

Instruction Manual for the
MS-4012/4024 and CMS-4012/4024
 Fire Alarm Control Panels

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. 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 72-1993 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 0-49° C/32-120° F and at a relative humidity of 85% RH (non-condensing) at 30° C/86° F. 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 its 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.

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.

Fire Alarm System Limitations

While installing a fire alarm system may make lower insurance rates possible, 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 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.

Any fire alarm system may fail for a variety of reasons:

Smoke detectors may not sense fire where smoke cannot reach the detectors such as in chimneys, in walls, or 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. Furthermore, all types of smoke detectors - both ionization and photoelectric types, have sensing limitations. No type of smoke detector can sense every kind of fire caused by carelessness and safety hazards like smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, children playing with matches, or arson.

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.

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.

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.

Equipment used in the system may not be technically compatible with the control. 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.

The most common cause of fire alarm malfunctions, however, is inadequate maintenance. All devices and system wiring should be tested and maintained by professional fire alarm installers following written procedures supplied with each device. System inspection and testing should be scheduled monthly or as required by National and/or local fire codes. Adequate written records of all inspections should be kept.

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 présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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Note: This instruction manual covers panels listed by UL (MS-4012 and MS-4024) and by ULC (CMS-4012 and CMS-4024). For simplicity, this document refers to these panels as the "4012" (for the 12-volt **MS-4012** and **CMS-4012** control panels) and the "4024" (for the 24-volt **MS-4024** and **CMS-4024** control panels).

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The MS-4012/4024 and CMS-4012/4024 Fire Alarm Control Panels are suitable for service under the following standards:

National Fire Protection Association (NFPA) Standards:



71 Signaling Systems for Central Station Service
72 Local Protective Signaling Systems
72 Auxiliary Protective Signaling Systems
72 Remote Station Protective Signaling Systems
72 Proprietary Protective Signaling Systems



Underwriter's Laboratories (UL) listed as a
Fire Protective Signaling System - Standard 864



Underwriter's Laboratories of Canada (ULC) listed
Standard CAN/ULC - S527 - M87



California State Fire Marshall (CSFM) listed
CSFM File Number: 7165-075:130



Bureau of Standards and Appeals listed
MEA Resolution Number: 578-81-SA

For Compatible Notification Appliances, 2 and 4-wire smoke detectors and door holders, refer to the Fire Lite Device Compatibility Document, 15384.

A Packaging Note

Each optional module listed in this manual as "**40xx**" is offered in 12 and 24-volt versions. The "**XX**" represents either "**12**" or "**24**" volts DC.

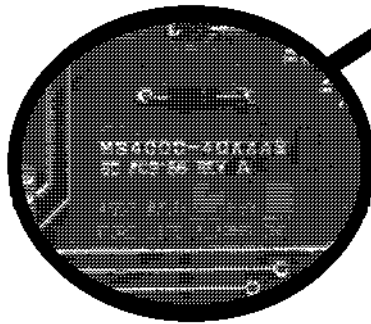
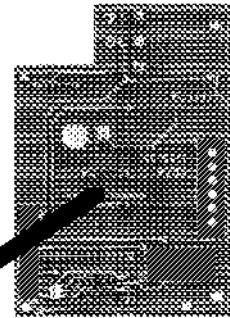
Each module is further distinguished by its respective two letter abbreviation (such as **TM** for **Transmitter Module**).

When received, the actual module **boards** will be marked as "**MS4000 - 40xx**" followed by a one letter abbreviation and the letter "**B**" (*for board*).

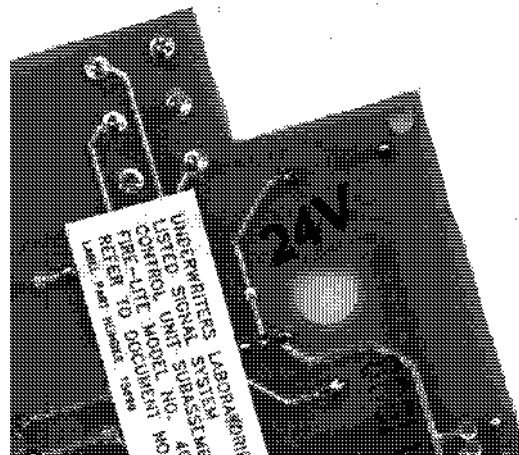
For instance:

To order a 24-volt General Alarm and Trouble Module, order a "**4024AT**".

The module received will be marked "**MS4000 - 40xxAB**."



The voltage of a particular module is inked on the bottom side of the PC board



1.0 Fire Alarm Control System

The **MS-4012/4024** and **CMS-4012/4024** are 4-zone fire alarm control panels designed for use in commercial, industrial, and institutional applications. The 4012 is designed for 12-volt (nominal) devices. The 4024 is designed for 24-volt (nominal) devices. Activation of any compatible two wire detector or any normally open initiating device will sound audible devices, annunciate a fire zone, trip a municipal box, notify a remote station and activate supplementary relay(s).

1.1 Standard features include:

- ✓ 4 Class B (Style B) initiating zones
- ✓ 2 Class B (Style Y) indicating circuits
- ✓ Normally closed supervisory zone
- ✓ Power limited initiating and indicating loops
- ✓ Walk test feature with indicator
- ✓ Disable switches per initiating zone
- ✓ Resettable regulated power for 4-wire smoke detectors
- ✓ Current limited float type charger for sealed batteries
- ✓ Battery supervision
- ✓ Ground fault indicator
- ✓ Extensive transient protection
- ✓ Single Form-C general alarm contact
- ✓ Supervision of option boards
- ✓ Conversion of Zone 4 to a N.O. sprinkler supervisory
- ✓ Waterflow Alarm Service, including two zone waterflow plates (4000 WF) that mechanically lock the disable switch on waterflow zones.

1.2 Optional features include:

- ✓ **Transmitter Module (40xxTM)** with reverse polarity alarm and trouble outputs, supervised output for local energy municipal box, and transmitter disable switch with indicator.
- ✓ **General Alarm and Trouble Module (40xxAT)** that provides one Form-C general alarm contact with disable switch and one Form-C dry trouble contact with visual trouble indicator.
- ✓ **Zone Relay Module (40xxZR)** that provides a Form-C alarm contact by zone, Form-A general alarm contact and Form-C trouble contact.
- ✓ **LED Annunciator Interface Module (40xxLI)** for use with a remote zone annunciator (type RZA-4).

2.0 Controls and Indicators

2.1 Control Switches

Trouble Silence switch will silence an audible trouble device. The system trouble LED and the trouble contact will remain activated until the trouble has been corrected. If trouble silence switch is still engaged when trouble is cleared, audible device will re-sound.

System Test switch while held down will energize an audible trouble device and will light all indicators except the zone alarm LEDs. Upon release of the switch, all zones will go into alarm mode and the supplementary relay(s) will be activated.

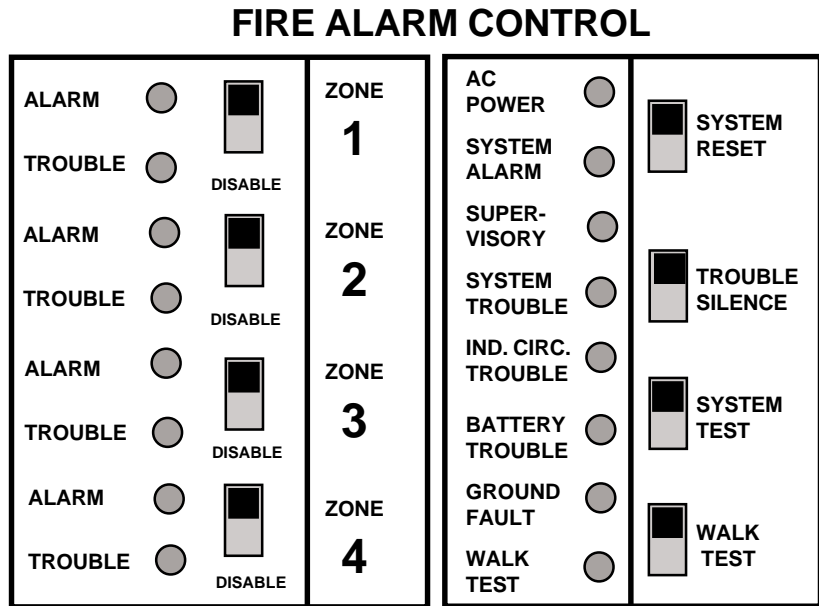


Figure 2A: Dress Panel

Note: The Supervisory LED may not light during System Test, depending on whether or not Zone 4 is programmed for supervisory service. To test the Supervisory LED, remove the jumper across Terminals 9 and 10, creating a supervisory condition. If the LED lights, it is good.

