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## Reference Manual

### 65 Series Unitized Audio Systems

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#### Section 1. Performance Characteristics

### Introduction

This manual relates specifically to Models MODUA2704-20 and MODUA2706-20 but can also be used as a reference for other 65 Series stations.

#### MODUA2704-20 consists of:

BO4453	Box with back panel, 1-party
C01B	Power Supply, PCBA
D01B	Speaker Amplifier, PCBA
UA2696-P20B	Dual Station Front Panel Assy

#### MODUA2706-20 consists of:

BO4455	Indoor Box with back panel, 5-party
C01B	Power Supply, PCBA
D01B	Speaker Amplifier, PCBA
UA2698-P20B	Dual Station Front Panel Assy

GAI-Tronics 65 Series Unitized Audio systems provide paging and party line capabilities in a durable easy-to-operate package. GAI-Tronics 65 Series is a distributed amplifier system and is available in single-party or multi-party for up to five simultaneous, two-way conversations. Every station consists of an enclosure, a cover plate, a power supply, and a speaker amplifier module.

All 65 Series station amplifiers are electrically paralleled: systems may be expanded by extending cable from the nearest amplifier or junction box. A single resistance load is required for each page and party line circuit to establish line impedance and minimize effects of stray induced hum or noise signals. For ease of load adjustment, a GAI-Tronics line balance assembly should be placed near the electrical center of the system, and near an indoor handset station in a quiet area.

### Expandability

System size can be changed at any time by simply adding additional stations. 65 Series system can be easily expanded by running cable and installing a station. The system is not affected by additional stations unless several speaker amplifiers are added, which will require adjustments to the line balance.

### Options

Various speaker and handset options are available to suit user needs. Horn and driver speakers are normally used in noisy areas, while cone speakers with enclosures can be used where noise levels are low and appearance is important. Tone generators are also available as options and can provide an alert or warning signal.

### Maintenance

Modular construction permits rapid troubleshooting and repair to minimize down time. The defective module can be replaced with a spare and then repaired by the user or returned to GAI-Tronics for service.

## Section 2. Installation

### System Installation

A step by step installation procedure should be followed to ensure ease of installation.

#### Step 1. Planning

The system should be carefully planned before starting the actual physical installation. Equipment locations should be determined to provide optimum coverage. If possible, equipment should be mounted so that it is readily accessible. Cable routing should be planned to permit ease of installation and minimize cable cost. Locate one and only one line balance unit near the center of the system and close to a handset or dual station.

#### Step 2. Mounting Boxes

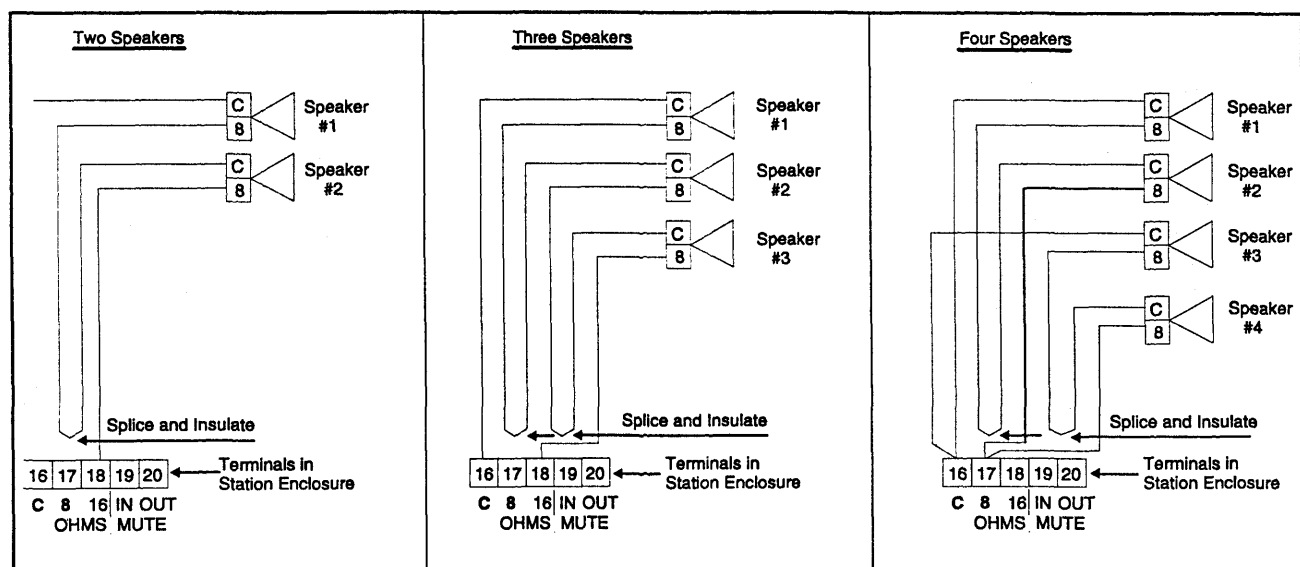
Refer to Figure 1 for equipment outline drawings to obtain the necessary mounting dimensions. The front panel and modules should be kept in a safe area until needed.

