TECHNICAL MANUAL
MAINTENANCE INSTRUCTIONS
ORGANIZATIONAL/DIRECT SUPPORT/GENERAL SUPPORT LEVELS
COMMUNICATION CONTROL CONSOLE
OJ-512/FRC-176(V)
(NSN 5895-01-123-0084)

CONTROL INTERFACE GROUP
O K-449(V)/FRC-176(V)

VOLUME I

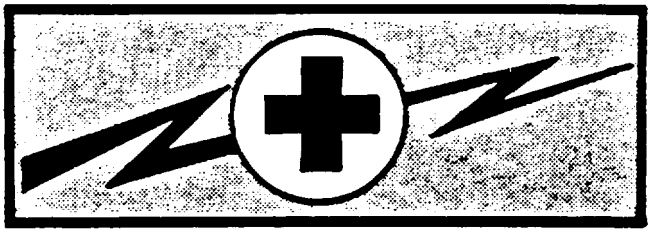
DEPARTMENTS OF THE ARMY AND AIR FORCE

MARCH 1983

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING



MI 131637

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

-.Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it

Be careful not to contact high-voltage connections of 115 volt ac input connections when installing or operating this equipment

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING Do not be misled by the term plow voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

WARNING

Lethal voltage (230 Vac) is present at the rear of the Control Interface Group, Telephone Equipment Bay, Unit 1.

WARNING

Lethal voltage (115 Vac) is present at the rear of Control Interface Group, Telephone Equipment Bay, Unit 1.

WARNING

Lethal voltage (230 Vac) is present on the rear of the LP Antenna Control-Indicators in the RF Equipment Bay, Unit 2, of the Control Interface Group.

WARNING

Lethal RF energy (1 kW) present on cables connected to Transmitter and Antenna Patch Panel.

HOW TO USE THIS MANUAL

The Communication Control Console OJ-512/ FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) manual is organized into two volumes which contain eight chapters and an appendix. Chapter 1 contains general information about Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V). Chapter 2 contains the general theory of operation. Chapter 3 contains maintenance instructions. Chapter 4 contains preparation for shipment instructions. Chapter 5 contains storage instructions. Chapter 6 contains schematic diagrams. Chapter 7 contains wire-run-lists for the cables and point-to-point wiring. Chapter 8 contains the cautions and warnings pertaining to the operation and maintenance of the aforementioned equipment. Appendix A contains the Maintenance Allocation Chart (MAC).

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TECHNICAL MANUAL
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TECHNICAL ORDER
TO 31R5-2FRC176-11-1

DEPARTMENTS OF THE

Washington, DC, 10 March 1983

VOLUME 1

Organizational/Direct Support/General Support Levels
COMMUNICATION CONTROL CONSOLE
OJ-512/FRC-176(V) (NSN 5895-01-123-0084)
CONTROL INTERFACE GROUP
OK-449(V)/FRC-176(V)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, US Army Communications - Electronic Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, NJ 07703.

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Volume 1

This Volume contains Chapters 1 through 5. Chapters 6 and 7, and Appendixes A and B are contained in TM 11-5805-734-14-2.

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CHAPTER 1
INTRODUCTION

1-1. PURPOSE AND FUNCTION

This manual covers organizational, direct support, and general support maintenance instructions for Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V). The Communication Control Console OJ-512/ FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) were procured under Army Contract DAABO7-79-G-6230/O03 as part of Radio Communications System AM/FRC- 176(V) for the RF Communications Division of Harris Corporation, 1680 University Avenue, Rochester, New York 14610.

1-2. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) GENERAL DESCRIPTION

Communication Control Console OJ-512/FRC-176(V) is a two operator, five bay console, that can accommodate .remote control operation of up to 12 Radio Sets AN/URC-103(V)l. The console accomplishes all of the audio switching required to supervise and operate the HF radio sets, audio monitors, headsets, microphones, telephones, and associated key line and interlock circuitry. The console offers wide versatility, ranging from selection of six voice control source modes, TTY mode selection, VOX or manual keying, to continuous channel monitoring and continuous tape logging.

Communication Control Console OJ-512/FRC-176(V) shown in figure 1-1 includes the following major equipment:

Equipment Bay No. 1 (7052-1500)

- Phone Patch Panel (RF-901A)
- Audio Monitor Assembly (7052-1100)
- Telephone Switch/Dial Panel (7052-0020)
- Space for future Communication Security Equipment (All sites except Bann "B" Site)
- Remote Audio Select Panel (7052-1010)(Bann "B" Site Only)
- Headset/Lamp Test Panel (7052-1120)
- Tape Transport Unit (7052-1252)
- Tape Recorder Interface PWB Assembly (7052-8040)
- Power Supply (-24 Vdc)(B24GT210-230)
- Power Supply (+24 Vdc)(B12GT650-230)
- Telephone Receiver (7052-1310)

- Headset (7052-3009)
- Boom Microphone (Model 562)
- Footswitch (RF-920)

Equipment Bay No.2 (7052-1600)

- Tape Control Unit (7052-1251)
- Audio/Keyline Switch Panel (7052-1200)
- Audio/Keyline Card Assembly (7052-1610)

Equipment Bay No.3 (7052-1700)

- Digital Clock Assembly (7052-1730)
- Status Monitor Unit (10063-5100)
- Status Monitor Unit (10063-5200)
- Audio Connector Panel (7052-3029)
- Remote Control-Monitor Unit C-11021/URC (10063-0000)
- Remote Control Monitor Unit C-11201/URC (10063-0000)
- Remote Control Connector Panel (7052-0110)
- Rack Connector/Switch Panel (7052-1710)
- Mitel Quadverter (CF1070)

Equipment Bay No.4 (7052-1800)

- Phone Patch Panel (RF-901A)
- Audio Monitor Assembly (7052-1100)
- Boom Microphone (Model 562)
- Telephone Switch/Dial Panel (7052-0020)
- Footswitch (RF-920)
- Space for future Communication Security Equipment (All sites except Bann "B" Site)
- Remote Audio Select Panel (7052-1010)(Bann "B" Site Only)
- Headset/Lamp Test Panel (7052-1120)

- Tape Transport Unit (7052-1252)
- · Tape Recorder Interface PWB Assembly (7052-8040)
- · Power Supply (-24 Vdc) (B24GT210-230)
- · Power Supply (+24 Vdc) (B12GT650-230)
- · Headset (7052-3009)

Equipment Bay No. 5 (7052-1900)

- Tape Control Unit (7052-1251)
- Audio/Keyline Switch Panel (7052-1200)
- Audio/Keyline Card Assembly (7052-1610)
- Telephone Receiver (7052-1310)

The major equipment are installed in standard 19 inch (48.26 cm) Console Units, and mounted on slides to provide easy access to internal components. All equipment in the Communication Control Console OJ-512/FRC-176(V) is cooled by convection and/ or conduction.