Walk Test switch allows one person to test all initiating and indicating devices. The function of this switch is to automatically reset the panel. After receiving an alarm signal, the panel will sound all signaling devices for two seconds and then will reset the panel. The procedure repeats every two to three seconds until the alarm condition is cleared.

Disable switch (per initiating zone) prevents the sounding of alarm indicating devices in response to an alarm condition on that zone. Zone and system trouble LEDs light and the audible trouble device sounds when a respective zone is disabled. Zone alarm LED continues to indicate any alarm condition on disabled zone.

Note: The alarm and trouble contacts on the optional zone relay module (40xxZR) are **NOT** disabled by the zone disable switch.

2.2 Status Indicators

A.C. Power - A green LED that remains on while the A.C. power supply is operating. If this indicator fails to light under normal conditions, service the system immediately.

System Alarm - A red LED that lights when an alarm condition is detected.

Supervisory - A yellow LED that indicates need for action in connection with the supervision or maintenance of sprinklers, extinguishing systems or other protective systems.

System Trouble - This yellow LED indicates that a fault or abnormal condition exists and that the fire alarm system may be inoperative.

Ind. Circuit Trouble - A yellow LED that lights in response to a fault in the main bell circuits, including an open or a short in the field wiring, or connection of a non-polarized indicating appliance.

Battery Trouble - A yellow LED that annunciates fault in the battery circuit.

Ground Fault - A yellow LED that lights when either side of the power source is shorted to the chassis.

Walk Test - A yellow LED that lights when the Walk Test feature is activated.

Zone Alarm - A red LED that lights when its associated zone is in alarm. The zone disable does not affect this annunciator.

Zone Trouble - A yellow LED that lights when its associated zone has a fault or abnormal operating condition. This trouble circuit monitors an initiating loop, local and remote zone alarm indicators, and the position of the zone disable switch .

3.0 Installation Instructions

3.1 General

Carefully unpack the system and check for shipping damage. Mount the cabinet in a clean, dry, vibration-free area in which extreme temperatures are not encountered. The location should be readily accessible with sufficient room for easy installation and maintenance. Locate the top of the cabinet approximately five feet above the floor with the hinge mounting on the left. Determine the number of conductors required for the devices to be employed. Pull required conductors into the box through the knockout provided. All wiring should be in accordance with the National and/or Local codes for fire alarm systems.

3.2 Initiating Circuits

Zones - Wire all alarm initiating devices sequentially for proper supervision. Initiating devices include: coded and non-coded pull stations; heat, photoelectric, and ionization type detectors; and waterflow alarm devices.

NOTE: To employ coded manual pull stations, inhibit the latching circuit for a particular zone by removing the associated diode in the zone circuit on the main board (see Figure 3L).

Observe polarity when connecting polarized devices. Connect first device to the panel, second device to the first device, third to the second and so on. Remove the End-of-Line resistor (ELR) from the terminals and install on the terminals of the last device. Wire the zones to the panel as shown in Figures 3A and 3B.

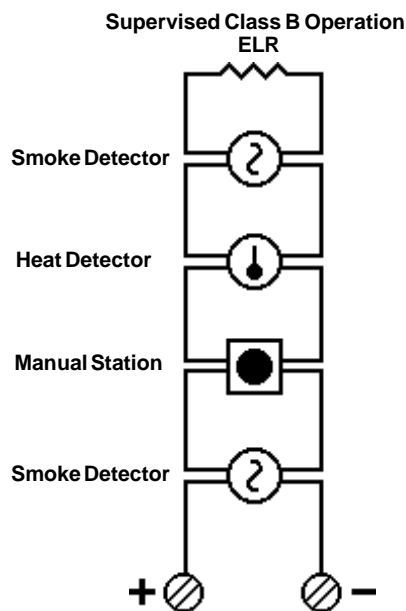


Figure 3A: Zone Wiring

Supervisory Circuit (Normally Open) - Zone 4 can be programmed to function as a normally open supervisory zone. A short across the loop will light the zone alarm and supervisory LEDs, and will activate an audible trouble device that can not be silenced and will sound until the panel is returned to normal. An open in the wiring will light zone and system trouble LEDs, and the audible trouble device will sound. In this mode, the audible device can be silenced. Remove jumper plugs JP5, JP6 and install JP7 and JP8. Connect normally open contacts to Zone 4 terminals with an ELR across the last device.

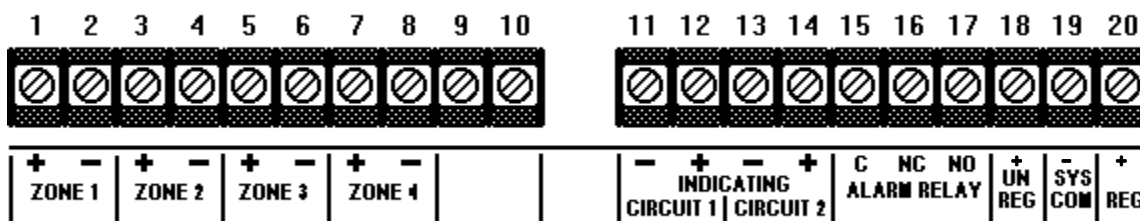


Figure 3B: Dress Panel Terminal Guide

Waterflow - For waterflow service without a disable capability, the 4000WF can be employed. This adhesive-backed metal plate can be affixed to the front dress panel over any zone used for monitoring sprinkler waterflow detection devices. The plate mechanically locks the disable switch in the enable position so that it cannot silence a waterflow alarm. To install, push the zone disable switch into the up (enable) position. Remove the adhesive backing from the 4000WF plate and place it over the dress panel so that the switch protrudes through the plate.

NOTE: *This option must not be used on Zone 4 if that zone is programmed for sprinkler supervisory service.*

See the Device Compatibility Document for compatible, UL listed detectors available from Fire Lite.

3.3 Output Circuits

Indicating (Bell) Circuits - Two Class B Indicating Appliance Circuits are provided as a standard feature on this panel. Each circuit is capable of 1.5 amperes of signaling current. Total current drawn from both circuits cannot exceed 2.5 amperes. Indicating appliances must be polarized. Remove ELR from each circuit and install after the last device connected to its respective circuit (see Figures 3B and 3C).

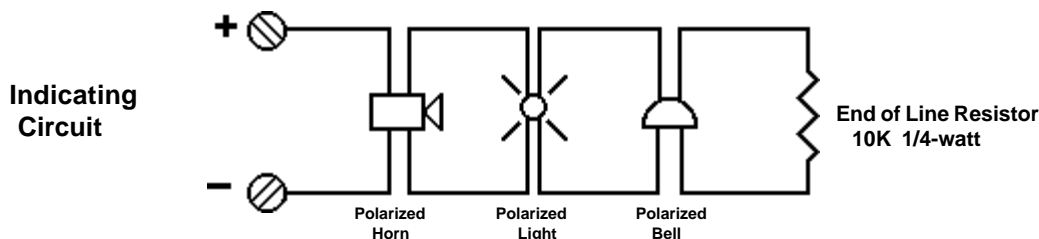


Figure 3C: Indicating Circuit Wiring Diagram

Alarm Relay - One Form-C dry supplementary alarm contact is provided in the basic panel for controlling supplementary devices. It is rated for 2 amps of current at 30 VDC and 0.5 amps at 30 VAC (resistive). See Figure 3B for terminal location.

3.4 Power



CAUTION: Several different sources of power can be connected to this panel. Disconnect all sources of power before servicing. The panel and associated equipment may be damaged by removing and/or inserting cards, modules, or interconnecting cables while this unit is energized.

Smoke Detector Power - Resettable power for 4-wire photoelectric and ionization smoke detectors can be obtained from terminals 19 (negative) and 20 (positive). Up to 200mA of current is available, depending on the number of optional modules in the system (see Appendix B: Table B-2).

