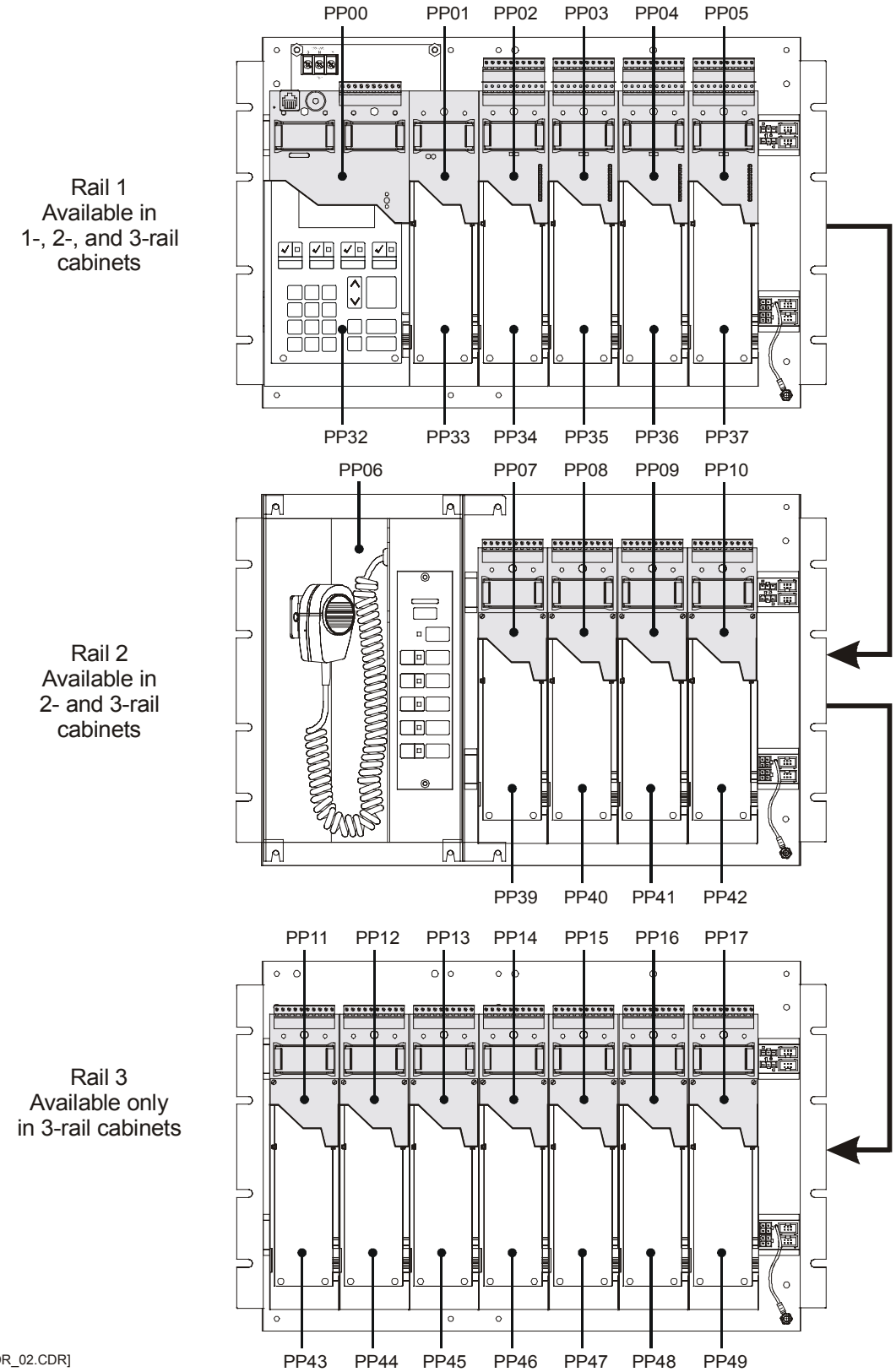


Figure A-3: LRM addresses for 3-CHAS7, 3-ASU/CHAS4, 3-CHAS7 configuration

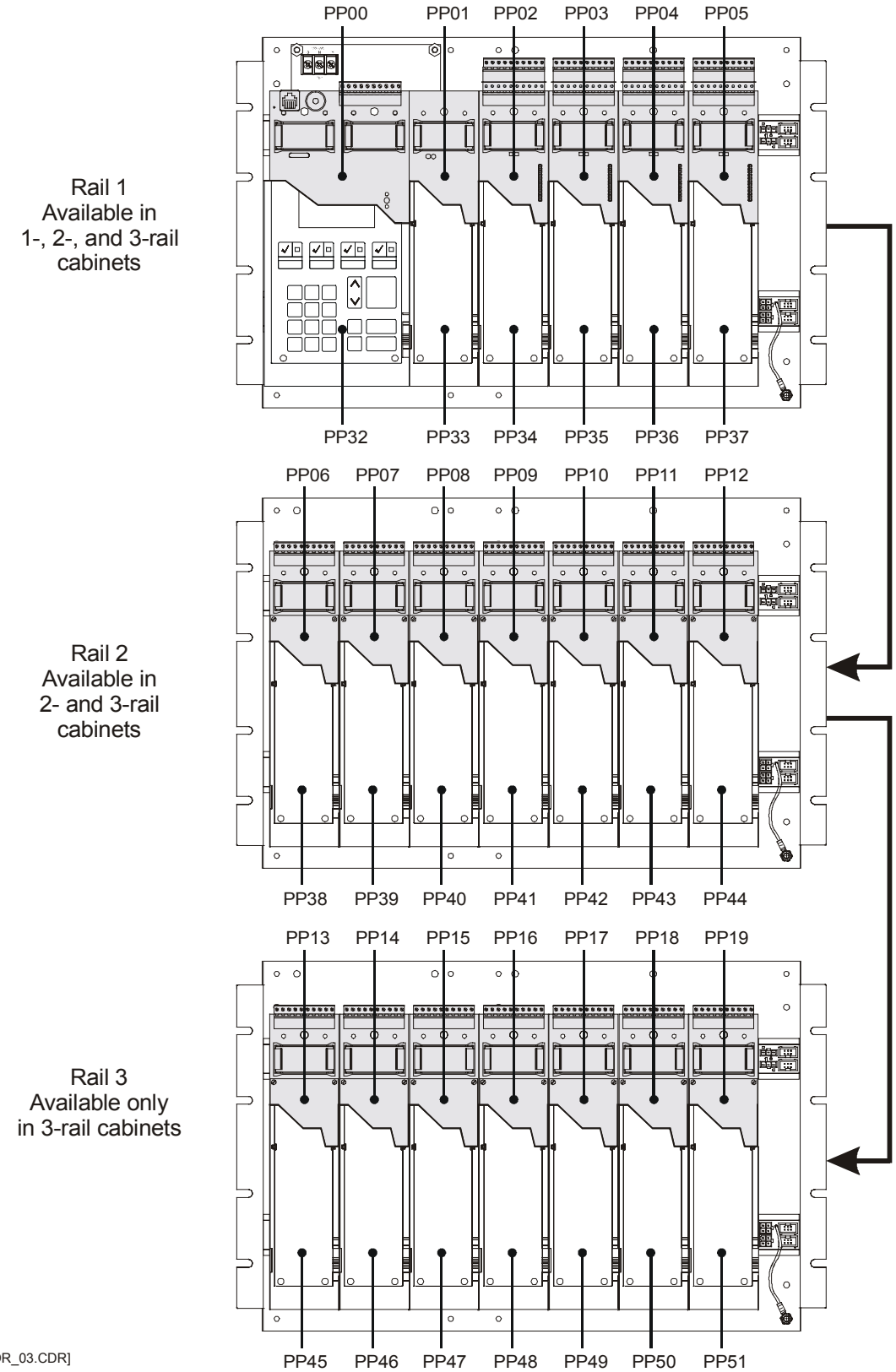


Figure A-4: LRM addresses for 3-CHAS7, 3-CHAS7, 3-CHAS7 configuration

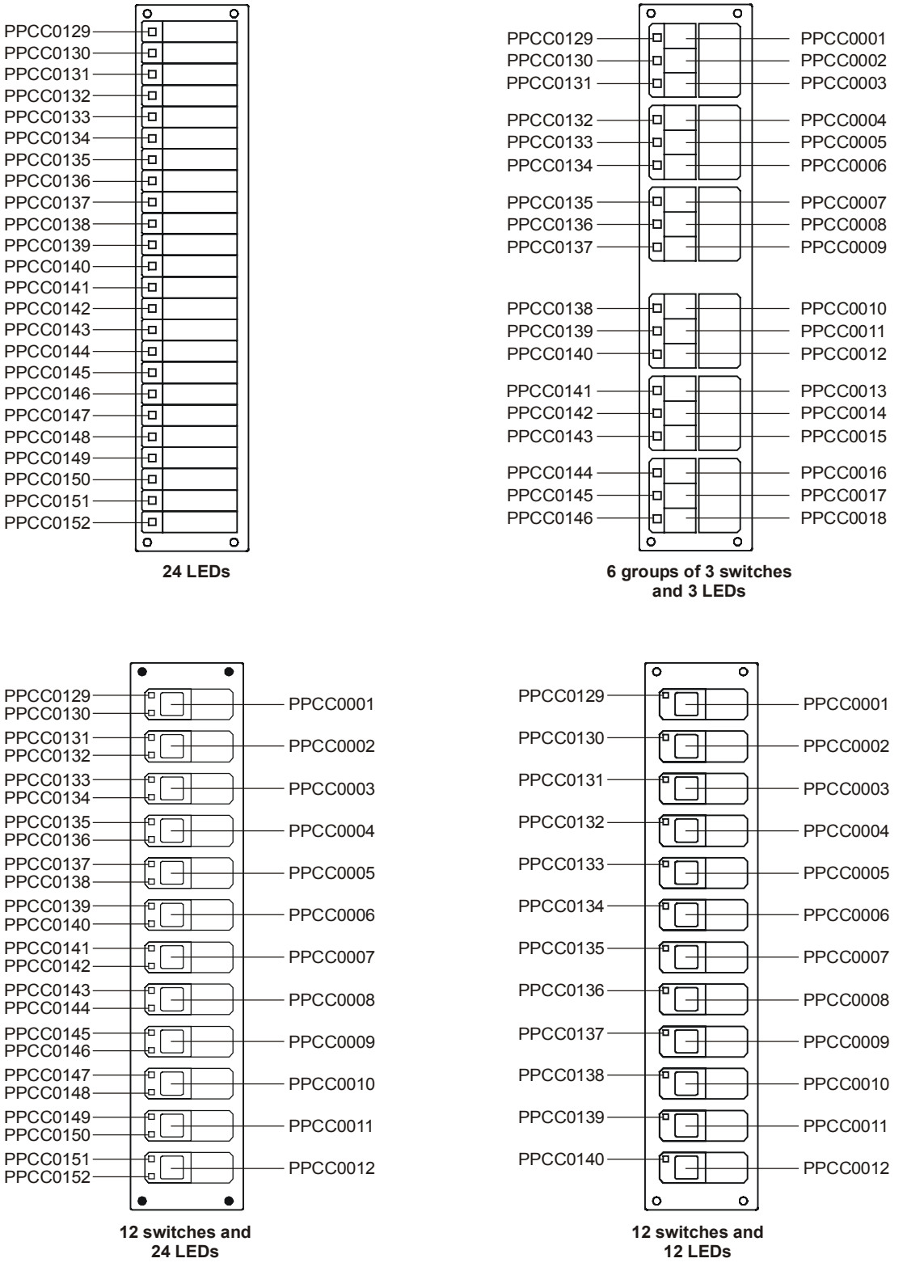
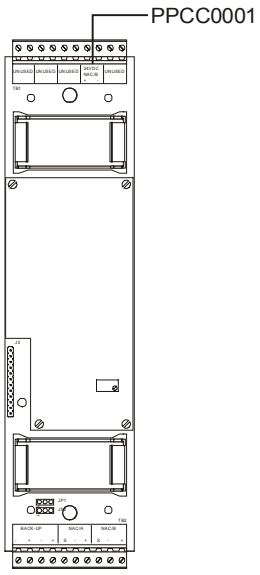
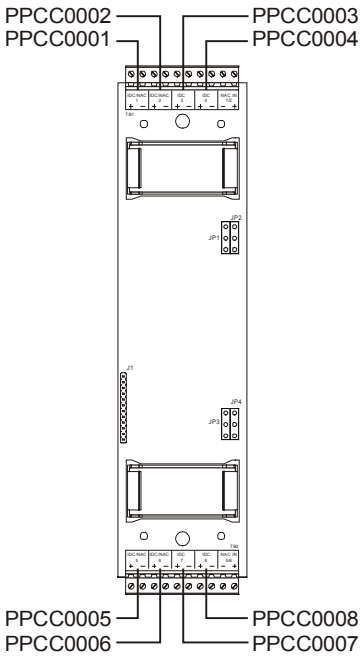


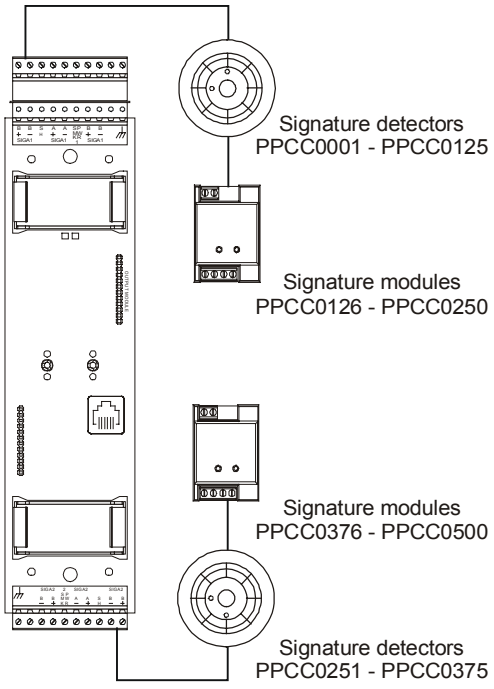
Figure A-5: Control/display module switch and LED device addresses



