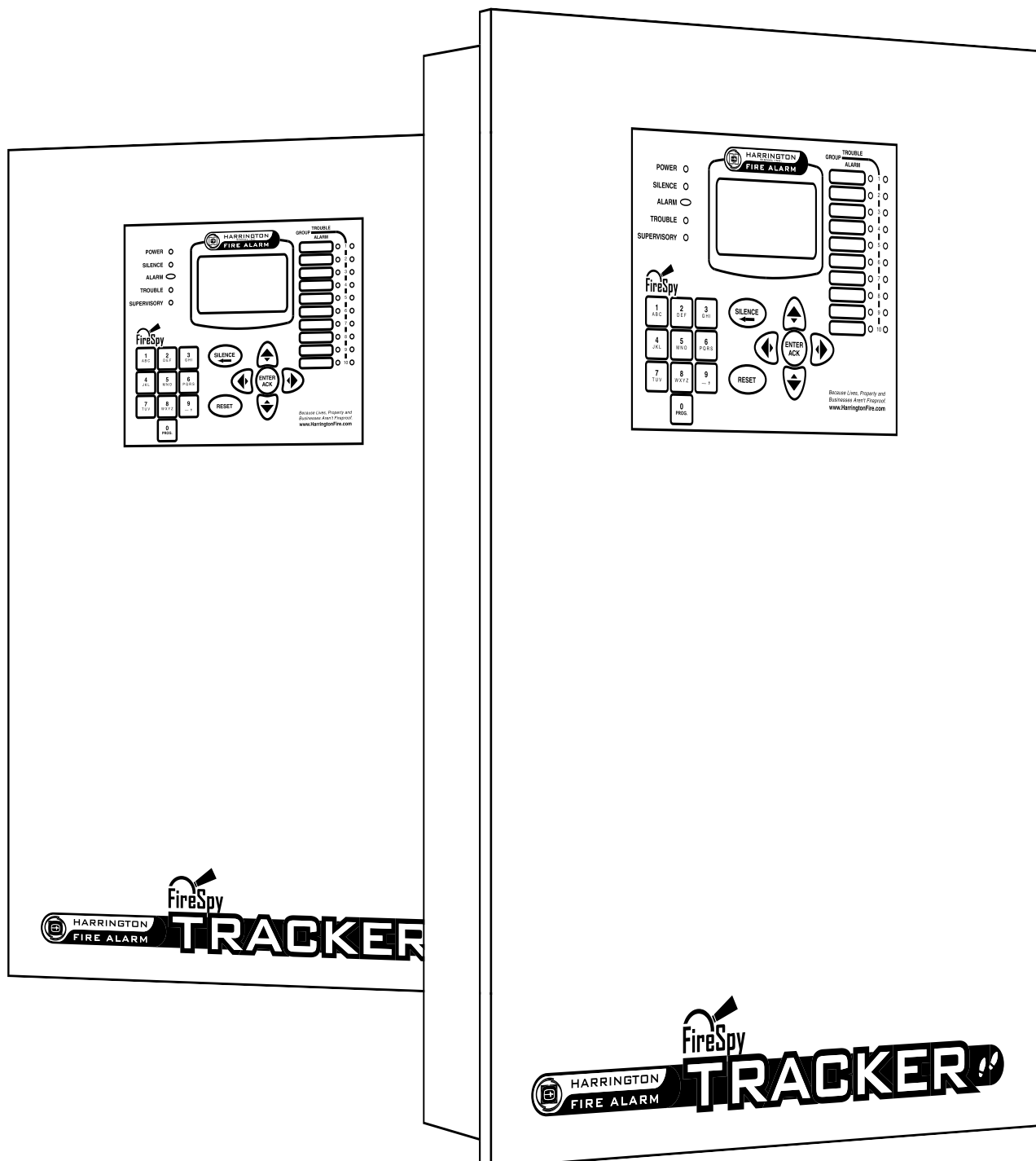
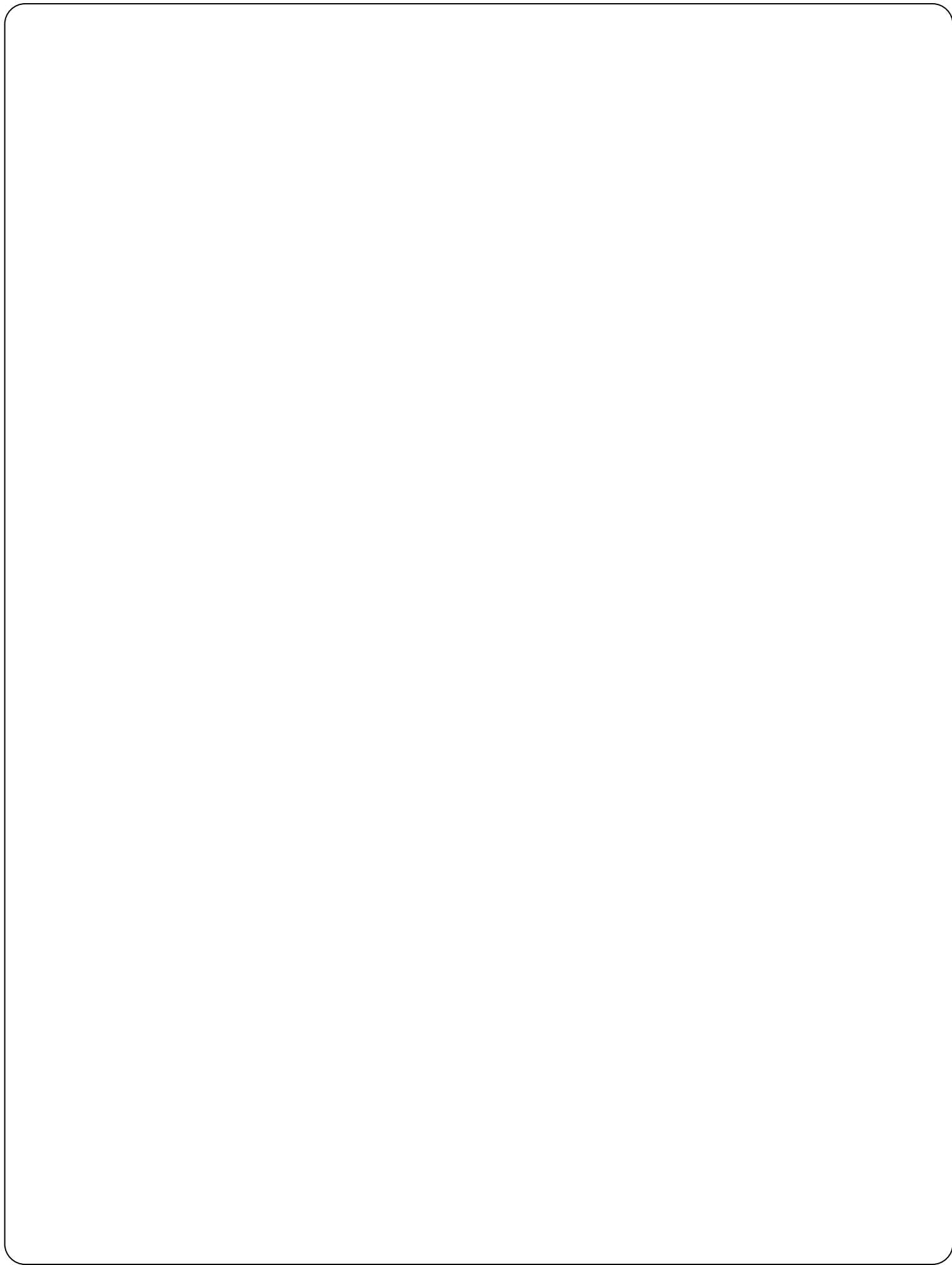


# Installation Manual

## FireSpy® Tracker T1000, T2000, T8000, T2000E

### Fire Alarm Systems





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# 1 Preliminary Information

## 1.1 Safety messages – Please read before proceeding

People's lives depend on your safe installation of our products. It is important to read, understand and follow all instructions shipped with this product. The equipment described herein is listed by the NRTL only when installed and configured in the manner described herein

It is possible to install equipment incorrectly or arrange system components and installation wiring in such a manner that life safety functions are not properly performed and, as a result, lives may be lost. To minimize this possibility, become familiar with the system layout and operation of the entire Fire-Protective Signaling System. Do not alter any mechanical or electrical features of the equipment supplied. Become familiar with the Building Code and Fire Prevention Code or other authority having jurisdiction requirements in the area of the installation.

The Facilities Engineer and the Safety Engineer should make selection of mounting location for this equipment and routing of wiring. Listed below are some other important safety instructions and precautions you should follow:

- This unit must be installed by a qualified electrician in accordance with NFPA 72, and national and local electrical and fire codes, under the direction of the authority having jurisdiction.
- Only authorized and competent personnel must be allowed access to panel controls or panel power source, to limit the possibility of malfunction or failure.
- Do not connect this unit to system wiring when circuits are energized. Check field wiring lines to ensure that voltages are not present. Warranty is void if the equipment is damaged by improperly connected untested wiring or if fused improperly.
- The equipment must be connected to a dedicated source of reliable AC power adequate for the rating of the system as configured. The source must be secure and properly labeled "Fire Alarm Circuit Control".
- A suitable battery set must be used to assure required operation in case of primary power loss. The battery set must be replaced after 4 years, or earlier if capacity is excessively reduced. The batteries should be checked at least twice per year, or more often if required by local codes.
- Wiring used in the system must be adequate for the service and installed in accordance with applicable codes.
- Devices used in the system and connected to the control panel must be verified compatible with the panel.
- All effective warning speakers produce loud sounds which, in certain circumstances, may cause permanent hearing loss. Take appropriate precautions such as wearing hearing protection. Recommendations in OSHA Sound Level Standard (29 CFR 1910) should not be exceeded.
- After installation and completion of initial system test, provide a copy of this instruction sheet to all personnel responsible for operation, periodic testing and maintenance of this equipment.
- After installation, ensure that all bolts and threaded joints are tightened.
- After installation and completion of initial system test, a program for periodic testing of this device must be established. Proper periodic maintenance is required to assure operation through the life of the system, and to determine that point at which useful life of the system or of any of its components has been reached. Any malfunctioning units must be repaired or replaced immediately by competent, authorized personnel. Refer to NFPA 72, local Fire Codes and the authority having jurisdiction.
- Instructions for proper response by building occupants must be developed and distributed in accordance with the Building Code and Fire Prevention Code or other authority having jurisdiction.
- Unauthorized repair or servicing of equipment may result in degradation of performance and/or property damage, serious injury, or death to you or others. If a malfunctioning unit is encountered, do not attempt any field repair/retrofit of parts.

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death to you and others.

The programming technician is ultimately responsible for conformance to the applicable codes and purchase order.

This manual cannot cover all details or contingencies which could exist in a system application. Refer to the authorized distributor if additional information is required.

Specifications are subject to change without notice.

## 1.2 Warranty

Harrington Signal products are covered by a limited warranty. See Harrington's warranty statement for more details (document #780-0762)

## 1.3 Support

If you have any questions or concerns about installation, operation, or programming of our equipment, please contact us at:

Harrington Signal Inc.  
2519 – 4<sup>th</sup> Ave  
Moline, IL 61265

Toll Free: (800) 577-5758  
Tel: (309) 762-0731  
Fax: (309) 762-8215  
Email: [techservices@harringtonsignal.com](mailto:techservices@harringtonsignal.com)  
Web: [www.harringtonfire.com](http://www.harringtonfire.com)

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## 2 Overview

### 2.1 General

The FireSpy Tracker series panels are sophisticated microprocessor-based fire alarm control systems suited to the various needs of commercial, industrial and institutional applications. The Tracker panel can connect to a Tracker network, a peer-to-peer network of up to 250 Tracker panels. Up to 254 points on each Signal Line Circuit (SLC) and up to 60 conventional fire detector zones can be configured. The distributed system architecture reduces the length of wiring needed because addressable SLC, conventional IDC, and other modules can be located closer to where devices are installed.

The Tracker panel functions in accordance with the National Fire Protection Association (NFPA) Standard 72 Fire Alarm Code. Activation of a compatible detector or normally open fire alarm initiating device will sound audible appliances, notify a remote station, annunciate a fire or alarm condition, and energize supplementary relays.

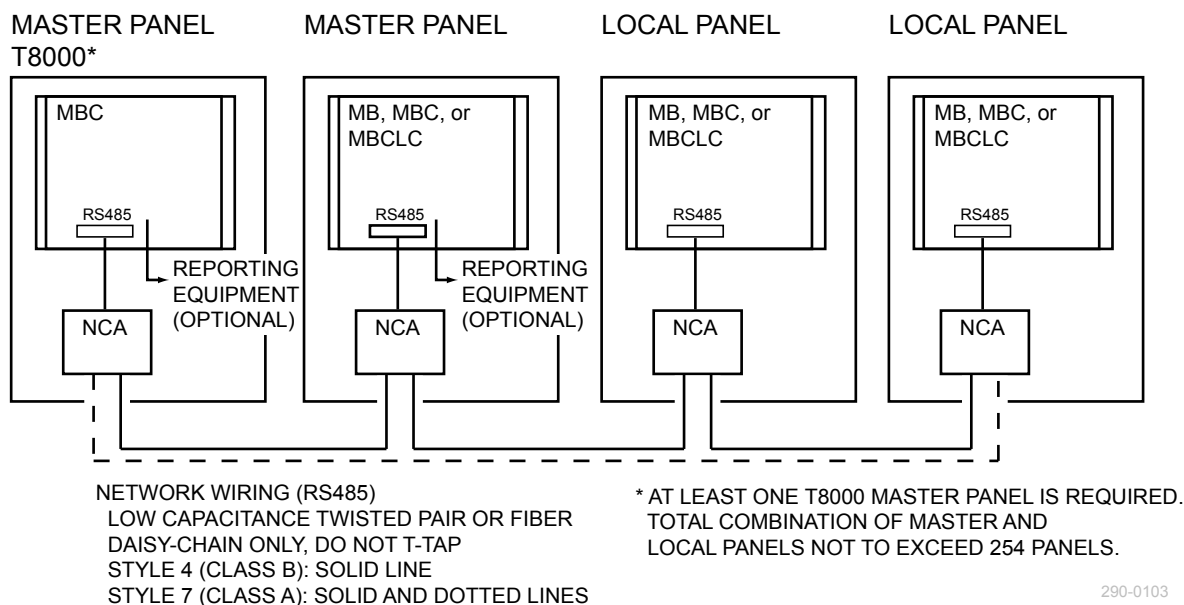
Automatic learning features can be used to quickly configure a system. Additional system configuration can be done through the annunciator or with a PC.