Non-resettable Power - Non-resettable power can be drawn from Terminal Block 3. Power obtained from TB3 must be subtracted from available Smoke Detector Power. **Note: If both Smoke Detector and Non Resettable Power is to be drawn from the control panel, limit combined current to 50 mA.**

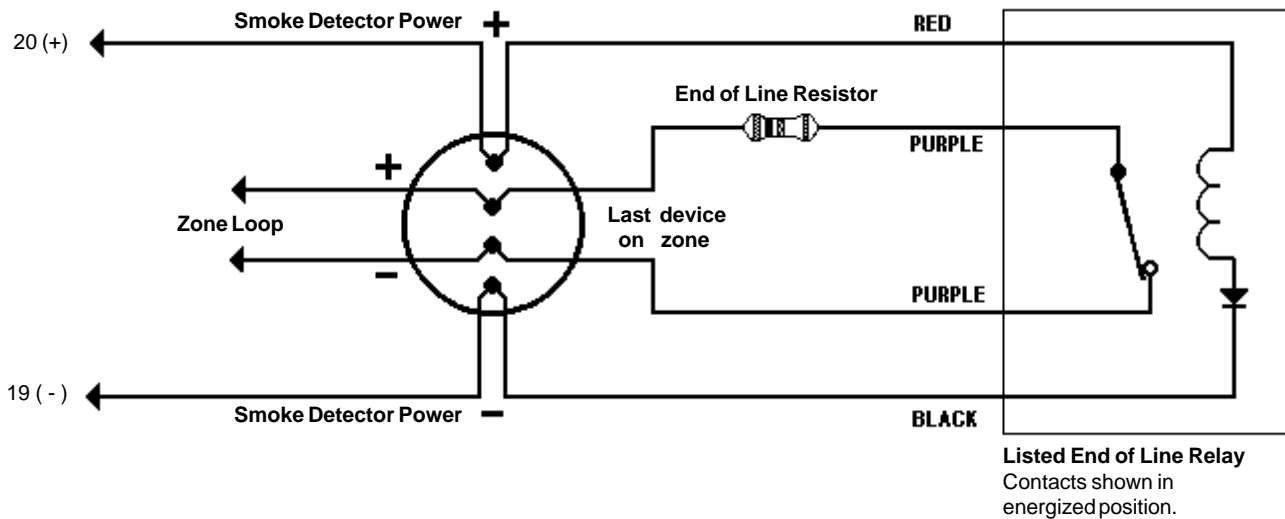


Figure 3D: Typical End of Line Relay Connection

Unregulated, Unfiltered Power: Devices such as door holders requiring such DC power, up to 200 mA for door holders, can be connected to terminal #18(+) and 19(-). See Figure 3B for terminal location.

AC Power - Primary power required for this panel is 120 VAC, 60 Hz, 1.2 amperes. Overcurrent protection for this circuit must comply with Article 760 of the National Electrical Code (NEC) and/or local codes. Use #14 AWG or larger wire with 600 volt. Connect AC power to panel terminals as illustrated in Figure 3E.



Figure 3E: AC Connections

Battery Power - Observe polarity when connecting battery. Connect battery to P2 on the main board using the plug-in connector provided. See Appendix B for calculation of correct battery rating. See Figure 3F for battery connections.



CAUTION: Battery contains 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.

Ammeter - To monitor charging current, employ a zero-centered meter with a minimum range of 4 - 0 - 4. Remove jumper JP2 and connect meter to plug P6 (see Figure 3F).

Voltmeter - To monitor the charger output voltage, use a voltmeter with a range of 0 - 50 VDC. Connect the meter to plug P5 (see Figure 3F).

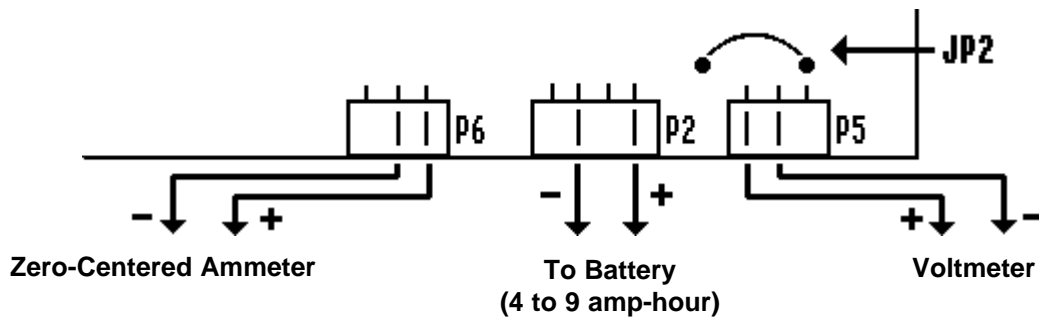
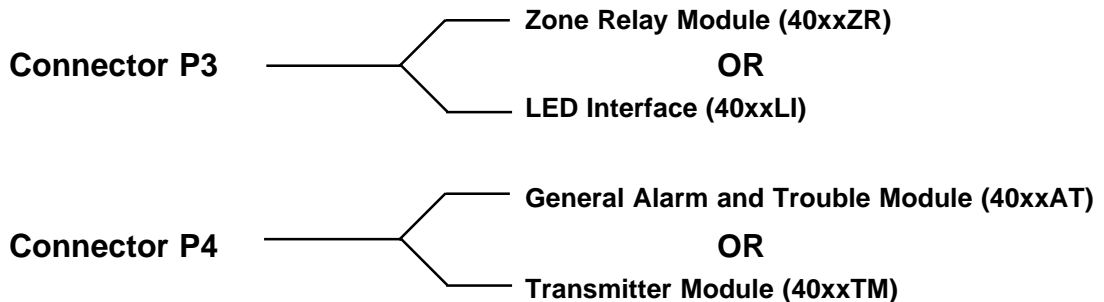


Figure 3F: Battery and Meter Connections

3.5 Optional Modules

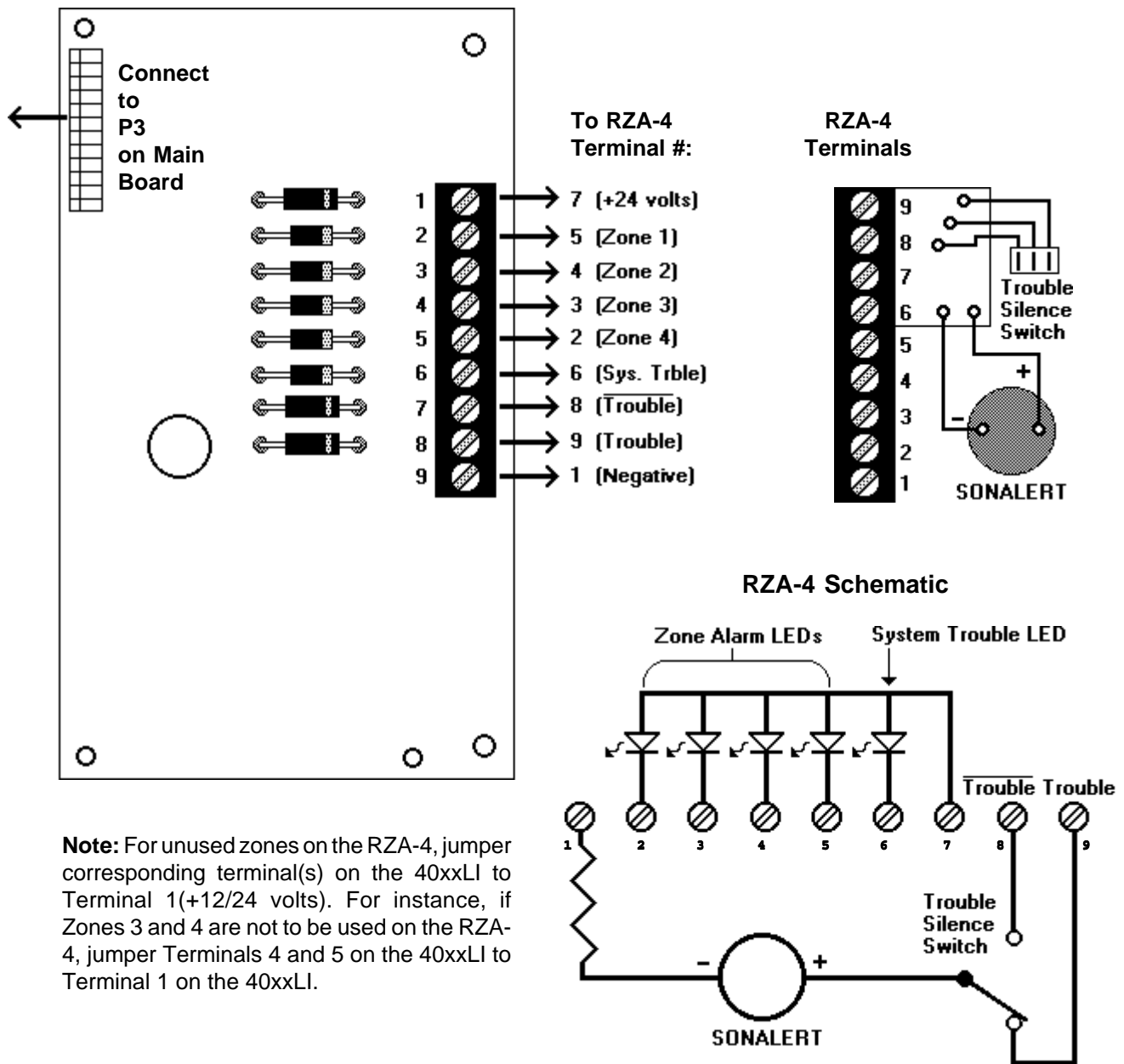
The 4012/4024 has two module connectors - P3 and P4. Four modules are available for the panel, and they can only be used in the combinations described below.



