



# **MULTICOM 2000<sup>®</sup>**

Administrative Communications System

Installation Instructions

## Compliance

**Warning:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

This digital apparatus does not exceed the Class A limits for radio 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 class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

## Safety

Complies with Standards: ANSI/UL 60950, 3rd Edition and CAN/CSA C22.2 N. 60950-00

### CAUTION ATTENTION

**TO REDUCE THE RISK OF FIRE, DO NOT INSTALL THIS EQUIPMENT ON OR NEAR ANY FLAMMABLE MATERIALS.**

Afin de réduire les risques d'incendie, ne pas installer cet équipement sur ou près de matériaux inflammables.

**REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

Soumettre l'entretien au personnel de maintenance qualifié.

**WHEN SERVICING MULTICOM, BE SURE TO REMOVE AC POWER ON ALL THE POWER SUPPLIES, THE MC512A, AND ALL MC2626B.**

Lors de l'entretien de MULTICOM, assurez vous de couper le secteur de toutes les alimentations, le MC512A et tous les MC2626B.

**TURN OFF AC POWER SWITCH ON POWER STRIP OR DISCONNECT MAIN AC POWER CORDS PRIOR TO SERVICING.**

Utiliser le bouton de la multiprise électrique pour l'éteindre, ou débrancher les cables secteur avant tout entretien.

**RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.**

Risque d'explosion si la batterie remplacée est d'un modèle non conforme. Se débarrasser des batteries usagées selon les instructions.

**REPLACE FUSES WITH ORIGINAL OR EQUIVALENT TYPE.**

Remplacer les fusibles par des modèles d'origine ou de type équivalent.

**THE AC POWER STRIP IS NOT FOR EXTERNAL USE.**

La bande de courant alternatif N'est pas pour l'usage externe.

### CAUTION

**RISK OF ELECTRIC SHOCK  
DO NOT OPEN**

**CAUTION: TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. DO NOT OPEN. REFER SERVICING TO QUALIFIED PERSONNEL.**

**Afin de prévenir tout risque d'électrocution, ne pas enlever le couvercle (au dos). Aucune pièce à maintenir ne se trouve à l'intérieur. Ne pas ouvrir. Soumettre l'entretien au personnel de maintenance qualifié.**

**NOTE: Prior to servicing, power must be removed from all power supplies.**

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## Introduction

This document provides installation information for Bogen's Multicom 2000® Administrative Communication system. It is for use by trained contractor personnel only.

Installation is subject to compliance with local electrical codes and other factors which are determined by local codes and ordinances. Therefore, some of the installation instructions in this manual are generalized and apply to different installation environments and not to any one specific installation.

The actual operating software for Multicom 2000 exists in various versions. The software is contained in Read Only memory on various chips on the processor card. It is important to consult the Applications Engineering Department of Bogen Communications, when software changes or updates are made. All user-determined program changes are made via an administrative phone. Instructions for customizing system programming are found in Bogen publication 54-5911-07x. User instructions are contained in Bogen publication 54-5912-06x.

## Configurations

The Multicom 2000 system is built around a card frame that accommodates the processor card and station/analog card pairs. These card pairs are interconnected to each other and to a respective relay card through the card frame back plane. It is available factory assembled in three configurations:

### Cabinet-Mounted

The cabinet-mounted system uses the MCMF card frame and MCRC relay cards. It holds one processor card and one station/analog card pair for each 24 stations. The cabinet system is designed for smaller installations where station capacity will not exceed 120 stations (or 96 stations plus up to 8 "telco" stations when using Model MCTC telephone option card). The cabinet-mounted system includes the audio program interface and all necessary power supplies in a heavy gauge steel cabinet (semi-recessed or surface wall-mounted) cabinet. (See *Figures 1 and 2.*)

### Rack-Mounted

The rack-mounted system uses the MCRMF card frame and the MCRM relay module. The MCRMF card frame has an extra slot not found in the cabinet-mounted frame and provides capacity of up to 120 stations, plus the added capacity of 8 "telco" stations (when telephone option card is included). Two card frames can be linked together to accommodate as many as 240 stations (and as many as 15 "telco" stations).

### Rack-Mounted with Bogen Multi-Graphic® equipment

The station capacity of the Multicom 2000 system is the same as the rack-mounted systems described above. The Multi-Graphic equipment provides redundant system capabilities, additional program channels (up to 2), custom emergency-page capabilities, high-power amplification, control of satellite systems, and control of Multi-Graphic system functions. (See *Figure 3.*)

# Cabinet-Mounted System Equipment

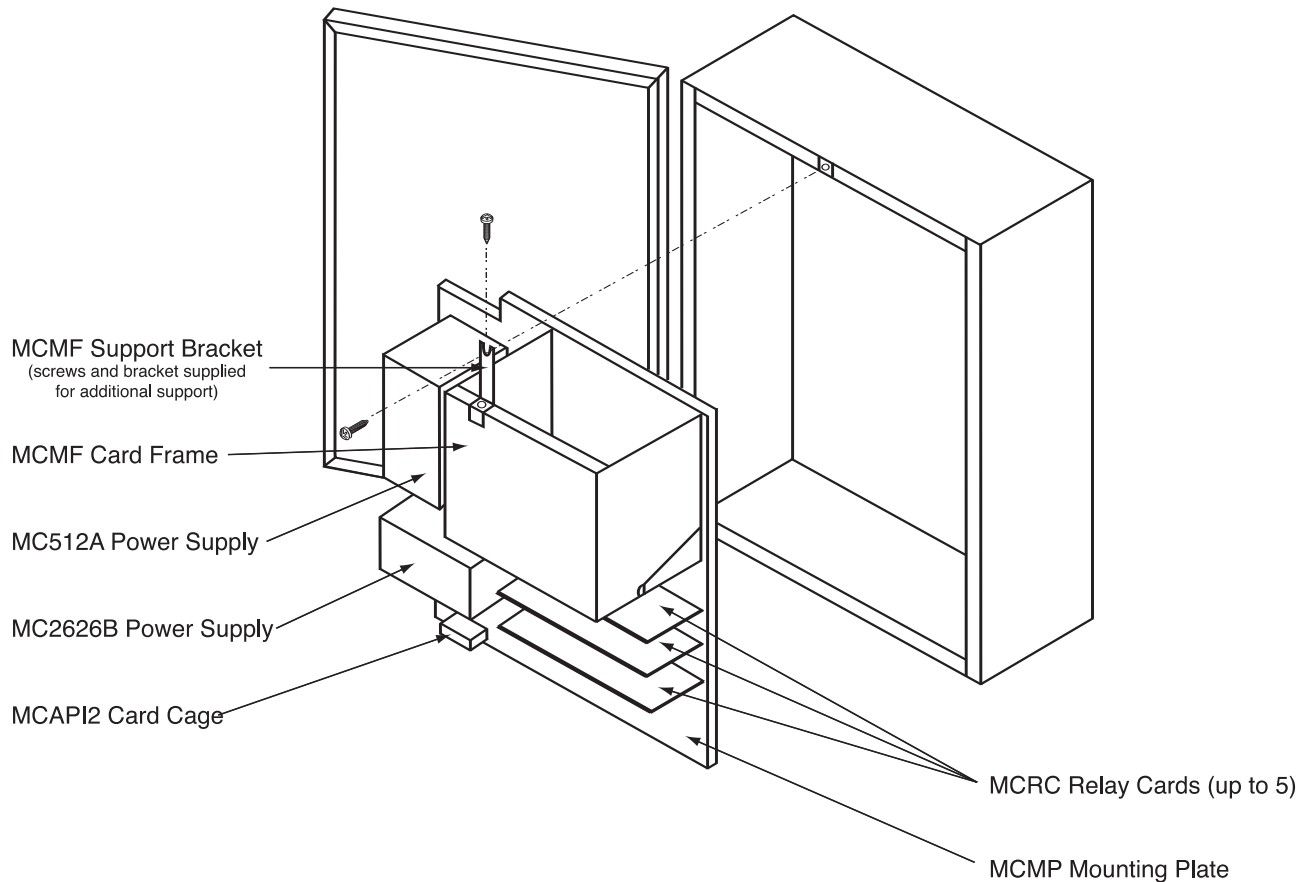
**MCBBC** Back Box Assembly, Complete

**MCMP** Mounting Plate with the following components:

|                |                                                            |
|----------------|------------------------------------------------------------|
| <b>MCMF</b>    | Mainframe assembly with the following circuit cards:       |
| <b>MCPCA2</b>  | Processor Card (1 per system)                              |
| <b>MCACB</b>   | Analog Card (1 per 24 stations)                            |
| <b>MCSC</b>    | Station Card (1 per 24 stations)                           |
| <b>MC512A</b>  | Power Supply (1 per system) $\pm 5/12V$ DC                 |
| <b>MC2626B</b> | Power Supply (1 per system) $\pm 26V$ DC analog board only |
| <b>MCAPI2</b>  | Audio Program Interface Assembly (911 Special Operation)   |
| <b>MCRC</b>    | Relay Card (1 per 24 stations)                             |
| <b>MCCA</b>    | Ribbon Cable Assembly                                      |

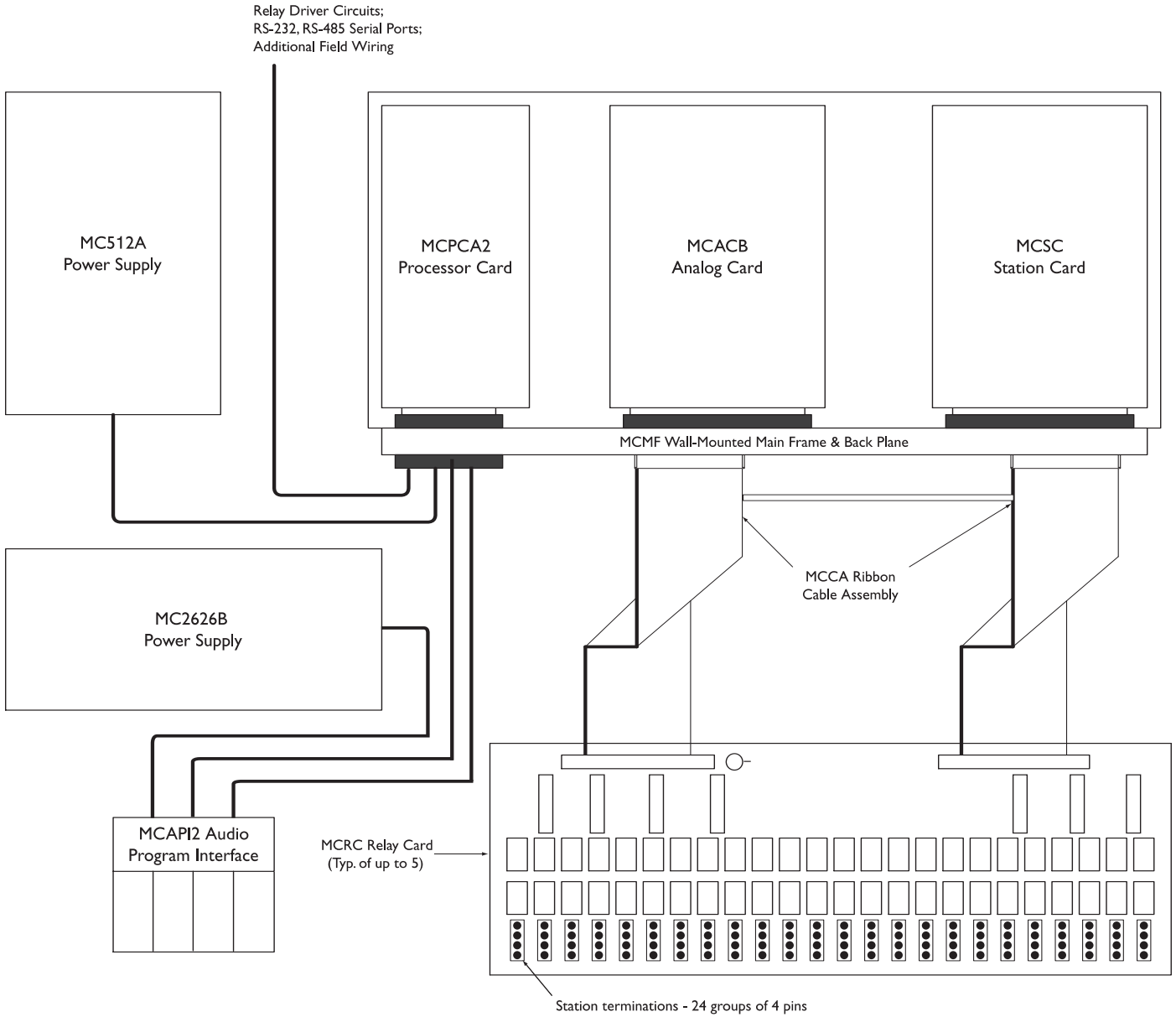
**MCTC** Optional Telco Access Card (MCTCA). Occupies one MCSC Station Card slot). Includes **MCOC** Connector Card and **MCOCA** Cable Assembly.

