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Assembly A84162-001 Rev. C

Part Number P84116 Rev. E

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# Typographical Notation Conventions

Thank you for using our products. Use this product according to this instruction manual. Please keep this instruction manual for future reference.


**ANY MATERIAL EXTRAPOLATED FROM THIS DOCUMENT OR FROM WHEELLOCK MANUALS OR OTHER DOCUMENTS DESCRIBING THE PRODUCT FOR USE IN PROMOTIONAL OR ADVERTISING CLAIMS, OR FOR ANY OTHER USE, INCLUDING DESCRIPTION OF THE PRODUCT'S APPLICATION, OPERATION, INSTALLATION AND TESTING IS USED AT THE SOLE RISK OF THE USER AND WHEELLOCK WILL NOT HAVE ANY LIABILITY FOR SUCH USE.**

Certain information contained in this manual has been extracted from the NFPA 72 Manual (1999 Edition) and the Life Safety Code 101™ Manual (2000 Edition).

## Notation Conventions

This manual uses the following notation conventions:

 **WARNING:** INDICATES A POTENTIALLY HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN PROPERTY DAMAGE AND SERIOUS PERSONAL INJURY OR DEATH TO YOU AND OR OTHERS.

 **CAUTION:** Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

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# Table of Contents

Typographical Notation Conventions.....	iii
Table of Contents.....	v
Table of Figures.....	vii
Table of Tables.....	viii
Chapter 1 – Safety Precautions.....	1-1
Section 1-1 – Read This Manual.....	1-1
Section 1-2 – Operational Safety.....	1-1
Section 1-3 – Compliance with Applicable Codes, Regulations, Laws, Standards, And Guidelines.....	1-2
Section 1-4 – Property Insurance Recommendation.....	1-2
Section 1-5 – Audio Output Considerations.....	1-2
Section 1-6 – RF Interference.....	1-3
Section 1-7 – General.....	1-3
Chapter 2 – Overview and Features.....	2-1
Section 2-1 - Description.....	2-1
Section 2-2 – Enclosure and Configuration.....	2-3
Section 2-3 – Nominal Electrical Data.....	2-3
Section 2-4 – Operation Modes.....	2-4
Chapter 3 – Installation and Setup.....	3-1
Section 3-1 – Introduction.....	3-1
Section 3-2 – Fire Alarm Control Panel Wiring Applications.....	3-1
Section 3-3 – General Installation Instructions.....	3-1
⚠ See warning concerning BGM source on page 3-7.	
Section 3-5 – Mounting.....	3-14
Section 3-6 – System Checkout.....	3-16
Section 3-7 – Ground Fault Detection Sensitivity Adjustment.....	3-20
Section 3-8 – Battery Care and Backup Battery Calculations.....	3-20
Section 3-9 – AC Power and Battery Installation Procedures.....	3-21
Chapter 4 – Operation.....	4-1
Section 4-1 – Introduction.....	4-1
Section 4-2 – Operator’s Console.....	4-1
Section 4-3 – Supervision.....	4-1
Section 4-4 – Actions That Initiate Alarms.....	4-2
Chapter 5 – Operational Procedures.....	5-1
Section 5-1 – Operator Instructions.....	5-1
Section 5-2 – To Make Live Announcements.....	5-1
Section 5-3 – To Record Digital Voice Messages.....	5-1

Chapter 6 – Periodic Testing and Maintenance.....	6-1
Section 6-1 – Introduction.....	6-1
Section 6-2 – Periodic Testing.....	6-1
Section 6-3 – Faulty Equipment.....	6-1
Section 6-4 – Qualified Personnel.....	6-1
Section 6-5 – Miscellaneous Hardware Testing.....	6-1
Chapter 7 – Troubleshooting.....	7-1
Section 7-1 Introduction.....	7-1
Section 7-2 Troubleshooting.....	7-1
Section 7-3 <b>SP40/2</b> Panel Wiring Diagram.....	7-7
Chapter 8 – Technical Data.....	8-1
Section 8-1 – Mechanical.....	8-1
Section 8-2 – Environmental.....	8-1
Section 8-3 – Electrical.....	8-1
Chapter 9 – Module Descriptions.....	9-1
Section 9-1 – Introduction.....	9-1
Section 9-2 <b>SP40/2</b> Motherboard .....	9-3
Chapter 10 – Warranty.....	10-1
Battery Backup Calculation Sheet.....	11

# List of Figures

Figure 2-1 Basic Capabilities of the <b>SP40/2</b> Panel.....	2-4
Figure 2-2 Layout of a <b>SP40/2</b> Panel.....	2-5
Figure 3-1 Location of Wire Connections.....	3-2
Figure 3-2 Removable Terminal Block.....	3-4
Figure 3-3 Strobe Input and Output Connections.....	3-5
Figure 3-4 Audio Output Connections.....	3-5
Figure 3-5 Digital Voice Initiating Connections.....	3-6
Figure 3-6 Ancillary Audio Input Connections.....	3-7
Figure 3-7 Alarm and Trouble Connections.....	3-8
Figure 3-8 Wiring Diagram for Visual Only Notification Appliances.....	3-11
Figure 3-9 Wiring Diagram for Combination Audio/Visual Notification Appliances.....	3-11
Figure 3-10 Wiring Diagram for Audio Only Notification Appliances.....	3-11
Figure 3-11 Alarm Relay Contacts.....	3-13
Figure 3-12 Trouble Status Relay Contacts.....	3-13
Figure 3-13 Input Power and Battery Connection Locations.....	3-14
Figure 3-14 <b>SP40/2</b> Panel Mounting and Grounding Location.....	3-15
Figure 3-15 Jumper/Switch/Variable Resistor Location.....	3-16
Figure 3-16 120VAC Input connection.....	3-22
Figure 3-17 Battery Wire Connections.....	3-23
Figure 3-18 Battery Alignment and Jumper Connection.....	3-24
Figure 5-1 Digital Voice Section.....	5-3
Figure 5-2 <b>SP40/2</b> Panel Operator Console.....	5-4
Figure 7-1 Trouble LED and Fuse Locations.....	7-2
Figure 7-2 <b>SP40/2</b> Panel Wiring Diagram.....	7-8
Figure 9-1 <b>SP40/2</b> Motherboard.....	9-2

# LIST OF TABLES

Table 3-1 Terminal Connection Definitions.....	3-3
Table 3-2 Jumper/Switch/Variable Resistor Functions.....	3-17
Table 3-3 Digital Voice Message Tests.....	3-19
Table 4-1 Alarm Conditions and Results.....	4-2
Table 6-1 Miscellaneous Hardware Tests.....	6-2
Table 7-1 Trouble LED Procedure Cross Reference.....	7-3
Table 8-1 Input Activation.....	8-2
Table 8-2 Outputs.....	8-2



# Chapter 1 - Safety Precautions

## Section 1-1 - Read This Manual

Personnel properly qualified in the application and use of life safety equipment ("qualified personnel") shall read this manual carefully before performing any actions to specify, apply, install, maintain and operationally test **SP40/2** products in accordance with the instructions in this manual.

This manual shall be kept with the **SP40/2** panel for reference during the life of the system. This manual shall be made available to all qualified personnel who operate, test, maintain, or service **SP40/2** products. It is strongly recommend that such personnel read and understand the entire manual.

## Section 1-2 - Operational Safety

**⚠ WARNING: IF SAFETY PRECAUTIONS, INSTALLATION AND TESTING INSTRUCTIONS ARE NOT PERFORMED PROPERLY, THE SP40/2 PANEL MAY NOT OPERATE IN AN EMERGENCY SITUATION WHICH COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.**

**⚠ WARNING: IF THE PROTECTIVE SIGNALING SYSTEM SOUNDS AND/OR FLASHES, IT IS A WARNING THAT A POSSIBLE SERIOUS SITUATION REQUIRES IMMEDIATE ATTENTION.**

**⚠ CAUTION:** **SP40/2** printed circuit boards are sensitive to static electricity and have delicate components mounted on it. Discharge any static electricity from your body by touching a grounded object, such as a metal screw, which is connected to earth ground. Handle the board by its edges and be careful not to twist or flex it. The **SP40/2** panel is to be installed in a static free area, and the user is to properly attach grounded wrist straps before touching any static sensitive areas. After handling **SP40/2** printed circuit board, the panel should be tested in accordance with Section 3-5 "System Checkout" of this manual to verify that it is functioning properly.

This **SP40/2** panel **will not work without power.** The **SP40/2** panel is powered by 120VAC. 24VDC re-chargeable batteries provide back-up power. If both sources of power are cut off for any reason, the **SP40/2** panel will not operate.

**DO NOT** assume any installation, operation and testing details not shown in this manual.

The **SP40/2** panel shall only be operated with the dead front panel **properly in place.**

Notification equipment cannot last forever. Even though **SP40/2** is expected to last up to ten years, any of its parts or components could fail before then. Therefore testing of the entire protective signaling system, including the **SP40/2** panel, all notification equipment, as well as all messages and their output channel, and priority assignment, shall be conducted at least twice each year, or more often as required by local, state and federal codes, regulations and laws, by qualified personnel. If the notification equipment is not working properly, immediately contact the installer and have all/any problems corrected immediately. Malfunctioning components should be replaced immediately. Do not attempt to repair malfunctioning components. Malfunctioning components should be returned for factory repair or replacement. In the event you cannot contact the installer, contact the manufacturer.

**⚠ WARNING:** FOR PROPER OPERATION IN LIFE SAFETY APPLICATIONS, THE *SP40/2* PANEL SHALL BE CONNECTED TO A LISTED COMPATIBLE AND PROPERLY OPERATING CONTROL PANEL, WHICH CONTROLS ITS ACTIVATION. ALL EQUIPMENT SHALL BE PROPERLY INTERCONNECTED AND OPERATING. THE INSTALLER SHALL CHECK COMPATIBILITY OF ALL EQUIPMENT PRIOR TO INSTALLATION, OTHERWISE THE *SP40/2* PANEL AND/OR THE CONTROL PANEL MAY BE DAMAGED AND/OR FAIL TO OPERATE IN AN EMERGENCY SITUATION.

**⚠ WARNING:** CERTAIN HARDWARE FUNCTIONS ON THE *SP40/2* PANEL ARE NOT SUPERVISED. IF ANY SUCH HARDWARE FUNCTIONS FAIL, THE *SP40/2* PANEL MAY NOT PROVIDE THE INTENDED WARNING AND/OR NOT INDICATE A TROUBLE CONDITION.

### **Section 1-3 - Compliance with Applicable Codes, Regulations, Laws, Standards, and Guidelines**

COMPLY WITH ALL OF THE LATEST APPLICABLE CODES, REGULATIONS, LAWS, STANDARDS, AND GUIDELINES.

**⚠ WARNING:** FOR EMERGENCY, LIFE SAFETY, AND FIRE PROTECTIVE SIGNALING, SYSTEM APPLICATIONS USING THE *SP40/2*, INSTALLATION, TESTING AND MAINTENANCE SHALL BE PERFORMED BY QUALIFIED PERSONNEL IN ACCORDANCE WITH ALL THE LATEST NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), UNDERWRITER'S LABORATORY (UL), NATIONAL ELECTRIC CODE (NEC), OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), STATE, COUNTY, LOCAL, PROVINCE, DISTRICT, FEDERAL, AND OTHER APPLICABLE BUILDING AND FIRE STANDARDS, GUIDELINES, REGULATIONS, LAWS, AND CODES INCLUDING, BUT NOT LIMITED TO, ALL APPENDICES AND AMENDMENTS AND REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ).

It is recommended that the local AHJ inspect and approve the proposed placement of all the notification appliances.

### **Section 1-4 - Property Insurance Recommendation**

The *SP40/2* panel is not a substitute for insurance. All users should have adequate levels of life and property insurance.

### **Section 1-5 - Audio Output Considerations**

**⚠ WARNING:** AUDIBLE SIGNALS MAY MASK MEDICAL EQUIPMENT MONITORING ALARMS. WHERE MEDICAL EQUIPMENT MONITORING ALARMS ARE IN USE, DO NOT USE AUDIBLE SIGNALS; PROVIDE VISUAL NOTIFICATION APPLIANCES IN HIGHLY VISIBLE LOCATIONS.

**⚠ CAUTION:** The output of the audio system may not be heard in all cases. Sound can be blocked or reduced by walls, doors, carpeting, wall coverings, furniture, insulation, bed coverings, and other obstacles that may temporarily or permanently impede the output of the audio system. Sound is also reduced by distance and masked by background noise. The output of the audio system may not be sufficient to alert all occupants, especially those who are asleep, those who are hearing-impaired, those who are wearing devices that plug or cover the ears, and those who have recently used drugs or alcohol. The output of the audio system may not be heard by an alert person if the output device is placed in an area which is isolated by a closed door, or is located on a different floor from the person in a hazardous situation or is placed too far away to be heard over ambient noise such as, but not limited to, running water, traffic, air conditioners, machinery or musical appliances.

If live microphone announcements, audible tones and/or voice messages cannot be readily heard and understood clearly within the protected areas as intended, it will be necessary to increase the number and/or sound output intensity of speakers within those areas so that they are heard and understood clearly when activated.

## **Section 1-6 - RF Interference**

The **SP40/2** panel has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## **Section 1-7 - General**

Each manufacturer's fire alarm control panel and notification appliances operate differently and have different features. Before specifying, installing, operating, testing, maintaining or servicing a system, carefully read the installation, operation and testing manual for each piece of equipment and applicable codes.

Additional copies of this manual may be obtained from:

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# Chapter 2 - Overview and Features

## Section 2-1- Description

### General

The **SP40/2** panel is a stand alone, single channel, 40 watt, supervised voice evacuation/emergency message system with additional features of a Telephone Page Input, Night Ring Input and Background Music Input. Figure 2-1 illustrates the basic capabilities.

The control panel that activates the **SP40/2** panel must provide a Notification Appliance Circuit with a voltage ranging from 9 to 31VDC.

The **SP40/2** panel **does not** sense an emergency condition or hazards such as fire; it is only a part of a system that **does** sense such conditions. The **SP40/2** panel, when activated, provides a pre-recorded voice message(s) to speaker notification appliances. When used as part of a protective signaling system, the **SP40/2** panel must be properly connected to a compatible control panel that has been approved by a nationally recognized testing laboratory ("LISTED") and to LISTED compatible notification appliances for proper operation.

**THE SP40/2 PANEL MUST BE PROPERLY INSTALLED, PROGRAMMED, AND CONNECTED TO A COMPATIBLE FIRE ALARM CONTROL PANEL TO FUNCTION IN A VOICE EVACUATION SYSTEM.**

**WHEELOCK EXPRESSLY DISCLAIMS ALL LIABILITY FOR THE CONTENT, CLARITY AND LANGUAGES OF, AND OUTPUT CHANNEL AND PRIORITY LEVEL ASSIGNED TO, ANY AND ALL MESSAGES. IT IS ESSENTIAL THAT YOU HAVE MESSAGE CONTENT AND LANGUAGE, SEQUENCE, OUTPUT CHANNEL AND PRIORITY ASSIGNMENTS REVIEWED AND APPROVED BY QUALIFIED LEGAL AND SAFETY ADVISORS, QUALIFIED REPRESENTATIVE(S) OF OWNER(S) AND USER(S), AND AUTHORITIES HAVING JURISDICTION.**

### Standard Features

- One strobe NAC output section.
  - 24VDC @ 2 Amps Maximum.
  - Requires separate NAC Circuit (9 to 31VDC) input or can be programmed to operate when Digital Voice messages are played.
  - Return allows pass through for Wheelock synchronized strobes, remote **SP40/2** panels, additional strobe appliances or EOLR.
  - Synchronized output when using Wheelock's Synchronized strobe products.
  - Supervised with 10K Ohm EOLR.
  - Trouble LEDs for Open and Short conditions.
- 40 Watt Audio Amplifier section.
  - Selection of 25V or 70V speaker output.
  - Supervised with 10K Ohm EOLR.
  - Trouble LEDs for Open and Short Conditions

- A Digital Voice Section.
  - Capable of playback and record.
  - Digital Voice Message Chip contains the recording program and memory for 3 message sections.
  - Memory in 3 sections with corresponding inputs.
    - Section 1/ IN1; 21 seconds
    - Section 2/ IN2; 18 seconds
    - Section 3/ IN3; 18 seconds
  - Activated by one of three NAC (9 to 31VDC) inputs (IN1, IN2, or IN3).
  - Capable of selecting the strobe NAC output for each input.

- Audio Processing Section

- 3 Priority ordered audio inputs

Hand held, push-to-talk (PTT) microphone, Priority One. For live, emergency voice announcements and instructions. The microphone overrides (mutes) any voice message or tones in progress.

Digital Voice Section inputs (IN1, IN2, IN3).

- IN1, IN2, and IN3 have priorities 3, 4, and 5 respectively.
- IN1, IN2, and IN3 are not supervised.
- Polarized for compatibility with standard reverse polarity supervision of circuit wiring.

Night Ring (NR), Priority 6.

- Contact closure activated.
- Will not operate if the panel is on Battery.

Telephone Page (TEL), Priority 7

- Accepts a Telephone Page Port Input.
- Will not operate if the panel is on Battery.

Background Music (BGM), Priority 8

- Line Level Input
- Will mute when any other input is used.
- Will not operate if the panel is on Battery.

**NOTE:** Night Ring, Telephone Page, and Background music will not operate when the SP40/2 is in the alarm condition.

- Power Supply Section.