1-3. CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) GENERAL DESCRIPTION

Control Interface Group OK-449(V)/FRC-176(V) functions as a common equipment bay housing telephone PBX interface equipment, RF patch panel, dc patch panel, audio patch panel, and the LP antenna remote control/indicator. These elements are common to both operator positions in the Communication Control Console. The Control Interface Group OK-449(V)/FRC-176(V) consists of two standard 19 inch (48.26 cm) Equipment Racks mounted side-by-side as shown in figure 1-2. The following major equipment are included:

Equipment Rack 1 (Telephone Equipment Bay (7052-2020)

- Telephone Punch Block (S66M2-5W)
- Telephone Card Shelf No.1 (400-11)
- Telephone Card Shelf No.2 (400-11)
- Telephone Card Shelf No 3 (800-11)
- Telephone Card Shelf No.4 (800-11)
- DC Patch Panel Assembly (7052-5100)
- Audio Patch Panel No.1 (JC-2-48/M)
- Audio Patch Panel No.2 (JC-2-48/M) (Blank Panel - Bann "B" Site Only)

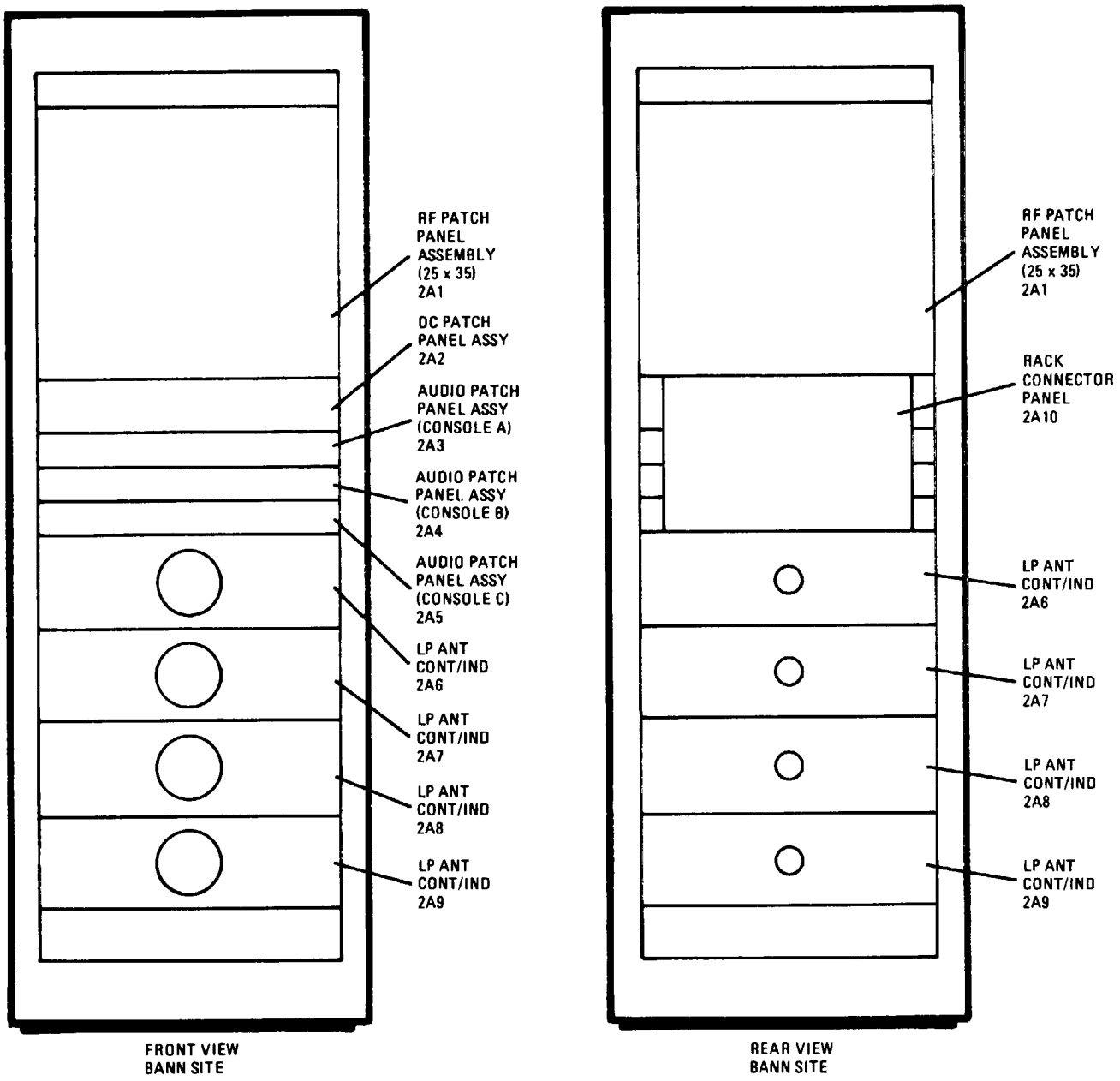


Figure 1-2. Control Interface Group OK-449(V)/FRC-176(V) (Sheet 2 of 5)