The Tracker 8000 allows up to eight SLCs for a total of 2032 addressable points. The SLCs are provided by the use of modular SLC boards, which may be mounted in the main enclosure or remotely.

The Tracker 2000 main board (MBCLC) has two SLCs for a total of 508 addressable points.

The Tracker 1000 main board (MB) has one SLC for a total of 254 addressable points.

The Tracker T2000E combines the Tracker 2000 fire alarm control panel and the HAVE audio voice evacuation systems into one convenient package. In addition to the features of the T2000, it also provides conventional audio with up to 8 Class B speaker circuits (or up to 4 Class A) with amplification for 25, 50 or 100 watts. Within this manual, references to the T2000 also apply to the fire alarm portion of the T2000E (the MBCLC main board).



**Figure 2-1: Peer-to-peer network layout**

## 2.2 System layout

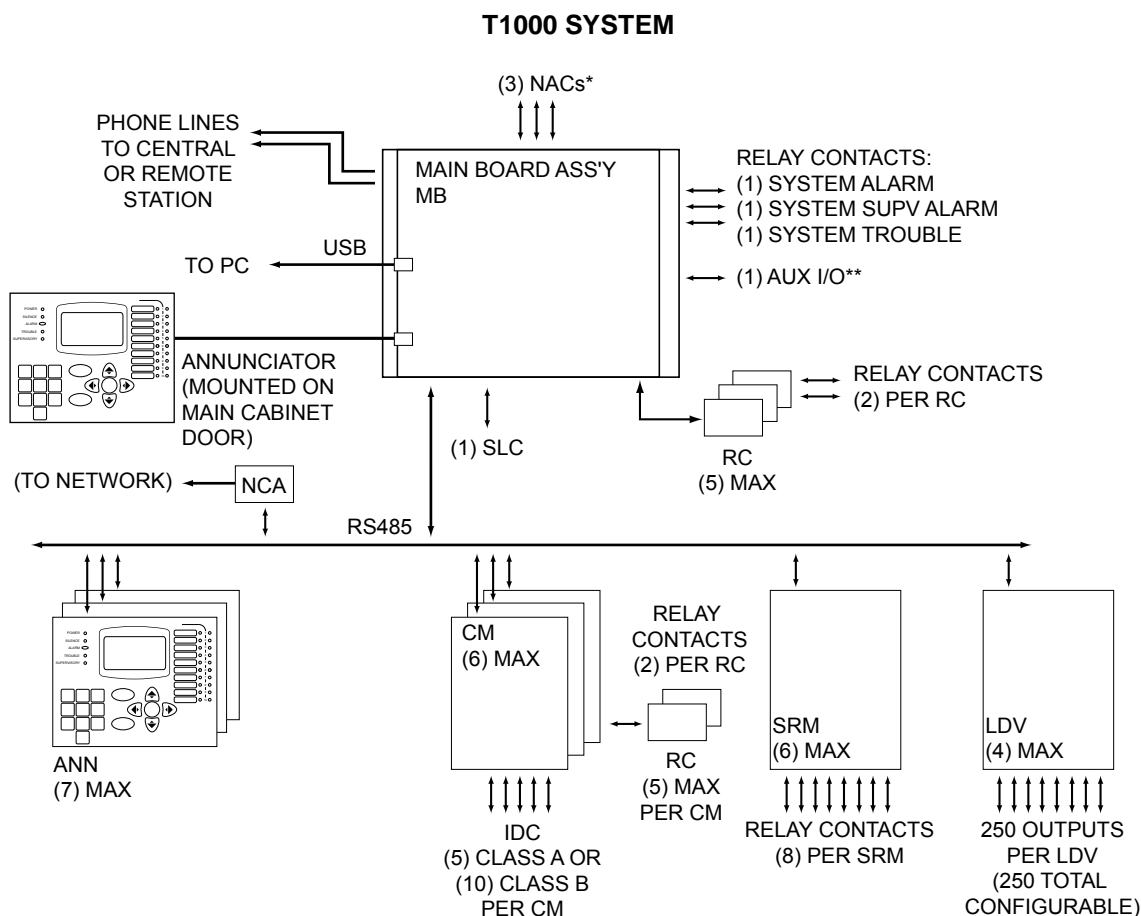
### 2.2.1 Standalone panel

A Tracker panel consists of the main board (MB for T1000, MBC for T8000 or MBCLC for T2000) in the main enclosure and various devices that connect to the main board (see *Figure 2-2*). System programming can be done from a PC or laptop through the serial port of the panel's communications adapter.

### 2.2.2 Multiple panel network

A Tracker network consists of multiple Tracker panels with each panel connected to the network through a communications adapter (see 2.3.3 *Network Communications adapter (T8000-NCA)*). Local network devices (annunciators, etc.) connect to the RS485 outputs of each panel, as they would in a standalone panel. Each panel provides the same capabilities as it would as a standalone panel, with the addition of the network connection. System programming can be done from a PC or laptop through the serial port of the panel's communications adapter.

**NOTE:** A Tracker network must include at least one T8000 panel, set up as master.



\* MAY BE INDIVIDUALLY CONFIGURED AS NAC, AUX POWER, OR INPUT

\*\* MAY BE CONFIGURED AS NAC (FOR CONNECTION TO NAC BOOSTER OR VOICE MODULE) OR INPUT  
A SYSTEM MUST USE AT LEAST ONE INITIATING DEVICE

290-0158

**Figure 2-2: System layout (T1000)**



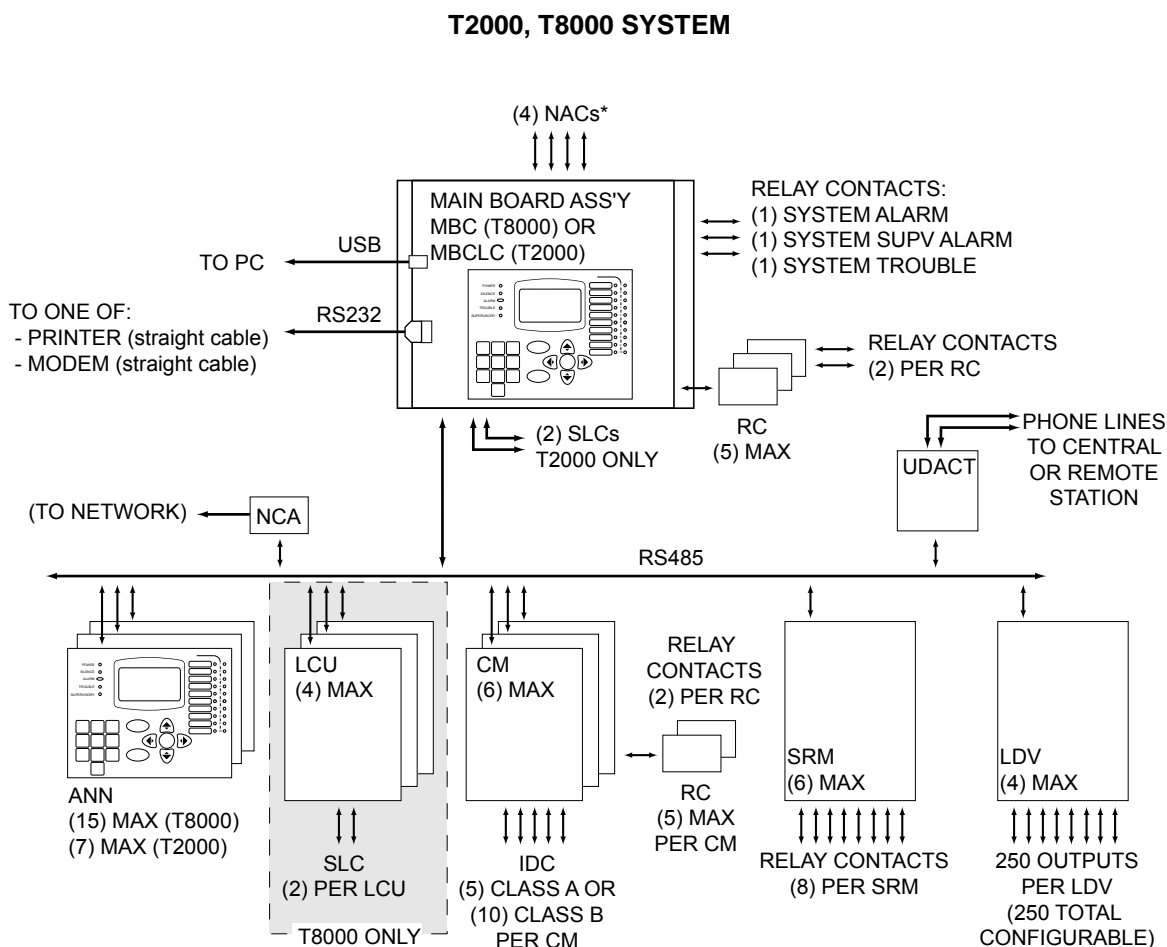
## 2.3 System components

The Tracker is a modular system. Each module may be purchased and installed separately. Some common system configurations are also available pre-assembled at the factory.

### 2.3.1 Main circuit board assembly (T1-MB, T8000-MBC, T2000-MBCLC)

The main circuit board assembly (T1-MB, T8000-MBC or T2000-MBCLC) is the core of the Tracker panel. It contains the main board and power supply mounted on a metal chassis. The MB / MBC / MBCLC mounts in the main panel enclosure.

The T1-MB, T8000-MBC and T2000-MBCLC are respectively referred to as MB, MBC and MBCLC in this manual.



\* MAY BE INDIVIDUALLY CONFIGURED AS NAC, AUX POWER, OR INPUT  
A SYSTEM MUST USE AT LEAST ONE INITIATING DEVICE

290-0104

**Figure 2-3: System layout (T2000, T8000)**

**Table 2-1: Power supply specifications (MBC/MBCLC).**

Parameter	Rating
Input voltage (AC supply)	120VAC @ 50/60Hz 230VAC @ 50/60Hz
Input current draw (AC supply)	1.8A @ 120VAC 0.4A @ 230VAC
24VDC power available (total system current) and max battery load	7A
Battery charge voltage, max	27.6V
Battery charge current, max	1.6A
Battery capacity	
Min	8Ah
Max	40Ah

Use two UL864 listed 12V batteries connected in series.

**Table 2-2: Power supply specifications (MB).**

Parameter	Rating
Input voltage (AC supply)	120VAC @ 50/60Hz 240VAC @ 50/60Hz
Input current draw (AC supply)	1.8A @ 120VAC 2.15A @ 240VAC
24VDC power available (total system current) and max battery load	4A
Battery charge voltage, max	27.6V
Battery charge current, max	1.6A
Battery capacity	
Min	7Ah
Max	40Ah

Use two UL864 listed 12V batteries connected in series.

**Table 2-3: Environmental specifications (MB / MBC / MBCLC).**

Parameter	Rating
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

**Table 2-4: RS-485 specifications (MB / MBC / MBCLC).**

Parameter	Rating
Output voltage (MBC / MBCLC)	24VDC
Max output current (MBC / MBCLC)	2.5A
Max impedance, RS-485 wiring*	100 ohms
Max capacitance, RS-485 wiring*	.3uF
Max impedance, power wiring, total (3V drop each wire @ 80mA)* (MBC / MBCLC)	75 ohms

\* See Appendix C Wire Selection for suggested wiring distances.

The main circuit board contains 4 circuits (3 for MB) that can be individually programmed to operate in the following modes:

- NAC (steady, temporal coding, or march time coding, Gentex 1 synchronization for Commander 3 and 4, Gentex 2 synchronization for Commander 1)
- Auxiliary power supply (resettable or continuous)
- Auxiliary input

**NOTE:** *UL864 requires audible alarm notification devices to be synchronized on a circuit or a system basis. If using notification appliances other than Gentex Commander 1, 3, or 4, synchronization modules must be used.*

**Table 2-5: NAC specifications (output modes) (MB / MBC / MBCLC)**

Parameter	Rating
Output voltage	24VDC
Output current, max	
MBC / MBCLC	3A
MB	1.8A
Wiring styles (NAC mode)	Style Y (Class B) Style Z (Class A)
End-of-line resistance (NAC mode, Class B)	10k ohm

\* See Appendix C Wire Selection for suggested wiring distances.

**Table 2-6: NAC specifications (input mode) (MB / MBC / MBCLC)**

Parameter	Rating
Input voltage (input mode)	24VDC
Input current draw, max (input mode), inherently power limited	5mA
End of line resistance (input mode)	10k

The MB contains an auxiliary input/output circuit that can be used in a NAC mode or as an input. The NAC mode can be used to activate an external NAC-driven device, such as a NAC power supply or HAVE voice evacuation system. The AUX IO port provides alarm activation, silencing and resound operation.

**Table 2-7: AUX IO specifications (output mode) (MB)**

Parameter	Rating
Output voltage	24VDC
Output current, max	0.02A
Wiring styles	Style Y (Class B)
End-of-line resistance	10k ohm

**Table 2-8: AUX IO NAC specifications (input mode) (MB)**

Parameter	Rating
Input voltage (input mode)	24VDC
Input current draw, max (input mode), inherently power limited	5mA
End of line resistance (input mode)	10k

The main board contains (1) common alarm relay output, (1) common supervisory alarm relay output, and (1) common trouble relay output, as well as a connection for up to (5) relay modules (T8000-RC).

**Table 2-9: Output relay specifications (MB / MBC / MBCLC)**

Parameter		Rating
Type		Form C (SPDT)
Contact rating		
MBC / MBCLC	resistive load, PF=1.0	10A @ 30VDC
	inductive load, PF=0.4	10A @ 240VAC*
		3A @ 240VAC*
MB	resistive load, PF=1.0	2A @ 30VDC

\* Limited to 50VDC due to spacing

**Table 2-10: SLC specifications (MB / MBCLC)**

Parameter		Rating
Loop output voltage		32V @ 10kHz
Max loop output current		400mA max
Max loop capacitance		0.5uF
Max loop impedance (total per loop)		40 ohms
Environment		
UL864 location		Indoor, dry
Temperature range		32 to 120°F
Maximum relative humidity		93%

\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.2 Display board (T-PDC)

The display board may mount either inside the enclosure door so its buttons are accessible with the door closed or on the chassis assembly (MBC or MBCLC only) so it is accessible after unlocking and opening the enclosure. When the PDC is mounted on the door and connected to the keyswitch, the keyswitch must be activated to enable keypad access to the system's security-sensitive control functions.

