Mobile Communications

C3 MAESTRO
CONSOLE SYSTEM

TABLE OF CONTENTS

Maintenance Manual

Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

Printed in U.S.A

LBI-38715

TABLE OF CONTENTS

SPECIFICATIONS

OPERATING VOLTAGE — 115 or 230 volts AC selectable, 47/63 Hz

TEMPERATURE RANGE — 0°F to 75°F

DIMENSIONS (H x W x D)

Audio Tower	18" x 6.5" x 15"
Remote Volume Controller Box	2.25" x 12" x 13"

WEIGHT

Audio Tower	27 lbs.
Remote Volume Controller Box	8 lbs.

INPUT SPECIFICATIONS

Headset Inputs

"SUPR MIC HI" and "OPR MIC HI"	Inputs for two carbon (simulated carbon) telephone-style headset microphones similar to Plantronics Model HS-0309-1 or equivalent. DC bias present (3 Vdc for 50 ohms).

Desk Microphone Input

"DESK MIC HI"	Input for an electret-type microphone similar to Ericsson GE DWG 19C851086P10, 11. DC bias present (3.5 Vdc for 1000 ohms).

Boom/Gooseneck Microphone Input

"B/G MIC HI"	High impedance input for a dynamic microphone similar to Shure Bros. Model VR300 (Ericsson GE DWG 19C337100).

Call Director Input

"CD MIC HI"	Unbalanced input designed to accept inputs from a call-director device similar to Plant Equipment Model 3780-L1-TT-010.

Page Tone Input

"PAGERINPUT HI"	Unbalanced input designed to accept inputs from a tone source.

Line (RJ11) Inputs

LINE A LINE B	Two balanced 2-wire inputs designed to receive voice bandwidth and analog audio from a conventional 4-wire, 600-ohm, twisted-pair transmission system.

PTT and Sense Inputs — Inputs used for detection of "dry-contact" switch closures of the type found in common push-to-talk microphones, foot-switches, and headset jacks.

Digital Inputs — "Generic" digital inputs designed to allow signaling to the computer (via the Logic Board) from external hardware.

OUTPUT SPECIFICATIONS

Line (RJ11) Outputs: LINE A LINE B	Two balanced 2-wire outputs designed to transmit voice bandwidth and analog audio to a conventional 4-wire, 600-ohm, twisted-pair transmission system.

Headset Receiver Outputs

"OPR RCVR HI" and "SUPR RCVR HI"	Analog audio outputs for two telephone-style headset earphones similar to Plantronics Model HS0309-1 or equivalent.

Speaker Outputs

Speaker A and Speaker B	Audio power amplifier outputs designed to drive compatible speakers (3.2-16 ohm) to room-filling audio levels.

Select Recorder/Unselect Recorder Output

"SEL RCDR HI" or "USEL RCDR HI"	Unbalanced audio output designed to connect to the audio input of a recording device.

Relay Outputs — Outputs consisting of a single pair of "dry" relay contacts isolated from all other signals or ground potential.

LBI-38715

SYSTEM DESCRIPTION

The Ericsson GE C3 Maestro Console System is a dispatch console system which provides common dispatcher features on a PC-AT platform. A display on the PC's video monitor replaces the conventional array of controls. A cabinet (the Audio Tower) contains the switching system. A remote Volume Controller Box (VCB) enables the dispatcher to control the output volume levels directed to the speakers (see Figure 1).

The C3 Maestro enables the dispatcher to use headsets, microphones, and a variety of external inputs. It supports 600-ohm balanced audio inputs and outputs. The C3 Maestro allows operation with 2 headsets: an operator headset and a supervisor headset. The C3 Maestro also allows the use of 2 microphones: a desk microphone and a boom or gooseneck microphone. Software and jack sense circuitry determine which of the inputs are active. Push-to-talk (PTT) capability is provided either in the headset jack, microphone jack, screw terminal jack, or an internal VOX (for Call Director).

The C3 Maestro also provides for 2 normally open relay contacts (NO) and 2 digital inputs on each active circuit board. This results in a total of 6 relay contacts and 6 digital inputs on a 4 speaker system. Recorder outputs are provided for use with external recorders.

The C3 Maestro consists of:

- a PC (with a Logic Board)
- a video monitor
- a dispatcher keyboard
- an Audio Tower
- a remote Volume Controller Box
- a set of speakers.

The C3 Maestro Audio Tower contains:

- up to two PA Boards (in a 4 speaker system)
- the Matrix Board
- the I/O Board.

The remote Volume Controller Box contains the Volume Controller Board.

The following is a detailed description of how the C3 Maestro main components work together.

The C3 Maestro is a complete dispatching system designed to be connected to Ericsson GE PST Trunking systems. The PC is connected to the Central Electronic Controller (CEC) by an RS-232 communications line.

The PC has a specialized program which enables the dispatcher to monitor and control a large number of radio links. The PC's video monitor displays graphic representations of the radio links which are currently being controlled by the dispatcher.

Through the use of the keyboard, PC hardware, and PC software, the dispatcher can issue commands to the Audio Tower, which interconnects the appropriate signal lines. All signal interfaces and switching logic are housed in the Audio Tower. The Audio Tower controls the C3 Maestro audio lines and the VCB. In most cases, ther Logic Board will make audio switching decisions without PC intervention.

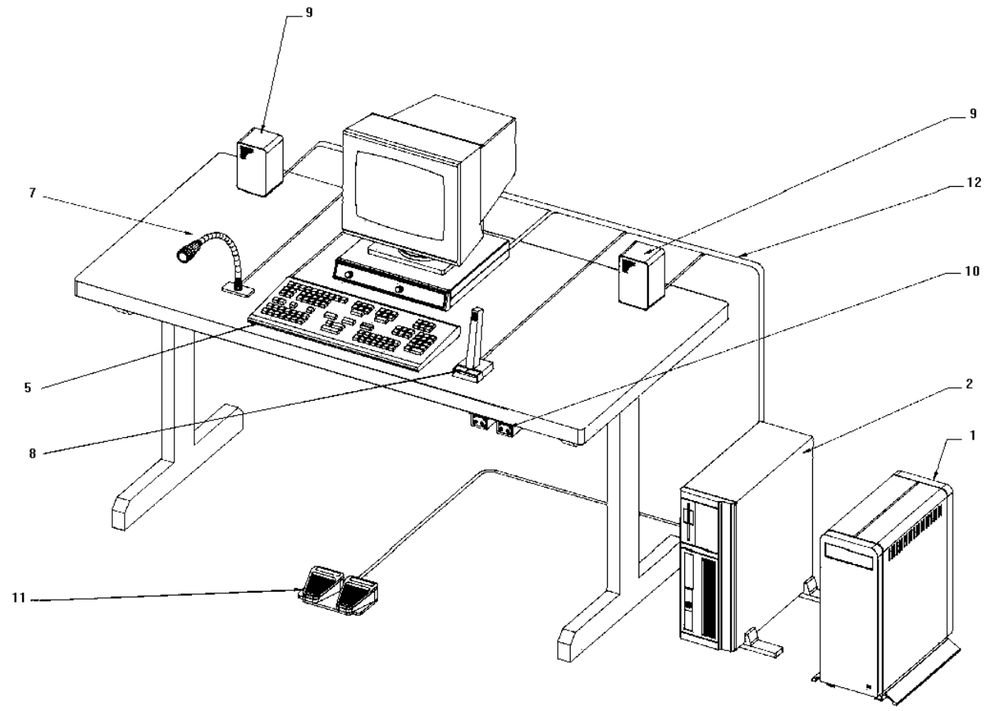
The PC controls the Audio Tower's functions through the 37-pin control cable, which provides a parallel interface. Switching signals are sent through the control cable only when an event, such as PTT, occurs. Other than PTT and the VU meter DC voltage, the control cable is idle most of the time. In addition, the electronics in the Audio Tower generate no clock signals and contain on oscillators. Therefore, the C3 Maestro will not be a source of signals to be received by other equipment.

When in use, the Central Electronics Controller (CEC) sends information over the communications link to the PC about calls that are currently active. The PC updates its video monitor to reflect the status of active links. The Audio Tower sends any PTT or jack sense information to the PC. The PC sends PTT request information to the CEC. The CEC then routes the incoming audio from the Audio Tower to the appropriate channel.

When the Audio Tower detects a change in jack sense information, it selects the appropriate microphone and speaker/headset input/outputs via the matrix switches, without need for PC intervention.

Normally, audio from the CEC consists of 2 channels: "Select" and "Unselect". The "Select" audio channel is associated with the dispatchers primary, or selected, group. The "Unselect" audio channel receives audio from the dispatcher's unselected groups.

The VCB contains the volume controls for the speakers connected to the Audio Tower. Normally there are two volume controls: one "Select" and one "Unselect."



NOTE: FURNITURE NOT SUPPLIED AS PART OF SYSTEM.

ITEM	DESCRIPTION	PART NUMBER		QTY.
15				
14				
13				
12	INTERFACE CABLES	5050006000		
11	FOOTSWITCH		19C337094P4	1
10	OPERATOR/SUPERVISOR HEADSET JACKS		19A705762G1	2
9	LOUDSPEAKER	3660011000		2
8	DESK MICROPHONE			1
7	GOOSENECK MICROPHONE		19B235093G1	1
6	PC KEYBOARD			1
5	SYSTEM KEYBOARD	7590148000		1
4	VOLUME CONTROL BOX	5050008000		1
3	CRT MONITOR			1
2	COMPUTER	505009000		1
1	AUDIO TOWER UNIT	5050011000		1

Figure 1 - C3 Maestro Console System

LBI-38715

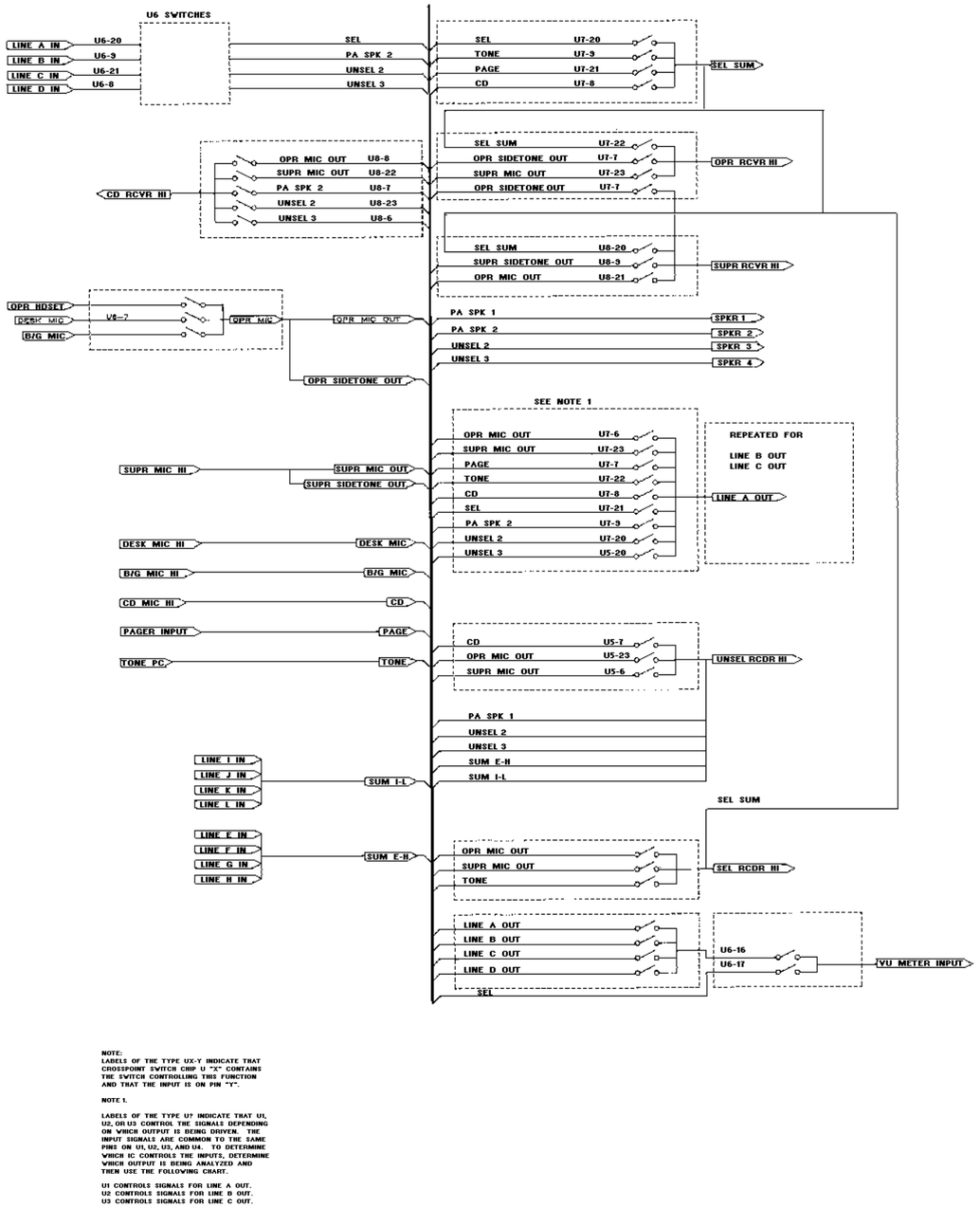


Figure 2 - System I/O Diagram
(This diagram shows the possible audio paths in the system)

OPERATING PROCEDURES

The following procedures are condensed instructions intended for use when installing the C3 Maestro. Refer to the Operator's Manual for more detailed operating instructions.

CABLING

The following links must be established to install the C3 Maestro properly:

- PC-to-Audio Tower
- PC-to-dispatcher keyboard
- PC-to-CEC
- Audio Tower-to-VCB
- Audio Tower-to-Speakers
- Audio Tower-to-Mic.
- Audio Tower-to-Footswitch

Internal cables are provided for the PA Board-to-"SPREADER BOARD" link.

The following are detailed instructions for cabling the C3 Maestro. (Refer to the System Interconnection Diagram and Audio Tower Rear Panel Diagram.)

PERSONAL COMPUTER (PC)

Connect the PC video board to the video monitor using the video monitor to computer cable.

Connect the PC keyboard to the standard keyboard jack on the back of the PC. The Logic Board, which has a DB37 jack and a 4-pin jack for the dispatcher keyboard, is installed as an expansion board in one of the ISA expansion slots in the PC. Connect the DB cable to the DB37 jack. Plug the 4-pin connector from the dispatcher keyboard into the 4-pin jack on the Logic Board. Note that the connector is keyed. The red dot on the 4-pin jack should be aligned with the red dot on the 4-pin cable plug. The 4-pin cable plug will latch in place. To remove the 4-pin cable, pull on the sleeve. Pulling on the 4-pin cable will not free the latch and may damage the cable if excessive force is used.

Connect the CEC cable to the "COM1" port on the "mother board" of the PC. Make the appropriate connection and fasten all connectors in place. Internal wiring of this DB-25 connector will determine whether RS-232 or RS-422 is used for the link.

AC power cables for both the video monitor and the PC are provided. Connect the AC power cables to their respective connectors located on the rear chassis, but do not connect them to the mains power at this point.

AUDIO TOWER

Verify that the circuit boards are installed properly. From the back of the Audio Tower with the door open, you can see the boards in the board cage. From left to right, they are: the I/O Board, the Matrix Board, the PA Board, and a blank panel. There will be an additional PA Board in place of the blank panel if the console is configured for 4 speakers.

The backplane connectors are designed to prevent boards from being inserted into incorrect slots.