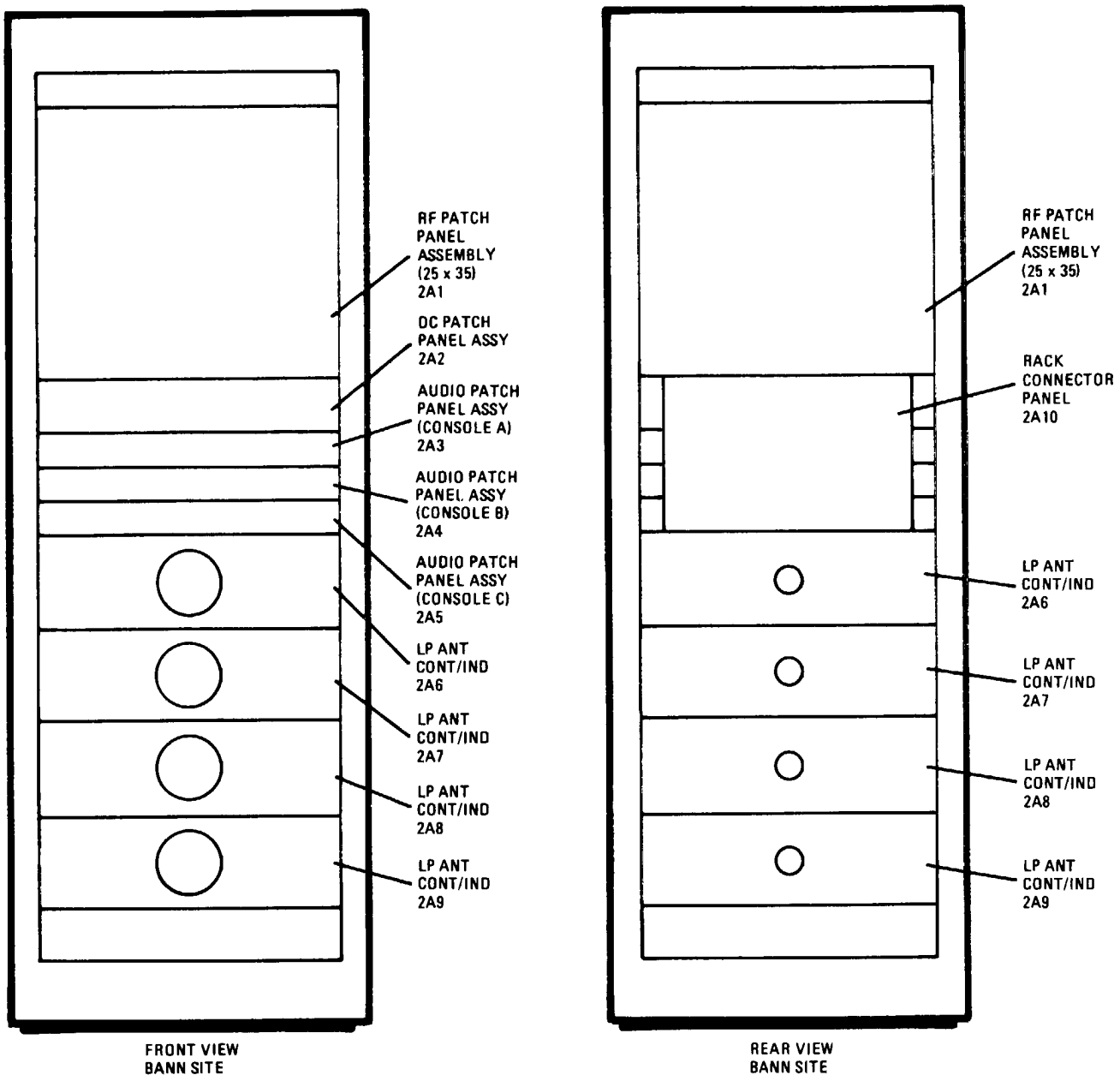


Figure 1-2. Control Interface Group OK-449(V)/FRC-176(V) (Sheet 5 of 5)

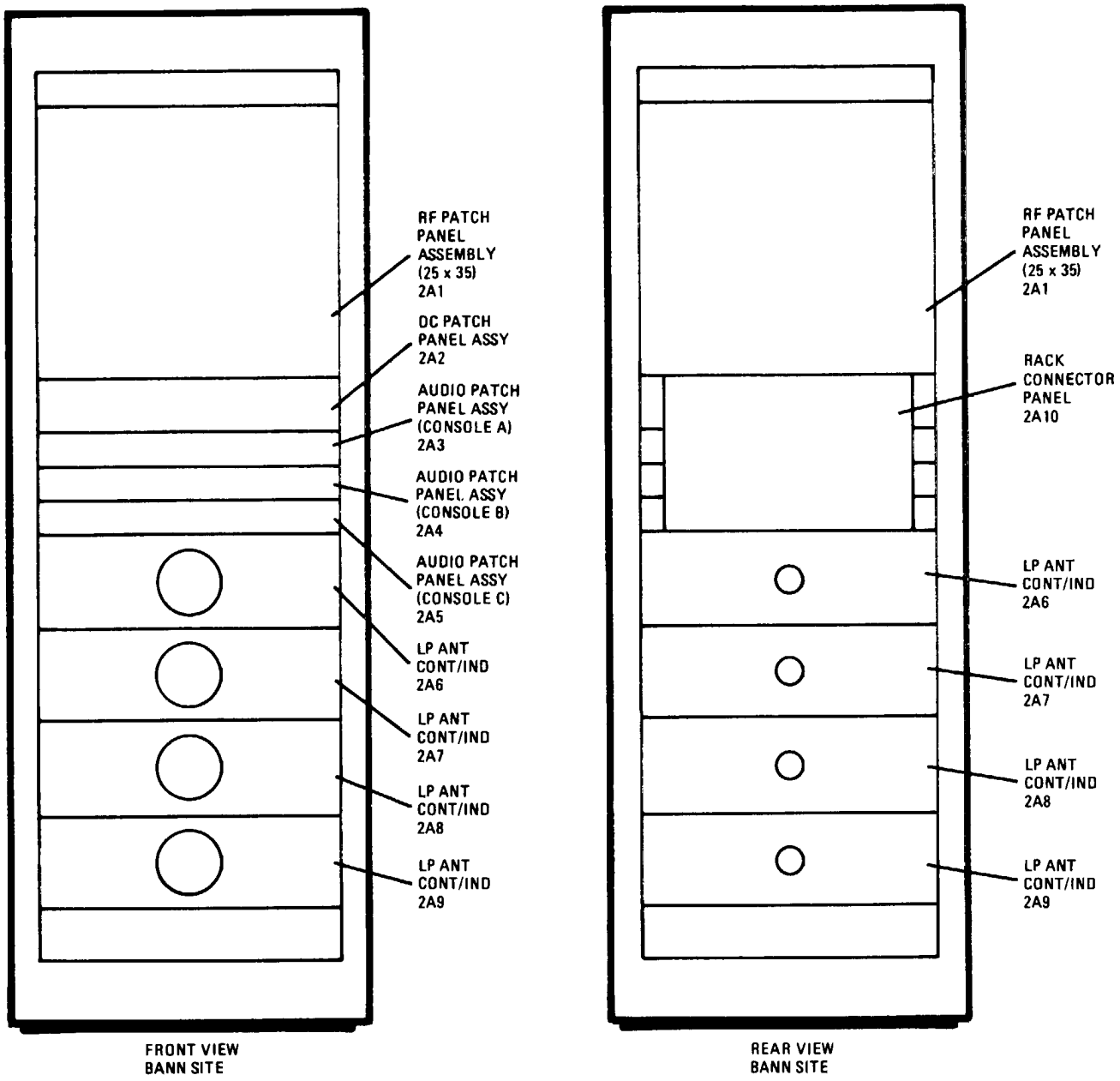


Figure 1-2. Control Interface Group OK (v)/Frc-176 (V) (Sheet 5 of 5)

- Key Service Panel Assembly (SB6615B03)
- Rack Connector Panel (7052-5018)
- Power Supply (48 Vdc Reg./ (8401-00)
- Power Supply (SB6613B-002)
- Transformer (35-1020)
- IDF Block 12 x 26
- IDF Block 6 x 26

Equipment Rack 2 (RF Equipment Bay) (7052-2010)

- RF Patch Panel (7052-2100) (Nellingen and Boeblingen) (2A1)
- RF Patch Panel (7052-2200) (Endingen) (2A1)
- RF Patch Panel (7052-2300) (Bann and Incirlik) (2A1)
- RF Patch Panel (7052-2400) (Bremerhaven) (2A1)
- LP Antenna Remote Control/indicator (873492) (Nellingen, Boeblingen, Endingen, Incirlik, and Bremerhaven) (2A2)
- DC Patch Panel Assembly (7052-5100) (Bann "B" Site Only) (2A2)
- LP Antenna Control/Indicator (873492) (Nellingen, Boeblingen, Endingen, and Incirlik) (2A3)
- Audio Patch Panel Assembly (JC-2-48/M) (Bann "B" Site Console A Only) (2A3)
- LP Antenna Control/Indicator (873492) (Incirlik) (2A4)
- Audio Patch Panel Assembly (JC-2-48/M) (Bann "B" Site Console B Only) (2A4) (2A5)
- LP Antenna Control/Indicator (873492) (Bann "B" Site Only) (2A6) (2A7) (2A8) (2A9)
- Rack Connector Panel (7052-5018) (Bann "B" Site Only) (2A1O)

All equipment in Control Interface Group OK-449(V)/FRC-176(V) is cooled by convection and/or conduction.

