NOTIFIER®

Addressable Power Supply
AMPS-24/E
Manual

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Fire Alarm System Limitations

While a fire alarm system may lower insurance rates, it is not a substitute for fire insurance!

An automatic fire alarm system—typically made up of smoke detectors, heat detectors, manual pull stations, audible warning devices, and a fire alarm control panel with remote notification capability—can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

The Manufacturer recommends that smoke and/or heat detectors be located throughout a protected premise following the recommendations of the current edition of the National Fire Protection Association Standard 72-1999 (NFPA 72-1999), manufacturer's recommendations, State and local codes, and the recommendations contained in the Guide for Proper Use of System Smoke Detectors, which is made available at no charge to all installing dealers. A study by the Federal Emergency Management Agency (an agency of the United States government) indicated that smoke detectors may not go off in as many as 35% of all fires. While fire alarm systems are designed to provide early warning against fire, they do not guarantee warning or protection against fire. A fire alarm system may not provide timely or adequate warning, or simply may not function, for a variety of reasons:

Smoke detectors may not sense fire where smoke cannot reach the detectors such as in chimneys, in or behind walls, on roofs, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level or floor of a building. A second-floor detector, for example, may not sense a first-floor or basement fire.

Particles of combustion or "smoke" from a developing fire may not reach the sensing chambers of smoke detectors because:

- Barriers such as closed or partially closed doors, walls, or chimneys may inhibit particle or smoke flow.
- Smoke particles may become "cold," stratify, and not reach the ceiling or upper walls where detectors are located.
- Smoke particles may be blown away from detectors by air outlets.
- Smoke particles may be drawn into air returns before reaching the detector.

The amount of "smoke" present may be insufficient to alarm smoke detectors. Smoke detectors are designed to alarm at various levels of smoke density. If such density levels are not created by a developing fire at the location of detectors, the detectors will not go into alarm.

Smoke detectors, even when working properly, have sensing limitations. Detectors that have photoelectronic sensing chambers tend to detect smoldering fires better than flaming fires, which have little visible smoke. Detectors that have ionizing-type sensing chambers tend to detect fast-flaming fires better than smoldering fires. Because fires develop in different ways and are often unpredictable in their growth, neither type of detector is necessarily best and a given type of detector may not provide adequate warning of a fire.

Smoke detectors cannot be expected to provide adequate warning of fires caused by arson, children playing with matches (especially in bedrooms), smoking in bed, and violent explosions (caused by escaping gas, improper storage of flammable materials, etc.).

Heat detectors do not sense particles of combustion and alarm only when heat on their sensors increases at a predetermined rate or reaches a predetermined level. Rate-of-rise heat detectors may be subject to reduced sensitivity over time. For this reason, the rate-of-rise feature of each detector should be tested at least once per year by a qualified fire protection specialist. Heat detectors are designed to protect property, not life.

IMPORTANT! Smoke detectors must be installed in the same room as the control panel and in rooms used by the system for the connection of alarm transmission wiring, communications, signaling, and/or power. If detectors are not so located, a developing fire may damage the alarm system, crippling its ability to report a fire.

Audible warning devices such as bells may not alert people if these devices are located on the other side of closed or partly open doors or are located on another floor of a building. Any warning device may fail to alert people with a disability or those who have recently consumed drugs, alcohol or medication. Please note that:

- Strobes can, under certain circumstances, cause seizures in people with conditions such as epilepsy.
- Studies have shown that certain people, even when they hear a fire alarm signal, do not respond or comprehend the meaning of the signal. It is the property owner's responsibility to conduct fire drills and other training exercise to make people aware of fire alarm signals and instruct them on the proper reaction to alarm signals.
- In rare instances, the sounding of a warning device can cause temporary or permanent hearing loss.

A fire alarm system will not operate without any electrical power. If AC power fails, the system will operate from standby batteries only for a specified time and only if the batteries have been properly maintained and replaced regularly.

Equipment used in the system may not be technically compatible with the control panel. It is essential to use only equipment listed for service with your control panel.

Telephone lines needed to transmit alarm signals from a premise to a central monitoring station may be out of service or temporarily disabled. For added protection against telephone line failure, backup radio transmission systems are recommended.

The most common cause of fire alarm malfunction is inadequate maintenance. To keep the entire fire alarm system in excellent working order, ongoing maintenance is required per the manufacturer's recommendations, and UL and NFPA standards. At a minimum, the requirements of Chapter 7 of NFPA 72-1999 shall be followed. Environments with large amounts of dust, dirt or high air velocity require more frequent maintenance. A maintenance agreement should be arranged through the local manufacturer's representative. Maintenance should be scheduled monthly or as required by National and/or local fire codes and should be performed by authorized professional fire alarm installers only. Adequate written records of all inspections should be kept.

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Installation Precautions

Adherence to the following will aid in problem-free installation with long-term reliability:

WARNING - Several different sources of power can be connected to the fire alarm control panel. Disconnect all sources of power before servicing. The control unit and associated equipment may be damaged by removing and/or inserting cards, modules, or interconnecting cables while the unit is energized. Do not attempt to install, service, or operate this unit until this manual is read and understood.

CAUTION - System Reacceptance Test after Software Changes. To ensure proper system operation, this product must be tested in accordance with NFPA 72-1999 Chapter 7 after any programming operation or change in site-specific software. Reacceptance testing is required after any change, addition or deletion of system components, or after any modification, repair or adjustment to system hardware or wiring.

All components, circuits, system operations, or software functions known to be affected by a change must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified.

This system meets NFPA requirements for operation at 0°C to 49°C (32°F to 120°F) and at a relative humidity (noncondensing) of 85% at 30°C (86°F) per NFPA, and 93% ± 2% at 32°C ± 2°C (89.6°F ± 1.1°F) per ULC. However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and all peripherals be installed in an environment with a nominal room temperature of 15-27° C/60-80° F.

Verify that wire sizes are adequate for all initiating and indicating device loops. Most devices cannot tolerate more than a 10% I.R. drop from the specified device voltage.

Like all solid state electronic devices, this system may operate erratically or can be damaged when subjected to lightning-induced transients. Although no system is completely immune from lightning transients and interferences, proper grounding will reduce susceptibility. Overhead or outside aerial wiring is not recommended, due to an increased susceptibility to nearby lightning strikes. Consult with the Technical Services Department if any problems are anticipated or encountered.

Disconnect AC power and batteries prior to removing or inserting circuit boards. Failure to do so can damage circuits.

Remove all electronic assemblies prior to any drilling, filing, reaming, or punching of the enclosure. When possible, make all cable entries from the sides or rear. Before making modifications, verify that they will not interfere with battery, transformer, and printed circuit board location.

Do not tighten screw terminals more than 9 in-lbs. Over-tightening may damage threads, resulting in reduced terminal contact pressure and difficulty with screw terminal removal.

Though designed to last many years, system components can fail at any time. This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits so that static charges are removed from the body. Use static-suppressive packaging to protect electronic assemblies removed from the unit.

Follow the instructions in the installation, operating, and programming manuals. These instructions must be followed to avoid damage to the control panel and associated equipment. FACP operation and reliability depend upon proper installation by authorized personnel.

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FCC Warning

WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for class A computing device pursuant to Subpart B of Part 15 of FCC Rules, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his own expense.

Canadian Requirements

This digital apparatus does not exceed the Class A limits for radiation noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la classe A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

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Send email messages to:

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Table of Contents

Section 1 Introduction

The AMPS-24/E is an addressable power supply and battery charger with one 5VDC and two 24 VDC outputs. It operates in FlashScan or CLIP (Classic Loop Interface Protocol) mode.

1.1 Features

- Addressable by any CLIP or FlashScan Fire Alarm Control Panel (FACP)
- Charges 26 to 200 AH batteries
- Isolated Signaling Line Circuit (SLC) interface
- Brownout detection
- Battery/battery charger supervision
- Selectable charger current
- AC loss detection and AC loss delay reporting

1.2 Specifications

- **Primary (AC) Power - TB3**

  AMPS-24 - 110-120 VAC 50/60 Hz input, 4.5 A maximum

  AMPS-24E - 240 VAC 50/60 Hz input, 2.25 A maximum
- One 5 VDC @ 1.0 A - nonpower-limited output - **TB6**
  One 24VDC @ 1.0 A - nonpower-limited output - **TB6**

  Power-limited if 5V output is not used.

  Maximum Ripple Voltage (24 VDC & 5VDC): 250 mVrms
- One 24 VDC @ 4.5 A - filtered, nonpower-limited source - **TB2**

  Maximum output:4.2 A when 5V output (TB6) is used.

  3.5 A when 24V output (TB6) is used.

  3.2 A when both outputs on TB6 are used.

  Maximum Ripple Voltage: 250 mVrms
- **Secondary Power (Battery) Charging Circuit - TB4, TB5** - current-limited, sealed lead-acid battery charger which will charge 26 to 200 AH batteries.

  Selectable charging current: 2.0 A or 5.0 A
- Utilizes wire sizes 12-18 AWG (3.25-0.75 $mm.^2$)
- Battery Fuse (F2) 10A, 3AB

1.3 Installation Standards and Codes

The AMPS-24/E complies with the following standards:

NFPA 72 National Fire Alarm Code

Underwriters Laboratories:

- UL 864 Standard for Control Units for Fire Alarm Systems

Underwriters Laboratories of Canada (ULC):

- ULC-S527-99: Standard of Control Units for Fire Alarm Systems
- ULC-S524: Standard for the Installation of Fire Alarm Systems

In addition, the installer should be familiar with the following standards:

- NEC Article 300 Wiring Methods
- NEC Article 760 Fire Protective Signaling Systems
- Applicable Local and State Building Codes
- Requirements of the Local Authority Having Jurisdiction
- The Canadian Electrical Code, Part 1

1.4 Related Documentation

To obtain a complete understanding of specific features of the AMPS-24, or to become familiar with functions in general, make use of the documentation listed in Table 1.1.

Title	Document Number
NFS-3030 Installation Manual	51330
NFS-3030 Operation Manual	51344
NFS-3030 Programming Manual	51345
NCA Network Control Annunciator	51482
BB-100/200 Cabinet Installation Instructions	51981
CAB-3/CAB-4 Series Installation Instructions	15330
BB-25 Cabinet Installation Instructions	50898
BB-55 Cabinet Installation Instructions	50295
VeriFire™ Tools Online Help	VeriFire-TCD
SLC Wiring Instruction Manual	51253
Device Compatibility Document	15378

Table 1.1 Related Documentation

NOTE: When used in this manual, NFS-3030 refers to both the NFS-3030 and NFS-3030E and AMPS-24 refers to both the AMPS-24 and AMPS-24/E.

1.5 Notes, Cautions, and Warnings

This manual contains notes, cautions, and warnings to alert the reader as follows:

NOTE: Supplemental information for a topic, such as tips and references.

CAUTION: Information about procedures that could cause programming errors, runtime errors, or equipment damage.

WARNING: Indicates information about procedures that could cause irreversible equipment damage, irreversible loss of programming data or personal injury.

1.6 Board Layout

The AMPS-24 board layout is illustrated in Figure 1.1. Figure 1.2 illustrates the positions of the LEDs.

