

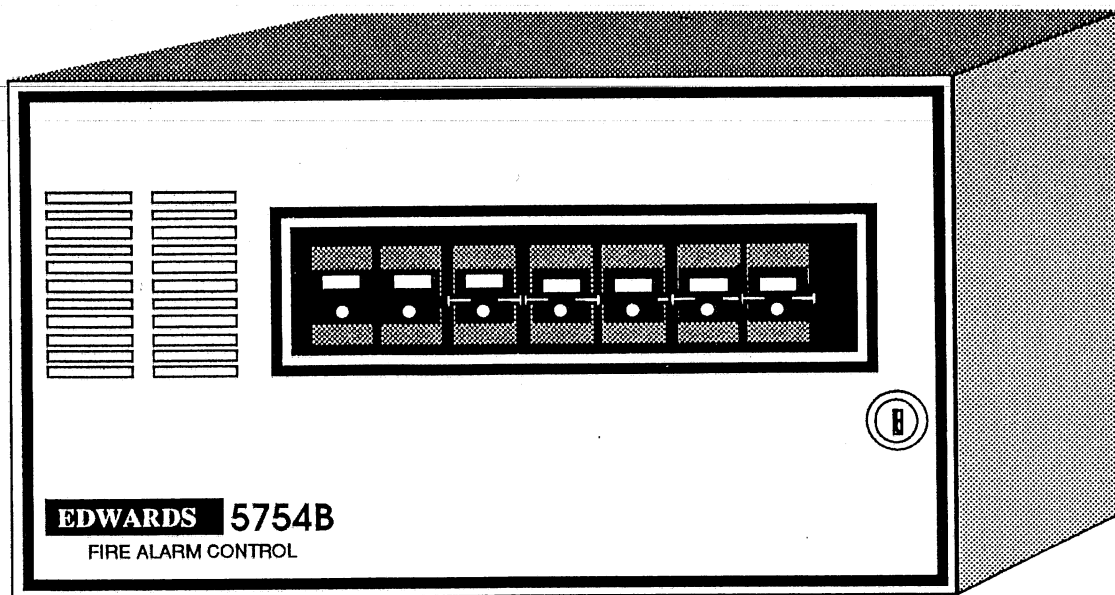
A UNIT OF GENERAL SIGNAL



EDWARDS

Fire Alarm Control Panel *5754B FOUR-ZONE*

OPERATION AND INSTALLATION MANUAL



CAUTIONS

1. READ AND THOROUGHLY UNDERSTAND THIS MANUAL BEFORE PROCEEDING TO INSTALL AND OPERATE THE CONTROL PANEL.
2. TO ENSURE PROPER OPERATION OF THE CONTROL PANEL, ONLY THOSE INITIATING, SIGNALING AND OTHER DEVICES WHOSE COMPATIBILITY WITH THE PANEL HAS BEEN ESTABLISHED BY UNDERWRITERS LABORATORIES MAY BE CONNECTED TO THE CONTROL PANEL. REFER TO THE COMPATIBILITY INFORMATION SUPPLEMENT (P-047550-0756) SUPPLIED WITH THE PANEL FOR A COMPLETE LIST OF COMPATIBLE DEVICES.
3. TEST ALL INSTALLATION WIRING FOR OPENS, SHORTS OR GROUNDS AND CORRECT ANY FAULTS FOUND BEFORE CONNECTING WIRING TO THE CONTROL PANEL.
4. DO NOT CONNECT AC OR BATTERY POWER UNTIL INDICATED.
5. SERVICING OF THE CONTROL PANEL MUST BE PERFORMED BY QUALIFIED FIRE ALARM SERVICE TECHNICIANS ONLY.

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PANEL DESCRIPTION

Standard Panel and Features

The Cat. No. 5754B Fire Alarm Control Panel is a 24VDC, supervised, four-zone panel. The panel is UL Listed and meets all performance and operational requirements of UL Standard 864 and the National Fire Protection Association Standards 72A, 72B and 72C.

The panel is supplied complete with back box, removable door, control switches, indicator lamps, and primary power supply. Standby power batteries and optional flush mounting trim and city tie module are ordered separately.

The panel, as supplied, provides the following features:

- Connections for four Class B alarm initiating circuits.
- Connections for one Class B alarm signaling circuit.
- RESET, TROUBLE SILENCE and ALARM SILENCE switches.
- A.C. POWER, TROUBLE SILENCED, and ALARM SILENCED LED indicators.
- Separate DISABLE switch and alarm and trouble LED indicators for each alarm initiating circuit.
- Internal audible tone - continuous on alarm, pulsing on trouble.
- Continuous signal output during alarm.
- Built-in 24V battery charger for battery capacity of up to 9.0 A.H.
- Low/no AC power and battery detection.
- Automatic loading and testing of battery.
- Battery lead reversal protection.
- Lightning protection.
- Ground detection.
- Auxiliary DC power outputs - unfiltered and filtered. Filtered source is resettable for use with 4-wire smoke detectors.
- Provision to accept city tie module with placement supervision.
- Separate output for each alarm initiating circuit to operate LED indicators of a remote alarm annunciator.
- Auxiliary alarm and trouble contacts.
- Suitable for waterflow alarm applications.

Field Programmable Features

To accommodate various installation requirements, the following field programmable features may be selected by cutting or installing jumper wires as indicated in the installation procedures:

- Signal operation on alarm may be converted from continuous to pulsing (120 ppm).
- ALARM DISABLE switches may be converted to TEST switches. Also, these switches may be converted from two-position switches to momentary action switches.
- The ALARM SILENCE switch may be disabled where installation requirements or the local authority having jurisdiction do not permit silencing of the alarm signals in waterflow alarm applications.

SECTION A - INSTALLATION

0 UNPACKAGING AND INSPECTION

Carefully unpack the control panel and inspect all items for possible damage incurred in shipment. If damage is found, immediately notify the local shipping company representative. Be sure that other installation instructions are not discarded along with packaging materials.

2.0 PANEL INSTALLATION

Unlock the panel door and remove the door by opening 90 degrees and lifting to disengage back box hinges. Remove the screw securing the face plate in place and remove the plate. The panel may be either surface mounted or flush mounted using the optional Flush Trim. Install the panel per the applicable procedure which follows:

For Surface Mounting - Mark four mounting hole positions per dimensions A and B as shown in Figure 1, Section D. Mount the panel using suitable 1/4-inch fasteners.

For Flush Mounting - See Figure 1, Section D, and note back box outer dimensions C and D to plan required wall cutout, and also note dimension E for required installation depth. Mark four mounting hole positions per dimensions A and B. Install the panel in the wall and secure using suitable 1/4-inch fasteners. To install the optional Flush Trim: Loosen the four lock screws in the trim; angle trim over back box hinges; press trim flush to wall, and tighten screws in trim.

0 INSTALLATION OF 5751B-031, -32, -33, OR -034 CITY TIE MODULE (If provided)

Before installing the module, cut gray jumper wire J2 on the control board to provide placement supervision of the module. Refer to Figure 10, Section D, for jumper location. Removal of the supervised module from the control board will result in a trouble condition. Then, with the component side of the module PC board facing the left side of the back box, install the module onto connector P2 as shown in Figure 2, Section D. Wiring to the module will be installed in paragraph 4.4.

4.0 INSTALLATION WIRING

4.1 General

All installation wiring must be installed in accordance with applicable local codes and National Electrical Code (NEC) requirements. Circuits that are marked "power-limited" on wiring diagrams may be installed using either the power-limited or nonpower-limited installation wiring methods and materials specified in the latest edition of the NEC, Article 760.

When a circuit that is marked "power-limited" is installed using the nonpower-limited method, the power-limited markings must be removed. Initiating and signaling circuit installation wiring must be continuous from one device to the next. Parallel branching from a circuit is not permitted. When splicing of wires is required, connections must be made in a junction box.

2 Alarm Initiating Circuit

The control panel provides four Class B alarm initiating circuits. Only compatible initiating devices specified

on the Compatibility Information Supplement (P-047550-0756) supplied with the panel may be connected to these circuits. These devices consist of normally open manual fire alarm stations, heat detectors, waterflow switches, and 2-wire and 4-wire ionization and photoelectric smoke detectors. The maximum standby current operating 2-wire smoke detectors is 1500 microamps, and the maximum filtered current available for operating 4-wire smoke detectors and an end-of-line power supervision relay is 200 milliamps.

- a) Install circuits in accordance with the wiring diagram and installation notes in Figure 6, Section D, when either 2-wire smoke detectors are or are not to be used, or in Figure 7, Section D, when 4-wire smoke detectors are to be used.
- b) Install the 4.7K ohm, 1/2 watt, end-of-line resistor (supplied) after the last initiating device on the circuit as shown in Figure 6 or 7, as applicable.
- c) If one of the initiating circuits is not used, connect a 4.7k ohm, 1/2 watt end-of-line resistor directly across the applicable circuit terminals on the control board.

NOTE

Failure to install the end-of-line resistor across unused initiating circuit terminals will result in a trouble condition when power is connected to the panel.

4.3 Alarm Signaling Circuit

The control panel provides a Class B alarm signaling circuit. Only compatible signaling devices specified on the Compatibility Information Supplement (P-047550-0813) supplied with the panel may be connected to this circuit. These devices consist of 24VDC, polarized bells, horns, strobes, combination horn/strobe units, and other specified electronic signaling devices. The maximum available signaling current is 3 amps minus the current load on the unfiltered auxiliary DC output (refer to paragraph 4.5).

- a) Install circuit in accordance with the wiring diagram and installation notes in Figure 8, Section D.
- b) Install the 10K ohm, 1/2 watt end-of-line resistor (supplied) after the last signaling device on the circuit as shown in Figure 8.

4.4 City Tie Circuit

When a city tie module has been installed in the panel, install wiring from the remote station or city box as shown on the customer drawing provided with the module. After testing the wiring, connect the wiring to the designated terminals on the module as shown on the drawing. Observe polarity shown.

4.5 Auxiliary DC Outputs

Unfiltered Output - Unfiltered, nonregulated 24VDC, +30%/-15%, is provided at TB1 terminals 13 (+) and 15 (-) on the control board as shown in Figure 4, Section D. This output may be used for operation of supplementary devices such as door holders, remote indicators, etc.

The maximum current available is 3 amps minus the current load on the signaling circuit. The output is power-limited, fused, and nonsupervised, and does not break with operation of the control panel RESET switch. Actual output voltage depends on circuit loading and on input voltage to the control panel. For typical connections of supplementary devices, refer to Figure 12, Section D.

Filtered Output - Filtered, resettable, nonregulated 21VDC, +30%/-15%, is provided at TB1 terminals 14 (+) and 15 (-) on the control board as shown in Figure 4, Section D. This output may be used for operation of 4-

wire smoke detectors and end-of-line power supervision relay or other low current electronic devices.

The maximum current available is 200 milliamps. Inductive loads must not be connected to this output. The output is power-limited, fused and nonsupervised, and breaks with operation of the control panel RESET switch. Actual output voltage depends on circuit loading and on input voltage to the control panel.

NOTE

Loading on the auxiliary outputs must be included when calculating the ampere-hour requirement for a standby battery (refer to paragraph 6.0 for details).