Verify that all boards are installed properly and that the screws holding them in place are completely tightened. Connect the DB37 cable from the PC to the DB37 jack on the Matrix Board. Disconnect the removable screw terminals for the speakers that are located on the PA Board and connect the speaker wires to the terminals. Reconnect the screw terminals to the PA Board, route the speaker leads to the correct location and connect the leads to the appropriate speaker (Select or Unselect). The upper pair of terminals is for the "Select" channel and the lower pair of terminals is for "Unselect". Speakers are normally located with one speaker on each side of the video monitor for ease of use.

Connect the DB15 cable to the back of the VCB. The VCB may be located under the video monitor or anywhere else that is convenient. Route the other end of the DB15 cable as needed and connect it to the DB15 jack labeled "Volume Controller" on the back of the Audio Tower. Connect the 12" DB9 cable from the DB9 jack labeled "PA Volume" on the first PA Board (adjacent to the Matrix Board) to the bottom DB9 jack (labeled "A") on the back of the Audio Tower. If you have a second PA Board, its "PA Volume" DB9 is cabled to the top DB9 connector (labeled "B") on the back of the Audio Tower. For the CEC remote audio input/output connections, use the RJ11 jacks on the PA Board. The top RJ11 jack (labeled "Line B") is for the "Unselect" audio (in and out). Consult the wiring diagram in the Maintenance Section to verify connections within the RJ11 plug.

To use a Boom, Gooseneck, or other dynamic microphone, connect it to the DB9 jack marked "B/G MIC" on the Matrix Board. Care must be taken to avoid connecting a magnetic microphone to the wrong jack otherwise damage may occur to the microphone.

If you have an electret-type Desktop Microphone, connect it to the jack marked "Desk Mic" on the Matrix Board.

Headset connections for Operator and Supervisor are also provided on the Matrix Board. Please refer to the wiring diagram in the Maintenance Section to verify correct connections before attempting to connect these devices.

LBI-38715

To use an adapter box which converts an Audio Tower DB9 headset connection to a "Bantam" jack box, please consult vendor information before connecting headsets.

Footswitches used to enable specific PTT and monitor functions may be connected at the I/O Board. Consult the wiring diagram in the Maintenance Section to verify connections before using them.

Removable screw terminals are provided for "Select" and "Unselect" recorder connections.

Removable screw terminals are also provided for the "B/G PTT" and "Desk PTT" circuits. You can use these terminals instead of the DB9 Footswitch jacks if desired, since the terminals are wired directly to the connections in the respective DB9 Footswitch jacks.

To use a Paging encoder input, connect it to the removable screw terminals provided. To use a Call Director input/output, consult the wiring diagram in the Maintenance Section and use the DB9 connector provided on the I/O Board. (NOTE: Use of a call director may require use of external transformers "in-line" with the call director I/O. All matrix board revisions require external "in-line" transformers).

Connect the power cable to the Audio Tower but do not connect it to line power yet.

CONTROLS

The On/Off switch is the only control device on the Audio Tower. A LED power indicator on the front panel and also on the back panel, indicate that the Audio Tower is on.

The PC has a single On/Off switch, as does the video monitor.

USING THE SYSTEM

With all of the separate components correctly cabled, connect the power cables to AC power mains.

Set the volume controls on the VCB at midpoint.

Power up the Audio Tower first to ensure that it is ready to receive the initialization commands from the PC. Next, power up the PC.

NOTE: The CCS software must already be loaded onto the PC for the system to function. Please refer to the Installation Manual for instructions on loading the C3 Maestro software onto the PC.

After a few seconds you should hear a short tone in the "Select" speaker. The tone signals that the PC software, Logic Board, Matrix Board, PA Board, and all links are working. If you do not hear the tone, check the volume controls and cycle the power to the PC off and on.

As the software on the PC initializes, a second tone will be heard and a partitioned screen appears on the video monitor. If communications cannot be established between the PC and the CEC, a "COMM ERROR:CIM Link Down" message is displayed. If this occurs, check the PC to CEC cable.

Note the large clock display in the lower right corner. Also note the 2 rows of 7 modules. These modules represent the entities (groups, units, etc.) that the dispatcher may program into the console. Consult the USER'S MANUAL for module programming instructions.

Using the dispatcher keyboard, the dispatcher can "Select" the desired module. The "Select" entity is then highlighted on the video monitor, and any audio received is sent to the "Select" speaker. Other audio received is sent to the "Unselect" speaker. Each speaker has its own volume control on the VCB.

Microphones or Headset/footswitches connected to the Audio Tower have their audio signals routed to the correct channel when their respective PTT is activated. When a channel is granted, the video monitor is updated to reflect the PTT's active status.

SPREADER BOARD

The Spreader Board is basically a "Y" cable adapter. It merges the signals from the PA board (s) into a single DB15 cable and connects to the Remote Volume Controller. Additionally it has a power jack to supply 15 Vdc for external devices and a LED which indicates that the chassis is powered up.

CONSOLE PROGRAM INSTALLATION DATA

SOFTWARE INSTALLATION

The DG Dasher 386SX-20 should be set up with the following directories and files:

Subdirectory

C:\Files:

autoexec.bat
config.sys
command.com (MS-DOS V3.30)
io.sys (MSW-DOS V3.30 - hidden)
msdos.sys (MS-DOS V3.30 - hidden)

Directories

DOS (MS-DOS V3.30)
CONSOLE
UTIL

Autoexec.bat

Contents of the **AUTOEXEC.BAT** file are:

```
path=c:\dos;c:\util
prompt $p$g
cd\console
conkey
console
```

Config.sys

Contents of the **CONFIG.SYS** file are:

```
Files=20
Buffers=25
device=c:\dos\ansi.sys
```

Contents of the **CONSOLE** directory will be supplied by Ericsson GE to Vendor with each release of the C3 Maestro Console software. Vendor will ensure that the newest release of the C3 Maestro console software, in their possession, will be placed on each unit delivered. Contents of the console directory are:

altkbd.dat
config.dat
conkey.com
console.exe
editor.exe
entity.dat
font33.dat
shift.dat

UTIL Directory

Contents of the **UTIL** directory should be empty.

EPROMS Files

In addition to files located on the DG Dasher 386SX-20 hard drive, a **CLB.HEX** file is required to program the EPROM located on the Console Logic Board. This file will be supplied by Ericsson GE to vendor with each release of CLB firmware. Vendor will ensure that the newest release CLB firmware in their possession will be placed on each unit delivered. Furthermore, the CLB firmware release number and checksum must be properly located on the EPROM labels supplied by Ericsson GE.

SYSTEM TEST

Listed below are test procedures for a complete C3 Maestro Console system. In case of problems, refer to the same item number in the **"PROBLEM RESOLUTION"** section.

Required tools: Oscilloscope, DVM, Audio signal source, test leads, Complete PC with Logic Board, Complete Audio Tower with I/O Board, Matrix Board, and PA Board installed, Complete VCB, "CTEST" test software diskette, Matrix Extender Board, PA Extender Board.

Setup procedure:

- Assemble and cable the Audio Tower and PC as described in the "Cabling" section.
- Cable the VCB to the Audio Tower.
- Cable the speakers to the removable screw terminals on the PA Board and install the screw terminals to the PA Board.
- Power up the Audio Tower, and then power up the PC.
- When the PC has finished booting up, insert the "CTEST" software diskette into the diskette drive and close the latch.
- From the PC keyboard type the command:

A:CTEST

and press the <Enter> key. A complete screen should appear which displays the following message at the top of the screen:

"Console Logic Board detected version x.xx "

You are now ready to test the functionality of the complete system.

Test procedures:

1. LINE A to Speaker B

- Using an RJ11 plug and the audio signal source, input a measured 2.2-volt (0.1) peak-to-peak 1 kHz sine wave into pins 2 and 5 of the 6-pin plug.
- Insert the plug into the top RJ11 jack on the PA Board.
- Measure and adjust the level of the signal as the PA Board places a 600-ohm load on its inputs.
- Adjust both volume controls on the VCB to the midpoint.
- From the keyboard type the command:

X6741

and press the Enter key. You should hear a tone in the speaker controlled by the right-most volume control knob.

- Adjust the volume up and down.
- When you have determined that both the input and the speaker work satisfactorily, type the command:

X6740

and press the Enter key. The tone should stop.

2. LINE A to Speaker A

- Type the following commands, making sure to press the Enter key after each command:

X6771
X7771
X8731

You should hear a tone in the speaker controlled by the left-most volume knob.

- Adjust the volume up and down.
- When you have determined that both the input and the speaker work satisfactorily, type the following commands, making sure to press the Enter key after each command:

X6770
X7770
X8731

- You have just tested the Line A input and switched it to both speakers. You have also tested:

1. The amplifiers on the PA Board
2. The VCB and its cabling
3. The PC with a Logic Board and its ability to control the switches on the Matrix Board.

3. LINE B To Speaker B

- Remove the RJ11 plug from the top RJ11 jack on the PA Board and insert it into the other RJ11 jack.
- Type the command:

X6641

and press the Enter key. You should hear a tone in the speaker controlled by the right-most volume knob.

- Adjust the volume up and down.
- When you have determined that both the input and the speaker work satisfactorily, type the command:

X6640

and press the Enter key. The tone should stop.

- Type the following commands, making sure to press the Enter key after each command:

X6671
X7771
X8371

4. **LINE B To Speaker A**

- You should hear a tone in the speaker controlled by the left-most volume knob. Adjust the volume up and down.
- When you have determined that both the input and the speaker work satisfactorily, type the following commands, making sure to press the Enter key after each command:

X6670
X7770
X8730

The tone should stop.

- You have just tested the LINE B input and switched it to both speakers.

This completes the system test.

PROBLEM RESOLUTION

Use the following procedures for problem resolution:

1. LINE A To Speaker B

- Power down the Audio Tower.
- Remove the PA Board from the board cage.
- Verify that the jumpers on the PA Board are in the "A" position. If they are not, set them in the "A" position and return to the regular test procedure to test again.
- Insert the PA Extender Board into the PA Board slot.
- Insert the PA Board into the connector on the edge of the PA Extender Board.
- Power up the Audio Tower.
- Using the oscilloscope, observe the signal at BR5, pins 1 and 3. If no signal is present, the problem is probably with the RJ11 jack or the plug. If the signal is present, trace it from beginning to end until the problem is found.
- Check for signal at U9, pin 12, 13. If no signal is found, the problem is in bridge BR1, T1, or the resistors between them.
- Connect the ground lead to ground on the board. Check for signal at U9, pin 14. Then check for signal at U9, pin 8. If signal is found at U9, pin 8, the problem is not on the input side of the PA Board.
- Check for signal at U5, pin 13. If signal is found, check for signal at U5, pin 12. If no signal is found, the problem may be with the VCB Box or the cable to it.
- Check for DC voltage at U5, pin 16. If the voltage is less than 1 volt DC even with the volume controls at maximum, the problem is in the VCB or its cables and connectors. If DC is present, U5 may be defective. If signal is found, check for signal at U8, pin 12.
- Check U8, pin 14. This is the final input to the amplifier. If signal is found there, either the amplifiers are defective or the speakers and their leads are suspect.
- If no signal was found at U5, pin 13, power down the Audio Tower. Remove the PA Board and the PA Extender Board from the board cage. Replace the PA Board in its slot. Remove the Matrix Board and place the Matrix Extender Board in its slot. Insert the Matrix Board into the connector on the edge of the Matrix Extender Board.
- Power up the Audio Tower.
- Connect the Oscilloscope ground lead to any ground on the Matrix Board. Look for signal at U6, pin 20. This is the input to the matrix. If no signal is detected, the problem is in the backplane or its sockets. If signal is present, connect the scope lead to U6, pin 14. There should be no signal present.
- From the PC keyboard type the command:

X6741

and press the Enter key. Signal should now be present. If no signal is seen, the matrix is not working or the cable from the PC to the Audio Tower is defective. In either case, the system is not functional.

- Repeat the procedure with a known functional cable and PC system. If the problem is still present, the decoder logic or address lines of the Matrix Board are defective. The problem may be with the backplane.

2. LINE A To Speaker A

- Power down the Audio Tower.
- Remove the PA Board from the board cage.
- Verify that the jumpers on the PA Board are in the "A" position. If they are not, set them in the "A" position and return to the regular test procedure to test again.
- Insert the PA Extender Board into the PA Board slot.
- Insert the PA Board into the connector on the edge of the PA Extender Board.
- Power up the Audio Tower.
- Using the oscilloscope, observe the signal at BR5, pins 1 and 3. If no signal is present, the problem is probably the RJ11 jack or the plug. If signal is present, trace it from beginning to end until the problem is found.
- Check for signal at U9, pin 12, 13. If no signal is found, the problem is in bridge BR1, T1, or the resistors between them.
- Connect the ground lead to ground on the board. Check for signal at U9, pin 14.
- Check for signal at U9, pin 8. If signal is found at U9, pin 8, the problem is not on the input side of the PA Board.
- Check for signal at U5, pin 4. If signal is found, check for signal at U5, pin 5. If no signal is found, the problem may be with the VCB or the cable to it.
- Check for DC voltage at U5, pin 1. If the voltage is less than 1 volt DC even with the volume controls at maximum, the problem is in the VCB or its cables and connectors. If DC is present, U5 may be defective. If signal is found, check for signal at U8, pin 3.

LBI-38715

- Check U8, pin 1. This is the final input to the amplifier. If signal is found there, either the amplifiers are defective or the speakers and their leads are suspect.
- If no signal was found at U5, pin 4, power down the Audio Tower.
- Remove the PA Board and the PA Extender Board from the board cage. Replace the PA Board in its slot.
- Remove the Matrix Board and place the Matrix Extender Board in its slot.
- Insert the Matrix Board into the connector on the edge of the Matrix Extender Board.
- Power up the Audio Tower.
- Connect the oscilloscope ground lead to any ground on the Matrix Board. Look for signal at U6, pin 20. This is the input to the matrix. If no signal is detected, the problem is in the backplane or its sockets. If signal is present, connect the scope lead to U6, pin 11. There should be no signal present.
- From the PC keyboard type the command:

X6771

and press the Enter key. Signal should now be present. If no signal is seen, the matrix is not working or the cable from the PC to the Audio Tower is defective. If signal is present, connect the scope lead to U7, pin 20. There should be signal present.

- Connect the scope lead to U7, pin 11. There should be no signal present.
- From the PC keyboard type the command:

X7771

and press the Enter key. There should be signal present.

- Connect the scope lead to U8, pin 20. There should be signal present.
- Connect the scope lead to U8, pin 15. There should be no signal present.
- From the PC keyboard type the command:

X8731

and press the Enter key. There should be signal present.

- With or without signal, the system is not functional. Repeat the procedure with a known functional cable and PC system. If the problem is still present, the decoder logic or address lines of the Matrix Board is defective. The problem may be with the backplane.