Four mounting holes are available for each box. The boxes have conduit knockouts, which should not be removed at this time. The boxes are normally mounted 4 or 5 feet from the floor.

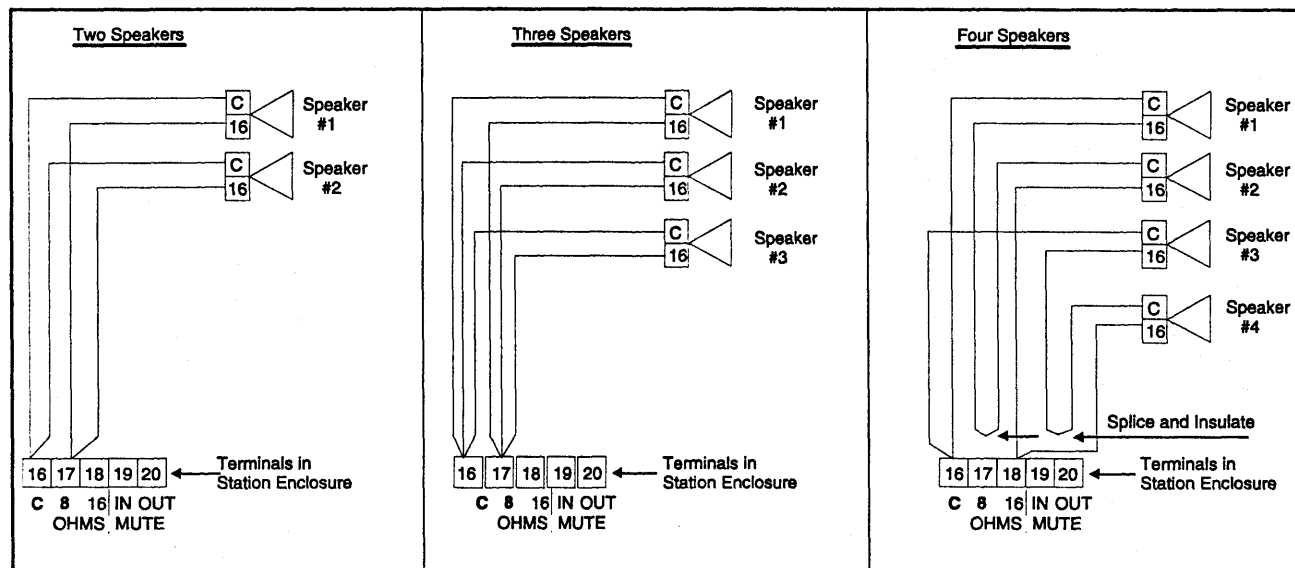
#### Step 3. Speaker Installation

For recommended horns, refer to publication 42004-135. Two basic types of speakers are normally used. Horns are normally used in high noise areas, each having its own speaker amplifier. Horns are normally mounted 8 to 10 feet from the floor. They should be oriented so that the desired area is covered. This can be accomplished by turning the speaker so it points at the middle of the area.

Office or other low noise areas may require cone speakers in enclosures. The cone speakers are normally mounted 8 to 10 feet from the floor or close to the ceiling to ensure that any partitions do not block the sound. In a low noise area several speakers can be driven from one speaker amplifier, to provide better coverage at lower levels. (Refer to the multiple speaker connection drawings.)



Typical 8 OHM Speaker Connections



Typical 16 OHM Speaker Connections

## Installation of Inter-Station Conduit and Cable

Generally, inter station cables are installed in cable trays or conduit. Size and installation of conduit and cable must meet the requirements of applicable electrical codes. A ground conductor, with green/yellow insulation, should be included with cable in any area where no conduit or non-metallic conduit is used. Non-metallic enclosures used with metallic conduit and cable without a ground conductor require a bond between the conduit(s) and the ground terminal within the enclosure.

Field wiring is carried from station to station and consists of:

1. One number 14 AWG triplet for providing power and ground.
2. One number 18 AWG twisted pair for paging to the loudspeakers in the system.
3. One number 18 AWG twisted pair for each party line to be used.
4. One number 18 AWG single wire for muting and special functions.

Unshielded cables are adequate for the system. It is vital however, all pairs be twisted and the maximum lay for number 18 signal pairs be no more than 2 inches (5 centimeters) and the lay for number 14 AWG power pair be no more than 3 inches (8 centimeters).

Exception: Some cables have an orange "spare" conductor. Unless otherwise instructed, this should be taped and not connected to the terminal strip(s) in the enclosures.

Cable	
60038-101	8 conductor
60029-101	16 conductor
WI2916	Twisted heavy duty pair

After the system cables have been physically run they must be connected to the mounted boxes and speakers. The appropriate conduit knock-outs should be removed from the mounted boxes at this time. The cables need to be lugged and connected to the terminal strips using Figure 1 as a guide. Party and page line polarity must be maintained throughout the system. That is, all L1 parties must be tied together; all L2 parties, all L1 pages, and all L2 pages are likewise maintained.