4.6 Auxiliary Contacts

Unsupervised, form C, auxiliary alarm and trouble contacts are provided on terminal block TB1 of the control board (refer to Figure 4, Section D) for supplementary control functions. Specifications for these contacts are as follows:

Auxiliary Alarm Contact

Connections: Terminals 16, 17 and 18

Rating: 5 amps resistive, 3 amps inductive, 120VAC/24VDC

Operation: Transfers upon alarm condition and resets with operation of ALARM SILENCE or RESET switch.

Auxiliary Trouble Contact

Connections: Terminals 19, 20 and 21

Rating: 3 amps resistive, 1 amp inductive, 120VAC/24VDC

Operation: Transfers upon trouble condition and resets when fault is cleared. Also transfers upon alarm and resets with operation of ALARM SILENCE or RESET switch.

4.7 Remote Annunciator Outputs

Separate alarm outputs for operation of remote LED indicators or a remote annunciator are provided at TB1 terminals 22, 23, 24, and 25 on the control board (refer to Figure 4, Section D). An alarm output operates when the associated initiating circuit changes to the alarm condition. Each output is power-limited and rated for 7mA at +24VDC. All negative connections from the remote LEDs or remote annunciator are made at TB1 terminal 15 on the control board.

4.8 Primary Power and Ground

The primary power source requirement for the control panel is 120V, 50/60 Hz, 1.0 amp maximum. The primary power circuit must be a separate circuit protected by an overcurrent device rated in accordance with applicable National Electrical Code requirements. No other equipment can be connected to this circuit.

- a) Connect the power source line and neutral wires to the two wire leads coming from the control board transformer using wire nuts (not supplied).
- b) Connect a ground wire from the building earth ground to the ground stud located on the rear wall of the back box.

NOTE

Do not energize the primary power circuit until indicated.

5.0 PULSING SIGNALS, TEST SWITCH, AND ALARM SILENCE DISABLE OPTIONS

The control panel provides the options to (1) - convert signal operation from continuous to pulsing (120 ppm), (2) - convert the ALARM DISABLE switches to TEST switches, and (3) - disable the ALARM SILENCE switch where installation requirements or the local authority having jurisdiction do not permit silencing of the alarm signals in waterflow alarm applications. Also, the TEST switch may be converted from 2-position operation to momentary. Refer to paragraph 1.1, Section B, for functional descriptions of the ALARM DISABLE or TEST switches. Select desired options as follows:

- a) To convert signal operation from continuous to pulsing, cut blue jumper wire J1 on the control board. Refer to Figure 10, Section D, for location of jumper.
- b) To convert the ALARM DISABLE switches (SW4, SW5, SW6, and SW7) to TEST switches, install a red jumper wire (supplied) on the switch as shown in Figure 10, Section D. Also, apply a "TEST" label (supplied) over the "DISABLE" designation on the face plate as shown. To convert the TEST switch from 2-position operation to momentary, remove the locking wire from each switch as shown.
- c) To disable the ALARM SILENCE switch (SW3), install a red jumper wire (supplied) on the switch as shown in Figure 10, Section D.

6.0 BATTERY CALCULATION AND INSTALLATION

6.1 Battery Calculation

The ampere-hour capacity of the standby battery depends on the total system load and on whether the standby operating requirement for the panel is 24 hours of supervision followed by a 5-minute alarm (NFPA 72A), or 60 hours of supervision followed by a 5-minute alarm (NFPA 72B and 72C).

Two methods follow for determining the ampere-hour requirement for the standby battery. Use Method A to determine the requirement when either (1) the auxiliary DC outputs (terminals 13, 14 and 15) are not used, or (2) the auxiliary DC outputs are used to operate devices which draw current only during the alarm mode (example: remote alarm buzzer). Use Method B to determine the requirement when the auxiliary DC outputs are used to operate devices which draw current during the supervisory mode (example: door holder).

Battery Ampere-Hour Calculation - Method A

- a) Determine the combined alarm current load on the signaling circuit (terminals 11 and 12) and on the unfiltered auxiliary DC output (terminals 13 and 15). Combined current must not exceed 3 amps. The alarm current load on the filtered auxiliary DC output (terminals 14 and 15), when used, does not need to be added to the combined alarm current as the maximum allowable current of 200mA for this output has already been factored into the ampere-hour requirements shown in Table 3, Section C.

NOTE

Method B must be used to calculate the ampere-hour requirement when devices which draw current during the supervisory mode are to be connected to either auxiliary DC output.

- b) Refer to Table 2, Section C, to determine the ampere-hour requirement for the current load.
- c) Refer to Table 3, Section C, and select a battery with an ampere-hour rating equal to or larger than the ampere-hour requirement.

Battery Ampere-Hour Calculation - Method B

- a) Determine the ampere-hour requirement using the worksheet in Figure 5, Section D.
- b) Refer to Table 3, Section C, and select a battery with an ampere-hour rating equal to or larger than the ampere-hour requirement.

6.2 Battery Installation

Install the selected battery (Edwards Cat. No. 5759B-024 2.6 A.H., 5759B-060 4.0 A.H., 5759B-065 6.5 A.H. or other recommended larger ampere-hour batteries) below the control board as shown in Figure 3, Section D. Connect the RED POSITIVE (+) lead coming from terminal block TB1 of the control panel to the RED POSITIVE lead from the battery, and the BLACK NEGATIVE (-) lead from terminal block TB1 to the BLACK NEGATIVE lead from the battery. Use the wire nuts attached to the ends of the control panel battery leads to make the connections.

NOTE

A trouble condition will be indicated when the battery is connected to the panel but the condition should clear once the primary power circuit is energized. If the trouble condition continues it may be due to low battery charge. This condition should clear once the battery has recharged. The control panel's battery charger will typically recharge a battery of up to 6.5 A.H. within 24 hours or a battery of up to 9.0 A.H. within 48 hours. Charger output voltage is 27.6VDC and maximum charge current is 1 amp. Typical charging current for most batteries is 300 to 400 milliamps. Maximum battery capacity is 9.0 A.H.

7.0 FINAL PREPARATIONS

- a) Remove the paper strip for zone identification and the acetate protection strip from the back side of the face plate by sliding the strips out to either side of the face plate. Mark applicable zone information on the paper strip within the designated area. Then replace both strips on the face plate and check that the zone information is centered within the opening in the face plate - see Figure 11, Section D.
- b) Replace the face plate and the door on the control panel. To prevent damage to panel components when replacing the plate, be careful to align the holes in the plate with the control switches and LED indicator lamps and, when a city tie module has been installed, verify that the front edge of the module PC board is located in the slot in the metal tab that extends from the back side of the plate.
- c) Check off applicable "Option" blocks on the Operating Instructions card, supplied with the panel. Then

frame the card and mount it adjacent to the panel.

- d) Energize the 120Vac primary power circuit.
- e) Conduct all tests in the System Check-out Procedures section which follows. If a trouble condition is indicated, correct the fault before testing.
- f) When testing has been completed, lock the control panel and forward the key, this manual, and all other instructional materials provided with the system to the person who will be in charge of the system.

8.0 SYSTEM CHECK-OUT PROCEDURES

8.1 General

The system check-out procedures consist of basic alarm and trouble tests to check for proper operation of the panel and system devices after installation has been completed. These tests should be conducted only by qualified fire alarm system service personnel. Notify fire headquarters and building occupants both before and after tests are conducted so that the alarm signals are disregarded during the test period.

8.2 Preliminary Test

With AC and battery power to the system on, verify that only the A.C. POWER lamp is on. If there are any trouble indications, correct faults before proceeding. One cause for a trouble condition at start-up may be a low battery charge - refer to "Battery Installation" section above.

8.3 Alarm Tests

- a) Initiate Alarm. Operate a restorable alarm initiating device and verify that:
 - All signals sound and operate continuously or pulse, as applicable.
 - The audible tone at the panel sounds continuously and the applicable zone alarm lamp and remote zone alarm lamp, when used, illuminate steadily.
 - The TROUBLE lamp flashes.
 - Auxiliary alarm contacts (terminals 16, 17 and 18) and auxiliary trouble contacts (terminals 19, 20 and 21) transfer to control auxiliary functions, as applicable.

For a system with a city tie module and the tie circuit is connected - verify that fire headquarters received the alarm.

NOTE

When the ALARM SILENCE switch has not been disabled, proceed to steps b and c. When the switch has been disabled, omit this step and continue to step d.

- b) Silence Alarm Signals. Operate the ALARM SILENCE switch and verify that:
 - All signals and the audible tone silence.
 - ALARM SILENCED lamp illuminates steadily.
 - The TROUBLE lamp turns off.
 - Auxiliary alarm and trouble contacts reset.

- c) Alarm Test While Signals Are Silenced. Operate a restorable alarm initiating device on another zone and verify that:
- All signals and the audible tone sound again.
 - The ALARM SILENCED lamp turns off and the auxiliary alarm and trouble contacts transfer again.
 - The TROUBLE lamp flashes again.
 - The applicable zone alarm lamp and remote zone alarm lamp, when used, illuminate steadily.
- d) Reset System. Reset initiating device(s) and operate the RESET switch and hold for 3 seconds. For a system with the Cat. No. 5751B-033 or -034 Municipal Tie Module and the tie circuit is connected, reset the city box. Verify that:
- All signals silence.
 - The TROUBLE lamp and zone alarm lamp turn off.
 - Auxiliary alarm and trouble contacts reset.
 - For a system with a city tie module and the tie circuit is connected, the alarm indication at fire headquarters or remote station has cleared.
- e) Test Remaining Restorable Devices. Repeat alarm test steps a) through d) for all other restorable initiating devices on all zones. For a system with a city tie module, place the CITY TIE switch in the DISCONNECT position for these tests, and return the switch to NORMAL when the tests have been completed.

NOTE

A trouble condition will be indicated when the CITY TIE switch is operated.

- f) City Tie Disconnect Test (Only for a system with a city tie module). Place the CITY TIE switch in the DISCONNECT position. Verify that:
- The audible tone pulses and the TROUBLE lamp flashes.
 - The auxiliary trouble contacts transfer.
 - The audible tone silences when the TROUBLE SILENCE switch is operated.

Initiate an alarm and verify that:

- Fire headquarters or remote station did not receive the alarm.
- For a system with the Cat. No. 5751B-031 Remote Station Module, operation of the CITY TIE disconnect switch caused a trouble signal at the remote station.

Return the CITY TIE and TROUBLE SILENCE switches to their normal positions. Reset the initiating device and operate the RESET switch for 3 seconds. Verify that:

- The system resets per step d).
 - For a system with the Remote Station Module, the trouble signal at the remote station has cleared.
- g) Zone Disable Test (Only for a system configured with ALARM DISABLE switches). Operate the ALARM DISABLE switch for zone 1. Verify that:
- The audible tone pulses and the TROUBLE lamp flashes.
 - The auxiliary trouble contacts transfer.
 - The applicable zone trouble (TBL) lamp illuminates steadily.

While the zone is disabled, initiate an alarm on the zone and verify that the system does not sound an alarm. Return the DISABLE switch to the normal position and verify that:

- The audible tone silences and the TROUBLE lamp turns off.
- The auxiliary trouble contacts reset.
- The zone trouble lamp turns off.
- Repeat this disable test for zone 2, 3, and 4 and check for proper operation of the zone's ALARM DISABLE switch and TROUBLE lamp.