1-4. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) PERFORMANCE CHARACTERISTICS AND CAPABILITIES

The performance characteristics and capabilities of Communication Control Console are listed in table 1-1.

Table 1-1. Communication Control Console OJ-512/FRC-176(V) Performance Characteristics and Capabilities

Functional Mode	Characteristic
BROADCAST	Retransmission of a selected receive audio to up to 11 additional transceivers.
MIKE	Console operator transmission to up to 12 transceivers.
TAPE	Broadcast of tape message to up to 12 transceivers.
REMOTE	Broadcast of any audio mode from the other operator position.
RAD/RAD	Cross patch of any two out of 12 transceivers.
TEL/RAD .	Phone patch of any one of 12 outside telephone lines to any one of 12 transceivers, or phone patch of a console operator's telephone to any one of 12 transceivers
TTY	Connection of any one of four teletype modems to any one of 12 transceivers, or split connecting a TTY modem to any one of the 12 receivers and connecting the transmit portion of the same modem to any one of the remaining 11 transmitters.
TELEPHONE	Connection of a console operator's telephone to any one of 12 outside telephone lines, or to the intercom system.
TAPE-RECORDER	Recording of off-the-air audio, telephone inputs, A and B monitor audio, and operator comments (operator comments are recorded on a separate tape track). Play-back of either tape track to any or all transceivers, to the other operator position, to the A and B monitor, or to any of 12 outside telephone lines.

REMOTE CONTROL AND MONITORING CAPABILITIES:

a. Each operator can access up to 99 transceivers and control the following functions:

- Frequency
- Mode (USB, LSB, AM, CW, and FSK)
- AGC (FAST or SLOW)
- Fine Tune
- Status (OFF, STANDBY, or OPERATE)

b. Each operator has a continuous status display of up to six transceivers of the following parameters:

- Frequency
- Mode (USB or LSB)
- AGC (FAST or SLOW)
- LOCAL or REMOTE
- Transmitter KEY
- Receiver UNSQUELCHED
- Transceiver power ON
- FAULT (visual and audible indicators)
- RF output present

1-5. CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) PERFORMANCE CHARACTERISTICS AND CAPABILITIES

The performance characteristics and capabilities of the Control Interface Group are listed in table 1-2.

Table 1-2. Control Interface Group OK-449(V)/FRC-176(V) Performance Characteristics and Capabilities

Patching Capabilities
• Patching of any transceiver to one of several antennas, or to a lkw dummy load.
• Patching of any transceiver receive line or transmit line to any other transceiver. (Provision for 12 transceivers provided.)
• Patching to monitor either channel of the tape recorder.
• Patching of any telephone line to any other available telephone li ne. (Provision for up to 12 two-wire or 12 four-wire lines.)
• Patching of any one of 12 keylines to any one of 12 transceivers.

1-6. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) AND CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) TECHNICAL AND PHYSICAL DESCRIPTION

The following paragraphs include technical and physical descriptions of the major equipments in the Communication Control Console and the Control Interface Group. Figure 1-3 shows an overall system interconnection diagram of these equipments. Theory of Operation for these equipments is covered in Chapter 2 of this manual.

a. Communication Control Console OJ-512/FRC-176(V) Technical Description.

The Communication Control Console is specifically designed to allow two console operators to control the configuring and mode selection of up to 12 Radio Sets, 12 two-wire or four-wire telephone circuits, and four teletypewriter (TTY) circuits. Since the console operator positions are identical, the following is applicable to each.

(1) RF-901A Phone Patch. The RF-901A Phone Patch provides receive/transmit (VOX) keyline control, and manual keyline control between the Radio Set and the telephone lines.

(2) Audio Monitor Panel. The Audio Monitor Panel provides the circuitry necessary to present audio, (as selected on the Audio/Keyline Switch Panel) on either Monitor A, Monitor B, Send/Receive loudspeakers, or on the operators headset. This panel also allows operator control of volume and squelch on any monitor channels selected.

(3) Telephone Switch/Dial Panel. The Telephone Switch/Dial Panel acts as a telephone attendant console allowing the operator to seize one of 12 telephone lines so that, the operator may use it as a regular telephone circuit for placing or receiving calls, or may dedicate it to the Audio/Keyline Switch circuit for retransmission over a radio.

(4) Communication Security Equipment (All sites except Bann "B" Site). A space is provided for future secure voice equipment.

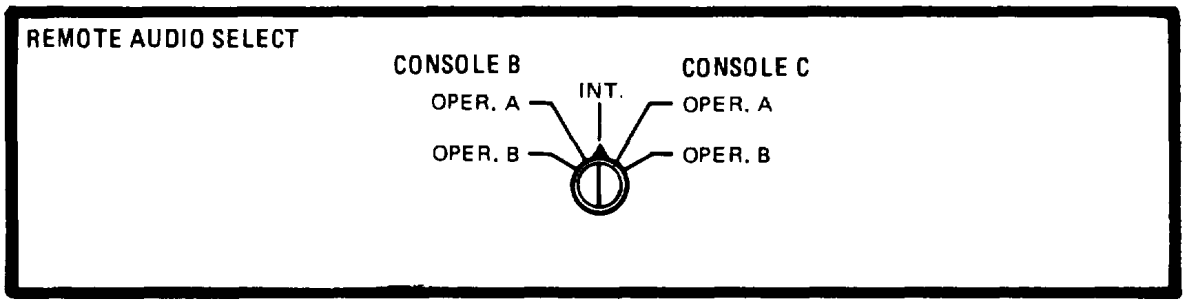
(5) Remote Audio Select Panel (Bann "B" Site Communication Control Consoles only). This unit allows the operator of any Bann "B" Site Console (Console A, B, or C) to select and monitor the audio of either of the remaining consoles. Referring to figure 1-4, if the operator of Console A wishes to monitor or record the audio information present at either Console B or Console C, he selects the appropriate Console's audio (Console B or C operator A or B station's audio) at his Remote Audio Select Panel.