120VAC, 2.15A 50 - 60Hz input (IN)

24VDC, 12Ah Battery Backup (BAT +/-)

24VDC, 0.5A output terminals (24V +/-)

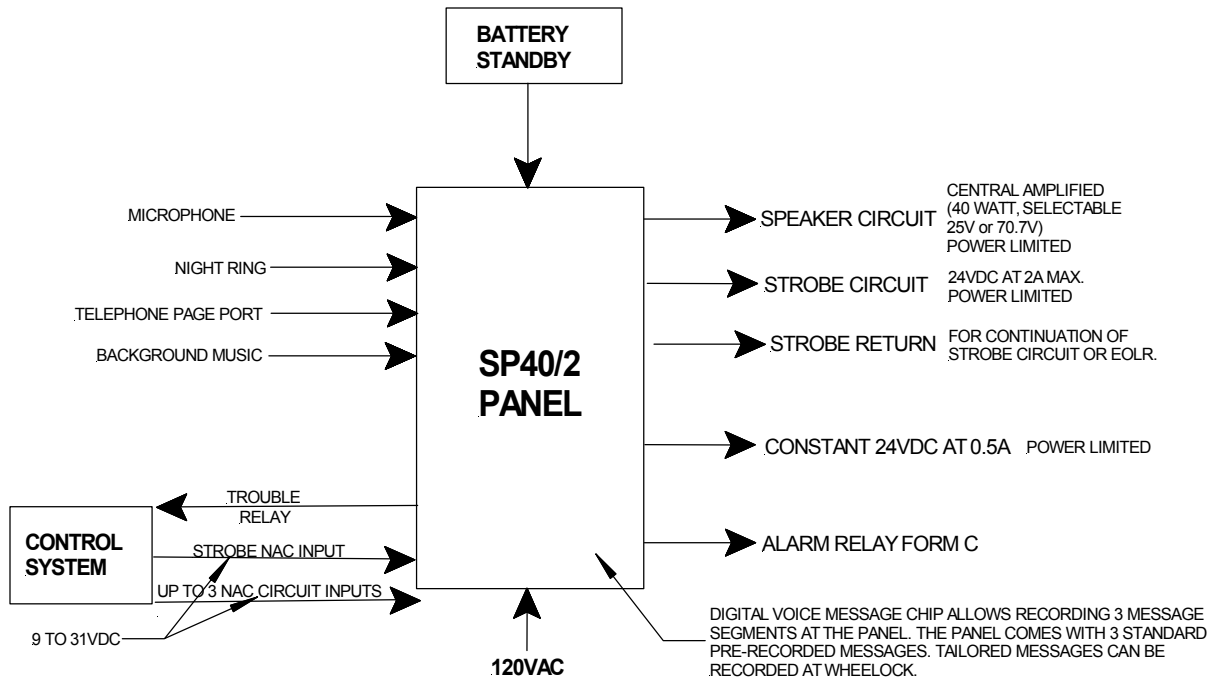
- Ground Fault Detection Section.  
Monitors Inputs and outputs for 600K Ohms minimum in relation to ground.
- A dual-tone tone generator with 2 field selectable sounds (Code 3 Tone, Slow Whoop) that sound when there is a Digital Voice Section Failure in alarm condition.
- Full supervision with on-board diagnostics and trouble reporting circuits for:
  - Audio NAC circuit wiring — open and short conditions
  - Ground Fault detection
  - Strobe NAC circuit wiring — open and short conditions
  - PTT Microphone — open or not installed condition
  - Amplifier— operation
  - Digital Voice Section
  - Input voltage/low battery
- Form C relay trouble contacts for external notification.
- Built in sounder to indicate trouble, with a trouble silence switch to silence it. If the trouble is not corrected in 20 minutes, the sounder will reactivate. (Trouble Silence Switch does not change the state of the Form C Trouble relay.)
- Remote reporting via output contacts for system trouble or alarm activation.

## **Section 2-2 - Enclosure and Configuration**

See Chapter 8 for Technical Specifications

## **Section 2-3 - Nominal Electrical Data**

See Chapter 8 for Technical Specifications.



**Figure 2-1  
Basic Capabilities of the SP40/2 Panel**

## Section 2-4 - Operation Modes

The **SP40/2** has two operation modes in the Voice Evacuation Modes:

1. Standby
2. Alarm

### Standby Mode

Standby is the normal mode. The **SP40/2** panel supervises the connections and internal components to maintain proper operation. All strobes and speaker appliances are off.

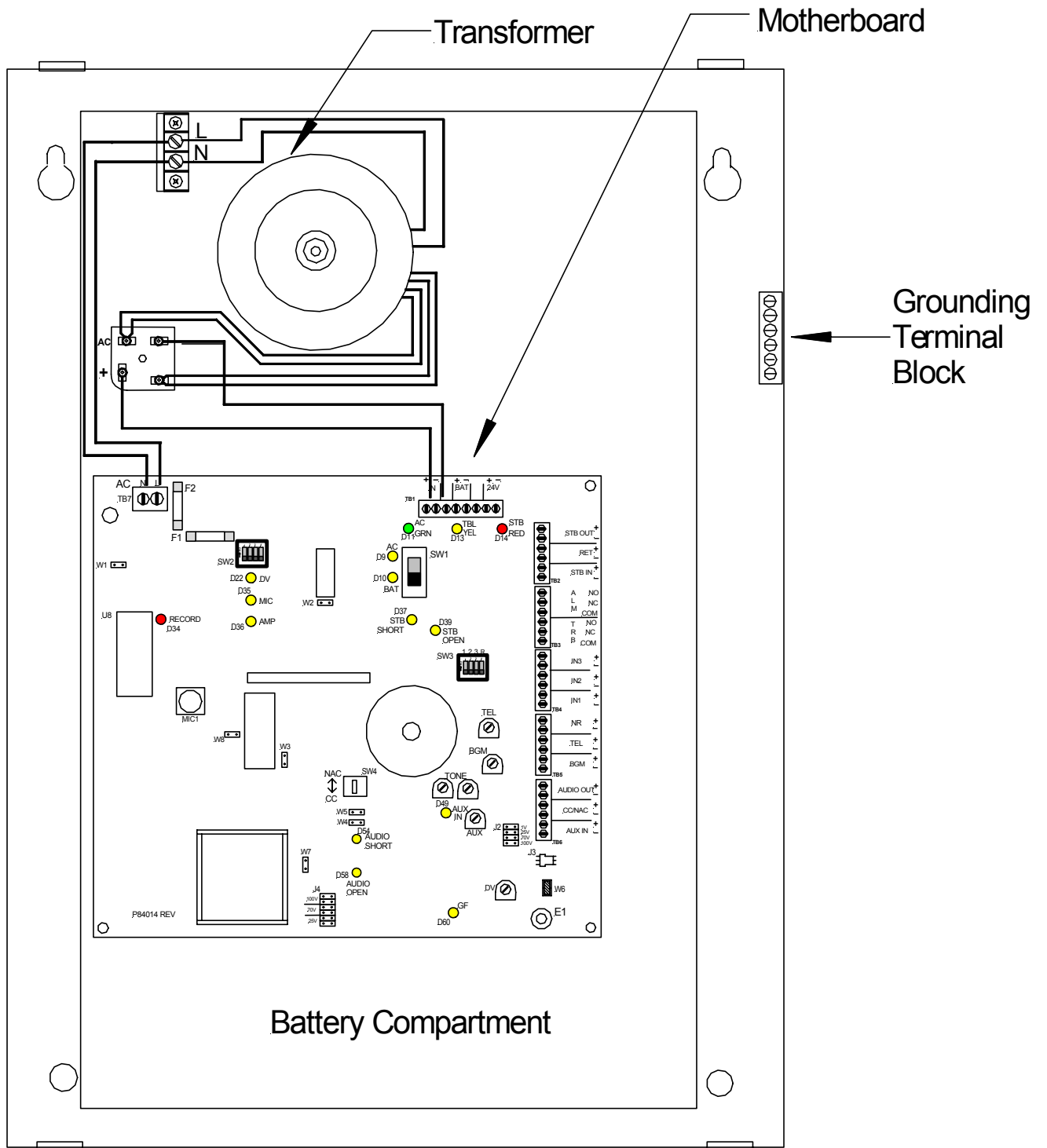
The **SP40/2** can also be used as a paging system with background music and night ring.

### Alarm Mode

Alarm mode occurs when an emergency signal is initiated by the Fire Alarm Control Panel (FACP) or control equipment.

**NOTE:** Telephone paging is not available when the SP40/2 is in the alarm mode.





**Figure 2-2.**  
**Layout of SP40/2 Panel**

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# Chapter 3 - Installation and Setup

## Section 3-1 - Introduction

The lives of people depend upon your safe and proper installation of the **SP40/2** panel. Please read, understand and carefully follow the specific installation instructions set forth below to avoid damage to the **SP40/2** panel and equipment connected to it. Only qualified personnel in accordance with the procedures in this manual should conduct installation.

**⚠ WARNING: SHUT OFF ALL POWER BEFORE STARTING THE INSTALLATION. ELECTRICAL SHOCK CAN CAUSE DEATH OR SERIOUS INJURY.**

**⚠ WARNING: DO NOT CONNECT AC POWER OR BATTERY BACKUP POWER UNTIL SYSTEM WIRING HAS BEEN CONNECTED, MODULES HAVE BEEN INSTALLED, AND FIELD WIRING HAS BEEN INSPECTED.**

**⚠ CAUTION:** The **SP40/2** printed circuit board is sensitive to static electricity and has delicate components mounted on it. Before handling the board or any component on it, discharge any static electricity from your body by touching a grounded object such as a metal screw, which is connected to earth, ground. The **SP40/2** panel is to be installed in a static free area and the user is to properly attach grounded wrist straps before touching any static sensitive areas.

The installer, prior to installation should consult with the authorities having jurisdiction (AHJ).

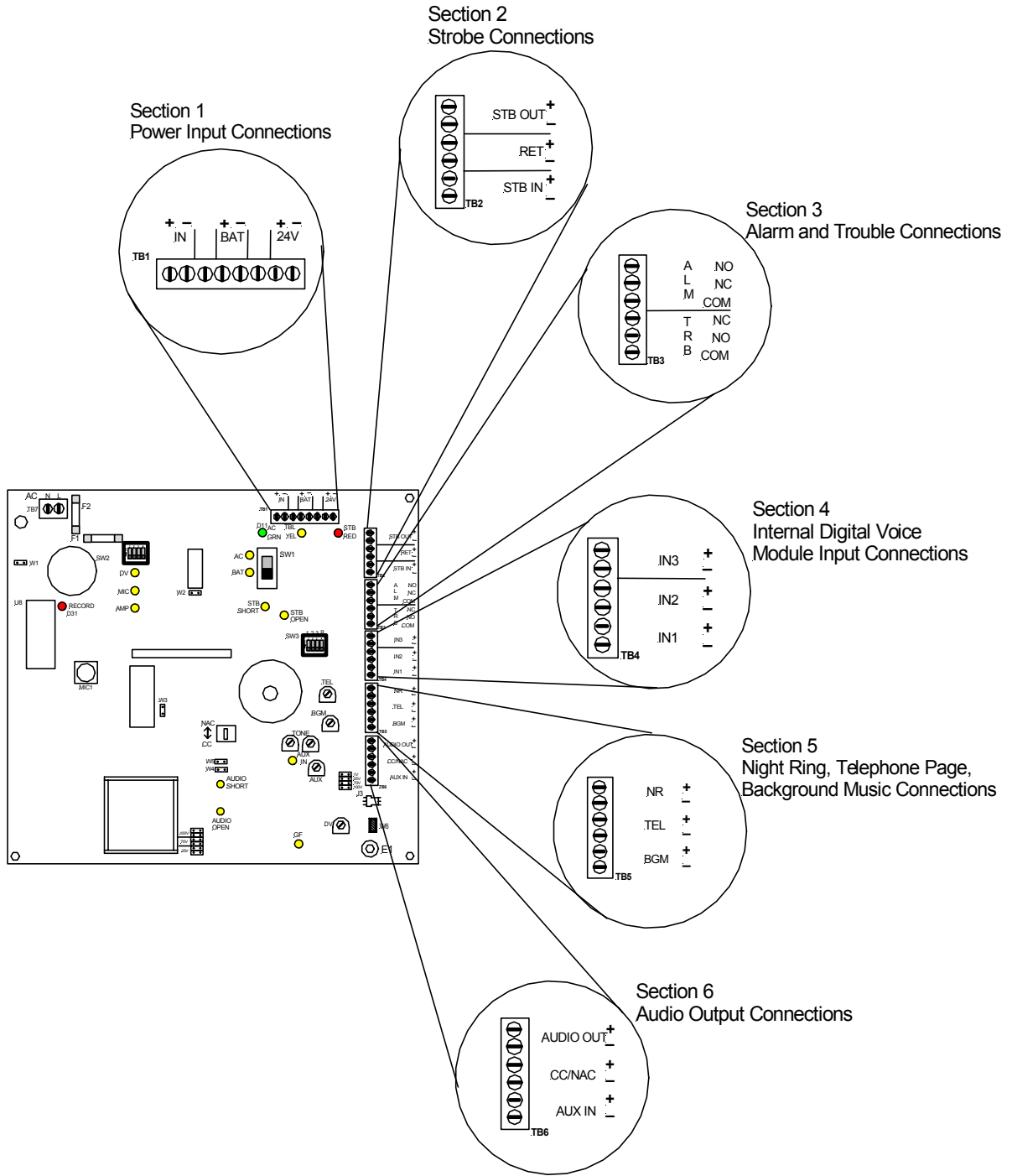
## Section 3-2 - Fire Alarm Control Panel Wiring Applications

The **SP40/2** Digital Voice Section inputs and the strobe input require an 9 to 31VDC. The Fire Alarm Control Panel (FACP) NAC Circuit of 12VDC or 24VDC will initiate these circuits. The strobe input NAC can be operated separately from the Digital Voice NAC circuits.

“TROUBLE”, Form C relay terminals and an internal sounder are available for monitoring the condition of the **SP40/2** panel.

## Section 3-3 - General Installation Instructions

Refer to Figure 3-1 on Page 3-2, which shows the location of wiring connections used in the installation of the **SP40/2** panel. Table 3-1 on Page 3-3 explains the functions of the different wiring connections.



**Figure 3-1**  
**Location of Field Wiring Connections**

**Table 3-1  
Terminal Connection Definitions**

	Symbol	Full Name	Definition
<b>TB1</b>		<b>Terminal Block 1 (Section 1)</b>	
	IN	28VDC Input Connection	28VDC Connection from Rectifier Module
	BAT	Battery Input Connection	24VDC, 12AH Battery Input Connection
	24V	24VDC 0.5A Output	24VDC, 0.5A Continuous Output Connection, Power Limited auxiliary power source
<b>TB2</b>		<b>Terminal Block 2 (Section 2)</b>	
	STB OUT	Strobe Output	24VDC, 2A Maximum Strobe NAC Output Supervised with UL Listed 10K Ohm, ½ W EOLR. (Power limited)
	RET	Return	Strobe Input Return for connecting additional strobe circuits, or UL Listed 10K Ohm, ½ W EOLR.
	STB IN	Strobe Input	9-31VDC Strobe NAC Input. Triggers Strobes in Alarm Condition
<b>TB3</b>		<b>Terminal Block 3 (Section 3)</b>	
	ALM	ALARM CONNECTIONS	Alarm Form C relay changes state in Audio Alarm Conditions. These conditions are: Push-to-talk Button on MIC depressed; and IN1, IN2, and IN3 inputs present. Contacts are rated at 24VDC, 2A. Resistive load.
	NO	Normally Open	Alarm Relay contact open to Common (COM) in non alarm condition.
	NC	Normally Closed	Alarm Relay contact closed to Common (COM) in non alarm condition.
	COM	Common	Alarm Relay Common (COM)
	TRB	TROUBLE CONNECTIONS	Trouble Form C relay changes state in panel trouble condition. Contacts are rated at 24VDC, 2A. Resistive load.
	NO	Normally Open	Trouble Relay contact open to Common (COM) in non alarm condition
	NC	Normally Closed	Trouble Relay contact closed to Common (COM) in non alarm condition
<b>TB4</b>		<b>Terminal Block 4 (Section 4)</b>	
	IN3	Input 3	Digital Voice initiating connection for message #3. (9-31VDC). Input 3 is a Priority 5 circuit. Reverse polarity.
	IN2	Input 2	Digital Voice initiating connection for message #2. (9-31VDC). Input 2 is a Priority 4 circuit. Reverse polarity.
	IN1	Input 1	Digital Voice Initiating Connection for message #1. (9-31VDC). Input 1 is a Priority 3 circuit. Reverse polarity.
<b>TB5</b>		<b>Terminal Block 5 (Section 5)</b>	
	NR	Night Ring	Contact Closure Input initiates chime sound for Night Ring. Non-supervised. Night Ring does not operate without 120VAC input and the Panel is operating on Battery.
	TEL	Telephone Page Input	Telephone Page Input from a telephone Page Port. Non-Supervised. Telephone Page does not operate without 120VAC input and the Panel is operating on Battery.
	BGM	Background Music Input	Line Level, 600 Ohm Background Music Input. Automatically mutes when any other input is in use. Non-Supervised. Background Music input does not operate without 120VAC input and the panel is operating on Battery
<b>TB6</b>		<b>Terminal Block 6 (Section 6)</b>	
	AUDIO OUT	Audio Output	Audio Output for 25V or 70V speakers. Supervised using UL Listed 10K Ohm, ½ W EOLR. Power Limited.
	CC/NAC		For future use. (NC – No Connection)
	AUX IN		For future use. (NC – No Connection)
<b>TB7</b>		<b>Terminal Block 7</b>	
	AC	AC Monitor Input	Monitors the AC input voltage and senses when the voltage is too low or not present and energizes the battery circuit. See Figure 7-2 (Page 7-8)

**NOTE: All Outputs (Strobe Output, Audio Output, and 24VDC Auxiliary Power Source) are power limited circuits.**

## **Prepare a System Wiring Diagram**

Using Section 3-4 (Page 3-8), prepare a complete system-wiring diagram.

Keep a copy of the system-wiring diagram with the **SP40/2** manual as a permanent record of the system wiring.

## **Unpack and Inventory**

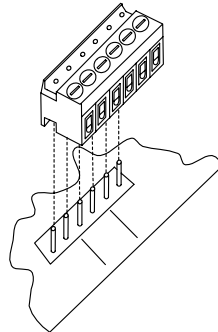
Carefully unpack the **SP40/2** panel and make sure each item described on the packing slip is present and undamaged.