**Modules** Accepts up to 3 input modules per system. Modules install in the MCAPI2 Assembly and interface with program sources (microphone, cassette tape player, CD Player, tuner, etc.).



**Figure 1. MCBBC Assembly**

**Figure 2. Multicom 2000, Cabinet-Mounted Configuration**



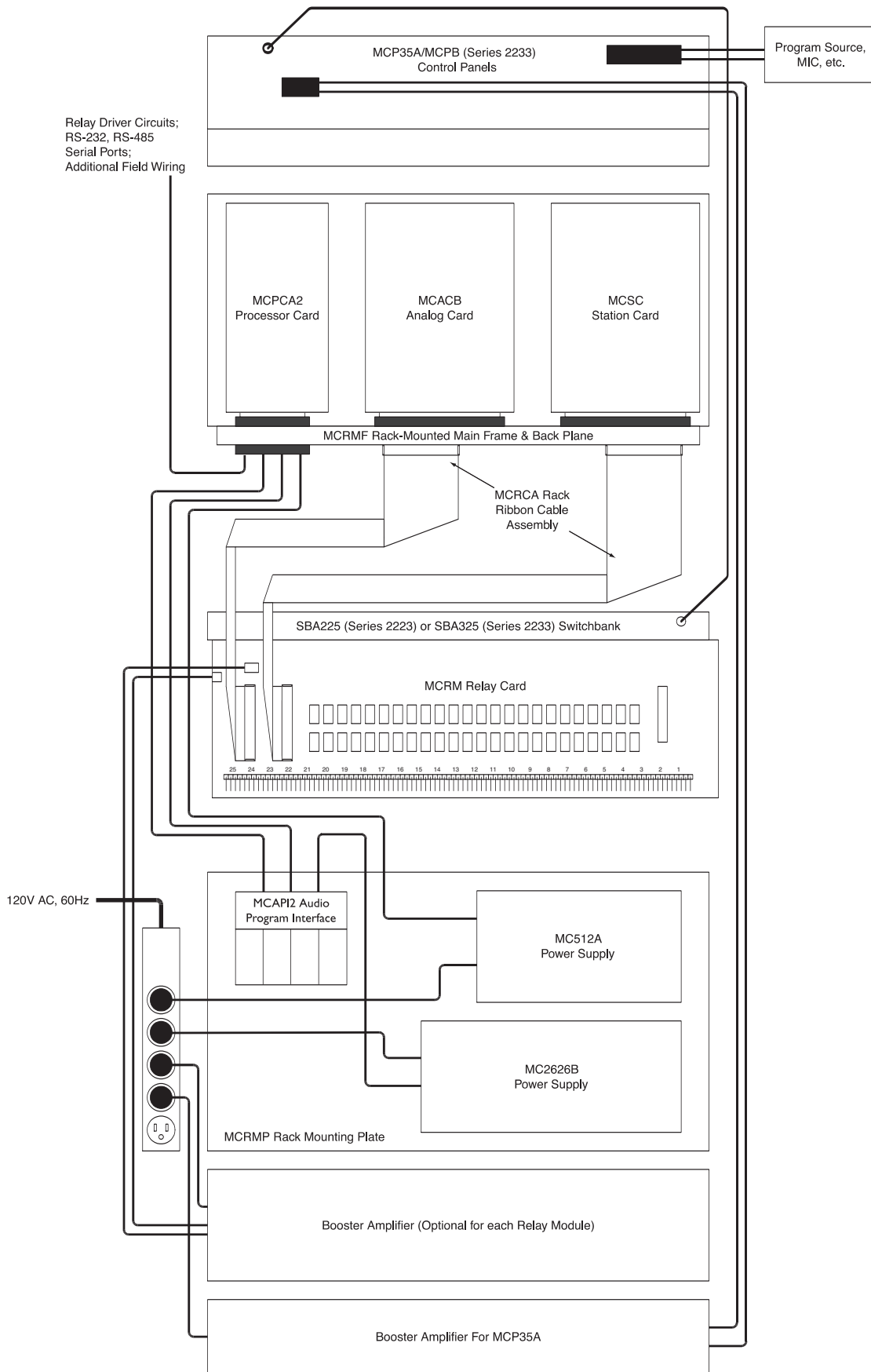
## Rack-Mounted System Equipment

|                |                                                                                                                                                                                                                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TCPER42</b> | Equipment Rack, 42" High (Contains 24 1-3/4" rack spaces)                                                                                                                                                                                                                                                                                 |
| <b>TCPER61</b> | Equipment Rack, 61" High (Contains 35 1-3/4" rack spaces)                                                                                                                                                                                                                                                                                 |
| <b>TCPER77</b> | Equipment Rack, 77" High (Contains 44 1-3/4" rack spaces)                                                                                                                                                                                                                                                                                 |
| <b>MCRMP</b>   | <b>Rack-Mounting Panel with the following components:</b><br><b>MC512A</b> ± 5/12V DC Power Supply (1 per system)<br><b>MC2626B</b> ± 26V DC Power Supply (1 for up to 120 stations, 2 for 121 stations or more)<br><b>MCAPI2</b> Audio Program Module Interface Assembly (1 per system)                                                  |
| <b>MCRMF</b>   | <b>Rack-Mounting Mainframe (1 per 120 stations)</b><br>Includes built-in ventilation fans and the following circuit cards:<br><b>MCPCA2</b> Processor Card (1 per MCRMF)<br><b>MCACB</b> Analog Card (1 per 24 stations)<br><b>MCSC</b> Station Card (1 per 24 stations)<br><b>MCJCA</b> Ribbon Cable Assembly interconnects 2 mainframes |
| <b>MCRM</b>    | Relay Module (1 per 24 stations). MCRM is mounted as MCRRP in stand-alone system, or <b>SBA225/325</b> Switchbank in systems incorporating Bogen Multi-Graphic Equipment.                                                                                                                                                                 |
| <b>MCRC</b>    | Relay Card (1 per 24 stations)                                                                                                                                                                                                                                                                                                            |
| <b>MCRCA</b>   | Ribbon Cable Assemblies                                                                                                                                                                                                                                                                                                                   |
| <b>MCTC</b>    | Optional Telco Access Card (1 per MCRMF). Includes:<br><b>MCTCA</b> Telco Card<br><b>MCOC</b> Connector Card<br><b>MCOCA</b> Cable Assembly                                                                                                                                                                                               |
| <b>Modules</b> | Up to 4 input modules per system. Modules install in MCAPI2 Assembly and interface with program sources (microphone, cassette tape player, CD player, tuner, etc.).                                                                                                                                                                       |

## Multi-Graphic System Equipment

|                   |                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>MCP35A</b>     | Master Control Panel                                                                                                   |
| <b>MCPB</b>       | Channel "B" Control Panel (Used in 2233-Series Systems only)                                                           |
| <b>SBA225</b>     | Switchbank for use in 2223-Series Systems (25 3-position lever-action switches)                                        |
| <b>SBA325</b>     | Switchbank for use in 2233-Series Systems (25 3-position lever-action switches and 25 2-position push-button switches) |
| <b>Amplifiers</b> | BPA60/HTA125A/HTA250A, as required by system capacity                                                                  |
| <b>CR100A</b>     | Cassette Tape Player/AM/FM Tuner                                                                                       |
| <b>CDC3</b>       | Multi-Disc CD Player                                                                                                   |

**Figure 3. Multicom 2000 with Multi-Graphic Equipment**





## MCP35A Control Panel

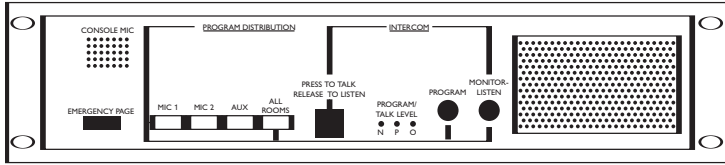


Figure 4. MCP35A

The MCP35A Master Control Panel is used in Multicom 2000/Multi-Graphic Series 2223 & 2233 Systems. It provides push-button selection of two microphones and one auxiliary program source, an additional (“A”) program channel (with level control), an intercom channel, monitoring capability, and emergency call capability. For detailed information on the MCP35A, refer to Bogen Publication No. 54-5871-xx.

## MCPB Control Panel

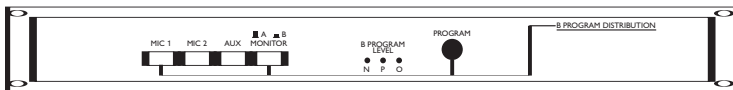


Figure 5. MCPB

The MCPB Control Panel is used with Multicom 2000/Multi-Graphic Series 2233 Systems. It provides push-button selection of two microphones and one auxiliary program source, a (“B”) program channel (with level control), and a monitor capability which permits listening to the “A” or “B” program over the monitor speaker of the MCP35A. For detailed information on the MCPB panel, refer to Bogen Publication No. 54-5875-xx.

## Switchbanks

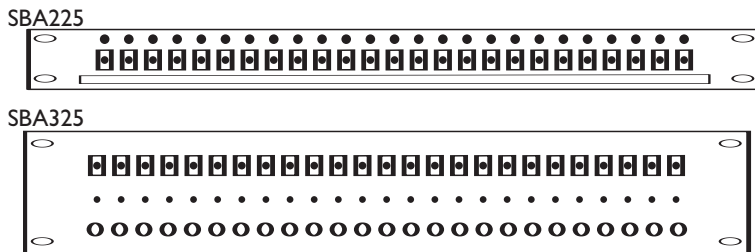


Figure 6. Switchbanks

The SBA225 and SBA325 Switchbanks are used in Multicom 2000/Multi-Graphic 2223 & 2233 Systems, respectively. The MCRM relay modules connect directly to the switchbanks and provide the interface between a Multi-Graphic and a Multicom 2000 System. The SBA225 has 25 3-position lever-action switches to select the “A” program channel, Intercom channel, or Off. The SBA325 has 25 3-position lever-action switches to select the “A” program channel, “B” program channel, or OFF, and 25 push-button switches to connect each station to the Multi-Graphic Intercom channel.