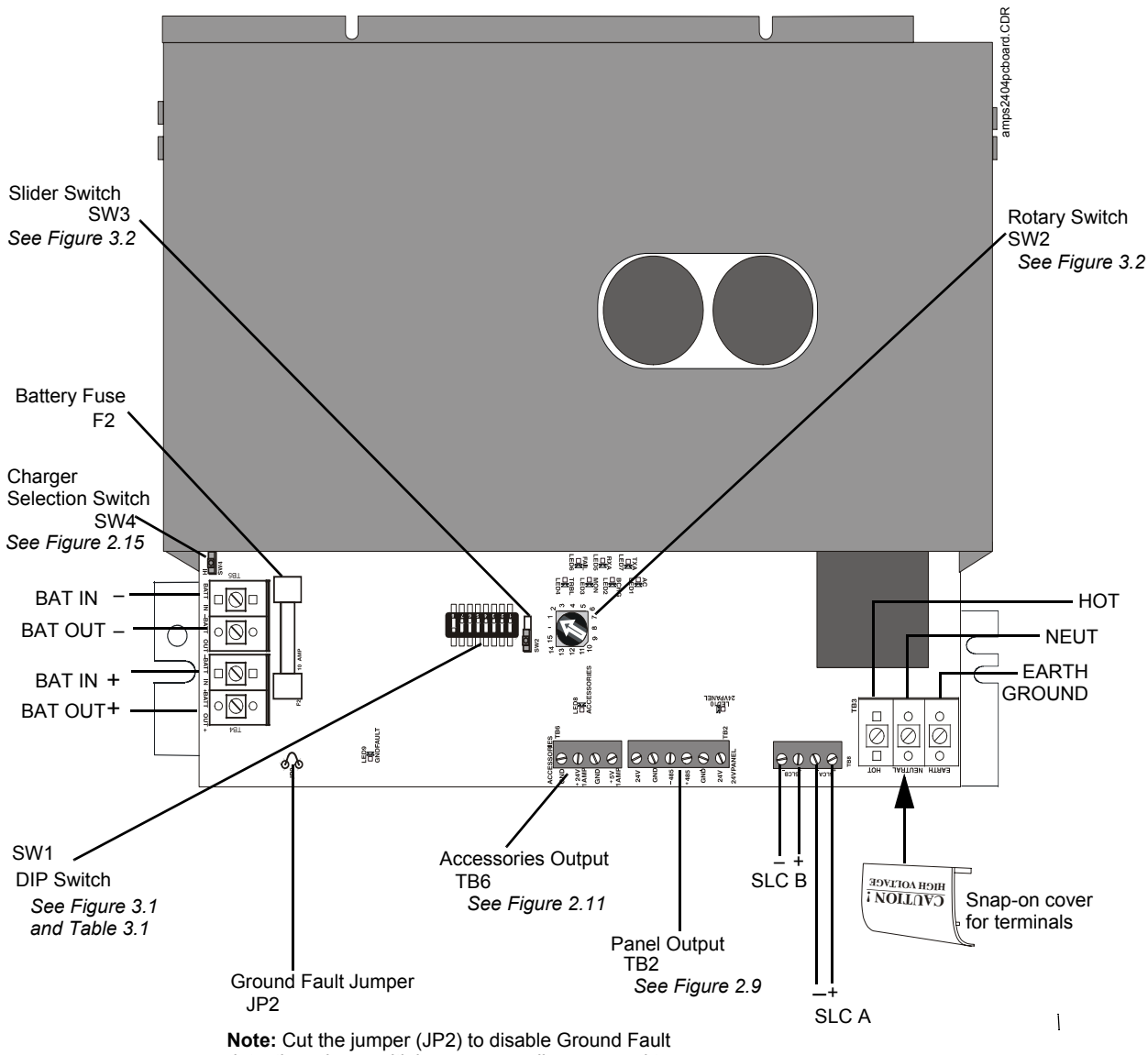


Figure 1.1 The AMPS-24 Board Layout

1.7 LED Indicators

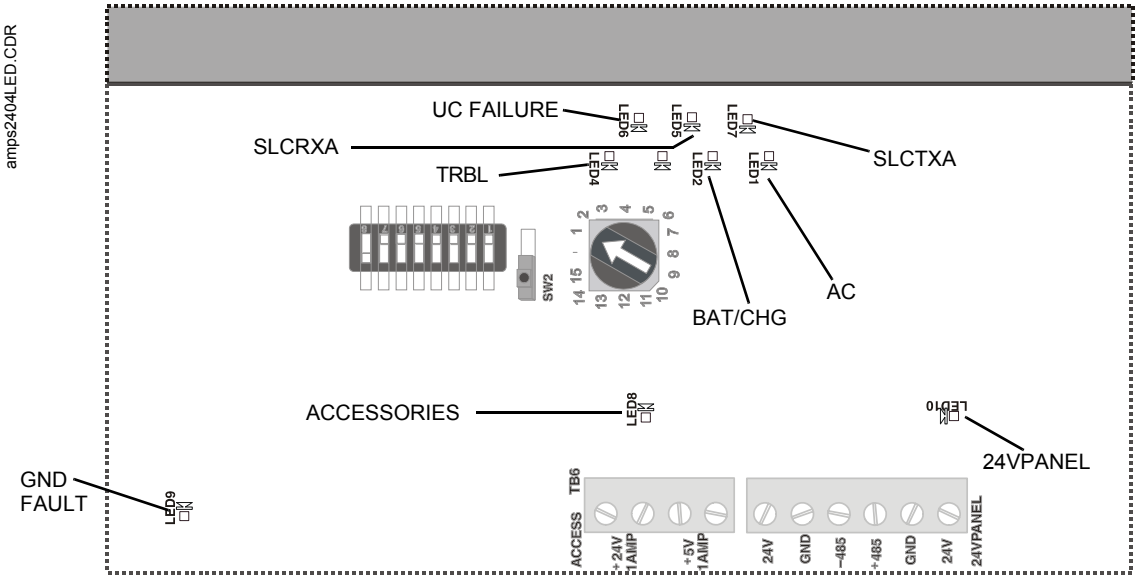


Figure 1.2 Locations of LED Indicators

There are nine LEDs that indicate various conditions and troubles. The following table lists and describes each.

Reference	LED Name	Color	Description
LED9	GND FAULT	Yellow	Illuminates when a ground fault is detected on any output or battery lead.
LED10	24VPANEL	Green	Illuminates when the Panel Output (TB2) is active. OFF during overload.
LED8	ACCESSORIES	Green	Illuminates when the 24V Accessories Output (TB6) is active. OFF during overload on TB6 and when total load on TB2 and TB6 exceeds 5A.
LED1	AC	Green	Illuminates when there is AC power. Blinks slowly until AC delay expires.
LED2	BCHG	Yellow	Illuminates when there is a battery or charger trouble.
LED4	TRBL	Yellow	Will illuminate or blink, pause and repeat; as specified below, when the following troubles occur: – Brownout Trouble ..... 1 blink *After AC delay expires* – Internal Power Failure..... 2 blinks – Incorrect SLC Address Selection..... 3 blinks – Battery Charger Shutdown..... 5 blinks – Accessories Output Overload..... 6 blinks – Panel Output Overload/Accessories Output Shutdown ON *Check LED8 and/or LED10 to determine condition.*

Table 1.2 LED Indicators

Reference	LED Name	Color	Description
LED6	FAIL	Yellow	Illuminates if the microcontroller fails.
LED5	RXA	Green	Blinks when data is received from the SLC.
LED7	TXA	Green	Blinks when data is transmitted to the SLC.

Table 1.2 LED Indicators

Section 2 Installation

WARNING: High Voltages Present.

Use extreme caution when working with the AMPS-24. High voltage and AC line-connected circuits are present in this power supply. Turn off and remove all power sources. To reduce the risk of electric shock, make sure to properly ground the AMPS-24.

Install the snap-on cover for TB3 after wiring.

2.1 In a CAB-4 Series Backbox.

WARNING: Due to heat dissipation, total battery capacity must not exceed 26 amp-hours when the AMPS-24 is charging in a CAB-4 series cabinet.

The AMPS-24 mounts in the lower left or lower right of a CAB-4 Series enclosure. The AMPS-24 should be mounted on the left of the enclosure when it will be connected to 26AH batteries that are located in the same cabinet. If another power supply occupies the left side of the enclosure mount the AMPS-24 on the right side and connect it to batteries that are located in a separate enclosure. This battery connection must be in conduit and less than 20 feet (6.0906 meters) from the power supply.

The AMPS-24 can fit in either the lower left or lower right of any CAB-4 Series cabinet.

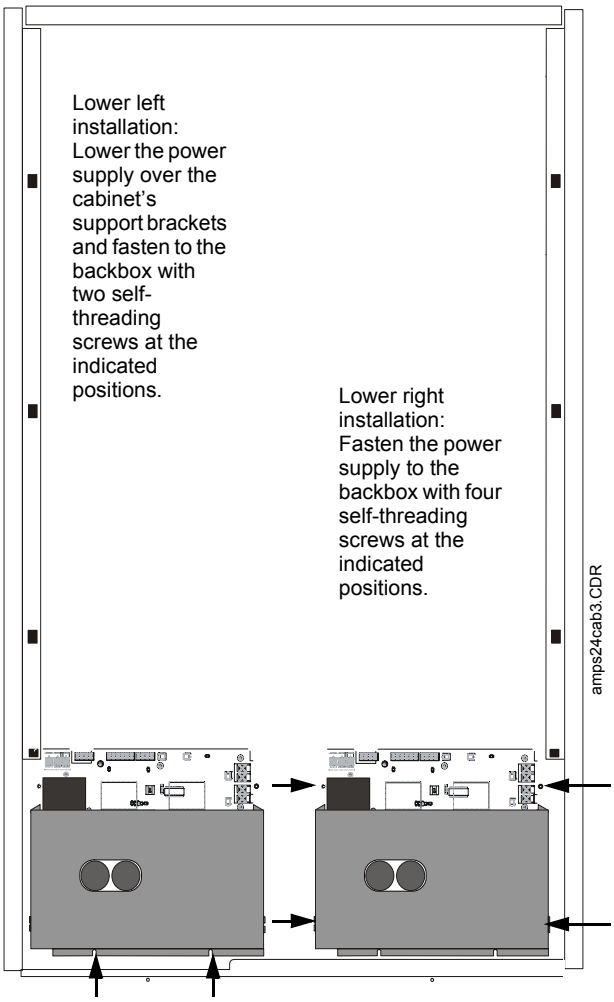


Figure 2.1 CAB-4 Series Backbox

2.2 In a BB-25 Cabinet

The AMPS-24 mounts in the left side of a BB-25 cabinet. Two 26 amp-hour batteries fit into the right side of the cabinet. A BB-100 or BB-200 cabinet is required for batteries larger than 26 amp-hour.