Remote Zone Annunciator (RZA-4) - This option provides remote LED annunciation of zone alarms and system trouble status. It includes an audible trouble device with a trouble silence switch. To make use of this remote function, an LED interface board (40xxLI) must be used. The 40xxLI module is supervised for insertion (once JP3 is removed from the main board). If the 40xxLI is then removed, all four zone trouble LEDs and the system trouble LED will come on, and the panel's audible trouble device sounds. All wiring except audible trouble is supervised for opens and ground faults. The 4012/24 can power only one annunciator.

To install:

- * Remove jumper JP3 on the main board.
- * Plug the 40xxLI into connector P3 on the main board. Note that either this module or a Zone Relay Module (40xxZR) may be plugged into P3, but not both.
- * Connect the RZA-4 to the 40xxLI as illustrated in Figure 3G below.



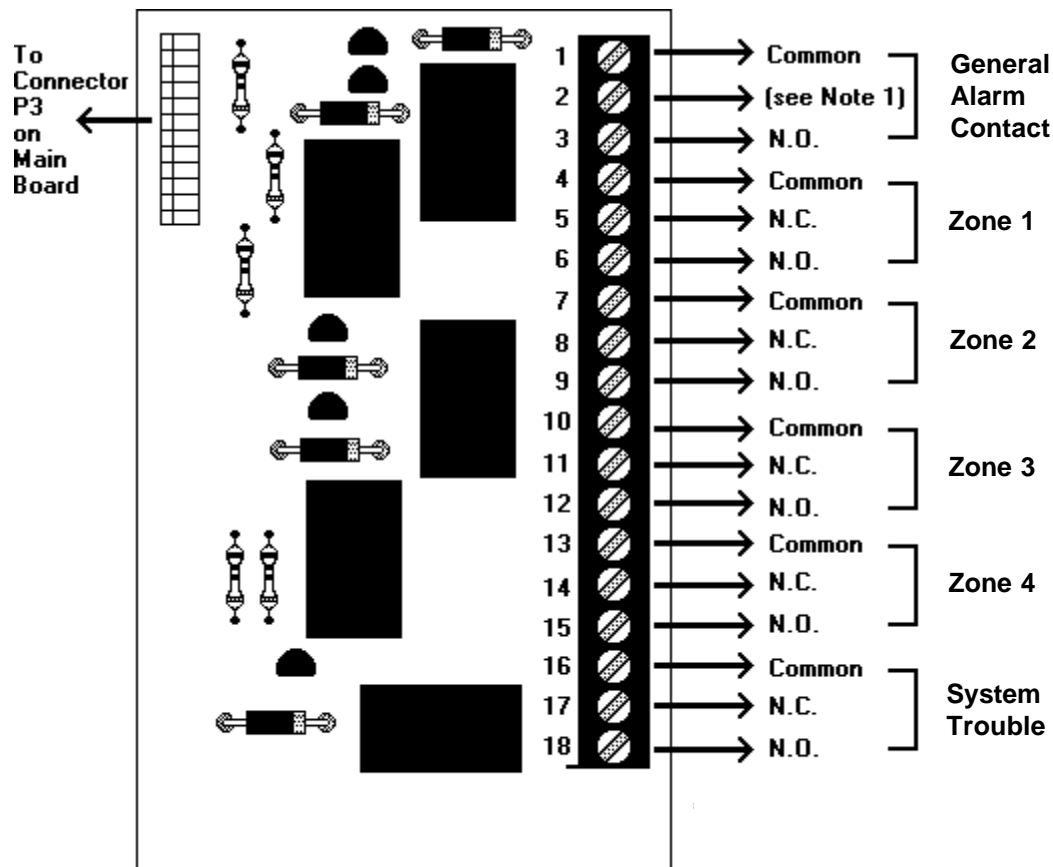
Note: For unused zones on the RZA-4, jumper corresponding terminal(s) on the 40xxLI to Terminal 1 (+12/24 volts). For instance, if Zones 3 and 4 are not to be used on the RZA-4, jumper Terminals 4 and 5 on the 40xxLI to Terminal 1 on the 40xxLI.

Figure 3G: 40xxLI - Remote Zone Annunciator (RZA-4) Installation

Zone Relay Module (40xxZR) - One Form-C dry alarm contact per zone, one Form-A general alarm contact, one Form-C trouble contact are provided with this option. The module is supervised for insertion (once jumper JP3 on the main board is cut). If the 40xxZR is then removed, all four zone trouble LEDs and the system trouble LED will come on, and the panel's audible trouble device sounds. Contacts are rated for 2.0 amps at 30 VDC and 0.5 amps at 120 VAC. For applications requiring ULC listing, these contacts shall be derated to 2.0 amps at 30 VDC and 0.5 amps at 30 VAC.

To install, remove jumper JP3 on the main board (Zone Alarm relays will NOT operate with JP3 installed). Plug the module into connector P3 on the main board. Note that either this module or the LED Interface Board (40xxLI) can be plugged into P3, but not both. Screw terminal connections are provided with each contact (see Figure 3H).

The Zone Disable and Trouble Silence switches will not affect operation of the relays on the 40xxZR module.



- Note 1:** Pin 2 is a Form-B general alarm contact. This pin provides a Normally Closed contact that will open only when ALL four zones are in alarm.
- Note 2:** Zone 4 alarm contacts WILL operate if Zone 4 is programmed as a supervisory zone.

Figure 3H: 40xxZR Zone Relay Module Connections

General Alarm and Trouble Module (40xxAT)- This module provides one Form-C general alarm contact and a system trouble contact. An Auxiliary Disable switch disables the alarm contact and creates a system trouble condition. A yellow LED indicates when the switch is in the disable position. This module is supervised for insertion (once jumper JP4 on the main board is cut). If the 40xxAT is then removed, the system trouble LED will light and the panel's audible trouble device will sound.

Contacts are rated for 2.0 amps at 30 VDC and 0.5 amp at 120 VAC. For applications requiring ULC listing, these contacts shall be derated to 2 amps at 30 VDC and 0.5 amps at 30 VAC.

To install, remove jumper JP4 on the main board. Plug the module into connector P4 through the standoff. Secure the board to the main board using two screws provided. Note that either this module or a Transmitter Module (40xxTM) may be plugged into P4, but not both.

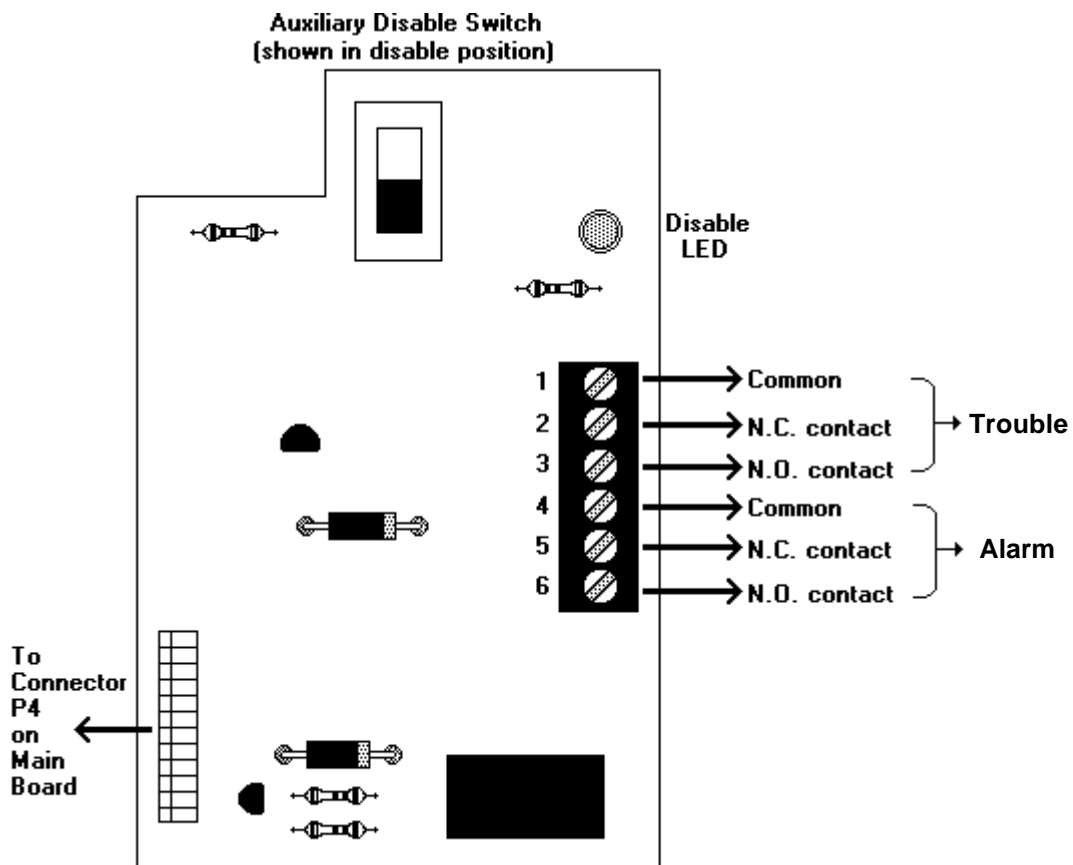


Figure 3I: 40xxAT General Alarm and Trouble Module Connections

Transmitter Module (40xxTM) - Use this module to connect to a local energy municipal box. Reverse polarity alarm and trouble outputs are also provided. The reverse polarity alarm and municipal box outputs can be disabled via a switch. A yellow LED indicates when the switch is in the disable position. The module is supervised for insertion (once JP4 on the main board is removed). If the 40xxTM is then removed, the system trouble LED will light and the panel's audible trouble device sounds. To install, remove jumper JP4 on the main board. Plug this module into connector P4 and secure with the screws provided.