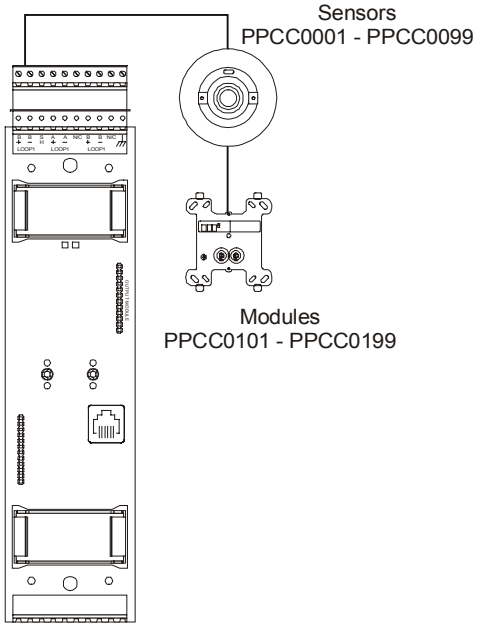
Zoned amplifier modules



Initiating device circuit module



Signature controller module



Addressable analog controller module

[DEV_ADDRESS_02.CDR]

Figure A-6: Rail module device addresses

Appendix B

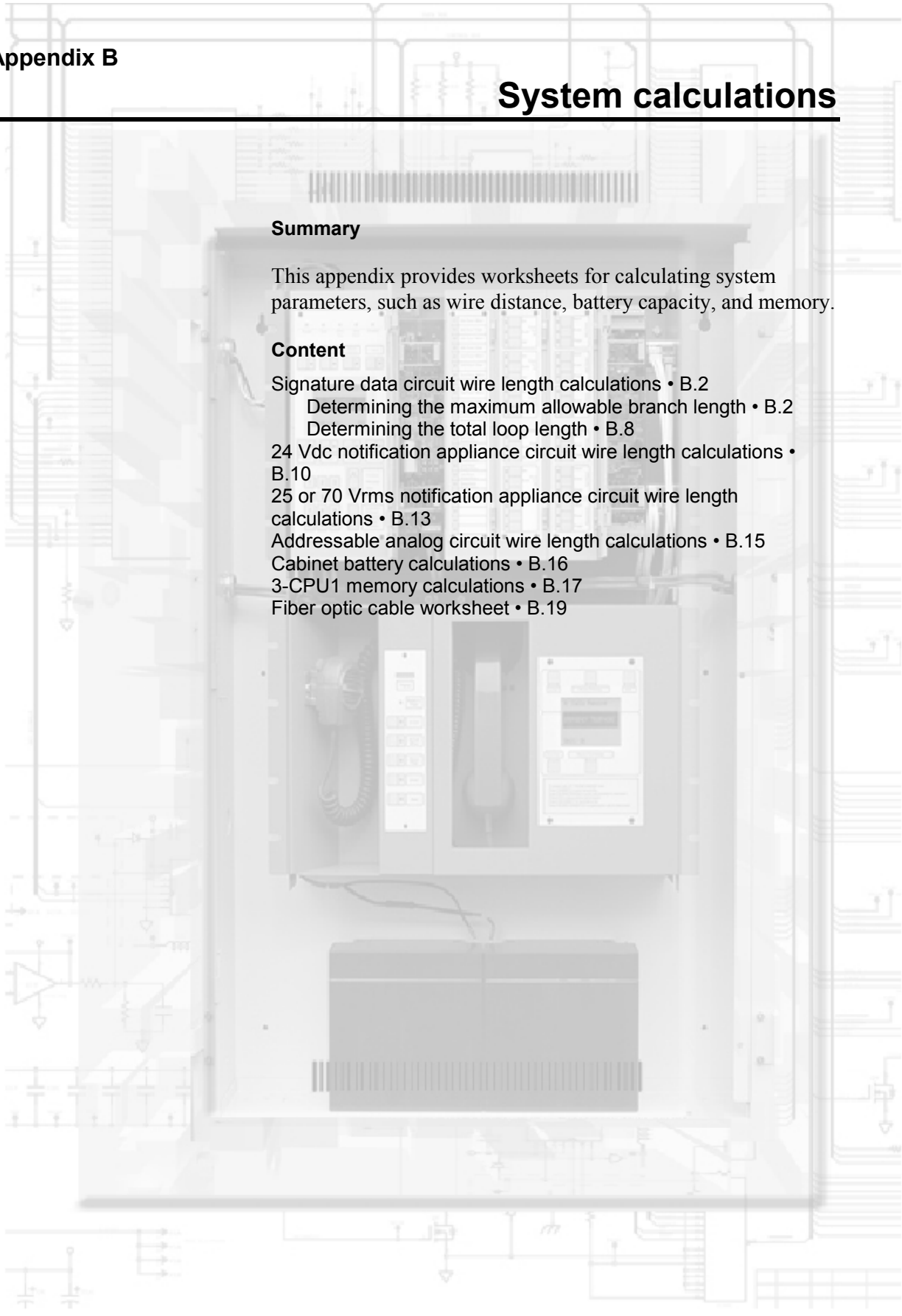
System calculations

Summary

This appendix provides worksheets for calculating system parameters, such as wire distance, battery capacity, and memory.