## **Mounting**

1. Mount the **SP40/2** panel and optional expansion modules in the desired locations as described in Section 3-5 (Page 3-13).
2. Mount any additional wiring boxes or junction boxes needed to interconnect field wiring.
3. Connect conduit fittings or bushings as needed through the knockouts provided on the top and bottom of the **SP40/2** panel.

## **Field Wiring Connections**

**NOTE:** The terminal blocks on the **SP40/2** are removable. To remove a terminal block, pull the block straight up from the circuit board, as shown in Figure 3-2. Attach wires to the desired connections, then plug the terminal block back on the board being careful to match the pins.



**Figure 3-2**  
**Removable Terminal Block**

**NOTE:** For power limited circuits all input power sources (Alarm and Trouble relay connections, NAC inputs, and auxiliary inputs) must be power limited.

**NOTE:** The AC Power input wiring is non-power limited and shall be routed on the left side of the enclosure. All power limited inputs and outputs shall be routed on the right side of the enclosure.

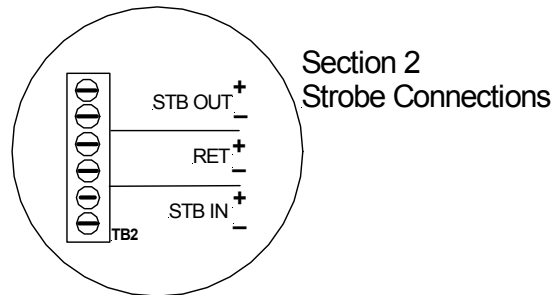
Install field wiring in conduit when required, following the most current National Electrical Code (NFPA-70) and local codes for the type of system being installed. Make all necessary connections at any additional wiring or junction boxes.

**⚠ CAUTION:** Provide proper strain relief for all wiring not in conduit.

**NOTE:** Shielded wire is not required on any circuit. If shielded wire is used, connect the shields to the ground terminal strip as shown in Figure 3-14 on Page 3-14.

### Strobe Appliance Circuit Connections

The strobe appliance circuit consists of a NAC (9 to 31VDC) input and a supervised NAC (24VDC) Output. As described in Table 3-1 on Page 3-3, the strobe output provides a synchronized output for compatible Wheelock, Inc. synchronized strobes. When a synchronized signal from a previous module is used open Jumper W2 (See Figure 3-15, Page 3-15). This also allows for pass through of the synchronized NAC Circuit on the RET connections. See Figure 3-1, Section 2 on Page 3-2 for location. Figure 3-3, below, is an enlarged picture of the referred area.



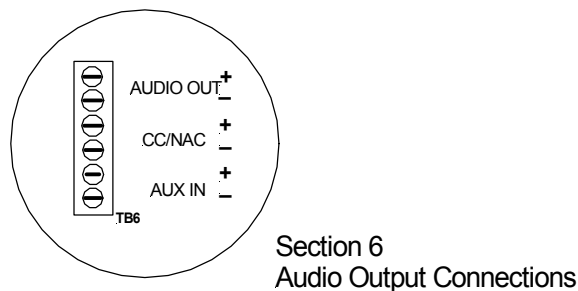
**Figure 3-3**  
**Strobe Input and Output Connections**

1. Connect strobe appliance circuit to Strobe NAC Circuit output STB OUT connection on TB2. Observe correct polarity. See Figure 3-1, Section 2 (Page 3-2) for location. Figure 3-3 is an enlarged picture of the referred area. The Strobe Appliance Output NAC Circuit is supervised. A UL Listed 10K Ohm, ½ W EOLR is required at the end of the circuit for proper supervision.

**NOTE: The strobe output circuit can be activated two ways. If the strobe output is to be activated when one or all the digital voice messages are initiated, operate DIP switch SW2 as explained in Table 3-2 on Page 3-16. The second way is to connect a NAC circuit input from an FACP to STB IN as described in step 8 below**

2. Connect Strobe NAC Circuit input (9 to 31VDC) from the FACP or other UL Listed control panels to the Strobe Input circuit (STB IN) connection on TB2. Observe correct polarity. See Figure 3-1, Section 2 for location. Figure 3-3 is an enlarged picture of the referred area.
3. Connect the FACP EOLR, additional appliances or additional **SP40/2** panels to RET connection on TB2. See Figure 3-1, Section 2 for location. Figure 3-3 is an enlarged picture of the referred area.

### Audio Output Circuit Connections



**Figure 3-4**  
**Audio Output Connections**

1. Connect Audio Appliance Circuit to Audio Output (AUDIO OUT) connection on TB6. See Figure 3-1, Section 6 (Page 3-2) for location. Figure 3-4, above, is an enlarged picture of the referred area. The Audio Output is supervised. A UL Listed 10K Ohm, ½ W EOLR is required at the end of the circuit for proper supervision.
2. Select the proper output voltage (25V or 70V) using the Audio Output Select Jumper J4. See Figure 3-15 (Page 3-15) for location.

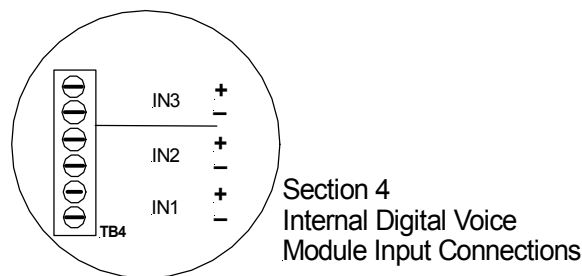
### Audio Input Connections

The **SP40/2** panel has 8 inputs. The highest priority input is the on board push-to-talk Microphone. It overrides all other audio inputs. Next are the IN1, IN2 and IN3 respectively, followed by Night Ring (NR), Telephone Page (TEL), and Background Music (BGM). Background Music will be muted when any other audio input is initiated. Night Ring (NR), Telephone Page (TEL), and Background Music (BGM) operate only when the panel has 120VAC applied.

### Digital Voice Initiating Connections

The Digital Voice Initiating Connections (IN1, IN2, IN3) provide the initiation of the stored messages in the Digital Voice Section of the **SP40/2** panel. Each initiation circuit requires a NAC (9 to 31VDC) input to trigger the respective voice message. Each Initiating circuit is polarized for compatibility with standard reverse polarity supervision of circuit wiring. Additional information can be found in Table 3-1 on Page 3-3.

The Digital Voice Initiating Connections (IN1, IN2, IN3) can also initiate the strobe NAC output circuit. Using DIP Switch SW2 (Strobe Select Sync/Non-Sync Select), strobes can be initiated by IN1, IN2, and/or IN3. (See Figure 3-15 on Page 3-15). Positions 1, 2, and 3 control the strobe initiation for inputs IN1, IN2, and IN3 respectively. Positioned in the ON or up position causes the strobes to operate during message playback. Position 4 (OFF) selects the Wheelock Sync Mode.



**Figure 3-5**  
**Digital Voice Initiating Connections**

While observing correct polarity, connect the Digital Voice Initiating connections (IN1, IN2, IN3) to the connections on TB4 as desired. Connect FACP EOLR across desired IN1 through IN3. See Figure 3-1, Section 4 on Page 3-2 for location. Figure 3-5, on Page 3-6, is an enlarged picture of the referred area.

### Ancillary Audio Input Connections

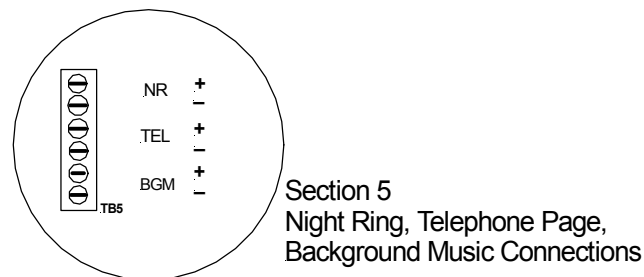
The **SP40/2** panel has three ancillary audio inputs. Listed in order of priority, they are Night Ring (NR), Telephone Page (TEL), and Background Music (BGM). **These inputs will not operate when the SP40/2 is in the alarm condition or when the input voltage (120VAC) is not applied and the SP40/2 is on battery backup.** These inputs are not supervised. The Telephone Page input requires input from a Telephone Page Port. The Night Ring input requires a dry contact closure. The Background Music input requires a line level, 600 Ohm, 1Vrms signal.



**NOTE:** Amplifier noise can be reduced by placing a jumper wire between the positive (+) and negative (-) terminals of the Background Music Input (BGM) and/or the Telephone Page Input (TEL) when these inputs are not in use. If the BGM is being used and the TEL is not, place a jumper wire on the TEL input. If the TEL is being used and the BGM is not, place a jumper wire on the BGM input.

1. Connect Telephone Page Input (TEL) to TB5. See Figure 3-1, Section 5 on Page 3-2 for location. Figure 3-6, below is an enlarged picture of the referred area.
2. Connect Night Ring Input (NR) to TB5. See Figure 3-1, Section 5 on Page 3-2 for location. Figure 3-6, below, is an enlarged picture of the referred area.

**NOTE:** The Night Ring (NR) input requires a contact closure from the phone system to activate. The NR must be connected to the phone line in the same room.



**Figure 3-6**  
**Ancillary Audio Input Connections**

3. Connect Background Music Input (BGM) to TB5. See Figure 3-1, Section 5 on Page 3-2 for location. Figure 3-6, above, is an enlarged picture of the referenced area.

**⚠ WARNING: EXCESSIVE BGM VOLTAGE INPUT CAN CAUSE AMPLIFIER FAILURE. THE PREFERRED AUDIO SOURCE OUTPUT FOR THE BGM INPUT OF THE SP40/2 (CD PLAYER, TUNER, EQUALIZER, ETC.) SHALL BE A FIXED LINE LEVEL VOLTAGE LESS THAN 2.5V PEAK TO PEAK OR 300mV RMS. AUDIO SOURCES MARKED “LINE LEVEL OUTPUT” WILL TYPICALLY BE WITHIN THIS LIMIT. AUDIO SOURCES WITH OTHER THAN FIXED LINE LEVEL OUTPUTS (I.E., ADJUSTABLE SPEAKER OUTPUTS, ETC.) REQUIRE THAT THE AUDIO SOURCE BE ADJUSTED USING A MULTIMETER ACROSS THE OUTPUT OF THE SIGNAL SOURCE (SEE PROCEDURE BELOW). ONCE THE LEVEL HAS BEEN SET PROPERLY, SECURE THE ADJUSTABLE AUDIO SOURCE SO THAT THE LEVEL CANNOT BE INADVERTENTLY CHANGED. FAILURE TO SET ADJUSTABLE AUDIO SOURCES APPROPRIATELY OR FAILURE TO SECURE AUDIO ADJUSTABLE SOURCES CAN LEAD TO FAILURE OF THE AMPLIFIER SECTION OF THE SP40/2. THIS FAILURE, IN TURN, COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.**

#### **Setting Adjustable Audio BGM Sources for the SP40/2**

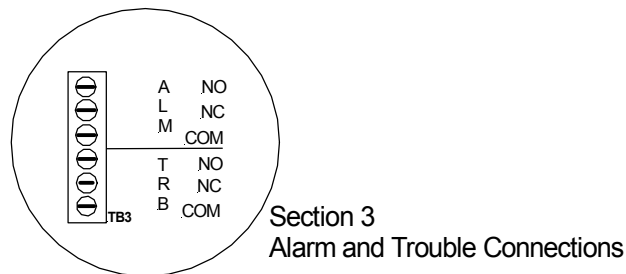
**NOTE:** Use a good multimeter that provides true RMS readings in the AC voltage scale and calculates the results through average sampling. Some multimeters can select instant or average sampling readings. This adjustment shall always be done in the averaging mode. Most digital multimeters use the average sampling method in the “AC Volts RMS” setting.

1. Insure that power is disconnected from the **SP40/2**.
2. Set Audio Source volume control to minimum setting.
3. Connect the Audio Source output to the BGM input terminals on the **SP40/2**.
4. Set the multimeter to the AC Volts scale, which is capable of reading 300mV RMS.

5. Connect the multimeter across the BGM terminals on the **SP40/2**.
6. Adjust the output control of the audio source to obtain a reading of 300mV RMS on the multimeter.
7. Secure the output control of the audio source so that it cannot be inadvertently changed.
8. Disconnect multimeter. The output of the Audio Source is now correctly set for the **SP40/2** BGM input.

### **Alarm and Trouble Output Connections**

The Alarm Form C relay contacts change state when certain audio inputs are in alarm. The Trouble Form C relay contacts change state when the panel goes into any trouble condition. See Table 3-1 on Page 3-3 for additional information.



**Figure 3-7**  
**Alarm and Trouble Connections**

1. Connect External alarm circuit to the proper Alarm (ALM) connections. See Figure 3-1, Section 3 on Page 3-2 for location. Figure 3-7, above, is an enlarged picture of the referred area.
2. Connect External Trouble circuit to the proper Trouble (TRB) connections. See Figure 3-1, Section 3 on Page 3-2 for location. Figure 3-7, above, is an enlarged picture of the referred area.
3. Connect the **SP40/2** panel to earth ground, following the National Electrical Code and local codes for the type of system being installed. Wire gauge selection of the earth ground wiring should involve consideration of all factors, including maximum allowable wire resistance and length. The panel is tied to earth ground by connecting the ground terminals to an earth ground. The location of the ground terminals within the panel is shown in Figure 3-16 on Page 3-21.

**⚠ CAUTION:** Do not connect input voltage to any equipment until the field wiring has been tested, inspected and approved.

4. Check the integrity of all field wiring. Confirm that the specified cable is installed, and that there is continuity between required points (no open circuits), with no unwanted shorts to other conductors, chassis, or earth ground.
  - a. Verify that the field wiring complies with the instructions of this manual and the detailed wiring diagram prepared for this installation.
  - b. Ensure that no unwanted voltages are present on circuit conductors and ground.
  - c. Test all ungrounded connectors for electrical isolation from ground.
  - d. Measure and record the resistance of each NAC circuit. Conduct this test reversing polarity.
5. Perform Ground Fault Installation Procedure as described in Section 3-7 (Page 3-19).
6. Calculate and Install properly sized backup batteries as described in Section 3-8 (Page 3-19) and 3-9 (Page 3-21). **The SP40/2 is UL approved for 24VDC at 12AH.**

**⚠ WARNING: TWO DIFFERENT SOURCES OF POWER MAY BE CONNECTED TO THIS UNIT. DISCONNECT BOTH SOURCES OF POWER BEFORE SERVICING. FAILURE TO DISCONNECT BOTH POWER SOURCES BEFORE SERVICING COULD RESULT IN PROPERTY DAMAGE, SERIOUS INJURY, OR DEATH TO YOU AND/OR OTHERS.**

**⚠ WARNING: ALWAYS APPLY AC VOLTAGE BEFORE APPLYING BATTERY BACKUP VOLTAGE. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE SP40/2 PANEL.**

7. Perform **System Checkout** Procedures as described in Section 3-6 System Checkout on Page 3-14.

## **Section 3-4 – Prepare a System Wiring Diagram**

### **Wiring Guidelines**

Although the **SP40/2** panel incorporates signal verification and noise filtering circuitry on their inputs, induced voltages or noise on the input wiring can cause improper operation. Therefore, use shielded twisted pair wire for all dry contact input wiring.

**The shield of each cable should be connected only at one end. Each shield of each cable that connects to the SP40/2 panel is to be connected to the grounding points provided near the knockout locations on the chassis (see Figure 3-14 on Page 3-14).**

The National Electrical Code defines two types of circuits for protective signaling systems: **power-limited** circuits and **non-power limited** circuits. All **SP40/2** outputs (STB OUT, AUDIO OUT, and  $\pm 24$ VDC auxiliary power source) are **power-limited** circuits.

**⚠ WARNING: ALL SP40/2 AUDIO WIRING SHOULD BE ROUTED AWAY FROM ANY HIGH VOLTAGE OR HIGH CURRENT WIRING (SUCH AS AC OR DC POWER WIRING, AUDIO POWER WIRING, AND MOTOR OR RELAY ACTUATION WIRING). FAILURE TO DO SO MAY CAUSE ELECTRICAL SHOCK RESULTING IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.**

**⚠ CAUTION:** The National Electric Code limits the maximum number of conductors that can be installed in conduit and wiring boxes depending on the size of the conduit, the volume of the boxes, and the gauge of the wire used. Make sure that wiring used for **SP40/2** installation complies with the latest NEC, NFPA, Local, State, County or Province requirements.

### **Field Wiring Connections**

**All SP40/2 wiring terminals are designed to accept #12 AWG through #22 AWG wiring for one wire per terminal or #16 AWG to #22 AWG for two wires per terminal. Proper wire gauge considerations for the Notification Circuit must take into account current requirements versus length of run.**

**NOTE: Only speakers with DC blocking capacitors will provide for proper speaker supervision.**

## **Prepare System Wiring Diagram**

Prepare a system-wiring diagram to include all Notification Appliances, and internal connections and power sources as required.

**NOTE: Separate input power wiring from the other input and output wiring. Wire the input power to the left side of the motherboard (Figure 3-16, Page 3-21) and the other input and output wiring to the right.**

### **Visual Notification Appliance Output Wiring**

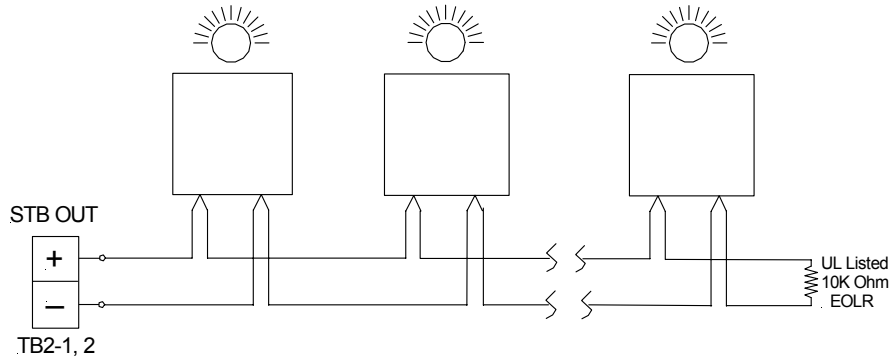
- Wire gauge selection involves consideration of all factors including, wire loop length, maximum current draw of each appliance, number of appliances, and maximum voltage drop allowable.
- Strobe NAC has a 24VDC, 2.0 amps maximum output.
- Strobe NAC meets Class B supervision requirements for notification appliance circuits.
- The strobe output circuit shall have a UL Listed 10K Ohm, ½ W EOLR installed across the last visual notification appliance. If the output is unused, a UL Listed 10K Ohm, ½ W EOLR shall be placed across the output terminals.