3. LINE B To Speaker B

- Power down the Audio Tower.
- Remove the PA Board from the board cage.
- Verify that the jumpers on the PA Board are in the "A" position. If they are not, set them in the "A" position and return to the regular test procedure to test again.
- Insert the PA Extender Board into the PA Board slot.
- Insert the PA Board into the connector on the edge of the PA Extender Board.
- Power up the Audio Tower.
- Using the oscilloscope, observe the signal at BR6, pins 1 and 3. If no signal is present, the problem is probably the RJ11 jack or the plug. If signal is present, trace it from beginning to end until the problem is found.
- Check for signal at U10, pins 12 and 13. If no signal is found, the problem is in bridge BR2, T2, or the resistors between them.
- Connect the ground lead to ground on the board. Check for signal at U10, pin 14.
- Check for signal at U10, pin 8. If signal is found at U10, pin 8, the problem is not on the input side of the PA Board.
- Check for signal at U5, pin 13. If signal is found, check for signal at U5, pin 12. If no signal is found, the problem may be with the VCB or the cable to it.
- Check for DC voltage at U5, pin 16. If the voltage is less than 1 volt DC even with the volume controls at maximum, the problem is in the VCB or its cables and connectors. If DC is present, U5 may be defective. If signal is found, check for signal at U8, pin 12.
- Check U8, pin 14. This is the final input to the amplifier. If signal is found there, either the amplifiers are defective or the speakers and their leads are suspect.
- If no signal was found at U5, pin 13, power down the Audio Tower.
- Remove the PA Board and the PA Extender Board from the board cage. Replace the PA Board in its slot.
- Remove the Matrix Board and place the Matrix Extender Board in its slot.
- Insert the Matrix Board into the connector on the edge of the Matrix Extender Board.
- Power up the Audio Tower.
- Connect the Oscilloscope ground lead to any ground on the Matrix Board. Look for signal at U6, pin 9. This is the input to the matrix. If no signal is detected, the problem is in the backplane or its sockets. If signal is present, connect the scope lead to U6, pin 14. There should be no signal present.
- From the PC keyboard type the command:

X6641

and press the Enter key. Signal should now be present. If no signal is seen, the matrix is not working or the cable from the PC to the Audio Tower is defective.

- With or without signal, the system is not functional. Repeat the procedure with a known functional cable and PC system. If the problem is still present, the decoder logic or address lines of the Matrix Board are defective. The problem may be with the backplane.

4. LINE B To Speaker A

- Power down the Audio Tower.
- Remove the PA Board from the board cage.
- Verify that the jumpers on the PA Board are in the "A" position. If they are not, set them in the "A" position and return to the regular test procedure to test again.
- Insert the PA Extender Board into the PA Board slot.
- Insert the PA Board into the connector on the edge of the PA Extender Board.
- Power up the Audio Tower.
- Using the oscilloscope, observe the signal at BR6, pins 1 and 3. If no signal is present, the problem is probably the RJ11 jack or the plug. If signal is present, trace it from beginning to end until the problem is found.
- Check for signal at U10, pins 12 and 13. If no signal is found, the problem is in bridge BR2, T2, or the resistors between them.
- Connect the ground lead to ground on the board. Check for signal at U10, pin 14.
- Check for signal at U10, pin 8. If signal is found at U10, pin 8, the problem is not on the PA Board.
- Power down the Audio Tower.
- Remove the PA Board and the PA Extender Board from the board cage. Replace the PA Board in its slot.
- Remove the Matrix Board and place the Matrix Extender Board in its slot.
- Insert the Matrix Board into the connector on the edge of the Matrix Extender Board.
- Power up the Audio Tower.
- Connect the Oscilloscope ground lead to any ground on the Matrix Board. Look for signal at U6, pin 9. This is the input to the matrix. If no signal is detected, the problem is in the backplane or its sockets. If signal is present, connect the scope lead to U6, pin 11. There should be no signal present.
- From the PC keyboard type the command:

X6671

and press the Enter key. Signal should now be present. If no signal is seen, the matrix is not working or the cable from the PC to the Audio Tower is defective.

- With or without signal, the system is not functional. Repeat the procedure with a known functional cable and PC system. If the problem is still present, the decoder logic or address lines of the Matrix Board are defective.
- If signal is seen, move the scope lead to U7, pin 20. Signal should be present.
- Move the scope lead to U7, pin 11. There should be no signal present.
- From the PC keyboard type the command:

X7771

and press the Enter key. There should now be signal present.

- If no signal is seen, U7 may be defective. If signal is seen move the scope lead to U8, pin 20. There should be signal present.
- Move the scope lead to U8, pin 15. There should be no signal.
- From the PC keyboard type the command:

X8731

and press the Enter key. There should be signal now.

- If no signal is seen, U8 may be defective. If signal is seen, there may be a problem with the backplane.

B/G: Boom/Gooseneck

CEC: Central Electronics Controller

DIP: Dual In-Line Package

DPRAM: Dual Port Ram

DVM: Digital Voltmeter

I/O: Input/Output

PC: Personal Computer

PCB: Printed Circuit Board

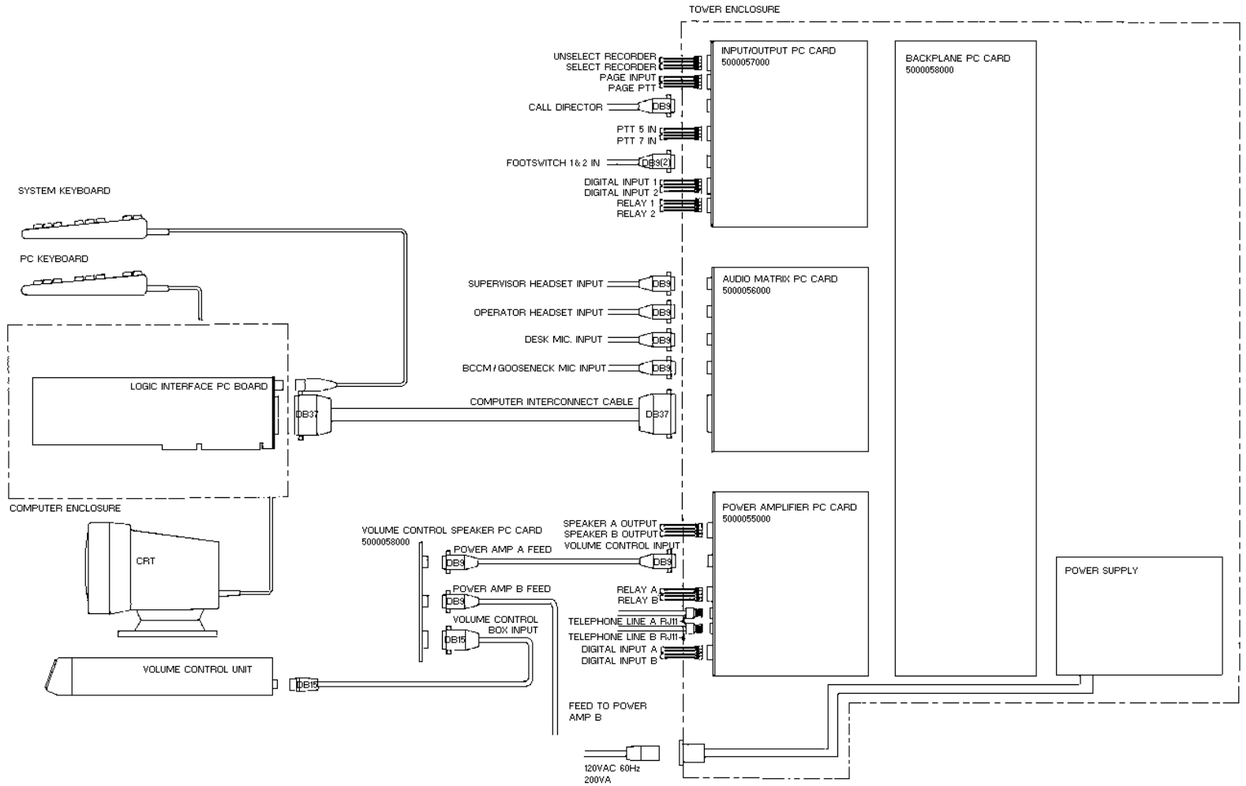
PTT: Push-To-Talk

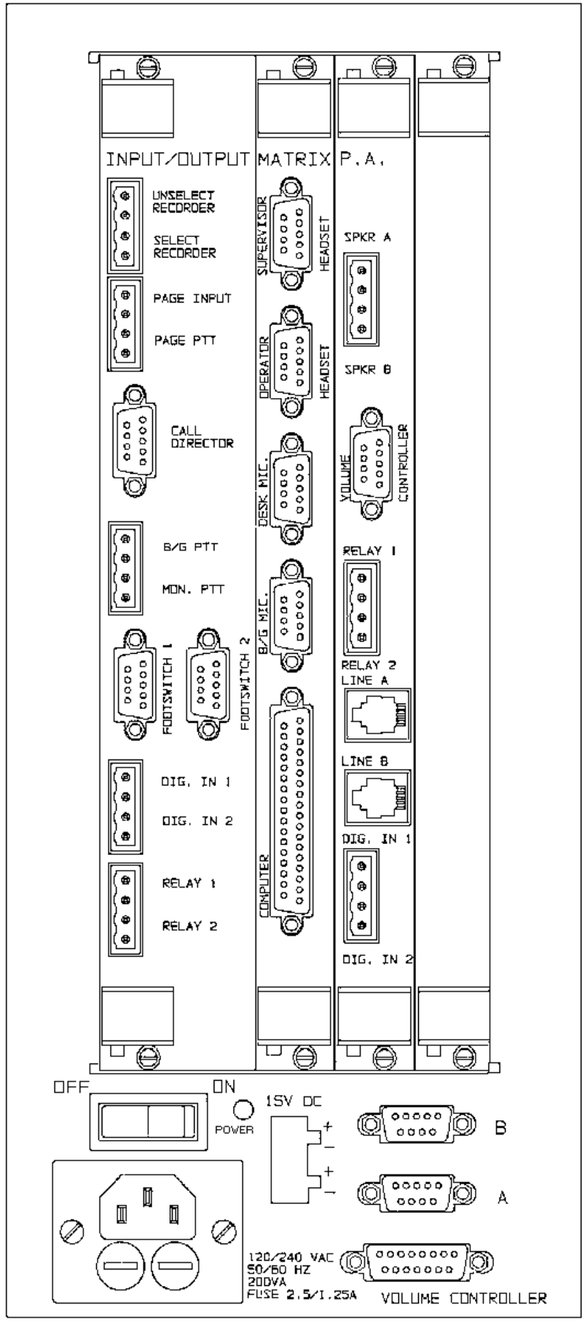
VCB: Volume Controller Box

VOX: Voice Operated Switch

NO: Normally Open

NC: Normally Closed

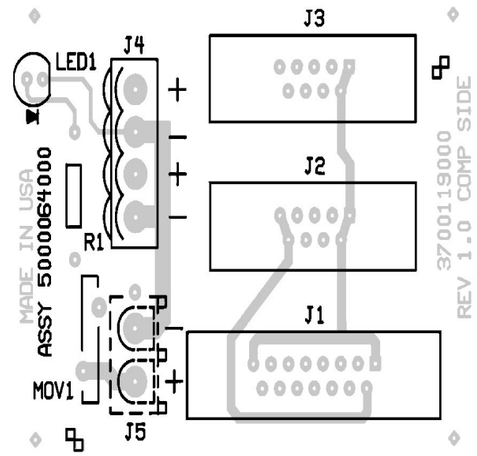




AUDIO TOWER REAR PANEL

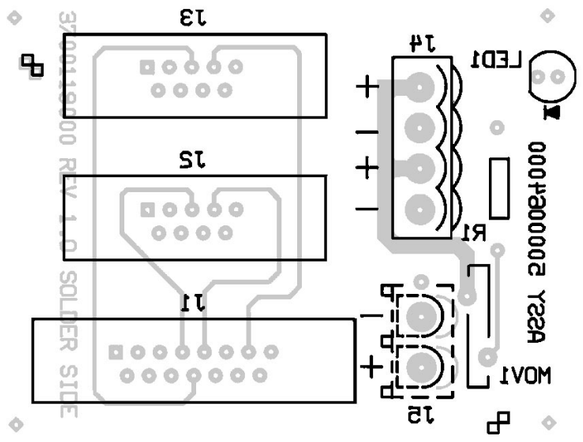
(P29/9030007000, Rev. 1)

COMPONENT SIDE



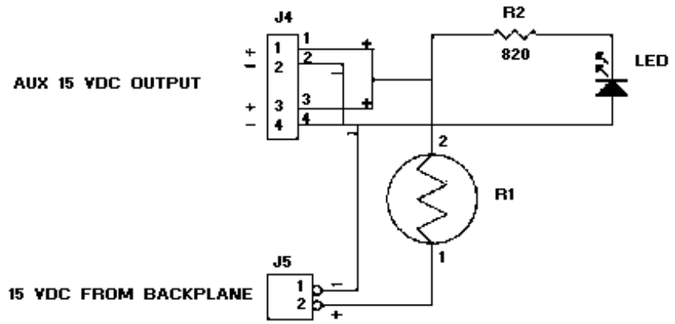
(P29/3700119000, Rev. 1.0)
(P29/3700119000, Rev. 1.0)

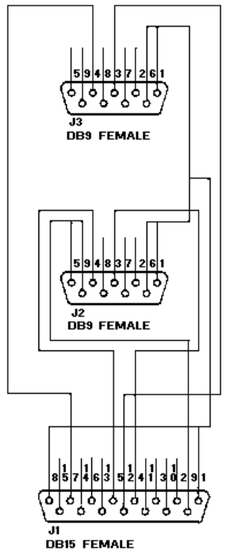
SOLDER SIDE



(P29/3700119000, Rev. 1.0)
(P29/3700119000, Rev. 1.0)

SPREADER BOARD





NOTE:

J3 CONNECTS VIA A 9 PIN CABLE TO PA BOARD 2.
J2 CONNECTS VIA A 9 PIN CABLE TO PA BOARD 1.
J1 CONNECTS VIA A 15 PIN CABLE TO THE REMOVE VOLUME CONTROLLER.
J4 IS A REMOVABLE SCREW TERMINAL.
J4 SUPPLIES 15 VDC TO POWER EXTERNAL EQUIPMENT.
J5 IS THE 15 VDC FROM THE BACKPLANE TO SUPPLY J4.

R1 IS A 5 OHM THERMAL FUSE. IT HEATS UP ON OVERLOAD AND INCREASES ITS RESISTANCE, SHUTTING DOWN THE OVERLOAD. WHEN THE OVERLOAD IS CORRECTED IT WILL COOL AND REDUCE ITS RESISTANCE TO 5 OHMS. THIS WILL EFFECTIVELY RESET THE FUSE.

DB15 PIN	FUNCTION	DB15 PIN	FUNCTION
1	GND	9	15 VDC POWER
2	VOL CONTROL 5	10	VOL CONTROL 6
3	VOL CONTROL 3	11	VOL CONTROL 4
4	VOL CONTROL 1	12	VOL CONTROL 2
5	VOL CONTROL 7	13	VOL CONTROL 12
6	VOL CONTROL 11	14	VOL CONTROL 10
7	VOL CONTROL 8	15	VOL CONTROL 9
8	GND		

ONLY VOLUME CONTROL CIRCUITS 1, 2, 3, AND 4 ARE ENABLED IN THIS CHASSIS

SPREADER BOARD
P29/5000064000

Revised: August 28, 1991
Revision: 1.0

ITEM	QUANTITY	REFERENCE	PART
1	2	J3, J2	DB9 FEMALE
2	1	J1	DB15 FEMALE
2	1	J4	WEIDMULLER 12593.6 BL4
4	1	J5	AMP 641964-1
5	1	R1	PTC KEYSTONE KC0055-ND
6	1	R2	820 Ohms
7	1	LED1	LED

ALL RESISTORS 1/4 WATT 10% CARBON UNLESS NOTED.