8.4 Trouble Tests

The following basic operations are to be performed or verified when called for in a trouble test:

Verify trouble indications - Check that the audible tone at the panel pulses and that the TROUBLE lamp flashes. When the auxiliary trouble contacts (terminals 19, 20 and 21) are used, check for activation of remote functions.

Silence trouble signal - Operate the TROUBLE SILENCE switch. Verify that the audible tone silences and that the TROUBLE lamp continues to flash.

Ringback occurs - When the trouble has been removed from the system, the audible tone sounds again (inverted). Return the TROUBLE SILENCE switch to normal to silence the tone. Verify that the TROUBLE lamp turns off and, when the auxiliary trouble contacts are used, verify that remote functions are reset.

- a) Open Line Test. Individually test the initiating and signaling circuits for proper operation with an open circuit condition. To test a circuit, create an opening in the circuit by disconnecting the end-of-line resistor on the circuit.
- Verify trouble indications.
 - For an initiating circuit, verify that the applicable zone trouble lamp illuminates steadily.
 - Silence trouble signal.

Reconnect the end-of-line resistor and verify that ringback occurs.

- b) Ground Fault Test. Individually test the initiating and signaling circuits for proper operation with a ground condition placed on the circuit. Separately check each circuit wire by connecting a jumper wire from the circuit wire termination on terminal block TB1 of the control board to the ground stud located on the rear wall of the back box.
- Verify trouble indications.
 - Silence trouble signal.

Disconnect the jumper wire and verify that ringback occurs.

- c) Battery Power Operation Test. Place the system on battery power by turning off AC power.

- Verify trouble indications.
- Silence trouble signal.
- Verify that A.C. POWER lamp has turned off.
- Place the CITY TIE switch in the DISCONNECT position. Conduct alarm test step a), paragraph 8.3, and verify that all events occur except that the audible tone is silent and the auxiliary trouble contacts which transferred during the alarm test are still transferred.
- Operate the RESET switch for 3 seconds and release.

- Return the CITY TIE switch to normal.
- Turn AC power on and verify that the A.C. POWER lamp illuminates.
- Verify that ringback occurs.

d) Battery Lead Supervision Test. Disconnect the RED POSITIVE (+) lead coming from the TB1 terminal. Wait a maximum of 10 seconds. Then:

- Verify trouble indications.
- Silence trouble signal.
- Reconnect the RED POSITIVE battery leads.
- Wait a maximum of 10 seconds and then verify that ringback occurs.

SECTION B - OPERATION

1.0 FUNCTIONS OF CONTROL SWITCHES AND INDICATORS

1.1 Control Switches

The control panel provides RESET, TROUBLE SILENCE, ALARM SILENCE, ALARM DISABLE (or TEST), and (optional) CITY TIE disconnect control switches. These switches, identified in Figure 11, Section D, provide the following functions:

RESET Switch - Depressing and holding this momentary switch for 3 seconds resets the control panel and smoke detectors provided that the alarm condition has been cleared. Operated initiating devices other than smoke detectors must be restored to normal first or the system will not reset.

TROUBLE SILENCE Switch - Depressing this locking switch during a trouble condition will silence the pulsing audible tone. When the trouble is corrected, the tone will sound again (inverted) indicating that the switch must be returned to its normal position.

ALARM SILENCE Switch - Depressing this momentary switch while the alarm signals are sounding will silence the signals and the continuous audible tone. The ALARM SILENCED lamp will illuminate, the flashing TROUBLE lamp will turn off, and the auxiliary alarm and trouble contacts will reset. The zone alarm LED indicator(s) will remain on. Should a subsequent alarm occur, the signals will resound.

ALARM DISABLE or ALARM TEST Switches - The system may be configured either with an ALARM DISABLE or ALARM TEST switches which are used for system maintenance purposes. Operation of a DISABLE switch will disable the applicable initiating circuit and cause the TROUBLE lamp to flash, the audible tone to pulse, the auxiliary trouble contacts to transfer, and the applicable zone trouble LED indicator to illuminate steadily. Operation of a TEST switch will activate the applicable zone and place the system in the alarm mode. The TEST switches may be configured for either locking or momentary operation.

CITY TIE Switch (Optional) - This switch (provided on the city tie module) is used to disconnect the city tie circuit when it is necessary to prevent an alarm from being transmitted to fire headquarters, such as when conducting a system test or fire drill. Placing the switch in the DISCONNECT position will disconnect the circuit. When disconnected, the TROUBLE lamp will flash, the audible tone will pulse, and the auxiliary trouble contacts will transfer. When the switch is returned to the NORMAL position, the city tie circuit is reconnected and the trouble indications stop.

1.2 Indicators

The control panel provides A.C. POWER, TROUBLE, ALARM SILENCED, and separate zone alarm (ALM) and zone trouble (TBL) LED indicator lamps, as well as an audible alarm/trouble tone. Indicator lamps are identified in Figure 11, Section D. The indicator lamps and audible tone provide the following indications:

A.C. POWER Lamp - Green LED illuminates steadily when ac primary power is supplied to the panel. When primary power drops below normal, the lamp turns off and the panel switches to battery power.

TROUBLE Lamp - Yellow LED flashes when a fault occurs in the system, and also flashes during an alarm.

ALARM SILENCED Lamp - Yellow LED illuminates steadily when the alarm signals have been silenced by the ALARM SILENCE switch.

Zone Alarm (ALM) Lamps - Applicable red LED illuminates steadily to indicate an alarm condition on initiating circuit 1, 2, 3, or 4. The lamp turns off when the system is reset.

e Trouble (TBL) Lamps - Applicable yellow LED illuminates steadily when either an open condition has occurred on initiating circuit 1, 2, 3, or 4 or the circuit has been disabled by operation of its ALARM DIS-ABLE switch. The lamp automatically turns off when either the fault has been corrected or the ALARM DIS-ABLE switch is returned to its normal position.

Audible Tone - Tone sounds continuously on alarm condition and pulses on trouble condition.

2.0 OPERATING MODES

2.1 General

The panel has three modes of operation: the supervisory mode, the alarm mode, and the trouble mode.

2.2 Supervisory Mode

The panel (or system) is in the supervisory mode when the A.C. POWER lamp is on and all other lamps are off. The supervisory mode is the normal operating mode and as long as this mode continues the system requires no attention other than periodic testing and preventive maintenance.

2.3 Alarm Mode

The actuation of any initiating device connected to the panel will cause the audible tone at the panel to sound continuously, the applicable zone alarm (ALM) lamp and remote zone alarm lamp (when used) to illuminate steadily, the TROUBLE lamp to flash, all signals to sound, fire headquarters to receive the alarm when the panel has an optional city tie module, and the auxiliary alarm and trouble contacts to transfer. The alarm mode will continue until the initiating device is reset and the RESET switch is operated and held for 3 seconds. The alarm signals and audible tone may be silenced by operating the ALARM SILENCE switch.

2.4 Trouble Mode

When a trouble condition occurs in the system, the audible tone at the panel will pulse, the TROUBLE lamp will flash, and the auxiliary trouble contacts will transfer. If the trouble is an open circuit condition on an initiating circuit, the applicable zone trouble (TBL) lamp also will illuminate steadily. The audible tone may be silenced by operating the TROUBLE SILENCE switch.

The trouble source must be identified and cleared before the system will return to the supervisory mode. When the trouble has been cleared and the TROUBLE SILENCE switch has been operated, the audible tone will re-sound (inverted from normal trouble) as a reminder to return the switch to its normal position. Some of the fault conditions which will be detected include:

- Open or ground fault on an initiating circuit.
- Open, short or ground fault on the signaling circuit.
- Low or no primary power and/or battery voltage.
- Disconnected or reversed battery leads.
- Open fuse on battery input or signaling circuit output.

- Off-normal position of a control switch.
- City tie module removed from control board.

3.0 RESPONDING TO AN ALARM OR TROUBLE SIGNAL

3.1 When An Alarm Sounds

- a) Notify the municipal fire department. This should be done for systems with or without a city tie connection.
- b) Evacuate all occupants from the building in an orderly manner. Avoid panic.
- c) Operate the ALARM SILENCE switch to silence the alarm signals.
- d) To reset the system after an alarm:
 - Reset or replace, as applicable, the alarm initiating device(s).
 - Open the panel door and operate the RESET switch for 3 seconds and release.
 - If the panel is provided with the Cat. No. 5751B-033 or -034 Municipal Tie Module, reset the city box.

3.2 When The Trouble Tone Sounds

- a) Open the panel door and operate the TROUBLE SILENCE switch. This:
 - Silences the tone.
 - Leaves the TROUBLE lamp flashing and zone trouble lamp (if illuminated) on steadily.
- b) Notify the responsible system maintenance personnel that there is trouble in the system.
- c) If any manual stations will be out of service for an extended period of time, place "OUT OF ORDER" signs on the affected stations and indicate the location of the nearest operational station.
- d) When the trouble has been cleared, the pulsing tone (inverted on ringback) sounds again. Place the TROUBLE SILENCE switch in the normal position. This:
 - Silences the tone.
 - Shuts off the TROUBLE lamp and, as applicable, zone trouble lamp.
 - Restores the system to the supervisory mode.

4.0 PERIODIC SYSTEM OPERATIONAL TEST OR FIRE DRILL

4.1 Requirements

A system operational test and/or fire drill must be made according to and at the intervals required by local fire authorities. Where there are no conflicting local regulations, a monthly test or drill is recommended. Should a trouble condition occur during a test or drill, the system must be serviced by a qualified fire alarm system service technician (refer to paragraph 5.3).

When the panel includes an optional city tie module and test or drill is to be performed, notify the fire department of the schedule and disconnect the tie circuit by placing the CITY TIE switch in the DISCONNECT position. This causes the audible tone to pulse, the TROUBLE lamp to flash, and the auxiliary trouble contacts to transfer. The audible tone may be silenced by operating the TROUBLE SILENCE switch.

When the Cat. No. 5751B-031 Remote Station Module is used, operation of the CITY TIE disconnect switch also causes a trouble indication at the remote station. Also, occupants of the building should be notified of the test so that the alarm signals are disregarded during the test period.

Initiating A Test Or Drill

A test or drill can be initiated from any restorable initiating device. Actuate the selected device as directed in the operating instructions provided with the device. Verify that:

- a) The audible tone sounds continuously (tone will not sound if TROUBLE SILENCE switch has been operated).
- b) Applicable Zone alarm (ALM) lamp and remote zone alarm lamp (when used) light steadily.
- c) TROUBLE lamp flashes.
- d) All signals operate continuously or pulse, as applicable.
- e) Auxiliary alarm and trouble contacts transfer. These can be used for fan shutdown, door release, etc.

A different initiating device should be used for each test or drill to ensure that all restorable devices will be checked periodically. Nonrestorable initiating devices, such as the fixed temperature element of heat detectors, also require periodic testing. Refer to the instructions provided with the device for recommended test frequency and test procedures.

When the test or drill has been completed:

- f) Restore the initiating device to normal.

NOTE

Smoke detectors are automatically restored to normal when the control panel RESET switch is operated.