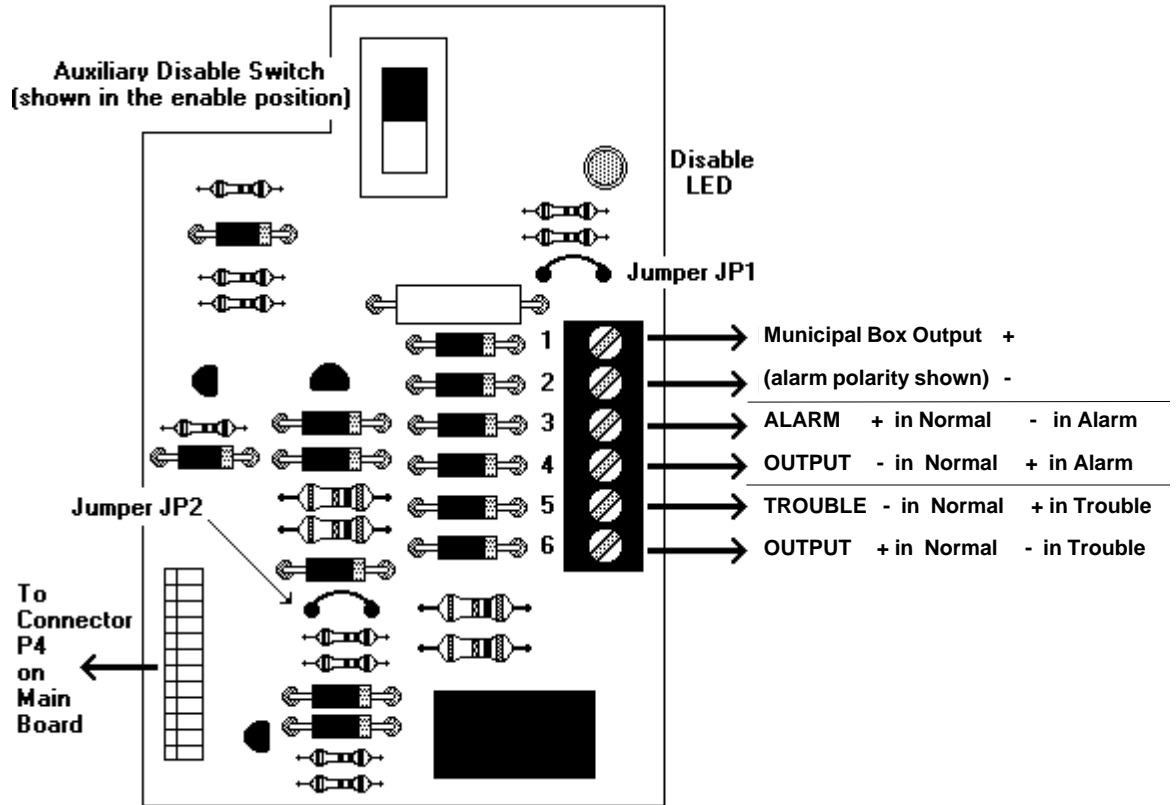


Figure 3J: 40xxTM Transmitter Module Connections

**** Local Energy Municipal Box (supervised circuit):** Remove jumper JP1. If box is equipped with a reset supervisory switch, remove jumper between main board terminals 9 and 10 (see Figure 3B). Wire the switch common to terminal 9 and the N.C. contact to terminal 10.

**** Remote Station Connection (non-supervised):** Terminals 3 and 4 provide a reverse polarity alarm output. Trouble signals can be transmitted on these same terminals by cutting jumper JP2 on the module (output voltage drops to zero (0) VDC during trouble unless overridden by an alarm condition).

Note: This panel is suitable for use as a remote station where separate transmission circuits are required for fire and trouble. To implement this feature, leave JP2 intact, use terminals 3 and 4 for alarm only, and terminals 5 and 6 for the reverse polarity trouble output.

McCulloh Transmitter - A McCulloh-type transmitter may be connected to the 4012/4024 (see Figure 3K for connection of a model ATTE-B transmitter). The transmitter is mounted in a separate cabinet. Note that a General Alarm and Trouble Module (40xxAT) is required to use the transmitter. **NOTE:** Be sure to derate available signaling power by the transmitter coil current.

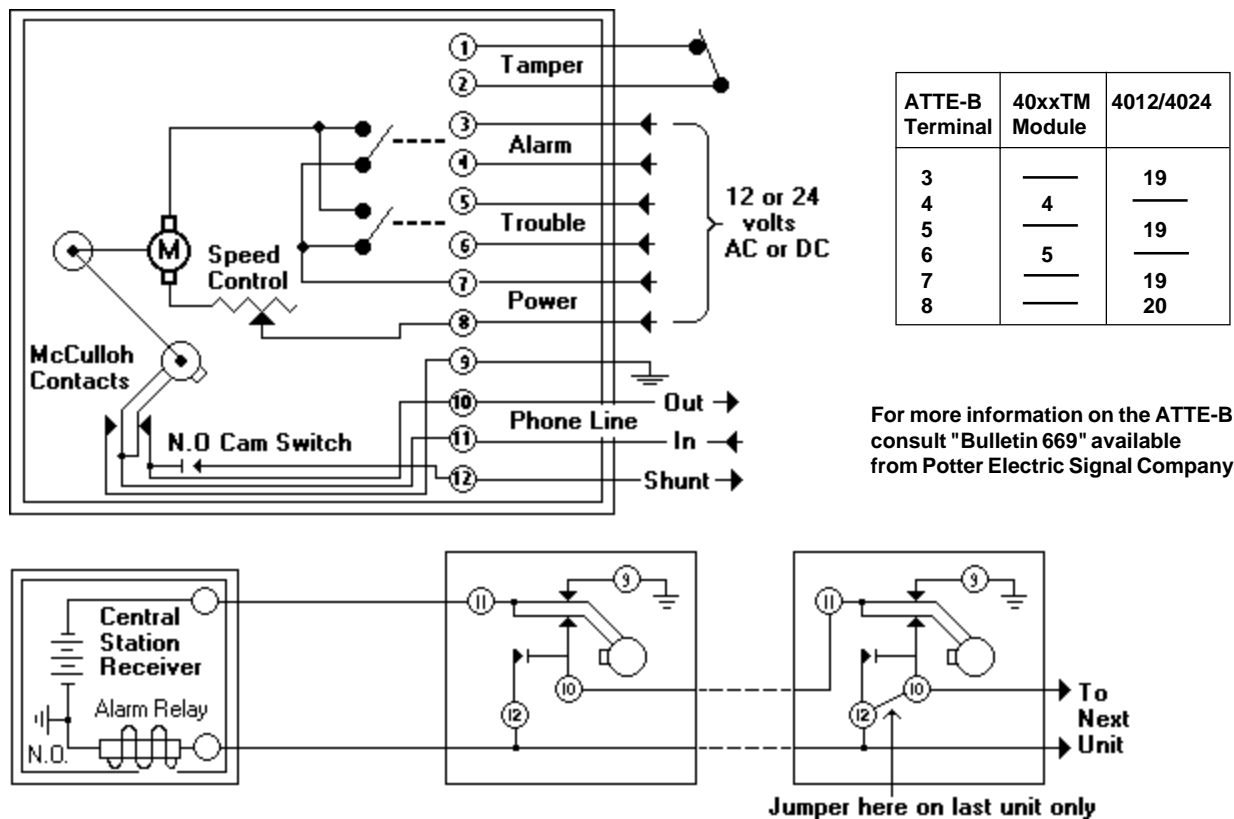


Figure 3K: ATTE-B McCulloh-Type Transmitter Connection

**** Alarm Operation** - During an alarm condition, the control panel will actuate the transmitter and cause the unit to transmit the following:

- Four rounds of coded signal if the control panel is in a normal state.
- Three rounds of coded signal if the control panel is in a trouble state.