BACKPLANE
P29/500058000

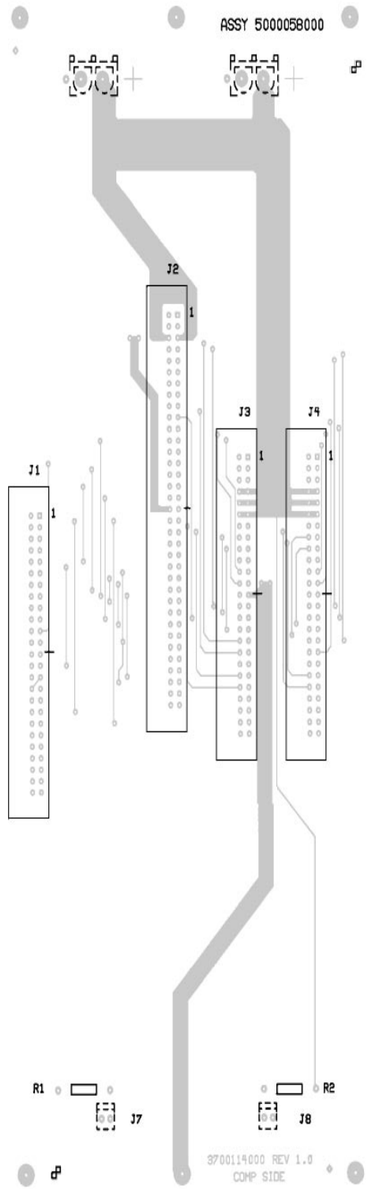
Revised: August 26, 1991
Revision: 1.0

ITEM	QUANTITY	REFERENCE	PART
1	3	J1, J3, J4	AMP102567-6
2	1	J2	AMP1-102692-4
3	2	J6, J5	AMP 641964-1
4	2	J7, J8	AMP 640456-2
5	2	R1, R2820 Ohms	
6	1	PCS	
7	1	2 FOOT CABLE, BACKPLANE TO POWER SUPPLY	AMP 350777-1
8	1	2 FOOT CABLE, BACKPLANE TO FRONT LED	AMP 640440-2
9	1	POWER SUPPLY	CONDOR GPC80-15
10	1	LED ON FRONT CABINET	
11	1	2 FOOT CABLE TO SPREADER BOARD	AMP350777-1 TO AMP350777-1
12	1	POWER RECEPTACLE FUSED	
13	1	POWER SWITCH	

ALL RESISTORS 1/4 WATT 10% CARBON UNLESS NOTED.

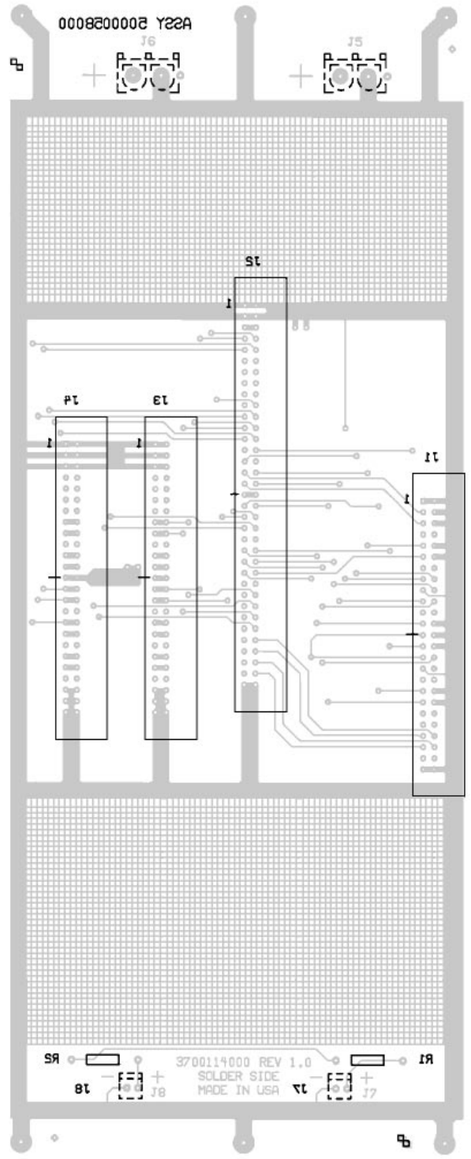
SPREADER BOARD

COMPONENT SIDE



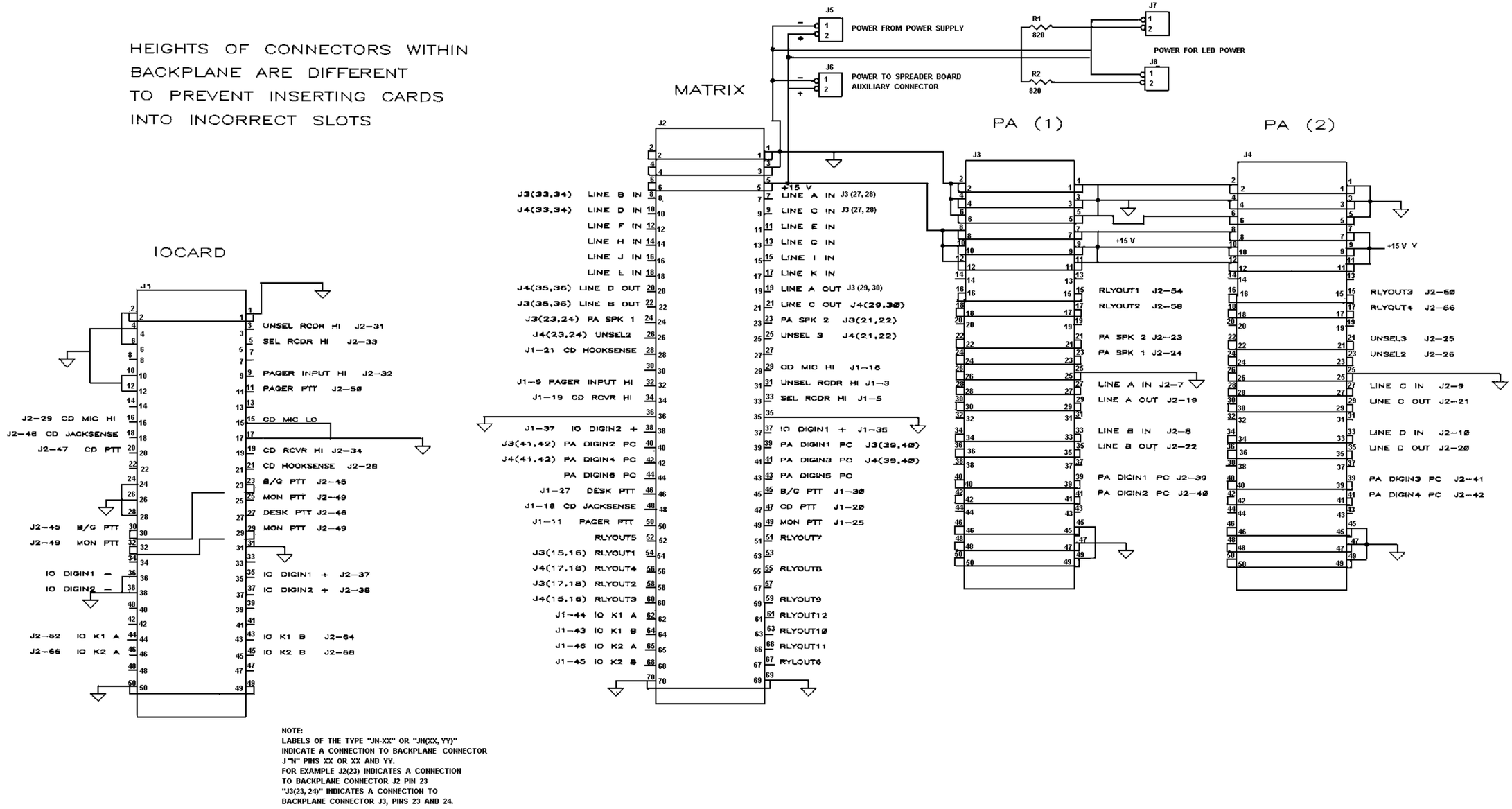
(P29/3700114000, Rev. 1.0)
(P29/3700114000, Rev. 1.0)

SOLDER SIDE



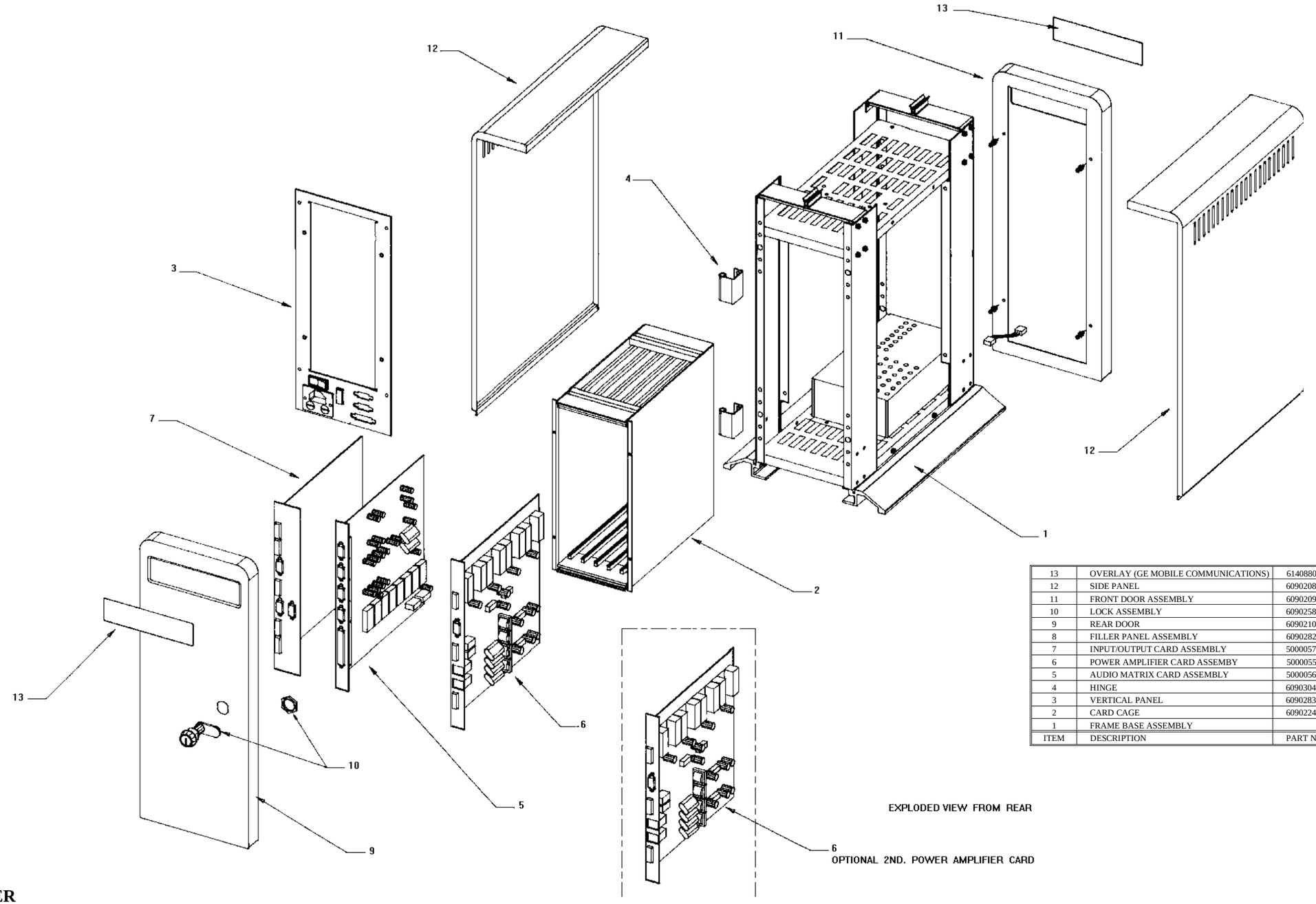
(P29/3700114000, Rev. 1.0)
(P29/3700114000, Rev. 1.0)

BACKPLANE



NOTE:
LABELS OF THE TYPE "JN-XX" OR "JN(XX, YY)" INDICATE A CONNECTION TO BACKPLANE CONNECTOR J"N" PINS XX OR XX AND YY.
FOR EXAMPLE J2(23) INDICATES A CONNECTION TO BACKPLANE CONNECTOR J2 PIN 23
"J3(23, 24)" INDICATES A CONNECTION TO BACKPLANE CONNECTOR J3, PINS 23 AND 24.

BACKPLANE

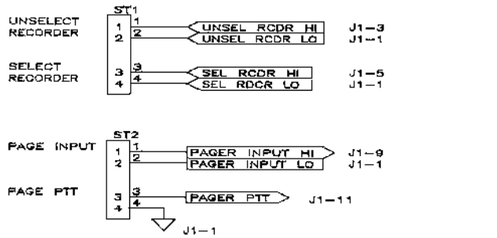


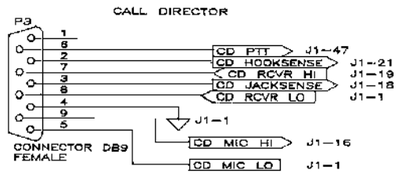
ITEM	DESCRIPTION	PART NUMBER	QTY.
13	OVERLAY (GE MOBILE COMMUNICATIONS)	614088000	2
12	SIDE PANEL	6090208000	2
11	FRONT DOOR ASSEMBLY	6090209000	1
10	LOCK ASSEMBLY	6090258000	1
9	REAR DOOR	6090210000	1
8	FILLER PANEL ASSEMBLY	6090282000	1
7	INPUT/OUTPUT CARD ASSEMBLY	5000057000	1
6	POWER AMPLIFIER CARD ASSEMBY	5000055000	1
5	AUDIO MATRIX CARD ASSEMBLY	5000056000	1
4	HINGE	6090304000	2
3	VERTICAL PANEL	6090283000	1
2	CARD CAGE	6090224000	1
1	FRAME BASE ASSEMBLY		1

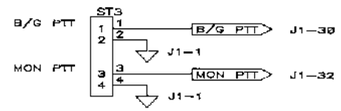
AUDIO TOWER

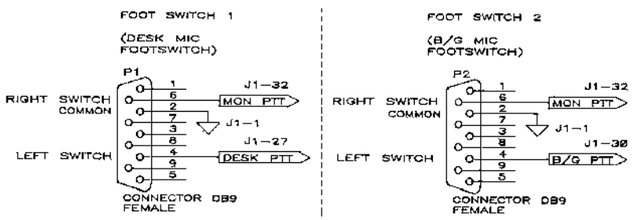
(P29/9030002000, Sh. 1, Rev. 1)

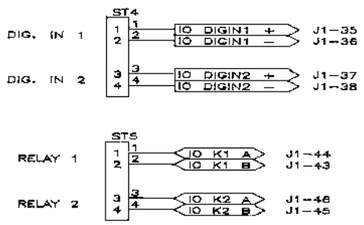
IO BOARD



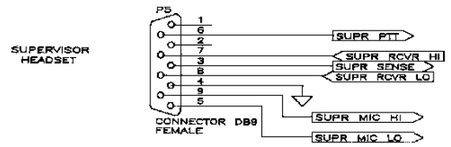


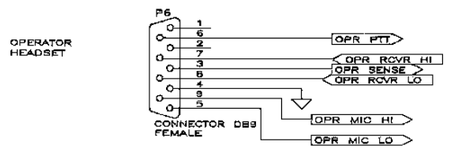


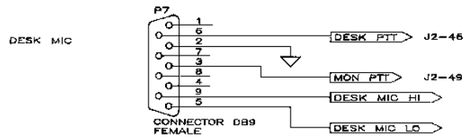


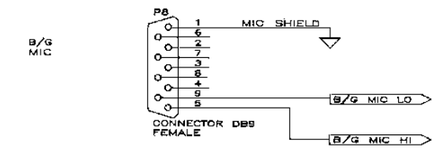


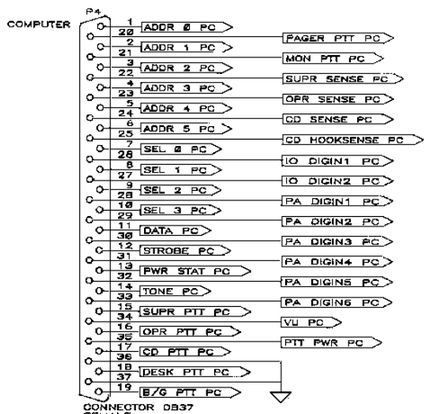
MATRIX BOARD



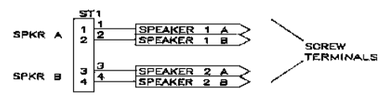


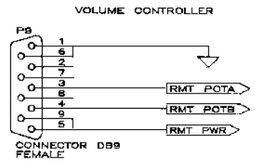


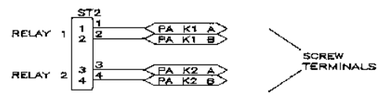


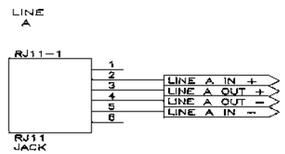


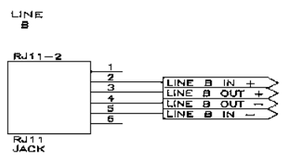
PA BOARD

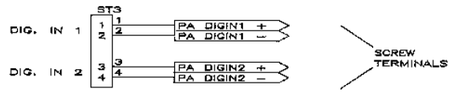












NOTE:

LABELS OF THE TYPE "JN-XX" INDICATE A CONNECTION TO THE BACKPLANE CONNECTOR J "N", PIN XX. FOR EXAMPLE J1-44 INDICATES A CONNECTION TO BACKPLANE JACK J1, PIN 44.