Content

Signature data circuit wire length calculations • B.2
Determining the maximum allowable branch length • B.2
Determining the total loop length • B.8
24 Vdc notification appliance circuit wire length calculations • B.10
25 or 70 Vrms notification appliance circuit wire length calculations • B.13
Addressable analog circuit wire length calculations • B.15
Cabinet battery calculations • B.16
3-CPU1 memory calculations • B.17
Fiber optic cable worksheet • B.19



Signature data circuit wire length calculations

Circuit resistance and capacitance determines the maximum length of a Signature data circuit. Circuit resistance affects the wire length of the longest circuit branch. Circuit capacitance affects the total amount of wire that can be used on the circuit.

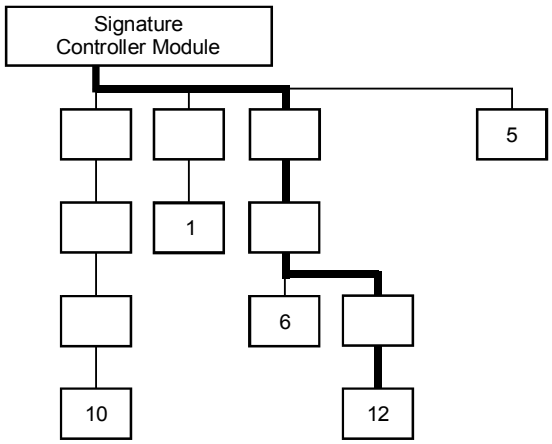
Notes

The design of the Signature data circuit must not exceed either of the two measurements.

There are no restrictions placed on the wiring used for the Signature data circuit. Longer wire runs may be obtained using standard (non-twisted, non-shielded) wire pairs.

Determining the maximum allowable branch length

The maximum branch length is the wire distance measured from the Signature controller module to the last device on the longest circuit path as shown below.



[WIRECALC2.CDR]

Several factors influence the maximum allowable branch length:

- Wire gauge and type
- Number of Signature detectors and modules installed on the branch
- Number of SIGA-UMs configured for 2-wire smoke detectors installed on the branch

Table B-1 through Table B-4 provide the maximum allowable branch length for any detector, module, SIGA-UM, and wire gauge combination. Using the wire distances specified in the tables ensures that the circuit does not exceed the maximum circuit resistance of the Signature data circuit.

Note: To calculate the wire distance with respect to circuit resistance, the tables assume that the circuit is end-loaded (all devices are clustered more towards the end of the circuit) and the circuit uses standard non-shielded wire.

To determine the maximum allowable length of a Signature data circuit branch:

1. Identify the device located farthest from the Signature controller.
2. Determine the number of Signature detectors, modules, and SIGA-UMs configured for 2-wire smokes that lie on the same conductive path between the device identified in step 1 and the Signature controller.
3. Calculate the number of detector and module addresses. Some Signature modules require two addresses.
4. Determine the size of the wire used to construct the circuit.
5. Find the maximum allowable wire distance for the longest branch in the lookup tables as follows:

   If no SIGA-UMs are installed, use Table B-1.

   If 1–5 SIGA-UMs are installed, use Table B-2.

   If 6–10 SIGA-UMs are installed, use Table B-3.

   If 11–15 SIGA-UMs are installed, use Table B-4.

Table B-1: Maximum branch length with 0 SIGA-UMs configured for 2-wire smokes

Signature detector addresses	Signature module addresses	Maximum allowable wire distance using non-twisted, non-shielded wire pairs					
		18 AWG		16 AWG		14 AWG	
		ft	m	ft	m	ft	m
1–25	0	7437	2267	11815	3601	18792	5728
26–50	0	7038	2145	11180	3408	17782	5420
51–75	0	6638	2023	10545	3214	16772	5112
76–100	0	6238	1901	9910	3021	15762	4804
101–125	0	5839	1780	9275	2827	14752	4497
0	1–25	7267	2215	11544	3519	18361	5597
1–25	1–25	6867	2093	10909	3325	17351	5289
26–50	1–25	6467	1971	10275	3132	16342	4981
51–75	1–25	6068	1849	9640	2938	15332	4673
76–100	1–25	5668	1728	9005	2745	14322	4365
101–125	1–25	5268	1606	8370	2551	13312	4057
0	26–50	6697	2041	10639	3243	16921	5157
1–25	26–50	6297	1919	10004	3049	15911	4850
26–50	26–50	5897	1798	9369	2856	14901	4542
51–75	26–50	5498	1676	8734	2662	13891	4234
76–100	26–50	5098	1554	8099	2469	12881	3926
101–125	26–50	4698	1432	7464	2275	11871	3618
0	51–75	5906	1800	9383	2860	14923	4549
1–25	51–75	5250	1600	8340	2542	13265	4043
26–50	51–75	4633	1412	7360	2243	11707	3568
51–75	51–75	4051	1235	6435	1961	10235	3120
76–100	51–75	3498	1066	5558	1694	8839	2694
101–125	51–75	2973	906	4723	1440	7512	2290
0	76–100	3931	1198	6245	1903	9932	3027
1–25	76–100	3404	1037	5407	1648	8601	2621
26–50	76–100	2899	883	4605	1404	7324	2232
51–75	76–100	2413	735	3833	1168	6096	1858
76–100	76–100	1945	593	3089	942	4913	1498
101–125	76–100	1493	455	2371	723	3771	1149
0	101–125	2631	802	4180	1274	6649	2027
1–25	101–125	2165	660	3439	1048	5470	1667
26–50	101–125	1713	522	2721	829	4328	1319
51–75	101–125	1274	388	2023	617	3218	981
76–100	101–125	847	258	1345	410	2140	652
101–125	101–125	431	131	685	209	1089	332

Table B-2: Maximum branch length with 1–5 SIGA-UMs configured for 2-wire smokes

Signature detector addresses	Signature module addresses	Maximum allowable wire distance using non-twisted, non-shielded wire pairs					
		18 AWG		16 AWG		14 AWG	
		ft	m	ft	m	ft	m
1–25	0	6778	2066	10768	3282	17126	5220
26–50	0	6131	1869	9741	2969	15492	4722
51–75	0	5501	1677	8739	2664	13899	4236
76–100	0	4885	1489	7760	2365	12342	3762
101–125	0	4282	1305	6802	2073	10819	3298
0	1–25	5353	1632	8504	2592	13525	4122
1–25	1–25	4720	1439	7498	2286	11926	3635
26–50	1–25	4100	1250	6513	1985	10359	3157
51–75	1–25	3491	1064	5546	1691	8821	2689
76–100	1–25	2893	882	4597	1401	7311	2228
101–125	1–25	2306	703	3663	1116	5826	1776
0	26–50	3776	1151	5999	1829	9542	2908
1–25	26–50	3153	961	5009	1527	7966	2428
26–50	26–50	2539	774	4034	1230	6416	1956
51–75	26–50	1935	590	3075	937	4890	1491
76–100	26–50	1340	409	2130	649	3387	1032
101–125	26–50	754	230	1197	365	1905	581
0	51–75	2491	759	3957	1206	6293	1918
1–25	51–75	1868	569	2967	904	4720	1439
26–50	51–75	1254	382	1992	607	3168	966
51–75	51–75	648	198	1030	314	1638	499
76–100	51–75	50	15	80	24	126	39
101–125	51–75						
0	76–100	1386	422	2201	671	3501	1067
1–25	76–100	760	232	1208	368	1921	586
26–50	76–100	143	44	227	69	361	110
51–75	76–100						
76–100	76–100						
101–125	76–100						
0	101–125						
1–25	101–125						
26–50	101–125						
51–75	101–125						
76–100	101–125						
101–125	101–125						

Table B-3: Maximum branch length with 6–10 SIGA-UMs configured for 2-wire smokes

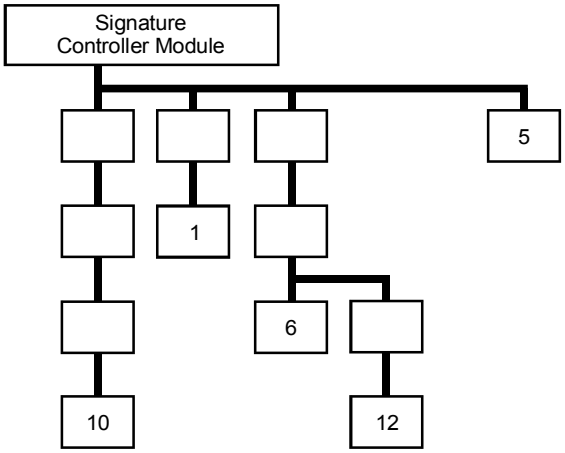
Signature detector addresses	Signature module addresses	Maximum allowable wire distance using non-twisted, non-shielded wire pairs					
		18 AWG		16 AWG		14 AWG	
		ft	m	ft	m	ft	m
1–25	0	5045	1538	8015	2443	12748	3886
26–50	0	4494	1370	7139	2176	11355	3461
51–75	0	3950	1204	6275	1913	9981	3042
76–100	0	3414	1040	5423	1653	8625	2629
101–125	0	2884	879	4581	1396	7286	2221
0	1–25	4106	1252	6523	1988	10375	3162
1–25	1–25	3542	1080	5627	1715	8950	2728
26–50	1–25	2985	910	4742	1445	7542	2299
51–75	1–25	2435	742	3868	1179	6152	1875
76–100	1–25	1891	576	3004	916	4778	1456
101–125	1–25	1353	412	2150	655	3419	1042
0	26–50	2869	874	4557	1389	7248	2209
1–25	26–50	2296	700	3648	1112	5802	1768
26–50	26–50	1730	527	2749	838	4372	1332
51–75	26–50	1170	357	1859	567	2957	901
76–100	26–50	617	188	979	299	1558	475
101–125	26–50	68	21	108	33	172	53
0	51–75	1796	547	2853	869	4537	1383
1–25	51–75	1214	370	1929	588	3067	935
26–50	51–75	638	195	1014	309	1613	492
51–75	51–75	69	21	109	33	173	53
76–100	51–75						
101–125	51–75						
0	76–100	833	254	1323	403	2105	642
1–25	76–100	242	74	385	117	613	187
26–50	76–100						
51–75	76–100						
76–100	76–100						
101–125	76–100						
0	101–125						
1–25	101–125						
26–50	101–125						
51–75	101–125						
76–100	101–125						
101–125	101–125						