### 2.3.3 Network Communications adapter (T8000-NCA)

The network communications adapter is used with each panel in a networked system. It allows the connected panel to communicate with other panels on the panel network.

**Table 2-11: Communications adapter (T8000-NCA) specifications.**

Parameter		Rating
Input voltage		Regulated 24 DC
Input current draw		60 mA
Max impedance, RS485 communication wiring, total		40 ohms*
Max capacitance, RS485 communication wiring		0.3 uF*
Environment		
UL864 location		Indoor, dry
Temperature range		32 to 120°F
Maximum relative humidity		93%

\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.4 LCD annunciator (T8000-RAN / -ANN)

The Tracker 8000 allows up to 15 remote display annunciators (Model T8000-ANN or T8000-RAN). The T2000 and T1000 allow up to 7 remote annunciators. The T8000-ANN remote annunciator is intended for surface or flush mounting and is comprised of the T8000-RAN module within the T8000-A-CAB cabinet.

**Table 2-12: Remote annunciator (T8000-RAN/T8000-ANN) specifications.**

Parameter	Rating
Dimensions (backbox of T8000-ANN)	8.5H x 10W x 2D (inches)
Input voltage	24VDC
Input current draw	
Standby	19mA
Alarm, without backlight	25mA
Alarm, with backlight (10 seconds after key press)	80mA
Max impedance, power wiring, total (3V drop each wire @ 80mA)*	75 ohms
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.5 Graphic annunciator

A graphic annunciator module (T8000-LDV) is for use in appropriately UL864 Listed custom enclosures to provide graphic annunciator capabilities. The module may be configured to use either LED or incandescent lamps; either type of output is supervised. Up to 4 lamp annunciator modules may be used for a total of 250 programmable outputs per Tracker panel. Additionally, each module has outputs for power on, common alarm and common trouble visual indicators and a sounder.

**Table 2-13: Lamp annunciator module (T8000-LDV) specifications.**

Parameter	Rating
Input voltage	24VDC
Input current draw	
Standby (no devices)	TBD
Alarm (full load)	
Max impedance, RS-485 wiring*	100 ohms
Max impedance, power wiring, total (3V drop each wire @ ?? mA)*	?? ohms
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.6 Addressable Signaling Line Circuit (SLC) module (T8000-LCU)

The Tracker panel monitors addressable fire detection devices that are connected to up to (4) loop modules (T8000-LCU).

Each loop module provides the following:

- Two Signaling Line Circuits (SLCs).
- Up to 254 addressable analog devices can be installed on any loop (limited by device protocol).

- Compatible with System Sensor, Apollo, Harrington and Air Products devices (see *Appendix B* for details).
- Mounts in the main enclosure or remotely (see Table 2-20)

**Table 2-14: Addressable SLC module (T8000-LCU) specifications.**

Parameter	Rating
Input voltage	24V
Input current draw	
Standby (no devices)	107mA
Alarm (full load)	
Max impedance on 24VDC input wiring (per side)	2 ohms
Loop output voltage	25V
Max loop output current	400mA max
Max loop capacitance	0.5uF
Max loop impedance (total per loop)	100 ohms
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.7 Conventional zone module (T8000-CM)

The Tracker panel monitors conventional fire detection devices that are connected to conventional zone modules (T8000-CM). Each zone module provides 5 Class A zones or 10 Class B zones for FireSpy conventional devices. Zone modules may be mounted in the main enclosure or in remote enclosures.

**Table 2-15: Conventional IDC module (T8000-CM) specifications.**

Parameter	Rating
Input voltage	24V
Input current draw	
Standby (no detectors)	11mA
Alarm, base module current	14mA
Alarm, each additional zone in alarm*	40mA
Max impedance, power wiring, total (3V drop each wire)	6V divided by total alarm current*
Max impedance, RS-485 wiring*	100 ohms
Zone output voltage (normal standby)	26.5V
Zone output current	
Supervision	5mA
Short circuit	40mA
Zone impedance (total per loop), max	100 ohms
Zone end-of-line resistor	4.7k ohms
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

\* For total alarm current, add 14mA plus 40mA for each additional zone used

\*\* See Appendix C Wire Selection for suggested wiring distances.

### 2.3.8 Relay module (T8000-RC)

The T8000-RC relay module has (2) form C (SPDT) relays, providing individually programmable dry contact outputs. Up to (5) relay modules may be daisy-chained, with the first one connected to a conventional zone module (T8000-CM) or the main board (MB, MBC, MBCLC) via the relay output connector. Relay modules may be mounted in the main enclosure or remotely (see Table 2-20).

**Table 2-16: Relay module (T8000-RC) specifications.**

Parameter	Rating
Input current draw	
Standby	2mA
Alarm	25mA
Relay type	Form C (SPDT)
Contact rating	
resistive load, PF=1.0	10A @ 30VDC 10A @ 240VAC
inductive load, PF=0.4	3A @ 240VAC
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

### 2.3.9 Serial relay module (T8000-SRM)

The T8000-SRM module provides (8) programmable relays. It may be mounted in the main enclosure or remotely (see Table 2-20).

**Table 2-17: Relay module (T8000-SRM) specifications.**

Parameter	Rating
Input current draw	
Standby	30mA*
Alarm	230mA*
Max impedance, power wiring, total (3V drop each wire)*	26 ohms
Max impedance, RS-485 wiring*	100 ohms
Relay type	Form C (SPDT)
Contact rating	
resistive load, PF=1.0	10A @ 30VDC 10A @ 240VAC
inductive load, PF=0.4	3A @ 240VAC
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

### 2.3.10 DACT communicator module (T-UDACT)

The T-UDACT is used for off-premises monitoring of the Tracker system. The T1000 has the DACT built-in. For the T2000 or T8000, the DACT mounts in the main cabinet or in a separate UL864 listed enclosure. Programming is done through the Tracker user interface or a PC with the Tracker PC Programmer software.

Signals are sent to a Digital Alarm Communicator Receiver (DACR) using either a primary or secondary telephone line. A test call is transmitted to the DACR every 24 hours.

The DACT flashes the Fault LED when it recognizes a fault condition on itself. The following are the possible fault conditions.

- Loss of communication with the fire panel. The DACT will attempt to communicate a trouble condition to the central station
- Low or missing phone line voltage

**Table 2-18: T-UDACT module specifications (T2000 / T8000).**

Parameter	Rating
Input current draw	
Standby	30mA
Alarm	32mA
Environment	
UL864 location	Indoor, dry
Temperature range	32 to 120°F
Maximum relative humidity	93%

\* Refer to T-UDACT installation instructions for other specifications.

### 2.3.11 Audio evacuation modules

These are the core of the audio system. The T2000E provides space for one of the following amplifier modules: 25HAVE, 50HAVE, or 100HAVE. Amplifier modules contain an amplifier, tone generator, digital message repeater, and supervisory interface. The amplifier provides a total of 25, 50, or 100 watts to the speaker outputs at 25 or 70 VRMS. The number in the model number indicates the number of watts available. The speaker outputs can be configured as a Class A (Style Z) or Class B (Style Y) speaker zone. The T2000E enclosure has space to connect up to two zone splitter modules:

- \* ZSC-2A: Splits a zone into two Class A (Style Z) speaker zones
- \* ZSC-4B: Splits a zone into four Class B (Style Y) speaker zones

### 2.3.12 City tie/reverse polarity communicator (UCT)

The model UCT interfaces between the Tracker and a local energy city box or remote station (reverse-polarity). The UCT provides a form C system trouble contact and a form C general alarm contact. The interface from the control panel is via 24VDC inputs for alarm, supervisory alarm, and trouble. A disconnect switch is provided to prevent false alarms while the system is being tested or serviced.

When configured for remote station, this module is intended for connection to a polarity reversal circuit of a remote station receiving unit having compatible ratings. This module is not suitable for Remote Station Protected Premises service where separate transmission circuits are required for fire, supervisory, and trouble signals. When configured for local energy, this module is intended for connection to a local energy city tie box having compatible ratings.



**Table 2-19: City tie/reverse polarity communicator (UCT) specifications.**

Parameter	Rating
Supply voltage	24V*
Input current draw	350mA max
Relay contacts	
Trouble contacts	1A @ 28VDC, form C
Alarm contacts	5A @ 28VDC, form C
Remote station transmitter circuit outputs (power limited)**	
Voltage	16.5 – 24.6VDC
Current	14mA max
Local energy city tie outputs (not power limited)	
Standby voltage	18-40mVDC
Standby current	1.5mA max
Alarm voltage	16-28VDC
Alarm current	270mA max (momentary load)
Ripple voltage (alarm)	1.2V max
Intended trip coil	14.5 ohm

\* The same power source must be used for powering the UCT and relay contact wiring.

\*\* These circuits are to be supervised by the remote station.

### 2.3.13 Enclosures

**Table 2-20: Enclosure dimensions and module mounting provisions.**

	T1-CAB	T8000-CAB T2000-CAB	T2000E-CAB	T8000-EXP
<b>Size (inches)</b>	W x H x D	W x H x D	W x H x D	W x H x D
Overall	15.88 x 25.19 x 4.8	15.88 x 25.19 x 4.8	19.25 x 33.25 x 4.5	11.37 x 15.44 x 3.8
Backbox	14.5 x 23.5 x 4	14.5 x 23.5 x 4	18 x 32 x 4	10 x 14 x 3
<b>Knockouts</b> (1-1/8 dia)	4 top 3 each side	4 top 3 each side	3 top, 2 bottom, 4 each side	3 top 3 bottom
<b>Module</b>	<b>Quantity of modules that may be mounted</b>			
T1-MB	1			
T8000-MBC or T2000-MBCLC or		1	1	
T8000-LCU		2*		2*
T8000-CM		2*		2*
T8000-SRM		1*		1*
T8000-RC		2		
T-UDACT		1		
T8000-NCA		1		
25HAVE, 50HAVE, or 100HAVE			1	
ZSC-2A or ZSC-4B			2*	
Batteries	(2) 12V, up to 12Ah**	(2) 12V, up to 12Ah**	(4) 12V, up to 18Ah†	

\* A total of two mounting locations are provided for a combination of these modules.

\*\* Larger batteries may be mounted in an auxiliary UL864 Listed enclosure.

† Two batteries are for the fire system and two batteries are for the audio system. 100HAVE may use up to 24Ah batteries.

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	T8000-A-CAB	T8000-EXP5	T8000-EXP5N	
<b>Size (inches)</b>	W x H x D	W x H x D	W x H x D	
Overall	11.37 x 9.94 x 2.8	15.88 x 19.44 x 3.8	7.38 x 19.5 x 2.88	
Backbox	10 x 8.5 x 2	14.5 x 18 x 3	6 x 18.13 x 3.13	
<b>Knockouts</b> (1-1/8 dia)	3 top 3 bottom	4 top 4 bottom	2 top 2 bottom 4 each side	
<b>Module</b>	<b>Quantity of modules that may be mounted</b>			
T8000-CM		1		
T8000-RC		5	5	
T8000-RAN	1			

## 2.4 Service use

The Tracker is suitable for the following NFPA72 service uses:

**Table 2-21: Service uses.**

Type	Service	Signaling	Required Equipment
Local (PPU)	A, M, SS, WF, R	Non-coded, march time	
Proprietary (PPU)	A, M, SS, WF, R	Multiplex	
Remote Station (PPU)	A, M, SS, WF, R	DACT Reverse polarity	T-UDACT* UCT
Central Station (PPU)	A, M, SS, WF, R	DACT	T-UDACT*
Auxiliary (PPU)	A, M, WF, R	N/A	UCT

Abbreviations for services:

A = Automatic fire alarm

M = Manual fire alarm

SS = Sprinkler supervisory service

WF = Waterflow alarm

R = Releasing device service

\* The T-UDACT is required equipment for these uses on the MBC and MBCLC. It is not required for these uses on the MB because the MB has a built-in DACT.

## 2.5 Listings and approvals

ETL Listed: Standard UL864

CSFM Listed 7165-0476:172 (T2000, T8000)

MEA/BSA MEA 43-05-E, 43-05-E Vol 2 (T2000, T8000)

## 3 Installation and Wiring

Installation of the panel and system accessories requires qualified, trained, and equipped personnel who are familiar with both the fire alarm codes and installation methods for this specific equipment. Final programming requires special familiarity with the applicable local codes. The versatility of this system implies sensitivity to mishandling and misprogramming beyond that of less capable equipment.

### 3.1 System planning

#### 3.1.1 Battery calculation

The battery provides a secondary source of power if loss of primary power occurs. The batteries need to have enough capacity to provide power for the control panel and attached devices for a minimum standby period followed by an alarm period. Follow the directions below to fill in the calculation template in the appendix.

The first section calculates the current draw loads for standby and alarm conditions.

1. Fill in the quantity and calculate standby and alarm current draw totals for each system component.
2. Fill in the quantity and calculate standby current draw totals for each detector, base, and module.
3. Use rows A, B, C and D to estimate the total alarm current for detector and module LEDs. Row B assumes that 5% of the LEDs of these devices will be turned on.
4. Fill in the quantity and calculate total alarm current for each NAC circuit.
5. Calculate the sum columns E and F. Verify that these values are within the limits of the power supply (see table at the bottom).
6. Verify that the current draw on each circuit is within the current limit of the circuit.

The second section calculates the battery size needed to sustain the loads for the minimum time durations.

1. Enter the standby and alarm time according to the type of system (see table at the bottom).
2. Fill in and calculate the remaining rows above row h and calculate row i.
3. Row i shows the battery size that is needed. Select a battery that is the next available size bigger than this value.

### 3.2 Control panel installation

#### 3.2.1 Preparation

Verify that all installation materials are on-hand. Read all instructions before beginning installation.

To avoid degradation of the operating circuitry, it is recommended that the printed circuit boards be removed during cabinet mounting, wire installation, and any other procedures that may introduce dust, metal shavings, grease or any other foreign matter into the area of the electronic circuitry.