THIS APPLIES TO ALL SUCH REFERENCES.

1. INTRODUCTION

This addendum provides details about the C3 Maestro Audio Tower hardware revisions designated as “Phase 2”. It also provides information on the Call Director (CD) telephone patch feature.

1.1. “PHASE 1” AND “PHASE 2”

The Phase 2 Audio Tower replaces the original Audio Tower which will be referred to as “Phase 1” in this document. All boards in the tower, the Audio Matrix Board, the Audio PA Board, the I/O Board and the Backplane, have been revised to support the Call Director telephone patch feature. Performance and reliability has also been improved. Except for minor changes noted in this document, the Phase 2 boards are designed to be backward compatible with Phase 1 boards. A revised maintenance manual documenting the Phase 2 hardware will be issued at a later date. Contact your service representative for additional information.

1.2. CALL DIRECTOR PATCH

The CD patch feature allows the Call Director to be "patched" to specific units, talk groups, conventional channels and radio patches in the CEC/IMC. The term *patch* or *patched* is used to convey the CD is connected to the CEC/IMC. This is derived from *phone patch*. The term *radio patch* shall be used to mean a collection of interconnected radio talk groups.

The CD-to-radio patch operates independently of the normal operator-to-radio communications. Using the CD interface, the operator is only required to connect the CD with the target entity. After that, no other operator intervention is required until the CD-to-radio connection must be disconnected.

The audio connections between the CD and the CEC/IMC are done inside the C3 Maestro Audio Tower as controlled by the Logic Board within the computer. The console application program has minimal involvement in the control of audio switching.

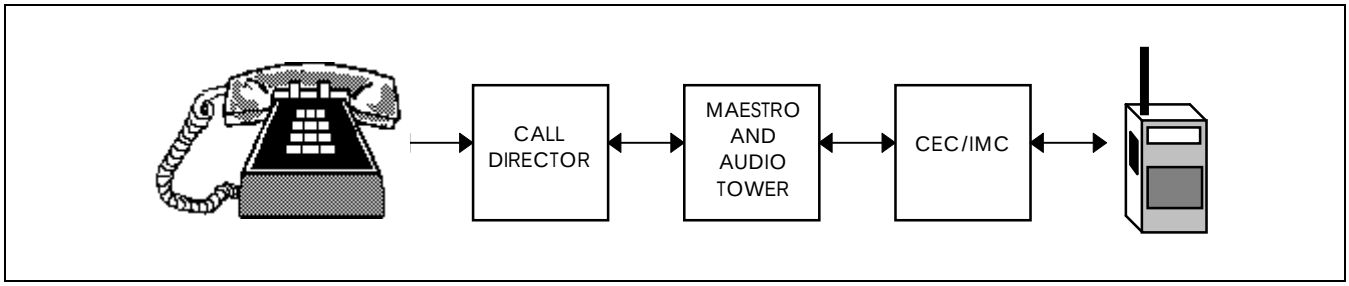


Figure 1 – Basic Call Director Audio Routing

The terms *incoming, outgoing, inbound, and outbound* shall be referenced from the console. Unless otherwise noted, all audio and signal descriptions are referenced from the Audio Tower.

Message-trunked calls are used to perform the patch operation. The console uses a secondary LID for the patch channel requests, thus allowing CD patch operation to work separately from, and concurrently with, the normal operator-to-radio communication. From the standpoint of the radio user, the patch will appear to operate the same as a telephone interconnect call.

2. PART NUMBERS

2.1. TOWER AND BOARD ASSEMBLIES

Part numbers for the new (Phase 2) Audio Tower and board assemblies are shown in Table 1. With the exception of the Audio PA Board, the Call Director patch feature requires all Phase 2 boards. Phase 1 Audio PA Boards (P29/500005500, any revision) may be used in an Audio Tower that supports CD patch.

TABLE 1 – PHASE 2 AUDIO TOWER ASSEMBLIES

ASSEMBLY	PART NUMBER	REVISION
2-Speaker Audio Tower	P29/7720033000	n/a
4-Speaker Audio Tower	P29/7720033001	n/a
Audio PA Board	P29/7720028000	A* (or later)
Backplane Board	P29/7720029000	A* (or later)
Audio Matrix Board	P29/7720030000	A* (or later)
I/O Board	P29/7720031000	A* (or later)

* Initial Revision

A board's part number and revision can be checked by removing it from the Audio Tower and verifying the vendor part number specified in the table above. Vendor parts *are not* marked with the "P29/" part number prefix. All Phase 1 boards have P29/50000xx00x part numbers.

2.2. UPGRADE KITS

An upgrade kit is available for upgrading Phase 1 C3 Maestro 4-speaker consoles to CD Patch capability. Each kit includes new (Phase 2) Audio Matrix, I/O, and Backplane Boards. Order CD Patch Upgrade Kit P29/7720034000 from Ericsson GE Service Parts.

Two-speaker Phase 1 consoles must be upgraded to 4-speaker consoles before the Call Director patch upgrade is performed. To upgrade a Phase 1 C3 Maestro 2-speaker console to a 4-speaker console, order option number CRFK1B.

3. "PHASE 1"-TO-"PHASE 2" HARDWARE CHANGES

3.1. AUDIO MATRIX BOARD

The following circuits have been eliminated in the Phase 2 Audio Matrix Board:

- CD VOX
- CD PTT

The following circuits have been added:

- Summing of incoming call director audio with line inputs for conversation monitoring
- Supervisor headset mic to call director
- Boom/gooseneck sense
- Call director on-hook relay

The following circuits have been changed:

- CD interface transformers are isolated
- Headset sidetone levels are controlled by digital pots
- Boom/gooseneck mic gain increased
- Paging tone level to speakers and headsets reduced

The Phase 2 Audio Matrix Board is required for the Call Director patch feature.

3.1.1. Summing Of Incoming CD Audio

3.1.1.1. Phase 1

Incoming CD audio summation did not exist.

3.1.1.2. Phase 2

Incoming CD audio may be summed with incoming select or unselect radio audio so that both sides of a CD patch conversation can be monitored by the dispatcher.

3.1.2. Supervisor Headset Mic To CD

3.1.2.1. Phase 1

The supervisor headphone could not be connected to the CD input via the Audio Matrix Board's audio switches. A modification was made by adding a resistor that connected the headphone to the CD when the operator headset was plugged in. However, the supervisor headset mic could not be connected to the CD output.

3.1.2.2. Phase 2

The supervisor headset is properly connected to both the CD input and output via the Audio Matrix Board's audio switches when the headset is plugged in. It is not affected by the operator headset.

3.1.3. Boom/Gooseneck Mic Sense

3.1.3.1. Phase 1

The sensing of a boom or gooseneck mic was not supported by hardware. If a headset was plugged in or unplugged, the Logic Board's firmware would switch the microphone between the headset mic or the default desk mic. A software-based method was utilized, where the C3 Maestro would set a "boom/gooseneck mic bit" in a Logic Board DPRAM options byte, and the firmware would check the bit before switching to the desk mic. If the bit was set, it would switch to the boom/gooseneck mic. The Maestro read the bit from CONFIG.DAT, which was set with the Editor program (see LBI-39056). It was desirable to have direct hardware sense support and eliminate the indirect support via the Editor program.

3.1.3.2. Phase 2

The unused Phase 1 CD PTT input has been changed to a boom/gooseneck sense input in the Phase 2 hardware. The Logic Board now has a direct hardware input to read to determine if a boom or gooseneck mic is connected. A connected boom/gooseneck mic will take priority over the default desk mic when a headset is unplugged or not sensed. The EDITOR/CONFIG.DAT/option bit method has been removed from the Maestro V3.0 Editor program. Existing Audio Matrix Boards, Rev 2.0 - Rev G, may be modified to duplicate the sense circuit so they will be compatible with Logic Board V3.0 firmware. See section 4.1 for specific modification instructions. Figure 2 shows the pin-out of the Phase 2 boom/gooseneck mic connector J4.

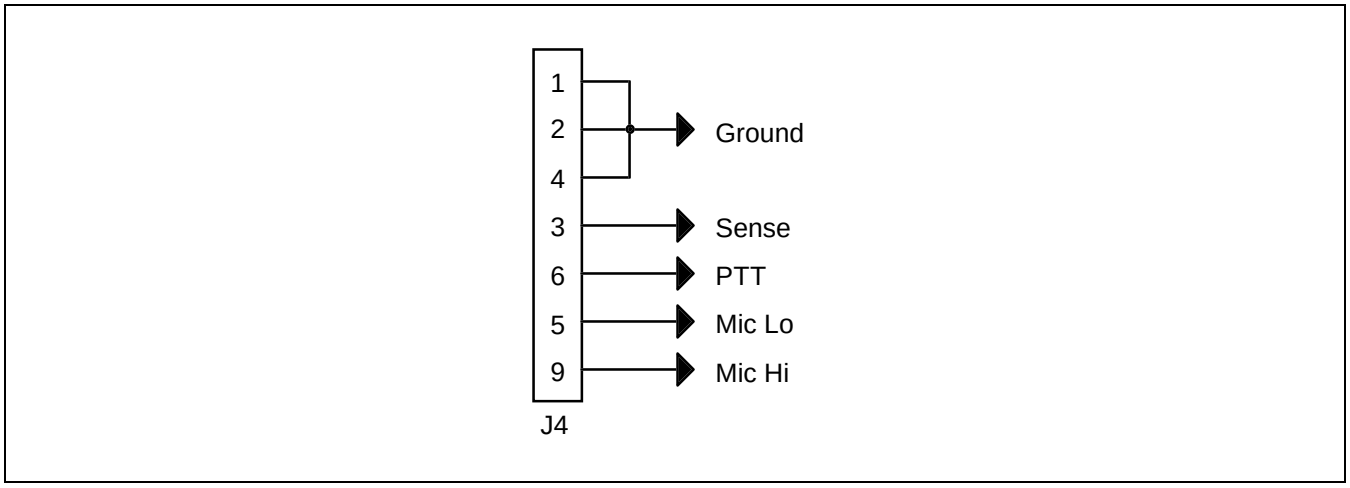


Figure 2 - Boom/Gooseneck Mic Connector J4

NOTE

All boom and gooseneck mic connectors (male DB-9) must have pins 2 and 3 jumpered together so the sense circuit will be active when the mic is connected.

Logic Board V3.0 firmware must be installed to support the hardware sense line.

3.1.4. Call Director On-Hook Relay

3.1.4.1. Phase 1

The CD on-hook relay did not exist.

3.1.4.2. Phase 2

A momentary relay contact closure is provided for automatically placing the CD on-hook without operator intervention. This "on-hook" relay is energized when the console disconnects the CD from the CEC/IMC due to operator manual operation or site time-out. Since most CDs do not have an on-hook input, use of this relay is optional. The relay contacts are available at CD connector J3 on the I/O Board (see Figure 6).

3.1.5. Call Director Interface Transformers

3.1.5.1. Phase 1

One leg of the external side of each transformer was inadvertently grounded, resulting in a single-ended interface which defeated the purpose of the transformers. An in-line “transformer box” was provided to isolate the call director from the Audio Tower’s circuit grounds. The external Phase 1 CD connections from the I/O Board, through the Backplane to the Audio Matrix Board are shown in Figure 3.

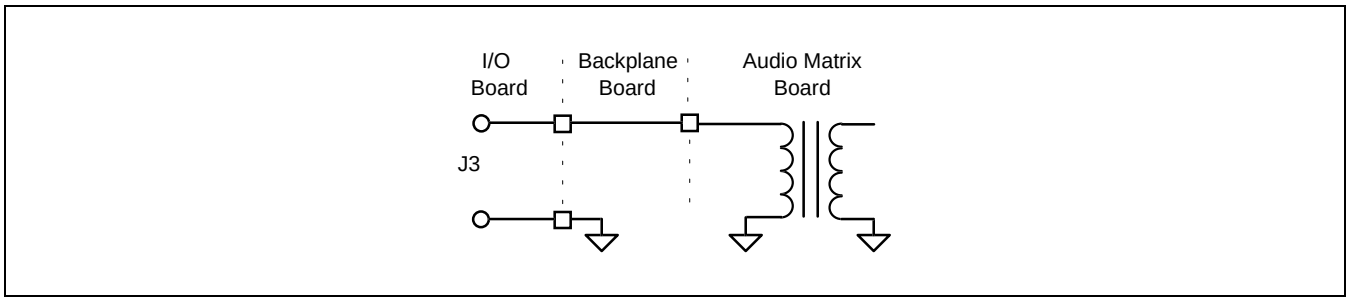


Figure 3 - Phase 1 CD Interface (Mic and Receive)

3.1.5.2. Phase 2

The external sides of both transformers are isolated from ground, resulting in a balanced interface. The transformer box is no longer required if the Phase 2 revisions of both the Audio Matrix Board and I/O Board are used. If only a Phase 2 Audio Matrix Board is used, two jumpers (JP1, JP2), one for each transformer, are provided to ground one leg of the transformers for backwards compatibility with the Phase 1 I/O Board. The external CD connections from the I/O Board across the Backplane to the Audio Matrix Board, and the grounding jumpers, as implemented in Phase 2, are shown in Figure 4.