**Note:** The 25th switch on each switchbank is reserved for Multi-Graphic use.

# Wiring and Setup

## Location Planning

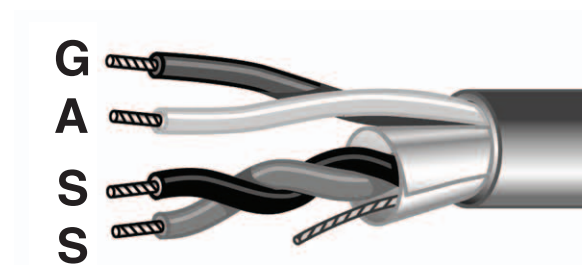
Both wall and rack-mounting versions of Multicom 2000 should be located centrally to the rooms to be served to minimize the length of cable runs. Consider the following requirements when choosing a location.

- The location should be well ventilated and dry. Avoid rain or moisture or areas likely to be exposed to these hazards.
- Do not locate the system near heat-generating sources such as direct sunlight, radiators, or warm air ducts.
- There should be enough room to open the door of the cabinet mounting system. In the case of a rack installation, there should be sufficient access to the rack door or enough room to move the rack to gain access.
- Where possible, do not locate it in a carpeted room, especially one where a lot of static is present. If this is not possible, the installation of an antistatic mat below the control center is required.

## Wiring Requirements

Class II wiring may be used for station wiring. Support wiring to prevent strain or sagging. Knockouts are provided on the wall-mounting enclosure or rack to admit wiring.

All stations use the same type one pair shielded 100% coverage of aluminum polyester foil with drain wire and one unshielded pair, such as West Penn #357 or Belden #8724. (See Figure 7.)



*Figure 7*

The cable from each station must be terminated to Bogen connectors (2518, 2520, 2522), which are then connected to the interface pins on the relay card or module. Failure to use the proper connectors, recommended wire type, or use of solder to terminate the cable to the relay card pins will void the warranty.

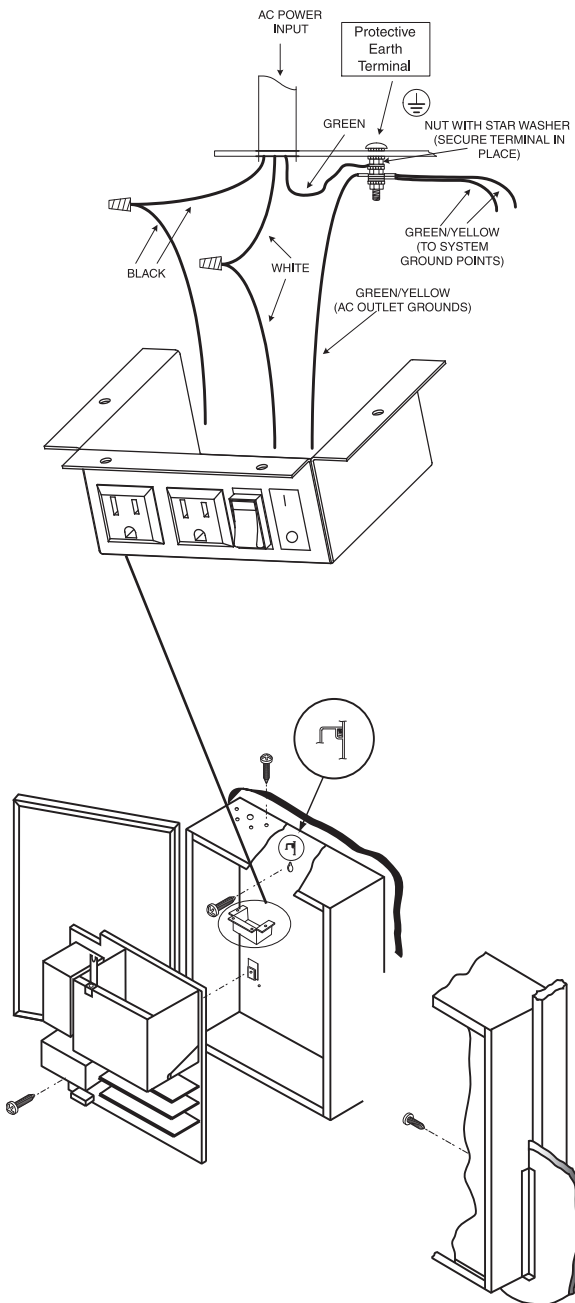
## Installation Precautions

The following precautions are mandatory when installing the Multicom 2000, or when making changes to the equipment and wiring after the initial installation.

- Disconnect all 120V AC power sources before making any changes in system equipment or wiring.
- Wear a properly grounded conductive wrist strap when working at the control center or at any staff station where the wiring for the staff station is connected to equipment at the control center.
- Use care when running wire from the station equipment to the control center. Keep all wiring well isolated from 120V AC (and higher) power lines.

**NOTE: Use grommet edging material to prevent abrasion against sharp edges of knockouts of rack.**

# Cabinet System Installation



**Figure 8. AC Box Connection**

## Wall Unit AC Box Connection

Supply 120V AC power to the unit through conduit, BX or Romex in accordance with local electrical codes.

Protective Earth Terminal must be secured in place with star washer and nut assembly. (See *Figure 8*.)

First connect 120V AC Green ground wire on protective earth terminal and secure with star washer and nut assembly.

Next connect three GREEN/YELLOW grounding wires and secure with star washer and nut assembly.

Connect the remaining two 120V AC wires using twist type wire nuts. Add a second securement means such as heatshrink tubing or electrical tape.

Install the junction box into the back box and secure with 4 #6-32 x 3/8 screws and keep nuts (surface-mount) or 4 #6 x 3/8 screws (recessed-mounted).

## Surface-Mounted

Install the back box on the wall, making sure that the box is squarely mounted. Allow access above box for 120V AC wiring. Remove knockouts from bottom or rear panels, as desired, to admit station wiring.

Bring 120V AC power to the upper left-hand corner of the box.

Secure the back box to the wall with screws through keyhole slots and back holes (16" on center).

## Recessed-Mounted

Prepare mounting hole for back box. Hole size should be 24" W x 32" H x 4" D minimum opening with studs or mounting surfaces on each side. The back box is designed to be recessed approximately 4 inches. Remove knockouts from bottom or rear panels, as desired, to admit station wiring.

Bring 120V AC power to the upper left-hand corner of the box.

Install the back box into the wall, making sure that it is squarely mounted. Secure the box to the mounting surfaces with screws through holes in side panels (2 per side, 2" from rear panel). Attach trim ships (MCTS) to outside panels and finished wall.

# System Assembly Installation

Make sure Tinnerman clips are installed on tabs on the lower part of back panel of box.

Lift the system assembly panel (hold by power supply and main card cage) and insert into box. Mount the panel to the box by engaging the lip on top of the panel with tabs in the upper part of back panel of box as shown in *Figure 8*.

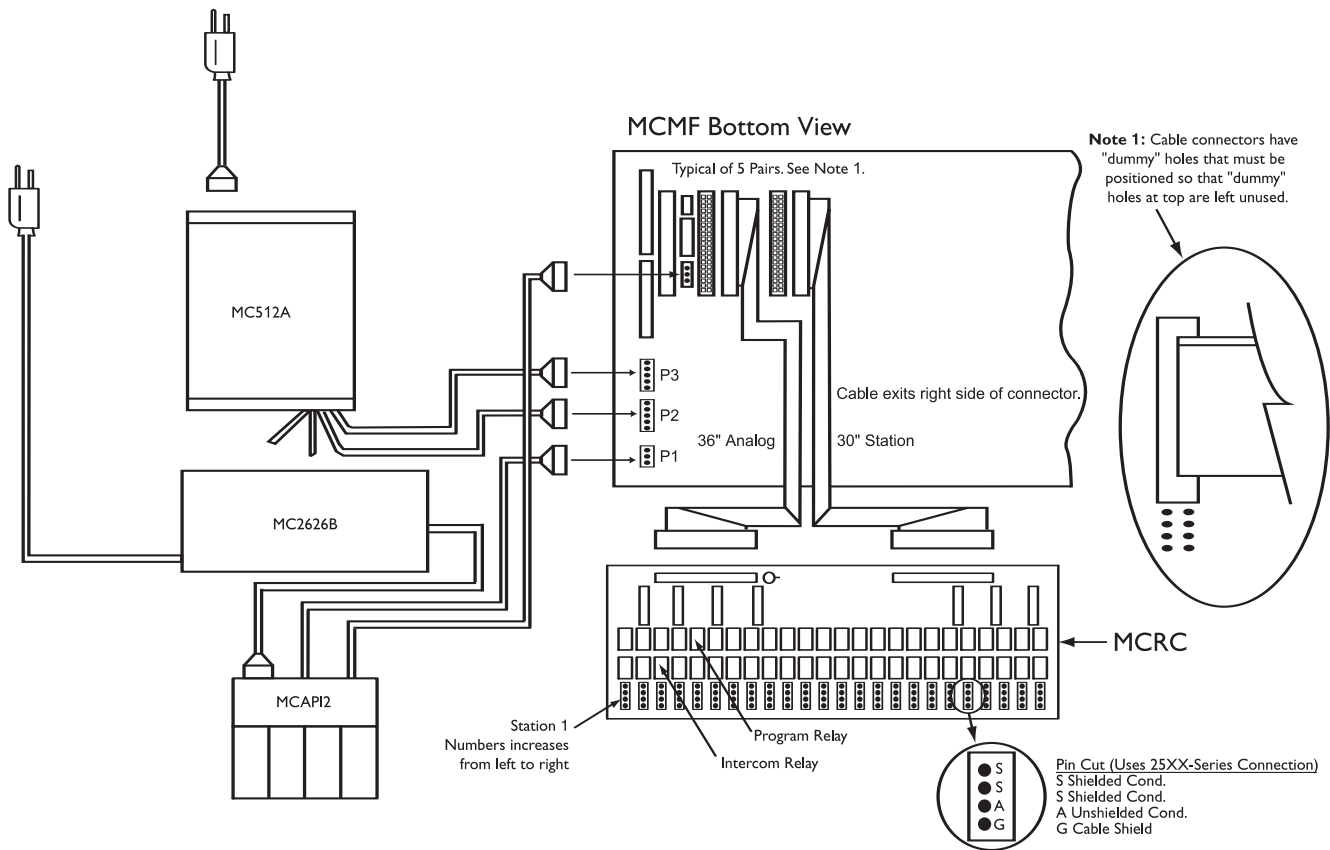
Secure the panel to the box with screws through Tinnerman clips, as shown.

# System Wiring Connections

## Power Supplies & Relay Card

The AC power cord from the MC512A power supply is plugged into the AC surge protector power strip on the cabinet. The power cord from the MC2626B power supply is also plugged into the same power strip. (See Figure 9.)

Power supply output wiring is grouped into cables, each ending with a keyed connector. Two of the cables from the MC512A are connected to P3 and P2 on the card frame back plane. The cable from the MC2626B is connected to J6 on the MCAPI2 and from the MCAPI2 to P1 back plane.



**Figure 9. System Wiring**

The MCRC relay card is used only in the cabinet-mounted version of the Multicom 2000 System. The card contains 24 (each) program and intercom relays and 24 sets of terminals (4 pins per set) for connection with station wiring.

Station numbers are assigned to the MCRC relay card in ascending order, from left to right. Station numbers are assigned to the MCRRP relay card in ascending order from the right to left, skipping the "V" pin.

Each station/analog card pair connects to a corresponding relay card via the card frame back plane "J" connectors, using two ribbon cables (MCCA ribbon cable assembly). The 36" long cable connects to the analog card "J" connector (on the back plane) to connector J26 on the relay card. The 30" long cable connects to the station card "J" connector (on back plane) to connector J25 on the relay card.

### Audio Program Interface

The MCAPI2 audio program interface is connected to P6 on the back plane. Up to (4) four input modules can be installed in the MCAPI2. The modules slide into the MCAPI2 and plug into an edge connector as shown in Figure 10.