- g) Place the CITY TIE switch in the NORMAL position.
- h) Operate the RESET switch and hold for 3 seconds. Verify that the applicable zone alarm lamp has turned off, the auxiliary alarm and trouble contacts have reset, and the audible tone has silenced (unless previously silenced by the TROUBLE SILENCE switch).
- i) If the TROUBLE SILENCE switch was operated, return the switch to normal and verify that the TROUBLE lamp turns off and the audible tone silences.

5.0 MAINTENANCE

5.1 General

Maintenance of the control panel consists of the periodic conducting of a system test and/or fire drill, and replacement of the standby battery every 4 to 5 years under normal conditions, or sooner as required by use. The Cat. No. 5759B-024, 5759B-060, 5759B-065, and other batteries recommended for use with the panel have sealed construction and do not require adding of electrolyte.

Maintenance of a complete fire alarm system should include periodic testing and cleaning of smoke and heat detectors. Refer to applicable testing and maintenance procedures supplied with the devices installed.

5.2 Panel Fuses

CAUTION

Always disconnect all power before servicing the control panel.

Four fuses are provided on the control board for protection of the following:

Fuse F1 - Battery input

Fuse F2 - Signaling circuit

Fuse F3 - Auxiliary unfiltered dc output

Fuse F4 - Auxiliary filtered dc output

Fuse F1 is a glass tube plug-in type fuse and fuses F2, F3 and F4 are subminiature fuses which are soldered to the control board. Fuses F1 and F2 are supervised and a trouble condition will occur when either fuse opens.

In the event that a fuse opens, the control panel must be serviced by a qualified fire alarm service technician (refer to paragraph 5.3). Replace fuses only with fuses having the same ratings. For fuse ratings and part numbers, refer to Figure 13, Section D. Should replacement of subminiature fuse F2 be required, a glass tube pig-tail type fuse also may be used as a replacement. This fuse must be a fast-acting type fuse such as Littelfuse catalog number 318 004. This fuse may be installed in the designated area on the control board without removing the subminiature fuse.

5.3 Servicing

In the event that trouble occurs in the system, the system must be serviced. Contact either your local Edwards authorized systems distributor or the nearest Edwards office in your region. Edwards Field Service Centers are listed on the back of this manual.

SECTION C - TABLES

| WIRE GAUGE | MAXIMUM LENGTH OF WIRE RUN FROM CONTROL PANEL TO LAST DEVICE ON CIRCUIT |
|---|--|
| 14 | 19,800 Feet |
| 16 | 12,450 Feet |
| 18 | 7,830 Feet |
| <p style="text-align: center;">NOTES</p> <p>1. Maximum resistance per installation wire is 50 ohms.</p> <p>2. National and local regulations may limit wire gauge. Follow those regulations.</p> | |

Table 1. Installation Wire Size Requirements For Alarm Initiating Circuits

| AMPERE-HOUR REQUIREMENT | | |
|--|--|--|
| TOTAL ALARM CURRENT LOAD* | 24-HOUR SUPERVISION FOLLOWED BY 5-MINUTE ALARM | 60-HOUR SUPERVISION FOLLOWED BY 5-MINUTE ALARM** |
| 3 AMPS | 2.55 A.H. | 4.02 A.H. |
| 2 AMPS | 2.17 A.H. | 3.69 A.H. |
| 1 AMP | 1.79 A.H. | 3.36 A.H. |
| <p>* Combined alarm current load on signaling circuit (terminals 11 and 12) and on unfiltered auxiliary dc output (terminals 13 and 15).</p> <p>** When a city tie module is installed in the panel, 60 hours of supervision must be provided.</p> | | |

Table 2. Determining Ampere-Hour Requirement Per Method A, Paragraph 6.1, Section A

BATTERIES 6.5 AMPERE-HOURS OR LESS

| Manufacturer | Catalog Number | Description |
|--------------|----------------|---------------|
| Edwards | 5759B-024 | 24V, 2.6 A.H. |
| Edwards | 5759B-060 | 24V, 4.0 A.H. |
| Edwards | 5759B-065 | 24V, 6.5 A.H. |

BATTERIES GREATER THAN 6.5 AMPERE-HOURS

| Manufacturer | Model Number | Description |
|--------------|--------------|----------------|
| Globe | GC690 | 6V, 9.0 A.H.* |
| Eaglepicher | CF6V9 | 6V, 9.0 A.H.* |
| Panasonic | LCR6V8P | 6V, 8.5 A.H.* |
| Powersonic | PS6100 | 6V, 10.0 A.H.* |
| Powersonic | PS6120 | 6V, 12.0 A.H.* |
| Elpower | EP695-1 | 6V, 9.5 A.H.* |
| Elpower | EP6120-1 | 6V, 12.0 A.H.* |

*Four batteries required, connected in series.

NOTES

1. Maximum system load must not exceed 9.0 ampere-hours.
2. Refer to Paragraph 6.1, Section A, to determine ampere-hour requirement.