Speaker lines must also be wiring observing polarity. Speaker 8 ohm ties to 8 ohm terminal and common ties to common terminal, etc. Polarity must be maintained for proper speaker phasing. If WI2916 is used, the black wire can be connected to the impedance tap and the white wire to common.

After the system is connected, any stations which require muting should be configured. Refer to the muting connection drawings.

### Step 5. Speaker Muting

If a speaker station is located near a handset station, it may be desirable to mute the speaker when paging on the local handset. This muting may be accomplished by interconnecting the handset station and speaker station as shown in Figure 3.

Where one speaker station is located near two or more handset stations, it may be desirable to mute the

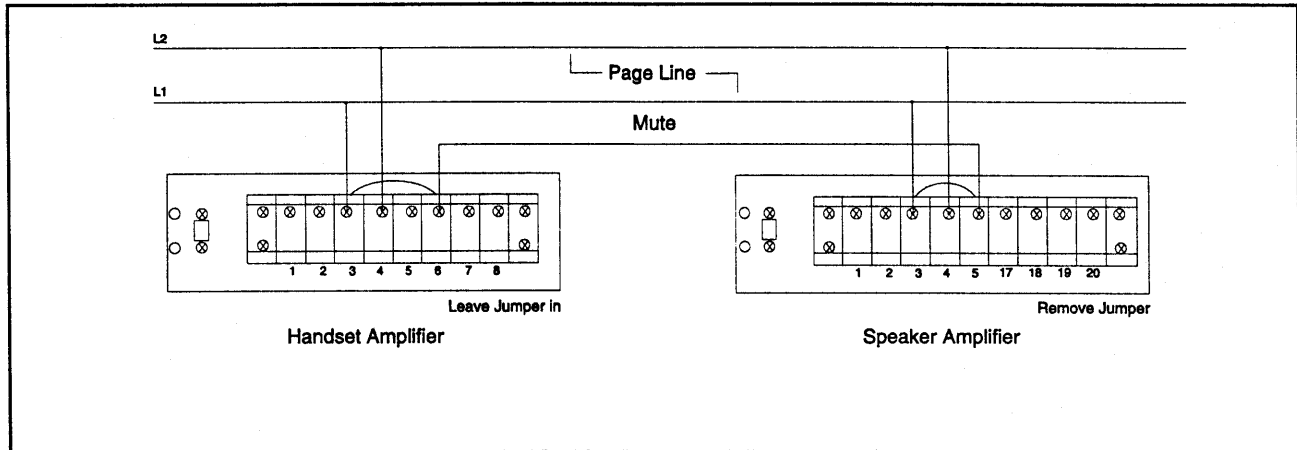


Figure 3. Single Station Muting

speaker when paging with either handset. This muting may be done by interconnecting the speaker and the handset station as shown in Figure 4.

### Step 6. Check-out/Start-up of System

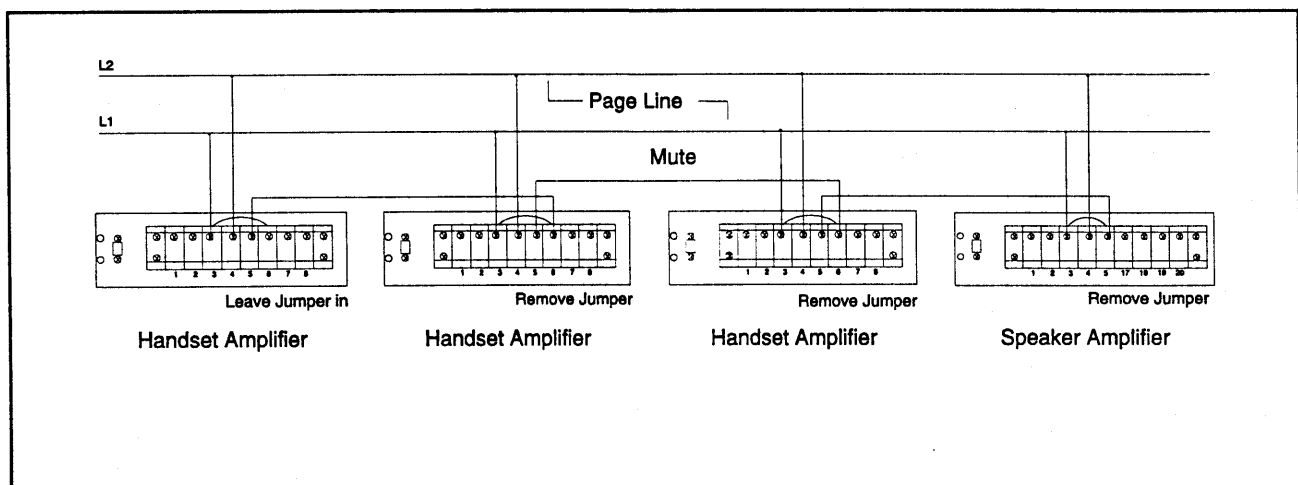


Figure 4. Multi-Station Muting

Cable Check-Out

After all station enclosures are mounted and terminated, it is time to perform the cable check-out. These tests can be performed only in Division 2 rated areas or unrated areas. Stations in Division 1 hazardous areas must be completely closed and sealed when power is applied.