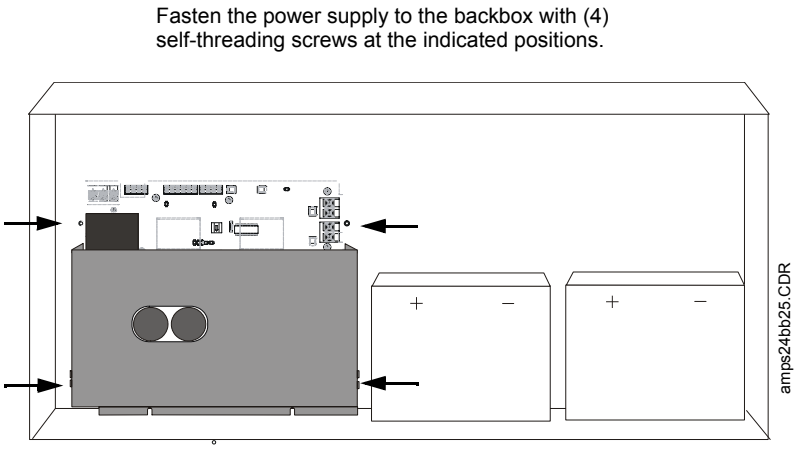


Figure 2.2 BB-25 Cabinet Mounting

2.3 In a BB-100 Cabinet

The AMPS-24 mounts in a BB-100 cabinet. Two 55 or 100 amp-hour batteries fit into the bottom of this cabinet under the AMPS-24. The power supply is fastened directly to the unpainted section of the backbox using the four provided keps nuts.

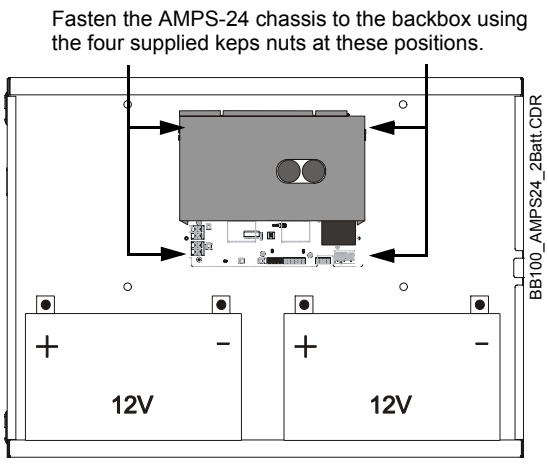


Figure 2.3 BB-100 Mounting

WARNING: The total weight of a fully loaded BB-100 will exceed 175 pounds. Additional support may be required when mounting this cabinet to a wall.
See BB-100/200 Cabinet Installation Instructions for more information.

2.4 In a BB-200 Cabinet

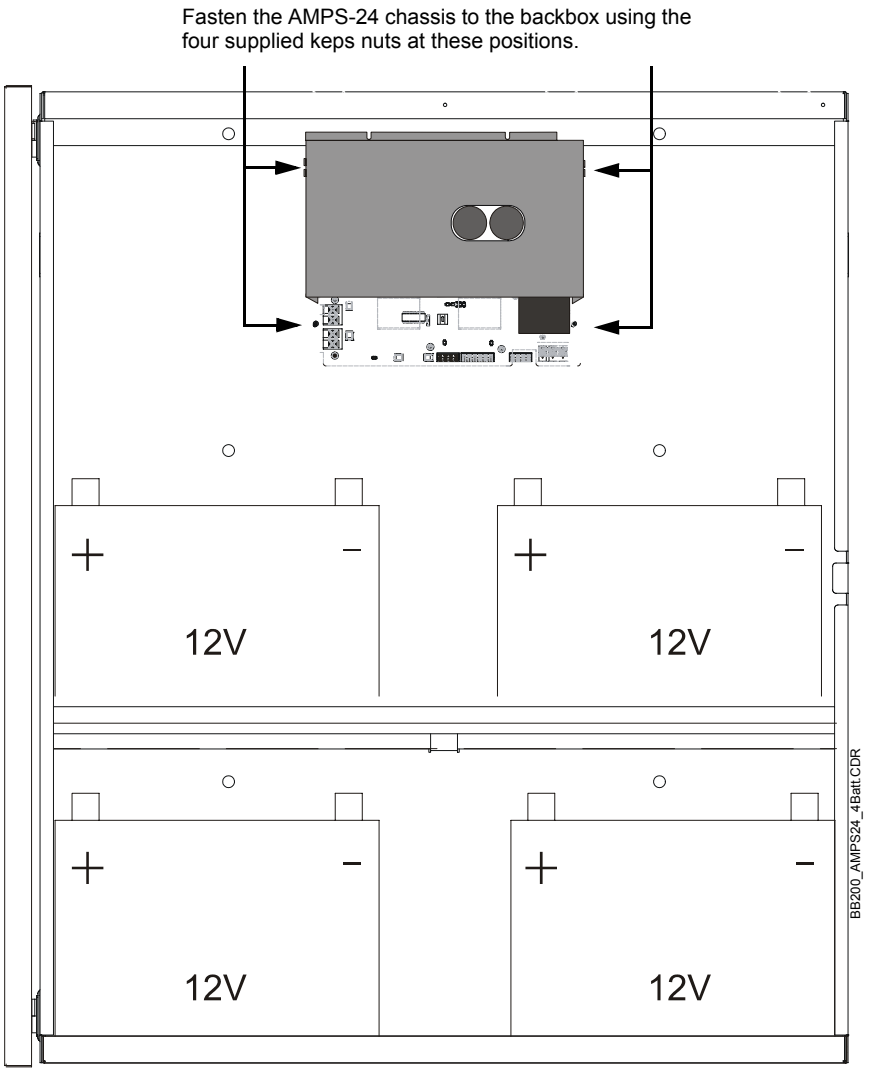


Figure 2.4 BB-200 Mounting

The AMPS-24 mounts in a BB-200 cabinet with four 100 amp-hour batteries (two on the top shelf and two on the bottom). The power supply is fastened directly to the unpainted section of the backbox with four keps nuts.

WARNING: The total weight of a fully loaded BB-200 will exceed 300 pounds. Additional support may be required when mounting this cabinet to a wall.
See BB-100/200 Cabinet Installation Instructions for more information.

2.5 Wiring

The terminal block and pin connections are illustrated in Figure 1.1.

Power-limited wiring must remain separated from nonpower-limited wiring by at least 0.25 in. (6.4 mm), and must enter an enclosure through different knockouts. Install tie wraps and adhesive squares to secure the wiring. Figures 2.5 through 2.8 show samples of power-limited and nonpower-limited wiring configurations in different cabinets.