### **Speaker Notification Appliance Output Wiring**

Wire gauge may vary for each audio appliance output on the panel. When:

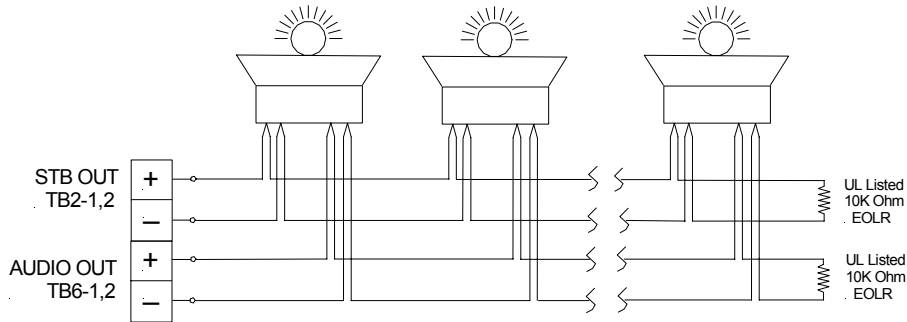
- Speaker (with transformer) appliances are used with supervised audio amplifier module. Wire gauge selection should involve consideration of all factors including, wire length, appliance power ratings, and the number of appliances.
- The amplified output is either a selectable 25 or 70.7Vrms audio output, rated for 40 watts maximum.
- The output meets Class B supervision requirements for notification appliance circuits.
- The audio output circuit shall have a UL Listed 10K Ohm, ½ W EOLR installed across the last notification appliance. If the output is unused, it shall have a UL Listed 10K Ohm, ½ W EOLR across the output terminals.

**Wiring Diagrams for Audio/Visual Notification Appliances**



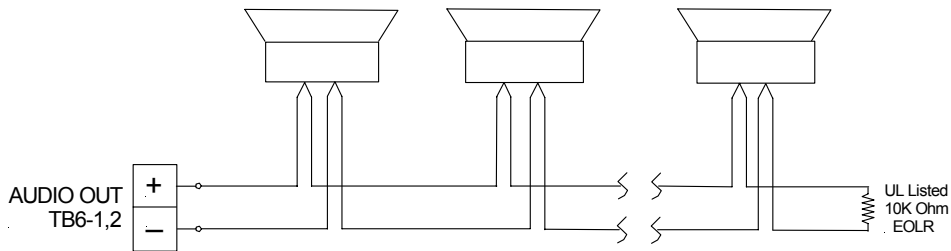
**Figure 3-8**  
**Wiring Diagram for Visual Only Notification Appliances**

**⚠ CAUTION:** Do not loop wire under terminals. Break wire run to provide supervision of connection.



**Figure 3-9**  
**Wiring Diagram for Combination Audio/Visual Notification Appliances**

**⚠ CAUTION:** Do not loop wire under terminals. Break wire run to provide supervision of connection.



**Figure 3-10**  
**Wiring Diagram for Audio Only Notification Appliance Output**

**⚠ CAUTION:** Do not loop wire under terminals. Break wire run to provide supervision of connection.

### **Strobe Appliance Circuit Input Wiring**

The Strobe Appliance Circuit Input consists of a NAC (9 to 31VDC) input and a Return (RET) that can be used for additional appliances or FACP end of line resistor. The output is a supervised NAC (24VDC) Circuit. As described in Table 3-1 on Page 3-3 this output can provide a synchronized output for compatible Wheelock, Inc. synchronized strobes. When a synchronized signal from a previous module is used open Jumper W2 (Figure 3-15, Page 3-15).

### **Digital Voice Initiating Input Wiring**

The Digital Voice Initiating Connections (IN1, IN2, IN3) provide the initiation of the stored messages in the Digital Voice Section of the **SP40/2** panel. Each initiation circuit requires a NAC (9 to 31VDC) input to trigger the respective voice message. Each initiating circuit has a blocking diode that allows supervision of the input wiring. Additional information can be found in Table 3-1 on Page 3-3.

The Digital Voice Initiating Connections can also be used to initiate the strobe circuit when the voice message is initiated. DIP Switch SW2 controls the strobe circuit for one or all voice messages.

### **Ancillary Audio Input Wiring**

The **SP40/2** panel has three ancillary audio inputs. Listed in order of priority, they are Night Ring (NR), Telephone Page (TEL), and Background Music (BGM). These inputs are not supervised. The Night Ring input requires a dry contact closure. The Telephone Page input requires an input from a Telephone Page Port. The Background Music input requires a line level, 600 Ohm, 1Vrms signal.

### **Alarm and Trouble Output Wiring**

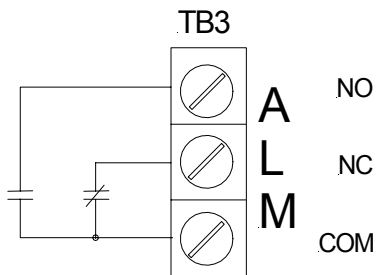
The Alarm Form C relay contacts change state when certain audio inputs are in alarm. The Trouble Form C relay contacts change state when the panel goes into any trouble condition. See Table 3-1 on Page 3-3 for additional information.

**⚠ WARNING: IT IS IMPORTANT THAT THE WIRING USED FOR INPUT VOLTAGE WIRING IS LARGE ENOUGH TO CARRY THE MAXIMUM CURRENT REQUIRED BY THE SP40/2 PANEL WITHOUT EXCESSIVE VOLTAGE DROP. IF VOLTAGE DROPS FROM AC POWER LINE LOADING AND WIRING RESISTANCE IS NOT WITHIN THE SPECIFIED OPERATING VOLTAGE RANGE, THE SP40/2 PANEL WILL NOT FUNCTION PROPERLY.**

### **Alarm Output Contact Wiring**

The location of the Alarm Output Connections is shown in Figure 3-1 Section 3 (Page 3-2). A magnified view of this area on the Mother Board is shown in Figure 3-7 on Page 3-7.

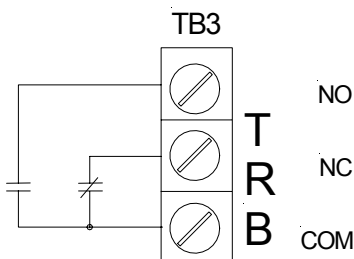
- Wire gauge selection of the Alarm Status output contact wiring should involve consideration of all factors including, wire loop length, maximum current capacity, and maximum voltage drop allowable.
- The Alarm Status output contact is Form C, rated for 2.0 amps at 24VDC, resistive load.
- For terminal connection details of the Alarm Status output contact (shown in the non-alarm mode) see Figure 3-11, below.
- An external 24VDC or the internal 24VDC connection (TB1) can be used to power non-supervised Alarm appliances. See Figure 3-1, Section 1 (Page 3-2) for location of TB1.



**Figure 3-11**  
**Alarm Relay Contacts**

### **Trouble Output Contact Wiring**

- The locations of the Trouble Status Output Connections are shown in Figure 3-1 Section 1 (Page 3-2). A magnified view of this area on the Mother Board is shown in Figure 3-7 on Page 3-7.
  - Wire gauge selection of the system Trouble Status output contact wiring should involve consideration of all factors including, wire length, maximum current capacity, and maximum voltage drop allowable.
  - The system Trouble Status output contact is Form C, rated for 2.0 amps at 24VDC, resistive load.
  - For a detail of the system Trouble Status output contact terminal connections (shown in the trouble position), see Figure 3-12 below.
  - An external 24VDC or the internal 24VDC connection (TB1) can be used to power Trouble indicating appliances. See Figure 3-1, Section 1 (Page 3-2) for location of TB1.

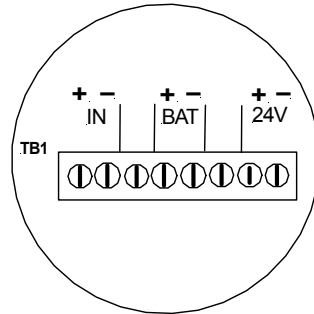


**Figure 3-12**  
**Trouble Status Relay Contacts**

### **POWER CONNECTION REQUIREMENTS**

The **SP40/2** contains a 24VDC Power Supply and a Battery Charger for the battery backup. Connections for the input power and batteries are shown in Figure 3-1, Section 1 (Page 3-2). A magnified view of this area on the Mother Board is shown in Figure 3-13, below. TB1 is for battery connection. TB1 has a 24VDC, 0.5A, power limited, auxiliary power source. Calculate proper backup battery requirements using Section 3-8 – Battery Care and Backup Battery Calculations.(Page 3-19). Section 3-9 on Page 3-21 is the AC and battery installation procedures.

## Section 1 Power Input Connections



**Figure 3-13**  
**Input Power and Battery Connection Locations**

Proceed to Step 2 in Section 3-3 – General Installation Instructions (Page 3-4).

## Section 3-5 - Mounting

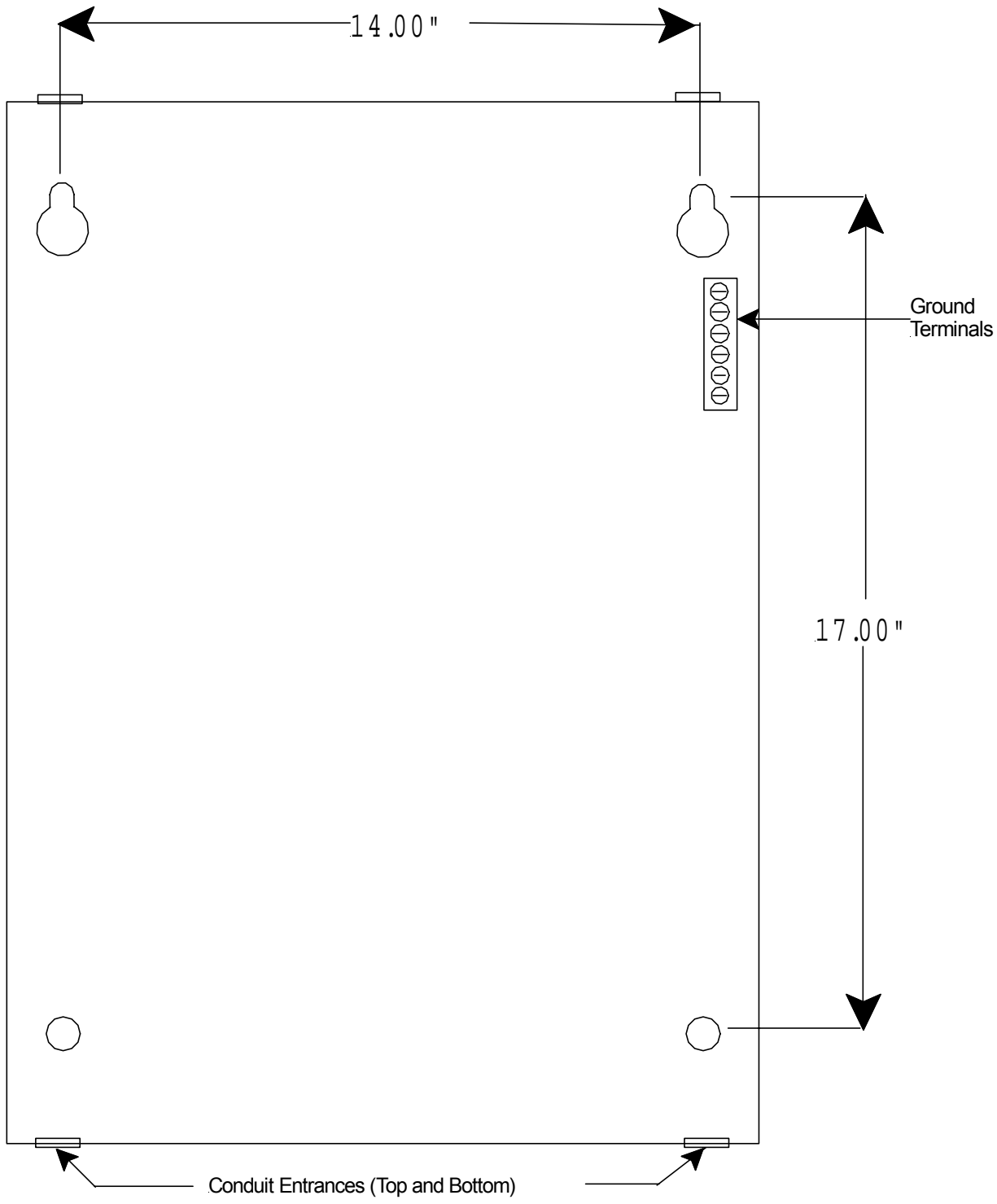
### Location

The **SP40/2** panel shall be mounted in a location within the environmental limits specified in the latest UL Standard 864 for indoor control panels. The **SP40/2** panel shall not be located in a hazardous area.

**CAUTION:** In order to comply with the latest NFPA and UL requirements for interconnection of fire alarm control equipment, the **SP40/2** must be located in the same room, and within 20 feet of, a listed compatible fire alarm control panel. Wiring shall be enclosed in conduit and properly connected to such control panel.

1. See Figure 3-14 on Page 3-14 for **SP40/2** panel mounting hole layout.
2. Mark and drill mounting holes for appropriate screws and anchors to ensure secure mounting to the type of surface at the selected location.
3. Prevent dust and dirt contamination of the **SP40/2** panel during installation. This contamination can interfere with the operation and reduce the life of the equipment.
4. Open the door and remove the dead front panel, and mount the **SP40/2** panel at the selected location. **Use care to avoid damage to the module during installation.** Do not apply excessive pressure to the PC board or its components, including field wiring terminals and connectors.
5. **Proceed to step 4 in Section 3-3 – General Installation Instructions (Page 3-4).**





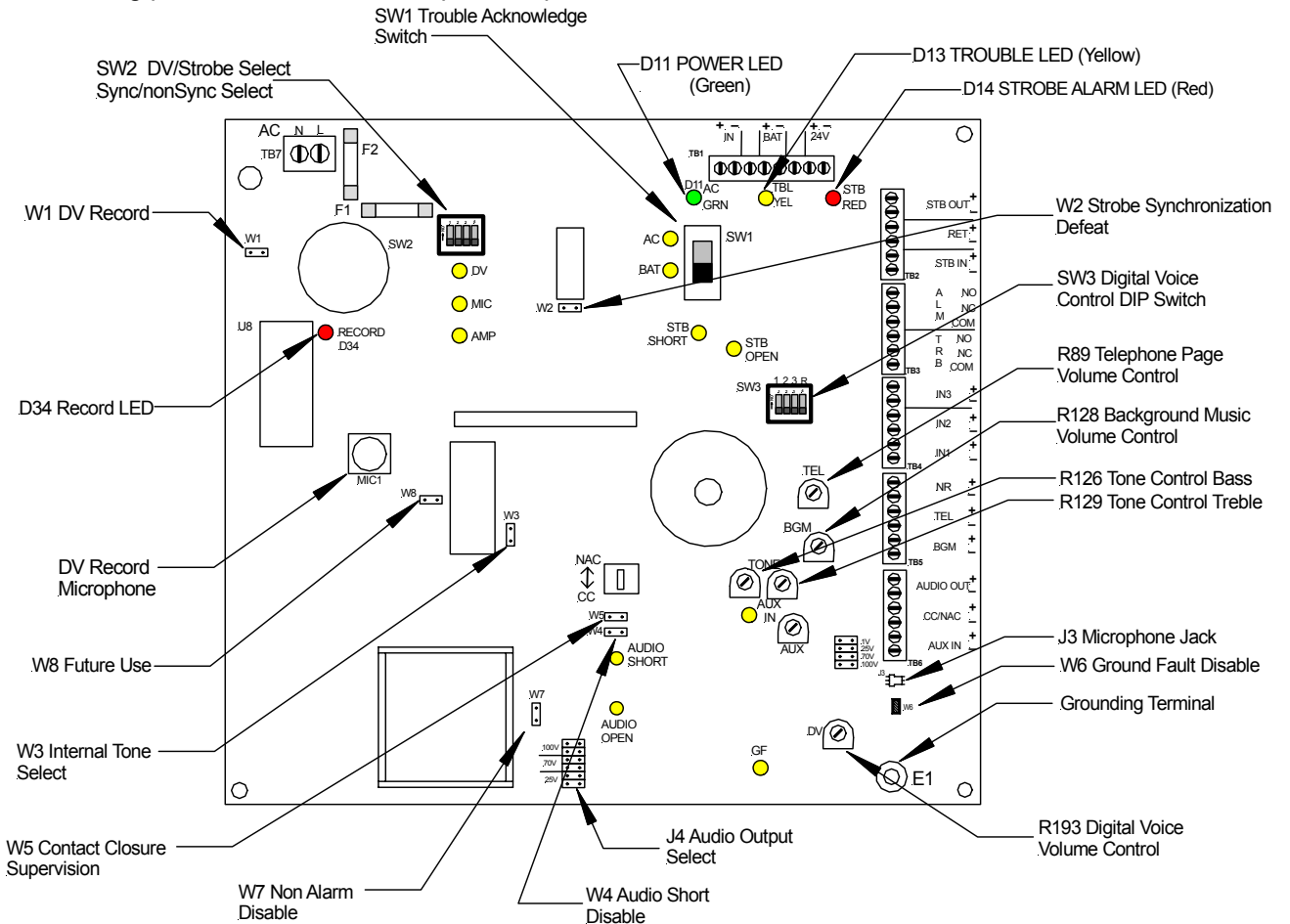
**Figure 3-14**  
**SP40/2 Panel Mounting and Grounding Location**

## Section 3-6 - System Checkout

Refer to NFPA 72 (1999 Edition) for guidelines on testing notification systems.