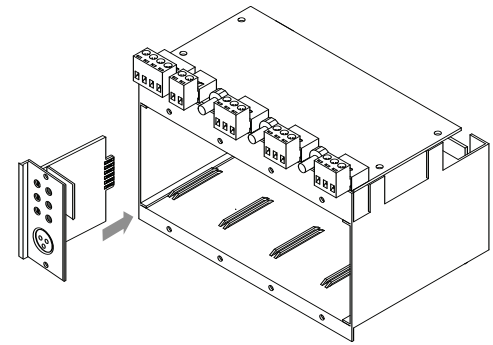


Figure 10. MCAPI2 Installation

### Card Frame/Circuit Card Installation

The MCMF card frame used in the cabinet-mounted system includes a swivel mount to make it easy to install circuit cards. Turn the knob on one end of the card frame to release the mount and tilt the frame towards you.

Install the circuit cards in the order shown below. Slide the card into the frame to engage the edge connectors. Align the locking tabs so that they close when the card is pressed into the connectors. Be sure that each card is properly seated in the card edge connectors. The cards will only fit one way!

Refer to the “Telephone Access Card” section on page 27 of this manual for instructions relating to telephone circuit card installation and connections.

### Mounting panel side

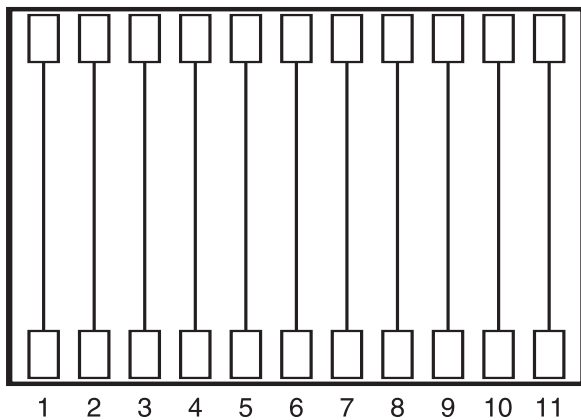


Figure 11. MCMF Card Frame, Top View

| Slot # | Part No.        | Type of Card                   | Station #'s            |
|--------|-----------------|--------------------------------|------------------------|
| 1      | MCPCA2          | Processor Card                 |                        |
| 2      | MCACB           | Analog Card                    |                        |
| 3      | MCSC            | Station Card                   | 001 - 024              |
| 4      | MCACB           | Analog Card                    |                        |
| 5      | MCSC            | Station Card                   | 025 - 048              |
| 6      | MCACB           | Analog Card                    |                        |
| 7      | MCSC            | Station Card                   | 049 - 072              |
| 8      | MCACB           | Analog Card                    |                        |
| 9      | MCSC            | Station Card                   | 073 - 096              |
| 10     | MCACB           | Analog Card                    |                        |
| 11     | MCSC<br>or MCTC | Station Card<br>Telephone Card | 097 - 120<br>097 - 104 |

### Station Wiring

Knockouts are provided to admit station wiring. Station wiring is described in detail in the *Station Equipment Installation* section of this manual.

### Other Back Plane Connections

Connectors are provided on the back plane to accommodate some of the options available to Multicom 2000 (relay driver circuits, external clock control, serial port, etc.). These connections are described in “Other Back Plane Connections” in the *Rack-System Installation* section of this manual.

# Rack System Installation

## Location and Power Guidelines

Follow the guidelines in the *Wiring and Setup* section of this manual when choosing a location for the rack.

When choosing a location, consider that if the rear panel of the rack is not accessible, there must be enough space to move the rack to gain access. Also provide enough cable slack so that station wiring does not interfere with the ability to move the rack.

Knockouts are provided in the rack to admit station cabling. Support all cables to prevent sagging or strain.

## Power Supplies

The rack system uses the MC512A and MC2626B power supplies. These supplies, and the API audio program interface, are mounted to the MCRMP panel which is itself mounted to the rack. For systems with more than 120 stations, a second MC2626B power supply must be mounted.

The MC512A and MC2626B power cords are plugged into a surge suppressor/power strip.

Auxiliary equipment (power amplifier, Multi-Graphic equipment, etc.) may be plugged into the ACFDS. The ACFDS, and any auxiliary equipment not plugged directly into the ACFDS, must be plugged into a properly grounded three-wire outlet or connected directly to AC by a qualified electrician.

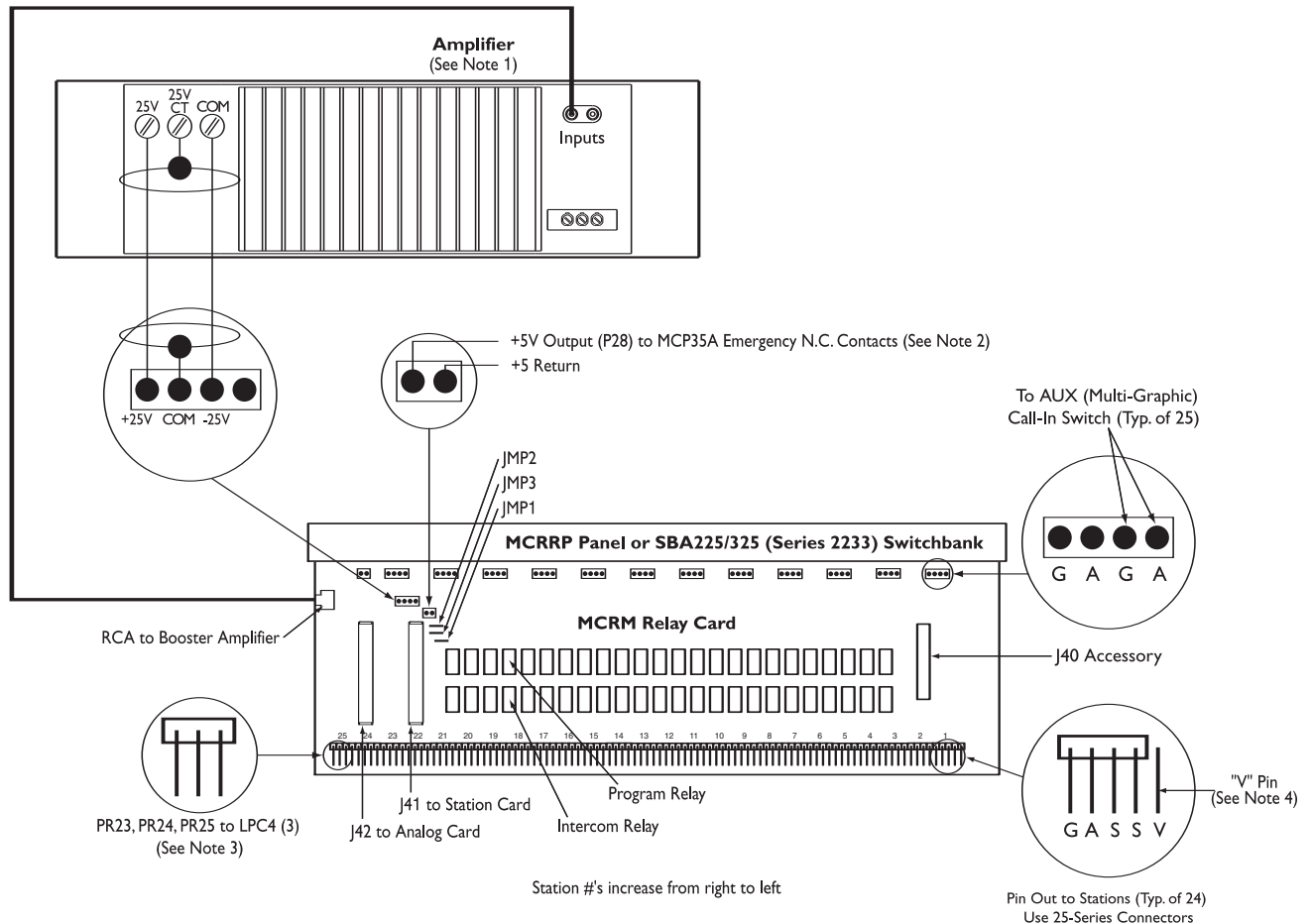
## Relay Modules & Ribbon Cable

The MCRM relay module is used only in the rack-mounted system. The module contains (24 each) program and intercom relays and 24 sets of terminals (4 pins per set) for connection with Multicom 2000 station wiring.

Relay modules are mounted to the MCRRP rack panel, or to SBA-series switchbanks when used with Multi-Graphic equipment. One relay module is required for each analog/station card pair installed.

Each analog/station card pair connects to the corresponding relay module via the card frame back plane "J" connectors, using two ribbon cables (model MCRCA ribbon cable assembly). Connect one end of a cable to the analog card "J" connector (on the back plane) and the other end to connector J26 on the relay module. Connect one end of the other cable to the station card "J" connector (on the back plane) and the other end to connector J25 on the relay module.

The relay module can handle a maximum of 250 watts of power (or 10 watts per station); connection for a booster amplifier is provided at RCA 1 & J39. J41 & J42 connect to the back plane of the MCRMF with MCRCA ribbon cable assemblies. The module also has connectors to interface with an SBA-Series switchbank, emergency contacts from the MCP35A Master Control Panel, and auxiliary call-in switches. An accessory connector (J40) provides relay driver capability whenever a station relay goes active. Refer to *Figure 13* and notes.



**Figure 12. Relay Modules**

**Note 1:** When an external booster amplifier is used, remove jumpers JMP2 & JMP3. Each Relay Module must use a separate booster amplifier.

**Note 2:** If using this option with one MCRM module, connect P28 “output” and “return” to MCP35A N.C. contacts and remove JMP1. If this option is used with multiple relay modules, parallel the “output” and “return” wires on P28 to each relay module and remove JMP1 on each module.