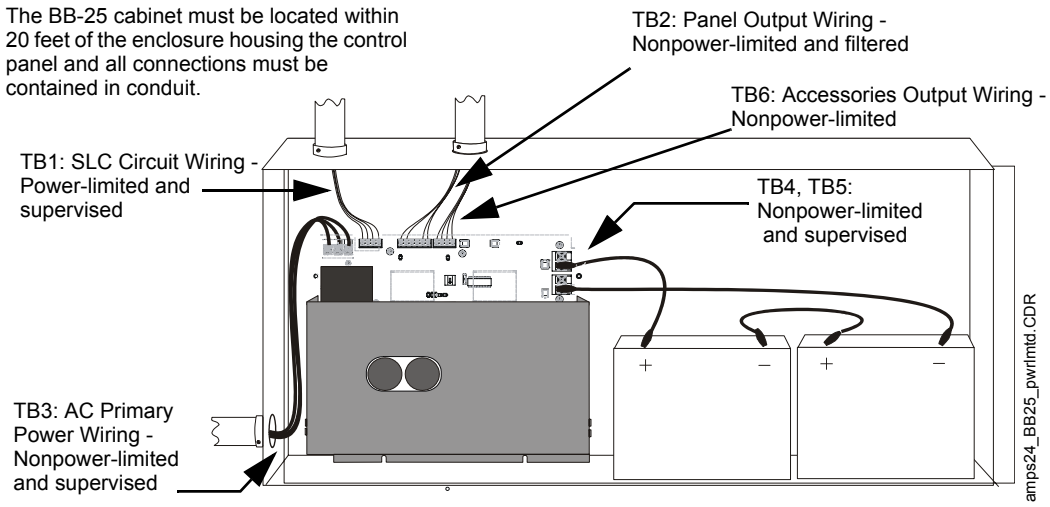


Figure 2.5 BB-25 Cabinet: Power-limited Wiring Example, with Two Battery Wiring

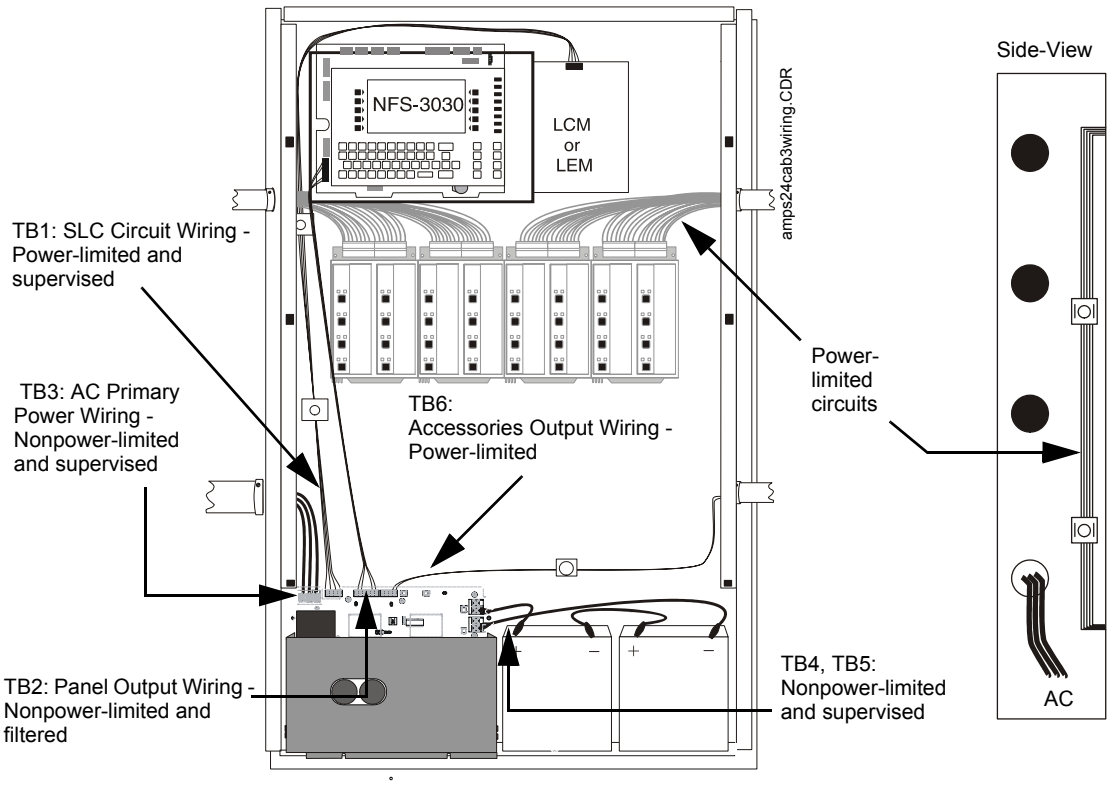


Figure 2.6 CAB-4 Series Cabinet: Power-limited Wiring Example

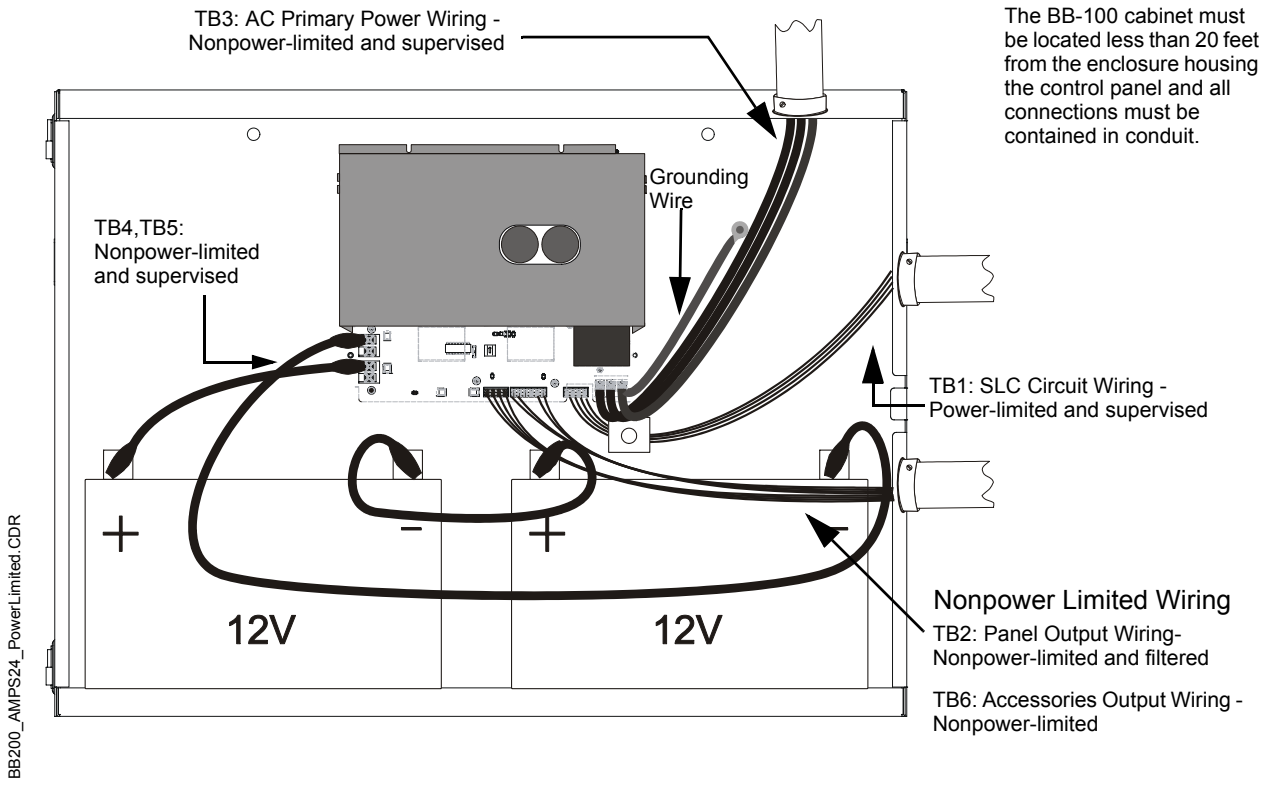


Figure 2.7 BB-100 Cabinet: Power-limited Wiring Example with Two Battery Wiring

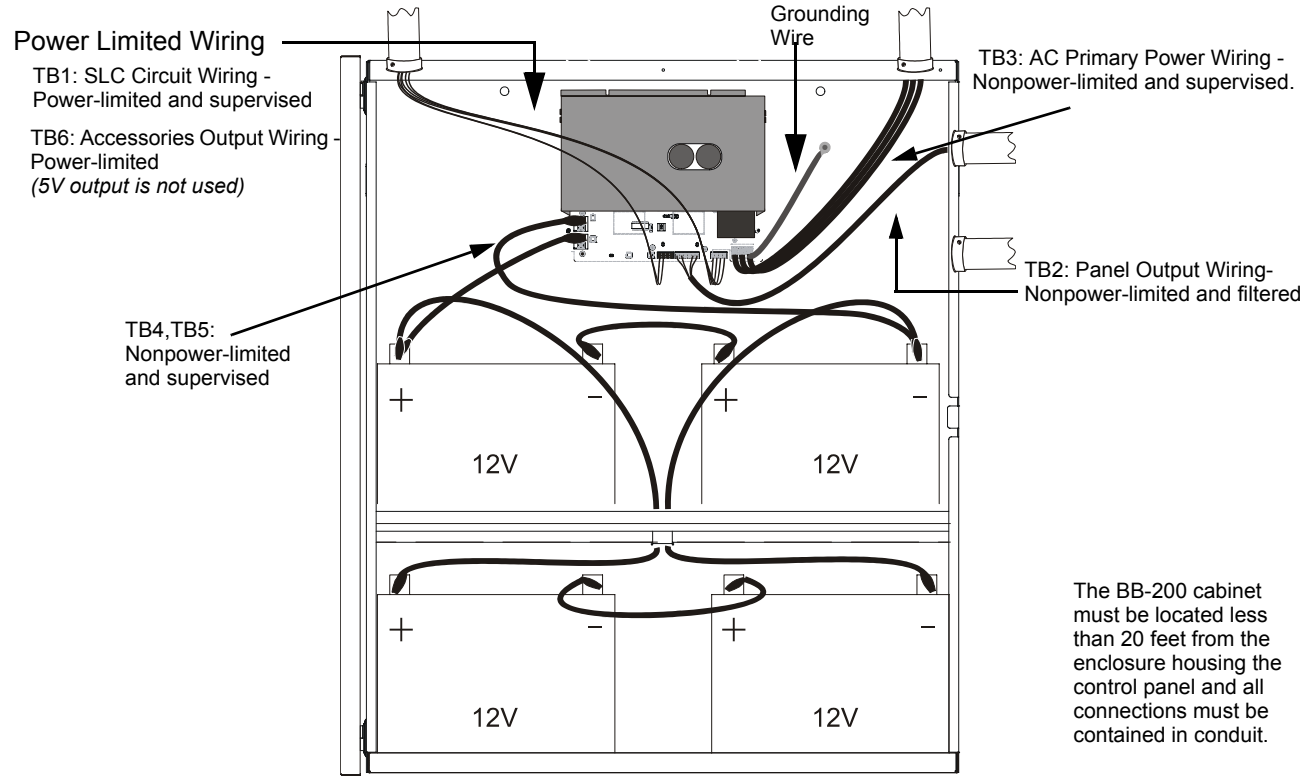


Figure 2.8 BB-200 Cabinet: Power-limited Wiring Example with Four Battery Wiring

2.6 Connecting the Power Cables

WARNING: Remove all power sources to equipment while connecting electrical components. Leave the external, main power breaker OFF until installation of the entire system is complete.

WARNING: Several sources of power can be connected to the control panel and/or power supply. Before servicing the control panel, disconnect all sources of input power *including the battery*. While energized, the control panel and associated equipment can be damaged by removing and/or inserting cards, modules, or interconnecting cables.

2.6.1 Overview

Complete all mounting procedures and check all wiring before applying power. Electrical connections are listed below and are detailed in the following paragraphs:

- **TB2** - Panel Output, 4.5 A, 24VDC, output for connection to the fire panel.

  Maximum output:4.2 A when 5V output (TB6) is used.
  3.5 A when 24V output (TB6) is used.
  3.2 A when both outputs on TB6 are used.
- **TB1** - SLC Wiring. Connect to panel Signaling Line Circuit.
- **TB6** - Accessories Output – 1.0 A; 24 VDC, non-resettable and 5 VDC.
- **TB3** - Primary AC power source – 120 VAC, 50/60 Hz, 4.5 A (AMPS-24E uses 240 VAC, 50/60 Hz, 2.25 A) from line voltage source.
- **TB4, TB5** - Secondary power source – 24 VDC from batteries installed in the appropriate enclosure. Secondary (battery) power is required to support the system during loss of primary power.

2.6.2 Connecting to the Fire Panel

TB2 - This output provides filtered, nonpower-limited 24VDC power to a fire panel using cable PN 75591. If not installed in the same enclosure as the fire panel; the power supply must be located in the same room, total wire length must be less than 20 feet (6.0906 meters), and all external connections must be in conduit. Do not splice or otherwise extend PN 75591. Connect wiring with all power sources off.

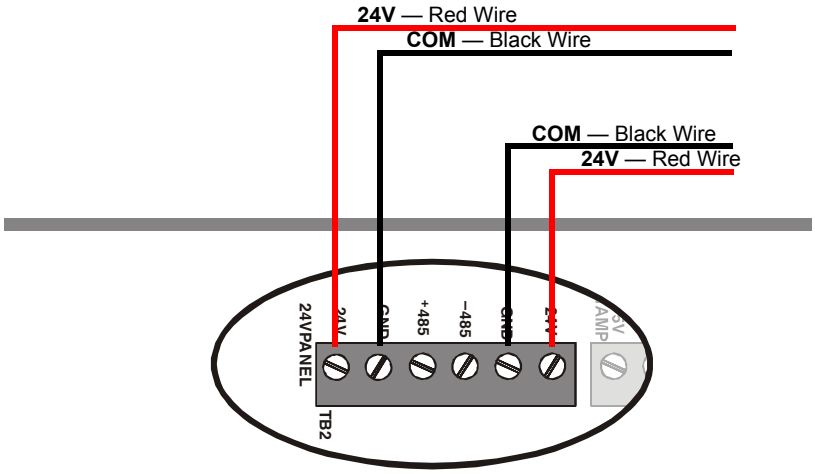


Figure 2.9 Connecting to the Panel Output TB2

2.6.3 Connecting to the SLC

TB1 - Supervised and power-limited. With all power sources off, connect the power supply from **TB1** to the SLC interface.

Refer to the SLC Wiring Manual for more information.

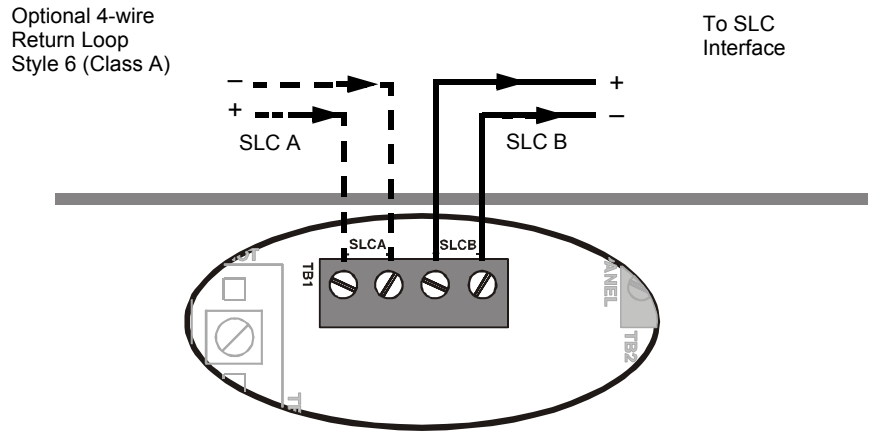


Figure 2.10 Connecting to the SLC Interface TB1

2.6.4 Connecting the Accessories Output

TB6 - Supplies one (1) non-resettable, nonpower-limited 24 VDC circuit available to power external devices. This output is power-limited when the 5V output is not connected. Applications that require a 5V connection to the Accessories Output, such as an AMG-1, must be within 10 feet (3.658 meters) of the power supply and should use the supplied cable, PN 75595. Do not splice or otherwise extend PN 75595. Do not connect to the 5V output for power-limited applications. Refer to the "Wire Requirements" section of the panel installation manual for all applications requiring a 24V connection. Connect wiring with all power sources off.