Table 3. Recommended Batteries For Use With Control Panel

SECTION D - ILLUSTRATIONS

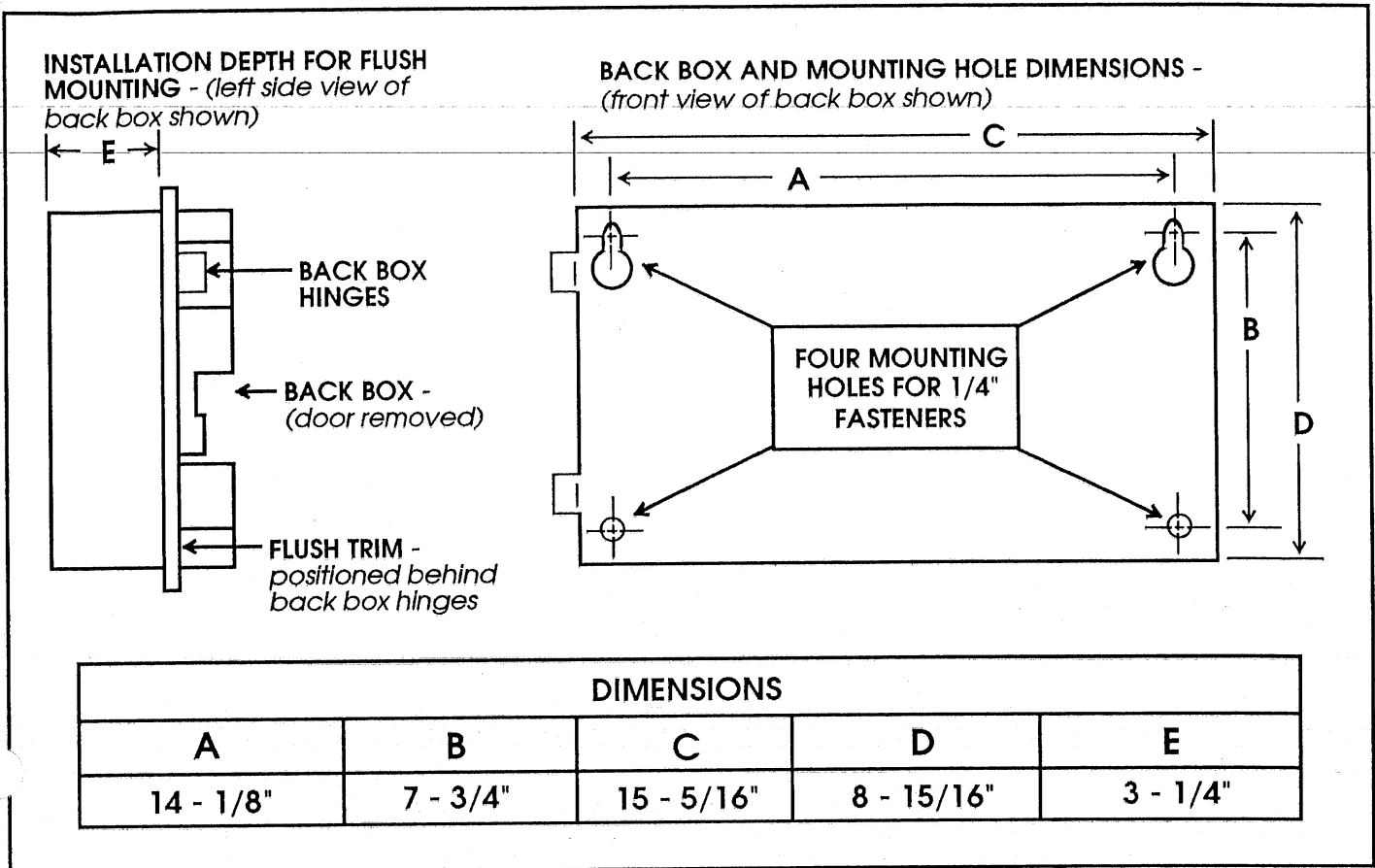


Figure 1. Control Panel Mounting Dimensions

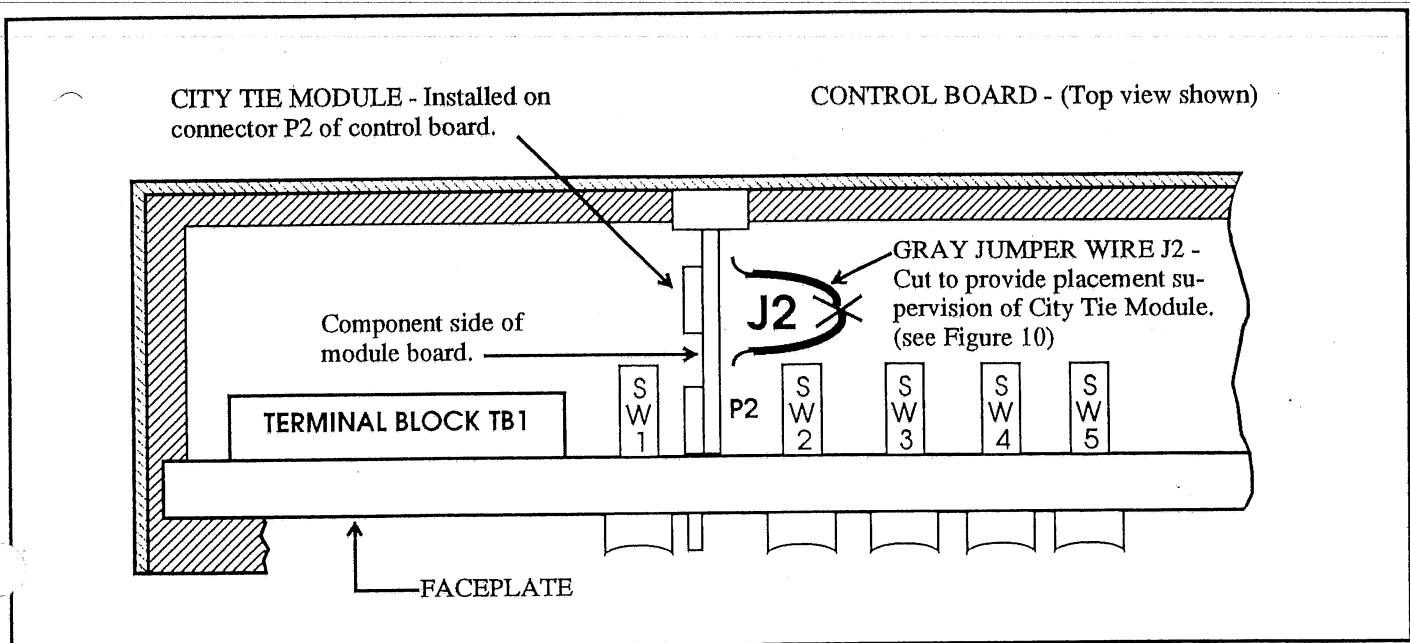


Figure 2. City Tie Module Installation

90586(24)
P-047570-0552

Kepl Kit

1K/1Watt

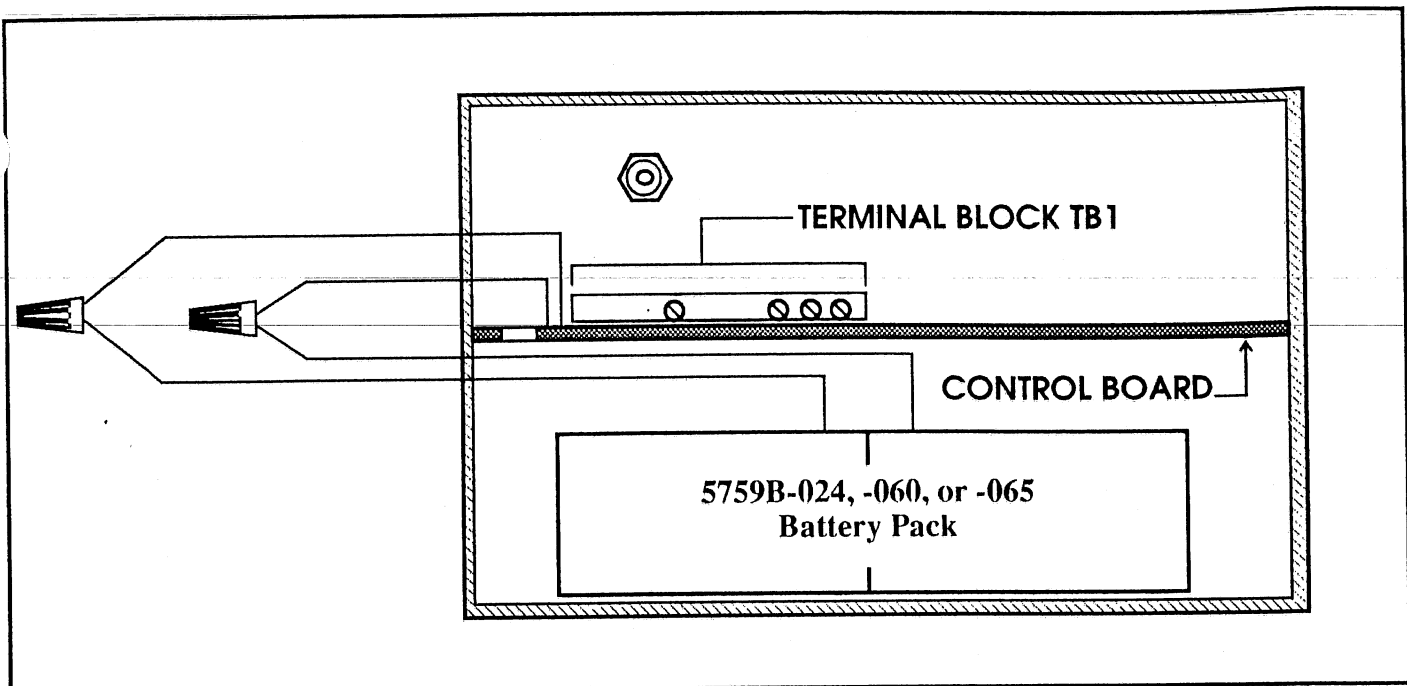


Figure 3. Battery Installation

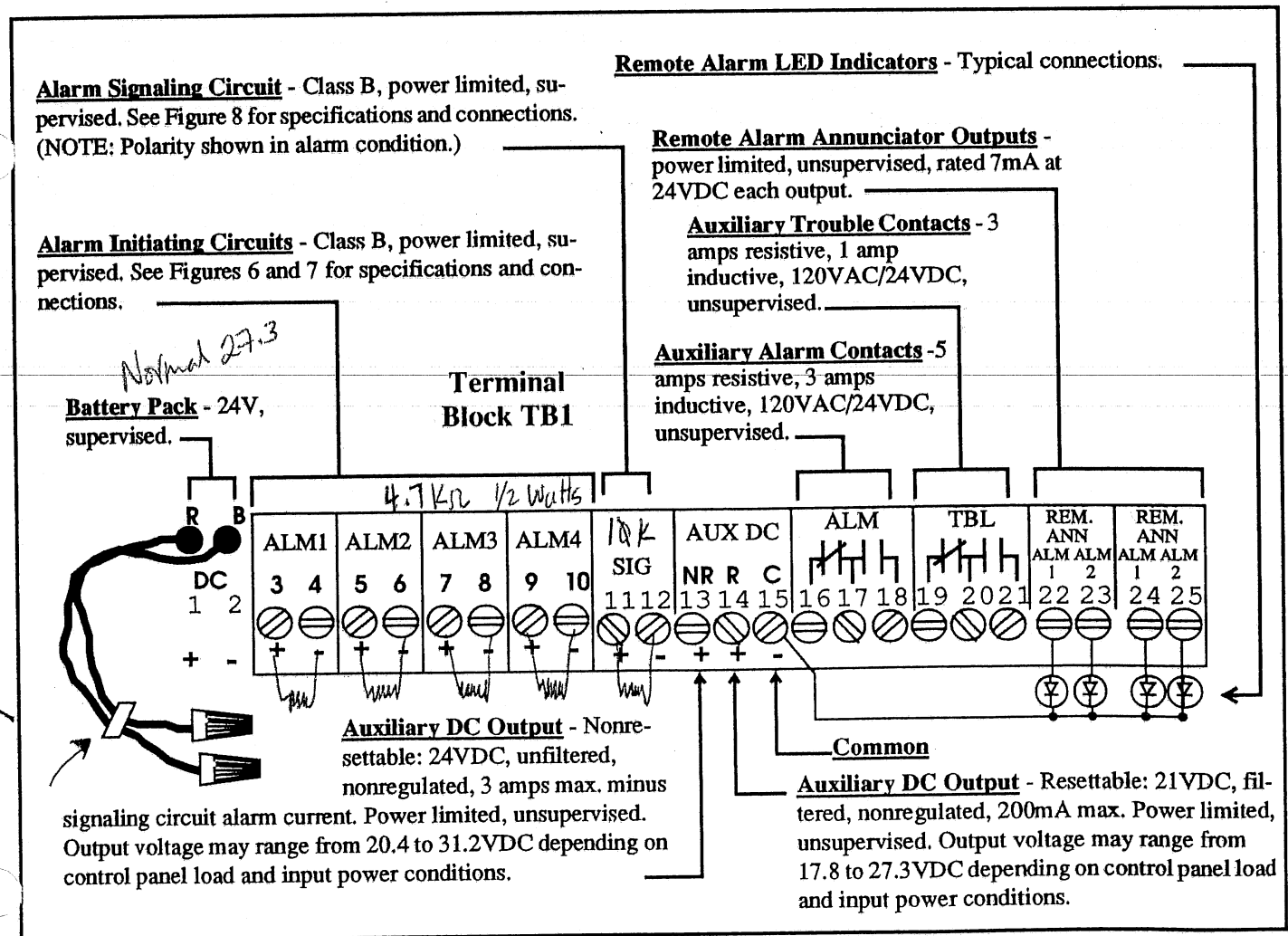


Figure 4. Field Wiring Connections

AMPS DURING
SUPERVISION

AMPS DURING
ALARM

A. Find Total Current Drain on Battery -

1. Fill in Required Currents:

a. Signaling Circuit Current (terminals 11 & 12): not to exceed 3 amps minus alarm current of b below

0

b. Auxiliary DC Unfiltered Current (terminals 13 & 15): not to exceed 3 amps minus alarm current of a above

c. Auxiliary DC Filtered Current (terminals 14 & 15): not to exceed 0.2 amp

2. Add a through c

3. Base Adder - Add to Step 2

0.05

0.1

Total Currents

(Supervisory)

(Alarm)

B. Find Battery Ampere-Hours Per Step 1 or 2 Below, As Applicable* -

1. For 24-Hour Supervision Followed By a 5-Minute Alarm:

a. Multiply Total Supervisory Current x 24 = _____ A.H. - Supervisory

b. Multiply Total Alarm Current x 0.33 = _____ A.H. - Alarm

c. Add Supervisory and Alarm Ampere-Hours = _____ A.H. - Sub-Total

d. Multiply Sub-Total Ampere-Hours x 1.15 = _____ A.H. - Total Required

2. For 60-Hour Supervision Followed By a 5-Minute Alarm:

a. Multiply Total Supervisory Current x 60 = _____ A.H. - Supervisory

b. Multiply Total Alarm Current x 0.33 = _____ A.H. - Alarm

c. Add Supervisory and Alarm Ampere-Hours = _____ A.H. - Sub-Total

d. Multiply Sub-Total Ampere-Hours x 1.15 = _____ A.H. - Total Required

* When a city tie module is installed in the panel, 60 hours of supervision must be provided.

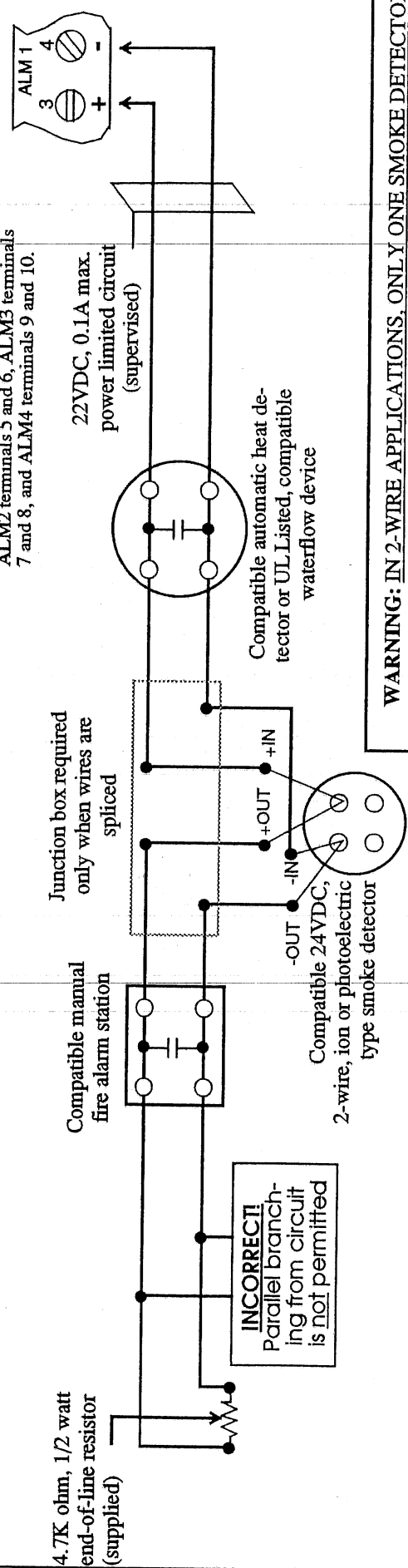
NOTE

DUE TO CHARGER RESTRICTIONS, SYSTEM LOADING OF THE BATTERY CANNOT EXCEED 9.0 A.H.