### System Control Settings

Figure 3-15 on Page 3-15 shows the location of the controls used to configure the **SP40/2** Table 3-2, Page 3-16, explains the functions of the different jumpers, switches, and variable resistors. The following procedure is a basic setup for the panel:



**Figure 3-15  
Jumper/Switch/Variable Resistor Locations**

1. Ensure that the AC and Battery Power **are not** connected.
2. Plug in the Microphone.
3. Select the proper audio output (25V or 70V) by using the two jumpers on J4 Audio Output Select.
4. Connect the speaker circuit to terminal block TB6 **AUDIO OUT**. **Verify that the speaker circuit has a UL Listed 10K Ohm, ½ W EOLR.**
5. If applicable, connect the strobe circuit to TB2 **STB OUT**. **Verify that the strobe circuit has a UL Listed 10K Ohm, ½ W EOLR.**
6. If Strobe synchronization is to be defeated, remove Jumper W2 Strobe Synchronization Defeat.
7. If the Ground Fault feature is not desired, remove Jumper W6 Ground Fault Disable.

**Table 3-2  
Jumper/Switch/Variable Resistor Functions**

<b>Jumpers</b>	<b>Name</b>	<b>Description</b>
W1	DV Record	Jumper in place – DV is in the Playback only mode. Jumper removed – DV is in the Record and Playback mode.
W2	Strobe Synchronization Defeat	Jumper in place – Wheelock Strobe Sync activated. Jumper removed – Strobe Synchronization defeated. Allows for Strobe Sync by a master unit and pass through on RET connection.
W3	Internal Tone Select	Jumper in place – Code 3 Tone Jumper removed – Slow Whoop Tone
W4	-----	Not Used - Jumper shall remain in place .
W5	-----	For future use.
W6	Ground Fault Disable	Jumper in place – Ground Fault Circuit Enabled. Jumper removed – Ground Fault Circuit Disabled.
W7	Shorted Audio Output Non Emergency Defeat	Jumper in place – Telephone Page, BGM, NR disabled. Jumper removed – Telephone Page, BGM, NR enabled
W8	-----	For future use.
J2	-----	For future use.
J4	Audio Output Select	Selects 25V or 70.7V for Audio Output (AUDIO OUT) by moving two jumpers.
<b>Switches</b>	<b>Name</b>	<b>Description</b>
SW1	Trouble Acknowledge	Spring loaded. When depressed, silences the internal trouble sounder.
SW2	DV/Strobe Select, Sync/Non-Sync Select	Four position DIP Switch. Positions 1, 2, and 3 allow strobe activation when IN1, IN2, and/or IN3 are initiated respectively. Position 4 controls Wheelock Sync (OFF) or Non-Sync (ON) mode for Switch SW2 only.
SW3	Digital Voice Selector Switch	Four position DIP Switch. Positions 1, 2, and 3 allow playback of the three messages when Jumper W1 is in place. Position 4 controls record mode when Jumper W1 is removed.
SW4	-----	For future use.
<b>Variable Resistors</b>	<b>Name</b>	<b>Description</b>
R89 (TEL)	Telephone Page Volume Control	Adjusts Telephone Page Volume
R128 (BGM)	Background Music Volume Control	Adjusts Background Music Volume
R126 (TONE)	Tone Control Treble	Adjusts Audio Amplifier Tone (Treble)
R129 (TONE)	Tone Control Bass	Adjusts Audio Amplifier Tone (Bass)
R158 (AUX)		For future use.
R193 (DV)	Digital Voice Volume Control	Adjusts Digital Voice Output Volume

## **Checkout Procedure.**

**⚠ CAUTION:** Connect the AC power source before connecting the battery backup power. Disconnect the battery backup power before disconnecting the AC power source.

**NOTE:** All switches, jacks and jumpers are illustrated in Figure 3-15 on Page 3-15.

1. Connect AC power, then connect battery backup.

**NOTE:** When the AC power source is applied to the panel, the battery voltage check circuitry is activated. If batteries are not connected within 20 seconds the panel trouble circuit will be activated. The battery voltage check circuitry will re-check for batteries every 2 minutes. If the batteries are installed during the 2 minute period, the panel will remain in trouble until the next re-check.

D11 AC LED (Green) should be "ON" to indicate normal operation. If LED D11 is "OFF", LED D13 TROUBLE LED (Yellow) is "ON", and the internal sounder is operating, a trouble condition is indicated. **STOP TESTING.** Refer to Chapter 7 of this manual, troubleshoot and correct the problem *before* you resume testing. See Figure 3-15 on Page 3-15 for location of LEDs.

Perform the following tests:

**NOTE:** Adjust tone to the desired level by turning potentiometers R126 (treble) and R129 (bass) to the desired levels.

### **Microphone Test**

2. Press the push-to-talk Button on the microphone and speak into the Mic. Insure voice can be heard on the output speaker circuit.

### **Digital Voice Message Test**

#### Message 1

3. Switch DIP switch SW3 (Digital Voice Selector Switch), Position 1 "ON". Message should be heard on output speaker circuit.
4. The strobe circuit associated with the first message can also be tested by switching DIP switch SW2 (DV/Strobe Select), position 1 "ON". The STB LED (Red) will turn "ON". If the strobe circuit is attached to TB2, strobes will flash. (See Figure 3-3 on Page 3-5.)

**NOTE:** If SW2 (DV/STROBE SELECT) switch has positions 1, 2, and/or 3 in the "ON" position (Figure 3-15, Page 3-15) and the associated digital voice message input (IN1, IN2, or IN3) is activated, D37 (STB SHORT) LED will illuminate during that alarm condition. **Unless D13 TROUBLE LED is illuminated, there is no trouble condition.** See Figure 7-1 on Page 7-2 for location of these LEDs.

5. Turn SW3 Position 1 OFF. The message will play to completion. If DIP switch SW2 (DV/Strobe Select), position 1 is ON the strobe circuit will be ON until the message is complete.
6. Turn DIP switch SW2, position 1 OFF.
7. Apply 24VDC from TB1 (Figure 3-13 on Page 3-13 ) to TB4 (IN1) connection (Figure 3-5 on Page 3-6 ). Message should be heard from output speaker circuit.

8. The strobe circuit associated with the first message can also be tested by switching DIP switch SW2 (DV/Strobe Select), position 1 “ON”. The STB LED (Red) will turn “ON”. If the strobe circuit is attached to TB2, strobes will flash.
9. Remove the 24VDC from TB4 (IN1). The message will play to completion. If DIP switch SW2 (DV/Strobe Select), position 1 is “ON” the strobe circuit will be ON until the message is complete.
10. Turn DIP switch SW2, position 1 OFF.
11. Perform Steps 3 through 10 on Messages 2 and 3. Use Table 3-1 below.

**Table 3-3  
Digital Voice Message Tests**

Message Number	TB4	SW3 Digital Voice Selector Switch	SW2 DV/Strobe Select
Message 1	IN1	Position 1	Position 1
Message 2	IN2	Position 2	Position 2
Message 3	IN3	Position 3	Position 3

**Strobe Circuit Test**

12. If Strobe circuit is being used separately, apply 24VDC from TB1 (Figure 3-13 on Page 3-13) to STB IN connection TB2 (Figure 3-3 on Page 3-5 ). Strobes on Strobe Output Circuit should flash. LED D9 STROBE ALARM (RED) shall be lighted. Remove Voltage

**Night Ring Test**

13. Test Night Ring by shorting NR connection TB5 (Figure 3-6 on page 3-7). The chime sound should be heard from the output speaker circuit.

**Telephone Page Test**

14. If the Telephone Page circuit is used, make a telephone page from the phone system. The page should be heard from the AUDIO OUT speaker circuit.

**Background Music Test**

15. If the Background Music circuit is used, energize the music source. The music source output should be heard from the output speaker circuit.
16. Installation and Checkout procedure is complete. Make and check final connections, replace dead front panel.

**⚠ WARNING: ALL PROTECTIVE SIGNALING SYSTEMS REQUIRE PERIODIC TESTING. ALL PROTECTIVE SIGNALING SYSTEM EQUIPMENT SHALL BE TESTED BY QUALIFIED PERSONNEL AT LEAST TWICE A YEAR FOR PROPER OPERATION, OR MORE OFTEN IF REQUIRED BY CODES, REGULATIONS AND LAWS. FAILURE TO MAINTAIN AND TEST PROTECTIVE SIGNALING SYSTEM EQUIPMENT CAN RESULT IN NOT DETECTING EQUIPMENT FAILURE THAT CAN CAUSE PROPERTY DAMAGE AND SERIOUS PERSONAL INJURY OR DEATH TO YOU AND/OR OTHERS DURING AN EMERGENCY SITUATION.**

## Section 3-7 – Ground Fault Detection

Ground fault detection sensitivity is 600K Ohms for Class B, Style Y connections. If ground fault detection is not desired, remove jumper W6. See Figure 3-15 on page 3-15 for location.

## Section 3-8 – Battery Care and Backup Battery Calculations

### Care of Sealed Lead Acid Batteries

Sealed lead acid batteries are designed to operate in standby service for approximately five years. This is based upon a normal service condition where there is an ambient temperature of 20 degrees C (68 degrees F) and batteries are completely discharged once every three months. LENGTH OF SERVICE LIFE WILL BE DIRECTLY AFFECTED BY THE NUMBER OF DISCHARGE CYCLES, DEPTH OF DISCHARGE, AND AMBIENT TEMPERATURE.

### Use Guidelines:

Avoid installation and/or operation in close proximity to heat sources. While the operating temperature range is 0 to 49 degrees C (32-120 degrees F), battery life will be maximized at an ambient temperature of 20 degrees C (68 degrees F).

Batteries may generate ignitable gases. Because of this, batteries shall be installed in a well-ventilated location, away from spark producing equipment.

Batteries shall not be installed in an atmosphere where organic solvents or adhesives may be present. The batteries shall not be cleaned with oils, thinners, or similar substances. The case and cover of the batteries are ABS plastic resin, which may suffer damage from these chemicals.

Batteries shall not be installed in a heavy vibration or shock location.

Insulated gloves shall always be worn when handling batteries.

**⚠ WARNING: BATTERIES SHALL NOT BE CRUSHED, INCINERATED, OR DISMANTLED. THE ELECTROLYTE CONTAINS SULFURIC ACID, WHICH CAN CAUSE SERIOUS DAMAGE TO EYES AND SKIN. IF CONTACT DOES OCCUR, FLUSH WITH WATER AND SEEK IMMEDIATE MEDICAL ATTENTION.**

Batteries of different capacities, age, or manufacturer shall not be used together.

### Battery Storage

Batteries which are to be stored for an extended period of time should be given a supplement charge monthly. Batteries should never be stored in a discharged condition.

The self-discharge rate of batteries is approximately 3% per month when the storage temperature is maintained at 20 degrees C (68 degrees F). The self-discharge rate will vary depending upon temperature. Cooler temperatures cause the self-discharge rate to decrease. Warmer temperatures cause the self-discharge rate to increase.

### Calculating Backup Battery Requirements

A Worksheet for assisting in calculating battery backup is available at the end of this manual.

**Due to the current drain on the battery, the maximum battery size for the SP40/2 is 12 Amp-hours.**

It is necessary to calculate the current draw for battery backup requirement. The current requirement depends on the system configuration and the appliances connected to the Strobe and Speaker output NAC circuits. Battery Backup current has two separate calculations that are added together. They are Standby Current and Alarm Current.

## **Standby Current**

The standby current consumes the largest part of the storage battery capacity. The standby current of the **SP40/2** panel is 0.125 Amp-hours. Multiply this value by the number of standby hours required. Normally this is 24 or 60 hours. This represents the total Standby current in amp-hours for the panel.

## **Alarm Current**

The maximum alarm current for the **SP40/2** panel is 4.30 Amps (1.6 Amps for audio, 2.0 Amps for strobe, and 0.5 Amps for auxiliary power).

1. Calculate strobe circuit output current by adding the current draw of all strobes. Current draw will be in amp-hours.
2. Calculate speaker output circuit current by totaling all the speaker wattage settings. Multiply the sum by .040. The result will be the current draw in Amps-hours.
3. Add the strobe circuit output current and the speaker output circuit current together. The results will be the total alarm current in amp-hours.

Alarm circuits are required to operate for 15 minutes on battery power. Multiply Step 3 by 0.25. The result is the total alarm current in amp-hours.


## **Battery Calculations**

**Good engineering practices recommend the total Amp-hours required for backup should not exceed 80% of the Backup Battery capacity. The SP40/2 has been UL approved for 12Ah batteries.**

1. Add the total Standby Current to the total Alarm Current.
2. Multiply Step 1 by 1.25. This is the minimum Backup Battery requirement for this panel.
3. Record results on worksheet.

## **Section 3-9 - AC Power and Battery Installation Procedures**

**NOTE: Power limited and non-power limited wiring must be separated. Non-power limited wiring (AC power and battery) shall be wired to the left of the motherboard. Power limited wiring shall be wired to the right of the motherboard.**

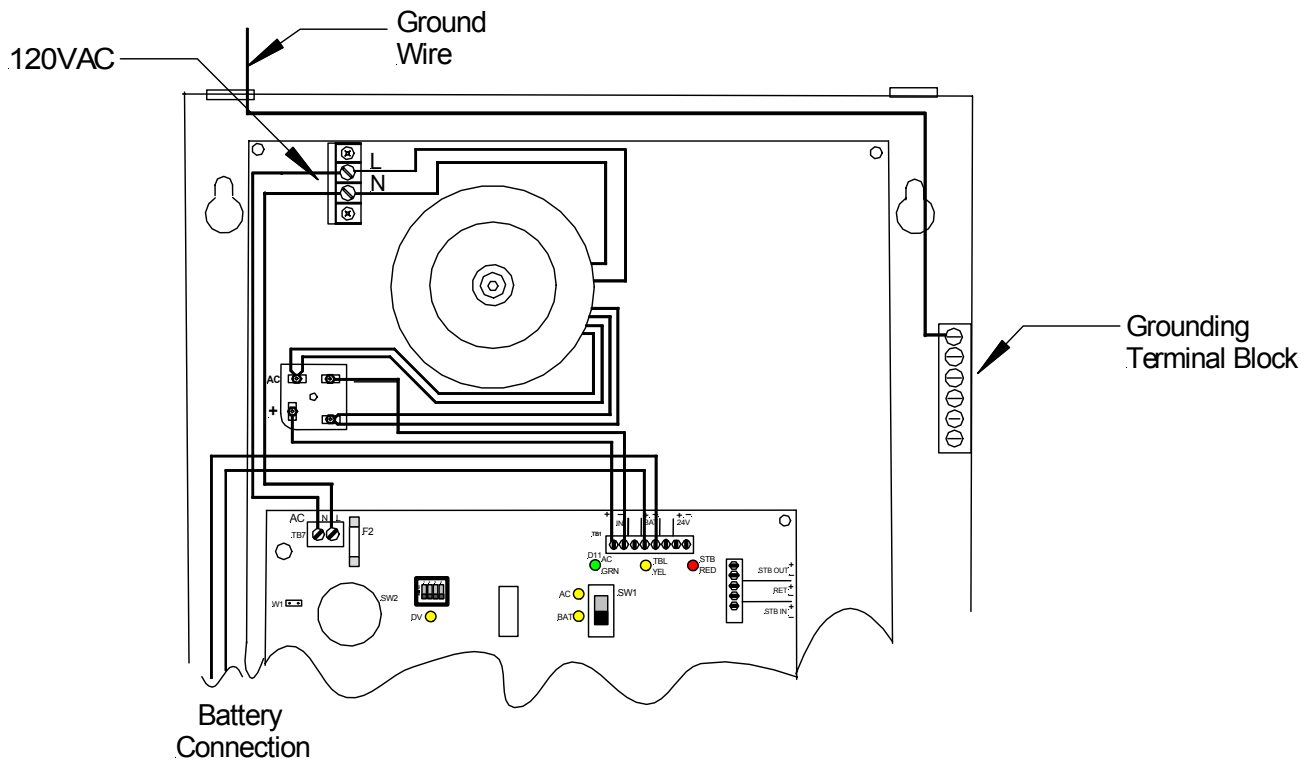
** WARNING: TWO DIFFERENT SOURCES OF POWER MAY BE CONNECTED TO THIS UNIT. DISCONNECT BOTH SOURCES OF POWER BEFORE SERVICING. FAILURE TO DISCONNECT BOTH POWER SOURCES BEFORE SERVICING COULD RESULT IN PROPERTY DAMAGE, SERIOUS INJURY, OR DEATH TO YOU AND/OR OTHERS.**

** WARNING: OBSERVE CORRECT POLARITY REQUIREMENTS ON ALL CONNECTIONS. FAILURE TO DO SO MAY DAMAGE THE EQUIPMENT.**

** WARNING: ALWAYS APPLY AC VOLTAGE BEFORE APPLYING BATTERY BACKUP VOLTAGE. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE SP40/2 PANEL.**

### AC Power Installation Procedure

1. Using Figure 3-16 below, connect the line and neutral 120VAC input wiring to the L (Line) and N (Neutral) terminals on the terminal block in the upper left corner of the chassis.
2. Insure the ground input wiring is connected to the grounding terminal block on the right side of the chassis as shown in Figure 3-16 below. Secure wire with the caps nut located in the hardware package.