The test listed below will be performed before any handset/speaker amplifiers or speaker/amplifiers are installed. The test below verifies proper wiring and power consumption by the Page/Party system.

Required tools and test equipment: Flat blade Screwdriver

VOM (Volt Ohm Meter), preferably analog. (Analog is preferred because the analog movement will integrate common mode noise to provide more accurate readings; it provides a lower input impedance (less than or equal to 20 Kohms/volt); and a high impedance digital VOM will tend to give false readings.

1. Locate a junction box which serves as a tie point between units. Do not disconnect any wires yet.
2. Set VOM to RX1 scale.
3. Read across page lines L1-L2. Reading should be approximately 15-115 ohms depending on the line balance potentiometer adjustment.
4. Read across party line L1-L2. Reading should be approximately 33 ohms.
5. Read from each side of the page line to ground. Reading should be 5K ohm or greater.
6. Read from each side of the party line to ground. The reading should be 5K ohm or greater.
7. Read from page line L1 to party line L1. The reading should be infinite.
8. Read from page line L1 to party line L2. The reading should be infinite.
9. Read from page line L2 to party line L1. The reading should be infinite.
10. Read from page line L2 to party line L2. The reading should be infinite.
11. If any of the measures above indicate a short, ground, or cross-wiring, the following steps can be followed to locate the fault.
  - a. Using a VOM on the RX1 scale, check various junction points of the system wiring to determine in which direction the fault is located.
  - b. The fault could be within a plug-in amplifier; however, most often, the fault is caused by improper terminations, small strands from improper lugging, or water leaking into the enclosures and junction boxes.

## Step 7. Final Installation

After the boxes have been installed and wired, the electronic units must be installed in their boxes. This is accomplished by simply plugging in the parts and tightening the screws. The only connection that does not plug in is the safety ground which must be installed separately. Reference Figure 2.

### Mounting of Line Balance Assembly

One Line Balance Assembly is required for each GAI-Tronics system. The function of the Line Balance Assembly is to properly load the page and party line circuits. There are three primary considerations in determining the locations: (1) it should be near the electrical center of the system; (2) it should be adjacent to an indoor station in a relatively quiet area; and (3) it should be no more than 5280 ft. (1600m) from the most distant station, when used with GAI-Tronics standard cable. For larger systems or when non-standard cable is used, please contact a GAI-Tronics representative for further information. The line balance assembly has one electrical adjustment that must be made while using a station (see Step 8. Station Adjustments).

The preferred mounting method is to suspend the assembly by one inch (1") conduit nipple (not supplied) from the lower side of an indoor station. One pair of twisted wires for the page circuit and one similar pair for each party line must be connected between the terminal blocks of the line balance assembly and the associated indoor wall station.

## Step 8. Station Adjustments

Ensure that all stations are connected properly and that all handsets are on hook (in their cradles). With power applied to the system, plug in the handset/speaker amplifiers and speaker/amplifiers one at a time. Applying power with all amplifiers installed can overload the system. Please note that this procedure may not be acceptable in a Division 2 area. Amplifiers in this type of area should be installed prior to applying power. These adjustments can be most easily performed by working with a partner who will remain at a fixed location. All of these adjustments can be accessed by removing the handset/speaker amplifier from the enclosure and turning the amplifier over. Each adjustment is clearly located and is adjusted using a small standard screwdriver.

### Handset Pre-amps

The screw-driver adjusted potentiometers are located on the printed circuit board mounted on the inside of the cover plate. MIC is the transmit level adjust potentiometer, RCVR is the receiver volume adjust potentiometer, and Receiver Sidetone is the station sidetone level adjust potentiometer. All the handset pre-amps have been adjusted before leaving the factory for correct output. Each system, however, may require a level adjustment due to system loading, and/or long cable runs. Party line level checks should read approximately .75 VRMS when whistling into a handset mic. Adjust the transmit level if the voltage is not correct from a station. Receiver volume will have to be adjusted according to the noise in the area and the preference of the user.

The Receiver Sidetone adjustment adjusts the amount of signal transmitted from the microphone to the receiver of a handset. Sidetone controls how loudly the station user hears his/her own voice through the handset to the earpiece.

### Speaker Amplifier

This is a screwdriver adjustment and is located on the D01B speaker amplifier module. A nameplate on the front panel indicates the location of the adjustment. The speaker amplifiers are normally adjusted at the factory for approximately half output with a normal voice input.

The output will have to be adjusted to suit conditions in the area. Maximum output is 9.8V with an 8 ohm speaker. If maximum output is desired, whistle into a handset and set the output for approximately 9V for an 8 ohm speaker. These levels are maximum speaker amplifier outputs. Exact requirements will vary according to personnel using the system as well as ambient noise levels.