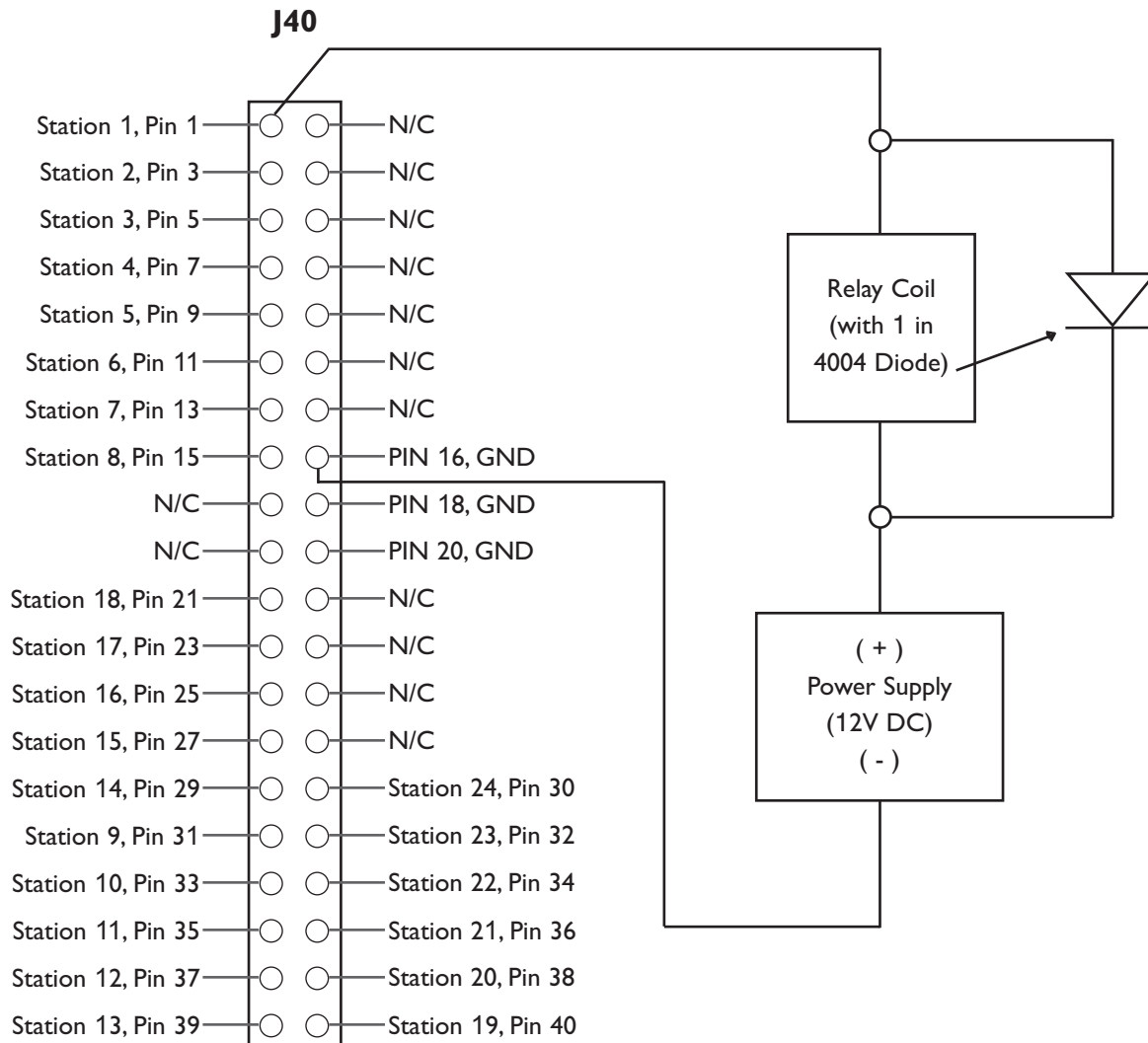
**Note 3:** Only the first 24 stations and PR23 & PR24 can be used by the Multicom 2000.

**Note 4:** The “V” pin is provided for special applications and is not used in typical station installations (“V” pin is omitted on Rev B versions and higher). It is only on the first station and is furthestmost to the right. **DO NOT** connect any station to this pin.

**Connector J40**

Connector J40 provides relay driver outputs for each station which goes active whenever the program or intercom relay for that station goes active. The pin-outs for J40 are shown in Figure 13. By cutting the proper diode, the output can be made to go active when one or the other relays activate. Refer to Figure 13 and the following example: If diode D49 (near program relay K1) is removed, the output S1RY (on the J40 connector) will go active only when relay K25 (intercom) is activated. Conversely, if diode D73 (near intercom relay K25) is removed, the output S1RY will go active only when relay K1 (program) is activated.

Optional circuitry is available at the J40 accessory which can be used to control external bells or other external devices. Contact Bogen Application Engineering for assistance.



**Figure 13. J40 Stations to Pin # Schematic**



### Audio Program Interface

The MCAPI2 audio program interface is connected to P6 on the back plane. Up to (4) four input modules can be installed in the MCAPI2. The modules slide into the MCAPI2 and plug into an edge connector as shown in Figure 10.

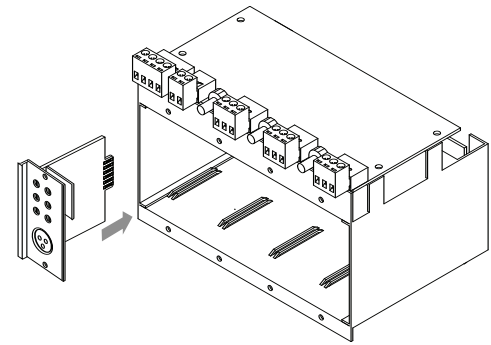


Figure 10. MCAPI2 Installation

### Card Frame(s) & Circuit Cards

The MCRMF card frame is used in rack-mounted versions of the Multicom 2000 only. It has 12 card slots, accessible from the front of the rack. Slot numbers run left to right, 1-12. Each card frame will support up to 120 stations (5 station/analog card pairs) plus a telephone access card. Each circuit card plugs into the connectors on the card frame and is connected to the associated relay module via the MCRCA ribbon cable assemblies.

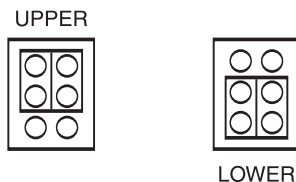
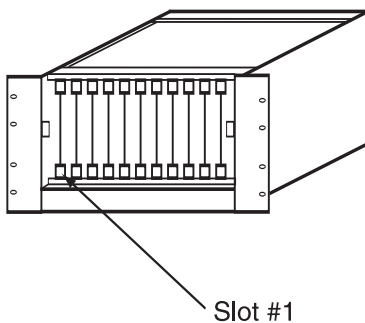


Figure 14. Card Frames

#### First Card Frame

| Slot # | Part No.         | Type of Card   | Station #'s |
|--------|------------------|----------------|-------------|
| 1      | MCPCA2           | Processor Card |             |
| 2      | MCACB            | Analog Card    |             |
| 3      | MCSC             | Station Card   | 001 - 024   |
| 4      | MCACB            | Analog Card    |             |
| 5      | MCSC             | Station Card   | 025 - 048   |
| 6      | MCACB            | Analog Card    |             |
| 7      | MCSC             | Station Card   | 049 - 072   |
| 8      | MCACB            | Analog Card    |             |
| 9      | MCSC             | Station Card   | 073 - 096   |
| 10     | MCACB            | Analog Card    |             |
| 11     | MCSC             | Station Card   | 097 - 120   |
| 12     | MCTCA (optional) | Telephone Card | 241 - 248   |

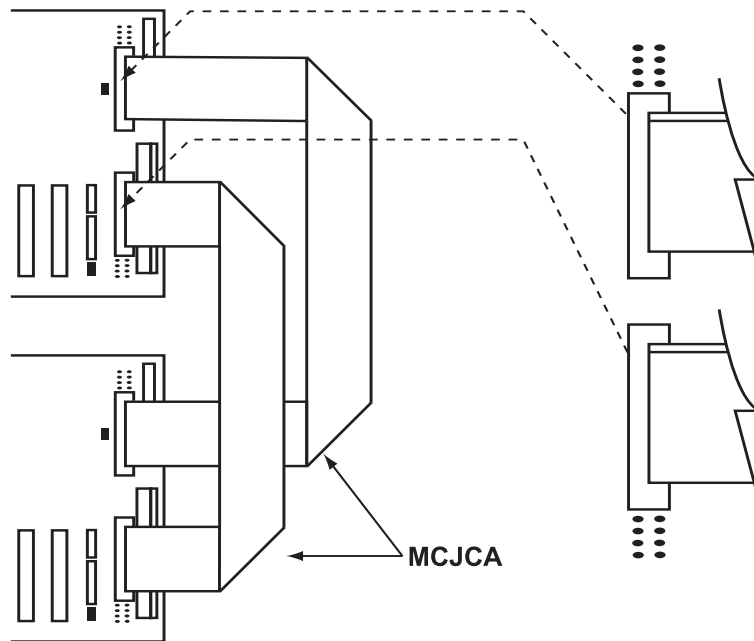
#### Second Card Frame in Systems with over 120 Stations

| Slot # | Part No.         | Type of Card   | Station #'s |
|--------|------------------|----------------|-------------|
| 1      | Blank            |                |             |
| 2      | MCACB            | Analog Card    |             |
| 3      | MCSC             | Station Card   | 121 - 144   |
| 4      | MCACB            | Analog Card    |             |
| 5      | MCSC             | Station Card   | 145 - 168   |
| 6      | MCACB            | Analog Card    |             |
| 7      | MCSC             | Station Card   | 169 - 192   |
| 8      | MCACB            | Analog Card    |             |
| 9      | MCSC             | Station Card   | 193 - 216   |
| 10     | MCACB            | Analog Card    |             |
| 11     | MCSC             | Station Card   | 217 - 240   |
| 12     | MCTCA (optional) | Telephone Card | 249 - 255   |

A second card frame is used in rack-mounted systems when capacity exceeds 120 stations; however, only one processor card is used per system.

The processor card is installed in slot #1 of the upper card frame. A jumper block on the back plane of each card frame must be placed in the proper position, as shown in Figure 14.

Two card frames are interconnected by the MCJCA ribbon cable assemblies, as shown in *Figure 15*. Note that the upper ribbon cable connector on both card frames must be installed so that the top four pins on each row of pins are left exposed. The lower ribbon cable connector on both card frames must be installed so that the bottom four pins on each row of pins are exposed (disregard the schematic representation of the connector printed on the back plane when connecting the lower ribbon cable assembly).



**Figure 15. MCJCA Ribbon Cable Assemblies**

### **Station Wiring**

Knockouts are provided to admit station wiring. Station wiring is described in detail in the *Station Equipment Installation* section.

### **Other Back Plane Connections**

Connectors are provided on the back plane to accommodate some of the options available to Multicom 2000 (relay driver circuits, external clock control, serial port, etc. *Figure 16* shows the back plane of the card frame assembly (typical of MCMF and MCRM). It illustrates the location and designations of the connectors used to wire external function relay drivers, Master clock, and 911 control inputs, and communication ports (future addition).

### **P4 External Control Inputs**

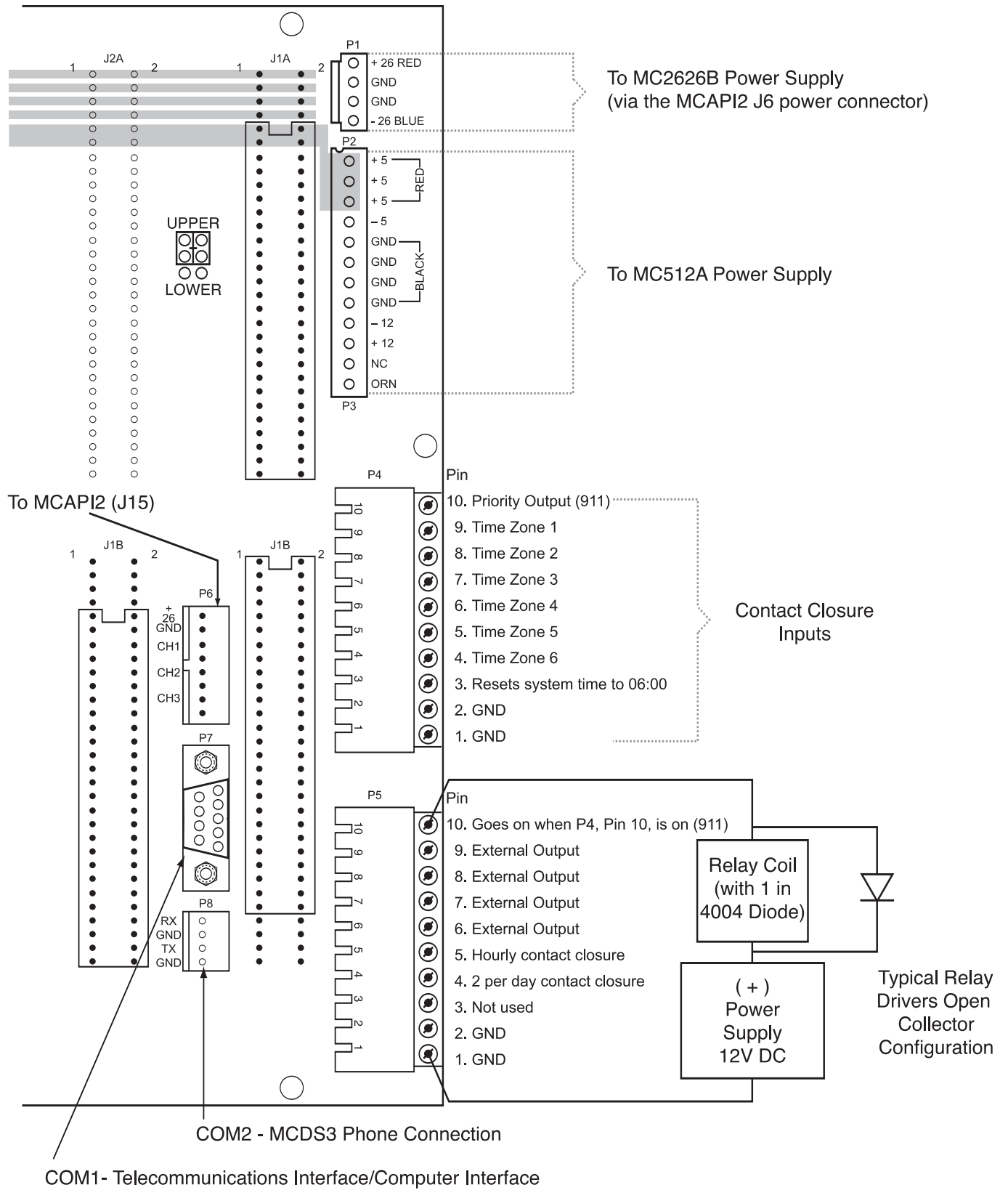
The terminal labeled CLOCK will reset the system time to 06:00 a.m. when shorted through a dry contact closure from an external master clock (Bogen Time Systems Master Clocks).