**WARNING:** *In an extended system, there may be several sources of power on devices connected into the control unit. All power must be disconnected during installation or wiring of system components and not introduced until installation is complete and checked out.*

#### 3.2.2 Panel location

The control unit should be located on the ground floor and easily accessible to authorized personnel. The area should be reasonably free of dust, vibration, and moisture and a dedicated source of power must be available. The mounted enclosure should be at a convenient height to facilitate servicing.

Annunciators should be mounted at convenient locations, at approximately eye-level.

### 3.2.3 Installation

#### Mount the enclosure

Remove circuit boards from the enclosure before mounting to avoid damage. Refer to enclosure documentation for detailed installation instructions.

If an auxiliary power supply or battery enclosure is being used at the panel, it may be mounted directly below the main panel enclosure, close-nipped, with a minimum of 1 inch between enclosures for door clearance. Wiring to these devices should be as short as possible to minimize voltage drop.

#### Prepare for wiring

Break out the required entry points and attach any required conduit. Run the system wires and label each adequately for future reference. The enclosure door may be temporarily removed for easier access by removing the screw at the bottom hinge and detaching the ground wire at one end.

Note that the code requirements for power-limited wiring apply to most external runs, and the requirements for non-power-limited wiring apply to the mains power inputs.

#### Install main circuit board and chassis set

For T1000, mount the main circuit board assembly (MB) onto the enclosure studs with the board oriented as shown in *Figure 3-4*. Secure with #8 nuts.

For T2000 or T8000, mount the main circuit board assembly (MBC or MBCLC) onto the enclosure studs with the board oriented as shown in *Figure 3-6*. Secure with #10 nuts.

For T2000E, mount the main circuit board assembly (MBCLC) onto the enclosure studs with the board oriented as shown in *Figure 3-8*. (T2000E). Secure with #10 nuts.

#### Install optional accessories

To install accessory assemblies, follow the installation instructions provided with the accessories (see Appendix A).

#### Connect AC power circuits

Wire the dedicated AC supply line to the terminals on the main circuit board as shown. The supply should have a separate fuse or breaker at the main distribution panel so that no other electrical devices can initiate power loss in the circuit. The grounding conductor must be at least 14AWG and 15A protection is required. Be sure that the ground terminal is wired directly to the electrical panel ground bonding point or another acceptable earth ground. The neutral wire must connect to the electrical panel neutral distribution bar and not directly to ground.

**WARNING** *Dangerous voltages appear on these terminals and associated circuitry when the AC supply is turned on. Be sure the circuit is protected from inadvertent energization during the assembly process.*

#### Connect external circuits

When all remote devices have been connected to their circuits, connect these circuits to the panel (see *Figure 3-1*, *Figure 3-2* and *Figure 3-3*).

**CAUTION:** *To maintain proper operation and supervision of detectors, indicators, and modules, it is necessary that wiring instructions with the devices be followed exactly, particularly with regard to in and out connections to the devices. It is also necessary that each addressable device be properly programmed with address and status (if applicable), and in conformance with the building system layout. Misaddressed or miswired devices may cause severe malfunctions and be difficult to locate.*

**Mount the door**

If the door was removed, remount it by installing the screw at the bottom hinge and reattaching the ground wire.

For T1000, connect the cable from the annunciator on the door to the main board.

Frame and mount a copy of the operating instructions found in the appendix to the wall near the panel.

**Install batteries**

**WARNING:** *Improperly connecting or shorting the battery terminals may cause severe damage to the panel and/or batteries and might result in personal injury.*

Place the required batteries in the space provided at the bottom of the control panel enclosure. If a battery set larger than 12Ah is required, an additional battery enclosure is required.

The 24V battery set required by the panel consists of two 12V sealed lead-acid batteries connected in series.

Attach the red wire to the red or + terminal of one battery. Attach the black wire to the black or – terminal of the other battery. Connect a jumper wire between the remaining two battery terminals.

**Apply system power**

Energize the AC power lines to the panel. The AC Power LED at the annunciator should be illuminated.

### 3.3 Configuration and programming

Initial configuration by scanning the network and loops will give all devices their initial default parameters and assign input and control devices to the default group. Performing the scan is recommended to assure that all accessories are as selected and at the assigned addresses. However, most systems also require specific programming. Refer to the programming manual for more instructions.

### 3.4 Check system operation

Initial acceptance testing is required before normal operation of the system. Inspection, testing, and maintenance may be performed by the owner, if qualified, or by a qualified contractor. Service personnel must be qualified and experienced in inspection, testing, and maintenance of fire alarm systems, including certification by the manufacturer or a recognized authority.

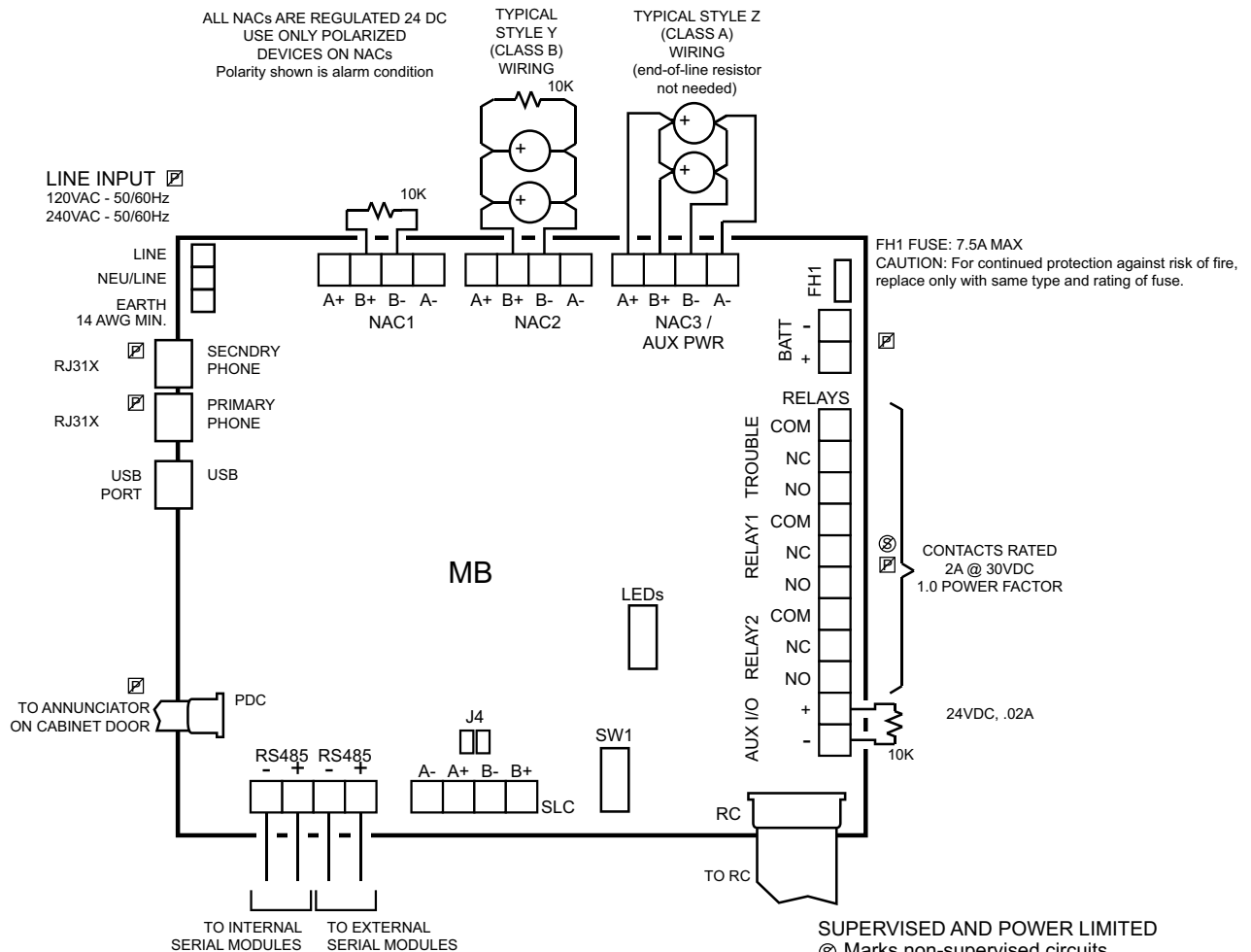
Any individuals or facilities receiving transmitted alarm, supervisory, or trouble signals, and all building occupants, must be notified before commencement and on completion of any test operations, to prevent unnecessary response.

Initial acceptance testing includes complete visual inspection and verifying the items below. NFPA 72 or the authority having jurisdiction may include additional requirements that must be followed.

- Correct function of the control panel in receipt of all functional inputs and operation of all signals and auxiliary functions, and supervision of shorts, opens, grounds, power supply faults and battery faults.
- Instrument measurement of the integrity and isolation of all applicable conductors (unpowered).
  - No improper shorts or opens.
  - No stray voltages between installation conductors and other conductors or ground. The maximum stray voltage must not exceed 1 volt ac/dc.
  - All conductors not intentionally grounded must be isolated from ground by at least 500k ohms (2.2M ohms for T1000). An isolation of 10k or less will cause a ground fault. An isolation of between 10k and 500k (10k and 2.2M for T1000) might or might not cause a ground fault, or will cause intermittent ground faults.

- All conductors not intentionally connected together must be isolated from each other and from ground.
- Loop resistance of each initiating and indicating circuit conductor loop must be recorded and must not exceed the resistance of the equivalent of maximum wire length and end-of-line device.
- Operation of lamps, LEDs, and displays
- Rated power supply load, and charging capability and parameters.
  - Power supply must be tested under worst-case maximum load with the battery disconnected.
  - With the batteries charged and on trickle charge from the power supply, the terminal voltage shall be approximately 27.6v.
- Visual inspection of the batteries and system connections must verify sound condition before conducting back-up power tests.
- Operation of back-up supply (battery), including standby and alarm load capability.
  - With the AC supply to the panel disconnected, the power loss trouble must be indicated, and the standby and alarm current demand measured. General alarm systems must be operated for at least 5 minutes to demonstrate the capability of operating standby and alarm on battery power.
- Proper operation of all audible and visual trouble signals, including ground-fault indication when any conductor is grounded.
- Proper operation of annunciators shall be verified, including fault conditions.
- Function of all detection devices.
  - Smoke and thermal fire detectors must be tested per manufacturer's instructions.
  - Manual fire alarm boxes and other input devices must initiate alarm.
- Function of all other sensing or initiating devices must be tested under defined operating conditions according to manufacturer's specifications.
- Function of all supervisory devices must be tested under operating conditions as specified by the manufacturer.
- Function of all notification devices, including visible indicators verified against approved plans and audible output levels measured with a sound level meter.
- Alarm verification time delay and alarm response must be verified for circuits so programmed.
- Circuit supervision must be verified by creating open circuits.
- Normal and trouble operation of the DACT, if used, and connection to two separate telephone lines must be verified.

Any change in system hardware or software must be followed by complete test of the items involved and 10% of the unchanged items up to 50 devices. Full change records must be kept, as well as the system test records. Changes to the control panel require retest of all critical functions.



# SUPERVISED AND POWER LIMITED

⊗ Marks non-supervised circuits

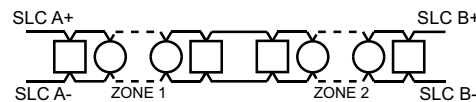
☒ Marks non-power-limited circuits

All others are supervised and power limited.

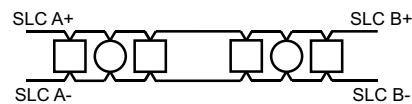
Segregate power-limited wiring from  
non-power-limited wiring by at least 1/4 inch.

## Example SLC wiring

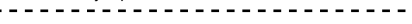
TYPICAL STYLE 4 (CLASS B) WIRING  
J4 jumpers present



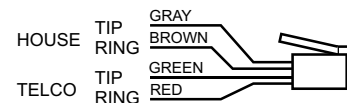
TYPICAL STYLE 6 (CLASS A) WIRING  
Isolators (optional) separate each zone  
Remove J4 jumpers



TYPICAL STYLE 7 (CLASS A) WIRING  
Isolators separate each detector  
Remove J4 jumpers



## Example RJ31X wiring



## NOTES:

- 1) Use only smoke detectors that are in the compatibility list in the owner's manual.
- 2) Leave end-of-line resistors on unused circuits.
- 3) Combined load of all devices, including indicating appliances, is not to exceed 4A.