The transmitter's red LED will light during an alarm. When the alarm has cleared, reset the panel to reset the transmitter.

**** Trouble Operation** - During a trouble condition, the control panel will actuate the transmitter and cause the unit to transmit one round of coded signal. The transmitter's yellow LED will light during trouble conditions. After the trouble condition in the control panel has been cleared, press the Reset switch on the ATTE-B to remove the transmitter from a trouble state.

3.6 Central Station Service

The 4012/4024 can be employed as a Central Station Protected Premise Control Unit under the following conditions:

- ✓ The control unit is used in conjunction with a compatible electrically actuated transmitter, UL listed for central station fire service under classification UUTV (Potter Electric Signal Company model ATTE-B)
- ✓ The central station receiving unit must be UL listed and compatible with the transmitter.
- ✓ The transmitter must be installed according to its installation instructions.
- ✓ The transmitter cabinet must be mounted adjacent to the control unit with interconnecting wiring enclosed in conduit.
- ✓ The fire alarm control unit, transmitter, and receiver are required to have at least 24-hour standby operating power.

Initiating Device Circuits: Class B operation. 2.0 mA per loop. Power limited circuitry.
ELR - 2.2K, 1/4-watt (4012); 4.7K, 1/4 watt (4024)

Indicating Appliance Circuits: Class B operation. Power limited circuitry. 2.5 amps max (1.5 amps/circuit). 1.2 mA in normal. ELR = 10K, 1/4 watt. Must use polarized indicating appliances.

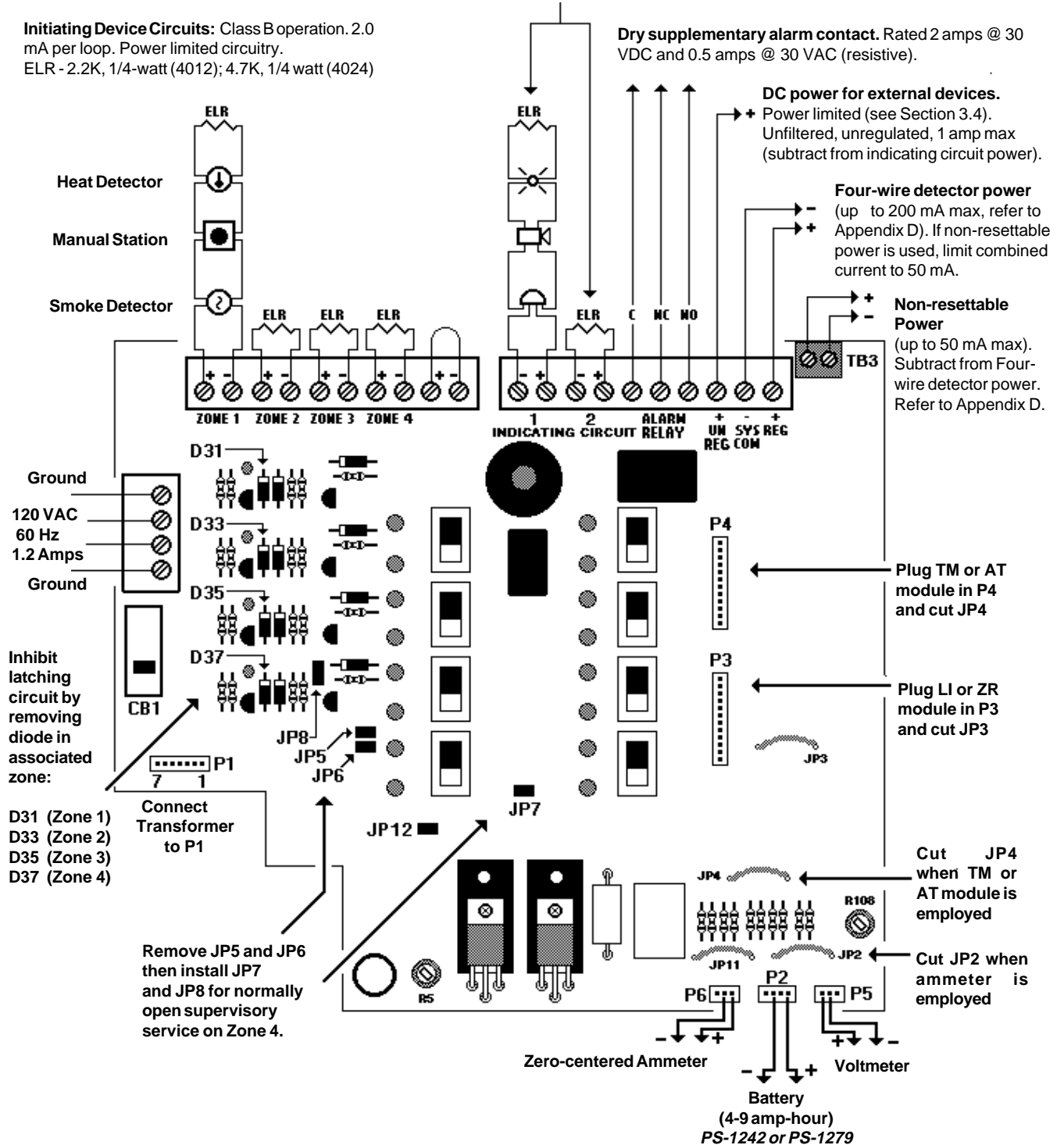


Figure 3L: Basic System Wiring Diagram

4.0 Periodic Testing

To insure proper and reliable operation, it is recommended that an inspection and testing of the system be conducted monthly, or as required by National and/or Local codes. Testing should be performed by a qualified service representative.

4.1 Notification

Before testing the panel, notify:

** Fire department and/or the central station receiving any transmitted alarm or trouble condition. If it is necessary to inhibit alarm transmission, slide the remote station disable switch to its abnormal position.

** Facility personnel so that the alarm sounding devices will be ignored during the test period.

4.2 System Test

Slide the System Test switch down and ensure that all indicators except the zone alarm LEDs light and that all signaling devices are active. Release the switch and ensure that all zone alarm LEDs light. Reset the panel.

4.3 Zone Test

Test a zone by shorting the zone contacts with a jumper. Ensure that the signaling devices are activated and that the zone and system alarm LEDs light. Reset the panel and repeat for each zone.

4.4 Walk Test

To check all initiating devices, slide the Walk Test switch down. The Walk Test LED will light and the system trouble devices will be activated. In this mode, the panel will reset automatically. Activate an alarm initiating device and ensure that the indicating devices function. Check each initiating device in this manner. When all initiating and indicating devices have been checked, return the Walk Test switch to its normal position.

4.5 Supervisory Test

When the fourth zone is programmed to monitor normally open supervisory devices, a contact closure across the loop will light the supervisory and zone alarm LEDs and will sound the audible trouble device. In this state, the audible device will continue to sound regardless of the position of the trouble silence switch. An open in the loop will light zone and system trouble LEDs and will sound the audible device.

4.6 Trouble Test

Momentarily open the following circuits, one at a time, and check for a trouble signal:

- Indicating Appliance Circuits 1 and 2
- All initiating zones
- Supervisory circuit
- Municipal Box (if employed)

4.7 Battery Test

With fully charged battery, remove AC power and repeat the test procedure outlined in Section 4.2. Measure battery voltage while the indicating appliances are activated. Reapply AC power and reset the panel. Replace any battery with terminal voltage less than 85% of rating.

4.8 Test Completion

At the conclusion of testing, return all switches to their normal (up) positions. Notify the fire department, central station and facility personnel that the test is complete.

5.0 Troubleshooting Guide

Troubleshooting is divided into two parts. Section 5.1 is a diagnostic procedure that can be used to determine the general condition of the control panel. Section 5.2 is to be used by **QUALIFIED SERVICE PERSONNEL ONLY** to isolate a specific problem with the panel.

5.1 Control Panel Checkup

This procedure must be used after initial installation of the control panel. The procedure should also be followed after any repairs are made to the panel. Follow the procedure step by step until the problem is eliminated or all tests have been completed. Remove both sources of power from this unit whenever working with the unit's terminals, modules, or plugs.

Jumpers - Ensure that jumpers JP2-JP8 and Diodes D31, D33, D35, and D37 are programmed in accordance with the guidelines below. Refer to Figure 3L for jumper and diode locations.

- * JP2 is cut only when an ammeter is employed.
- * JP3 is cut only when a 40xxLI or 40xxZR is being used.
- * JP4 is cut only when a 40xxTM or 40xxAT is being used.
- * For normally open supervisory service on Zone 4, JP7 & JP8 must be installed and JP5 and JP6 must be removed. For normal operation on Zone 4, JP5 & JP6 must be installed and JP7 & JP8 removed.
- * For coded output, inhibit the alarm latching circuit on an initiating zone by cutting its respective diode: D31-Zone 1; D33-Zone 2; D35-Zone 3; D37-Zone 4.