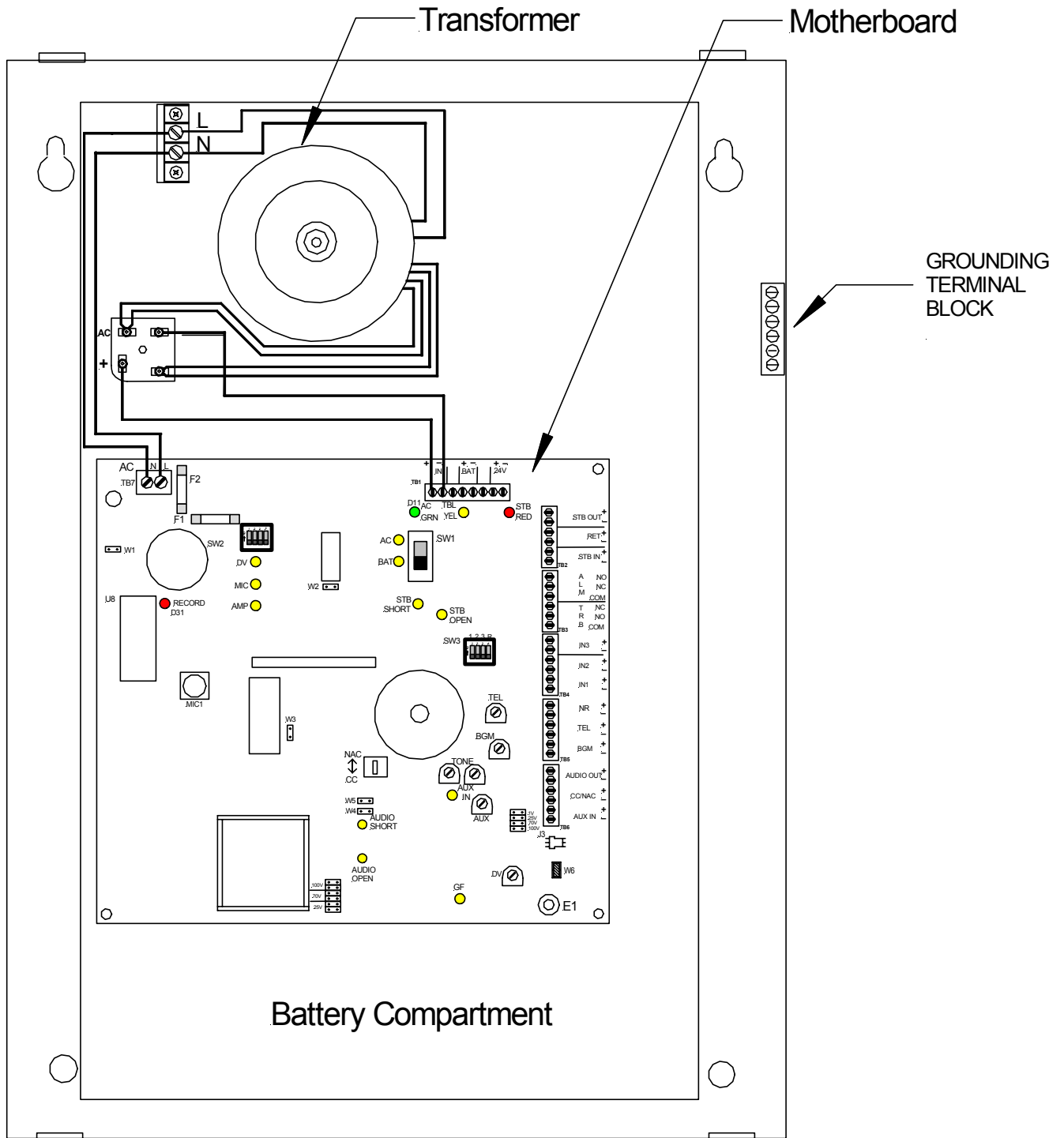
**Figure 3-16**  
**120VAC Input Connection.**

### Battery Installation Procedure

**NOTE: Batteries are not supplied with this panel and must be purchased separately.**

1. Connect the supplied red battery wire to the (+) terminal and the supplied black battery wire to the (-) terminal of TB1. (See Figure 3-13 on Page 3-13)
2. Using Figure 3-17 below, run jumpers down the left side of the chassis to the battery compartment.

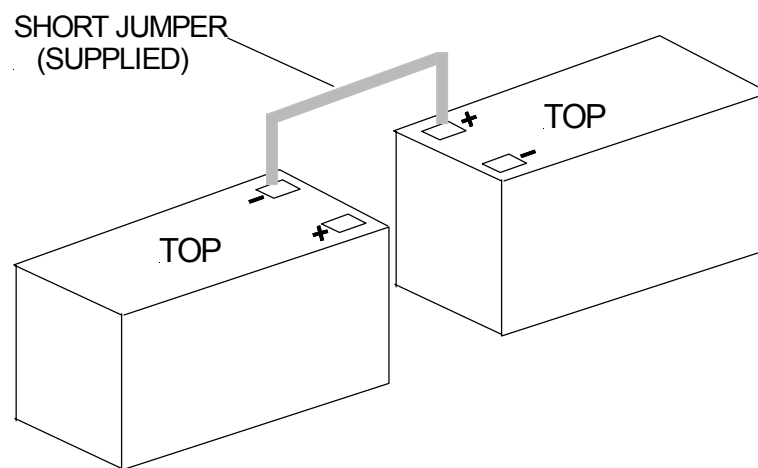




**Figure 3-17**  
**Battery Wire Connections**

- Using Figure 3-18 on Page 3-23, place one 12 Volt battery with the battery terminals on top and to the right. Place the second battery to the right of the first battery with the battery terminals on top and to the left.

**⚠ CAUTION:** Always install the two batteries with the battery terminals pointing to the center and in the upright position as shown in Figures 3-17 and 3-18. Failure to do so may cause a short circuit which may damage the **SP40/2** panel or batteries and cause the panel to fail to operate in an emergency condition.



**Figure 3-18**  
**Battery Alignment and Jumper Connection**

- Connect the short jumper (included) to the back terminals (negative to positive) of the two batteries as shown in Figure 3-18. This connects the 12VDC batteries in series in order to produce 24VDC.
- Place the batteries in the battery compartment with the battery terminals and jumper facing "UP" or toward the top of the **SP40/2** panel as shown in Figure 3-18. Make sure that the red and black battery jumpers are clear of the batteries.
- Attach the red and black battery wires (red to (+), black to (-)) to the proper battery terminals.

# Chapter 4 - OPERATION

## Section 4-1- Introduction

This chapter describes the operating characteristics of the *SP40/2* panel. Included is information about the following *SP40/2* panel features:

- Operator's Console
- Supervision
- Digital Voice Section
- Audio Notification Appliance Output Circuit Supervision
- Amplifier Supervision
- Actions that Initiate Alarms

## Section 4-2 - Operator's Console

The operator's console includes a microphone, an AUDIBLE TROUBLE SILENCE Switch, an AC LED, a TROUBLE LED, and a STROBE ALARM LED. Opening the enclosure door accesses the operator's console.

## Section 4-3 - Supervision

A TROUBLE LED indicates that the supervisory functions have detected a malfunction in the panel. When a trouble condition is detected, the panel may not be able to receive and/or remember message requests from the control panel. The installer and/or user must make sure that any message requests to the panel during a trouble condition are reactivated if necessary, when the panel returns to normal.

If a trouble condition is detected by any of the supervisory functions, the internal sounder will operate, the panel Form C TROUBLE relay (normally energized) will change state, and the yellow TROUBLE LED will turn "ON". The Trouble Status Relay (TB3-4, 5 and 6) must be properly connected to and used by the control panel to indicate a system trouble. At the same time one of the yellow trouble location LEDs will identify the location of the trouble condition. The internal sounder can be silenced for 20 minutes by depressing the "Trouble Acknowledge" Switch (SW1). Any subsequent troubles will cause the sounder to be activated. If a trouble condition is indicated, follow the procedures in Chapter 7 "Troubleshooting".

**⚠ WARNING: DO NOT LEAVE THE PANEL IN A TROUBLE CONDITION, AS IT MAY NOT PLAY WARNING MESSAGES WHICH COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS. IF THE PANEL INDICATES A TROUBLE CONDITION: (1) PROVIDE UL REQUIRED ALTERNATIVE SIGNALING AND (2) HAVE QUALIFIED SERVICE PERSONS IMMEDIATELY REPLACE UNIT(S) THAT HAVE MALFUNCTIONED.**

**⚠ WARNING: MESSAGES REQUESTED BEFORE AND DURING A TROUBLE CONDITION MAY NOT BE HEARD, WHICH COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS. IF MESSAGES REQUESTED BEFORE AND DURING A TROUBLE CONDITION ARE STILL NECESSARY, THEY SHOULD BE REPEATED WHEN THE SP40/2 PANEL IS RETURNED TO NORMAL.**

**Visual Notification Appliance Output Circuit Supervision**

The visual notification appliance output circuit uses Class B, Style Y wiring, and is supervised for open and short circuits when the output is de-energized. Output circuit supervision requires installation of UL Listed 10K Ohm, ½ W EOLR on the output circuit. A sensed Strobe short circuit trouble will illuminate D37 STB SHORT LED. A sensed strobe open circuit trouble will illuminate D39 STB OPEN LED. See Figure 7-1 on Page 7-2 for LED location.

**Audio Notification Appliance Output Circuit Supervision**

The audio notification appliance output circuit uses Class B, Style Y wiring, and is supervised for open and short circuits when the output is de-energized. Output circuit supervision requires installation of UL Listed 10K Ohm, ½ W EOLR on the output circuit. A sensed open circuit trouble will illuminate D58 AUDIO OPEN LED. A sensed strobe short circuit trouble will illuminate D54 AUDIO SHORT LED. See Figure 7-1 on Page 7-2 for LED location.

**Amplifier Supervision**

A supervisory tone plays through the amplifier section during standby for supervision purpose. Any sensed trouble illuminates D36 “AMP” LED. See Figure 7-1 on Page 7-2 for LED location.

**Ground Fault Supervision**

The **SP40/2** panel supervises for ground fault conditions on Class B, Style Y field wiring that is not electrically isolated. The supervised wiring includes contact inputs, visual NAC circuits, audio NAC circuits, amplified speaker NAC circuits, trouble audible output circuits, All other wiring is electrically isolated. Removing jumper W6 shall disable ground fault supervision. If a ground fault condition exists D60 GF LED illuminates. See Figure 7-1 on Page 7-2 for LED locations.

**Section 4-4 - Actions That Initiate Alarms**

Table 4-1 indicates what can initiate an alarm condition and the resulting **SP40/2** panel actions.

**Table 4-1 Alarm Conditions and Results**

PRIORITY OF EVENT	INITIATING ACTION	RESULT
1	Panel microphone push-to-talk button, is depressed.	Panel microphone live voice broadcast enabled.
1	Strobe NAC (9 to 31VDC) input	Strobes enabled.
3, 4, 5	Digital Voice circuit NAC (9 to 31VDC) inputs. (IN1, IN2, IN3)	Selected Digital Voice enabled. If digital voice is non-operational, program tone broadcasts.

# Chapter 5 - Operational Procedures

## Section 5-1 - Operator Instructions

The **SP40/2** panel provides an operator console for push-to-talk Microphone capability and monitoring normal and trouble conditions. The operator console includes a microphone, a green AC LED, a yellow TROUBLE LED, and a red STROBE ALARM LED. The operator instructions are shown in Figure 5-2 on Page 5-3.

**The TROUBLE and AC LEDs identify to the operator the condition of the SP40/2. The yellow TROUBLE LED will be illuminated whenever there is a trouble detected by the panel. If no troubles are detected, only the green AC LED will be illuminated.**

## Section 5-2 - To Make Live Announcements

1. Hold the microphone within 2 inches from your mouth, press push-to-talk switch and begin speaking. (For best results hold the microphone within a half inch from your mouth.)
2. When finished, release the PTT switch and return the microphone to its holder.

**NOTE: If the microphone push-to-talk button is depressed and remains depressed for two and a half minutes, the microphone circuit will automatically switch to the selected supervision tone.**

## Section 5-3 - To Record Digital Voice Messages

The Digital Voice section of the **SP40/2** panel contains a digital voice memory chip that contains the digital voice program and the voice messages. The memory chip comes with 3 messages installed. The DV Memory Chip (See Figure 5-1 on Page 5-2) can be removed and the messages will remain on the chip. If tailored messages (messages with tones) are required from Wheelock Inc. the new chip can be installed when received.

The message chip memory is divided into three segments. Each segment is prioritized 1 through 3 matching the inputs IN1 through IN3. If IN3 message is playing and either messages IN2 or IN1 are initiated, the message on IN3 will immediately stop and the higher priority message will play.

As long as the NAC voltage is applied to the input, the message will repeat. When the voltage is removed, the message will play to the end and stop.

When the Digital Voice Section is set up for record mode it is important to remember that there are three memory segments on the DV Memory Chip. Segment 1 is 21 Seconds, Segments 2 and 3 are 18 seconds each.

**NOTE: If the Digital Voice Section should fail the SP40/2 panel will play the selected tone (Code 3 Tone or Slow Whoop). See Figure 3-15 on Page 3-15 for the location of jumper W3. See Table 3-2 for explanation of the jumper.**

## **Procedure for Recording Messages on the Digital Voice Section**

**⚠ CAUTION:** Recording of any new message will permanently erase the previous message. If a Wheelock, Inc. factory prerecorded fire or emergency message, or a tailored message is accidentally or intentionally erased, a new factory recorded message kit must be purchased to restore the message.

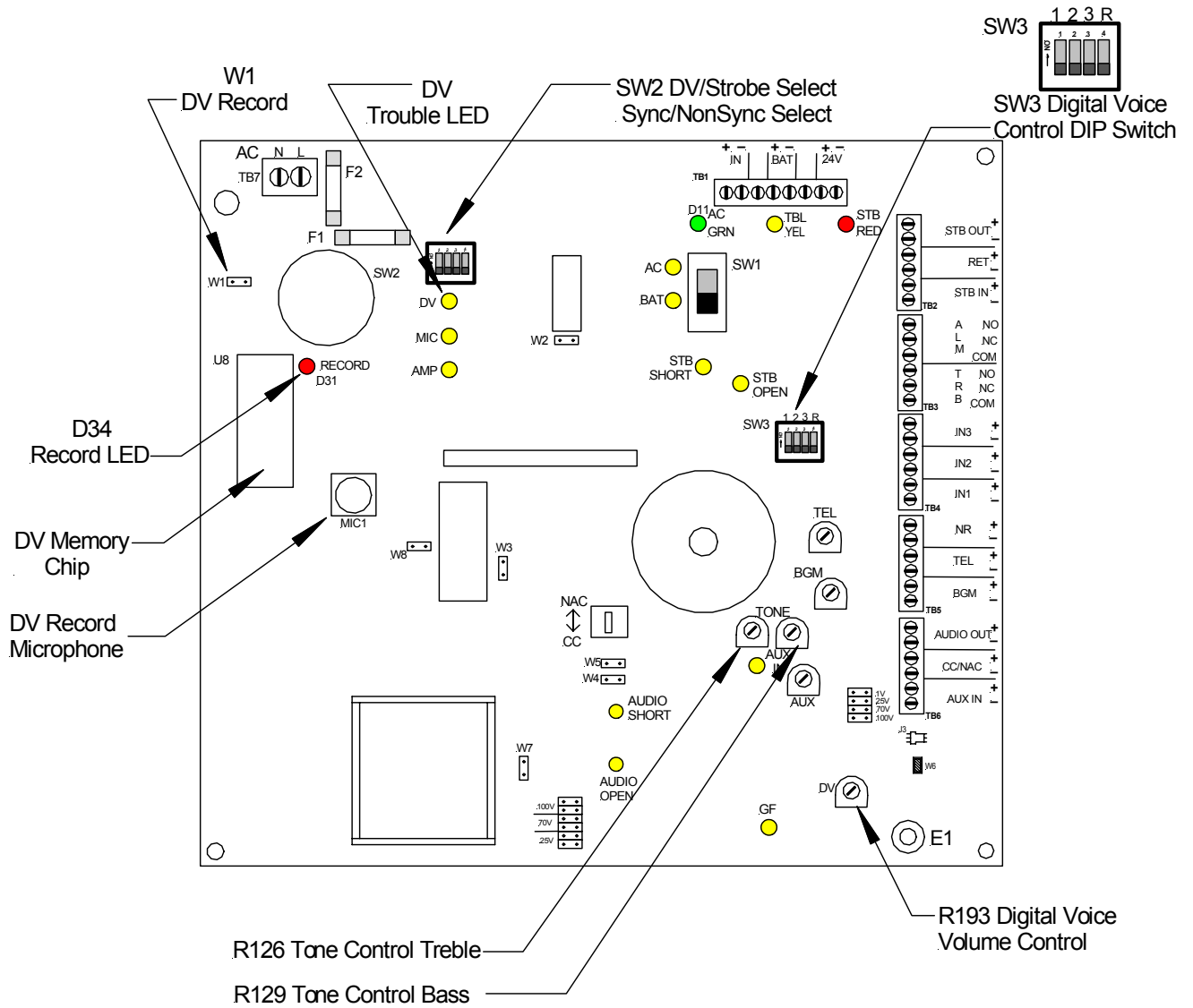
Refer to Figure 5-1 (Page 5-2) for location of all Digital Voice Section operating components. Decide which message segment that the recording will be made on. Read through this procedure carefully before attempting a recording. Identify all components mentioned.

1. Remove the DV Record Jumper W-1. Place jumper in a secure place. It will be replaced at the end of the recording procedure.
2. Turn switch 4 (R) on the DV Select DIP Switch (SW3) to the up or **ON** position.
3. Determine which one of the three messages you wish to record.
4. With the mouth approximately one inch from the DV Microphone and the right hand on the proper message switch on SW3 (DV Select Switch) 1, 2, or 3, turn **ON** or to the up position, the desired switch and immediately state the message.
5. When the message has concluded turn **OFF** switch 4 (R) on the DV Select Switch (SW3).
6. Turn **OFF** the selected switch on SW3.
7. Check recorded message by momentarily turning **ON** the selected switch on the DV Select Switch (SW3). The message will play in its entirety.
8. For additional message recording, repeat steps 2 through 7.
9. When recording is done replace DV Record Jumper (W1).