### **P5 Relay Driver Outputs**

Each relay driver output is an open collector output that goes low towards ground when activated. Each output is activated by a DTMF sequence from an administrative telephone: 9421, 9422, 9423, 9424. Connect the external relay and power supply (12V DC) between the desired output and one of the ground terminals.

Pin 10 of the P4 connector provides Audio Program Input (MCAPI2) #3 emergency priority page when shorted to pin 1 ground or Pin 2 ground through a customer-supplied contact closure.

**Figure 16. Rack Back Plane External Connections**



## Station Equipment Installation

The following is a list of staff station equipment that can be connected to the Multicom 2000.

|               |                                                                                      |
|---------------|--------------------------------------------------------------------------------------|
| <b>MCDS3</b>  | Administrative Telephone (DTMF dialing with 4-line x 16-character LCD display panel) |
| <b>MCESS</b>  | DTMF Dialing, Enhanced Staff Telephone, Desk Mount                                   |
| <b>MCWESS</b> | DTMF Dialing, Enhanced Staff Telephone, Wall-Mounted                                 |
| <b>HS201C</b> | Staff Handset (single-gang plate)                                                    |
| <b>HS202C</b> | Staff Handset (double-gang plate)                                                    |
| <b>CA15C</b>  | Call-In Switch (Press to Call)                                                       |
| <b>CA21B</b>  | Call-In Switch (Press to Call/Privacy)                                               |

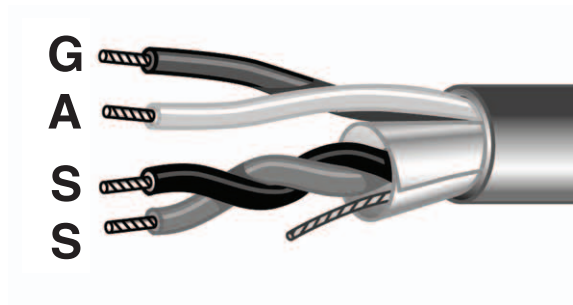
In addition to the telephone/handset at each location, the system is designed so that there can be a ceiling- or wall-mounted speaker at each location for the purpose of intercom communication, paging, program material distribution, and dissemination of time signals and alarm tones.

We recommend the Bogen S86 loudspeaker equipped with the T725 line matching transformer as the speaker of choice at each station location. This speaker is available mounted to a ceiling grille or enclosed in a wall-mounting baffle. *Figures 17- 21* show wiring diagrams for connection to each type of staff station equipment. In these illustrations, the transformer is tapped at 1/2 watt. **The transformer may be tapped at any desired power level; however, 1/2-watt is the recommended load for each speaker.** In any event, make sure that the total load to relay card or relay module (group of 24 stations) does not exceed 20 watts. Contact our Applications Engineering Department if the load on a card must exceed 20 watts.

*Figure 7* shows the termination of one station's cable at the relay card or relay module.

**Important: Termination of staff station wiring at the control center must be made using Bogen 25-Series connector kits to maintain warranty coverage.**

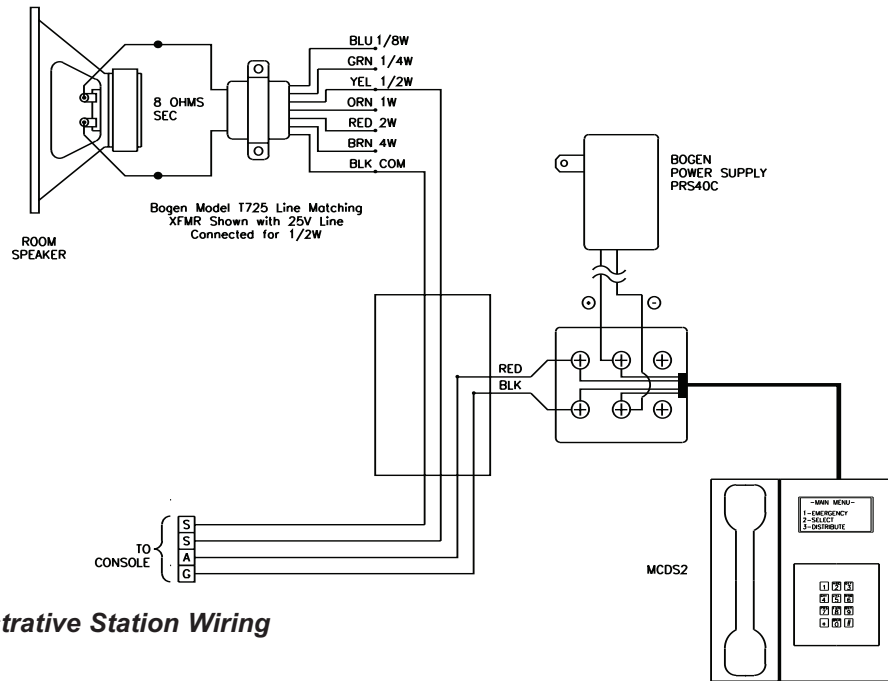
Attach the conductors to the connector as shown in *Figure 7*, using the TL156 tool. The connector is then placed on the corresponding pins on the relay card or relay module.



*Figure 7. Termination of one pair shielded and one unshielded pair to centerline connectors*

# Administrative Station Wiring

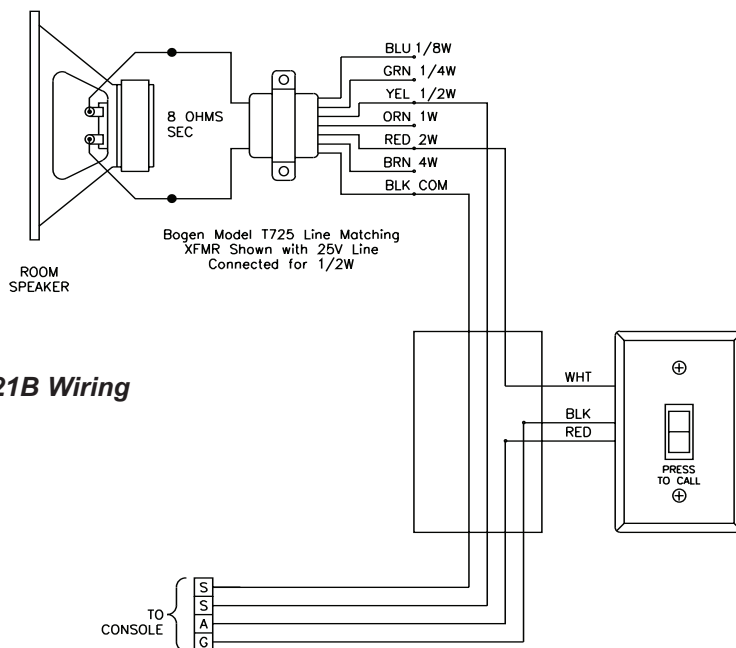
Administrative stations are wired to the control center through a junction box as shown in *Figure 17*. The administrative station is equipped with a PRS40C power supply which must be plugged into a 120V, 60Hz wall outlet.



**Figure 17. Administrative Station Wiring**

# CA21B Call-In/Privacy Switch Wiring

When a station includes the CA21B, the white wire from the CA21B must be connected to the center tap of the station speaker transformer. The center tap of the transformer depends upon the power tap chosen for the speaker. To determine the appropriate center tap, determine the power tap of the station speaker and use *Figure 18* to determine the color of the wire that is the center tap of the transformer. Connect the white wire of the CA21B to the center tap. Note the 4-watt power tap does not have a center tap; the privacy feature cannot be used in this case.

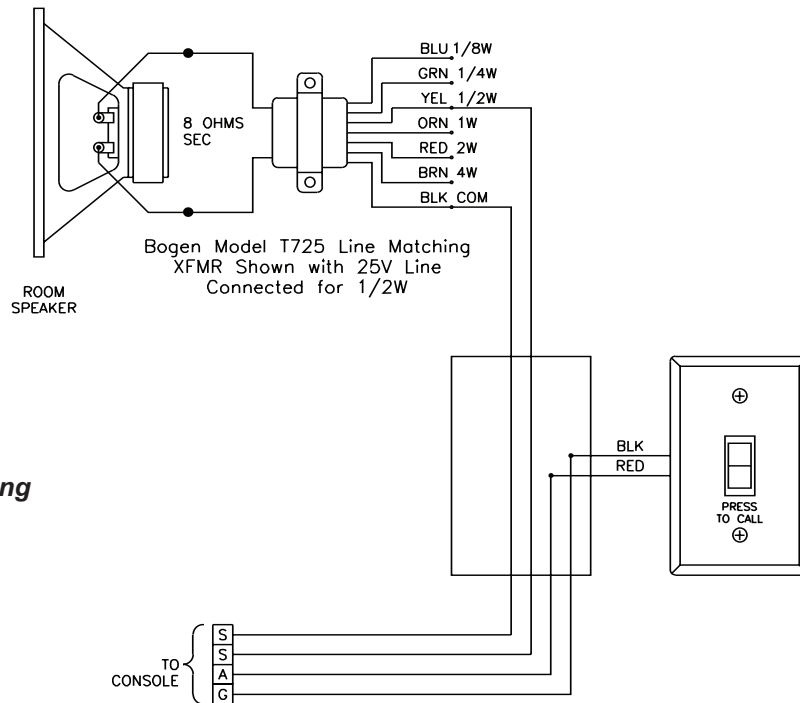


**Figure 18. CA21B Wiring**

| 8Ω     | 70V    | 25V  |
|--------|--------|------|
| BLACK  | COMMON |      |
| BROWN  |        | 4W   |
| RED    |        | 2W   |
| ORANGE |        | 1W   |
| YELLOW | 4W     | 1/2W |
| GREEN  | 2W     | 1/4W |
| BLUE   | 1W     | 1/8W |
| VIOLET | 1/2W   |      |
| GREY   | 1/4W   |      |
| WHITE  | 1/8W   |      |

## CA15C Call-In Switch Wiring

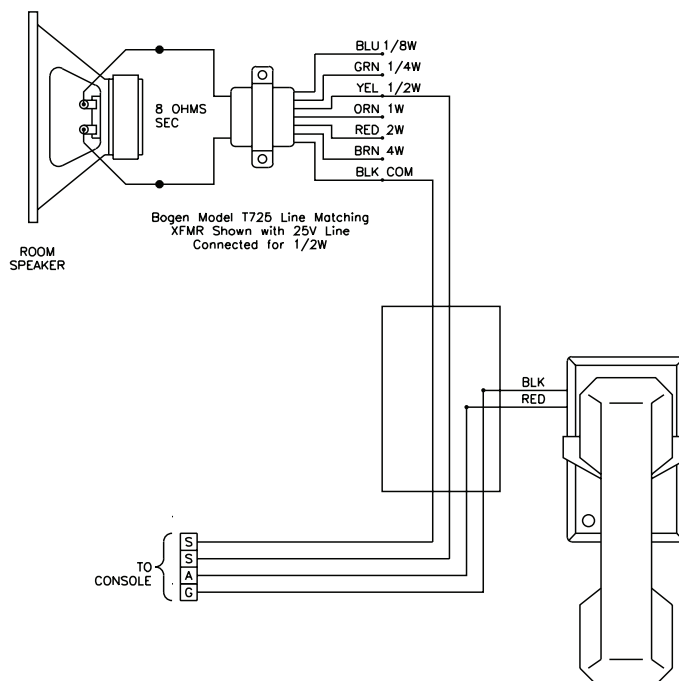
The CA15C Call-In Switch is designed for use with Bogen Multicom 2000 Systems. The red wire connects to the unshielded conductor, as shown in *Figure 19*.