Table B-4: Maximum branch length with 11–15 SIGA-UMs configured for 2-wire smokes

Signature detector addresses	Signature module addresses	Maximum allowable wire distance using non-twisted, non-shielded wire pairs					
		#18 AWG		#16 AWG		#14 AWG	
		ft	m	ft	m	ft	m
1–25	0	3931	1198	6245	1903	9932	3027
26–50	0	3427	1045	5444	1659	8659	2639
51–75	0	2928	892	4651	1418	7397	2255
76–100	0	2432	741	3864	1178	6145	1873
101–125	0	1941	592	3083	940	4903	1495
0	1–25	3247	990	5158	1572	8204	2501
1–25	1–25	2722	830	4324	1318	6878	2096
26–50	1–25	2202	671	3498	1066	5563	1696
51–75	1–25	1686	514	2678	816	4259	1298
76–100	1–25	1174	358	1865	568	2966	904
101–125	1–25	666	203	1058	323	1683	513
0	26–50	2204	672	3502	1067	5570	1698
1–25	26–50	1664	507	2644	806	4205	1282
26–50	26–50	1129	344	1793	547	2852	869
51–75	26–50	598	182	950	289	1511	460
76–100	26–50	71	22	113	34	179	55
101–125	26–50						
0	51–75	1263	385	2007	612	3192	973
1–25	51–75	710	216	1128	344	1794	547
26–50	51–75	161	49	256	78	407	124
51–75	51–75						
76–100	51–75						
101–125	51–75						
0	76–100						
1–25	76–100						
26–50	76–100						
51–75	76–100						
76–100	76–100						
101–125	76–100						
0	101–125						
1–25	101–125						
26–50	101–125						
51–75	101–125						
76–100	101–125						
101–125	101–125						

Determining the total loop length

The total loop length is the sum of the lengths of all the wire segments installed in the data circuit.



[WIRECALC3.CDR]

The total length of all the cable installed in the Signature data circuit can not exceed the values listed below:

	Wire Size		
Wire type	**14 AWG**	**16 AWG**	**18 AWG**
Twisted pair	13,157 ft (4,010 m)	13,888 ft (4,233 m)	20,000 ft (6,096 m)
Twisted-shielded pair	5,952 ft (1,814 m)	6,098 ft (1,859 m)	8,621 ft (2,628 m)
Non-twisted, non-shielded pair	20,000 ft (6,096 m)	20,000 ft (6,096 m)	20,000 ft (6,096 m)

If the cable manufacturer's data indicates the capacitance per foot of the cable, the following method may be used to determine the maximum total loop length.

Note: In no case may the total loop length of a Signature data circuit exceed 20,000 feet (6,098 meters).

$$L_{Max} = \frac{500{,}000}{C_{pf/Ft}}$$

where:

- L_{Max} = maximum total cable length in feet
- $C_{pf/Ft}$ = Cable capacitance in picofarads per foot

Note: A short circuit on a Signature data circuit can disable the entire circuit. In order to limit the effect of a single short circuit on the SDC, SIGA-IB Isolator Bases or SIGA-IM Isolator modules can be installed at strategic points in the circuit.

24 Vdc notification appliance circuit wire length calculations

The 24 Vdc notification appliance circuits must be a minimum of 18 AWG (0.75 mm^2) pair. Circuit length limits are determined using the maximum allowable circuit resistance and cable manufacturer's specifications.

Table B-5: Wire resistance ratings to use for wire length calculations

Wire Size	Resistance per 1000 ft pair (ohms)
18 AWG (0.75 mm^2)	13.0
16 AWG (1.0 mm^2)	8.0
14 AWG (1.50 mm^2)	5.2
12 AWG (2.5 mm^2)	3.2

The following restrictions apply when calculating the wire size for 24 Vdc notification appliance circuits:

- Minimum supply voltage available is 20.4 V
- Minimum required circuit voltage at any notification appliance is 17.0V

Using Ohm's Law, the NAC current requirement (total current of all installed notification appliances) and the allowable voltage drop of 3.4 volts (20.4 - 17), the maximum allowable NAC circuit resistance is determined as follows:

$$R_{Max} = \frac{V_{drop}}{I_{Max}}$$

Equation B-1

where:

- R_{Max} = Maximum allowable notification appliance circuit resistance
- V_{drop} = Maximum allowable voltage drop from power supply to the last notification appliance
- I_{Max} = Maximum notification appliance circuit current requirement

Using Equation B-1, the maximum permissible circuit resistance for a fully loaded (3.5 A) NAC using 14 AWG wire is determined to be 0.97Ω, as follows:

$$0.97\Omega = \frac{3.4V}{3.5A}$$

Using wire resistance Table B-5, the maximum allowable length (D) of any listed wire gauge pair may be determined as follows:

$$D = \frac{R_{Max}}{R_{/1000'\ PAIR}} X1000$$

Equation B-2

where:

- D = Distance in feet
- R_{Max} = Maximum permissible wire resistance
- R/1000 ft pair = Wire resistance per 1000 ft (305 m) pair [Table B-5]

Using Equation B-2, the maximum length of a fully loaded (3.5 A) notification appliance circuit using a pair of 14 AWG wires is:

$$187' = \frac{0.97}{5.2} \times 1000$$

187 ft (57 m) is the maximum length of a fully loaded (3.5 A) notification appliance circuit using a pair of 14-gauge wires. Other loads and wire sizes may be calculated in a similar manner. Table B-6 lists allowed distances for selected current draws and wire sizes.

Table B-6: Load vs Distance Notification Appliance Circuit (3.4V drop)

	Maximum distance to last appliance							
LOAD CURRENT	**12 AWG (2.50 mm^2)**		**14 AWG (1.50 mm^2)**		**16 AWG (1.00 mm^2)**		**18 AWG (0.75 mm^2)**	
	ft	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**
0.1 A	10,625	3,239	6,538	1,993	4,250	1296	2,615	797
0.25 A	4,250	1,296	2,615	797	1,700	518	1,046	319
0.5 A	2,125	648	1,308	399	850	259	523	159
0.75 A	1,406	429	865	264	563	172	346	105
1.0 A	1,062	324	654	199	425	130	262	80
2.0 A	531	162	327	100	213	65	131	40
3.0 A	353	108	217	66	141	43	87	27
3.5 A	303	92	187	57	121	37	75	23

25 or 70 Vrms notification appliance circuit wire length calculations

The maximum allowable wire length is the farthest distance that a pair of wires can extend from the amplifier to the last speaker on the notification appliance circuit without losing more than 0.5 dB of signal. Calculating the maximum allowable wire length using this method ensures that each speaker operates at its full potential.

Several factors influence the maximum allowable wire length:

- Wire size
- Output signal level of the amplifier driving the circuit
- Number of speakers installed on the circuit

To calculate the maximum allowable wire length for a 0.5 dB loss, use the following formula:

$$\text{Max length} = \frac{59.25 \times \text{Amplifier output}^2}{\text{Wire resistance} \times \text{Circuit load}}$$

where:

- Amplifier output is the signal level in Vrms supplied by the amplifier driving the circuit
- Circuit load is the total watts required by the audio circuit
- Wire resistance is the resistance rating of the wire per 1000 ft pair, see Table B-5.

For example, the maximum allowable wire length for an audio circuit consisting of a 40 W, 25 Vrms amplifier driving thirty 1-watt speakers, using 18-guage wire would be 95 ft.

$$94.95 = \frac{59.25 \times 25^2}{13 \times 30}$$

Table B-7 and Table B-8 gives the maximum allowable wire lengths for various wire sizes and loads. Use Table B-7 when designing circuits for amplifiers set for 25 Vrms output. Use Table B-8 when designing circuits for amplifiers set for a 70 Vrms output.

Table B-7: Maximum allowable length at 25 Vrms, 0.5 dB loss

	Circuit load requirement											
Wire Size	**15 W**		**20 W**		**30 W**		**40 W**		**90 W**		**120 W**	
	ft	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**
18 AWG (0.75 mm^2)	190	58	142	43	95	29	71	22	Over max current limit		Over max current limit	
16 AWG (1.0 mm^2)	309	94	231	70	154	47	116	35	51	16	39	12
14 AWG (1.5 mm^2)	475	145	356	109	237	72	178	54	79	24	59	18
12 AWG (2.5 mm^2)	772	235	579	176	386	118	289	88	129	39	96	29

Table B-8: Maximum allowable length at 70 Vrms, 0.5 dB loss

	Circuit load requirement											
Wire Size	**15 W**		**20 W**		**30 W**		**40 W**		**90 W**		**120 W**	
	ft	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**	**ft**	**m**
18 AWG (0.75 mm^2)	1489	454	1117	340	744	227	558	170	248	76	186	57
16 AWG (1.0 mm^2)	2420	738	1815	553	1210	369	907	276	403	123	302	92
14 AWG (1.5 mm^2)	3722	1134	2792	851	1861	567	1396	426	620	189	465	142
12 AWG (2.5 mm^2)	6049	1844	4537	1383	3024	922	2268	691	1008	307	756	230

Addressable analog circuit wire length calculations

Table B-9 lists the maximum wire distances allowed for Addressable Analog circuits.

Notes

Maximum wire resistance can not exceed 50 ohms.

Maximum wire capacitance can not exceed 0.05 microfarads.