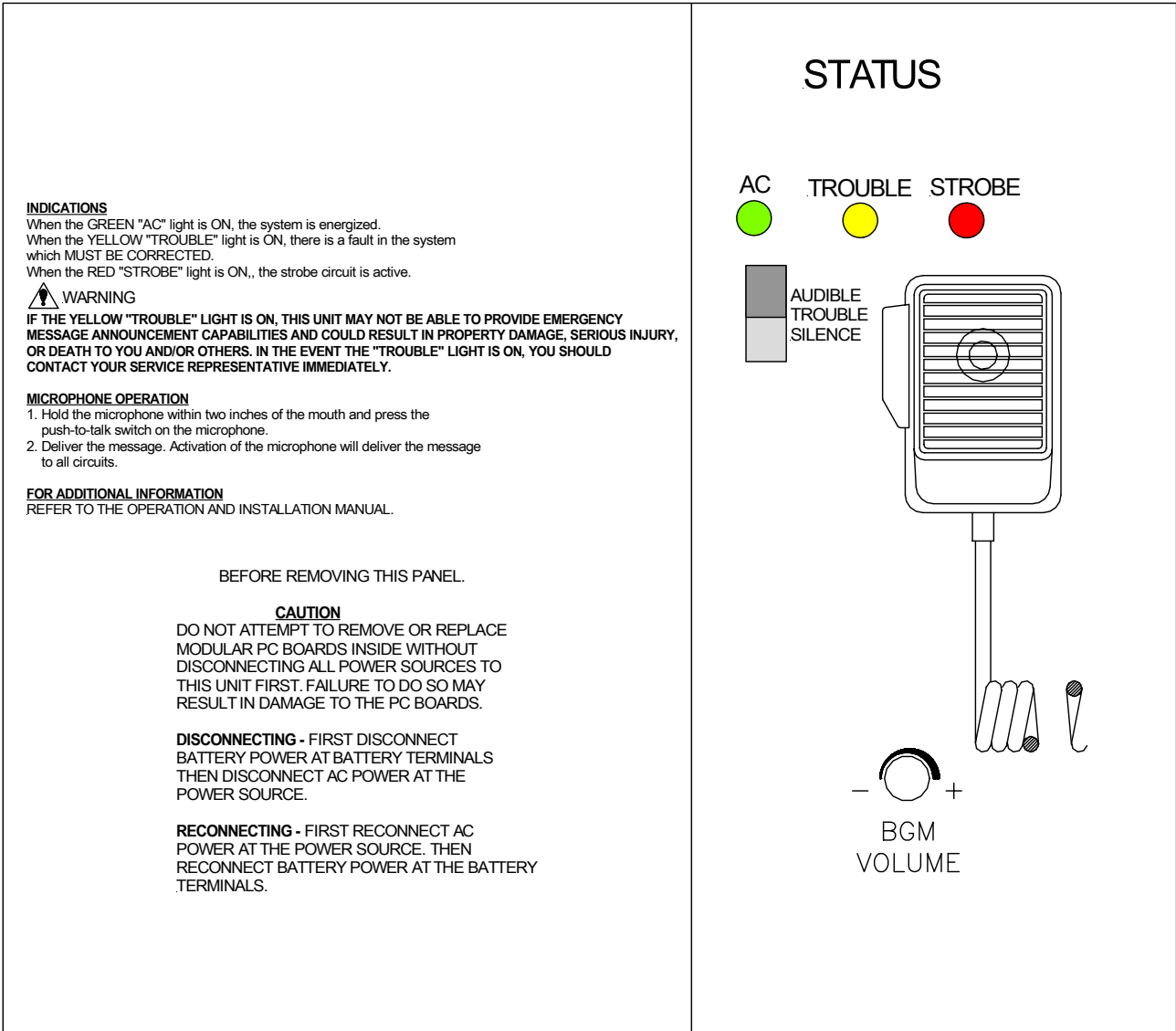
## **Procedure for Verifying Messages**

**NOTE:** Verify SW3 DIP switch, position 4 (R) is in the **OFF** position.

1. Momentarily switch on selected switch on the DV Select Switch (1, 2, or 3) (SW3). The message will play in its entirety.
2. Adjust R126 (treble) and R129 (bass) tone controls for desired output.



**Figure 5-1**  
**Digital Voice Section**



**Figure 5-2**  
**SP40/2 Panel Operator Console**



# Chapter 6 - Periodic Testing and Maintenance

## Section 6-1 - Introduction

Periodic testing and maintenance of the **SP40/2** panel and all notification equipment must be conducted frequently. Check local, state and federal codes, regulations and laws, for required tests. Qualified personnel should perform all tests and maintenance.

## Section 6-2 - Periodic Testing

### Test Frequency

Equipment shall be tested at least twice each year, or more often as required by local, state and federal codes, regulations and laws.

### Equipment

The following equipment needs to be tested to ensure that equipment is operating properly:

- **SP40/2** panel
- All notification appliances

## Section 6-3 - Faulty Equipment

If the notification equipment is not working properly, contact the service representative and have problems corrected immediately. If the service representative is not available, contact the manufacturer.

Malfunctioning modules in the panel shall be replaced immediately. Do not attempt to repair them.

Malfunctioning modules should be returned to the manufacturer for repair or replacement.

## Section 6-4 - Qualified Personnel

Qualified personnel are those who can evaluate proper equipment functionality and ensure its proper operation and shall perform all testing procedures on the **SP40/2** panel.

**⚠ WARNING: PROVIDE ALTERNATIVE SIGNALING MEANS DURING PERIODIC TESTING TO ASSURE ADEQUATE PROTECTION OF PEOPLE AND PROPERTY. FAILURE TO PROVIDE ALTERNATIVE SIGNALING MAY CAUSE PEOPLE TO NOT BE WARNED OF AN EMERGENCY CONDITION WHICH COULD RESULT IN PROPERTY DAMAGE AND SERIOUS INJURY OR DEATH TO YOU AND/OR OTHERS.**

## Section 6-5 - Miscellaneous Hardware Testing

In addition to testing required by relevant fire codes, regulations, and laws, the following hardware functions shall be tested (see Table 6-1).

**Table 6-1**  
**Miscellaneous Hardware Tests**

TEST/HARDWARE	TEST DESCRIPTION
Proper Operation/Status Contact	Monitor the status contact, while causing the panel to alternate between trouble and normal states to verify proper operation.

If the panel fails to perform any of the above tests correctly, Go to Chapter 7 – Troubleshooting.

# Chapter 7 - Troubleshooting

## Section 7-1 - Introduction

**⚠ WARNING:** SOME ELECTRONIC COMPONENTS STORE A HIGH VOLTAGE CHARGE, EVEN THOUGH POWER IS NOT CONNECTED, AND CAN CAUSE A DANGEROUS SHOCK IF TOUCHED. DO NOT TOUCH EXPOSED CIRCUITRY ON THE SP40/2 PANEL UNLESS THE CIRCUITRY HAS DISCHARGED FOR ONE HOUR AND A SAFE DISCHARGE PROCEDURE IS USED.

**⚠ WARNING:** PROVIDE UL REQUIRED ALTERNATIVE SIGNALING MEANS DURING TROUBLE CONDITIONS AND SERVICING TO ASSURE ADEQUATE PROTECTION OF PEOPLE AND PROPERTY. HAVE QUALIFIED SERVICE PERSONS IMMEDIATELY REPLACE ANY MODULES THAT HAVE MALFUNCTIONED.

**⚠ CAUTION:** Only qualified persons in accordance with the procedures in this manual should conduct troubleshooting and servicing. Do not attempt to make other adjustments, modifications, or repairs. Never use water, steam, cleaning liquids or sprays on the panel.

**⚠ CAUTION:** User servicing of the SP40/2 panel is limited to field-wiring changes and following the instructions in Chapter 3 and procedures in this chapter of this manual.

**AFTER ANY TROUBLESHOOTING PROCEDURE IS COMPLETED, PERFORM A COMPLETE SYSTEM CHECKOUT AS DESCRIBED IN CHAPTER 3.**

## Section 7-2 - Troubleshooting

The panel monitors system integrity. Items monitored for integrity are:

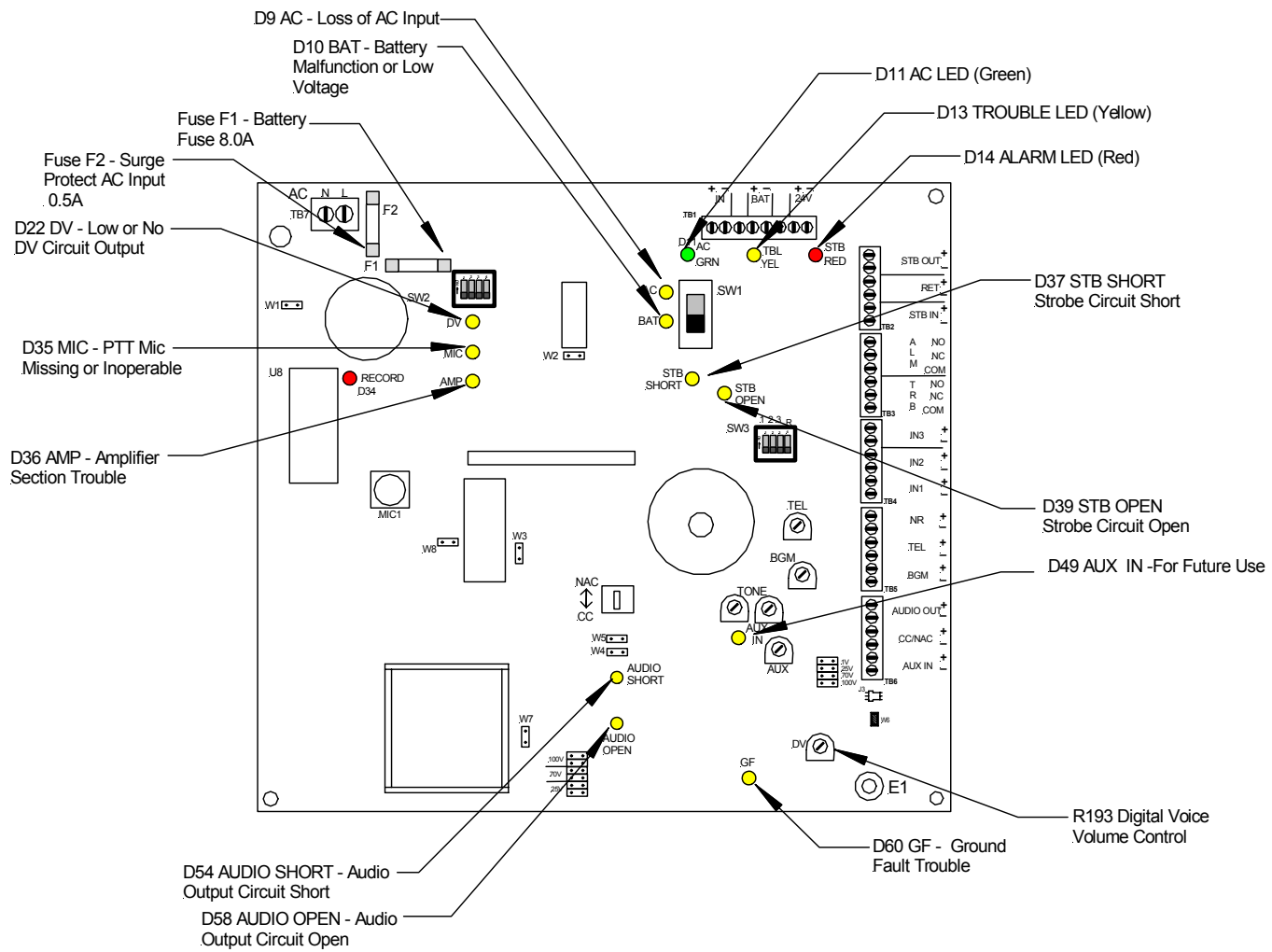
1. Visual appliance circuit field wiring.
2. Audio appliance circuit field wiring.
3. Input voltage. AC (120VAC, 50-60 Hz), Backup Battery (24VDC).
4. Battery voltage level.
5. Battery circuit field wiring.
6. Amplifier functionality.
7. Digital Voice Section functionality.

System status is indicated to the operator via the AC and TROUBLE LEDs, the internal TROUBLE sounder, and the Trouble Form C relay contacts. If a trouble condition is detected, the panel will respond as follows:

1. Turn "ON" the TROUBLE LED.
2. Turn "ON" the internal sounder.
3. Change the state of the Form C trouble contact to the TROUBLE position.

When there are no trouble conditions detected, the AC LED will always be "ON" and the TROUBLE LED will always be "OFF". When a trouble condition is detected, the AC LED will remain "ON" and the TROUBLE LED will always be "ON".

Figure 7-1 shows the location of all trouble location LEDs within the panel. Table 7-1 on Page 7-3 cross-references the trouble location LEDs on the motherboard to the proper troubleshooting procedure.



**Figure 7-1  
Trouble LED and Fuse Locations**

**NOTE: When D13 TBL LED is illuminated, indicating a panel Trouble, at least 1 of the 12 yellow LEDs will also be illuminated indicating the trouble location.**

**Table 7-1  
Trouble LED Procedure Cross Reference**

<b>D13 TBL LED (YELLOW)</b>	<b>LED</b>	<b>TROUBLE DESCRIPTION</b>	<b>TROUBLE SHOOTING PROCEDURE</b>
"OFF"	D11 AC LED "OFF"	No AC Power to the Motherboard.	Procedure A
"ON"		No Audio and/no strobe output	Procedure B
	D10 BAT	Battery voltage is below 18.5 VDC or battery is missing.	Procedure C
	D9 AC	AC input voltage missing for more than 6 hours.	Procedure D
	D22 DV	Digital Voice Section output voltage is too low or missing.	Procedure E
	D35 MIC	Push-to-talk Microphone inoperable or missing.	Procedure F
	D36 AMP	Amplifier failure or J4 jumpers incorrect.	Procedure G
	D37 STB SHORT	Strobe Notification Appliance Circuit is shorted.	Procedure H
	D39 STB OPEN	Strobe Notification Appliance Circuit is open	Procedure I
	D49 AUX IN	Auxiliary input is open or remote MIC is in TROUBLE	Procedure J
	D54 AUDIO SHORT	Audio Notification Appliance Circuit is Shorted	Procedure K
	D58 AUDIO OPEN	Audio Notification Appliance Circuit is open	Procedure L
	D60 GF	Ground Fault Trouble	Procedure M

**BEFORE PERFORMING ANY OF THE FOLLOWING TROUBLESHOOTING PROCEDURES, THE PRELIMINARY TROUBLESHOOTING INFORMATION AT THE BEGINNING OF THIS "TROUBLESHOOTING" SECTION MUST BE READ, UNDERSTOOD, AND FOLLOWED.**

### **Procedure A**

If the green AC LED is "OFF", and all other LEDs are "OFF", a power loss condition has occurred. A power loss condition may be caused by:

1. Loss of AC input voltage and battery back-up voltage.
2. Faulty internal wiring between the rectifier module and the ± IN (TB1) on the motherboard and batteries missing.
3. Faulty Motherboard.
4. Faulty Transformer Assembly

Perform the following:

1. Check for 24VDC at TB1 on the Motherboard. If voltage is not present, replace the Transformer Assembly (SP40XFMR). Check for battery installation.
2. If the 24VDC is present on TB1, replace the motherboard.

**NOTE: Mark all wires before removing components. When the trouble is repaired, and before testing, replace all wires to the proper locations and replace all covers.**

## Procedure B

If the green AC LED is "ON", yellow TROUBLE LED may or may not be "ON", no other LED's are "ON" and there is no audio output and or strobe output the **SP40/2** is in an overcurrent state:

Check the strobe output (if applicable) and the speaker output for excessive current calculation. (2.0A for strobe circuit, 1.6 Amps for audio circuit, and 0.5 Amps for auxiliary power)

Perform the following:

1. If excessive current is calculated remove appliances until the strobe current is below 2.0 Amps and the audio circuit current is below 1.6 Amps (Refer to Section 3-8, Alarm Current calculation on Page 3-20).
2. If excessive current does not exist and audio and/or strobe outputs are not operating the SP40/2 must be reset by turning it off and reenergizing it. Remove battery power first, then remove AC power. Wait 30 seconds. Apply AC Power first, then apply battery power. This will reset the Overcurrent circuit.

## Procedure C

If the green AC LED is "ON", yellow TROUBLE LED is "ON" and D10, BAT LED is "ON", Battery Voltage is below 18.5VDC or battery is missing. A battery trouble condition might be caused by:

1. Battery charging section of Motherboard is inoperable.
2. Batteries are missing.
3. Batteries are defective.
4. Battery wiring is incorrect.

Perform the following:

1. Check for 24VDC at  $\pm$  BAT connection at TB1 on the motherboard. If the voltage is below 18.5VDC, battery-charging section of the motherboard is inoperable. Replace the Motherboard.
2. Check battery compartment for the presence of batteries. If batteries are not installed, install them.
3. Insure that batteries are properly wired. See Figure 7-2 on Page 7-8.
4. If Steps 1 through 3 are satisfied replace batteries.

## Procedure D

If the green AC LED is "OFF", yellow TROUBLE LED is "ON", and D9, AC LED is "ON", 24VDC on +/- IN connection (TB1) is low or missing. An AC trouble condition might be caused by:

1. AC input missing or low.
2. No AC voltage to the AC Monitor Circuit.
3. Faulty internal wiring between the rectifier module and TB1 on the motherboard.
4. Rectifier module trouble.
5. A faulty Motherboard.

Perform the following:

1. Check AC input.
2. Check fuse F2 on motherboard.
3. Check wiring between the rectifier assemble and TB1 on the motherboard.
4. Check for 24VDC at TB1. If voltage is not present, replace rectifier module. If voltage is present replace motherboard.

## **Procedure E**

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D22, DV LED is "ON", the Digital Voice messages are missing or the DV output voltage is too low. A DV low output voltage condition might be caused by:

1. Missing memory chip.
2. No messages recorded on memory chip.
3. Digital Voice volume control (R193) set too low.
4. A faulty Motherboard.

Perform the following:

1. Check for missing memory chip.
2. Verify messages are recorded on chip by activating them using switch SW3.
3. Check Digital Voice volume control (R193) for proper volume level.
4. Replace the Motherboard.

## **Procedure F**

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D35, MIC LED is "ON", the push-to-talk microphone is missing, improperly plugged in, or defective. A MIC trouble condition might be caused by:

1. Missing push-to-talk Microphone
2. Microphone Improperly installed.
3. Defective Microphone.
4. A faulty Motherboard, replace.