(6) Headset/Lamp Test Panel. The Headset/Lamp Test Panel provides circuitry to interface the operator's headset with the Audio Monitor Panel and Audio/Keyline Panel. It also provides circuitry to test incandescent lamps on the Telephone Switch/Dial Panel.

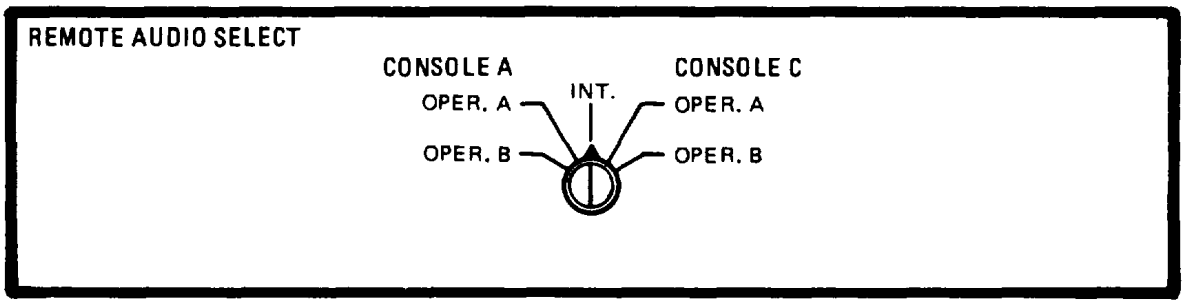
(7) Tape Transport. This unit contains three ac driven spooling motors, and an integrated control logic with tape motion sensor, that provides for any desired transition between different operating modes. Contactless electronic switching is provided for an electronic timer, for all motors and for remote control of all tape recorder functions.

(8) Tape Recorder Interface PWB. The Tape Recorder Interface PWB is used to provide the signal level control and impedance matching between the Tape Transport and Audio/Keyline Switch Panel.

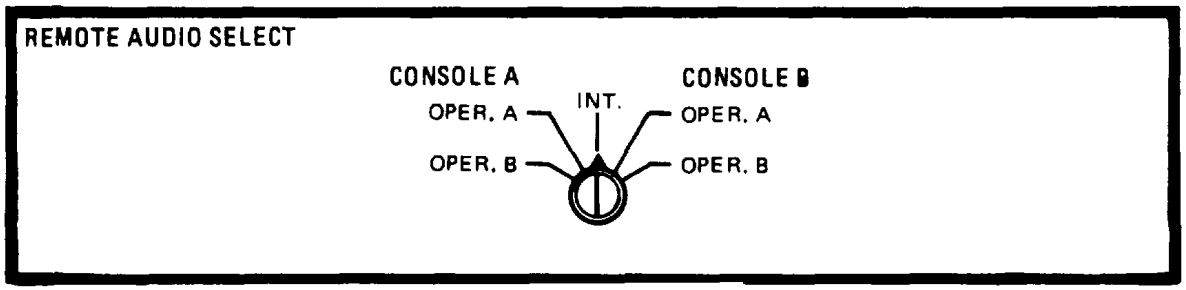
(9) 24 Vdc Power Supply, P/N B24GT210-230, lPSl and 4PS1 Communication Control Console OJ-512/FRC-176(V). This Power Supply provides -24 Vdc to the Telephone Switch/Dial Panel and to the Audio/Keyline Switch Panel.



CONSOLE A REMOTE AUDIO SELECT PANEL 1A4/4A4



CONSOLE B REMOTE AUDIO SELECT PANEL 1A4/4A4



CONSOLE C REMOTE AUDIO SELECT PANEL 1A4/4A4

Figure 1-4. Communication Control Console - Remote Audio Select Panel 1A4/4A4 (Bann Site Only)

(10) +12 Vdc Power Supply, P/N B12GT650-230, lPS2 and 4PS2 Communication Control Console OJ-512/FRC-176(V). This Power Supply provides +12 Vdc to the Audio/Keyline Panel.

(11) Telephone Handset. The telephone handset is used by the operator in conjunction with the Telephone Switch/Dial Panel.

(12) Headset. The headset is used by the operator in conjunction with the Audio/Keyline Switch Panel.

(13) Boom Microphone Model 562. The Shure Model 562 is a noise-cancelling, low-impedance boom microphone designed for highly intelligible speech communication in an environment where high volume background noise is present. This microphone is used by the operator in conjunction with the Audio/Keyline Switch Panel.

(14) Footswitch RF-920. The RF-920 Footswitch provides manual transmitter keying in conjunction with the Audio/Keyline Switch Panel.

(15) Audio/Keyline Switch Panel. The Audio/Keyline Switch Panel is the heart of the console's operation. It provides controls and indicators for configuring and monitoring Radio, Telephone, and TTY communications modes. Through this panel, the operator can select the voice control source, transceiver modes, TTY versus transceiver configuration, tape recorder modes, or the monitor modes.

(16) Audio/Keyline Card Cage. The Audio/Keyline Card Cage contains all of the printed circuit board modules required to accomplish the task selected on the Audio/Keyline Switch Panel.

(17) Tape Control Unit. The Tape Control Unit provides controls and indicators that perform record and playback functions for either tape recorder channel.

(18) Digital Clock. The Digital Clock unit provides a continuous time readout in hours, minutes, and seconds.

(19) Status Monitor Panel. Each Status Monitor Panel provides a direct status readout for up to six individual transceivers and sounds an alarm if any monitored transceiver should fault.

(20) Remote Control-Monitor Unit. Each Remote Control-Monitor Unit provides complete configuration and function control, plus readback status for up to 99 transceivers via a tri-statable RS-422 serial data bus.

(21) Console Units. There are five identical Console Units which house the Communication Control Console equipment.

b. Communication Control Console OJ-512/FRC-176(V) Physical Description. The physical characteristics of the Communication Control Console shown in figure 1-1, are as follows:

Width: 105 Inches (266.7 cm)

Height:: 50 Inches (127 cm)

Depth: 25.5 Inches (64.77 cm)

Weight: 1080 Pounds (489.89 kg)

c. Control Interface Group OK-449(V)/FRC-176(V) Technical Description. The Control Interface Group consists of two identical Equipment Racks which house equipment to interface the external telephone PBX with the console's telephone equipment; and also to interface the Radio Sets audio lines with the console's Audio/Keyline Switch Panel equipment. The Control Interface Group also contains the Control/Indicator Units 873492 which are used to position the Model LP-10O5AA 3/30 MHz Log Periodic Antennas described in Antenna Manual TM 11-5985-363-14.