**Line Balance Assembly Adjustment**

While making a page in the page mode, adjust line balance potentiometer for minimum handset receiver sidetone. This adjustment should be readjusted if more than 10 speaker amplifiers are added or deleted from the system.

**Section 3. Operation****Single-Page/Single-Party Line System Operation**

1. Listen in the receiver to determine if the party line channel is in use.
2. If the system is not in use, press the "page" bar switch on the handset and page the desired party. Then release the "page" bar switch which disconnects the "page" circuit and connects the party line channel. Speak directly into the handset transmitter at all times.
3. When the page is heard, the called party removes the handset from the nearest station and is now in direct contact with the caller.
4. While two or more persons are talking on the party line channel, the page channel is free for use. Simultaneous conversations on the page and the party line channel will not interfere with one another since they are completely separate circuits. A conversation taking place on the page channel will be broadcast over all loudspeakers.
5. A muting system is available for loudspeakers to eliminate acoustical feedback in the handset transmitter element.
6. If emergency communications are required, both the page and the party line channels can be interrupted to communicate information or instructions.

**Single-Page/Multi-Party Line System Operation**

1. To use a multi-party system, remove the handset from its cradle and select a party line channel that is not in use.
2. Then page the desired individual and specify which party line channel the individual should respond on; for example, "John Smith, party line 2."
3. The called individual then selects the party line channel requested and conversation can begin with the calling party. The multi-party line channel system allows several simultaneous conversations without interference between channels.

## SPECIFICATIONS

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### Overall

Power Requirements.....	105-130 Volts/50/60 Hz. No signal; 3 watts, 4 volt amperes, max. signal 30 watts, 35 volt amperes
Temperature Range .....	Operable from -30 to +70C
Finish .....	Gray enamel or stainless steel
Line Balance Unit .....	one per system, model 305-001 (replaced 5800)

### Module Specifications: Handset Assembly

Handle and Caps.....	Black cyclolac. Page switch on handle
Transmitter .....	10 ohms; pressure differential noise-canceling dynamic
Receiver .....	130 ohms; high efficiency dynamic
Handset Cord .....	6 conductor PVC cord retractable; 20 ft. length

### Transmitter Pre-Amplifier: WBA4254

Output.....	1.5V RMS (minimum) into 33 ohms
Input Sensitivity	Less than 1 mv for rated output
Input Impedance.....	100 ohms @ 1,000Hz
Gain.....	68dB (minimum)
Distortion .....	2% THD maximum, 1,000Hz, rated output
Frequency Response .....	250 to 6,500 Hz +/- 1.5dB
Noise Level.....	60dB below rated output
Current Drain.....	Party: 35 mA maximum @ 24VDC, Page: 55mA maximum @ 24 VDC
Controls .....	Transmitter level, receiver volume, sidetone adjustments
Supply Voltage .....	24VDC +/- 20%
Sidetone Rejection .....	20dB (minimum) below rated output
Output Impedance.....	33 ohms
Line Loading .....	9 units off hook will reduce level less than 3dB

### Loudspeaker Amplifier, Module D01B

Output.....	Push-Pull: Class B: 12 watts into 8 ohm or 16 ohm load
Gain.....	57 dB
Frequency Response .....	250 Hz to 9,000 Hz
Distortion .....	Less than 0.25% THD at 12 watts, 1000 Hz
Input Impedance.....	21,000 ohms bridging input (min)
Output Impedance.....	Taps for 8 or 16 ohm voice coil
Controls .....	Speaker volume adjustment
Regulation .....	Less than 1 dB