Table B-9: Maximum allowable wire distance for Addressable Analog circuits

		Twisted, non-shielded		Twisted, shielded		Non-twisted, non-shielded	
Wire gauge	**Max loop Capacitance**	**ft**	**m**	**ft**	**m**	**ft**	**m**
18	0.01 µF	4000	1219	1724	525	5000	1524
	0.02 µF	8000	2438	3448	1051	10000	3048
	0.03 µF	12000	3658	5172	1576	15000	4572
	0.04 µF	16000	4877	6896	2102	20000	6096
	0.05 µF	20000	6096	8620	2627	25000	7620
16	0.01 µF	2777	846	1219	372	5000	1524
	0.02 µF	5555	1693	2439	743	10000	3048
	0.03 µF	8333	2540	3658	1115	15000	4572
	0.04 µF	11111	3387	4878	1487	20000	6096
	0.05 µF	13888	4233	6097	1858	25000	7620
14	0.01 µF	2631	802	1190	363	5000	1524
	0.02 µF	5263	1604	2380	725	10000	3048
	0.03 µF	7894	2406	3571	1088	15000	4572
	0.04 µF	10526	3208	4761	1451	20000	6096
	0.05 µF	13157	4010	5952	1814	25000	7620

Cabinet battery calculations

Use the following method to calculate the minimum ampere-hour capacity of a battery required in order to operate a panel in the absence of ac power. Battery calculations must be performed separately for each cabinet in the system.

Determine the total amount of current in milliamps required by all of the components that derive power from the battery while the panel is in standby mode. Multiply the total amount of standby current by the number of hours that the panel is required to operate in standby mode while on battery power.

Determine the total amount of current in milliamps required by all of the components that derive power from the battery while the panel is in alarm mode. Multiply the total amount of alarm current by the number of minutes that the panel is required to operate in alarm mode while on battery power. Divide the result by 60 to convert minutes to hours.

Add the total amount of standby current and the total amount of alarm current then divide the result by 1000 to convert to ampere-hours. Multiply this number by 1.2 to add a 20% safety factor to the calculations.

3-CPU1 memory calculations

Use the 3-CPU1 memory calculation worksheet, Table B-10, to determine if a 3-CPU1 requires additional memory. Each line in the worksheet is a system variable and is referenced by a line identification (ID) letter. The line IDs also appear in the formula column. The result of solving a formula is then placed in the "Results" column.

- Enter the values for each variable in the "#" column on the same line.
- Replace the variables in the formula by the value entered in the "#" column having the same letter as the formula.
- Calculate the formula and put the results in the "Results" column.
- Determine the memory size required as indicated at the bottom of the worksheet.

Note: The Systems Definition Utility will prevent you from downloading if the compiled project database exceeds the amount of memory on the 3–CPU1.

Table B-10: 3-CPU1 memory calculation worksheet

Line	Variable	#	Formula	Result
A	Base usage	N/A	N/A	70,000
B	Label usage	N/A	48+(22 x (H+K+L+N+Q+S+T))	
C	Average number of characters in a message		Between 0 and 42	
D	Average number of characters in a rule		Between 4 and 10 per controlled output	
E	Number of routing definitions		2 + (E x 8)	
F	Number of rail modules other than Signature controller modules		F x 916	
G	Number of Signature controller modules		G x 1,776	
H	Number of zones		H x (22 + C + (J x 4) + (D x 2))	
J	Average number of devices in typical zone		N/A	
K	Number of Service groups		K x (14 x C + (2 x D))	
L	Number of AND groups		L x (22 + C + (D x 2) + (M x 4))	
M	Average number of devices in AND Group		N/A	
N	Number of Matrix groups		N x (22 + C + (2 x D) + (4 x P))	
P	Average number of devices in a Matrix Group		N/A	
Q	Number of Check-In groups		Q x ((24 + C) + (2 x D) + (4 x R))	
R	Average number of devices in Check-In Group		N/A	
S	Number of time controls		S x ((26 + C) + (2 x D) + 14))	
T	Number of Guard Patrols		T x (22 + C + (V x 4) + (U x 4))	
U	Number of Guard Patrol routes		N/A	
V	Number of Guard Patrol stations		N/A	
W	Number of physical devices		W x (46 + C + (Y x 4) + (2 x D) + 8)	
Y	Average number of Logics per device		N/A	
Z	Sum of Results Lines A to Y		A+B+C+D+E+F+G+H+J+K+L+M+N+P+Q+R+S+T+U+V+W+Y	

If result on line Z is less than 262,144, no additional memory is required.

If result on line Z is greater than 500,000 then enter the job in 3-SDU to determine the exact size requirement (size of CABxx.bin file).

If result on line Z is still greater than 500,000 reduce the number of points on the panel, for example, by splitting the panel into two panels.

Fiber optic cable worksheet

The fiber optic cable worksheet should be used to verify that the light attenuation factors do not exceed the fiber optic budget for any fiber optic cable segment.

Notes

The contractor installing the fiber optic cable provides items A, B, and D.

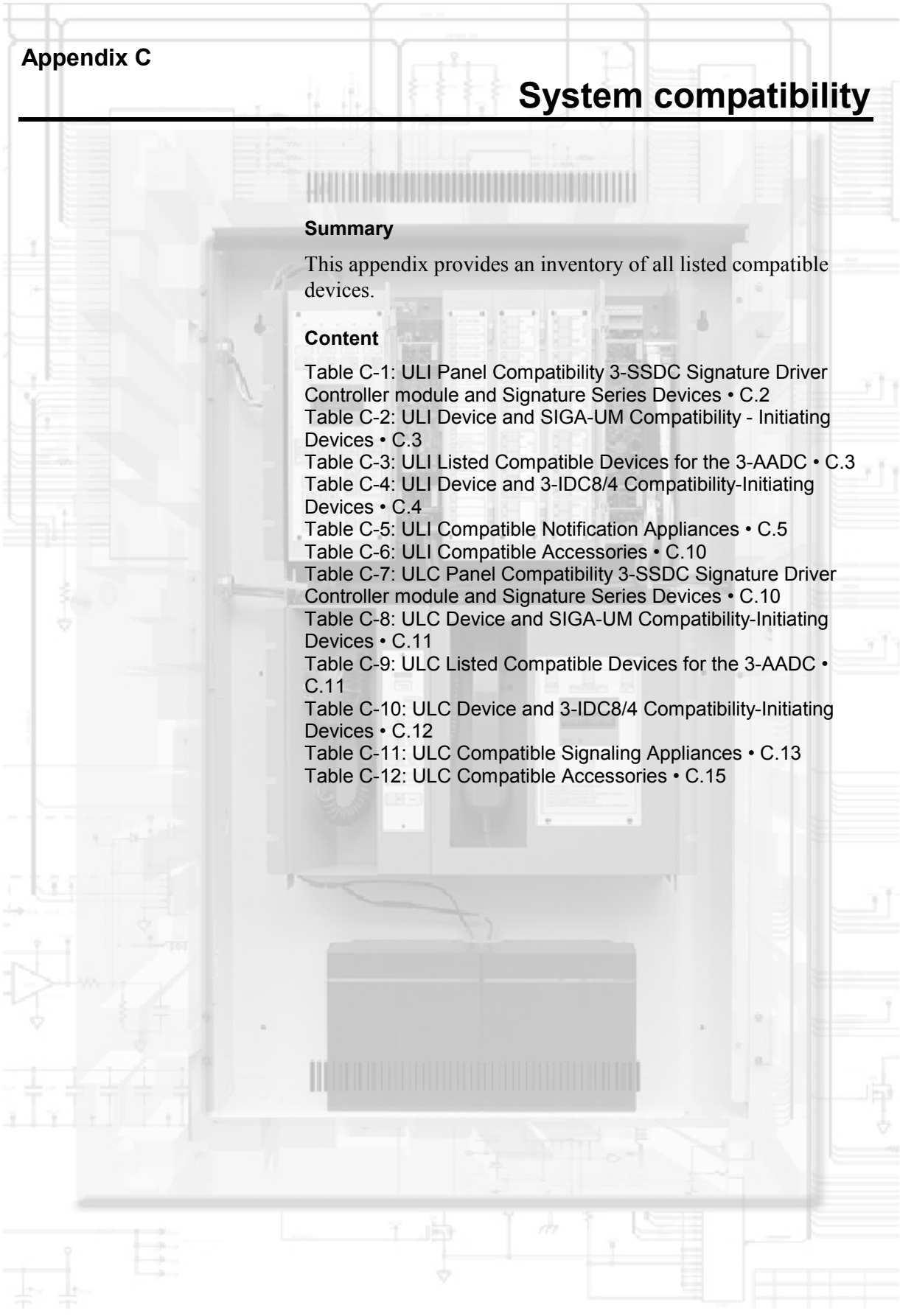
Fiber optic budget must be greater than the total link loss (F).

Table B-11: Fiber Optic Cable Worksheet

Link Name	A Cable loss per unit distance ☐ dB/Ft ☐ dB/Km ☐ dB/Mi	B Distance ☐ Feet ☐ Kilometers ☐ Miles	C Cable Loss A x B	D Number of Splices	E Contingency Splices	F Total Link Loss (dB) C+2[D+E]

Appendix C

System compatibility



Summary

This appendix provides an inventory of all listed compatible devices.