- 24 VDC (nominal) @ 1.0 A max.
- 5 VDC (nominal) @ 1.0 A max.

Refer to the *Device Compatibility Document* for compatible devices and notification appliances.

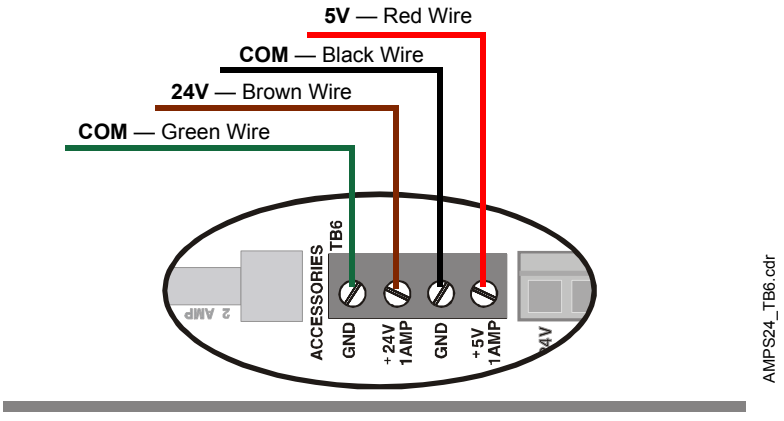


Figure 2.11 Connecting to the Accessories Output TB6

2.6.5 Connecting the Power Supply to AC Power

The AMPS-24 requires connection to a separate dedicated AC branch circuit. Follow these guidelines when connecting the AC branch circuit:

- Label the branch circuit “Fire Alarm”.
- Connect the branch circuit to the line side of the main power feed of the protected premises.
- Do not power other equipment from the fire alarm branch circuit.
- Run the AC branch circuit wire continuously, without any disconnect devices, from the power source to the power supply.
- Overcurrent protection for the AC branch circuit must comply with Article 760 of the National Electrical Codes, as well as local codes.
- Use 12–14 AWG (3.25–2.00 mm^2) or larger wire with 600 VAC insulation for the AC branch circuit.

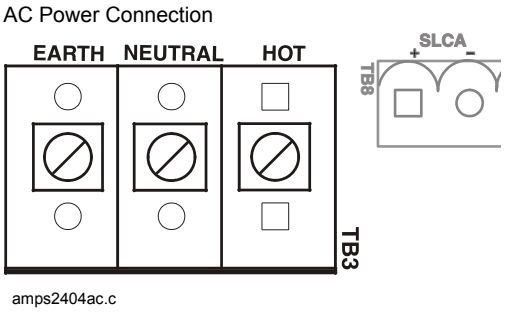


Figure 2.12 AC Power Connection

Connect primary power as follows:

1.Turn off the circuit breaker at the main power distribution panel.

2.Remove the plastic insulating cover from TB3.

3.Connect the earth ground terminal (TB3-EARTH) to a solid earth ground (a metallic, cold water pipe may be suitable in some installations). This connection is vital to maintaining the power supply's immunity to unwanted transients generated by lightning and electrostatic discharge.

4.Connect the primary power neutral line to terminal marked NEUTRAL and the primary power AC line to terminal marked HOT.

5.Reinstall the plastic insulating cover over TB3.

WARNING: Install the snap-on cover for TB3 after wiring. Refer to Figure 2.13 for cover installation.

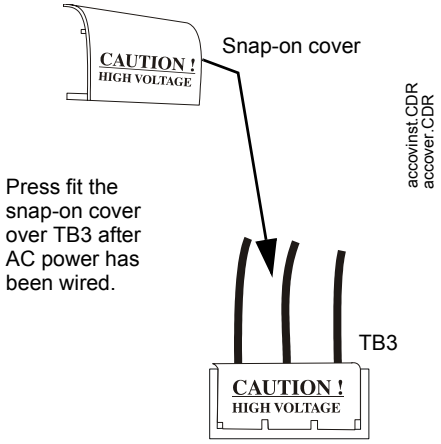


Figure 2.13 Installing the TB3 Snap-on Cover

2.7 Installing and Connecting the Batteries

WARNING: Batteries contain sulfuric acid which can cause severe burns to the skin and eyes, and can destroy fabrics. If contact is made with sulfuric acid, immediately flush skin or eyes with water for 15 minutes and seek immediate medical attention.

WARNING: Do not connect the battery interconnect cables (PN 75560, 75561, or 71070) at this time. Leave the battery interconnect cables disconnected until after initial system power-up.

WARNING: To avoid contact with metal cabinet, always install terminal bolts towards the center of the battery. See Figure 2.14.

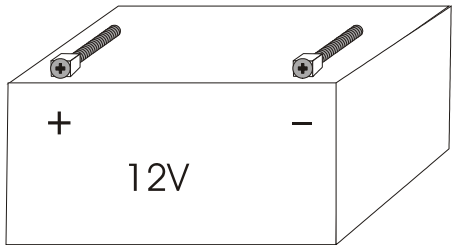


Figure 2.14 Terminal Bolt Installation

Certain system designs may require connecting two or four batteries to the power supply, connecting multiple power supplies to each other, or connecting one set of batteries to multiple power supplies. Always use wire size 12-22 AWG (3.25-0.32 mm^2), and install the power supply and the batteries in the appropriate enclosures, as described in Sections 2.3 and 2.4.

2.7.1 Setting the Charger Selection Switch (SW4)

The AMPS-24 battery charger will charge 26 to 200 AH lead-acid batteries. The Charger Selection Switch, SW4, selects the appropriate battery charger size for the system's battery capacity from two settings: **LO** (2.0 A) or **HI** (5.0 A). Slide the switch to **LO** to charge 26 AH batteries. Set the charger to **HI** when the power supply will be charging a system that requires 55 to 200 AH. Refer to Section 4.2, "Calculating the Battery Requirements", on page 36 for more information on determining your system's battery capacity.

SW4 is located on the AMPS-24 board next to the secondary power terminal, TB5, and partially beneath the metal case which covers the bottom half of the power supply. To place the switch in the **HI** position, use a small screwdriver to slide the switch towards the metal case. To place a switch in the **LO** position, slide the switch away from the metal case. Refer to Figure 2.15 on page 22.

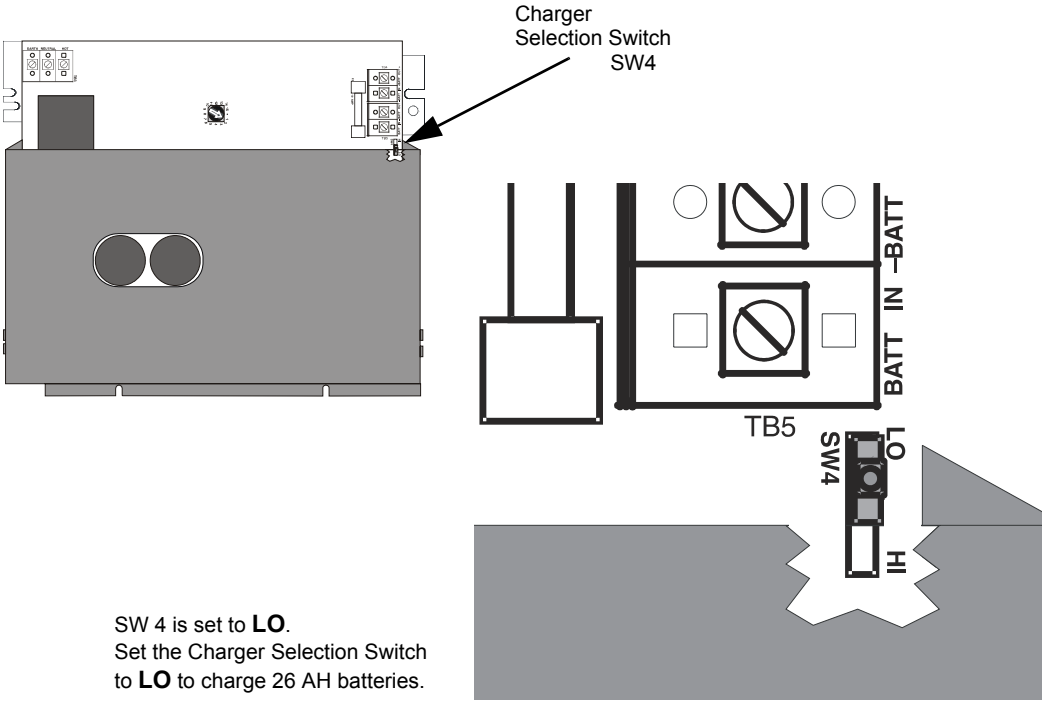


Figure 2.15 The Charger Selection Switch (SW4)

2.7.2 Connecting the Power Supply to Two Batteries:

1. Set the Charger Selection Switch, SW4, to the appropriate battery charger size for the system's battery capacity.
2. Connect one cable from TB4 (BATT IN +) on the power supply to the positive (+) terminal of one battery.
3. Connect another cable from TB5 (BATT IN -) on the power supply to the negative (–) terminal of the other battery.
4. **Only after initial system power-up,** connect a battery interconnect cable between the negative (-) terminal on the first battery to the positive (+) terminal on the second battery.

To determine battery requirements, refer to Section 4 of this manual.

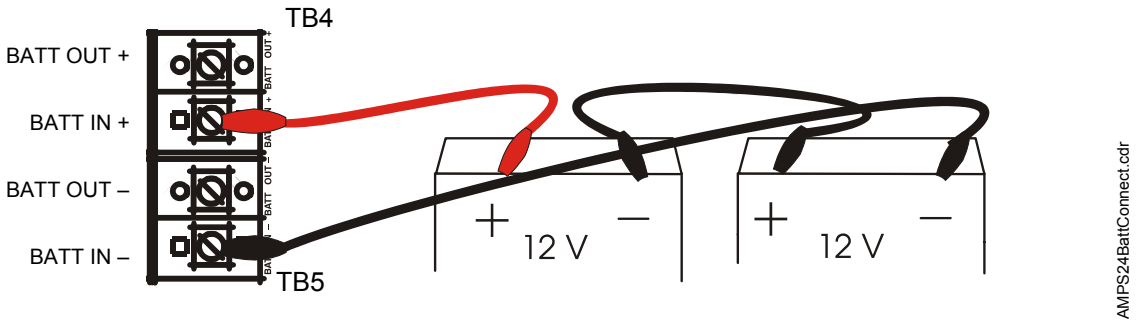


Figure 2.16 Connecting Two Batteries to the Power Supply

2.7.3 Connecting the Power Supply to Four Batteries:

1. Set the Charger Selection Switch, SW4, to the appropriate battery charger size for the system's battery capacity.
2. Connect one cable from TB4 (Batt In +) on the power supply to the positive (+) terminal of one battery.
3. Connect another cable from TB5 (Batt In –) on the power supply to a negative (–) terminal of a different battery.
4. Continue the connection from the occupied positive (+) battery terminal to the positive (+) terminal of the next unconnected battery.
5. Continue the connection from the occupied negative (–) battery terminal to the negative (–) terminal of the remaining unconnected battery.
6. **Only after initial system power-up,** connect the two pairs of batteries. Use two battery interconnect cables to tie each unoccupied negative (–) terminal to an unoccupied positive (+) terminal, as shown in Figure 2.17.