(1) Telephone Punch Block (Seimens) S-66M2-5W. The S-66M2-5W punch retainer plate has four rows of 50 holes to accommodate the wire wrap tail on the two prong clip that is used in the S-66M2 Series Punch Blocks. The Telephone Punch Block (Seimens) contains two rows of "2 clip" terminals with wire wrap tails. Each terminal permits connection of two conductors (50 pair) with the advantage of a wire wrap tail. The tail is in the "B" and "C" retainer holes. The Telephone Punch Block (Seimens) is designed for installation in telephone equipment rooms, and is pre-wired to two 50 terminal female connectors, one mounted on each side of the bracket.

(2) Telephone Card Shelf No. 1. The Telephone Card Shelf No. 1 consists of a Wescom type 400-11 shelf frame, which houses three Scanner Output Relay Cards (4315-08), two Ringing Timer Cards (7052-8200), and two Transfer Relay Cards (41000) used in the telephone circuitry.

(3) Telephone Card Shelf No. 2. The Telephone Card Shelf No. 2 consists of a Wescom type 400-11 shelf frame, which houses six dual E&M/20 Hz to Signal Lead Converter modules (7392), and four Transfer Relay modules (410-00) used in the telephone circuitry.

(4) Telephone Card Shelf No. 3. The Telephone Card Shelf No. 3 consists of a Wescom 811-00 type shelf frame, which houses 12 Loop to E&M Long Line Station End modules (7361) used in the telephone circuitry.

(5) Telephone Card Shelf No. 4. The Telephone Card Shelf No. 4 consists of a Wescom 811-00 type shelf frame, which houses 12 two-wire to four-wire Repeaters used in the telephone circuitry.

(6) DC Patch Panel Assembly 7052-5100. The DC Patch Panel 7052-5100, is a pre-wired ACD type PJ-397 long frame jack panel designed to fit into a standard 19 inch equipment rack. The jack panel has 26 sets of three jacks, with the "A" row wired to the input (LINE), the "B" row wired to the output (DROP), and the "C" row wired as a MONITOR jack, which does not break the line. The first eight jacks from the left are used to interface the Audio/Keyline Switch Panel in the Communication Control Console, with the four TTY (teletypewriter) modems. Each TTY modem interface requires two sets of jacks with one set wired for receive (RX) and one set wired for transmit (TX). The next five jack sets are not used. The 12 jacks sets following, are used to interface the E&M signaling lines, from the 12 individual 7361 Loop-to-E&M Dial Long Line Station End modules to the 12 telephone lines. The "A" row is wired to the input (LINE), the "B" row is wired to the output (DROP), and the "C" row is wired as a MONITOR jack, which does not break the line. The last jack set on the right side of the jack panel is not used.

(7) Audio Patch Panel 1A7 ADC type JC-2-48/M. The Audio Patch Panel 1A7 is a pre-wire ADC type JC-2-48/M jack panel designed to fit into a standard 19 inch equipment rack. This jack panel has two sets of 24 jack sets, with each individual set wired as follows: the "A" row is wired to the input (LINE), the "B" row is wired to the output (DROP), and the "C" row is wired as a MONITOR jack, which does not break the line. The first eight jack sets in the left-hand set of 24 are used to provide patching capability for the Tape Player input/output. Four jack sets are used for each tape player, with two jack sets used for the tape player input and two jack sets used for the tape player output. The next 12 jack sets in the left-hand group of 24 are not used. The right-hand group of 24 jack sets are used to provide patching capability for the 12 telephone input lines from the PBX. Two jack sets are required for each telephone line, one for receiver (RX) and one for transmit (TX).

(8) Audio Patch Panel 1A8 ADC type JC-2-48/M.

NOTE

Audio Patch Panel 1A8 is included in the Telephone Equipment Bay of all sites except the Bann "B" Site. One of these units (for each Console) is located in the RF Equipment Bay (refer to figure 1-2) of the Control Interface Group.

The Audio Patch Panel 1A8 is a pre-wired ADC type JC-2-48/M jack panel designed to fit into a standard 19 inch equipment rack. This jack panel has two sets of 24 jack sets, with each set wired as follows: the "A" row is wired to the input (LINE), the "B" row is wired to the output (DROP), and the "C" row is wired as a MONITOR jack, which does not break the line. The first 12 jack sets in the lefthand group of 24 are used to provide patching capability for the 12 receive (RCV) audio channels between the transceivers (XCVRS) and the console. The second 12 jack sets in the left-hand group of 24 are used to provide patching capability for the 12 transmit (XMT) audio channels between the transceivers (XCVRS) and the console. The first four jack sets of the right-hand group of 24 are used to provide patching capability for the TTY KEYLINE between the console and the four TTY modems. The next eight jack sets in the right-hand group of 24 are used to provide patching capability for the TTY receive (RX) and transmit (TX) audio lines between the TTYs and the console. The last 12 jack sets in the right-hand group of 24 are used to provide patching capability for the transmitter KEYLINE signals between the transceivers (XCVRS) and the console.

(9) Key Service Panel, San/Bar Type SB6615B-3. The Key Service Panel is part of the telephone interface equipment. It provides the 12 KTU Key System Line Cards which allows for a multiline telephone interface with the console's attendant panel. The Solid State Interrupter Card in the Key Service Panel causes the lights on the console's attendant panel to blink when there is an incoming call and provides the intermittent ringing signal to alert the console's operator. The Key Service Panel also provides a Single Link-To-Station Intercom Card which allows the console's operators to use a paging system.

(10) Rack Connector Panel 7052-1710. The Rack Connector Panel provides a connection point in the interface between the Control Interface Group and Communication Control Console.

(11) Power Supply 8401-00. Power Supply 8401-00 is a standard key telephone unit (KTU) with transistorized circuitry that provides a regulated -48 Vdc output, at loads up to I A, from a nominal 230 Vac; 50 or 60 Hz single phase input. The Power Supply 8401-00 employs series regulation and foldback current limiting. The output voltage variation due to the line voltage or load fluctuations is +1 Vdc maximum (typically, +0.25 Vdc) output ripple is 15 mV rms maximum.

(12) Power Supply SB6613B-002, 1PS2 in Control Interface Group OK-449(V)/FRC176(V). Power Supply SB6613B-002 is a standard KTU that uses a 115 Vac input to supply the following outputs:

- 10 Vac +1 V at four amps continuous or eight amps intermittent current lamp supply.
- 20 Vac +2 V at 1.5 amps maximum continuous buzzer supply. (NOT USED IN THIS SYSTEM).
- 20-26 Vdc signal battery at two amps continuous current. Maximum ripple at full load 1.0 mV rms.
- 24 Vdc +1 V at .7 amps continuous current for talk battery. Maximum ripple at full load 10 mV rms. Load regulation is less than 2% output variation over full line/load range.
- 105 Vac, 30 Hz, at 50 mA ringing supply.

(13) Transformer 35-1020. This transformer is a 230 Vac to 115 Vac stepdown transformer used to supply the input voltage to Power Supply SB6613B-002.