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Table C-1: ULI Panel Compatibility
3-SSDC Signature Driver Controller module and Signature Series Devices

Catalog No.	Description
SIGA-IS	Ionization Smoke Detector
SIGA-PS	Photoelectric Smoke Detector
SIGA-PHS	Combination Photoelectric Smoke and Fixed Temperature Detector
SIGA-IPHS	Combination Ionization, Photoelectric Smoke, and Fixed Temperature Detector
SIGA-HFS	Fixed Temperature Detector
SIGA-HRS	Combination Fixed Temperature and Rate-of-Rise Heat Detector
SIGA-CC1, -MCC1, -CC1P	Single Input Signal Module
SIGA-CC2, -MCC2	Dual Input Signal Module
SIGA-CT1	Single Input Module
SIGA-CT2, -MCT2	Dual Input Module
SIGA-CR, -MCR	Control Relay Module
SIGA-MM1	Monitor Module
SIGA-WTM	Waterflow/Tamper Module
SIGA-UM, -MAB	Universal Class A/B Module
SIGA-MDM	Digital Message Module
SIGA-UIO2R, -UIO6R, -UIO6	Universal Input/Output Module
SIGA-APS	Auxiliary Power Supply
SIGA-AA30	30-watt Audio Amplifier
SIGA-AA50	50-watt Audio Amplifier

Table C-2: ULI Device and SIGA-UM Compatibility - Initiating Devices

Manufacturer	Cat. #	Description	UL Identifier	Compatible Base	Max. # Devices per IDC Zone
Edwards	6250B	Ionization Smoke Detector	001/001	6251B-001A	20
Edwards	6270B	Photoelectric Smoke Detector	001/001	6251B-001A	14
System Sensor	1451	Ionization Smoke Detector	A/A	B401(B)	8
System Sensor	2451	Photoelectric Smoke Detector	A/A	B401(B)	8

Note: Manufacturer of 2-wire smoke detectors installed on a single IDC must be identical. Do not mix Edwards and System Sensor detectors on the same IDC circuit.

Table C-3: ULI Listed Compatible Devices for the 3-AADC

Model No.	Description
1551FB	Intelligent Ionization Detector
2551FB	Intelligent Photoelectric Detector
2551TB	Intelligent Photoelectric/Heat Detector
5551FB	Intelligent Fixed Temperature Heat Detector
5551FR	Intelligent Fixed/R-O-R Heat Detector
B501	Intelligent Sensor Base, European (BESA) Style
B501B	Intelligent Sensor Base, North American Style
B501BH	Intelligent Sensor Base Adapter Plate w/Sounder
DH500F	Duct Housing
M500CFS	Intelligent Control Module
M500MFB	Intelligent Monitor Module
M500XF	Intelligent Isolator Module
M501MF	Intelligent Mini-Monitor Module

Note: Do not use UIO-12's and RZB12-6's with the 3-AADC module.

Table C-4: ULI Device and 3-IDC8/4 Compatibility-Initiating Devices

Mfg.	Cat. #	Description	UL Identifier	Compatible Base	Maximum devices per IDC zone
Edwards	6249B	Ionization Smoke Detector w/Base	001/001	N/A	50
Edwards	6250B	Ionization Smoke Detector	001/001	6249B-001	50
Edwards	6250B	Ionization Smoke Detector	001/001	6251B-001(A)	50
Edwards	6260A-100 Housing w/6264B-001 Head	Ionization Duct Smoke Detector	001/001	6251B-001(A)	45
Edwards	6260A-100 Housing w/6266B-001 Head	Photoelectric Duct Smoke Detector	001/001	6251B-001(A)	45
Edwards	6269B	Photoelectric Smoke Detector w/Base	001/001	N/A	45
Edwards	6269B-003	Photoelectric Smoke/Heat Detector w/Base	001/001	N/A	45
Edwards	6270B	Photoelectric Smoke Detector	001/001	6249B-001	45
Edwards	6270B	Photoelectric Smoke Detector	001/001	6251B-001(A)	45
Edwards	6270B-003	Photoelectric Smoke/Heat Detector	001/001	6249B-001	45
Edwards	6270B-003	Photoelectric Smoke/Heat Detector	001/001	6251B-001(A)	45
System Sensor	1451	Ionization Smoke Detector	A/A	B401(B)	25
System Sensor	2451	Photoelectric Smoke Detector	A/A	B401(B)	25
System Sensor	2451TH	Photoelectric Smoke/Heat Detector	A/A	B401	25

Table C-4: ULI Device and 3-IDC8/4 Compatibility-Initiating Devices

Mfg.	Cat. #	Description	UL Identifier	Compatible Base	Maximum devices per IDC zone
System Sensor	DH400I	Ionization Duct Smoke Detector w/Base	A/A	N/A	25
System Sensor	DH400P	Photoelectric Duct Smoke Detector w/Base	A/A	N/A	25

Table C-5: ULI Compatible Notification Appliances

Catalog No.	Description
202-3A-T	Strobe
202-3A-TW	Strobe
202-5A-T	Strobe
202-5A-TW	Strobe
202-6A-T	Strobe
202-6A-TW	Strobe
202-7A-T	Strobe
202-7A-TW	Strobe
202-8A-T	Strobe
202-8A-TW	Strobe
323D-10AW	AdaptaBel 10-inch single stroke bell
323D-10AW-R	AdaptaBel 10-inch single stroke bell
329D-AW	Chime
403-3A-R	Bell/strobe plate
403-5A-R	Bell/strobe plate
403-7A-R	Bell/strobe plate
403-8A-R	Bell/strobe plate
405-3A-TW	Strobe
405-3A-TW	Strobe
405-5A-T	Strobe
405-5A-TW	Strobe

Table C-5: ULI Compatible Notification Appliances

Catalog No.	Description
405-6A-T	Strobe
405-6A-TW	Strobe
405-7A-T	Strobe
405-7A-TW	Strobe
405-8A-T	Strobe
405-8A-TW	Strobe
439D-10AW	10-inch Vibrating bell, Gray
439D-10AW-R	10-inch Vibrating bell, Red
439D-6AW	6-inch Vibrating bell, Gray
439D-6AW-R	6-inch Vibrating bell, Red
439D-8AW	8-inch Vibrating bell, Gray
439D-8AW-R	8-inch Vibrating bell, Red
439DEX-10AW	10-inch Explosion proof bell
439DEX-6AW	6-inch Explosion proof bell
439DEX-8AW	8-inch Explosion proof bell
5520D-AW	Duotronic Horn/Siren, Diode Polarized
5522D-AW	Explosion Proof Duotronic Horn
5523D-AW	Explosion Proof Duotronic Siren
5524D-AW	Explosion Proof Duotronic Horn
5525D-AW	Explosion Proof Duotronic Siren
5530D-AW	Adaptatone Signal
5533D-AW	Explosion Proof Adaptatone Signal
5534D-AW	Explosion Proof Adaptatone Signal
682-1B-002	Mini-Horn
682-1B-012	Mini-Horn, w/LED
682-1B-102	Mini-Horn
682-1B-112	Mini-Horn, w/LED
692-5A-003	Mini-Horn/Strobe
692-5A-103	Mini-Horn/Strobe
692-7A-003	Mini-Horn/Strobe
692-7A-103	Mini-Horn/Strobe
692-8A-003	Mini-Horn/Strobe

Table C-5: ULI Compatible Notification Appliances

Catalog No.	Description
692-8A-103	Strobe/Horn, Beige
757-1A-C	Electronic chime, Wall-mounted
757-1A-H	Electronic Horn
757-1A-HW	Electronic Horn
757-1A-R25	Re-entrant Speaker
757-1A-R25W	Re-entrant Speaker, White
757-1A-R70	Re-entrant Speaker
757-1A-R70W	Re-entrant Speaker, White
757-1A-S25	Speaker, 4-inch Cone
757-1A-S25W	Speaker, 4-inch cone
757-1A-S70	Speaker, 4-inch cone
757-1A-S70W	Speaker, 4-inch cone
757-1A-T	Temporal Horn, Red
757-1A-TW	Temporal Horn, White
757-3A-25	Speaker/Strobe, 4-inch cone
757-3A-25W	Speaker/Strobe, 4-inch cone
757-3A-HS	Horn/Strobe
757-3A-HSW	Horn/Strobe
757-3A-RS25	Strobe/Re-entrant Speaker, Red
757-3A-RS25W	Strobe/Re-entrant Speaker, White
757-3A-RS70	Strobe/Re-entrant Speaker, Red
757-3A-RS70W	Strobe/Re-entrant Speaker, White
757-3A-T	Temporal Horn, Red
757-3A-TW	Temporal Horn, White
757-5A-CS	Chime/Strobe
757-5A-CSN	Chime/Strobe
757-5A-HS	Horn/Strobe
757-5A-HSW	Horn/Strobe
757-5A-SS25	Speaker/Strobe, 4-inch cone
757-5A-SS25W	Speaker/Strobe, 4-inch cone
757-5A-SS70	Speaker/Strobe, 4-inch Cone
757-5A-SS70W	Speaker/Strobe, 4-inch Cone

Table C-5: ULI Compatible Notification Appliances

Catalog No.	Description
757-5A-T	Temporal Horn, Red
757-5A-TW	Temporal Horn, White
757-7A-CS	Chime/Strobe
757-7A-CSN	Chime/Strobe
757-7A-HS	Horn/Strobe
757-7A-HSW	Horn/Strobe
757-7A-RS25	Strobe/Re-entrant Speaker, Red
757-7A-RS25W	Strobe/Re-entrant Speaker, White
757-7A-RS70	Strobe/Re-entrant Speaker, Red
757-7A-RS70W	Strobe/Re-entrant Speaker, White
757-7A-SS25	Speaker/Strobe, 4-inch cone
757-7A-SS25W	Speaker/Strobe, 4-inch cone
757-7A-SS70	Speaker/Strobe, 4-inch cone
757-7A-SS70W	Speaker/Strobe, 4-inch cone
757-7A-T	Temporal Horn, Red
757-7A-TW	Temporal Horn, White
757-8A-CS	Chime/Strobe
757-8A-CSN	Chime/Strobe
757-8A-HS	Horn/Strobe
757-8A-HSW	Horn/Strobe
757-8A-RS25	Strobe/Re-entrant Speaker, Red
757-8A-RS25W	Strobe/Re-entrant Speaker, White
757-8A-RS70	Strobe/Re-entrant Speaker, Red
757-8A-RS70W	Strobe/Re-entrant Speaker, White
757-8A-SS70	Speaker/Strobe, 4-inch cone
757-8A-SS70W	Speaker/Strobe, 4-inch cone
757-8A-T	Temporal Horn, Red
757-8A-TW	Temporal Horn, White
757-8-SS25	Speaker/Strobe, 4-inch cone
757-8-SS25W	Speaker/Strobe, 4-inch cone
822-1B-102W	Wall Mounted Electronic Chime
889D-AW	Explosion Proof Horn