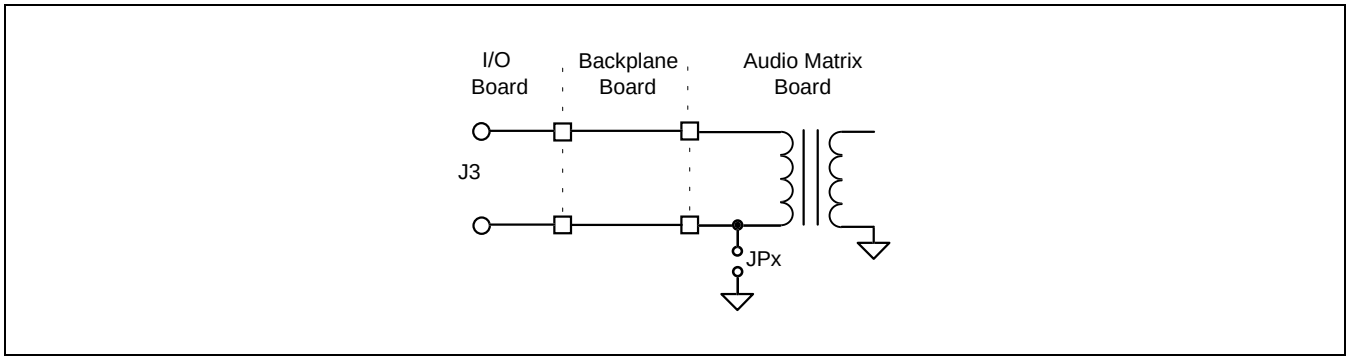


Figure 4 – Phase 2 CD Interface (Mic and Receive)

Figure 5 shows the locations of JP1 and JP2 near Backplane Board connector (J6) at the rear of the Audio Matrix Board. The jumpers should be removed if a Phase 2 I/O Board is used. If a Phase 1 I/O Board is used, the jumpers should be inserted. If a call director is not attached to the Audio Tower, the placement of the jumpers is insignificant.

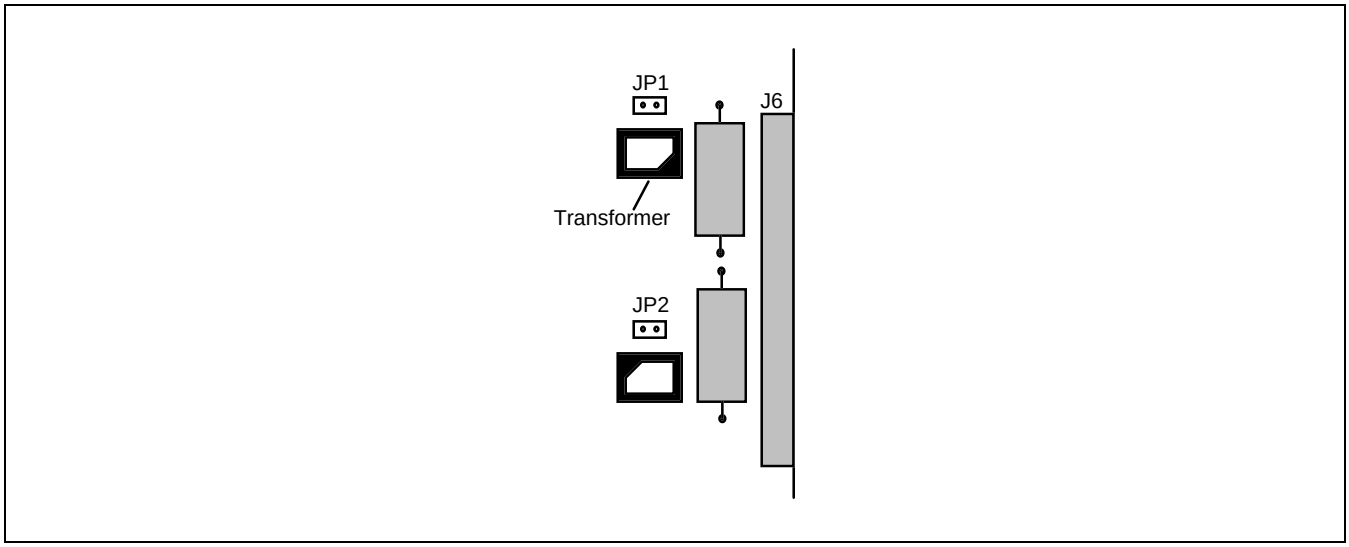


Figure 5 – CD Transformer Jumper Locations

3.1.6. Headset Sidetone Pots

3.1.6.1. Phase 1

Operator and supervisor headset sidetone levels were controlled by manual pots. The levels were set by placing the Audio Matrix Board on an extender board and manually adjusting the pots. No other level adjustment method was provided.

3.1.6.2. Phase 2

The manual pots have been replaced with digitally-controlled pots which can be set via commands from the Logic Board. From new software in the Maestro V3.0 application, the Logic Board can be commanded to vary the sidetone level.

Operator and supervisor sidetone levels are stored in the user profile of each setup. The Maestro application reads the values from SETUPS.DAT at startup and sends commands to the Logic Board to set the pots to those values. The user adjusts the *operator* sidetone level using the <Alt>+ <Vol Up> and <Alt>+ <Vol Down> keys. The supervisor sidetone cannot be adjusted from the application. It is set via the Editor program by editing the user profile and setting the “Sup Sidetone” field to a value between 0 - 255. See LBI-39056 for specific details.

3.1.7. Boom/Gooseneck Mic Gain

3.1.7.1. Phase 1

Gain was not always sufficient to provide enough mic level for the dispatcher to be heard clearly. For sufficient transmit audio level, an input of approximately 20 mV peak-to-peak was required.

3.1.7.2. Phase 2

The gain has been increased. Typical input is now 7 mV peak-to-peak at an average voice level.

3.1.8. Paging Tone Level

3.1.8.1. Phase 1

The paging tone was summed at the same level as all other audio signals routed to the headset and speakers. This caused the tones to be heard at an unpleasant level for most console operators. There was no way to reduce the tone relative to the other audio signals.

3.1.8.2. Phase 2

The level of the paging tone has been reduced by approximately 16 dB below the other audio signals summed to the headsets and speakers. This reduction value is fixed, but it provides a more pleasing level to the operator.

3.2. I/O BOARD

The following changes were made to the I/O Board:

- Addition of the CD on-hook relay contacts
- Footswitch connectors now match standard C3 Modular/Desktop footswitch connections
- Relay-1 and Relay-2 connectors are correct
- All unused connections to the Backplane Board are no longer grounded

The Phase 2 I/O Board is required for the Call Director patch feature.

3.2.1. CD On-Hook Relay

3.2.1.1. Phase 1

The on-hook relay did not exist. Connector J3 pin 6 carried the CD PTT signal and pin 1 was not used.

3.2.1.2. Phase 2

Signal lines to carry the call director on-hook relay contacts from the Backplane Board to connector J3 have been added. Pin 1 and pin 6 carry the relay contacts. Figure 6 shows the pin-out of J3 on the Phase 2 I/O Board.

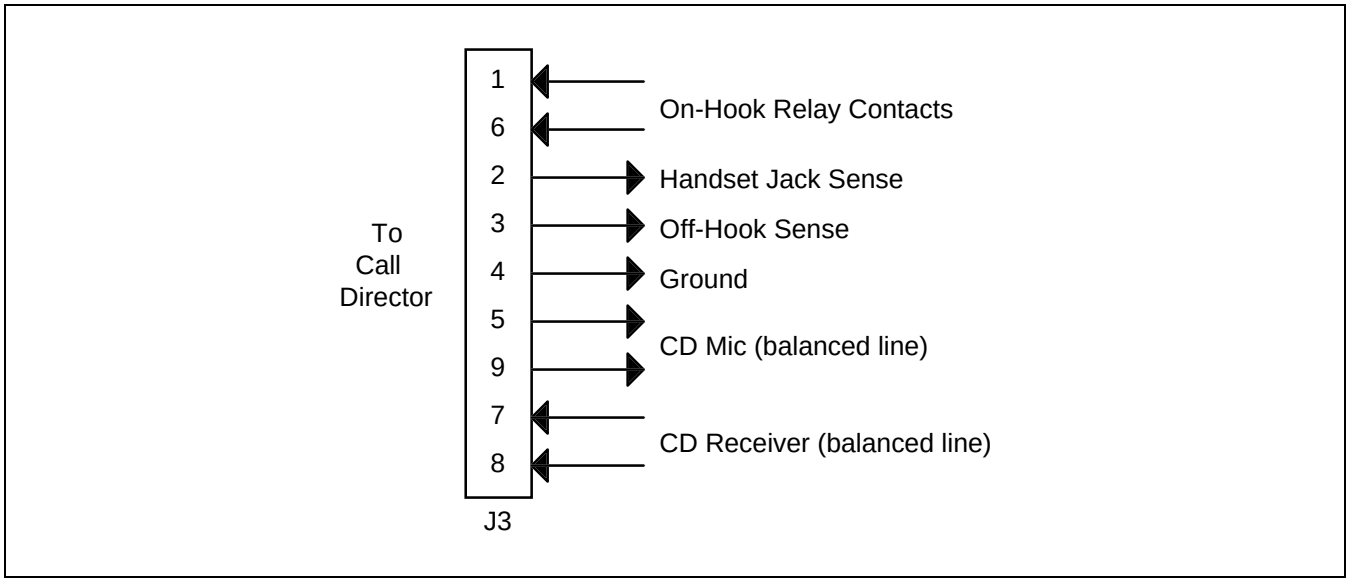


Figure 6 - I/O Board Call Director Connector J3

3.2.2. Footswitch Connectors

3.2.2.1. Phase 1

The PTT and MONITOR connections for FOOTSWITCH-1 and FOOTSWITCH-2 were reversed. A single footswitch would activate the MONITOR signal when pressed. Single footswitches had to be rewired so the corresponding Audio Tower PTT pin was used. Many dual footswitches were wired with their connections reversed. Therefore, these dual footswitches worked correctly with the reversed Audio Tower connections.

3.2.2.2. Phase 2

The new I/O Board has pin 6 as PTT and pin 4 as MONITOR on both footswitch connectors as shown in Figure 7. This is consistent with C3 Modular/Desktop consoles which are used as the standard.

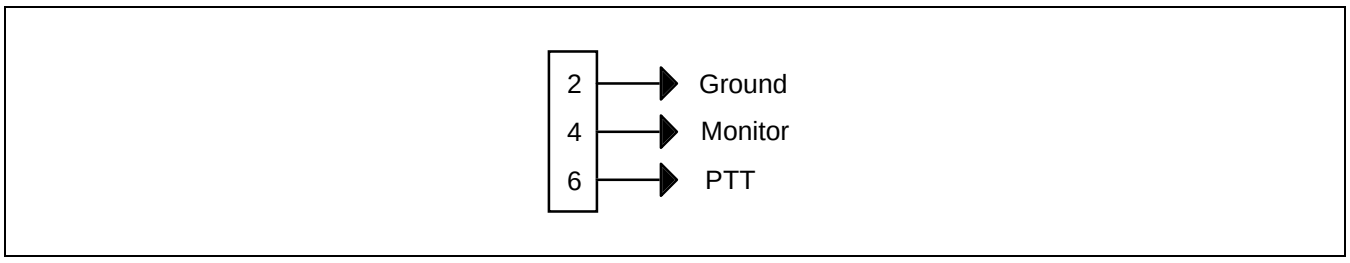


Figure 7 – Phase 2 I/O Board Footswitch Connectors J5 And J6

If a Phase 2 I/O Board is inserted into the Audio Tower, users with footswitches that operate with Phase 1 I/O Boards must rewire the footswitch DB-9 connectors to conform to the Phase 2 pin-outs. This can be done by reversing pins 4 and 6 in the connector or by placing an in-line adapter between the I/O Board and the footswitch to reverse the signals. Figure 8 shows a simple schematic of an adapter.

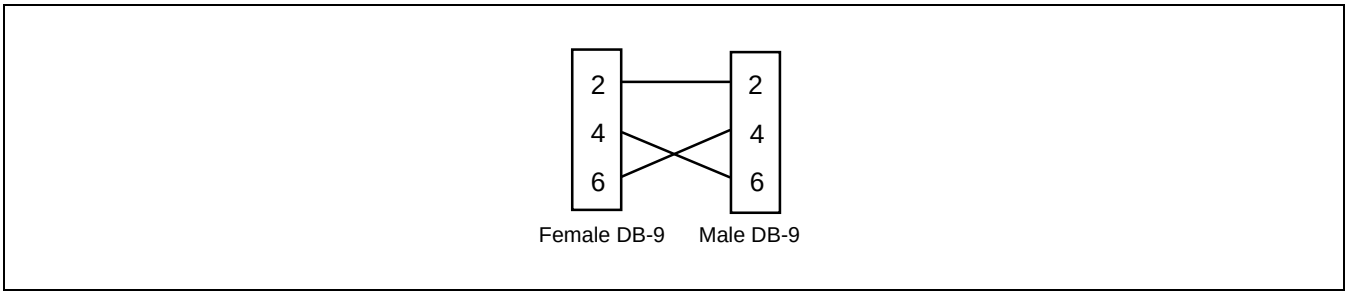


Figure 8 – Footswitch Adapter

3.2.3. Relay Connections

3.2.3.1. Phase 1

The contacts for Relay-1 were actually available at the connector (J8 or ST5) labeled "RELAY 2" and the contacts for Relay-2 were never available.

3.2.3.2. Phase 2

With a Phase 2 I/O Board, both sets of relay contacts are available at connector J8. Relay-1 is the relay that follows console PTTs. Relay-2 is reserved for future use. The pin-out of the connector did not change.

3.3. PA BOARD

The following changes were made to the Audio PA Board:

- A maximum audio output selection DIP switch was added.
- Audio source jumpers JP1 and JP2 were replaced with DIP switches.

3.3.1. Audio Output Switches

These switches (SW1) are new to Phase 2, and provide a method to limit the maximum audio output from each speaker power amplifier. Levels of 5 watts (recommended) or 8 watts are available. See Table 6 and Figure 10 for details. The switches have no effect on headset outputs.

3.3.2. Audio Source Switches

These switches (SW2) and their Phase 1 jumper counterparts are provided for testing. The audio source for each speaker power amplifier can be selected to be either the corresponding Line Input or the Audio Matrix Board. The Audio Matrix Board source is the normal selection, but the Line Input selection can be used to test the entire Audio PA Board by bypassing the Audio Matrix Board. The Line Input is fed directly into the power amplifier. See Table 7 and Figure 11 for details.

3.4. BACKPLANE BOARD

The following changes were made to the Backplane Board:

- Signal lines to carry the call director on-hook relay contacts were added.
- The previously grounded legs of both CD interface transformers were added as isolated signals.
- Criss-crossed Line B Out and Line D Out signals were fixed. These signals were not used in Phase 1 Audio Towers.

The Phase 2 Backplane is required for the Call Director patch feature.

4. COMPATIBILITY

Phase 2 boards were designed to provide the maximum amount of backwards compatibility with existing Phase 1 Audio Towers in the event that they are used as replacement parts. The incompatibilities that do exist can be worked around with external connector wiring changes or Logic Board firmware updates.

4.1. AUDIO MATRIX BOARD

The Phase 2 Audio Matrix Board is fully backwards compatible for use in a Phase 1 Audio Tower, with the following exceptions:

1. If a Call Director is being used, one leg of the primary side of each of the CD interface transformers must be grounded by jumpering JP1 and JP2. Also, the in-line "transformer" box must be used. See section 3.1.5 for details.
2. The supervisor headset mic to unselect recorder connection is not supported using Logic Board V2.11 or earlier firmware. This connection is supported by using Logic Board V3.0 firmware.
3. If a boom/gooseneck mic is used with the Audio Tower, the following modifications must be made if the Audio Matrix Board is a Phase 1 board and the Logic Board is equipped with 344A4245G10 (or later) firmware:
    - remove Q1 (disconnects VOX output)
    - jumper P8 pin 3 to the collector of Q1 (connects new boom/gooseneck sense input to CD PTT)
    - jumper P8 pin 1 to P8 pin 2 (grounds pin 2)

4.2. I/O BOARD

The Phase 2 I/O Board is fully backwards compatible for use in a Phase 1 Audio Tower, with the following exceptions:

1. The footswitch connector PTT and Monitor connections are reversed. See section **3.2.2 Footswitch Connectors** for specific details.
2. The relay that follows console PTT is available as "Relay 1" on the Phase 2 I/O Board. Unmodified Phase 1 I/O Boards had these PTT relay contacts available as "Relay 2".