Reset - Disconnect the batteries. Remove AC power from the panel. Wait 30 seconds and reconnect AC power first, followed by the batteries. This resets the panel's built-in fuses.

Isolate - To distinguish between a problem in the field wiring, disconnect all initiating and indicating loops and reinstall the end-of-line resistors across the appropriate terminals. Jumper terminals 9 and 10 together. Disconnect any wiring on terminals 15-20. If employing any of the optional modules, disconnect all wiring but leave the modules in their appropriate connectors (P3 & P4). The only wires leading to the panel should be the AC power connections. Refer to Figure 3L for ELR values.

If this action clears the problem, the trouble lies in the field wiring. To isolate the problem, reconnect the wires one at a time until the problem reappears.

Remove one module at a time and reconnect the corresponding jumper (JP3 for 40xxLI or 40xxZR - and JP4 for 40xxTM or 40xxAT).

If this action clears the problem condition, the trouble lies in the module. Replace the module.

Leave each module off to continue the testing.

System Test - Slide the system test switch down and ensure that all LEDs except the zone alarm LEDs light. Release the switch and ensure that all alarm LEDs light. **Note:** The Supervisory LED may not light during System Test, depending on whether or not Zone 4 is programmed for supervisory service. To test the Supervisory LED, remove the jumper across Terminals 9 and 10, creating a supervisory condition. If the LED lights, it is good.

If any LED fails to light or the audible trouble device fails to sound, the panel must be repaired or replaced.

Conclusion - If the problem still exists, four conditions may prevail:

- a) Main board has failed.
- b) Power Supply (transformer) has failed.
- c) Batteries have failed.
- d) Combination of the above three.

If the AC led is on, the transformer can be eliminated as the source of the problem. If the battery trouble LED is off (but passed the system test), the batteries are not the source of the problem. If the batteries and transformer are known to be good, have the panel repaired or replaced.

Problems concerning the AC power supply or the batteries are covered in Section 5.2.

5.2 Component Troubleshooting



QUALIFIED SERVICE PERSONNEL ONLY!

The test procedures in Section 5.1 must be conducted prior to conducting the test in this section in order to accurately troubleshoot the control panel.

Battery Test (Battery Trouble Indication)

The batteries may be tested by conducting the procedure in Section 4.7.

Transformer Test (AC Power LED off)

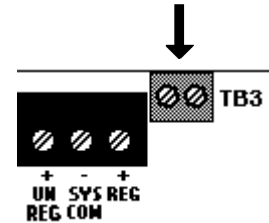
Ensure that circuit breaker CB1 is not tripped. Measure the AC voltage applied to the transformer primary winding (pins 5 & 7 on plug P1- see Figure 3L for plug locations). This voltage should fall in the range 102 - 132 VAC. Measure the transformer secondary voltage on plug P1 to determine if it falls within the following specifications: P1 - Pins 2 & 3: 24 - 32 AC volts P1 - Pins 1 & 3: 12 - 16 AC volts

If the transformer secondary voltage does not meet specifications, replace the transformer.

Charger Test, New Models (CMS-4012/4024s and newer model MS-4012/4024s only)

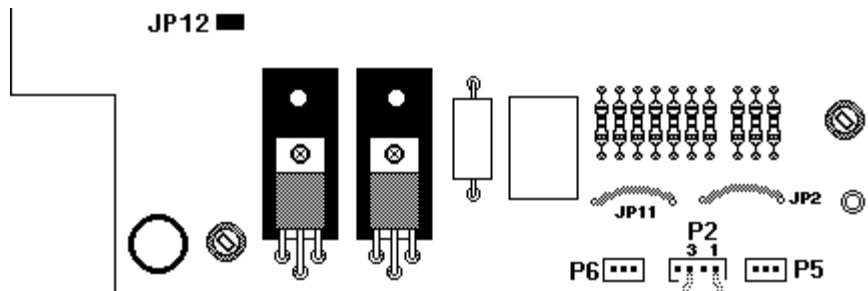
IMPORTANT! The Battery Charger Output cannot be field adjusted on CMS-4012/4024 control panels and on newer revisions of the MS-4012/4024 control panels. These panels are distinguished from earlier models by the addition of two non-resettable power terminals (Terminal Block 3) in the upper right-hand part of the control board. Any attempts to adjust this output may result in damage to the batteries (to read and adjust the charger output on earlier model MS-4012/4024s, see the next page).

Newer 4012s and 4024s contain TB3 (Non-resettable Power Output).

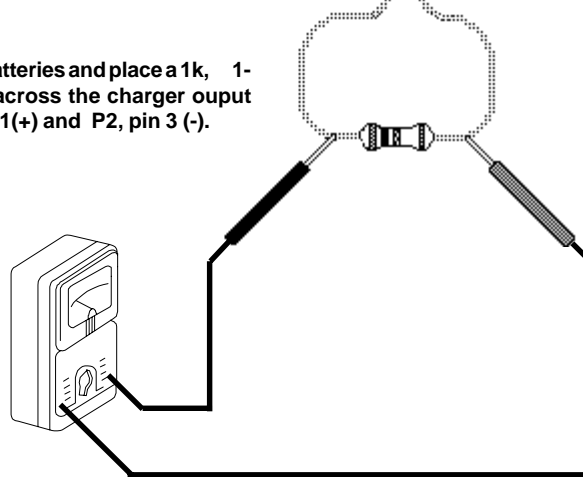


The charger output can be read with a voltmeter to determine if the panel is operating properly. To read the charger output, see Figure 3M: Battery Charger Check Procedure. If the charger output voltage does not meet specifications (and the transformer is known to be good), the control panel will have to be repaired or replaced.

Step 1
Remove and save JP12 from the control panel.



Step 2
Remove the batteries and place a 1k, 1-watt resistor across the charger output pins - P2, pin 1(+) and P2, pin 3 (-).



Step 3
Using a voltmeter, measure the DC voltage across the 1K resistor. This voltage must be 13.2 - 13.3 on the 4012, or 27.5 - 27.7 on the 4024.

At the conclusion of the test, remove the voltmeter and 1K resistor, replace the batteries, and reinstall JP12!

Figure 3M: Battery Charger Check Procedure

Charger Test, Older Models (Older Model MS-4012/4024s only)

Note: This procedure may result in destruction of the batteries if used on CMS-4012/4024s and newer MS-4012/4024s that provide non-resettable power!

For MS-4012/4024s that do not provide non-resettable power, the battery charging circuit can be checked and if necessary, calibrated under the following procedure. Remove the batteries and place a 1k, 1-watt resistor across the charger output pins [plug P2: pin 1 - (+), pin 3 (-)]. Using a voltmeter, measure the DC voltage across the 1K resistor. If the voltage measured is not 13.2 - 13.3 (4012) or 27.5 - 27.7 VDC (4024), perform the following calibration procedure:

- Step 1** Adjust R5 until the voltage across the 1K resistor is 30 VDC (MS-4024) or 15 VDC (MS-4012).
- Step 2** Adjust R108 until the the Battery Trouble LED just turns on (threshold point).
- Step 3** Adjust R5 until the voltage across the resistor is 27.6 VDC (MS-4024) or 13.2 VDC (MS-4012).
- Step 4** Remove the meter and resistor and reconnect the batteries to Plug P2.

If this adjustment fails to bring the charger voltage to within the specified range, or fails to extinguish the battery trouble indication, (and the transformer and batteries are known to be good), have the panel repaired or replaced.

Appendix A: Specifications

A.1 Initiating Circuits

Power-limited circuitry

Operation: Class B (Style B)

Standby voltage: 4012 = 12 VDC (ripple = 10mV peak-to-peak)

4024 = 24 VDC (ripple = 10mV peak-to-peak)

Alarm current: 15 milliamps minimum

Short circuit current: 35 milliamps typical

Maximum detector current in standby: 2 milliamps (peak) per zone

Maximum loop resistance = 200 ohms

End-of-line resistor: 4012 = 2.2K, 1/4-watt 4024 = 4.7K, 1-4-watt

Detector loop current is sufficient to ensure operation of one alarmed detector per zone.

Supervisory current: 5mA

A.2 Indicating Circuits

Power-limited circuitry

Maximum voltage drop due to wiring: 4012 = 1 VDC 4024 = 2 VDC

Indicating device operating range: 4012 = 9 - 15 VDC 4024 = 18-31 VDC

Total current to all external devices: 2.5 amps

Maximum signaling current per circuit: 1.5 amps

End-of-line resistor = 10k, 1/4 watt

A.3 Alarm Relay

Dry Form-C contacts rated for: 2.0 amps @ 30 VDC (resistive)

0.5 amps @ 30 VAC (resistive)

A.4 AC Power

120 VAC, 60 Hz, 1.2 amps

Wire size: #14 AWG with 600V insulation

A.5 Transmitter Module (40xxTM)

For local energy municipal box service

Output current: 1.2 mA (in normal).