Table C-5: ULI Compatible Notification Appliances

Catalog No.	Description
890RDA	Lamp Station, Integrity Monitored
890RDB-G5	Lamp Station, Integrity Monitored
890WDA-G5	Lamp Station, Integrity Monitored
890WDB-G5	Lamp Station, Integrity Monitored
922-1B-222	Ceiling Mounted Chime
960B-202	Ceiling Speaker
964-1A-8R	Speaker, 8-inch cone
964-1A-8S	Speaker, 8-inch cone
964-5A-4R	Strobe/Speaker, 4-inch cone
964-5A-8R	Strobe/Speaker, 8-inch cone
964-5A-8S	Strobe/Speaker, 8-inch cone
964-7A-4R	Strobe/Speaker, 4-inch cone
964-7A-8R	Strobe/Speaker, 8-inch cone
964-7A-8S	Strobe/Speaker, 8-inch cone
964-8A-4R	Strobe/Speaker, 4-inch cone
964-8A-8R	Strobe/Speaker, 8-inch cone
964-8A-8S	Strobe/Speaker, 8-inch cone
964A-4R	Speaker, 4-inch cone
965-5A-4R	Strobe/Speaker, 4-inch cone
965-5A-8R	Strobe/Speaker, 8-inch cone
965-5A-8S	Strobe/Speaker, 8-inch cone
965-7A-4R	Strobe/Speaker, 4-inch cone
965-7A-8R	Strobe/Speaker, 8-inch cone
965-7A-8S	Strobe/Speaker, 8-inch cone
965-8A-4R	Strobe/Speaker, 4-inch cone
965-8A-8R	Strobe/Speaker, 8-inch cone
965-8A-8S	Strobe/Speaker, 8-inch cone
965A-4R1	Speaker, 4-inch cone
965A-8R1	Speaker, 8-inch cone
965A-8S1	Speaker, 8-inch cone
97DEXR-G1	Explosion Proof Strobe

Table C-6: ULI Compatible Accessories

Catalog No.	Description
*MR-101/C	1-SPDT Relay w/LED
*MR-101/T	1-SPDT Relay w/LED
*MR-104/C	4-SPDT Relay w/LEDs
*MR-104/T	4-SPDT Relay w/LEDs
*MR-201/C	1-DPDT Relay w/LED
*MR-201/T	1-DPDT Relay w/LED
*MR-204/C	4-DPDT Relay w/LEDs
*MR-204/T	4-DPDT Relay w/LEDs
*PAM-1	1-SPDT w/LED, Adhesive Mt.
6254A-003	Fire Alarm/Power integrity monitoring Relay
* Manufactured by Air Products & Control, Ltd.	

Table C-7: ULC Panel Compatibility
3-SSDC Signature Driver Controller module and Signature Series Devices

Catalog No.	Description
SIGA-IS	Ionization Smoke Detector
SIGA-PS	Photoelectric Smoke Detector
SIGA-PHS	Combination Photoelectric Smoke and Fixed Temperature Detector
SIGA-IPHS	Combination Ionization, Photoelectric Smoke, and Fixed Temperature Detector
SIGA-HFS	Fixed Temperature Detector
SIGA-HRS	Combination Fixed Temperature and Rate-of-Rise Heat Detector
SIGA-CC1, -MCC1	Single Input Signal Module
SIGA-CC2, -MCC2	Dual Input Signal Module
SIGA-CT1	Single Input Module
SIGA-CT2, -MCT2	Dual Input Module
SIGA-CR, -MCR	Control Relay Module
SIGA-MM1	Monitor Module
SIGA-WTM	Waterflow/Tamper Module
SIGA-UM, -MAB	Universal Class A/B Module

Table C-7: ULC Panel Compatibility
3-SSDC Signature Driver Controller module and Signature Series Devices

Catalog No.	Description
SIGA-MDM	Digital Message Module
SIGA-UIO2R, -UIO6R, -UIO6	Universal Input/Output Module
SIGA-APS	Auxiliary Power Supply
SIGA-AA30	30-watt Audio Amplifier
SIGA-AA50	50-watt Audio Amplifier

Table C-8: ULC Device and SIGA-UM Compatibility-Initiating Devices

Manufacturer	Cat. #	Description	UL Identifier	Compatible Base	Max. # Devices per IDC Zone
Edwards	6250B	Ionization Smoke Detector	001/001	6251C-001A	20
Edwards	6270B	Photoelectric Smoke Detector	001/001	6251C-001A	14
System Sensor	1451	Ionization Smoke Detector	A/A	B401(B)	8
System Sensor	2451	Photoelectric Smoke Detector	A/A	B401(B)	8

Note: Manufacturer of 2-wire smoke detectors installed on a single IDC must be identical. Do not mix Edwards and System Sensor detectors on the same IDC.

Table C-9: ULC Listed Compatible Devices for the 3-AADC

Model No.	Description
1551AB	Intelligent Ionization Detector
2551AB	Intelligent Photoelectric Detector
2551TF	Intelligent Photoelectric / Heat Detector
5551AB	Intelligent Fixed Temperature Heat Detector
5551AR	Intelligent Fixed/R-O-R Heat Detector
B501B	Intelligent Sensor Base, North American Style
B501BH	Intelligent Sensor Base Adapter Plate w/Sounder
DH500A	Duct Housing

Table C-9: ULC Listed Compatible Devices for the 3-AADC

Model No.	Description
M500MA	Intelligent Monitor Module
M501MA	Intelligent Mini-Monitor Module
M500CHA	Intelligent Control Module
M500XF	Intelligent Isolator Module
Note: UIO-12's and RZB12-6's can not be used with the 3-AADC module.	

Table C-10: ULC Device and 3-IDC8/4 Compatibility-Initiating Devices

Mfg.	Cat. #	Description	UL Identifier	Compatible Base	Maximum devices per IDC zone
Edwards	6249B	Ionization Smoke Detector w/Base	001/001	N/A	50
Edwards	6250B	Ionization Smoke Detector	001/001	6249B-001	50
Edwards	6250B	Ionization Smoke Detector	001/001	6251B-001(A)	50
Edwards	6260A-100 Housing w/6264B-001 Head	Ionization Duct Smoke Detector	001/001	6251B-001(A)	45
Edwards	6260A-100 Housing w/6266B-001 Head	Photoelectric Duct Smoke Detector	001/001	6251B-001(A)	45
Edwards	6269B	Photoelectric Smoke Detector w/Base	001/001	N/A	45
Edwards	6269B-003	Photoelectric Smoke/Heat Detector w/Base	001/001	N/A	45
Edwards	6270B	Photoelectric Smoke Detector	001/001	6249B-001	45
Edwards	6270B	Photoelectric Smoke Detector	001/001	6251B-001(A)	45

Table C-10: ULC Device and 3-IDC8/4 Compatibility-Initiating Devices

Mfg.	Cat. #	Description	UL Identifier	Compatible Base	Maximum devices per IDC zone
Edwards	6270B-003	Photoelectric Smoke/Heat Detector	001/001	6249B-001	45
Edwards	6270B-003	Photoelectric Smoke/Heat Detector	001/001	6251B-001(A)	45
System Sensor	1451	Ionization Smoke Detector	A/A	B401(B)	25
System Sensor	2451	Photoelectric Smoke Detector	A/A	B401(B)	25
System Sensor	2451TH	Photoelectric Smoke/Heat Detector	A/A	B401	25
System Sensor	DH400I	Ionization Duct Smoke Detector w/Base	A/A	N/A	25
System Sensor	DH400P	Photoelectric Duct Smoke Detector w/Base	A/A	N/A	25

Table C-11: ULC Compatible Signaling Appliances

Catalog No.	Description
128D-AWC	Mini-Horn
128D-AWCR	Mini-Horn
200E1-CULC-24	Strobe, Clear
200E1-RULC-24	Strobe, Red
200E-CULC-24	Strobe, Clear
200E-RULC-24	Strobe, Red
202-7A-001	Strobe, Red
202-7A-101	Strobe, Beige
202-8A-001	Strobe, Red
202-8A-101	Strobe, Beige
333D-10G1	AdaptaBel, Single Strk Bell, 10-inch

Table C-11: ULC Compatible Signaling Appliances

Catalog No.	Description
333D-4G1	AdaptaBel, Single Strk Bell, 4-inch
333D-6G1	AdaptaBel, Single Strk Bell, 6-inch
339D-G1	Chime
439D-10AWC	10-inch Vibrating Bell, Gray
439D-6AWC	6-inch Vibrating Bell, Gray
439DEX-10AWC	10-inch Explosion Proof Bell
439DEX-6AWC	6-inch Explosion Proof Bell
5520D-G1	Duotronic Horn/Siren, Diode Polarized
5524D-G1	Explosion Proof Duotronic Horn
5525D-G1	Explosion Proof Duotronic Siren
5530D-AWC	Adaptatone Electronic Signal
692-7A-003	Strobe/Horn, Red
692-7A-103	Strobe/Horn, Beige
692-8A-003	Strobe/Horn, Red
692-8A-103	Strobe/Horn, Beige
732-7A-006	Strobe/Chime, Red
732-7A-106	Strobe/Chime, Beige
732-8A-006	Strobe/Chime, Red
732-8A-106	Strobe/Chime, Beige
792-7A-006	Strobe/Horn, Red
792-7A-106	Strobe/Horn, Beige
792-8A-006	Strobe/Horn, Red
792-8A-106	Strobe/Horn, Beige
882-2C-001	Electronic Horn
889D-AWC	Explosion Proof Horn
892E-3001	Strobe/Horn w/Leads, Red
MBG10-24-R-ULC*	Bell, Motor, 10-inch
MBG6-24-R-ULC*	Bell, Motor, 6-inch
MBSG10-24-WHFR-ULC*	Strobe/Bell, Motor, 10-inch
MBSG6-24-WHFR-ULC*	Strobe/Bell, Motor, 6-inch