4.3. PA BOARD

The Phase 2 Audio PA Board is fully compatible with the Phase 1 Audio Tower. Also, the Phase 1 Audio PA Board is fully compatible with the Phase 2 Tower.

4.4. BACKPLANE BOARD

The Phase 2 Backplane Board is fully compatible with the Phase 1 Audio Tower.

5. UPGRADING

The following instructions detail the upgrading of an existing Phase 1 Audio Tower to Phase 2. This would be required if Call Director patch was being added to the system. Table 2 summarizes the items that must be added or replaced in existing Phase 1 console configurations to implement Call Director patch. The Logic Board in the PC does not have to be changed; however the firmware may need to be updated. CD patch requires Logic Board firmware 344A4245G10 (or later) firmware.

TABLE 2 – HARDWARE ADDITIONS AND REPLACEMENTS REQUIRED FOR CALL DIRECTOR PATCH

EXISTING (Phase 1) CONSOLE CONFIGURATION				
2 Speakers with CD	**2 Speakers without CD**	**4 Speakers with CD**	**4 Speakers without CD**	
	Add		Add	Call Director
Replace	Replace	Replace	Replace	Phase 1 Audio Matrix Board, I/O Board and Backplane Board with Phase 2 Rev. A (or later) boards
Add	Add			a second Audio PA Board (Phase 1 or Phase 2)
Add	Add	Add	Add	Line D In to CIM TX4 (CIM out) wiring (if not already present)
Add	Add	Add	Add	Line D Out to CIM RX4 (CIM in) wiring

5.1. EXTRACTING PHASE 1 BOARDS

1. Turn off the power switches on the PC and the Audio Tower and disconnect power.
2. Unlock and open the Audio Tower rear access door.
3. Wear an anti-static strap from this point in the procedure forward.
4. Remove all cables connected to boards in the Audio Tower.
5. Loosen screws on the I/O Board and pull the board from the Audio Tower by the ejector handles.
6. Loosen screws on the Audio Matrix Board and pull the board from the Audio Tower by the ejector handles. Place the Audio Matrix Board in an anti-static bag.
7. Loosen screws on the Audio PA Board and pull the board from the Audio Tower by the ejector handles. Place the Audio PA Board in an anti-static bag.
8. If the system has a second Audio PA Board, pull the board from the Audio Tower by the ejector handles. Place the second Audio PA Board in an anti-static bag. Otherwise, loosen screws on the Filler Panel and remove it from the Audio Tower.
9. Remove the front snap-on cover of the Audio Tower.
10. Disconnect the LED plug from J7 on the Backplane.
11. Disconnect the power plugs from J5 and J6 on the Backplane.
12. Remove the six (6) screws from the Backplane and remove the Backplane from the Audio Tower.

5.2. INSTALLATION OF PHASE 2 BOARDS

1. Attach the Phase 2 Backplane to the card-cage with six (6) screws. Leave the screws just loose enough to slightly slide the Backplane.
2. Insert an Audio PA Board into the far right card slot. Seat the edge connector firmly in the Backplane connector. Minor lateral positioning of the Backplane may be necessary to make this connection.
3. Insert a second Audio PA Board adjacent to the first board. Seat the edge connector firmly in the Backplane connector. Minor lateral positioning of the Backplane may be necessary to make this connection.

4. Remove the shorting plug from JP1 on the Audio Matrix Board and place shorting plug back on one of the header pins for storage. Remove the shorting plug from JP2 on the Audio Matrix Board and place shorting plug back on one of the header pins storage.
5. Insert the Phase 2 Audio Matrix Board into the correct position in the card-cage. Seat the Audio Matrix Board edge connector firmly in the Backplane connector. Minor lateral positioning of the Backplane may be necessary to make this connection.
6. Insert the Phase 2 I/O Board into the correct position in the card-cage. Seat the edge connector firmly in the Backplane connector. Minor lateral positioning of the Backplane may be necessary to make this connection.
7. Tighten the front panel screws on all four (4) boards.
8. Tighten the six (6) screws on the Backplane.
9. Attach the power plugs to the Backplane connectors J5BP and J6BP.
10. Attach the LED plugs to connector J7BP located at the bottom of the Backplane.
11. Attach the front snap-on panel.
12. Attach the external cables to the I/O, Audio PA and Audio Matrix Board.
13. Close the rear door of the Audio Tower and lock it.
14. Re-connect and switch on power to the PC and the Audio Tower.
15. After PC has booted, run the Maestro software application.

5.3. ALIGNMENT PROCEDURES

NOTE

The Phase 2 Matrix and PA boards have been aligned at the factory for typical operating conditions. Further adjustment is not recommended unless a non-typical signal level is present in the field situation.

5.3.1. Phase 2 Audio Matrix Board

1. With the Audio Matrix Board connected to the Backplane via an Audio Matrix Board extender board, and the Maestro system in operation, the potentiometers indicated in Table 3 may be adjusted to achieve desired operating levels for the corresponding signals. Figure 9 indicates the positions of the potentiometers.

TABLE 3- AUDIO MATRIX BOARD

SIGNAL	POTENTIOMETER	TEST POINT
BOOM/GOOSENECK MIC GAIN	R86	TP19
DESK MIC GAIN	R88	TP20
OPERATOR HEADSET MIC GAIN	R59	TP18
OPERATOR SIDETONE LEVEL	R194	TP31
SUPERVISOR-TO-OPERATOR SIDETONE LEVEL	R90	n/a
SUPERVISOR MIC GAIN	R55	TP33
SUPERVISOR SIDETONE LEVEL	R178	TP32
OPERATOR-TO-SUPERVISOR SIDETONE LEVEL	R213	n/a
CALL DIRECTOR INPUT	R182	TP39, TP40
CALL DIRECTOR OUTPUT	R204	TP43, TP46
SELECT RECORDER OUTPUT	R202	TP44
UNSELECT RECORDER OUTPUT	R187	TP45
PAGING ENCODER INPUT	R199	TP41
VU_METER *	R219	TP48

* Adjustment not recommended

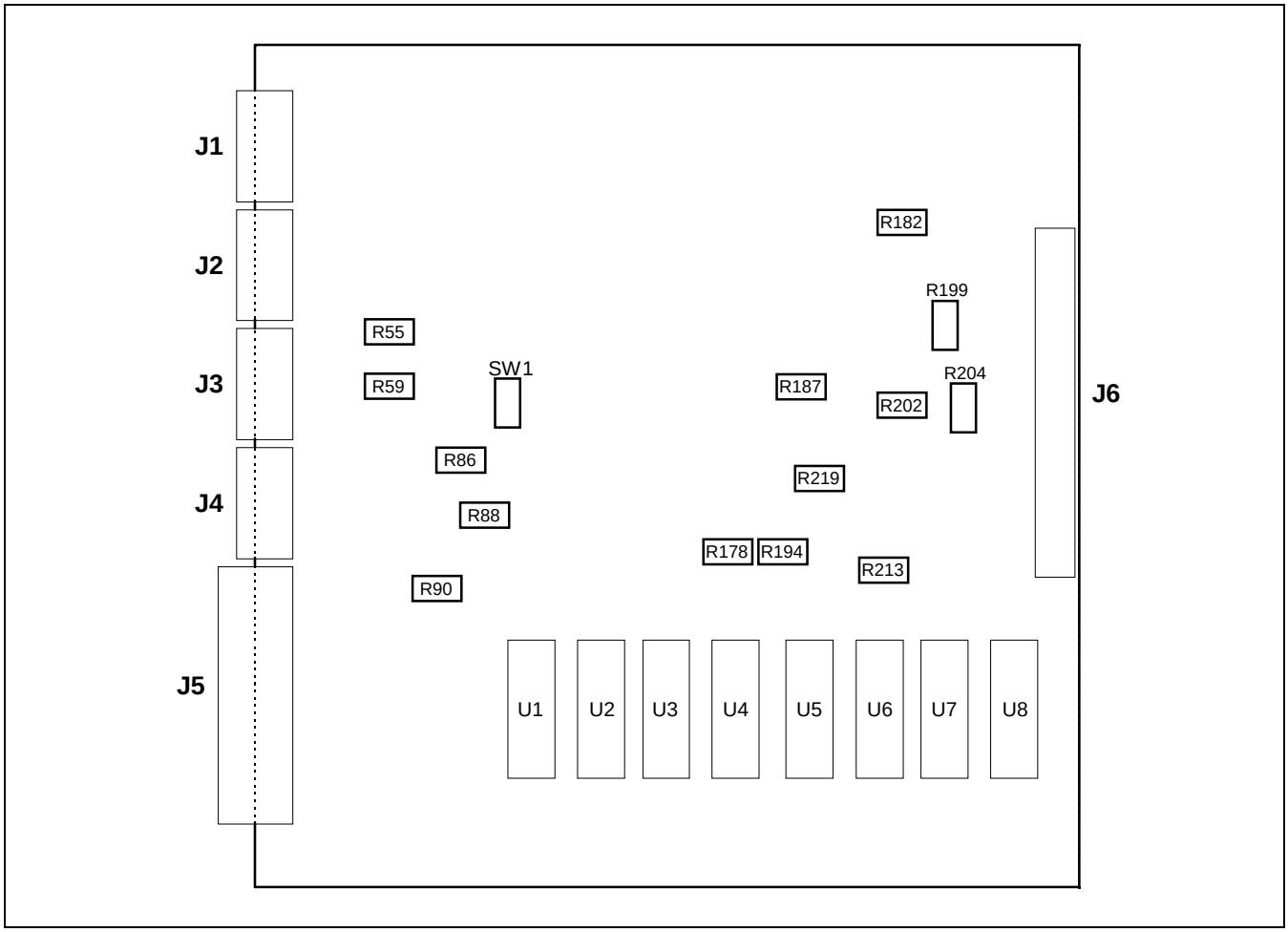


Figure 9 – Audio Matrix Board Potentiometer And SW1 Locations

2. Switch SW1 (unmarked DIP switch) is used to enable/disable automatic level control (ALC) for the inputs indicated in Table 4. Enable ALC by setting the appropriate switch to its ON position.

TABLE 4 – AUDIO MATRIX BOARD ALC SWITCH SW1

SW1 POSITION	INPUT SIGNAL
1	B/G MIC
2	DESK MIC
3	OPERATOR HEADSET MIC
4	SUPERVISOR HEADSET MIC

3. Turn off power and remove the extender board to restore the system to the standard setup.

5.3.2. Phase 2 Audio PA Board

1. With the Audio PA Board connected to the Backplane via an extender board and the Maestro system in operation, the potentiometers indicated in Table 5 may be adjusted to achieve desired operation levels for the line A and line B signals.

TABLE 5 – AUDIO PA BOARD LINE A AND B ADJUSTMENTS

SIGNAL	POTENTIOMETER	TEST POINT.
LINE A IN	R56	TP16
LINE B IN	R58	TP17
LINE A OUT	R95	TP3, TP7
LINE B OUT	R97	TP5,TP9

2. DIP switch SW1 allows selection of the maximum power level available to the speakers. Set the switches to the desired output level. Table 6 shows the switch settings that apply to the corresponding speakers. Figure 10 shows the default switch settings (low power).

TABLE 6 – AUDIO PA BOARD MAXIMUM SPEAKER POWER LEVEL SELECTION

SW1 POSITION				MAX. OUTPUT (Watts)	
1	**2**	**3**	**4**	**SPKR 1**	**SPKR 2**
OFF	OFF	x	x	5W	5W
ON	OFF	x	x	8W	5W
OFF	ON	x	x	5W	8W
ON	ON	x	x	8W	8W

"x" = either position

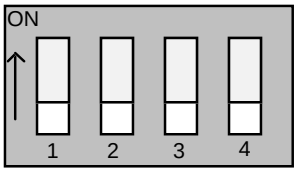


Figure 10 – Switch SW1 Maximum Speaker Output Settings (Default)

3. DIP switch SW2 allows selection of the audio sources feeding the speakers. The switches should be set to the default positions (source = Audio Matrix Board) shown in Figure 11. Table 7 shows the switch settings to select the audio source.

TABLE 7 – AUDIO PA BOARD AUDIO SOURCE SELECTION

SW2 POSITION				SOURCE	OUTPUT
1	**2**	**3**	**4**		
ON	OFF	x	x	MATRIX BD.	SPEAKER 1
OFF	ON	x	x	LINE A IN	SPEAKER 1
x	x	ON	OFF	MATRIX BD.	SPEAKER 2
x	x	OFF	ON	LINE B IN	SPEAKER 2

"x" = either position

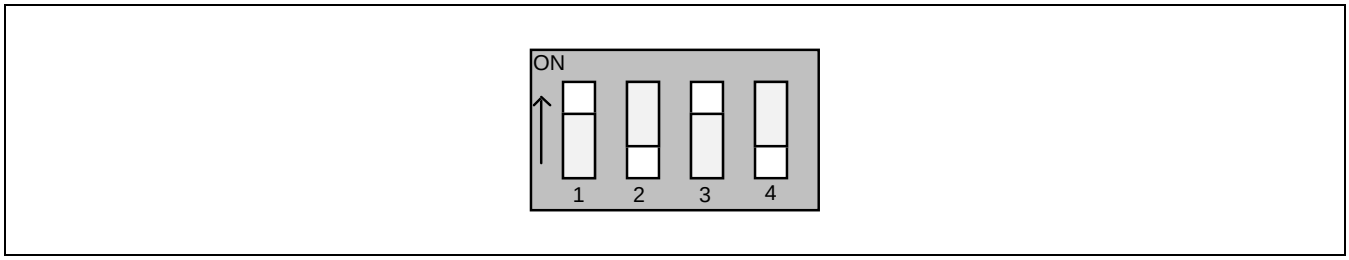


Figure 11 – SW2 Default Selection Settings

4. Turn power off and remove the extender board to restore the system to the standard setup.

6. CD ELECTRICAL INTERCONNECTIONS

The CD-to-CEC/IMC interconnections via the Audio Tower require a second Audio PA Board in the Audio Tower. Also, a 4-wire CD audio line between this Audio PA Board and the console's CIM within the CEC/IMC is required.

Figure 12 shows the basic equipment interconnection with all CD patch hardware installed. The number of conductors required for the patch-related cables is shown. See section 6.2 SIGNAL INTERCONNECTIONS for wiring details.

Both Audio PA Boards will have the same LINE A IN/OUT and LINE B IN/OUT labels. LINE A and LINE B labels on the second Audio PA Board are considered as LINE C and LINE D respectively. Figure 13 shows the locations of the various LINE connectors.

Both Audio PA Boards will have the same SPKR A and SPKR B labels. SPKR A and SPKR B labels on the second Audio PA Board are considered as SPKR C and SPKR D respectively.