Perform the following:

1. Install Microphone.
2. Remove microphone plug and plug it back in.
3. Replace Microphone.
4. Replace motherboard.

## **Procedure G**

If the green AC LED is "ON", yellow TROUBLE LED is "ON", D36, AMP LED is "ON", input to amplifier section is missing or too low, or amplifier section on motherboard is defective. An amplifier trouble condition may be caused by:

1. No message or Volume is too low on the DV Memory Chip.
2. 900 HZ tone missing

Perform the following:

Replace the Motherboard.

## **Procedure H**

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D37, STB SHORT LED is "ON", a short condition exists on the STB OUT NAC output circuit. A STB SHORT trouble condition might be caused by:

1. Shorted appliance on STB OUT.
2. Faulty wiring between STB OUT and strobe notification appliance circuit causing a short..

Perform the following:

Check wiring and strobe notification appliances for a short circuit condition.

## Procedure I

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D39, STB OPEN LED is "ON", an open condition exists on the STB OUT NAC output circuit. A STB OPEN trouble condition might be caused by:

1. Missing UL Listed 10K OHM, ½ W EOLR on the STB OUT circuit (TB2)
2. Faulty wiring causing an open on the Strobe Notification Appliance Circuit.

Perform the following:

1. Check for proper EOLR.
3. Check strobe notification appliance circuit wiring for an open condition.

## Procedure J

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D49, (AUX IN LED) is "ON", an open condition exists on the CC/NAC input circuit. An AUX IN trouble condition might be caused by:

1. A Remote Microphone trouble being reported to the SP40/2 (if a remote MIC is connected).
2. Faulty wiring causing an open on the CC/NAC input circuit.
3. Jumper W5 being removed and missing UL Listed 10K Ohm, 1/2W EOLR on the CC/NAC circuit (TB 6) (if a remote MIC is not connected).
4. If remote MIC is used, a 10K Ohm resistor is needed on AUX IN.

Perform the following:

1. Check Remote Microphone wiring for an open condition.
2. Check jumper setting if a Remote Microphone is not connected to the SP40/2.

## Procedure K

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D54, AUDIO SHORT LED is "ON", a short condition exists on the AUDIO OUT NAC output circuit. An AUDIO SHORT trouble condition might be caused by:

2. Shorted speaker appliance on AUDIO OUT.
5. Faulty wiring between AUDIO OUT and Speaker Notification Appliance Circuit causing a short.

Perform the following:

Check wiring and Audio Notification Appliances for a short circuit condition.

## Procedure L

If the green AC LED is "ON", yellow TROUBLE LED is "ON", and D58 AUDIO OPEN LED is "ON", an open condition exists on the STB OUT NAC output circuit. A STB OPEN trouble condition might be caused by:

1. Missing UL Listed 10K OHM, ½ W EOLR on the AUDIO OUT circuit (TB6)
2. Faulty wiring causing an open on the speaker notification appliance circuit.

Perform the following:

1. Check for proper EOLR.
2. Check speaker notification appliance circuit wiring for an open condition.



## Procedure M

If the green AC LED is “ON”, yellow TROUBLE LED is “ON”, and D60, GF LED is “ON”, a ground fault condition exists on the output wiring. A GF trouble condition might be caused by:

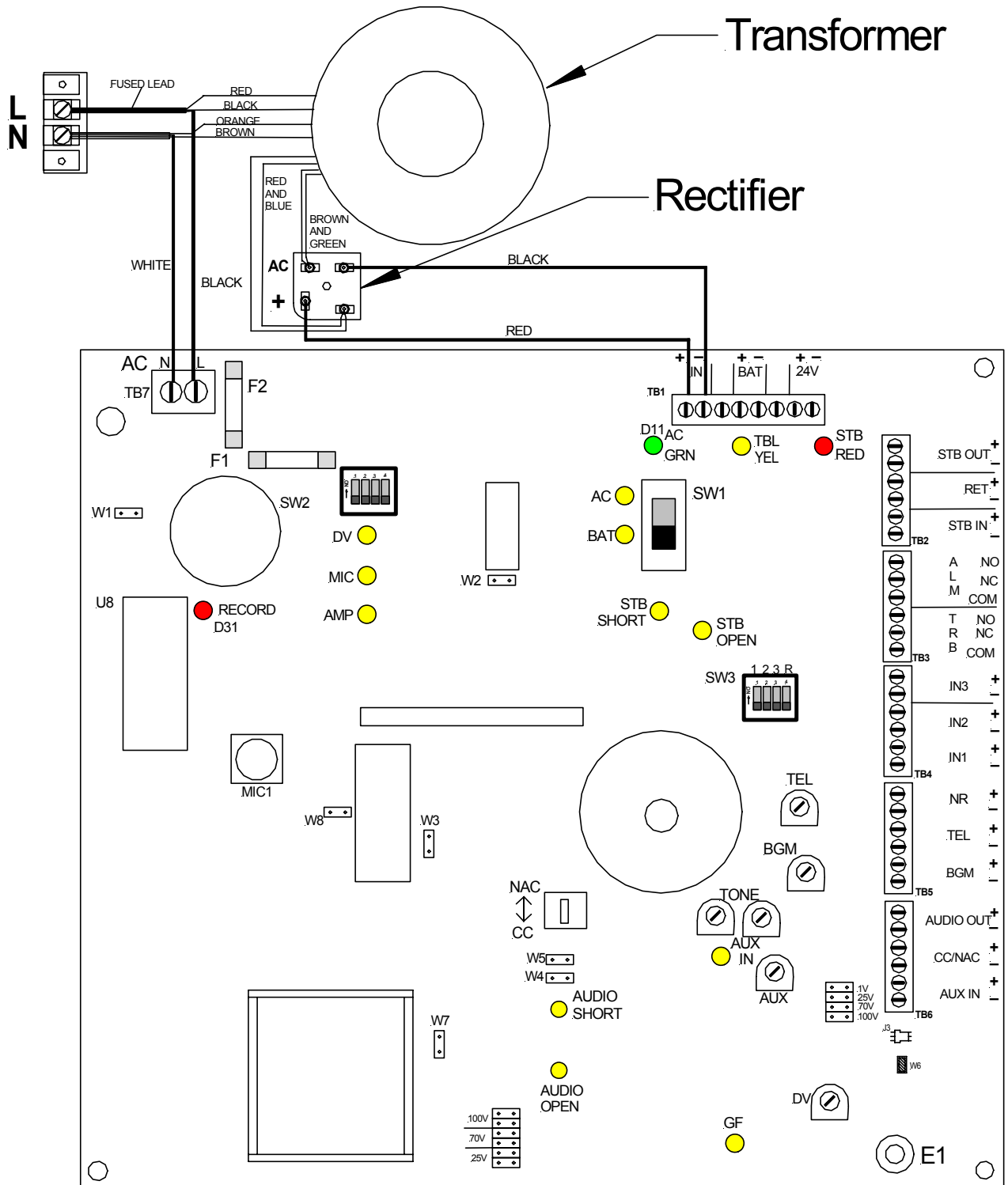
1. Appliance wiring touching conduit.
2. Improper Installation of an appliance(s).

Perform the following:

Disconnect appliances from the strobe and speaker connection on the motherboard. Troubleshoot NAC circuits by checking for a resistance reading other than infinity between the appliance leads and the conduit.

## Section 7-2 – SP40/2 Panel Wiring Diagram

Figure 7-2 on Page 7-8 illustrates the **SP40/2** panel wiring between modules. Note that the wires are color coded. If modules have been replaced and trouble exists or improper wiring is suspected, use this wiring diagram to trace the proper wiring route.



**Figure 7-2**  
**SP40/2 Panel Wiring Diagram**

# Chapter 8 Technical Data

## Section 8-1- Mechanical

Dimensions (H x W x D)	21 x 16 x 6 in.
Weight	36 lb.
Finish	Red
Enclosure Construction Type	Enclosure Door 0.05" steel Enclosure Backbox 0.62" steel
Mounting	Indoor surface mount
Wiring Entry	Top, and bottom knockouts (1") (8 total)
Door Lock	Standard Wheelock key-lock
PC Boards	1 Motherboard

## Section 8-2 - Environmental

Operating Temperature	0 to 49 °C (32 to 120 °F)
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Humidity, Non-condensing	85±5% at 30±2 °C (86 ± 4 °F)

## Section 8-3 - Electrical

### Input

Input Voltage	120VAC, 2.15A, 50-60Hz
---------------	------------------------

### Battery Current Calculations

The current draw of the **SP40/2** is determined by the configuration being utilized. Section 3-8 Battery Care and Battery Backup Calculation will assist you in developing the current requirements.

## Activation

There are nine ways to activate the **SP40/2** panel. Table 8-1 lists these sources in the order of their priority.

**Table 8-1**  
**Input Activation**

Method of Activation	Description
Strobe *	NAC 9-31VDC
Push-to-Talk Microphone	Connected to Mother Board
IN1 *	NAC 9-31VDC. Activates Message 1 on Digital Voice Section.
IN2 *	NAC 9-31VDC. Activates Message 2 on Digital Voice Section
IN3 *	NAC 9-31VDC. Activates Message 3 on Digital Voice Section
Telephone Page	Telephone Page Port
Night Ring	Contact Closure
Background Music	Line Level Signal 2.5V P-P or 300mV RMS at 600 Ohms.

\* **NOTE:** Alarm current: 5mA at 24VDC, 2.5mA at 12VDC.

## Outputs

**Table 8-2**  
**Outputs**

Visual Notification Appliance Output	1 output circuit. 2.0 amps at 24VDC. Supervised.
Central Amplified Audio Output	1 output circuit. Selectable 25 or 70.7 Volt output at 40W max. Supervised.
Trouble Contact	Form C contact normally energized. Contacts transfer during trouble: 2.0 amps at 24VDC max, resistive load (see following warning). Non-Supervised.
Alarm Contact	Form C contact normally de-energized. Contact transfers during alarm: 2.0 amps at 24VDC max, resistive load (see following warning). Non-Supervised.

**⚠ WARNING: DO NOT EXCEED THE RATINGS OF THE STATUS CONTACTS. EXCEEDING THIS RATING MAY CAUSE THE RELAY TO FAIL AND PREVENT A TROUBLE CONDITION FROM BEING INDICATED.**

**⚠ WARNING: DO NOT EXCEED THE RATINGS OF THE ALARM CONTACTS. EXCEEDING THIS RATING MAY CAUSE THE RELAY TO FAIL AND PREVENT THE MESSAGES FROM BEING PLAYED.**

## **Wiring Connections**

Screw terminals	Accepts #12 to #22 AWG for single wire connection, or #16 to #22 AWG for double wire connection.
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## **End of Line Resistor**

Visual Notification Appliance Outputs	UL Listed 10K Ohm, 1/2 W, EOLR
Audio Notification Appliance Outputs	UL Listed 10K Ohm, 1/2 W, EOLR

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# Chapter 9 - Module Descriptions

## Section 9-1 - Introduction

There are three items on the parts list for the **SP40/2** panel. They are:

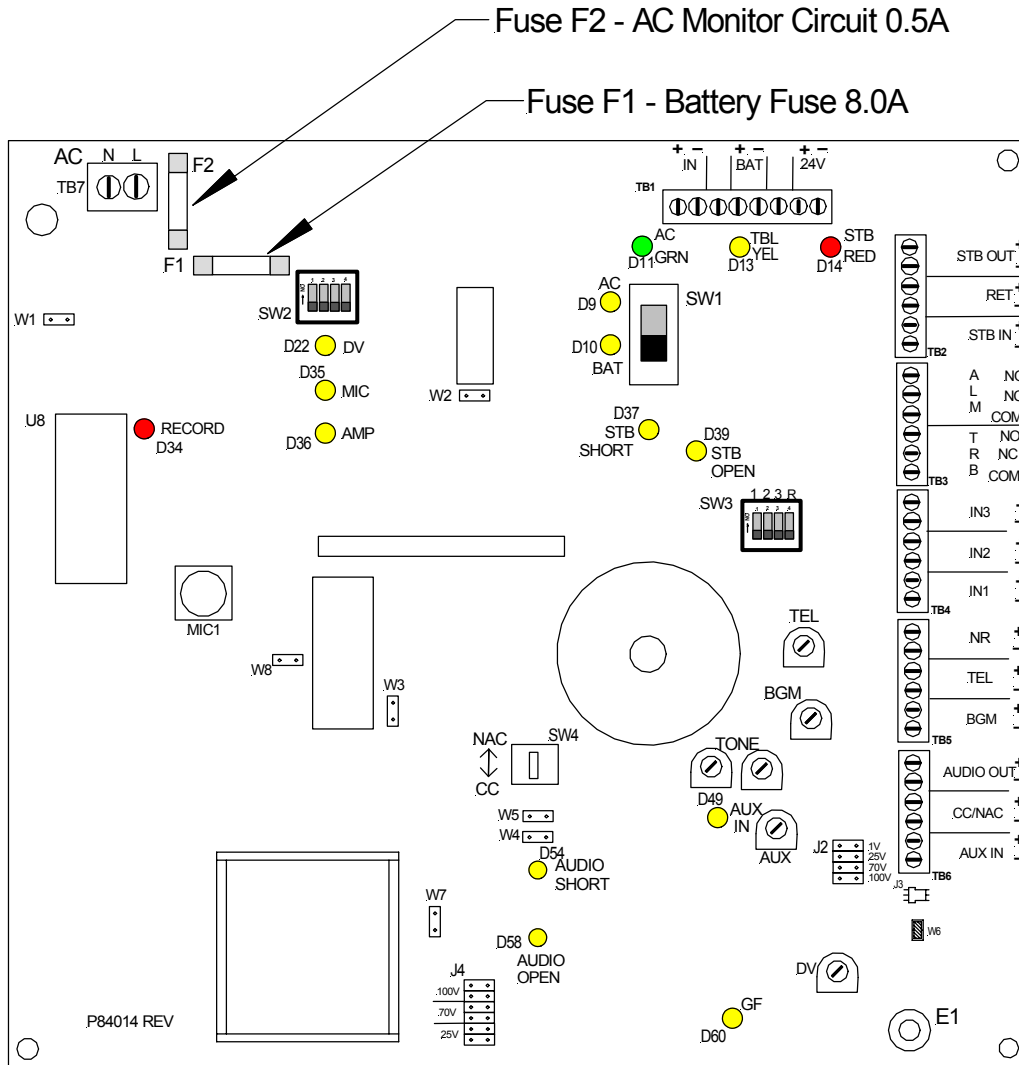
- SP40MB (Motherboard)
- SP40XFMR (Transformer and Rectifier Assembly)
- MIC-400 (Microphone)

The SP40MB is discussed in this chapter.

## Motherboard

The **SP40/2** Motherboard provides all signal handling capabilities, digital voice processing, amplification and supervision.

The Motherboard is illustrated in Figure 9-1.



**Figure 9-1**  
**SP40/2 Motherboard**



# Chapter 10 - Warranty

## Limited Warranty

Wheelock products must be used within their published specifications and must be PROPERLY specified, applied, installed, operated, maintained and operationally tested in accordance with these instructions at the time of installation and at least twice a year or more often and in accordance with local, state and federal codes, regulations and laws. Specification, application, installation, operation, maintenance and testing must be performed by qualified personnel for proper operation in accordance with all of the latest National Fire Protection Association (NFPA), Underwriters' Laboratories (UL), Underwriters' Laboratories of Canada (ULC), National Electrical Code (NEC), Occupational Safety and Health Administration (OSHA), local, state, county, province, district, federal and other applicable building and fire standards, guidelines, regulations, laws and codes including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ). Wheelock products when properly specified, applied, installed, operated, maintained and operationally tested as provided above are warranted against mechanical and electrical defects for a period of three years from date of manufacture (as determined by date code. Correction of defects by repair or replacement shall be at Wheelock's sole discretion and shall constitute fulfillment of all obligations under this warranty.

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## SP40/2 BATTERY CALCULATION SHEET

### STANDBY CURRENT CALCULATIONS

1. The Standby Current for the SP40/2 is 0.125 Amps. \_\_\_\_\_ Amps
  2. Enter Auxiliary Current (if Applicable) \_\_\_\_\_ Amps
  3. Add Steps 1 and 2. Multiply by the number of hours required.
    - 24 Hours - Multiply By 24 \_\_\_\_\_
    - 60 Hours - Multiply By 60 \_\_\_\_\_
- TOTAL STANDBY CURRENT IN AMP HOURS.** \_\_\_\_\_ Ah

### ALARM CURRENT CALCULATIONS

**NOTE: DO NOT EXCEED 40 WATTS.**

**Good engineering practices call for amplifier to operate at 85% Max wattage.**

1. List the speaker and strobe requirements.

NOTIFICATION APPLIANCE	SPEAKER WATTAGE	STROBE CURRENT

2. Calculate total Strobe current. (2 Amps Max.) \_\_\_\_\_ Amps
3. Calculate total speaker wattage. \_\_\_\_\_
4. Multiply the total speaker wattage by 0.040 (40 Watts Max.) \_\_\_\_\_ Amps
5. Add Auxiliary Power (if applicable) \_\_\_\_\_ Amps
6. Add Steps 2, 4 and 5 together. \_\_\_\_\_ Amps
7. Multiply Step 6 by 0.25. (This represents 15 minutes of alarm.) \_\_\_\_\_ Ah
8. **Total Alarm Current in Amp-hours. (4.30 Amps Max.)** \_\_\_\_\_ Ah

### BACKUP BATTERY REQUIREMENTS

1. Enter **Standby Current.** \_\_\_\_\_ Ah
  2. Enter Alarm current \_\_\_\_\_ Ah
  3. Add Steps 1 and 2 together. \_\_\_\_\_ Ah
- Multiply Step 3 by 1.25 for minimum Backup Battery Requirements. \_\_\_\_\_ Ah

**NOTE: THE UL LISTED BACKUP BATTERIES FOR THIS PANEL IS TWO 12 VOLT, 12 AMP-HOUR.**

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