**Figure 19. CA15C Wiring**

## HS201C and HS202C Handset Wiring

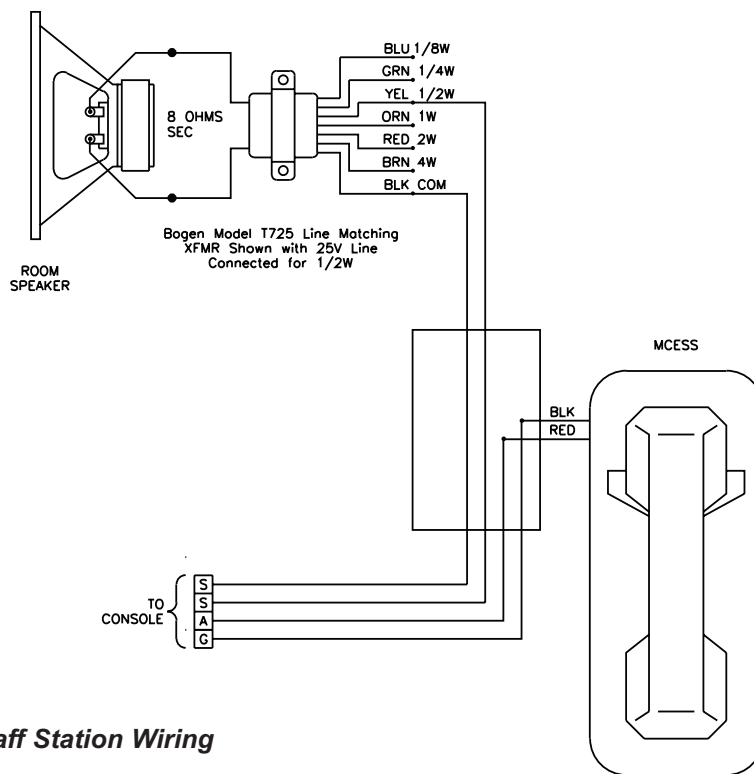
The HS201C and HS202C handsets include a mounting plate which contains the switching mechanism and wiring. The wire jumper on the underside of the printed circuit board (next to the resistor) must be cut when the handset is used with Multicom systems (see instructions provided with the HS201C/202C handset). Connect the red wire to the unshielded conductor and the black lead to the cable shield, as shown in *Figure 20*.



**Figure 20. Handset Wiring**

# Enhanced Staff Station Wiring

Enhanced staff stations are wired to the control center through a junction box as shown in *Figure 21*.



**Figure 21. Enhanced Staff Station Wiring**

## Circuit Cards

The following circuit cards (Processor/Station/Analog) can be used in the wall-mounted system and the rack-mounted system. Circuit cards are mounted in the card frame assembly.

### Processor Card (Model MCPCA2)

The processor card is the functional heart of the Multicom 2000. It contains the microprocessor; DTMF encoder; memory, and system clock. One card is used per system regardless of system capacity and is installed in the first position of the MCMF card frame (wall-mount) or MCRMF card frame (rack-mount). (In rack-mount systems with greater than 120 stations, there are 2 MCRMF card frames. In this case, the processor card is installed in the first position of the upper card frame.)

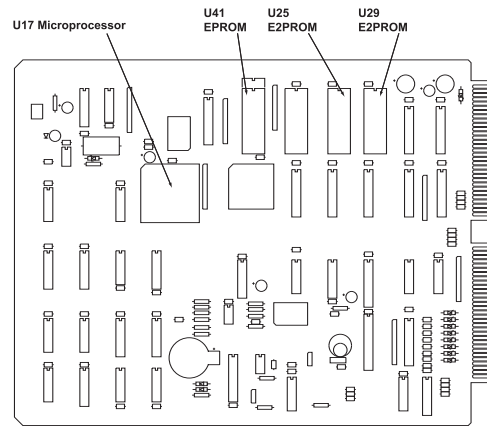


Figure 21. MCPCA2

### Station Card (Model MCSC)

The station card contains crosspoint switches, DTMF decoder, and talk battery circuits. The card handles the telephonic switching between the stations on that card and the system (one card per 24 stations).

The station card is installed in alternating slots of the card frame, along with its associated analog card.

The card uses a plug-in slo-blo fuse.

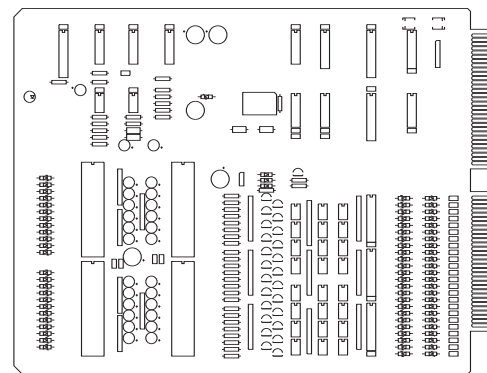


Figure 22. MCSC

### Analog Card (Model MCACB)

The analog card contains a 20-watt program amplifier, 12-watt intercom amplifier, and relay control circuits. The card handles all program amplification and intercom amplification, and talk back operation for the stations on that card (one card is used for each 24 stations). The analog card is installed in alternate slots of the card frame, along with its associated station card.

The card uses a plug-in fuse. (Bogen Part No. 94-0001-31).

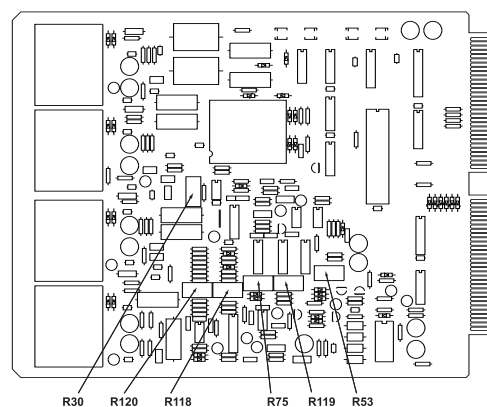


Figure 23. MCACB



## Analog Card Adjustment Procedure

The MCACB includes controls to adjust the Program/Page Volume, Compression, Talk Back Level, Switching Sensitivity, and Switching Delay.

### Adjustment instructions for the analog card.

- 1) Adjustment requires two people – one at a speaker station having the highest background noise level, and one at a telephone at the circuit card location.
- 2) Do not use a speaker near the telephone that is being used, as this may make it difficult to adjust properly.
- 3) In wall-mounted systems, the controls can be reached through the slots in the side of the card frame. In rack-mounted systems, adjustment requires the use of an extender card (Model MCEC).
- 4) The adjustment instructions listed here are for use by qualified service personnel only.

### Caution: System Power must be OFF prior to removing or installing circuit cards.

- 5) Adjustment controls operate as follows:

**Program Page Volume (R30):** Clockwise rotation of this control increases program/page volume.

**Compression (Listen) Level (R120):** The compression level on the MCACB card is factory set and not adjustable.

**Speaker Volume (R53):** Clockwise rotation of the control increases volume at the station loudspeaker.

**Talk back Level (R75):** Adjusts the talk back volume level in the handset earpiece. Clockwise rotation increases the level; counterclockwise rotation decreases the level.

**Switching Sensitivity (R119):** Adjusts the point at which the VOX circuit will switch from talk back to tally modes. Clockwise rotation increases sensitivity; counterclockwise rotation decreases sensitivity.

**Switching Delay (R118):** Adjusts the release time of the VOX circuit, allowing for short pauses between words without causing the unit to switch to the talk back mode in the middle of a sentence. Clockwise rotation increases the delay; counterclockwise rotation decreases delay.

### Procedure

- 1) Set the switching sensitivity control (R119) at full counterclockwise position.
- 2) Set the switching delay control (R118) at about mid-rotation.
- 3) Have the person at the speaker location speak in a voice loud enough to overcome the ambient background noise level. Rotate the Talk Back Level control (R75) clockwise to obtain an acceptable volume level over the handset (should be set on the low side to improve intelligibility).
- 4) With the person at the loudspeaker silent, rotate Switching Sensitivity control (R119) clockwise until the switching becomes unstable (i.e., it switches back and forth by itself). Rotate the control counterclockwise until the switching again becomes stable. At this point, the unit is critically stable; any noise on the telephone side will cause the unit to switch to the talk mode and any loud impulse-type noise at the loudspeaker wall cause the unit to switch to the talk back mode.

- 5) With the person at the speaker location speaking, rotate the Switching Sensitivity control (R119) counterclockwise so that the unit does not switch to the talk mode.
- 6) Have the person at the speaker location make loud impulse noises (such as hand clapping) that may be characteristic of the environment. If necessary, make additional adjustments to the Switching Sensitivity control so that the unit does not switch momentarily to the talk mode.
- 7) Speak into the telephone handset in a normal paging voice. The circuit should switch to the talk mode (switching will be apparent by the total absence of background noise in the handset earpiece). If the unit does not switch, increase the sensitivity by rotating the Switching Sensitivity (R119) control clockwise until switching becomes consistent. Recheck the unit's response to impulse noises (step 6), making sure that the person at the speaker location is not uncharacteristically close to the speaker.
- 8) To set the switching delay, start a moderately fast alternate count between the telephone side and the talk back side. Adjust the Switching Delay control (R118) so that the complete response from the talk back side can be heard. (Clockwise rotation minimizes delay, counterclockwise rotation increases delay.) Then, while speaking into the telephone handset, check the delay to ensure it will allow short pauses between words without switching into the talk back mode. Adjust for a slightly longer delay if the unit switches between words. A slight pause is generally advisable for speech continuity and intelligibility.