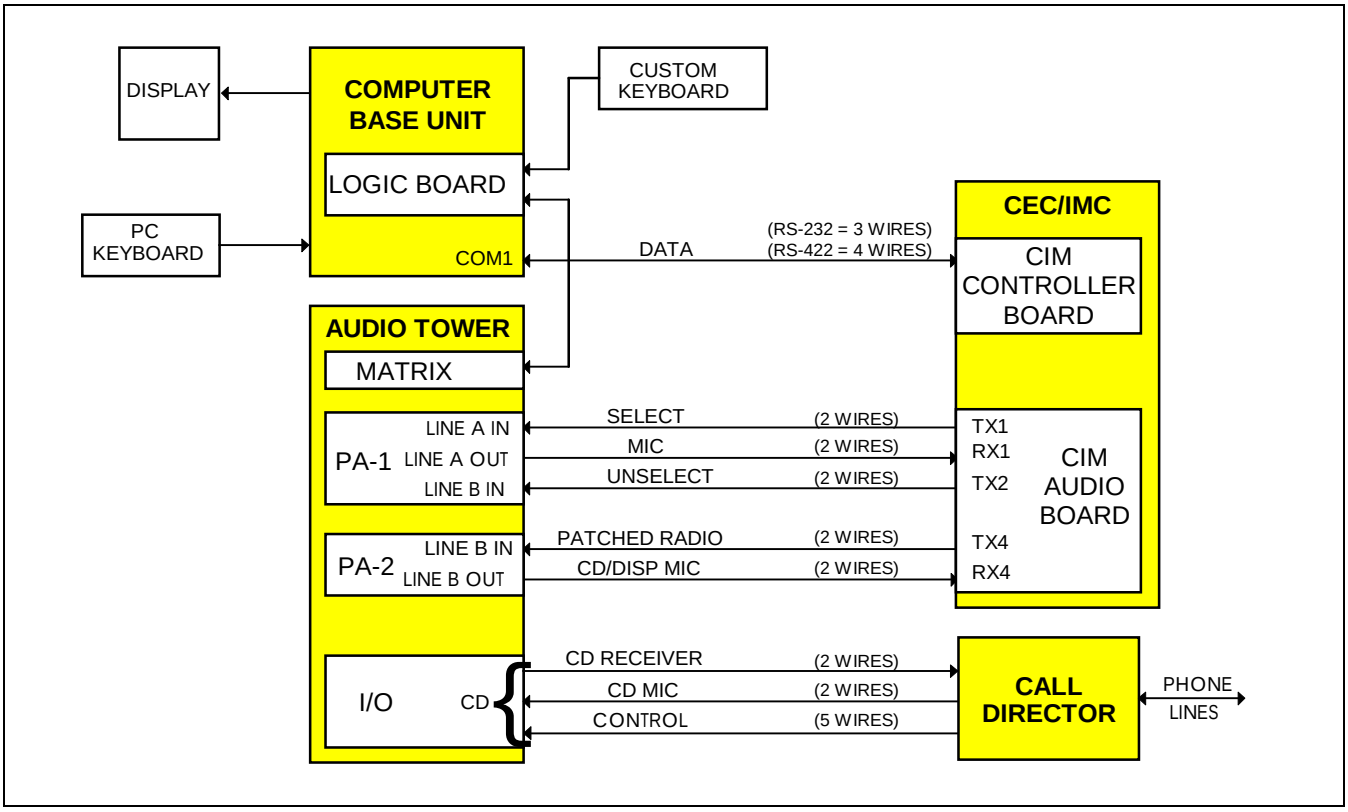


Figure 12 – Basic Equipment Interconnection with CD Patch

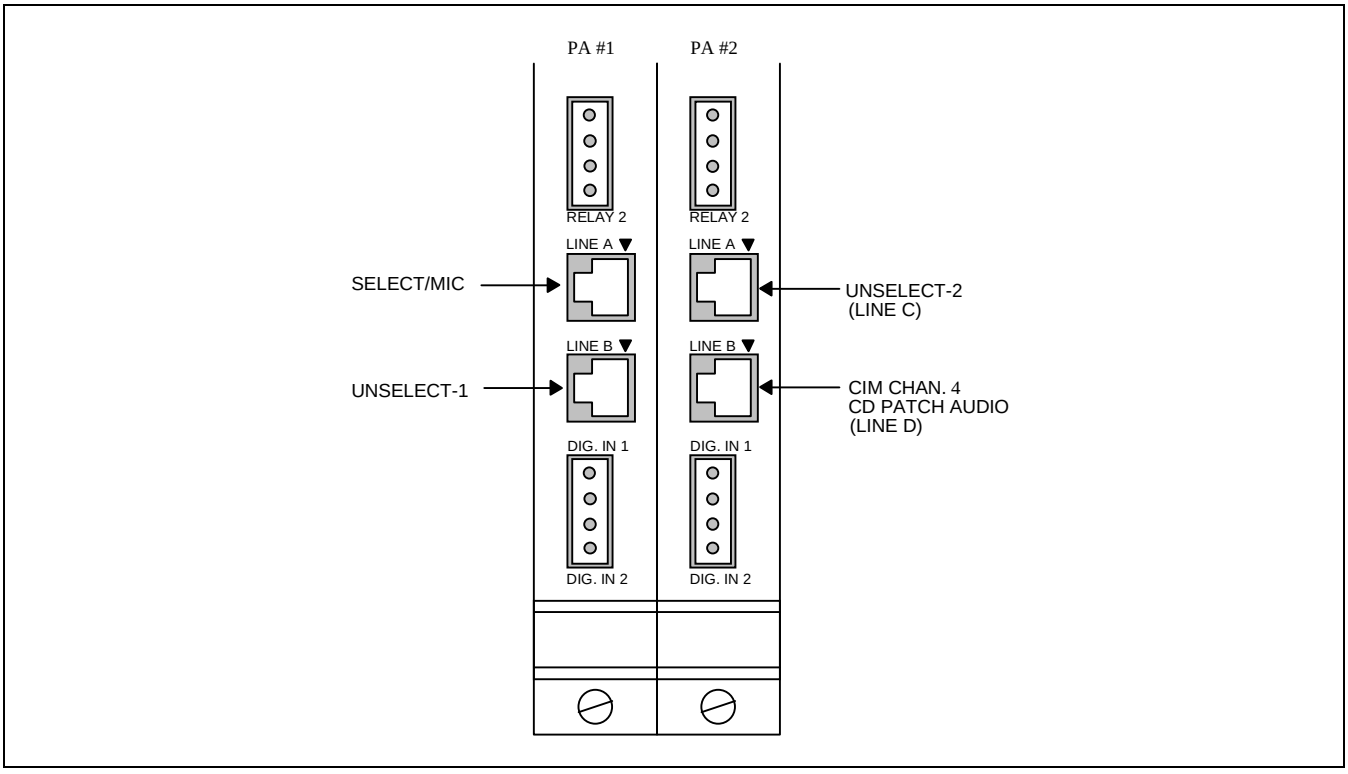


Figure 13 – Audio PA Board LINE Connectors

6.1. SIGNAL DESCRIPTIONS

6.1.1. I/O Board-To-Call Director

Table 8 describes the various signals between the Audio Tower's I/O Board and the Call Director. The descriptions are relative to the Audio Tower.

TABLE 8 – I/O BOARD-TO-CALL DIRECTOR SIGNAL DESCRIPTIONS

TYPE	INPUT OR OUTPUT	USE
Handset Jack Sense (optional)	Input	Active low when a handset is plugged into the CD. This handset overrides all audio connections to the Audio Tower. The operator talks directly to the phone via the handset instead of using the console's headset or mic/speaker. Dry contact.
Off-Hook Sense	Input	Active low when the CD is placed off-hook. Dry contact.
CD Receiver	Output	Radio/operator mic audio to the CD (telephone receiver). This audio is heard by the telephone. 600-ohm balanced output: -45 dBm to -20 dBm, typically -25 dBm.
CD Mic	Input	Audio from the CD (telephone mic). This audio is heard by a radio in patch operation, or by operator headset in normal operation. 600-ohm balanced input: -37 dBm to +8 dBm, typically -25 dBm.
On-Hook Relay (optional)	Output	Normally open dry contact. Closure generated when the console disconnects the CD from the CEC/IMC. Used to put CD on-hook, if an input exists. The relay contact is normally-open and remains energized for approximately 1.2 seconds. This value is fixed in the Logic Board firmware and cannot be changed. Relay contact ratings are: 0.6 A @ 125 Vac 0.6 A @ 110 Vdc 2.0 A @ 30 Vdc
Ground	Input	Signal ground for dry contact sense lines.

6.1.2. Audio PA Board #2-To-CIM

Table 9 describes the audio signals between the Audio Tower's Audio PA Board #2 and the CIM within the CEC/IMC. The descriptions are relative to the Audio Tower. These signals are interfaced via 600-ohm balanced lines and they have typical levels of 0 dBm.

TABLE 9 – AUDIO PA BOARD #2-TO-CIM SIGNAL DESCRIPTIONS

TYPE	INPUT OR OUTPUT	USE
Patched Radio	Input	Radio audio from CIM TX channel 4. This audio is heard by the telephone.
CD/Operator Mic	Output	Telephone/operator mic audio to CIM RX channel 4. This audio is heard by a radio.

6.2. SIGNAL INTERCONNECTIONS

6.2.1. I/O Board-To-Call Director

All Audio Tower-to-CD wiring should be included in a single cable that terminates at the Audio Tower in a male DB-9 connector. Since the connections at the CD vary according to manufacturer and model, no specific pin-outs are provided in the drawing below. The signal names at the CD will not necessarily be the same as those used in this document. It is left to the end user to determine the proper connections at the CD, based on the previous descriptions given.

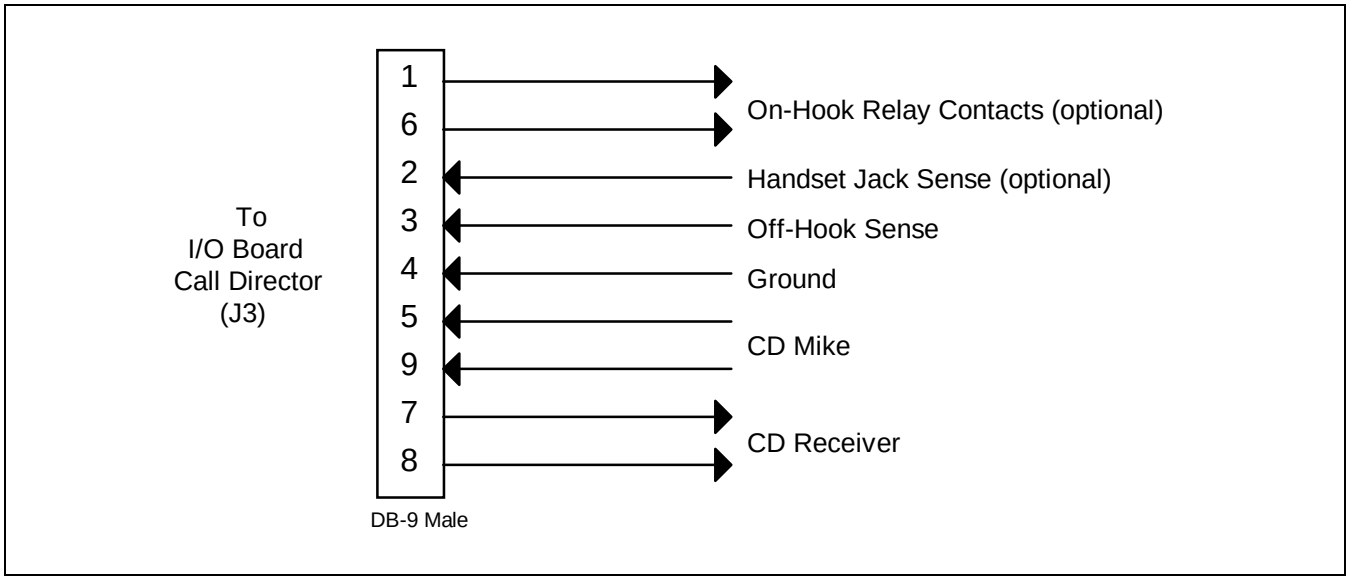


Figure 14 – CD-To-I/O Board DB-9 Wiring

NOTE

Some existing call director installations have an in-line "transformer box" installed between the CD and J3. The box may be removed and the DB-9 from the CD going into the box's cable can be plugged directly into J3. *Audio Matrix Board jumpers JP1 and JP2 must be removed if the transformer box is removed.* One jumper is located just above each of the two transformers near the Backplane connector. See section 3.1.5 for additional details.

6.2.2. Audio PA Board #2-To-CIM

On the second Audio PA Board (#2), the LINE A IN/OUT connections physically become LINE C IN/OUT and the LINE B IN/OUT connections physically become LINE D IN/OUT.

Since the CEC/IMC is using RX4/TX4 for CD audio, the console uses the Audio Tower's LINE D IN and LINE D OUT connections to keep CD connections to a "fourth" channel on all hardware. This allows the console to use CIM RX3 for Unselect Speaker 2, connected to LINE C IN (labeled LINE A IN) on Audio PA Board #2.

Install two (2) pairs of audio cables between the CEC/IMC CIM Audio Board and Audio PA Board #2 in the Audio Tower. Terminate the Audio PA Board's connection with an RJ-11 connector. The RJ-11 pin-outs are shown in Figure 15. Due to the distances involved, shielded cable is recommended for these interconnections between the Audio Tower and the CEC/IMC.

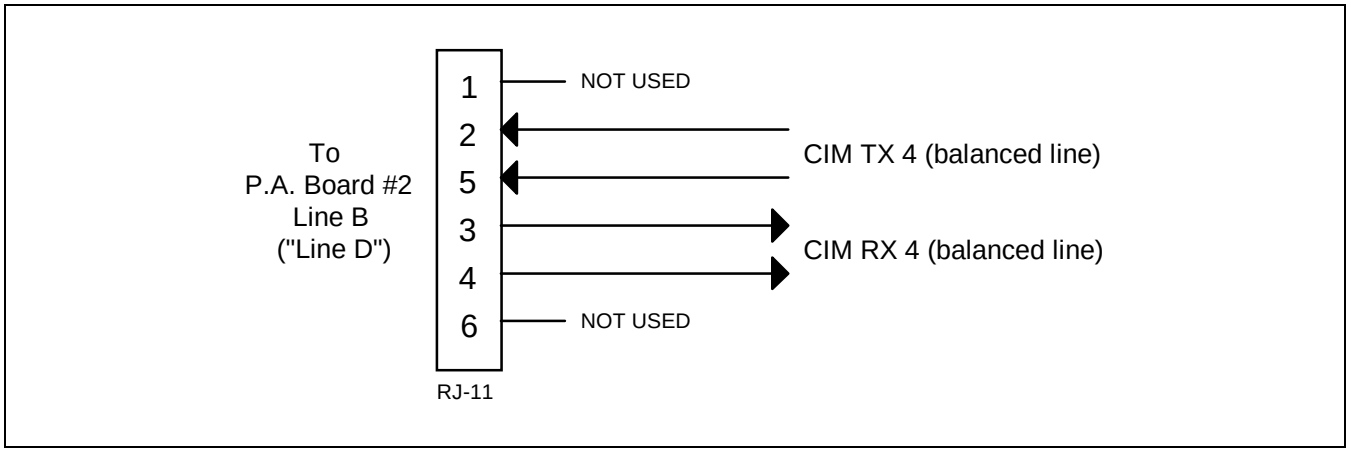


Figure 15 – Audio PA Board #2-To-CIM RJ-11 Wiring

6.3. CONSOLE CONFIGURATION

The C3 Maestro console must be properly configured to support Call Director patch. This configuration is set at the CEC/IMC Manager (MOM PC) and sent via the CIM to the console. If the configuration is not valid, the console will reject attempts to patch to the CD.

6.3.1. Audio Slots

The CEC/IMC Manager's System Audio Configuration for Console Audio Slots must be set to four (4) for each console that is equipped with CD patch.

6.3.2. Hardware

The following procedure must be executed at the CEC/IMC Manager for each console that uses CD patch:

1. From the Main Menu, access "Console Configuration", then "Console Hardware Configuration".
2. Set "Console Number" to the number of the target console.
3. Set "Phone Configuration" to "b) CD".
4. Set "Call Director ID" to an unused LID. Each "Call Director ID" must be unique, i.e. not used by any radio or console. This LID must be programmed or reserved in the System Manager.
5. Set "Number of PA Boards" to two (2).
6. Press <F5> to save the configuration to disk.
7. Press <F7> to send the configuration to the target console.