290-0159

Figure 3-1: Wiring on MB

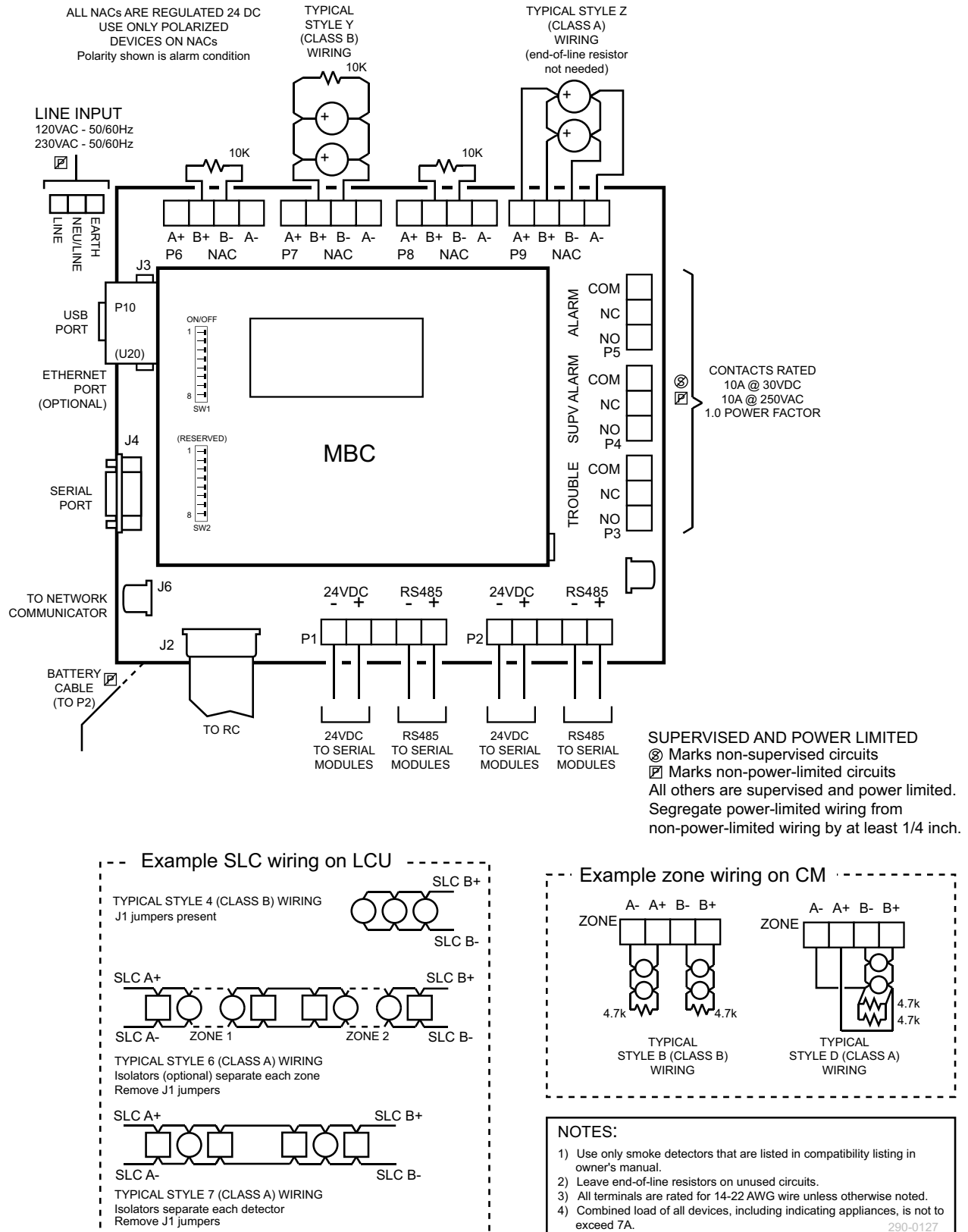
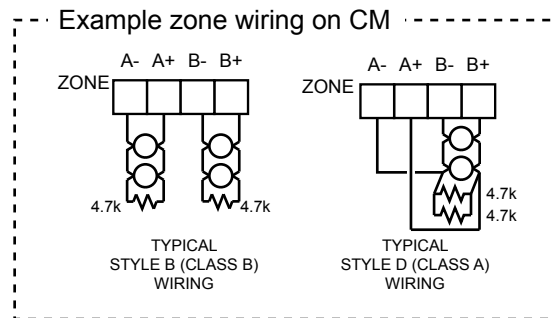
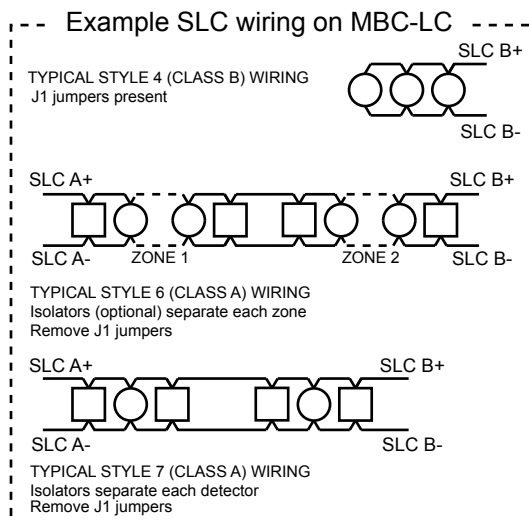
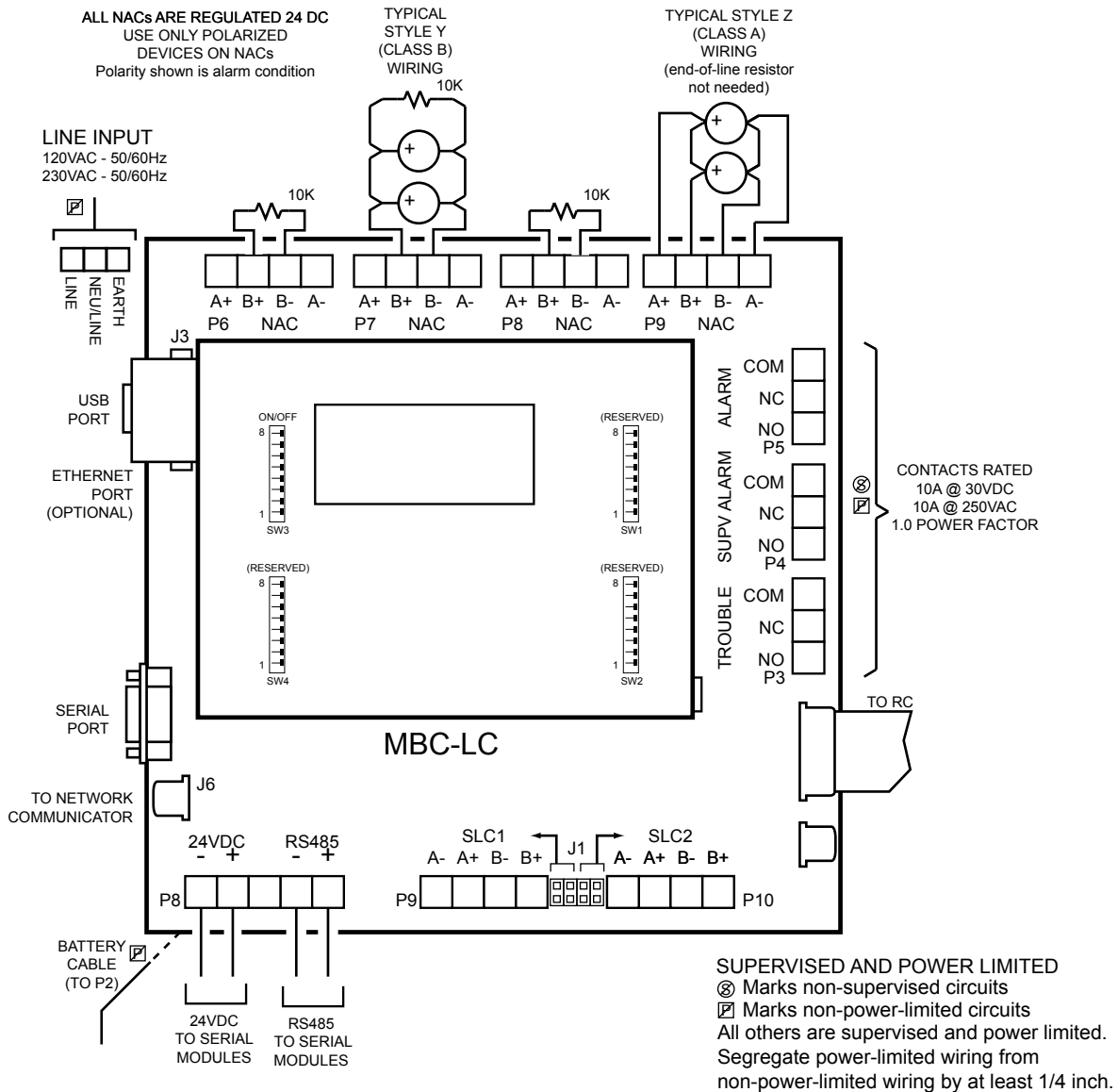


Figure 3-2: Wiring on MBC





- NOTES:
- 1) Use only smoke detectors that are listed in compatibility listing in owner's manual.
  - 2) Leave end-of-line resistors on unused circuits.
  - 3) All terminals are rated for 14-22 AWG wire unless otherwise noted.
  - 4) Combined load of all devices, including indicating appliances, is not to exceed 7A.
- 290-0119