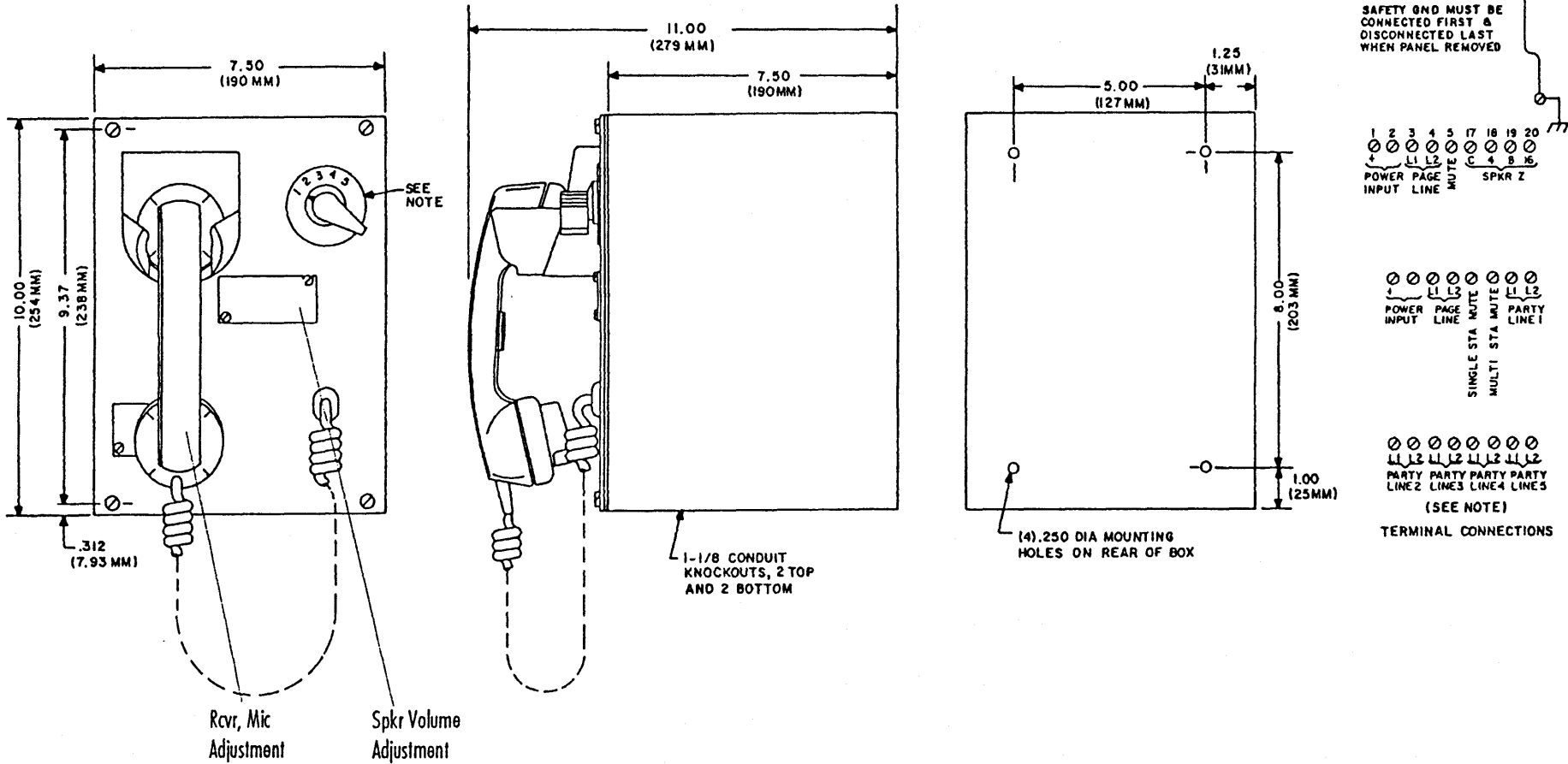
### Power Supply, Module C01B

Input Voltage .....	105-130 volts AC; 35 volt amperes
Fuse .....	1/2 ampere SLO BLO