(14) IDF Block, 12 X 26 (TB1) and IDF Block, 6 X 26 (TB2). These two IDF Blocks are used as tie points to interface the telephone signals from equipment in the Control Interface Group to the Rack Connector Panel and Communication Control
Console.

(15) Equipment Racks. There are two Equipment Racks that house the Control Interface Group equipment.

(16) RF Patch Panels. There are four different RF Patch Panels available for use in the Control Interface Group: a 10 X 15 Patch Panel 7052-2100, used at the Nellingen and Boeblingen sites; a 10 X 20 Patch Panel 7052-2200, used at the Edingen site; a 25 X 35 Patch Panel 7052-2300, used at the Bann and Incirlik sites; and a 10 X 25 Patch Panel 7052-2400, used at the Bremerhaven site.

(17) LP (Log Periodic) Antenna Remote Control/Indicators. Depending on the site there are up to four possible LP Antenna Remote Control/Indicators used in the Control Interface Group. There is only one LP Antenna Remote Control/Indicator used at the Bremerhaven site. There are two LP Antenna Remote Control/Indicators used at the Nellingen, Boeblingen, and Edingen sites. There are three LP Antenna Remote Control/Indicators used at the Incirlik site, and four used at the Bann site. For more information regarding the LP Antenna Remote Control/Indicator, refer to Antenna Technical Manual TM 11-5985-363-14.

d. Control Interface Group PK-449(Vy/FRC-17(_6(V) Physical Description. The physical characteristics of the Control Interface Group shown in figure 1-2, are as follows:

Width (each bay): 22.250 Inches (56.52 cm)

Height (each bay): 70 Inches (177.8 cm)

Depth (each bay): 26.750 Inches (67.95 cm)

Weight (Telephone Equipment Bay): 414 Pounds (187.79 kg)

Weight (Rf Equipment Bay): 208 Pounds (94.35 kg)

1-7. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) POWER AND UTILITY REQUIREMENTS

The Communication Control Console requires input power of 230 Vac +10%, 47-63 Hz, Single Phase, Amperes, maximum.

1-8. CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) POWER AND UTILITY REQUIREMENTS

The Control Interface Group requires input power of 230 Vac, +10%, 47-63 Hz, Single Phase, Amperes, maximum.

1-9. ENVIRONMENTAL REQUIREMENTS

The Communication Control Console and Control Interface Group provide full-rated performance over the following temperatures and relative humidity ranges:

Temperature: +32 to +122 F (O to 50°C)

Relative Humidity: O to 95%

1-10. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) AND CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) ITEMS FURNISHED.

The items furnished as part of the Communication Control Console and the Control Interface Group are listed in table 1-3. Miscellaneous non-electronic hardware items, such as blank panels, screws, washers, are not included in this list.

Table 1-3. List of Items Furnished as Part of Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V)

Ref. Desig	Description	Part No.
	Console, Communication Control OJ-512/FRC-165(V)	7052-1000
Unit 1	Equipment Bay No 1	7052-1500
Unit 2	Equipment Bay No2	7052-1600
Unit 3	Equipment Bay No 3	7052-1700

Table 1-3. List of Items Furnished as Part of Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) (Cont)

Ref. Desig.	Description	Part No.
Unit 4	Equipment Bay No. 4	7052-1800
Unit 5	Equipment Bay No. 5	7052-1900
	Control Interface Group OK-449(V)/ FRC-176(V)	7052-2000
Unit 1	Telephone Equipment Bay	7052-2020
Unit 2	RF Patch Equipment Bay	7052-2010
Site 1	Edingen Site Cable Group	7052-7001
Site 2	Nellingen Site Cable Group	7052-7002
Site 3	Boeblingen Site Cable Group	7052-7003
Site 4	Bremerhaven Site Cable Group	7052-7004
Site 5	Incirlik Site Cable Group	7052-7005
Site 6	Bann Site Cable Group	7052-7006
	(Two each) Executive Swivel Chair	#2526

1-11. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) AND CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) ITEMS REQUIRED

The only items required to operate the Communication Control Console and Control Interface Group, which are not supplied are:

- Power cables, two each, 230 Vac, 50-60 Hz, (3-conductor; No. 10 or No. 12 AWG) - supplied by local installations to meet particular requirements for the Communication Control Console.
- Power cable, one each, 230 Vac, 50-60 Hz, (3-conductor; No. 10 or No. 12 AWG) - supplied by local installation to meet particular requirements for the Control Interface Group.
- Group Straps for grounding all equipment racks.
- Interface cable between the Hy-Gain LP Remote Control/Indicator Units and the Hy-Gain LP Antennas.
- Teletypewriter Units, four each, and interface cables to connect to the Communication Control Console.

1-12. STORAGE DATA

No storage particulars apply to the Communication Control Console or Control Interface Group. If replacement or spare components are to be removed and/or stored for extended periods of time, the environment specified in paragraph 1-9 is recommended.

1-13. TOOLS AND TEST EQUIPMENT

Table 1-4 lists the tools and test equipment required to perform, verify, and maintain Communication Control Console and Control Interface Group.

Table 1-4. Tools and Test Equipment

Name	Mil Type	Commercial Part No.
Attenuator, 2KW, 30 dB	FSCM 70998	8329
Audio Oscillator	AN/URM 127	HP2-00CD
Blank Tape		211-1/4-R30
Logic Probe		HP545A
Logic Pulser		HP546A
Oscilloscope	0S261U	475 FSCM 80009
Probe-T-Connector		HP11042
VTVM	ME-303A U	HP410C
Millivoltmeter	AN/URM145B	HP92C
Signal General		HP606B
Test Adapter, Audio MON,J1 Plug Amp 206434 Pin Amp 1-66506-0 Shell Amp 206062-1		
Test Adapter, Audio MON,J2 Plug Amp 206-039-1 Pin Amp 1-66506-0 Shell Amp 206072-1		
Tool Kit	TK-101/G	
Telephone	FSCM 92728	Model 500 or equivalent
Transmission Test Set		HP3551A
VOM	AN/USM 223	

1-14. WARRANTY INFORMATION

Harris RF Communications warrants the equipment purchased hereunder to be free from defect in material and workmanship under normal use and service, when used for the purpose of which the same was designed, for a period of one year from the date of delivery, provided that notice of such defect is given to Harris RF Communications within sixty (60) days after the discovery thereof and provided that inspection by Harris RF Communications indicates the parts are defective to Harris RF Communications reasonable satisfaction. Harris RF Communications' obligations under this warranty are limited to the repair or replacement of defective parts and the return of such repaired or replaced parts to the purchaser FOB factory. At Harris RF Communications' option, any defective part shall be returned to Harris RF Communications' factory for inspection, properly packed and all expenses prepaid. No parts shall be returned unless the purchaser first obtains a return authorization number, which will be furnished on request. Electron tubes are warranted in accordance with the manufacturer's standard tube warranty policy, which will be furnished on request. Equipment furnished by Harris RF Communications, but manufactured by another, bears only the warranty given by such other manufacturer, which will be furnished upon request. NO WARRANTIES OTHER THAN THOSE SET FORTH IN THIS SECTION ARE GIVEN OR ARE TO BE IMPLIED INCLUDING IMPLIED WARRANTY FOR MERCHANTABILITY OR FITNESS FOR THE INTENDED PURPOSE, WITH RESPECT TO THE EQUIPMENT FURNISHED HEREUNDER AND HARRIS RF COMMUNICATIONS SHALL IN NO EVENT BE LIABLE FOR CONSEQUENTIAL DAMAGES, OR FOR LOSS, DAMAGES, OR EXPENSE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THE PRODUCTS, OR ANY INABILITY TO USE THEM EITHER SEPARATELY OR IN COMBINATION WITH OTHER EQUIPMENT.