## Power Supplies

### Model MC512A

- Type:** Regulated, switching
- Output Voltage:** +5V DC @ 25A, -5V DC @ 0.5A, +12V DC @ 10A, -12V DC @ 0.5A
- Ripple:** Less than 20mV p-p on any output
- Power Consumption:** 75 watts maximum (under normal operating conditions with 120 station system);  
Power supply is capable of 250 watts total output
- Power Required:** 110/120 V AC  $\pm 20\%$
- Fuse:** 1 x 3A (internal) Part No. 94-0001-08
- Output Connectors:** 2 x 6-position, polarized; 4 x 4-position, polarized

### Model MC2626B

- Output Voltage:**  $\pm 26$ V DC and -26V DC nominal, unregulated
- Output Current:** 4A
- Power Consumption:** 230 watts maximum
- Power Required:** 120 V AC  $\pm 10\%$
- Fuses:** 1 x 2A Part No. 94-0001-06; 2 x 4A slo-blo Part No. 94-0001-21
- Output Connectors:** 1 x 4-position, polarized

# Telephone Station

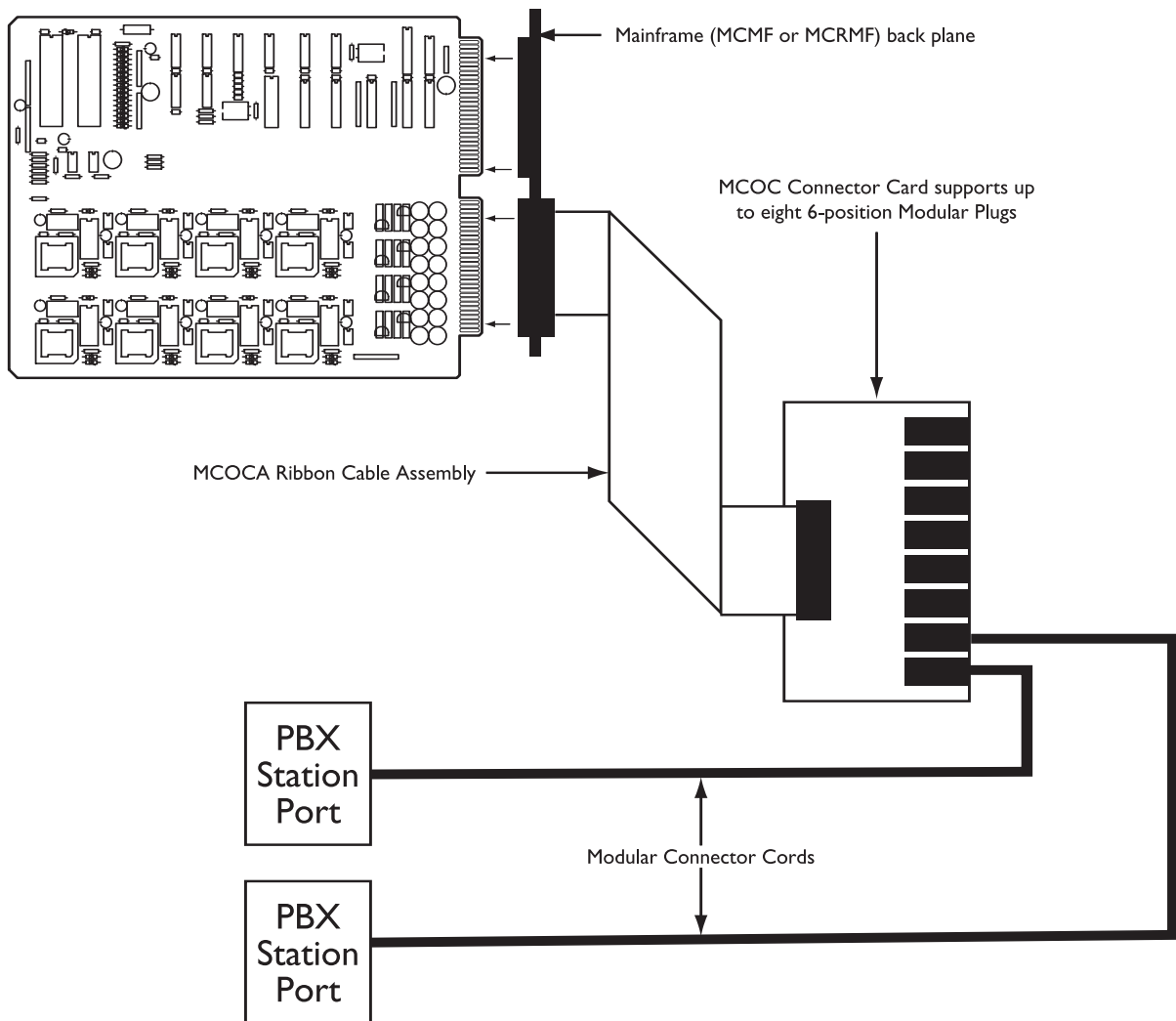
## Telephone Access Card (Model MCTCA)

The Telephone access option consists of the Model MCTCA circuit card, Model MCOC connector card and MCOCA ribbon cable assembly. Fuses F1, F8 are Pico fuses, 250mA. F17 is 1A Slo-Blo Pigtail.

In wall-mounting systems, the MCTCA is usually installed in slot #11 of the MCMF Mainframe (reduces system capacity).

In rack-mounted systems with one card cage (MCRMF), the MCTCA installs in slot #12. In rack-mounted systems with two card cages, a second MCTCA can be installed in slot #12 of the second card cage to provide additional external telephone capacity.

The MCOC card contains eight 6-position modular telephone jacks which can be connected to station ports of a PBX system (the two center conductors are Tip & Ring).

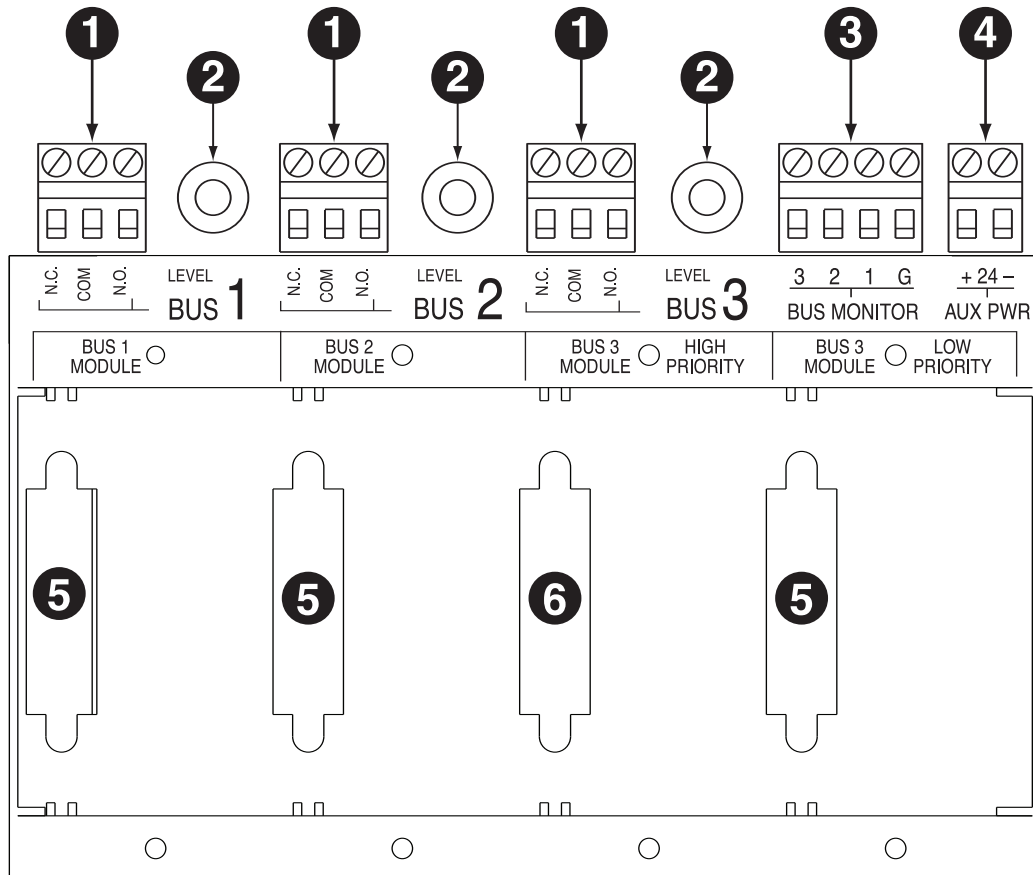


**Figure 24. MCTCA Connection**



## MCAPI2

The MCAPI2 provides configurable inputs for each of the Multicom audio buses using Bogen's advanced input modules. A fourth module position allows a priority override function for audio bus 3. Each audio bus input has a C-Form contact closure that changes state when the installed module detects audio (VOX) activity. An LED indicates the VOX status of the bus input to aid in troubleshooting. An output level control from the MCAPI2 to its associated audio bus is provided. Further control over the audio bus signal is provided by the functionality of the modules themselves, and differs depending on which modules are installed.



- 1) VOX triggered contact closure. C-Form contact set changes state when the associated module detects audio activity. VOX detection is actually done on the module itself and the relay follows modules VOX activity. Modules without mute send features, like the BAL2S, will not activate the relay. Therefore module threshold and duration controls (if applicable) determine relay operation. An LED indicator near each relay will illuminate when audio activity is detected.
- 2) Controls signal level applied to audio bus. Level controls on the module will also affect signal level applied to bus. Bus 3 level control affects the signal level of both the high and low priority modules, but each module's level control can be set independently.
- 3) The signal on each audio bus is available here for monitoring purposes. Typically these signals are wired to a sector switch to allow monitoring. A single ground is used for all of these signal outputs. These outputs are line level only and cannot directly operate a speaker.
- 4) 24V DC is available on these terminals. Provided for powering a self amplified speaker for bus monitoring purposes. Max current should not exceed 150mA.
- 5) Input module bays accept any of the Bogen Advanced Plug-In modules (output modules are not usable in these bays).
- 6) This high priority bay can override and mute the lower priority module that is supplying signal to audio bus 3. The priority level of the module in this bay (set by jumpers on the module) must be higher than the priority level set on the module in the Low Priority bay for mute and override operation to work properly.



## Warranty Information

Bogen Multicom products are warranted to be free from defects in material or workmanship for two (2) years from the date of sale to the original purchaser. Any part of the product covered by this warranty that, with normal installation and use, becomes defective will be repaired or replaced by Bogen, at our option, provided the product is shipped insured and prepaid to: Bogen Factory Service Department, 50 Spring Street, Ramsey, NJ 07446, USA. The product will be returned to you freight prepaid. This warranty does not extend to any of our products that have been subjected to abuse, misuse, improper storage, neglect, accident, improper installation or have been modified or repaired or altered in any manner whatsoever, or where the serial number or date code has been removed or defaced.

**THE FOREGOING LIMITED WARRANTY IS BOGEN'S SOLE AND EXCLUSIVE WARRANTY AND THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY. BOGEN MAKES NO OTHER WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED AND EXCLUDED TO THE MAXIMUM EXTENT ALLOWABLE BY LAW.** Bogen's liability arising out of the manufacture, sale or supplying of products or their use or disposition, whether based upon warranty, contract, tort or otherwise, shall be limited to the price of the product. In no event shall Bogen be liable for special, incidental or consequential damages (including, but not limited to, loss of profits, loss of data or loss of use damages) arising out of the manufacture, sale or supplying of products, even if Bogen has been advised of the possibility of such damages or losses. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

Products that are out of warranty will also be repaired by the Bogen Factory Service Department -- same address as above or call 201-934-8500. The parts and labor involved in these repairs are warranted for 90 days when repaired by the Bogen Factory Service Department. All shipping charges in addition to parts and labor charges will be at the owner's expense. All returns require a Return Authorization number.

8/10/2004

### For Your Records:

**Model No.**

---

**Serial No.**

---

**Date of Purchase**

---

**Purchased From**

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**BOGEN<sup>®</sup>**  
**COMMUNICATIONS, INC.**

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