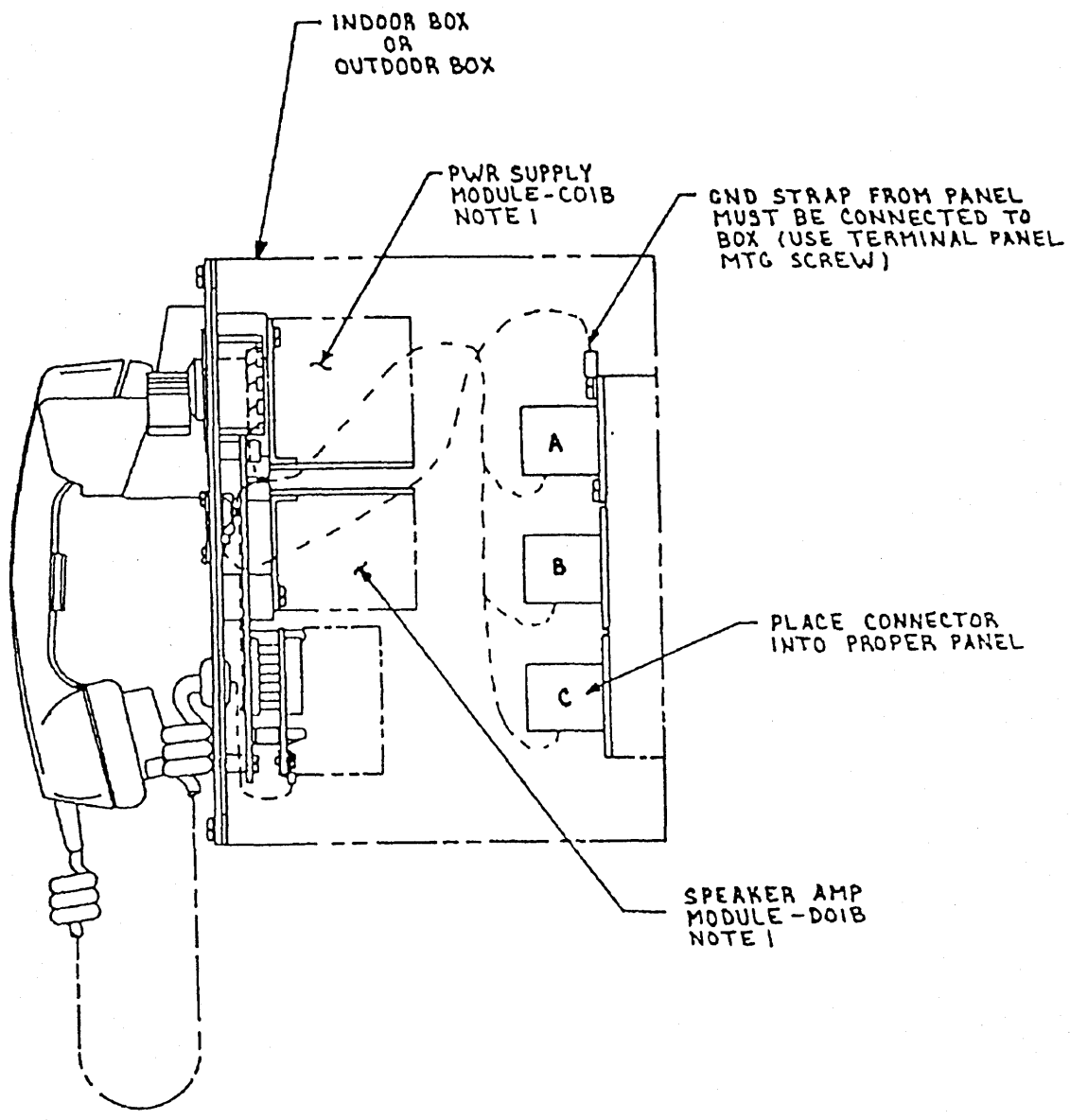
### Cable Specifications

60038-101 (replaced WI2905 and WI2912) .....	8 conductor
60029-101 (replaced WI2913).....	16 conductor
WI2916 .....	Twisted heavy duty pair

Figure 1. Mounting Dimensions and Terminal Connections



NOTE: THIS UNIT CAN BE SUPPLIED AS EITHER A SINGLE PARTY STATION (WITHOUT SELECTOR SWITCH & ASSOC TERM CONNECTIONS) OR AS A 5 PARTY STATION.



SIDE VIEW  
 (W/ INDOOR BOX OUTLINED)

Figure 2. Installation Details

## UNITIZED AUDIO MODULAR 65 & 70 SERIES REPLACEMENT PARTS LIST

Front Panels/Handset Amplifiers Replaced by GAI - Tronics Part Number		UA2696 **	UA2698 **	UA2732 H93041	UA2734 H93042	UA2690 H93045	UA2691 H93045	UA2697 H93043	UA2699 H94044	UA2750 H93047	UA2755 H93046	UA2763 H93046
RPL PART #	DESCRIPTION											
CH3081	ENCL CONN PANEL, SPKR AMP	X	X			X	X	X	X			
CH3083	ENCL CONN PANEL, HANDSET AMP		X		X				X			
CN2972	CONN ASSY SPKR AMP	X	X	X	X	X	X	X	X			X
CN2840	CABLE ASSY		X		X				X			
* MC2708	GROMMET	X		X	X			X	X		X	
* 12564-001	KNOB (replaced KN2552)		X		X				X			
* MI2999	DYN HS W/PAGE SW, BLK, 5FT	X	X	X	X			X	X		X	X
* 13204-001-00	RECEIVER CAP (replaced MI2776)	X	X	X	X			X	X		X	X
* MI2976	RECEIVER ELEMENT	X	X	X	X			X	X		X	X
MI2784	CLEANABLE MICROPHONE CAP	X	X	X	X			X	X		X	X
* MI2785	CLEANABLE MICROPHONE ELEMENT	X	X	X	X			X	X		X	X
* 13203-002	MICORPHONE CAP (replaced MI2998)	X	X	X	X			X	X		X	X
MI2999	HANDSET ASSY, 6FT COIL CORD	X	X	X	X			X	X		X	X
MI3000	HANDSET ASSY, 20FT COIL CORD	X	X	X	X			X	X		X	X
* MI3003	MICROPHONE ELEMENT	X	X	X	X			X	X		X	X
MO3400-B	HANDSET CRADLE	X	X	X	X			X	X		X	X
* WI2885A	6 COND PVC BLK COIL CORD, 6FT	X	X	X	X			X	X		X	X
WI2886A	6 COND PVC BLK COIL CORD, 20FT	X	X	X	X			X	X		X	X
RFP7061-001	6 COND NEO CC, 6FT (replaced WI2720)	X	X	X	X			X	X		X	X
WI2730	6 COND NEOPRENE COIL CORD, 20FT	X	X	X	X			X	X		X	X
* SW2779	HOOK SWITCH ASSY FOR MO3400	X	X	X	X				X		X	X
51008-005	BAR SWITCH ASSY, ASH (replaced SW3170)	X	X	X	X				X		X	X
WBA3986	SPKR AMP MOTHER BD					X	X					
WBA3988	HS AMP MOTHER BD			X	X							
WBA3996	DUAL STAT MOTHER BD	X	X					X	X			
WBA4017	DUAL STAT MOTHER BD											X
WBA4018	HS AMP STAT MOTHER BD										X	
WBA4019	SPKR AMP STAT MOTHER BD									X		
WBA4254	HANDSET AMPLIFIER BD ASSY	X	X	X	X			X	X		X	X

\* Parts Common With Femco Call/Talk 5000 Series.