Table C-12: ULC Compatible Accessories

Catalog No.	Description
MR-101/C	1-SPDT Relay w/LED
MR-101/T	1-SPDT Relay w/LED
MR-104/C	4-SPDT Relay w/LEDs
MR-104/T	4-SPDT Relay w/LEDs
MR-201/C	1-DPDT Relay w/LED
MR-201/T	1-DPDT Relay w/LED
MR-204/C	4-DPDT Relay w/LEDs
MR-204/T	4-DPDT Relay w/LEDs
PAM-1	1-SPDT w/LED, Adhesive Mt.
6254A-003	Fire Alarm/Power integrity monitoring Relay
1598D-1FG1	1 Face English Fire Sign
1598D-F1FG1	1 Face French Fire Sign
1598D-2FG1	2 Face English Fire Sign
1598D-F2FG1	2 Face French Fire Sign
7651-9	Corridor Lamp, Red
7651-AQ	Corridor Lamp, Red
(C) = English/French bilingual version.	

Glossary

A Device/Zone	An Alarm device/zone.
Activate	To turn on or energize. Outputs may be activated.
Address	A numbering system used to uniquely identify a device, output, panel, etc.
Alarm	A condition or state of a Fire Alarm Initiating Device that has detected a smoke/fire condition.
Alarm Silence Timer	A panel option that automatically silences the Notification Appliance Circuits (NACs) after a pre-programmed time limit after the last alarm.
Alarm Silence/Reset Inhibit Timer	A panel option which prevents silencing Notification Appliance Circuits (NACs) or resetting the panel for a programmed period after the last alarm.
AND Statement	A system input that will activate when ALL the input conditions as indicated in its AND statement list, are active.
Audible Circuit	A Notification Appliance Circuit that is turned OFF when the Alarm Silence switch is activated.
Change of State	An input zone or device that has changed from a restored to an active condition or from the active condition back to the restored condition.
Check-In Group	A collection of input devices used to monitor the wellness of facility occupants. Typically used in senior citizen housing.
Class A IDC	A circuit connected directly to initiating devices, which signals a trouble condition upon an open condition on the circuit. All devices wired on the circuit to continue to operate in the event of a single open. Similar to Style D & E integrity monitoring.
Class A NAC	A circuit connected directly to notification appliances, which signals a trouble condition upon an open or shorted condition on the circuit. All appliances wired on the circuit to continue to operate in the event of a single open. Similar to Style Z integrity monitoring.
Class B IDC	A circuit connected directly to initiating devices, which signals a trouble condition upon an open condition on the circuit. All devices wired on the circuit to continue to operate up to the location of a break. Similar to Styles A, B, C, & D integrity monitoring.
Class B NAC	A circuit connected directly to notification appliances, which signals a trouble condition upon an open or shorted condition on the circuit. All appliances wired on the circuit to continue to operate up to the location of a break. Similar to Styles W, X, & Y integrity monitoring.

Coder	A device that provides interruption of power to audible devices at a predetermined rate or sequence.
Compile	Assembling data entered during the data entry phase of programming into a format used by the fire alarm control panel.
DACT-Digital Alarm Communicator Transmitter	A system component which transmits digital alarm, supervisory, and trouble signals to a Central Monitoring Station (CMS) over dial-up telephone lines.
Database	User-defined, permanently stored system parameters containing system zone definitions, device types, responses, messages, etc.
Device	Any Signature Series detector or module.
Device Address	A number that uniquely identifies a detector or module on a Signature data circuit.
Dialer	See DACT.
Disable	Prevent an input, output, or system feature from functioning.
Download	Sending the compiled database from your PC to the fire alarm control panel.
EEPROM	Electrically Erasable Programmable Read-Only Memory. Non-volatile memory containing the system database.
Emergency	The check-in group response generated when an active check-in occurs outside the normal check-in time period, i.e. an emergency.
Enable	Permit an input, output, or system feature to function.
EPROM	Erasable Programmable Read-Only Memory. Non-volatile memory containing the operating system. EPROM is erasable only by ultra-violet light.
External Command Port	An RS-232 connection which permits the 3-CPU to be connected to a remotely located control system.
Fiber Optic	Communications format which uses light signals carried on glass fibers to transmit and receive data.
Flash Memory	Non-volatile read-write memory.
Global Domain	Features which operate in all network cabinets.
Group	A collection of Signature devices that is treated as a single entity for programming purposes. Groups can have messages and responses over and above the messages and responses of the individual group members.
Group Domain	Features that operate in a specific group of network cabinets.
Initiating Device Circuit (IDC)	An input circuit connected directly to any manual or automatic initiating device, whose normal operation results in an alarm or supervisory signal indication at the control panel. The electrical integrity of the circuit is monitored by the fire alarm system.

Input	A signal generated by a field device and sent to the control panel for evaluation and responses as determined by the system database. Inputs to the system are detectors, modules, and switches.
Label	A unique identifier for an object.
Listing	A readout of all system configuration data contained within the panel.
Local Domain	Features which operate only within the local cabinet.
Local System	A system which operates according to the provisions of NFPA 72, Chapter 3.
Logic Functions	AND and OR statements.
M Device/Zone	A Monitor device/zone.
March Time	A 50% duty cycle, 120 beats per minute signal pattern.
Matrix	A correlation sheet that indicates the relationship between the activation of an input and the effect it will have upon all system outputs.
Non-Silenceable	A notification appliance circuit that remains active after initiating, independent of the panel's alarm silence features. Non-silenceable NACs are typically used for visual devices.
Notification Appliance Circuit (NAC)	A circuit connected directly to notification appliances. The electrical integrity of the circuit is monitored by the fire alarm system.
Object	Input, output and controls which are used as the basis for creating system rules.
Output	A signal generated by the system, based upon responses defined in the system database, and sent to external field devices. Outputs are LEDs, and modules.
Output Priority	A system of hierarchy that allows or prevents setting or resetting outputs. Output priorities range from low to high.
Personality Code	A number code used to set the configuration and operation of a SIGA module. A personality code is either factory installed or must be downloaded into SIGA modules for proper operation.
Power-limited	Wiring and equipment that conforms with, and is installed to, the National Electrical Code, Article 760, power-limited provisions.
Proprietary System	A system which operates according to the provisions of NFPA 72, Chapter 4-4.
Pseudo point	An input or output point that is not a physical device. Example: ground fault and communication fault notification.
PSNI	Positive, Successive, Non-Interfering code.
RAM	Random Access Memory. Volatile memory containing the system on-line or active status.

Reset	An active condition or command used to force an output to its OFF condition. An output's OFF state may be in the restored condition (normal condition, not under the influence of a response) or the reset condition. An output reset state contains a priority level.
Response	A list of outputs or functions that occur as a result of the change of state of an input.
Restore	Refers to a condition of an input, where the input is not active. It also refers to the condition of an output where the output is not in its SET or RESET condition and does not have a priority value associated with it.
Retard	The delay of water flow signals to prevent false alarms due to fluctuations in water pressure.
Riser	An electrical path that contains power or signal that is used by multiple outputs, zones, or circuits.
RS-232	A serial communications format normally used for serial peripheral devices (i.e., printers) from a computer. RS-232 cables have a maximum length of 50 ft (15.2M).
RS-485	A serial differential communications format used to communicate between the panel and some remote annunciators.
Rule	A logical relationship between objects defined in the network's object list. Rule format:[rule label] (input state) (input device type) 'input label' : Output command (output device type) (priority) 'output label' {comments};
S Device/Zone	Supervisory device/zone.
Sensitivity	The relative percent obscuration of a detector.
Sequence	A series of actions separated by time delays.
Service Group	A collection of devices that are configured for testing as a group using the system test function.
SIGA	An abbreviation for SIGnAture.
Signature Data Circuit	The wiring which connects Signature series devices to the fire alarm panel.
Silenceable	Notification Appliance Circuits that follow the action of the panel's alarm silence features, Silenceable NACs are used for audible devices only.
SPM	Abbreviation for Strokes Per Minute.
Start Action	An action that is activated upon power-up of the panel and remains active until manually reset.
Start Sequence	A sequence that is begun upon power up of the panel.
Supervisory Circuit	An IDC input circuit used to monitor the status of critical fire protection equipment, i.e. sprinkler valves, etc.

Supervisory Open (Trouble)	Condition generated when a supervisory zone is open, ground fault, or when a Signature Series device is not responding to a poll.
Supervisory Short	Condition generated when a supervisory zone or device is shorted.
System Definition Utility	A Windows-based program used to enter and modify information contained in the system.
Temporal Pattern	A universal “3 pulse” evacuation signal meeting the requirements of NFPA Standard 72, section A-2-4.10(a) and ULC 527.
Time Control	An input activated by the time of day or day of the month.
Verification Alarm	Upon receipt of an alarm by a smoke detector, verified detectors attempt to automatically reset. Receipt of a second alarm within the 60-second confirmation period after the automatic detector reset period is indicative of a verified alarm.
Waterflow Device	Devices/zones defined as waterflow devices are not permitted to silence their notification appliances while the alarm is active.
Zone	A grouping of Signature series detectors and modules which has a unique zone number and acts as a single entity for programming purposes, whenever any component of the zone is activated.

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