To determine battery requirements, refer to Section 4 of this manual.

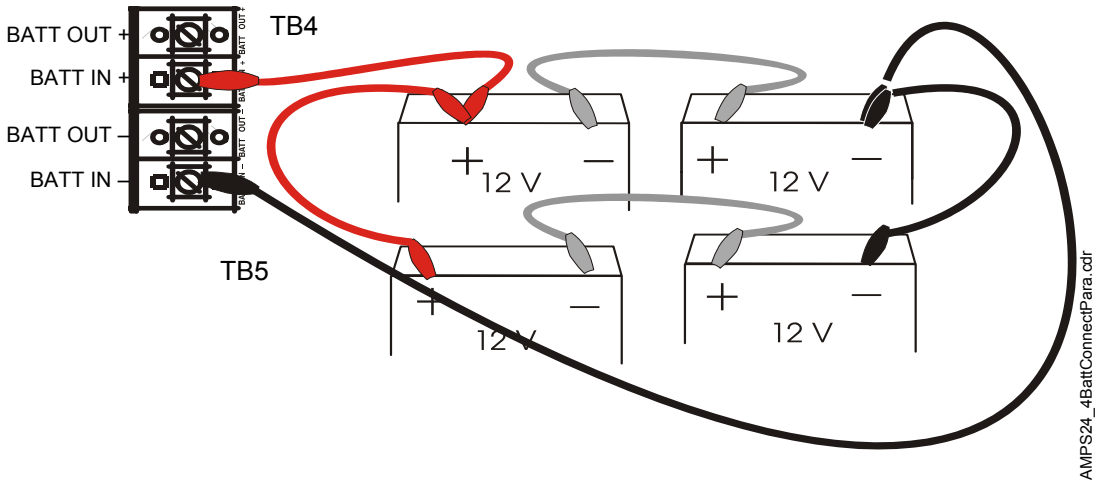


Figure 2.17 Connecting Four Batteries to the Power Supply

NOTE: Use a ring terminal to attach two cables to one battery terminal.

2.7.4 Connecting Multiple Power Supplies (Separate Batteries)

Follow these guidelines when connecting multiple power supplies:

- Disable Ground Fault detection. See Figure 1.1 on page 10.
  Do not disable ground fault detection on the NFS-3030's main power supply!
- Connect common bond wire between the main power supply and power supplies with disabled ground fault detection.
- All power supply to power supply connections must be in conduit and the total battery connection must be less than 20 feet (6.09 meters) from the enabled power supply.
- The AMPS-24 must be located in the same room, less than 20 feet (6.09 meters) from the panel enclosure and all external connections must be in conduit.
- Confirm that enabled chargers have the capacity to charge the total load of the selected battery configuration.
- Set each Charger Selection Switch, SW4, to the appropriate battery charger size for the system's battery capacity.
- Connect battery interconnect cables **only after initial system power-up**. Refer to "Installing and Connecting the Batteries" on page 21.

To determine AMPS-24 battery requirements, refer to Section 4 on page 33 in this manual.

Refer to the specific power supply manual(s) and/or Device Compatibility Document for further information and instructions.

CAUTION: To maintain proper supervision, auxiliary supplies used to power Panel Circuits, such as the ICM-4/E, must be connected to the same batteries as the main power supply. Failure to do so may result in equipment damage.

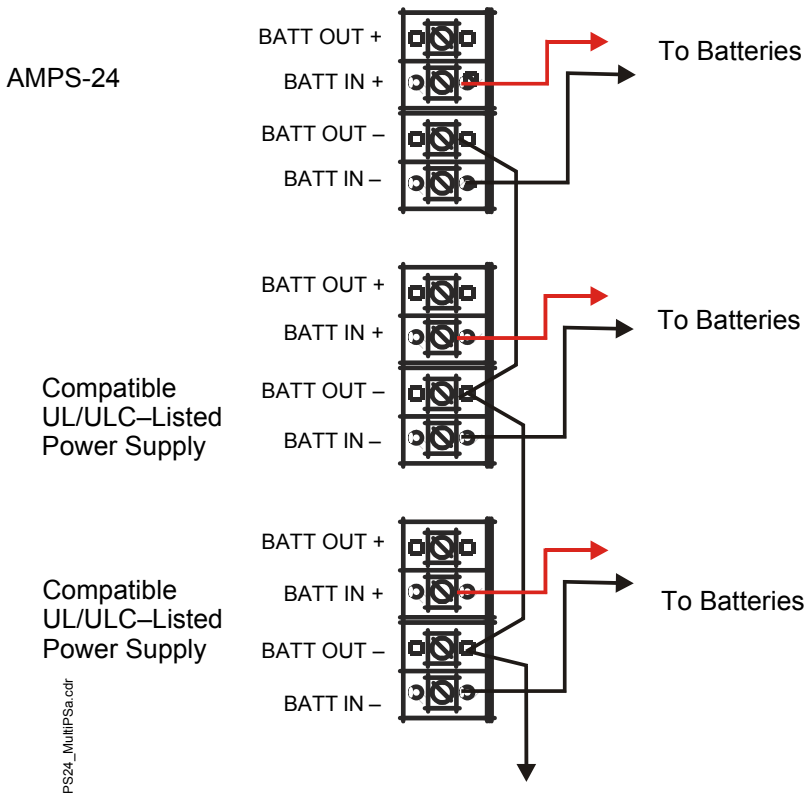


Figure 2.18 Connecting Multiple Power Supplies with Common Bond Wire

2.7.5 Connecting Multiple Power Supplies (One Set of Batteries)

Certain system designs may require connecting multiple power supplies to one set of batteries. Follow these guidelines when connecting multiple power supplies:

- For proper supervision, enable only the last charger on the wiring circuit. Disable all other chargers.
- Confirm that the enabled charger has the capacity to charge the total load of the selected battery configuration.
- Set the Charger Selection Switch, SW4, to the appropriate battery charger size for the system's battery capacity.
- Disable Ground Fault detection. See Figure 1.1 on page 10.
  Do not disable ground fault detection on the NFS-3030's main power supply!
- All power supply to power supply connections must be in conduit and the total battery connection must be less than 20 feet (6.09 meters) from the enabled power supply.
- The AMPS-24 must be located in the same room, less than 20 feet (6.09 meters) from the panel enclosure and all external connections must be in conduit.
- Connect battery interconnect cables **only after initial system power-up**. Refer to "Installing and Connecting the Batteries" on page 21.

To determine battery requirements, refer to Section 4, "Power Supply Calculations" in this manual.

Refer to the specific power supply manual(s) and/or Device Compatibility Document for further information and instructions.

CAUTION: To maintain proper supervision, auxiliary supplies used to power Panel Circuits, such as the ICM-4/E, must be connected to the same batteries as the main power supply. Failure to do so may result in equipment damage.

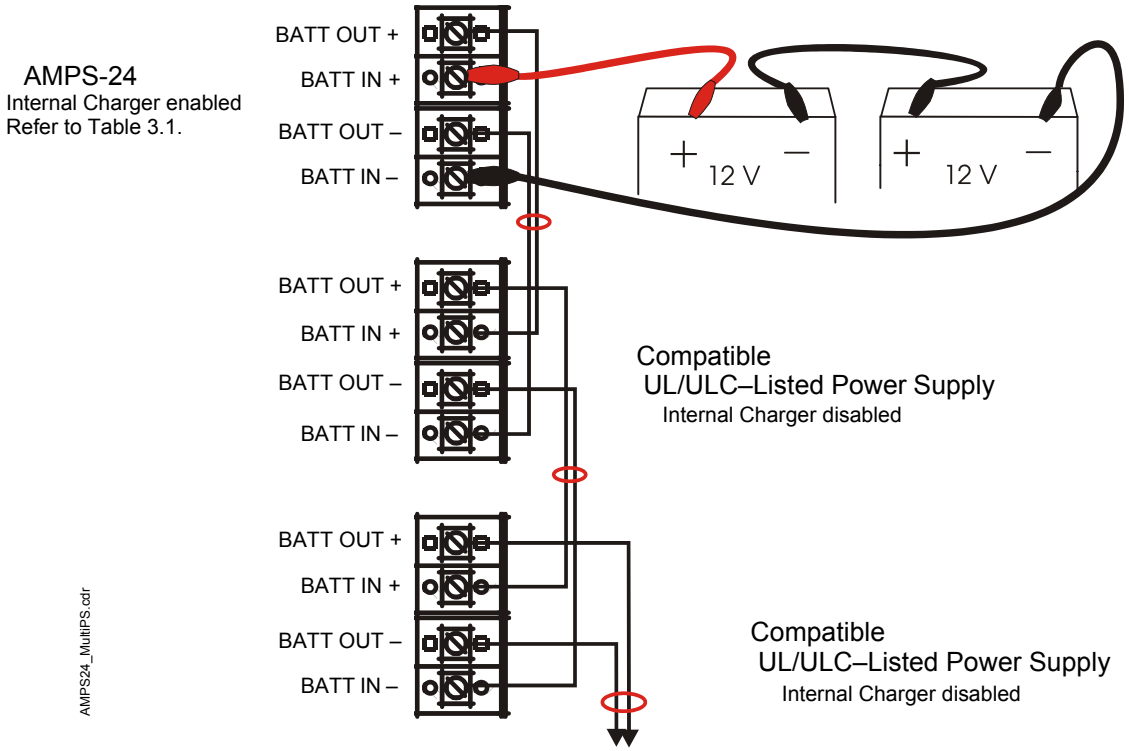


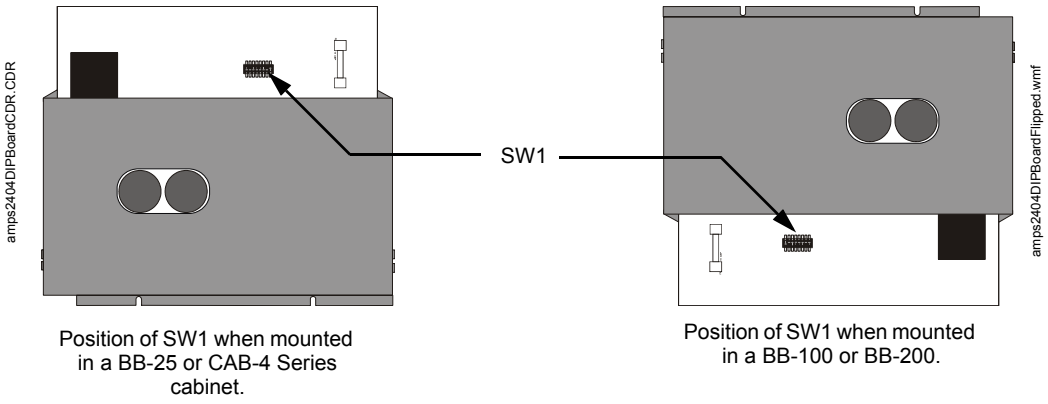
Figure 2.19 Connecting Multiple Power Supplies

Section 3 Configuring the AMPS-24

3.1 DIP Switch Configuration

Program the AMPS-24 by configuring the DIP switch, SW1. Table 3.1 describes how to configure the AMPS-24 DIP Switch settings.