\*\* Original part numbers remain available with the P20B handset option.

**Note:**

The replacement parts listed in the left column are for Front Panels and Handset Amplifiers used in 65 & 70 Series Unitized Audio Models. The Models also use parts C01B or WBA3978 power supplies and D01B speaker amplifier. These parts are also considered replacement parts and are used in conjunction with the front panels and handset amplifiers listed above.

The following handset options were available for Handset Amplifier Models UA2372, UA2374, UA2696, UA2697, UA2698, UA2699, UA2755, UA2763. When ordering replacement parts for Handset Amplifiers, please identify the original handset option purchased and use the chart below to identify the appropriate replacement part.

**For Reference Only:**

HANDSET ASSEMBLIES		REPLACEMENT PARTS			
OPTIONS AVAILABLE		HNDL +	XMTR CAP	XMTR	CORD
P5B	- 5' PVC COIL CORD (CC)	13201-009	13203-002	MI3003	WI2885A
P20B	- 20' PVC CC	13201-009	13203-002	MI3003	WI2886A
N5B	- 5' NEOPRENE CC	MI3005	13203-002	MI3003	WI2720
N20B	- 20' NEOPRENE CC	MI3005	13203-002	MI3003	WI2730
***P5F	- 5' PVC CC W/CLEANABLE MIC	13201-009	MI2784	MI2785	WI2885A
***P20F	- 20' PVC CC W/CLEANABLE MIC	13201-009	MI2784	MI2785	WI2886A
N5F	- 5' NEOPRENE CC W/CLEANABLE MIC	MI3005	MI2784	MI2785	WI2720
N20F	- 20' NEOPRENE CC W/CLEANABLE MIC	MI3005	MI2784	MI2785	WI2730

\*\*\* Replaced by Cleanable Mic Kit 12511-002.

+ Currently unavailable

# Warranty

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Equipment. GAI-Tronics warrants for a period of one (1) year from the date of shipment, that any GAI-Tronics equipment supplied hereunder shall be free of defects in material and workmanship, shall comply with the then-current product specifications and product literature, and if applicable, shall be fit for the purpose specified in the agreed upon quotation or proposal document. If (a) Seller's goods prove to be defective in workmanship and/or material under normal and proper usage, or unfit for the purpose specified and agreed upon, and (b) Buyer's claim is made within the warranty period set forth above, Buyer may return such goods to GAI-Tronics nearest depot repair facility, freight prepaid, at which time they will be repaired or replaced, at Seller's option, without charge to Buyer. Repair or replacement shall be Buyer's sole and exclusive remedy. The warranty period on any repaired or replacement equipment shall be the greater of the ninety (90) day repair warranty or one (1) year from the date the original equipment was shipped. In no event shall GAI-Tronics warranty obligations with respect to equipment exceed 100% of the total cost of the equipment supplied hereunder. Buyer may also be entitled to the manufacturer's warranty on any third-party goods supplied by GAI-Tronics hereunder. The applicability of any such third-party warranty will be determined by GAI-Tronics.

Services. Any services GAI-Tronics provides hereunder, whether directly or through subcontractors, shall be performed in accordance with the standard of care with which such services are normally provided in the industry. If the services fail to meet the applicable industry standard, GAI-Tronics will re-perform such services at no cost to buyer to correct said deficiency to Company's satisfaction provided any and all issues are identified prior to the demobilization of the Contractor's personnel from the work site. Re-performance of services shall be Buyer's sole and exclusive remedy, and in no event shall GAI-Tronics warranty obligations with respect to services exceed 100% of the total cost of the services provided hereunder.

Warranty Periods. Every claim by Buyer alleging a defect in the goods and/or services provided hereunder shall be deemed waived unless such claim is made in writing within the applicable warranty periods as set forth above. Provided, however, that if the defect complained of is latent and not discoverable within the above warranty periods, every claim arising on account of such latent defect shall be deemed waived unless it is made in writing within a reasonable time after such latent defect is or should have been discovered by Buyer.

Limitations / Exclusions. The warranties herein shall not apply to, and GAI-Tronics shall not be responsible for, any damage to the goods or failure of the services supplied hereunder, to the extent caused by Buyer's neglect, failure to follow operational and maintenance procedures provided with the equipment, or the use of technicians not specifically authorized by GAI-Tronics to maintain or service the equipment. **THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES AND REMEDIES, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

## Return Policy

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If the equipment requires service, contact your Regional Service Center for a return authorization number (RA#). Equipment should be shipped prepaid to GAI-Tronics with a return authorization number and a purchase order number. If the equipment is under warranty, repairs or a replacement will be made in accordance with the warranty policy set forth above. Please include a written explanation of all defects to assist our technicians in their troubleshooting efforts.

Call 800-492-1212 (inside the USA) or 610-777-1374 (outside the USA) for help identifying the Regional Service Center closest to you.