Figure 5. Determining Ampere-Hour Requirement Per Method B, Paragraph 6.1, Section A

NOTE: Connectors are identical for ALM2 terminals 5 and 6, ALM3 terminals 7 and 8, and ALM4 terminals 9 and 10.

— TERMINAL BLOCK TBI



WARNING: IN 2-WIRE APPLICATIONS, ONLY ONE SMOKE DETECTOR ON AN INITIATING CIRCUIT CAN BE ACTIVATED. WHEN CONTACTS ON RELAY BASES ARE USED TO CONTROL MORE THAN ONE FUNCTION (e.g. EVAPORATOR CAPTURE, FAN SHUT DOWN) ONLY ONE (1) SMOKE DETECTOR PER INITIATING CIRCUIT IS PERMITTED AND ALL OTHER INITIATING DEVICES SUCH AS HEAT DETECTORS, MANUAL STATIONS, WATERFLOW SWITCHES, ETC., MUST BE CONNECTED TO SEPARATE INITIATING CIRCUITS.

INSTALLATION NOTES

1. Electrical Specifications (Each Initiating Circuit):

| | |
|---------------------------------------|---|
| Classification: | Power-limited, supervised |
| Operation: | Class B |
| End-of-Line Resistor: | 4.7K ohms, 1/2W |
| Maximum Installation Wire Resistance: | 50 ohms per wire (each side) |
| Supervisory Voltage: | 16-28VDC (22VDC nominal), 300 millivolt ripple (max.) |
| Supervisory Current: | 5 milliamps |
| Short Circuit Current: | 73 milliamps |
| Max. Smoke Detector Standby Current: | 1500 microamps (1.5 milliamps) |
| Current Req'd. For Alarm: | 25 milliamps |

2. Use only compatible alarm initiating devices. Refer to the Compatibility Information Supplement (P-047550-0756) supplied with the panel for compatible devices.

3. Refer to the installation instructions provided with the initiating devices for electrical specifications and connection information.

4. Two-wire smoke detectors obtain operating power through the initiating circuit installation wires and also transmit alarm signals to the control panel through the same wires. The initiating circuit provides the capacity for 1500 microamps maximum of smoke detector standby current. The maximum number of 2-wire smoke detectors that may be connected to the circuit depends, therefore, on their standby current ratings. The sum of these currents must not exceed 1500 microamps.

5. Normally open manual stations, heat detectors, and waterflow switches may be connected to the circuit in the quantities required.

6. Four-wire smoke detectors may be connected to the same initiating circuit with 2-wire smoke detectors. Four-wire detectors obtain operating power from a separate circuit and provide a normally open contact for alarm initiation. When 4-wire detectors are to be installed, refer to Figure 7 for installation requirements.

7. The resistance of each installation wire must not exceed 50 ohms for proper panel operation. Determine the required length of the installation wire run from the control panel to the last initiating device on the circuit. Then refer to Table 1, Section C, to determine the wire gauge that may be used.

8. To provide proper electrical supervision of installation wiring connections, be sure to break the wire run when connecting to devices. Also, ensure that the circuit is continuous from one device to the next. Parallel branching from the circuits is not permitted since proper supervision would not be maintained.

9. Install the initiating circuits as shown above and connect the 4.7K ohm, 1/2 watt end-of-line resistors (supplied) after the last initiating device on the circuits as shown. After testing the wiring connect it to the designated terminals on the control board as shown.

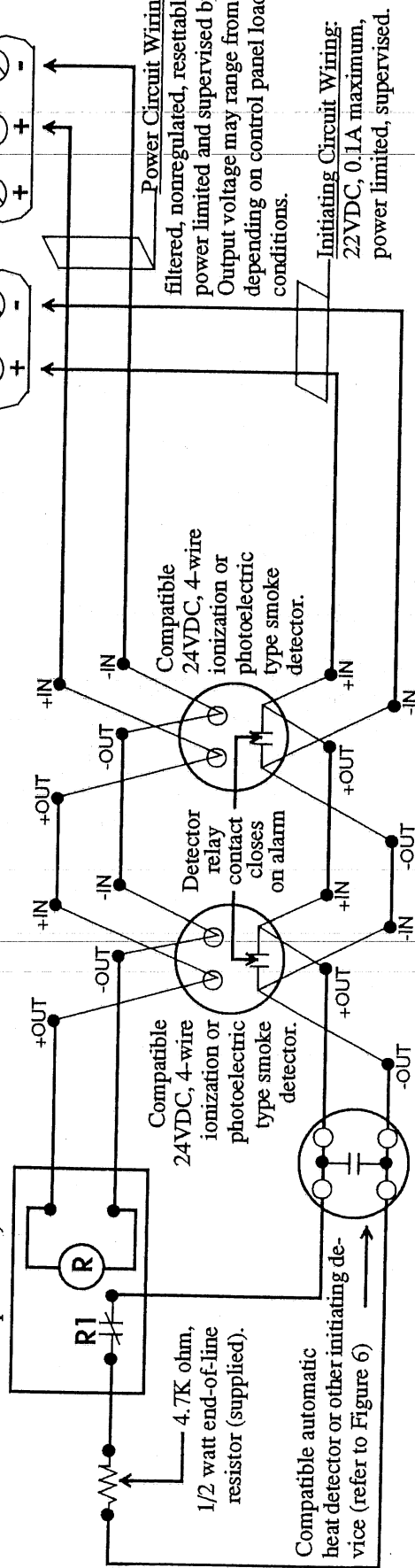
10. Refer to paragraph 4.2, Section A, for additional installation requirements.

Figure 6. Installation Wiring For Alarm Initiating Circuit Using 2-Wire Smoke Detectors

Compatible 24VDC fire alarm relay for end-of-line power supervision (shown energized in supervision).

NOTE: Connectors are identical for ALM2 terminals 5 and 6, ALM3 terminals 7 and 8, and ALM4 terminals 9 and 10.

— TERMINAL BLOCK TBI



INSTALLATION NOTES

1. Four-wire smoke detectors provide a normally open alarm initiating contact. They do not utilize power from the initiating circuit as they are supplied with power through a separate circuit. An end-of-line relay is required on the power circuit to provide supervision of the power supply to the detectors and relay.
2. Voltage for operating 24DC, 4-wire smoke detectors is provided at auxiliary DC output terminals 14 (+) and 15 (-) on the control board. This output is power-limited, fused, and unsupervised, and provides filtered, nonregulated voltage of 21VDC, +30%-15%. Actual output voltage depends on the load and on the input voltage to the control panel. The maximum load is 200 milliamps. The output breaks with operation of the control panel RESET switch.
3. Use only compatible 4-wire smoke detectors and end-of-line (fire alarm) relay. Refer to the Compatibility Information Supplement (P-047550-0756) supplied with the panel for compatible devices.
4. Four-wire smoke detectors may be installed independently or in combination with 2-wire smoke detectors and normally open manual stations, heat detectors, and waterflow switches. Operation of any of these devices, when used, will not prevent the operation of the 4-wire smoke detectors since the detectors are separately powered. When using other types of initiating devices with the detectors, refer to Figure 6 for installation requirements for these devices.
5. The maximum number of 4-wire smoke detectors that may be used depends on the alarm current ratings of the detectors, and on the operating current rating of the end-of-line relay. The sum of the detector and relay currents must not exceed 200 milliamps. Refer to the installation instructions provided with these devices for electrical specifications and connection information.
6. The current load on the auxiliary filtered output must be included when calculating the amperage.

hour requirement for a standby battery (refer to paragraph 6.1, Section A, for details). Four-wire detector alarm current must be included as alarm amps, and end-of-line relay operating current must be included as both supervisory and alarm amps since the relay will be energized during both of these operating modes.

7. The power circuit wiring to 4-wire smoke detectors must be properly sized to ensure adequate operating voltage to the detectors and the end-of-line relay. The graph in Figure 9 may be used to determine the appropriate wire size.

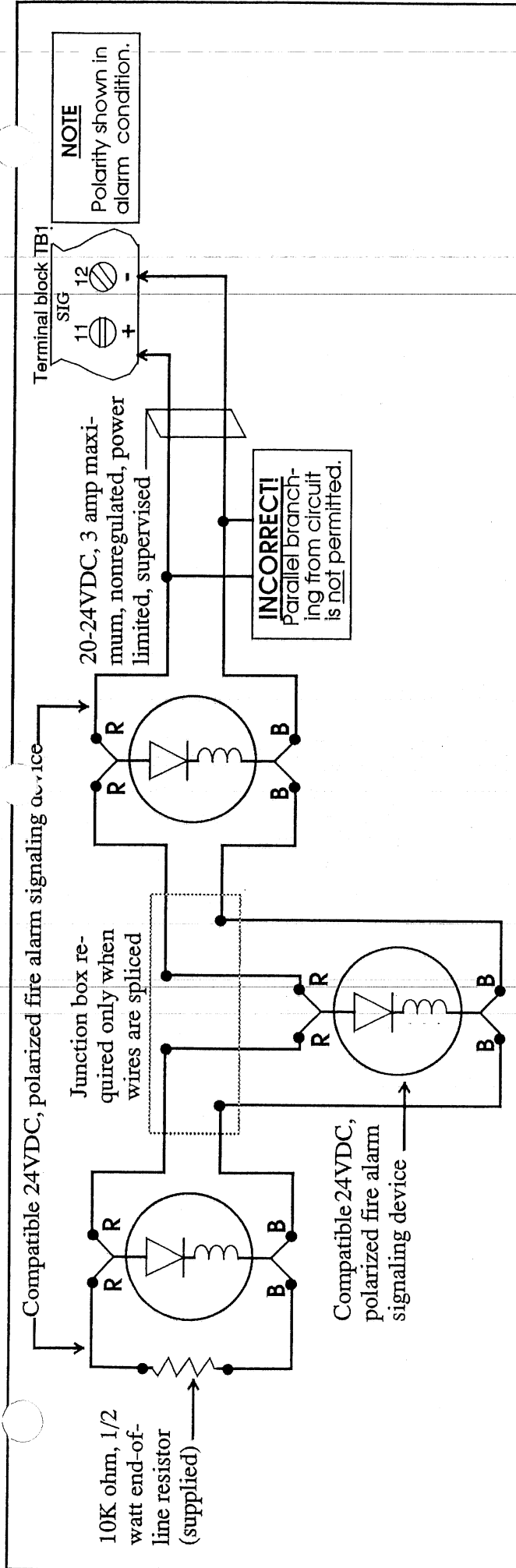
8. The resistance of each initiating circuit installation wire must not exceed 50 ohms for proper panel operation. Determine the required length of the wire run from the control panel to the last initiating device on the circuit. Then refer to Table 1, Section C, to determine the wire gauge that may be used.

9. To provide proper electrical supervision of installation wiring connections, be sure to break the wire run when connecting to devices. Also, ensure that the initiating and power circuits are continuous from one device to the next. Parallel branching from the circuits is not permitted since proper supervision would not be maintained.

10. Install the initiating and power circuits as shown above and connect the 4.7K ohm, 1/2 watt end-of-line resistors (supplied) after the last initiating device on the circuits as shown. Polarity must be observed when making wiring connections. After testing all wiring connect it to the designated terminals on the control board as shown.