Figure 3-3: Wiring on MBC-LC

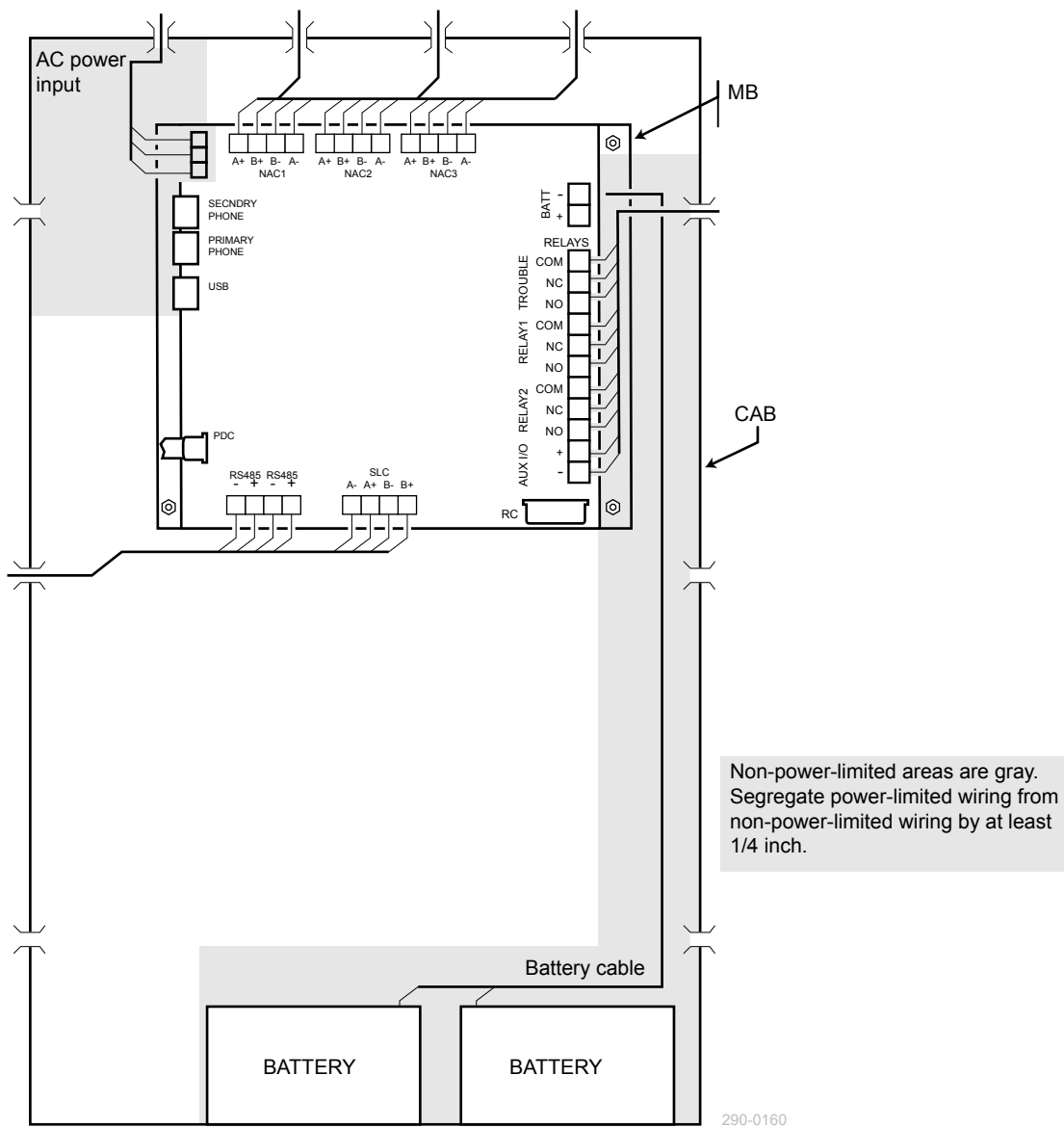


Figure 3-4: Wire routing on T1000

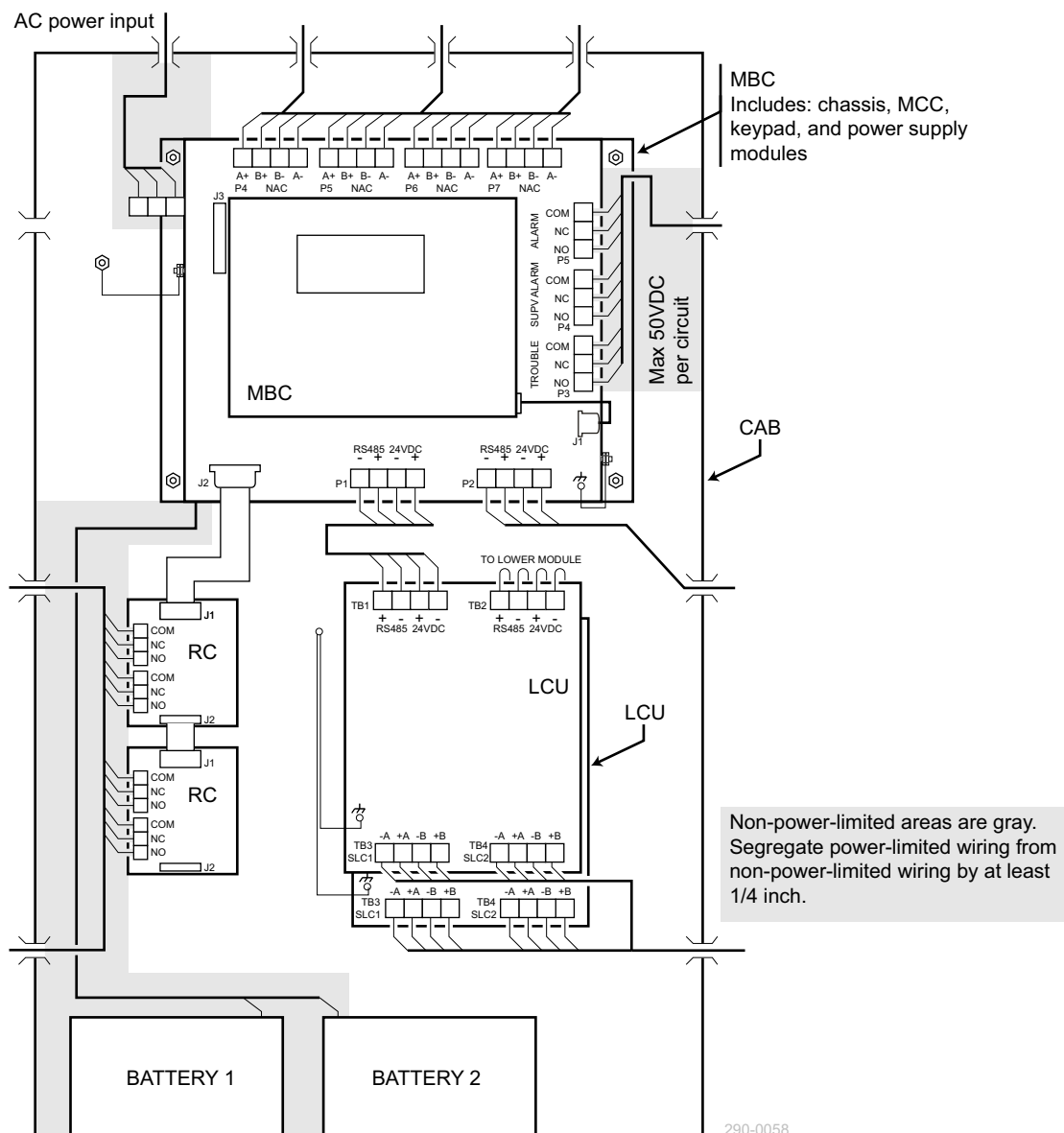


Figure 3-5: Wire routing on T8000 with LCU modules

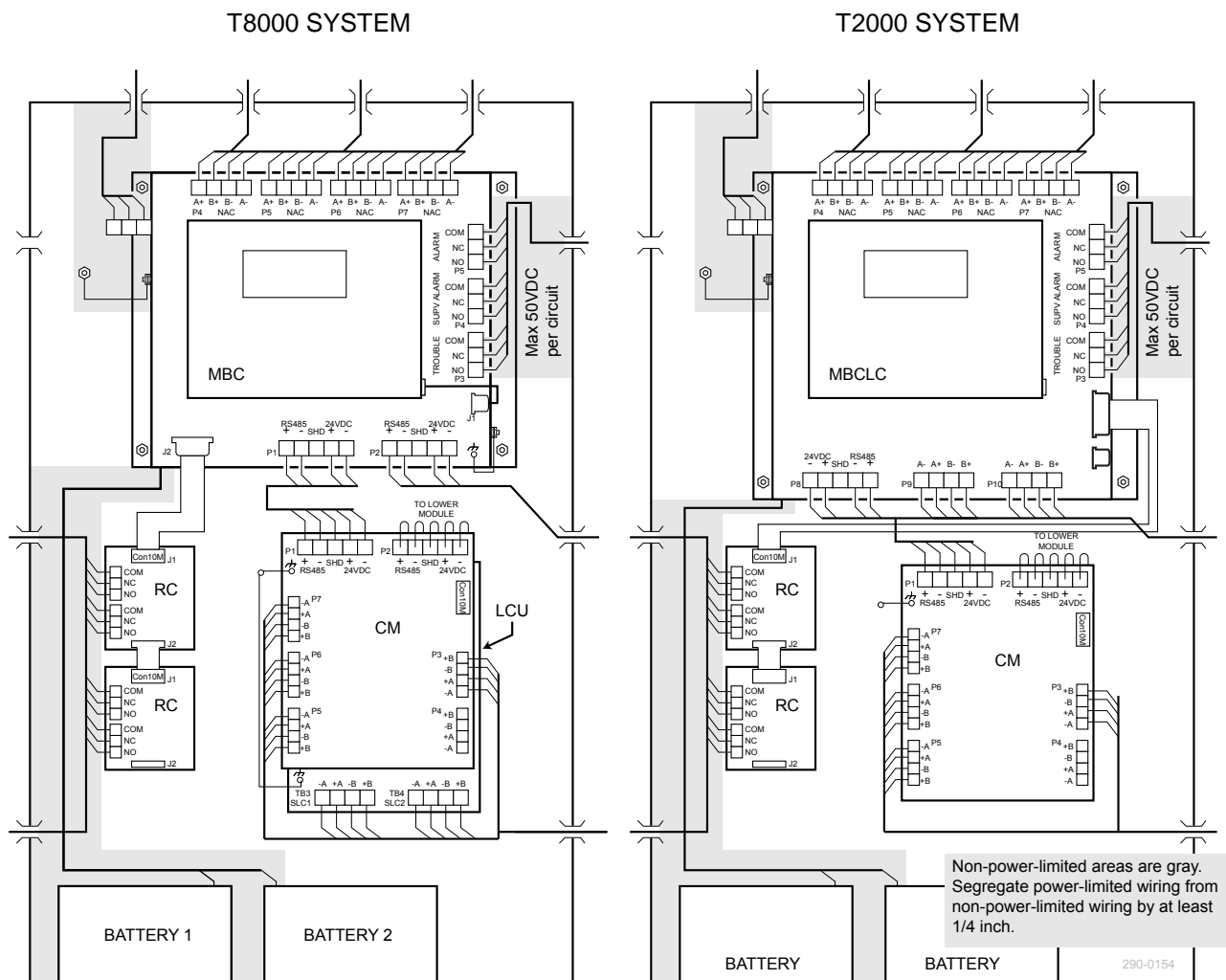
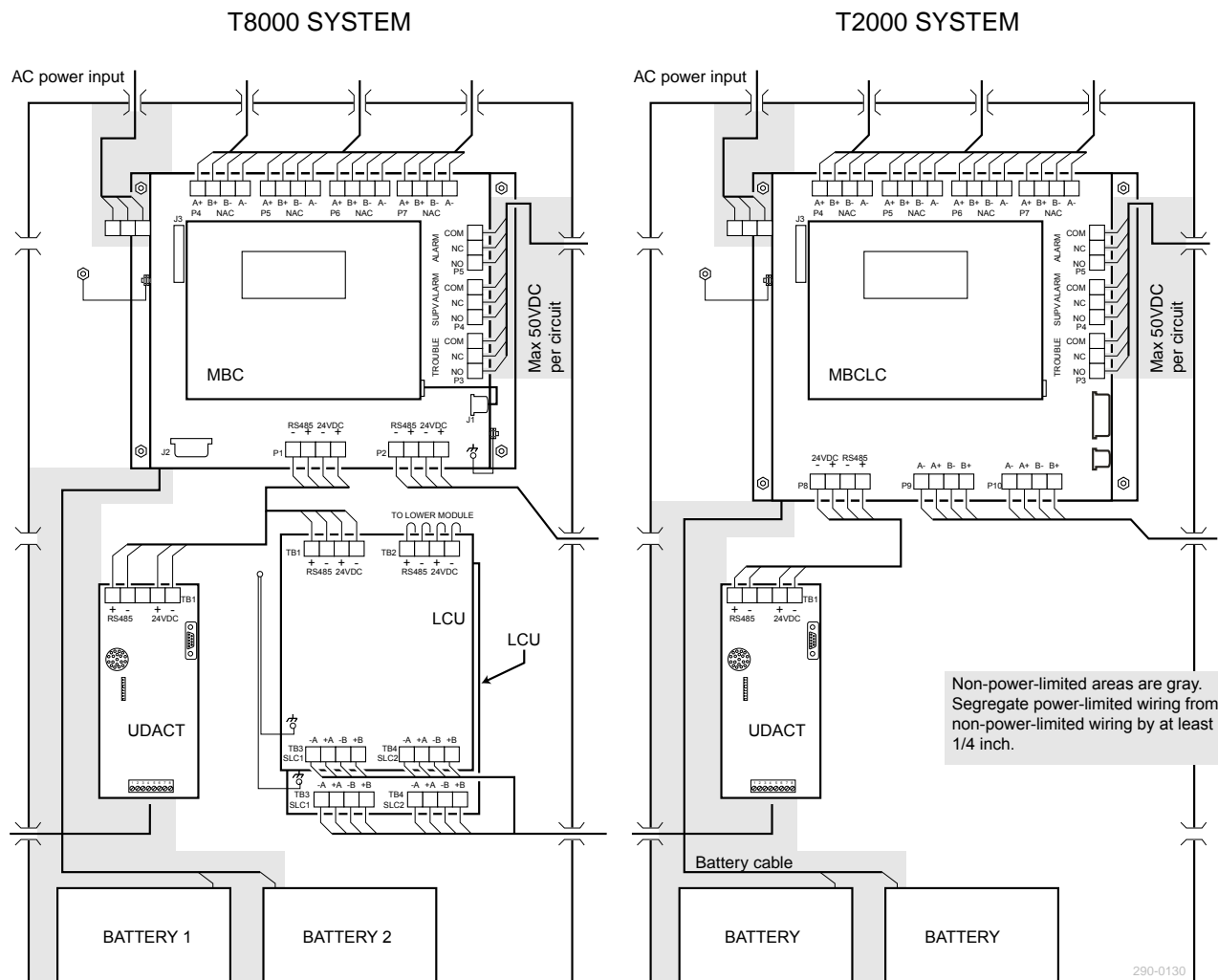


Figure 3-6: Wire routing with LCU and CM / CM



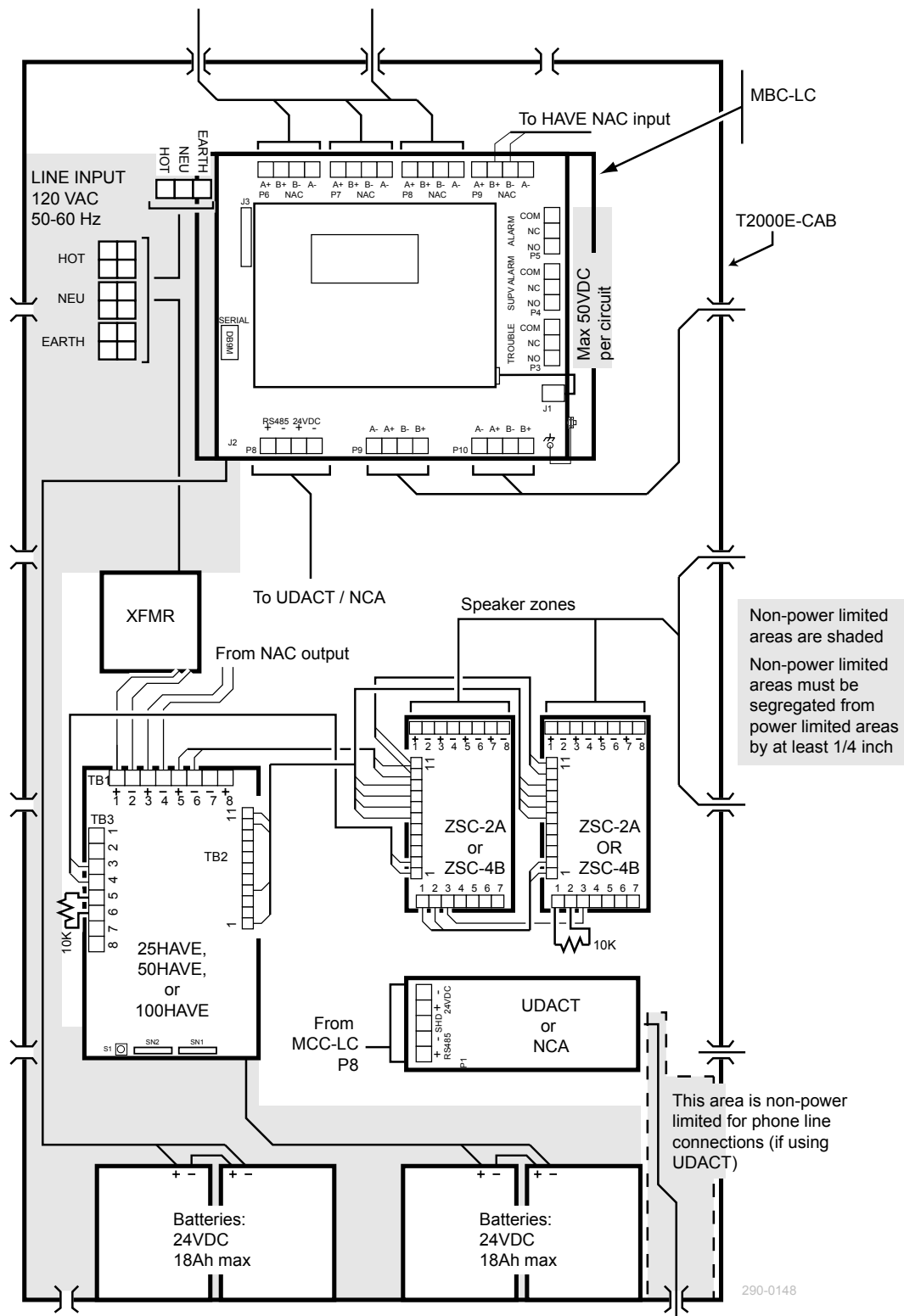


Figure 3-8: Wire routing on T2000E

# Appendix A. Ordering and Parts Information

## A.1 Component matrix

### A.1.1. Available panel configurations (factory pre-wired)

Part Number	T1-MB	T8000-MBC	T2000-MBCLC	T-PDC	T8000-LCU	T8000-CM	T8000-RC	T1-CAB	T8000-CAB or T2000-CAB	T8000-EXP	T8000-EXP5	T-UDACT
T1-P	1			1				1				
T8-P-U		1		1	1				1			
T8-P-UD		1		1	1				1			1
T8-P-2U		1		1	2				1			
T8-P-2UD		1		1	2				1			1
T8-P-C		1		1		1			1			
T8-P-CD		1		1		1			1			1
T2-P			1	1					1			
T2-P-D			1	1					1			1
T8-EXP5-R							1				1	
T8-EXP-U					1					1		
T8-EXP-2U					2					1		

### A.1.2. Board modules

Model	Description	Reference Document
T1-MB	Main board set	780-0935
T8000-MBC	Main board set	780-0862
T2000-MBCLC	Main board set	780-0929
T-PDC	Main display board	780-0936
T8000-ANN	Annunciator with T8000-RAN module in T8000-A-CAB enclosure	780-0856
T8000-RAN	Annunciator module	780-0856
T8000-LCU	Addressable SLC module	780-0921
T8000-CM	Conventional zone module	780-0859
T8000-RC	Relay module	780-0861
T8000-SRM	Serial relay module	780-0879
T8000-NCA	Communications adapter	780-0922
T-UDACT	Point DACT communicator	780-0914

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Model	Description	Reference Document
UCT	City tie/reverse polarity communicator	780-0773

### A.1.3. Enclosures

Model	Description	Reference Document
T1-CAB	Main cabinet (T1000)	780-0858
T8000-CAB	Main cabinet (T8000)	780-0858
T2000-CAB	Main cabinet (T2000)	780-0858
T2000E-CAB	Main cabinet (T2000E)	780-0858
T8000-EXP	Small expansion cabinet	780-0858
T8000-EXPD	Small expansion cabinet for UDACT	780-0858
T8000-EXP5	Large expansion cabinet	780-0858
T8000-EXP5N	Narrow expansion cabinet	780-0858
T8000-A-CAB	Annunciator cabinet	780-0858
327-0089	UCT enclosure	780-0773
HS-SBC	Small battery box	780-0855
HS-LBC	Large battery box	780-0855

### A.1.4. Accessories

Part	Description
TG-CBL-RC	Cable for T8000-RC
T-4.7K	4.7k ohm end-of-line resistor
T-10K	10k ohm end-of-line resistor



## Appendix B. Compatible Devices

### B.1 Startup delay for devices with alarm verification

The Tracker system includes an alarm verification feature that will result in a delay of the system alarm signal from the indicated circuits.