When the AMPS-24 is mounted in a BB-25 or a CAB-4 Series cabinet, the DIP switch is located on the board to the left of the battery fuse and above the metal case which covers the bottom half of the power supply. When the AMPS-24 is mounted in a BB-100 or a BB-200, the DIP switch is located to the right of the battery fuse and below the metal case. To place a switch in the OFF position, use a small screwdriver to slide the end of the switch towards the metal case. To place a switch in the ON position, slide the end of the switch away from the metal case. Refer to Figure 3.1 below for an illustration of the OFF and ON positions.



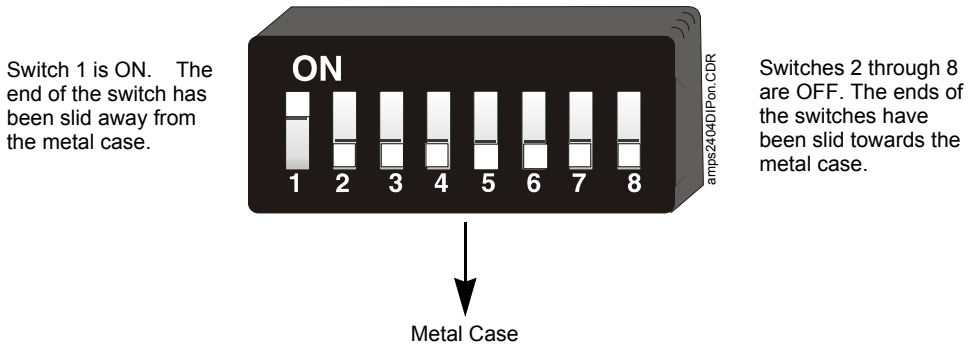


Figure 3.1 Setting a DIP Switch

NOTE: Change DIP Switch settings only while the AMPS-24 is powered down.

Table 3.1 DIP Switch Settings

Switch SW1	ON	OFF
1.1, 1.2	1.1 OFF, 1.2 OFF = US AC Delay OFF* 1.1 OFF, 1.2 ON = US 8 hour AC Delay* 1.1 ON, 1.2 OFF = US 16 hour AC Delay* 1.1 ON, 1.2 ON = Trouble Reporting (See Table 3.2)	
1.3	**Factory Set to "OFF"**	
1.4		
1.5		
1.6		
1.7		
1.8	Disable Battery Charger†	Enable Battery Charger

* Do not use this setting with an NFS-3030.

† Disable the battery charger when batteries are charged by another power supply. See "Connecting Multiple Power Supplies (One Set of Batteries)" on page 25.

3.2 Addressing

The installer must reserve sequential SLC addresses (an address block) equal to the number of addresses that will be consumed by the AMPS-24. Determining the size of the address block and setting the SLC base address is described in this section.

3.2.1 Determining Address Consumption

CAUTION: Always select "Trouble Reporting" when connecting the AMPS-24 to an NFS-3030.

DIP Switch configurations determine the AMPS-24 address consumption. An AMPS-24 can occupy either one or four addresses on an SLC, depending on the configuration of AMPS-24 DIP Switch. The AMPS-24 will consume four addresses on the SLC if both DIP Switches SW1.1 and SW1.2 are set to ON (Trouble Reporting). If the DIP Switches SW1.1 and SW1.2 are not both ON, the AMPS-24 will only consume one address. Table 3.2 details the DIP Switch/address consumption relationship.

Table 3.2 DIP Switch/SLC Address Consumption

Trouble Reporting NOT SELECTED	Trouble Reporting SELECTED* (SW1.1 ON, SW1.2 ON)	AMPS-24 Addresses	SLC Address
✔	✔	Monitor General	B†
	✔	Monitor AC Fail	B + 1
	✔	Monitor Battery	B + 2
	✔	Monitor Earth Fault	B + 3
Total: 1 Address	Total: 4 Addresses Assign 4 sequential SLC addresses for this DIP Switch configuration.		

* Required for use with NFS-3030
† B = SLC Base Address

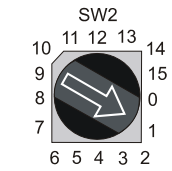
3.2.2 Setting the Base Address

The base address is the first address used in an SLC address block. Combine rotary switch (SW2) and address switch (SW3) settings to determine the base address (B). The base address will be a number that ends in zero or five and the rest of the address block will progress sequentially from that number until all the addresses in the block are consumed.

NOTE: The lowest base address for the AMPS-24 is 05. Do not use FACP addresses 00 through 04 for the AMPS-24.

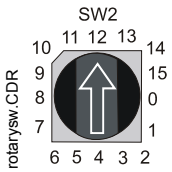
The Rotary Switch

The rotary switch SW2 determines the address decade. Each number on the dial represents the ten addresses of a decade. Turning the arrow until it points at a number selects that number's decade.



For example:

Pointing the arrow at the 1 selects the "one" address decade, beginning at 10.

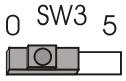


Pointing the arrow at the 12 selects the "twelve" address decade, beginning at 120.

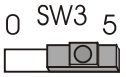
SW3

Use the slider switch, SW3, to further define the SLC base address. While an address' decade is defined by the rotary switch, the slider determines whether the base address (B) will end in a zero or a five. Sliding the switch towards the 0 selects a base address that ends with a zero. Sliding the switch towards the 5 selects a base address that ends with a five.

For example:



Slide the switch towards the 0, as shown in the illustration to the left, to select an initial address that ends in zero. Since the rotary switch defines the decade, if the rotary switch were to point at 8, the base address in this address block would be 80.



SW3Amps2404.cdr

Slide the switch towards the 5, as shown in the illustration to the left, to select an initial address that ends in five. Since the rotary switch defines the decade, if the rotary switch were to point at 8, the base address in this address block would be 85.

Figure 3.2 below gives two examples of setting the base address with both rotary and slider switch settings.

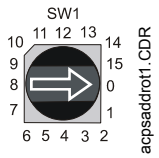
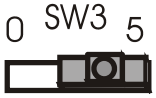
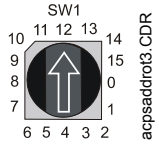
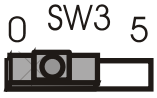
ROTARY SWITCH SETTING	SW3 SLIDER SWITCH POSITION	SLC BASE ADDRESS	SLC ADDRESSES SELECTED with four AMPS-24 Addresses
 acpsaddrot1.CDR	 amps2404sw32.cdr	5	5-8
 acpsaddrot3.CDR	 amps2404sw31.cdr	120	120-123

Figure 3.2 SLC Address Selection

3.3 Panel Programming

3.3.1 Panel Addressing

Assign the main power supply's AC Fail address at the Panel Program submenu, Supervision; or at the VeriFire Tools System Programming worksheet, General II. The Autoprogram command will show the assignments of the three remaining AMPS-24 addresses according to the rotary and slider switch selection and in the order given in Table 3.3. Each SLC address may also be programmed manually at the panel or through the VeriFire Tools utility. Note that either one or four addresses can be associated with the power supply depending on the DIP switch configuration.

3.3.2 Software Type ID Codes

When manually programming AMPS-24, each address point on the AMPS-24 should carry the module type, "MONITOR"; the Type Code Label, "POWER MONITR"; and the FlashScan Code Label "PS MON." Refer to the panel programming manual or VeriFire Tools Online Help for further instructions.

3.3.3 Panel Display

When the power supply is configured for Trouble Reporting, the panel displays a specific trouble message for each AMPS-24 address. Trouble Reporting must be selected for proper AC Fail reporting. See Sections 3.1 and 3.2 for further information.

CAUTION: Trouble Reporting must be selected when an AMPS-24 is connected to an NFS-3030.

Table 3.3 Addressing

Order of AMPS-24 Address Assignment	AMPS-24 Addresses	Type ID	FlashScan Code Label
B*	Monitor General	POWER MONITR	PS MON
B+1	Monitor AC Fail	POWER MONITR	PS MON
B+2	Monitor Battery	POWER MONITR	PS MON
B+3	Monitor Earth Fault	POWER MONITR	PS MON

* B = Base Address

Section 4 Power Supply Calculations

Calculations must be done to determine standby and alarm DC current loads. Ampere-hour requirements must be calculated as well to determine battery size.

The AMPS-24 provides filtered 24VDC power that may be used for operating external devices. The power for operating external devices is limited. Use Table 4.1 to determine if external loading is within the capabilities of the power supply.

4.1 Calculating the System Current Draws

The control panel's main power supply must be able to power all internal system devices (and several types of external devices) continuously during non-fire alarm conditions. Use column 1 in Table 4.1 to calculate the Non-Fire Alarm Load on the power supply when applying primary power. The main power supply must also provide a finite amount of additional current during a fire alarm condition. Use column 2 in Table 4.1 to calculate the additional current needed during fire alarms. The requirements for non-fire alarm and fire alarm current loads cannot exceed the capabilities of the power supply as listed below:

4.1.1 How to Use the Calculating Tables

In the following section, the term "secondary" refers to the AMPS-24's backup batteries: the term "primary" is reserved for the AMPS-24's primary source of power, 120 VAC 50/60 Hz power (240 VAC 50/60 Hz for the AMPS-24E). The term "standby" refers to the output current required when no fire alarm is present. The term "alarm" refers to the output current required when a fire alarm is present.

The Primary Non-Fire Alarm Current and Fire Alarm Current columns are DC current calculations. Use these calculations to confirm that the AMPS-24 can provide enough current to support the system during Primary Non-Fire Alarm and Fire Alarm conditions.

Quantities List the number of devices powered by the Panel Output (TB2) and the Accessories Output (TB6). Devices powered by the Accessories Output draw current directly from the AMPS-24. Devices powered by the Panel Output draw current through the fire panel's connection to the power supply. Use these quantities to calculate total current draw of each set of devices in calculation columns 1, 2, and 3.

Calculation Column 1 (Primary, Non-Fire Alarm Current in amps) Add the contents of calculation column 1 to get the current drawn from the AMPS-24 during a non-fire alarm condition, with AC power applied. See Section 2.6.1.

Calculation Column 2 (Primary, Fire Alarm Current in amps) Calculation column 2 lets the system designer determine the current load that the AMPS-24 must support during a fire alarm. See Section 2.6.1.

Typically, a system should contain capacity to activate all output circuits and relays, and support fire alarms on no less than 10% of Initiating Device Circuits, subject to the requirements of the Authority Having Jurisdiction (AHJ).

The Control Panel provides power for Notification Appliance Circuits. Refer to the Device Compatibility Document for 24 VDC notification appliances that are UL/ULC-listed for fire alarm systems.

Calculation Column 3 [Secondary (Battery) Non-Fire Alarm Current] Calculation column 3 lets the system designer calculate the non-fire alarm current drawn from the secondary source in a non-fire alarm condition during AC power loss. The non-fire alarm current is required to complete the standby battery calculations. After summing all current draws, insert the total in Table 4.2.