Trip current: 0.35 amps.

Coil Voltage: 3.65 VDC.

Coil resistance: 14.6 ohms.

Total wire resistance between panel and trip coil = 3 ohms

For Remote Station service:

Output current shall not exceed 10 milliamps per circuit.

Reverse polarity output voltage: 4012 = 12 VDC 4024 = 24 VDC.

See Figure 3J for terminal information.

A.6 Zone Relay Module (40xxZR)

Contacts rated for: 2.0 amps @ 30 VDC (resistive) 0.5 amps @ 120 VAC (resistive)

Note: For U.L.C. applications, contacts are derated for: 2.0 amps @ 30 VDC (resistive)
0.5 amps @ 30 VAC (resistive)

A.7 General Alarm and Trouble Relay Module (40xxAT).

Contacts rated for: 2.0 amps @ 30 VDC (resistive) 0.5 amps @ 120 VAC (resistive)

Note: For U.L.C. applications, contacts are derated for: 2.0 amps @ 30 VDC (resistive)
0.5 amps @ 30 VAC (resistive)

A.8 Four-wire Smoke Detector Power

Up to 200mA of current can be provided to four-wire smoke detectors. Note: If using Non-Resettable power (Terminal Block 3), the combined current shall be limited to 50 mA.

A.9 Unregulated, Unfiltered Power

Total DC current available for powering external devices is 1.0 amp (subtracted from indicating appliance power).

A.10 Non-resettable Power

DC current available from this output and four-wire smoke power output combined is 50mA.

A.11 Cabinet Dimensions

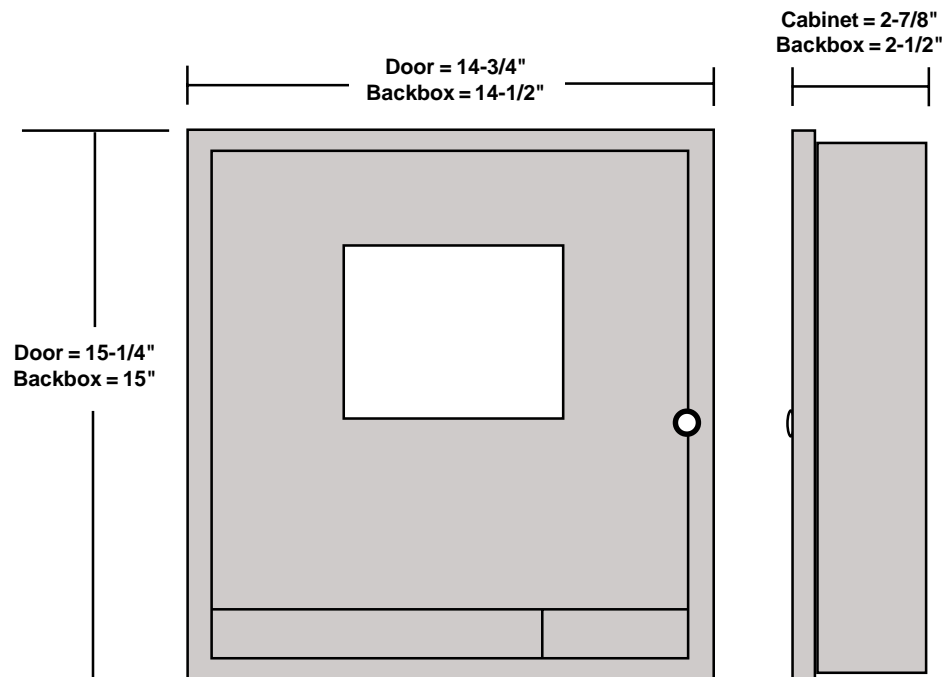


Table 2: Power Supply Loading

Basic Control Panel (all zones in alarm) _____	340 mA
If using the Zone Relay Module, add _____ 64 mA for the MS-4012 or 32 mA for the MS-4024	
If using General Alarm & Trouble Module: add _____ 18 mA for the MS-4012 or 10 mA for the MS-4024	
If using the Transmitter Module (40xxTM), add 13 mA _____	
If using the Reverse Polarity Trouble output , add 10 mA _____	
Current (in mA) drawn from Non-resettable Power (TB3) _____	
Place subtotal from line d, Table 1 here	
Add column for Total Alarm Current: (Total Alarm Current cannot exceed 550 mA)	

Table 3: Ampere-Hour Calculations

Standby Battery Current	Standby Time	
Convert the total from Table 1 to amps and enter here	24 or 60 hours	
<input style="width: 60px; height: 25px;" type="text"/>	amps X	<input style="width: 60px; height: 25px;" type="text"/> hours =
	Enter 0.3 for 5 minutes in alarm or 0.6 for 10 minutes in alarm +	=
	Add Standby and Alarm amp/hours	=
		=

Standby amp/hours

Alarm amp/hours

Total amp/hours needed

Select a battery with a greater amp/hour rating.

- Notes:**
- * NFPA 72 Local and 72 Proprietary Protected Premises systems require 24 hours of standby.
 - * NFPA 72 Auxiliary and 72 Remote Station systems require 60 hours of standby.
 - * The battery charger in this panel will charge a maximum of 9 AH batteries within 48 hours (6 AH minimum).
(Batteries larger than 7-AH battery will have to be mounted in a separate cabinet adjacent to panel).

Batteries available from FireLite
 PS-1242 4.2 AH @ 12 VDC (MS-4012 requires two)
 PS-1270 7.0 AH @ 12 VDC (MS-4024 requires two)

Limited Warranty

Fire-Lite[®] warrants its products to be free from defects in materials and workmanship for eighteen (18) months from the date of manufacture, under normal use and service. Products are date stamped at time of manufacture. The sole and exclusive obligation of **Fire-Lite**[®] is to repair or replace, at its option, free of charge for parts and labor, any part which is defective in materials or workmanship under normal use and service. For products not under **Fire-Lite**[®] manufacturing date-stamp control, the warranty is eighteen (18) months from date of original purchase by **Fire-Lite**[®]'s distributor unless the installation instructions or catalog sets forth a shorter period, in which case the shorter period shall apply. This warranty is void if the product is altered, repaired or serviced by anyone other than **Fire-Lite**[®] or its authorized distributors or if there is a failure to maintain the products and systems in which they operate in a proper and workable manner. In case of defect, secure a Return Material Authorization form from our customer service department. Return product, transportation prepaid, to **Fire-Lite**[®], 12 Clintonville Road, Northford, Connecticut 06472-1653.

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INCORPORATED

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FAX: (203) 484-7118

MS-4012/4024 Quick Reference Sheet

Operation

- Alarm Condition:** 1) The system alarm and zone alarm indicators will light.
 2) Indicating appliances will be activated.
 3) Supplementary output will be activated.
- Alarm Silence:** Locate alarmed zone and slide zone disable switch downward.
- Alarm Reset:** After correcting the alarm condition, reset the control panel by depressing the SYSTEM RESET switch.
- Trouble Condition:** A trouble signal under normal operation indicates a condition that requires immediate correction. Contact your local service representative. The panel's audible trouble buzzer that sounds in response to a trouble condition may be silenced by depressing the TROUBLE SILENCE switch (the trouble LED will remain on).

Testing

Action	Result
Notify fire department, central station, and facility personnel of test.	
Slide SYSTEM TEST switch down. -----	All LEDs (except zone alarm) light and indicating appliances are activated.
Release SYSTEM TEST switch. -----	All zone alarm LEDs will light.
Short out each zone, one at a time. -----	Zone and system LEDs light. All indicating appliances are activated.
Slide WALK TEST switch down. -----	Walk Test LED and system trouble activated.
Activate alarm initiating devices, one at a time -----	Zone alarm and system LEDs light. Indicating appliances are briefly activated then reset.
Slide WALK TEST switch up. -----	Panel exits test mode and returns to normal.
Short out Zone 4 (if monitoring N.O. supervisory devices). -----	Supervisory and zone alarm LEDs light. Audible device continues to sound until trouble condition is corrected.
Open Zone 4 (if monitoring N.O. supervisory devices). -----	Zone and system trouble LEDs light and audible trouble device sounds.
Momentarily open all circuits, one at a time. -----	System and respective circuit trouble LEDs light. Audible trouble device sounds.
Remove AC power and conduct SYSTEM TEST again. Measure battery voltage. -----	Battery terminal voltage should be at nominal rating.
Notify fire department, central station, and facility personnel that test is complete.	

Local Service Representative

Name: _____
 Address: _____
 Telephone: _____

CMS-4012/4024 Quick Reference Sheet

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3) Supplementary output will be activated.
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