The following statement applies to installations intended to meet UL864 requirements: The total delay (control unit plus smoke detector) shall not exceed 60 seconds. No other smoke detector shall be connected to these circuits unless approved by the local authority having jurisdiction.

The following statement applies to installations intended to meet California State Fire Marshal requirements: For fire alarm verification feature (delay of fire alarm), the maximum retard/reset/restart period (control unit plus detector) must be adjusted to 30 seconds or less.

For the devices below, the delay start-up time marked on the installation wiring diagram of the smoke detector or on the installed smoke detector is to be used.

Circuits	Compatible smoke detectors with alarm verification	
LCU and MCCLC, Class A and B	Apollo	55000-550, -650, -886
	Harrington	TS8-DP, TS8-DH, TS8-DM

### B.2 Addressable SLC devices (for use with T8000-LCU, T2000-MBCLC, and T1-MB)

Each SLC circuit must use devices from a single series of compatible devices. Do not mix and match unless otherwise noted. For example, do not use System Sensor and Apollo devices on the same circuit.

The following devices below may be used together on the same SLC circuit:

- Harrington ISpy, TSpy, HSPS
- Apollo XP95, Discovery
- Air Products

#### B.2.1. System Sensor

Harrington Part No.	System Sensor Model	Description
<b>Detectors</b>		
349-0508	1551	Ion smoke detector
349-0494	2551	Photo smoke detector
349-0495	5551	Heat detector, fixed temperature
349-0646	5551R	Heat detector, rate-of-rise
349-1048	1251B	Ion smoke detector – low profile
349-1046	2251, 2251B	Photo smoke detector – low profile
349-1056	2251BR	Photo smoke detector to be used with DNR/DNRW duct smoke detector
349-1047	2251TB	Photo/thermal multicriteria detector (Acclimate)
349-1071	2251TMB	Photo/thermal multicriteria detector (Acclimate)
349-1049	5251B	Fixed temperature heat detector, 135°
349-1059	5251H	Fixed temperature heat detector, 190°

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Harrington Part No.	System Sensor Model	Description
349-1050	5251RB 5251P 5251RP	Rate-of-rise heat detector
349-1055	DH200RPL	Duct smoke detector, photoelectric
349-1057	DH200PL	Duct smoke detector with auxiliary relay contacts
BEAM200, 200S	BEAM200, 200S	Beam smoke detector
DNR	DNR, DNRW	Duct smoke detector (use with 2251BR head)
<b>Bases</b>		
349-0496	B501B	Addressable analog detector base
349-0525	B501BH, B501BH-2	Addressable analog detector base w/sounder
349-1023	B501BHT, B501BHT-2	Addressable analog detector base w/sounder, temporal
349-0757	B210LP	Base, low profile
349-0647	B224RB	Relay base
349-0856	B224BI	Isolator base
	B200SR	Sounder base
<b>Accessories</b>		
349-0667	M502M	Conventional zone interface module*
349-1069	CZ-6	Conventional zone interface module, 6 zones*
349-0509	M500M, M500MB	Input module
349-0497	M501M	Input module, miniature
349-1020	M500DM	Input module, 2 inputs
349-1068	IM-10	Input module, 10 inputs
349-1021	M500S	Supervised output module
349-1067	SC-6	Supervised output module, 6 outputs
349-1022	M500R	Relay module
349-1066	CR-6	Relay module, 6 relays
349-0511	M500X, M500XB	Isolator module

\* Refer to manufacturer's documentation for compatible 2-wire detectors

### B.2.2. Harrington Signal

#### ISpy Series

Harrington Part No.	Harrington Signal Model	Series	Description
<b>Detectors</b>			
	IS800	ISpy	Heat detector (Apollo Discovery)
	IS801	ISpy	Ion smoke detector (Apollo Discovery)
	IS802	ISpy	Photo smoke detector (Apollo Discovery)
	IS803	ISpy	Photo/heat multicriteria detector (Apollo Discovery)

Harrington Part No.	Harrington Signal Model	Series	Description
<b>Bases</b>	IS818	ISpy	Beam smoke detector
	IS804	ISpy	4" mounting base
	IS805	ISpy	Short-circuit isolator mounting base
	IS806	ISpy	6" mounting base
	IS807	ISpy	6" low profile mounting base
	IS808	ISpy	4" low power relay mounting base
	IS809	ISpy	E-Z fit mounting base
	IS821	ISpy	6" mounting base
<b>Accessories</b>	IS810	ISpy	Short-circuit Isolator
	IS811	ISpy	Switch monitor module
	IS812	ISpy	Priority switch monitor module
	IS813	ISpy	Switch monitor input-output module
	IS814	ISpy	Sounder control module
	IS815	ISpy	Mini switch monitor unit
	IS816	ISpy	Mini priority switch monitor module

## TSpy Series

Harrington Part No.	Harrington Signal Model	Series	Description
<b>Detectors</b>	TS8-DP*	TSpy	TSpy photo smoke detector
	TS8-DH*	TSpy	TSpy photo heat detector
	TS8-DM*	TSpy	TSpy photo/heat multicriteria detector
<b>Bases</b>	TS8-B4	TSpy	TSpy 4" base
	TS8-B6	TSpy	TSpy 6" base

\* A remote LED is included. Installation of the LED is optional.

## HSPS Series

Harrington Part No.	Harrington Signal Model	Description
<b>Pullstations</b>		
238-5001	HSPS-1T-S	Addressable Single action pull station (HSPS-1T) with System Sensor M501M
238-5002	HSPS-1T-A	Addressable Single action pull station (HSPS-1T) with Apollo 55000-765
238-5003	HSPS-1T-KL-S	Addressable Key Lock pull station (HSPS-1T-KL) with System Sensor M501M
238-5004	HSPS-1T-KL-A	Addressable Key Lock pull station (HSPS-1T-KL) with Apollo 55000-765

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**B.2.3. Apollo**

Harrington Part No.	Apollo Model No.	Series	Description
<b>Detectors</b>			
55000-450	55000-450	XP95	Heat detector
55000-550	55000-550	XP95	Ion smoke detector
55000-650	55000-650	XP95	Photo smoke detector
	55000-266	XP95	Beam detector
55000-886	55000-886	XP95	Photo/heat multicriteria detector
	58000-450	Discovery	Heat detector
	58000-550	Discovery	Ion smoke detector
	58000-650	Discovery	Photo smoke detector
	58000-750	Discovery	Photo/heat multicriteria detector
<b>Bases</b>			
	45681-210	XP95	4" mounting base
	45681-211	XP95	Short-circuit isolator mounting base
	45681-225	XP95	6" mounting base
	45681-234	XP95	6" low profile mounting base
	45681-242	XP95	4" low power relay mounting base
	45681-250	XP95	E-Z fit mounting base
	45681-321	XP95	Short-circuit isolating mounting base
	45681-261	XP95	Sounder base
	45681-259	XP95	Sounder base
<b>Accessories</b>			
	55000-750	XP95	Short-circuit isolator
	55000-805	XP95	Switch monitor module
	55000-806	XP95	Priority switch monitor module
	55000-820	XP95	Switch monitor input-output module
	55000-825	XP95	Sounder control module
	55000-831	XP95	Mini switch monitor unit
	55000-830	XP95	Mini priority switch monitor module
	55000-790	XP95	Dual monitor module
	55000-863	XP95	Dual relay module
	55000-765	XP95	Micro monitor module

**B.2.4. Air Products**

Harrington Part No.	Apollo Model No.	Description
<b>Detectors</b>		
	SL-DAA-N	2 wire addressable ion duct detector
	SL-DAA-P	2 wire addressable photo duct detector

Harrington Part No.	Apollo Model No.	Description
<b>Bases</b>	RW-AA-N	2 wire addressable ion duct detector
	RW-AA-P	2 wire addressable photo duct detector
	MB-SDR-XP95	Sounder base
	MB-SDRT-AA	Sounder base
	MB-RLY-XP95	Relay base
	MB-RLYT-AA	Relay base
<b>Accessories</b>		
	MB-SDRT-SM	Synchronization module for sounder and relay bases

### B.3 Conventional two-wire smoke detectors (for use with T8000-CM)

#### B.3.1. *Harrington Signal*

##### C-Spy Series

Max No. Detectors Per Zone	Harrington Model	Description
Detectors*		
31	CS822	C-Spy photo smoke detector
31	CS823	C-Spy ion smoke detector
28	CS824	C-Spy 135F heat detector with flashing LED and reed switch
28	CS825	C-Spy 170F heat detector
28	CS826	C-Spy 200F intermediate heat detector
Bases*		
	CS831 -200	C-Spy standard base
	CS832 -251	C-Spy 6" E-Z fit base
	CS827 -255	C-Spy standard relay base
	CS828 -256	C-Spy auxiliary relay base
	CS829 -257	C- Spy end-of line 12V relay base
	CS830 -258	C- Spy end-of-line 24V relay base

\* The compatibility identifier is the same as the model number

\*\* Any C-Spy detector can be used on any C-Spy base

Max No. Detectors Per Zone	Detector Model	Detector Identifier	Base Model	Base Identifier
25	H511C	S10A	N/A	N/A
	H511CXT	S11A	N/A	N/A

#### B.3.2. *Apollo*

Max No. Detectors Per Zone	Apollo Model	Description
Detectors*		

Max No. Detectors Per Zone	Apollo Model	Description
25**	55000-150	Series 60A heat detector - low (115F)
	55000-151	Series 60A heat ordinary (160F)
	55000-152	Series 60A heat intermediate (210F)
	55000-153	Series 60A heat ordinary (135F)
	55000-250	Series 60A ion smoke detector
	55000-350	Series 60A photo smoke detector
28***	55000-380	Series 60A photo/heat multicriteria detector
	55000-138	Series 65A heat detector 135F – ordinary - flashing LED / reed switch
	55000-139	Series 65A heat detector 135F – ordinary - flashing LED
	55000-140	Series 65A heat detector 135F – ordinary - standard
	55000-141	Series 65A heat detector 170F – ordinary - flashing LED / reed switch
	55000-142	Series 65A heat detector 170F – ordinary - flashing LED
	55000-143	Series 65A heat detector 170F – ordinary - standard
	55000-144	Series 65A heat detector 200F – intermediate - flashing LED / reed switch
	55000-145	Series 65A heat detector 200F – intermediate - flashing LED
	55000-146	Series 65A heat detector 200F – intermediate - Standard
31***	55000-225	Series 65A ion detector – flashing LED / reed switch
	55000-226	Series 65A ion detector – flashing LED
	55000-227	Series 65A ion detector – standard
19***	55000-325	Series 65A photo detector – flashing LED / Reed Switch
	55000-326	Series 65A photo detector – flashing LED
	55000-327	Series 65A photo detector – standard
	55000-328	Series 65A photo detector – high sensitivity flashing LED / reed switch
Bases*		
	45681-200	Series 60A 4" mounting base
	45681-220	Series 60A 6" mounting base
	45681-227	Series 60A 6" relay mounting base
	45681-230	Series 60A 6" mounting base with red flashing LED
	45681-231	Series 60A 6" mounting base with green flashing LED
	45681-232	Series 60A 6" low profile mounting base
	45681-251	Series 60A E-Z fit mounting base
	45681-252	Series 60A E-Z fit mounting base with flashing LED
	45681-255	Series 65A 4" relay mounting base
	45681-256	Series 65A 4" auxiliary relay mounting base
	45681-257	Series 65A 4" 12v eol mounting base
	45681-258	Series 65A 4" 24v eol mounting base

\* The compatibility identifier is the same as the model number

\*\* Use with the following bases: 45681-200, -220, -227, -230, -231, -232

\*\*\* Use with the following bases: 45681-200, -220, -227, -230, -231, -232, -251, -252, -255, -256, -257, -258

**B.3.3. ESL/Sentrol**

Max No. Detectors Per Zone	Detector Model	Detector Identifier	Base Model	Base Identifier
25	429C, 521B, 521CRXT	S10A	N/A	N/A
	429CRT, 429CSST, 429CST	S11A	N/A	
25	711U, 711UT, 712U	S10A	702, 702E, 701U, or 701E	S00
	713-5U, 713-6U	S10A	701U, 702U, or 702E	
	721U, 721UD, 721UT, 722U, 731UD	S10A	702U or 702E	
	731U, 732U	S11A	702, 702E, 701RU, or 701RE	

**B.3.4. System Sensor**

Max No. Detectors Per Zone	Detector Model	Detector Identifier	Base Model	Base Identifier
20	1400, 2400, 2400TH	A	N/A	N/A
	1451, 2451, 2451TH	A	B401B	A
25	2W-B, 2WT-B	A	N/A	N/A

**B.4 Releasing devices (for use with a NAC on MB / MBC / MBCLC)**

Refer to the installation document 780-0930 for proper wiring of releasing devices to the NAC.