4.1.2 Calculation for Main Supply Current

	Quantities		Calculation Column 1 Primary, Non-Fire Alarm Current (amps)			Calculation Column 2 Primary, Fire Alarm Current (amps)			Calculation Column 3 Secondary, Non-Fire Alarm Current (amps)		
AMPS-24 *Terminal Blocks:*	TB2*	TB6	X [current draw]=	Total on: TB2	TB6	X [current draw]=	Total on: TB2	TB6	X [current draw]=	Total on: TB2	TB6
CPU-3030	1	N/A	x [0.120]=	0.12	0	x [0.120]=	0.12	0	x [0.120]=	0.12	0
Keyboard/Display Option	1	N/A	x [0.220]=	0.22	0	x [0.220]=	0.22	0	x [0.220]=	0	0
LCM-320 (refer to Doc. 51330)	[ ]	N/A	x [0.130]=		0	x [0.130]=		0	x [0.130]=		0
LEM-320 (refer to Doc. 51330)	[ ]	N/A	x [0.100]=		0	x [0.100]=		0	x [0.100]=		0
SLC Loop†	[ ]	N/A	x [0.200]=		0	x [0.200]=		0	x [0.200]=		0
NCA (Backlight ON)	[ ]	[ ]	x [0.400]=			x [0.400]=			x [0.400]=		
NCA (Backlight OFF)	[ ]	[ ]	x [0.200]=			x [0.200]=			x [0.200]=		
NCM-W, NCM-F	[ ]	[ ]	x [0.110]=			x [0.110]=			x [0.110]=		
DPI-232‡	[ ]	[ ]	x [ ]			x [ ]=			x [ ]=		
ICM-4RK, CRM-4RK	[ ]	N/A	x [0.007]=		0	x [0.072]=		0	x [0.007]=		0
ICE-4	[ ]	N/A	x [0.001]=		0	x [0.065]=		0	x [0.001]=		0
CRE-4	[ ]	N/A	N/A		0	x [0.065]=		0	N/A		0
DCM-4RK	[ ]	N/A	x [0.008]=		0	x [0.080]=		0	x [0.008]=		0
VCE-4	[ ]	N/A	x [0.001]=		0	x [0.040]=		0	x [0.001]=		0
VCM-4RK	[ ]	N/A	x [0.007]=		0	x [0.040]=		0	x [0.007]=		0
IZM-8RK	[ ]	N/A	x [0.047]=		0	x [0.047]=		0	x [0.047]=		0
IZE-A	[ ]	N/A	x [0.004]=		0	x [0.003]=		0	x [0.004]=		0
ARM-4 Auxiliary Relay	[ ]	[ ]				x [0.146]=					
DHX-501 (Duct Detector)	[ ]	[ ]	x [0.025]=			x [0.087]=			x [0.025]=		
ACM-24AT	[ ]	[ ]	x [0.016]=			x [0.070]=			x [0.016]=		
ACM-48A	[ ]	[ ]	x [0.016]=			x [0.070]=			x [0.016]=		
AEM-24AT	[ ]	[ ]	x [0.002]=			x [0.056]=			x [0.002]=		
AEM-48A	[ ]	[ ]	x [0.002]=			x [0.056]=			x [0.002]=		
Maximum number of LEDs illuminated on these annunciators during non-fire conditions:	[ ]	[ ]	x [0.0054]=						x [0.0054]=		
AFM-16AT, AFM-32A	[ ]	[ ]	x [0.040]=			x [0.056]=			x [0.040]=		
ACM-16AT, ACM-32A	[ ]	[ ]	x [0.040]=			x [0.056]=			x [0.040]=		
AEM-16AT, AEM-32A	[ ]	[ ]	x [0.002]=			x [0.018]=			x [0.002]=		
TM-4	[ ]	[ ]	x [0.110]=			x [0.175]=			x [0.110]=		
SCS-8 (refer to Doc. 15712)	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
AFM-16A	[ ]	[ ]	x [0.025]=			x [0.065]=			x [0.025]=		
LCD-80	[ ]	[ ]	x [0.100]=			x [0.100]=			x [0.050]=		
ACM-8R (refer to Doc. 15342)	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
LDM (refer to Doc. 15885)	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
UZC-256	[ ]	[ ]	x [0.035]=			x [0.085]=			x [0.035]=		
AMG-1, AMG-E, ATG-2	[ ]	[ ]	x [0.060]=			x [0.060]=			x [0.060]=		
FFT-7, FFT-7S	[ ]	[ ]	x [0.060]=			x [0.120]=			x [0.060]=		
RM-1	[ ]	[ ]	x [0.020]=			x [0.020]=			x [0.020]=		
FZM-1, MMX-2	[ ]	[ ]	x [0.0094]=			x [0.090]=			x [0.0094]=		
XPIQ (Refer to Doc. 51013)	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
RPT-W, RPT-WF, RPT-F	[ ]	[ ]	x [0.017]=			x [0.017]=			x [0.017]=		
RPT-485W, RPT-485WF	[ ]	[ ]	x [0.049]=			x [0.049]=			x [0.049]=		
RFX	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
UDACT Communicator	[ ]	[ ]	x [0.040]=			x [0.100]=			x [0.040]=		
VEC-25/50	[ ]	N/A	x [0.215]=		0	x [1.215]=		0	x [0.215]=		0
with optional FC-AAM25	[ ]	N/A	x [0.245]=		0	x [2.215]=		0	x [0.245]=		0
Four-Wire Smoke Detectors	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
Power Supervision Relay (A77-716B)	[ ]	[ ]	x [0.020]=			x [0.020]=			x [0.020]=		
Compatible Devices not listed above**	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
	[ ]	[ ]	x [ ]=			x [ ]=			x [ ]=		
Accessories Output (TB6) Sub-totals (Cannot exceed 1.0 A)			Primary, non-alarm:			Primary, alarm:			Secondary, non-alarm:		
Panel Output (TB2) Sub-totals (Cannot exceed 4.5 A††)			Primary, non-alarm:			Primary, alarm:			Secondary, non-alarm:		
AMPS-24									[ ] x [0.052]=		
Local Energy Municipal Box						[ ]x [ ]=					
Sum each column for totals			Primary, non-alarm:			Primary, alarm:			Secondary, non-alarm:		

Table 4.1 System Draw Current Calculations

* Devices powered by the Panel Output (TB2) draw current through the fire panel's connection to the power supply.

† Value represents an SLC's maximum current draw. Refer to device datasheets for individual current draws. Total device current cannot exceed 200mA.

‡ Current consumption of the DPI-232 is dependent upon the baud rate selection (via slide switch on the DPI-232). See DPI-232 manual for details.

** Refer to manual and/or Device Compatibility Document.

††Maximum output:4.2 A when 5V output (TB6) is used.
3.5 A when 24V output (TB6) is used.
3.2 A when both outputs on TB6 are used.

4.1.3 Calculating the Maximum Secondary Power Non-Fire Alarm Current Draw

Use the table below to determine the maximum current requirements of the secondary power source during non-fire alarm conditions. The result obtained is the amount of current that the batteries must be able to supply to the fire alarm system. Use the result in Table 4.4 to determine the size of the batteries needed for the fire alarm system.

Results taken from the table below assume that, while in a non-fire alarm condition, batteries must feed the AMPS-24 (and any additional supplies) with the maximum rated power each supply can provide.

Device	Quantity	Alarm Current (in amps)	Total Current/Type
Alarm Current, from Table 4.1, col 3		=	
Additional Load	[ ] X	=	
Sum Column for Secondary Non-Fire Alarm Load		=	

Table 4.2 Maximum Secondary Power Non-Fire Alarm Current Draw

4.1.4 Calculating the Maximum Secondary Power Fire Alarm Current Draw

Use the table below to determine the maximum current requirements of the secondary power source during fire alarm conditions. The result obtained is the amount of current that the batteries must be able to supply to the fire alarm system. Use the result in Table 4.4 to determine the size of the batteries needed for the fire alarm system.

Results taken from the table below assume that, while in a fire alarm condition, batteries must feed the AMPS-24 (and any additional supplies) with the maximum rated power each supply can provide.

Device	Quantity	Alarm Current (in amps)	Total Current/Type
Alarm Current, from Table 4.1, col 2		=	
Additional Load	[ ] X	=	
Sum Column for Secondary Fire Alarm Load		=	

Table 4.3 Maximum Secondary Power Fire Alarm Current Draw

4.2 Calculating the Battery Requirements

4.2.1 Calculating the Battery Capacity

Use this table to determine the battery capacity needed for the system:

Current (amps)	**X**	**Time (hours)**	**=**	**_____AH**
Secondary Non-Fire Alarm Current (from Table 4.2)		Required Secondary Non-Fire Alarm Standby Time (24 or 60 hours)		
_____	X	_____	=	_____AH
Secondary Fire Alarm Load (from Table 4.2)		Required Fire Alarm Standby Time:*		
_____	X	_____	=	_____AH
Sum Column for Total Secondary Amp Hours calculated			=	_____AH
Multiply by the derating factor x 1.2 (See Note 7)			=	_____AH
Battery Size – Total Secondary Amp Hours Required			=	_____AH

* Following are decimal conversions for standard numbers of minutes:

5 minutes	0.084
10 minutes	0.167
15 minutes	0.250
30 minutes	0.5
60 minutes	1.0
120 minutes	2.0

Table 4.4 Secondary Power Standby and Fire Alarm Load

The following notes apply to Table 4.4:

1. NFPA 72 Local, Proprietary, and Central Station systems requires 24 hours of standby power followed by 5 minutes in alarm.
2. NFPA 72 Auxiliary and Remote Station Systems require 60 hours or standby power followed by 5 minutes in alarm.
3. Batteries installed in a system powered by an automatic starting engine generator need to provide at least 4 hours of standby power.
4. Factory Mutual requires 90 hours of standby for deluge-preaction systems.
5. Emergency voice/alarm communications systems require 2 hours of operation in the alarm condition. Due to the sporadic nature of voice operation, however, NFPA 72 permits 15 minutes of operation at a maximum connected load to equal 2 hours of normal use.
6. If the total exceeds 200 AH, an Uninterruptable Power Supply with sufficient amp-hour capacity is needed. The Uninterruptable Power Supply must be UL-listed for Fire-Protective Signaling.
7. The following battery derating factors must be used for Canadian installations using an AMPS-24 charger:
    - For 26 AH capacity, use derating factor of 1.2
    - For 55 AH capacity, use derating factor of 1.8
    - For 100 – 200 AH capacity, use derating factor of 2.5

4.2.2 Calculating the Battery Size

Use this table to choose the battery size, in amp-hours, needed to support the fire alarm system. The AMPS-24 can charge batteries from 26 to 200 AH. Select batteries that meet or exceed the Total Amp-Hours calculated in Table 4.4 and that are within the acceptable battery charger range. Write the amp-hours requirements on the Protected Premises label.

Battery Size	Voltage Rating	Number Required	Our Part Number*	Backbox† (Order Part Number)
26 AH	12 volts	two	BAT-12260	SBB-A4, SBB-B4, SBB-C4, SBB-D4, BB-25
55 AH	12 volts	two for 55 AH four for 110 AH	BAT-12550	BB-55, NFS-LBB BB-100
100 AH	12 volts	two for 100 AH four for 200 AH	BAT-121000	BB-100 BB-200

Table 4.5 Selecting the Battery Size

* Manufactured to our specifications by WUHAN SOTA ENERTECH, INC.
† Red version available; add "R" to part number listed here.

NOTE: Battery size is limited to 26 AH minimum to 200 AH maximum using the internal AMPS-24 battery charger.

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