11. Refer to paragraph 4.2, Section A, for additional installation requirements.

Figure 7. Installation Wiring For Alarm Initiating Circuit Using 4-Wire Smoke Detectors



INSTALLATION NOTES

1. Electrical Specifications:

| | |
|-----------------------|---|
| Classification: | Power-limited, supervised |
| Operation: | Class B |
| End-of-Line Resistor: | 10K ohms, 1/2 Watt |
| Supervisory Voltage: | -17V DC |
| Supervisory Current: | -1.7 milliamps |
| Alarm Voltage: | 20 - 24V DC, unfiltered, nonregulated |
| Maximum Current: | 3 amps minus unfiltered auxiliary DC output current |
| Minimum Current: | 1.5 amps minus unfiltered auxiliary DC output current |
| Fuse Rating: | 4 amps |

2. Use only compatible 24VDC, polarized alarm signaling devices. Refer to the Compatibility Information Supplement (P-047550-0756) supplied with the panel for compatible devices.

3. Refer to the installation instructions provided with the signaling devices for electrical specifications and connection information.

4. The maximum signaling current available is 3 amps minus the current load on the unfiltered auxiliary DC output (refer to paragraph 4.5, Section A).

5. The sum of the alarm current ratings of the signaling devices must not exceed the available current determined in note 4.

6. The installation wiring must be correctly sized for proper operation of the signaling devices. The wire gauge that may be used depends on the following:

a) The total alarm current of all devices on the circuit.

b) The length of the wire run from the control panel to the last signaling device on the circuit.

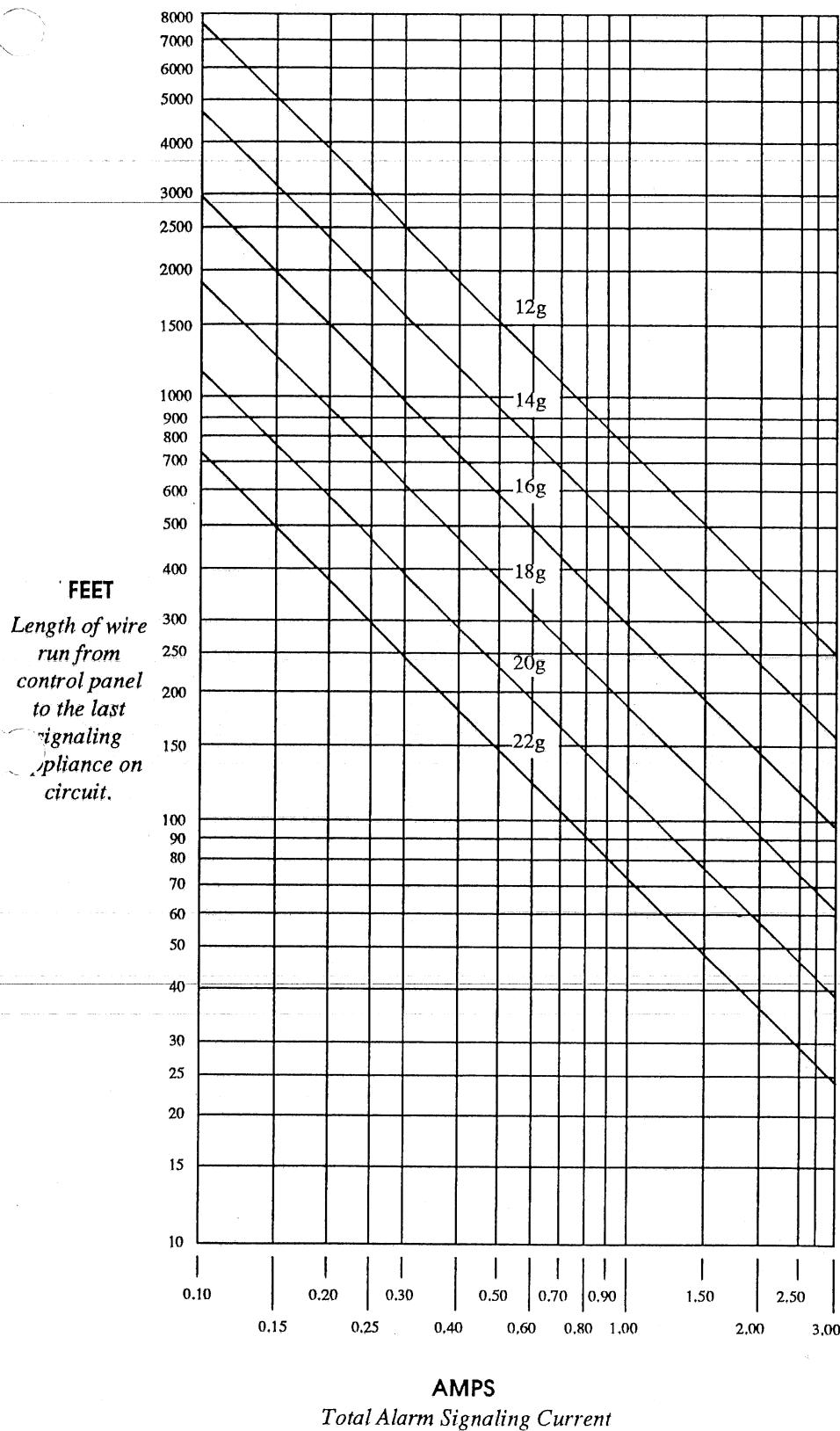
After determining a) and b), refer to the graph in Figure 9 to find the wire gauge that may be used.

7. To provide proper electrical supervision of installation wiring connections, be sure to break the wire run when connecting to devices. Also, ensure that the circuit is continuous from one device to the next. Parallel branching from the circuit is not permitted since proper supervision would not be maintained.

8. Install the circuit as shown above and connect the 10K ohm, 1/2 watt end-of-line resistor (supplied) after the last signaling device on the circuit as shown. All signaling devices must be connected in parallel and polarity must be observed. After testing the wiring connect it to the designated terminals on the control board as shown.

9. Refer to paragraph 4.3, Section A, for additional installation requirements.

Figure 8. Installation Wiring For Alarm Signaling Circuit



HOW TO USE GRAPH

1. On the left side of the graph, locate the length of the installation wire run from the control panel to the last device on the circuit.

2. On the bottom of the graph, locate the previously determined total alarm signalling current.

3. Project lines from the locations in steps 1 and 2 until they intersect. Determine the minimum wire gauge (12g through 22g) that may be used per A or B below, as applicable.

A. If the intersection of the lines occurs on a wire gauge line, that gauge is the minimum gauge that may be used. Example: signaling current is 0.75 amp and wire run is 250 feet - minimum wire gauge is 18.

B. If the intersection of the lines occurs between wire gauge lines, the wire gauge line to the right is the minimum wire gauge that may be used. Example: current is 1.00 amp and wire run is 400 feet - minimum wire gauge is 14.

NOTES

The graph is based on maximum line voltage drop of approximately 2 volts.

National and local regulations may limit wire gauge. Follow those regulations.

Figure 9. Graph for Determining Installation Wire Size for Alarm Signaling Circuit Installation Wiring