Manufacturer	Models	Description	Electrical rating
Asco	8210A107 series	1/2 in. NPS, 5/8 in. orifice	16.8 Watts (700mA @ 24Vdc)
Asco	8210G207 series	1/2 in. NPS, 1/2 in. orifice	10.6 Watts (440mA @ 24Vdc)
Parker Hannifin (Skinner)	73212 series	1/4 to 1 in. NPT, 1/4 to 1 in. orifice	10 Watt (420mA @ 24Vdc)
Parker Hannifin (Skinner)	73218 series	3/8 to 1-1/4 in. NPT, 1/2 to 1-1/8 in. orifice	10 Watt (416 mA @ 24Vdc)
Viking	11591, 11592, 11595, 11596	1/2 in. NPT, 9/16 in. orifice	10 Watt (416 mA @ 24Vdc)
Viking	11601, 11602	1/2 in. NPT, 5/8 in. orifice	9 Watt (338 mA @ 24Vdc)
Viking	13215	1/2 in. NPT, 5/8 in. orifice	9 Watt (338 mA @ 24Vdc)
Viking	13843, 13844	1/2 in. NPT, 5/8 in. orifice	2 Watt (250 mA @ 24Vdc)

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## Appendix C. Wire Selection

### C.1 General wiring guidelines

Induced noise (transfer of electrical energy from one wire to another) can interfere with the communication and may cause false alarms. To avoid induced noise, follow these guidelines:

- Isolate input wiring from high current output and power wiring. Do not pull one multi conductor cable for the entire panel. Instead, separate the wiring as follows:
  - High voltage
  - Notification appliance Circuits (NAC)
  - Signal Line Circuits (SLC)
  - Network circuits
  - Relay circuits
- Do not pull wires from different zones through the same conduit. If you must run them together, do so for as short a distance as possible or use shielded cable. Connect the shield to the terminal earth (RS485 terminal) at the panel. You must route high and low voltages separately.
- Route the wiring around the inside perimeter of the cabinet. It should not cross the circuit board where it could induce noise into the sensitive microelectronics or pick up unwanted RF noise from the high speed circuits.
- High frequency noise, such as that produced by the inductive reactance of a speaker or bell, can be reduced by running the wire through ferrite shield beads or by wrapping it around a ferrite.
- “T-tapping” and “starring” are not recommended.

### C.2 Wire length calculations

**Note:** *These calculations account for cable resistance only. Refer to the ratings of the source circuit and installed devices to determine other parameters that may need to be considered.*

The equation below can be used to estimate maximum recommended wiring distances. The equation assumes all of the load is at the end of the line, which is true for a single device load, but is a worst-case scenario if you have many devices. The best case scenario, devices distributed evenly along the entire length of the wire, results in twice the available length than the worst case scenario. A typical configuration has a segment with no devices followed by a segment loaded with devices. The wire length for the typical job will be somewhere between the worst case and the best case.

#### Eq. C-1 Worst case wire length, simple form

$$\text{Length}_{w.c.} = \frac{V_{\text{drop}}}{I_{\text{draw}} \times (R_{\text{cable}} \times DF2)}$$

$\text{Length}_{w.c.}$  is the worst case length of wire (distance from panel) in feet

$V_{\text{drop}}$  is the maximum voltage drop in volts. Use 2.4 to assume 10% voltage drop on a 24V circuit.

$I_{\text{draw}}$  is the total current draw of the circuit in Amps

$R_{\text{cable}}$  is the total resistance of the cable in ohms

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**Eq. C-2 Worst case wire length, general form (for SLC circuits)**

$$\text{Length\_w.c.} = \frac{\text{Vdrop}}{\text{Idraw} \times \{ \text{Rpanel} + (\text{Rcable} \times \text{DF2}) + (\text{Rdevices} \times \text{DF2}) \}}$$

Length\_w.c. is the worst case length of wire (distance from panel) in feet

Vdrop is the maximum voltage drop in volts. Use 2.4 to assume 10% voltage drop on a 24V circuit.

Idraw is the total current draw of the circuit in Amps

Rpanel is the resistance of the circuit internal to the panel, in ohms. Use 0 if unknown.

Rdevices is the total internal resistance of the devices (usually isolators), in ohms. Use 0 if unknown.

Rcable is the total resistance of the cable in ohms

Equation Eq. C-3 calculates the voltage drop of a cable run having devices evenly distributed on the cable, following a run with no devices. The voltage drop must not exceed the allowable voltage drop of devices installed on the circuit, i.e. the voltage supplied to a device must be above the minimum input voltage for the device.

$$\text{Eq. C-3} \quad \text{Vdrop} = \text{Idraw} \times \{ \text{Rpanel} + (\text{Rcable} \times \text{DF2}) + (\text{Rdevices} \times \text{DF2}) \}$$

$$\text{Eq. C-4} \quad \text{Rcable} = 2 \times \text{Rwire} \times 1000 \times \text{Ltotal}$$

$$\text{Eq. C-5} \quad \text{DF2} = \frac{\text{Lfirst}}{\text{Ltotal}} + \frac{(\text{Ltotal} - \text{Lfirst}) \times \text{DF1}}{\text{Ltotal}}$$

$$\text{Eq. C-6} \quad \text{DF1} = \frac{\text{Number of devices} + 1}{\text{Number of devices} \times 2}$$

Vdrop is the maximum voltage drop in volts

Rwire is the resistance of the wire in ohms per 1000 ft (see Table C-1)

Idraw is the total current draw of the circuit in Amps

Ltotal is the length of wire (distance from panel) in feet

Lfirst is the length of wire to the first device (distance from panel) in feet

**Table C-1: Resistance of Solid Copper Wire**

Wire gauge (AWG)	Resistance (ohms per 1000 ft)
18	6.39
16	4.02
14	2.52
12	1.59

\* Values are for uncoated copper at 20°C (68°F) and are only applicable within certain parameters, especially temperature. Not all parameters are shown here for simplicity. Refer to NEC Chapter 9, Table 8 for additional information.

### C.3 Wire selection tables

**NOTE:** All wire lengths below assume the use of solid copper wire and worst case loading (all load at the end of the wire run). The length shown is based on resistance, capacitance and/or voltage drop only. Other parameters may need to be considered, as well.

**Table 3-2: Wire Lengths for powering devices (worst case)\***

Load (A)	Maximum distance to farthest point (ft)			
	18 AWG	16 AWG	14 AWG	12 AWG
0.10	1878	2984	4753	7561
0.25	751	1194	1901	3024
0.50	376	597	951	1512
0.75	250	398	634	1008
1.00	188	298	475	756
1.25	150	239	380	605
1.50	125	199	317	504
1.75	107	171	272	432
2.00	94	149	238	378
2.25	83	133	211	336
2.50	75	119	190	302
2.75	68	109	173	275
3.00	63	99	158	252

\* The result is for the worst case loading. Best case loading allows the cable to be twice as long, considering resistance only. These values were obtained using Eq. C-1 with a maximum voltage drop of 2.4V

**Table 3-3: Wire Lengths for powering T8000 devices\***

Module	Voltage drop (V)	Load (mA)	Maximum distance to device (ft)			
			18 AWG	16 AWG	14 AWG	12 AWG
RAN / ANN	6	80	5869	9325	14854	23627
LDV	6	TBD	TBD	TBD	TBD	TBD
LCU	4.6	1150	313	497	792	1260
CM (one zone)	6	54	8695	13815	22006	35004
CM (five zones)	6	214	2194	3486	5553	8833
SRM	6	230	2041	3244	5167	8218

\* These distances are valid if only one device is powered by the cable. If more than one device is connected to the cable, the distance must be based on the voltage drop at each device. Other considerations may also apply. These values were obtained using Eq. C-1 with a maximum voltage drop and current draw as specified for each device.

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**Table 3-4: Wire Lengths for SLC**

	Units	18 AWG	16 AWG	14 AWG	12 AWG
Part number of cable referenced for ratings	Belden	9571	9572	9580	9582
Resistance rating of cable	ohm/kFT	6.3	4.1	2.5	1.6
Capacitance rating of cable	pF/ft	22	29	27	30
Max distance, resistance candidate (worst case)	ft	7937	12195	20000	31250
Max distance, resistance candidate (best case)	ft	15873	24390	40000	62500
Max distance, capacitance candidate	ft	22727	17241	18519	16667
Max distance (worst case load distribution)	ft	7937	12195	18519	16667
Max distance (best case load distribution)	ft	15873	17241	18519	16667
Allowable loop current (worst case)	mA	46.30	46.30	49.71	81.52
Allowable loop current (best case)	mA	46.30	63.54	92.09	144.23

Resistance-based distance calculations were performed by using Eq. C-2 with  $R_{panel} = 8$ ,  $R_{devices} = 0$   
 Loop current calculations were performed by using Eq. C-3, with  $V_{drop} = 5$  and solving for  $I_{draw}$

**Table 3-5: Wire Lengths for Local RS485**

	Units	18 AWG	16 AWG	14 AWG	12 AWG
Part number of cable referenced for ratings	Belden	9571	9572	9580	9582
Resistance rating of cable	ohm/kFT	6.3	4.1	2.5	1.6
Capacitance rating of cable	pF/ft	22	29	27	30
Max distance, resistance candidate (worst case)	ft	7937	12195	20000	31250
Max distance, resistance candidate (best case)	ft	15873	24390	40000	62500
Max distance, capacitance candidate	ft	13636	10345	11111	10000
Max distance, wavelength candidate	ft	25614	25614	25614	25614
Max distance (worst case load distribution)	ft	7937	10345	11111	10000
Max distance (best case load distribution)	ft	13636	10345	11111	10000

Many factors are involved with communication circuits. Special considerations may need to be made for any specific job, especially if these distances are exceeded.

Resistance-based distance calculations were performed by using Eq. C-1

Wavelength candidates are based on 25% of the wavelength of the circuit's operating frequency, 9600 baud

**Table 3-6: Wire Lengths for Panel Network RS485**

	Units	18 AWG	16 AWG	14 AWG	12 AWG
Part number of cable referenced for ratings	Belden	9571	9572	9580	9582
Resistance rating of cable	ohm/kFT	6.3	4.1	2.5	1.6
Capacitance rating of cable	pF/ft	22	29	27	30
Max distance, resistance candidate (worst case)	ft	7937	12195	20000	31250
Max distance, resistance candidate (best case)	ft	15873	24390	40000	62500
Max distance, capacitance candidate	ft	6818	5172	5556	5000
Max distance, wavelength candidate	ft	4269	4269	4269	4269
Max distance (worst case load distribution)	ft	4269	4269	4269	4269
Max distance (best case load distribution)	ft	4269	4269	4269	4269

Many factors are involved with communication circuits. Special considerations may need to be made for any specific job, especially if these distances are exceeded.

Resistance-based distance calculations were performed by using Eq. C-1

Wavelength candidates are based on 25% of the wavelength of the circuit's operating frequency, 57600 baud

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## Appendix D. Battery Capacity Calculation

A	B	C	D	E	F
	QUANTITY OF DEVICE/ MODULE	STANDBY CURRENT (Amps)	MAXIMUM ALARM CURRENT (Amps)	TOTAL STANDBY CURRENT (Amps)	TOTAL ALARM CURRENT (Amps)
<b>SYSTEM COMPONENTS</b>					
T1-MB and PDC	1	0.190	0.211	0.190	0.211
T2000-MBCLC and PDC	1	0.155	0.21	0.155	0.21
T8000-MBC and PDC	1	0.155	0.21	0.155	0.21
<b>SERIAL DEVICES</b>					
T8000-LCU Addressable loop module	1	0.065	0.070	0.065	0.070
T8000-CM Conventional zone module		0.11	0.14		
T8000-ANN/-RAN Remote annunciator		0.03	0.04		
T8000-RC Two relay module		0.002	0.05		
<b>DETECTORS</b>					
ISpy IS800 58000-450 Heat detector		0.000 35			
ISpy IS801 58000-550 Ion smoke detector		0.000 38			
ISpy IS802 58000-650 Photo smoke detector		0.000 44			
ISpy IS803 58000-886 Multi detector		0.000 47			
55000-450 XP95A Heat detector		0.000 25			
55000-550 XP95A Ion smoke detector		0.000 28			
55000-650 XP95A Photo smoke detector		0.000 34			
55000-266 XP95A Beam detector		0.0165			
55000-886 XP95A Multi detector		0.000 47			
C-Spy, S60 and S65 Conventional (avg current)		0.0001			
<b>MODULES</b>					
ISpy IS810 55000-750 Short circuit isolator		0.000 12			
ISpy IS811 55000-805 Switch monitor module		0.0006			
ISpy IS812 55000-806 Priority switch monitor module		0.0006			
ISpy IS813 55000-820 Switch monitor in/out module		0.000 85			
ISpy IS814 55000-825 Sounder control module		0.001			
ISpy IS816 55000-831 Mini switch monitor module		0.0006			
ISpy IS815 55000-830 Mini priority switch mon mod		0.0006			
<b>Detectors and Modules LED ON current</b>					
A) Detectors and modules, total number					
B) Estimated LED-ON number $= (0.05 \times A)$					
C) Alarm current LED = 0.0035 Amps					
D) Total alarm LED ON current $= (B \times C)$					
<b>NOTIFICATION APPLIANCES</b>					
Other -NAC #1, 3 Amps maximum					
Other -NAC #2, 3 Amps maximum					
Other -NAC #3, 3 Amps maximum					
Other -NAC #4, 3 Amps maximum					
<b>Maximums are subject to total available</b>					
<b>TOTAL CURRENT (Amps)</b>					

	UNITS	FORMULA	RESULT
a) Standby current	Amps	a	
b) Standby time (24 or 60 hours)	hours	b	
c) Standby requirement (demand)	Ah	a x b	
d) Alarm current	Amps	d	
e) Alarm time (5 min = 0.0833, 10 min = 0.167)	hours	e	
f) Alarm requirement (demand)	Ah	d x e	
g) Battery backup capacity (supply)	Ah	c + f	
h) Safety factor	Ah	g x 0.1	
i) Minimum battery size required	Ah	g + h	
<b>REQUIRED BATTERY SIZE</b>	Ah		

Service	Standby Time	Alarm Time	Max Standby	Max Alarm	Max Battery Size
Local	24 hours	5 min	1.5A	7A for MBC 7A for MBCLC 4A for MB	40Ah
Central Station	24 hours	5 min	1.5A		40Ah
Proprietary	24 hours	5 min	1.5A		40Ah
Remote Station	60 hours	5 min	0.6A		40Ah
Auxiliary	60 hours	5 min	0.6A		40Ah



**Harrington Signal Inc.**

2519 4<sup>th</sup> Ave., P.O. Box 590, Moline, IL 61265

(800) 577-5758 • (309) 762-0731 • FAX (309) 762-8215

[www.harringtonfire.com](http://www.harringtonfire.com)