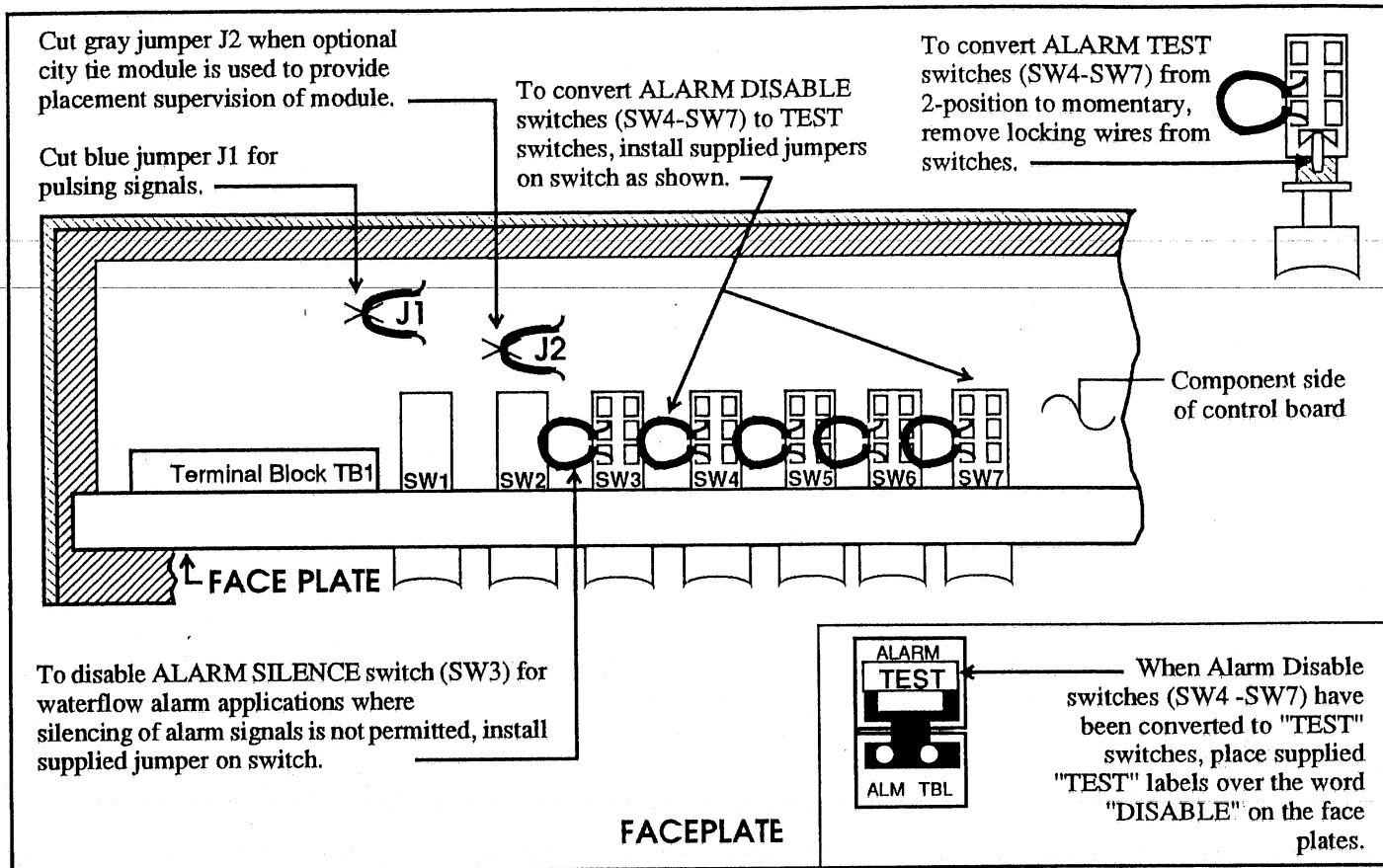


Figure 10. Locations of Jumper Wires And Locking Wires

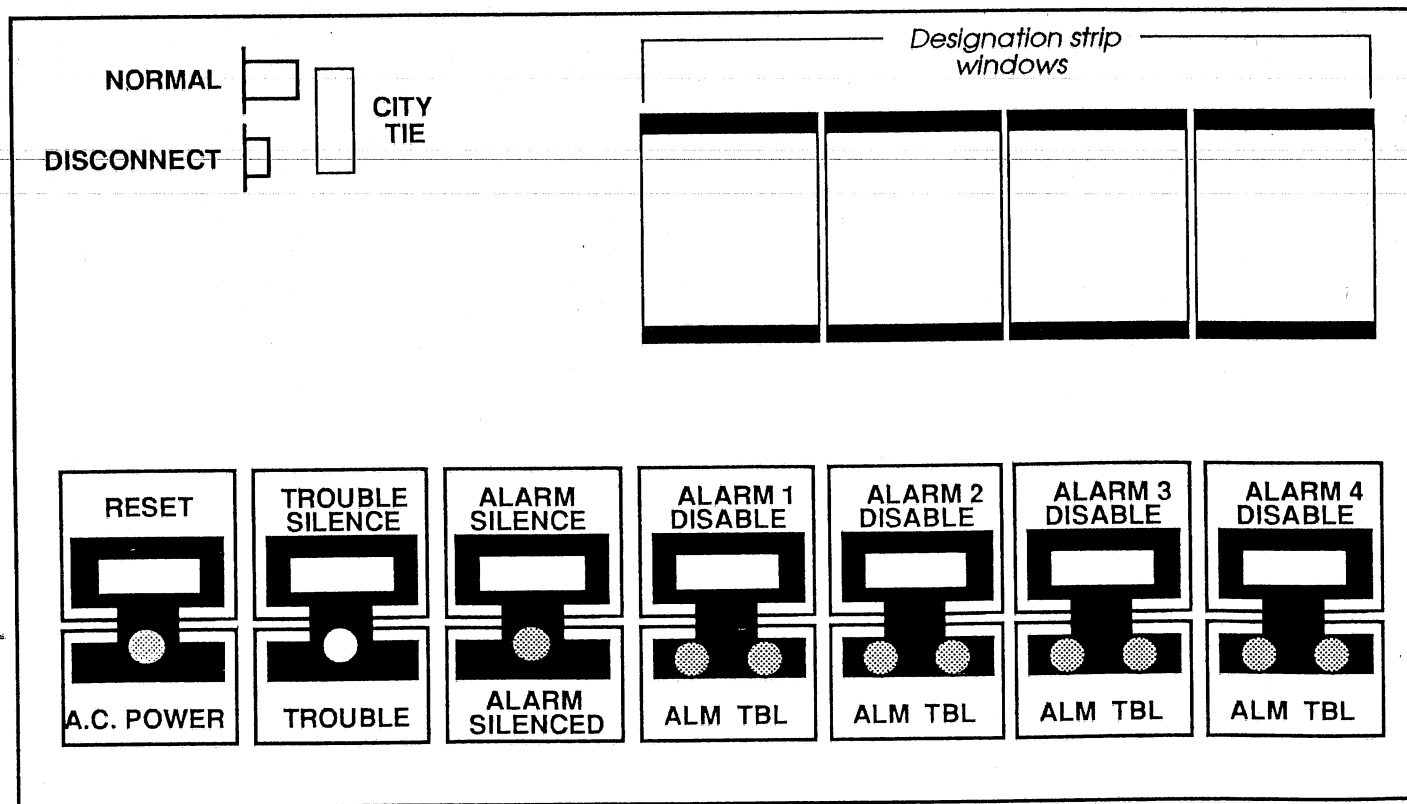
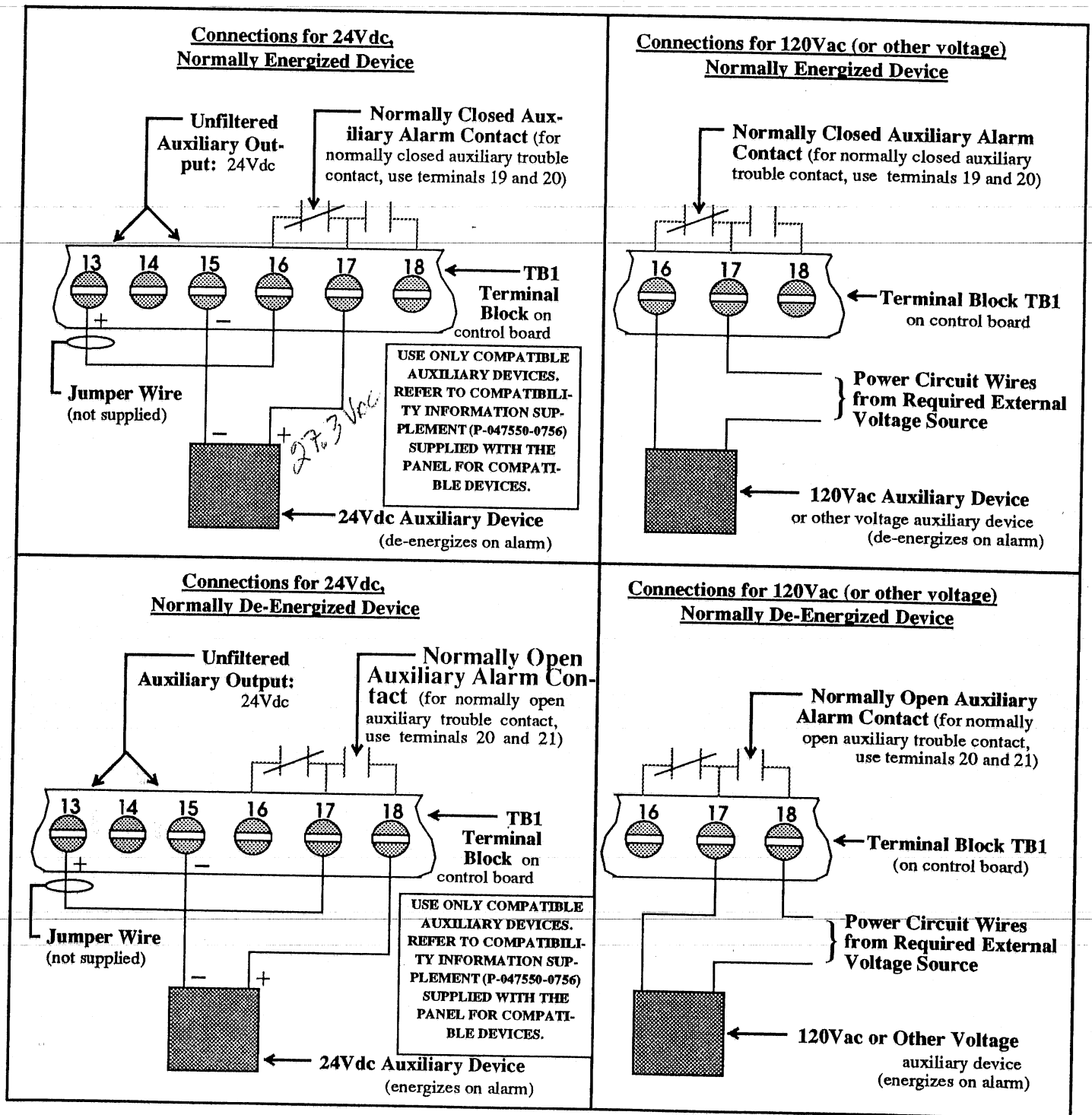


Figure 11. Face Plate (Control Switches/Indicator Lamps)

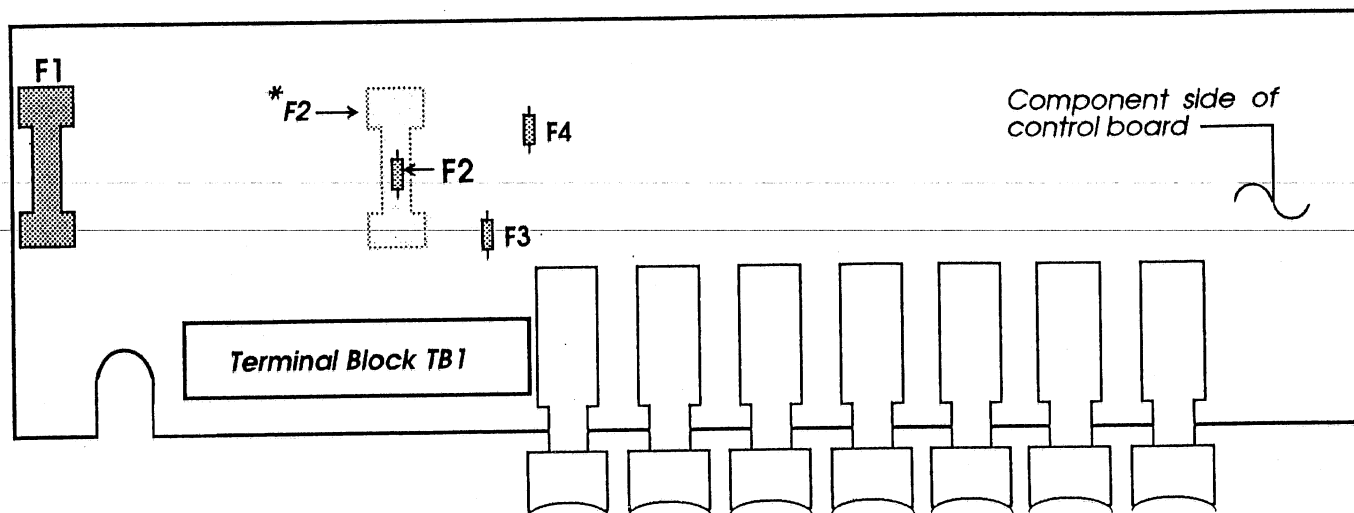


NOTES

1. Auxiliary alarm contact transfers on alarm condition only. Auxiliary trouble contact transfers on alarm or trouble condition only.
2. Refer to paragraphs 4.5 and 4.6, Section A, for auxiliary dc output and contact specifications.
3. The current load of devices connected to the auxiliary dc output (terminals 13 and 15) must be included when calculating the ampere-hour requirement for a standby battery (refer to paragraph 6.0, Section A). Current of normally energized devices must be included as supervisory (standby) current, and current of normally de-energized devices must be included as alarm current.

Figure 12. Typical Connections Of Auxiliary Devices To Control Panel

FUSE LOCATIONS



FUSE DATA

| FUSE | CIRCUIT PROTECTED | RATING | PART NUMBER |
|------|-----------------------------------|---------|--|
| F1 | Battery Input | 5 Amps | Edwards: P-028360 Bussmann: MTH-5 Amp |
| F2 | Signaling Circuit | 4 Amps | Edwards: P-039310-0021 Littelfuse: PICO 251 004 |
| F3 | Auxiliary DC Output Unfiltered | 4 Amps | Edwards: P-039310-0021 Littelfuse: PICO 251 004 |
| F4 | Auxiliary DC Output Filtered | 3/8 Amp | Edwards: P-039310-0018 Littelfuse: PICO 251.375 |

CAUTIONS

1. Fuses must be replaced by a qualified service technician,
2. Replacement fuses must have the same amperage rating as those indicated above. Never replace a fuse with one having a higher rating.

* Designates location for glass tube pigtail type fuse which may be used in place of standard subminiature fuse. Use only a fast acting fuse such as Littelfuse catalog number 318 004.

Figure 13. Control Board Fuses