1-15.INDEXES OF PUBLICATIONS

a. DA Pam 310-1 Refer to the latest issue of DA Pam 310-1 to determine whether there are any new editions, changes or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine if there are any modification work orders (MWO's) pertaining to the equipment.

1-16. MAINTENANCE FORMS AND RECORDS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS). Air Force personnel will use AFM 66-1 for maintenance reporting and TO-OO-35D54 for unsatisfactory equipment reporting.

b. Report of Item and Packaging. Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD) as prescribed in AR 735-11-2/DLAR 4140.55/NAVSUPINST 4440.127E/AFR 400.54/MCO 4430.E.

c. Discrepancy_ in Shipment Report (DISREP)(SF 361). Fill out and forward Discrepancy in Shipment Report (DISCREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-17. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have

preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness.

1-18. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-19. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

a. Army. If your Communication Control Console OJ-512/FRC-176(V) or Control Interface Group OK-449(V)/FRC-176(V) needs improvement, let us know. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put in on an SF 368 (Quality Deficiency Report). Mail it to Commander, Communications-Electronics Command; ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send you a reply.

b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFM 900-4.

CHAPTER 2
GENERAL THEORY OF OPERATION

2-1. SCOPE

This chapter is a detailed functional description of all assemblies and subassemblies which make up the Communication Control Console and Control Interface Group.

2-2. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V)

The Communication Control Console shown in figure 1-1 and figure 2-1, accommodates remote control and operation of up to 12 RF-270-5A Transceivers. Audio switching, required to supervise and operate the HF radio transceivers, loudspeakers, headsets, microphones, telephones, tape recorders, and audio keyline equipment is accomplished by the console and described in the following paragraphs. The console provides space and wiring interface for future secure teletypewriter and COMSEC equipment.

a. Communication Control Console OJ-512/FRC-176(V) Configuration. There are two operator positions at the console, "A" operator position is located to the left front of console, and "B" operator position to the right. A shared equipment position is located in the center bay of the five bay console. Each operator position includes the following equipments:

- RF-901A Phone Patch Panel
- Audio Monitor Panel
- Telephone Operator Dial Switch Panel plus Telephone Handset and Hookswitch
- Space for future COMSEC equipment
- +12 Vdc Power Supply
- -24 Vdc Power Supply
- B77-SLS Revox Tape Recorder
- Audio Keyline Panel plus Headset, Boom Microphone, and Footswitch

Operator shared equipment includes:

- Digital System Clock
- Status Display Panels (2)
- RF-7401 Remote Control Unit (2)

b. Operator Position Operational Description. For detailed description see System Operator's Manual for Radio Communications System TM 11-5895-1137-10.

c. RF-901A Phone Patch 1Al, 4Al Communication Control Console OJ-512/FRC-176(V). The RF-901A Phone Patch Panel provides receive/transmit (VX)' keyline control, and manual keyline control between the RF-270-5A Transceivers and telephone lines.

(1) RF-901A Phone Patch Panel Indicators and Controls. The RF-9OlA Phone Patch Panel indicators and controls are shown in figure 2-3 and description follows:

- S1 - Function Switch
- R3 - VOX Threshold Control
- DS1 - Telephone ON Light
- Ml - Meter
- 53 - Balance Switch (Rear Panel)
- S2 - Meter Switch
- R1 - RECEIVE LEVEL Control
- R2 - TRANSMIT LEVEL Control

For complete compatibility with existing systems, front panel control adjustments include: input and output audio levels, VOX threshold level, and operating mode selector (off, VOX, manual receive/transmit). A front panel meter has been included for input/output level monitoring and null adjustment.

(2) RF-901A Phone Patch Panel Description. The operation of the RF-901A Phone Patch Panel is based on the use of a resistive balanced bridge. The bridge, consisting of resistors R18, R19, R21, and R22, supplies a high degree of isolation between the receive and transmit audio circuits in the unit. This permits two-way communications between the four-wire audio circuits of a radio set with a two-wire phone line. Variable resistor R18 compensates for the normal impedance variation of the phone line, to maintain a balanced bridge network.

(a) Transmit Mode Operation. Refer to figure 2-2. Audio signals received over the phone lines are applied to the balanced bridge. This causes current to flow through the bridge and through the primary winding of transformer T2. From the secondary of T2 the audio signal is applied to radio transmit amplifier, Q7/Q9 and to amplifier assembly Al and Q2. From transistor Q9 the audio is applied to the radio set transmitter. The output of the amplifier Q1 and Q2 is applied to the input of VOX amplifier IC4, and to transmit detector IC3. Amplifier IC4 provides additional amplification of the audio signal for rectification by the VOX detector circuit Q8. The dc voltage is filtered and applied to relay driver Q10. Transistor Q10 when forward biased by the dc VOX signal, energizes relay K1 to supply a closure on the radio set transmitter keyline. VOX THRESHOLD control R3 provides continuous adjustment of the VOX threshold (trip level) from -25 dBm to -5 dBm depending on the level of the received signal from the radio set.

(b) VOX Inhibit Circuitry Operation. Detector IC3 provides a dc voltage to the input of differential amplifier IC2. The other input to IC2 is provided by the radio receive amplifier Q3 and receive detector IC1. The differential amplifier switches off the VOX inhibit signal at VOX amplifier IC4 during periods of radio

set transmission. During periods of radio set reception the VOX inhibit signal at IC4, provided by Q5 and Q6, prevents accidental radio set keying by leakage of the received audio signal through the balanced bridge network. In the MANUAL mode the input to relay driver Q10O is shorted to ground by the Function switch to override the automatic keying feature. The keyline closure in this mode is then supplied by a ground signal from the foot switch at relay K1.

(c) Receive Mode Operation. Audio signals from the radio receiver are applied by the two-wire input through RECEIVE LEVEL control R1 to receive amplifier Q3. The signal, amplified to a level sufficient for transmission over the phone line, is applied to the primary windings of transformer T1. The secondary winding of T1 couples the audio signal to the balanced bridge network for transmission over the phone line. This causes current to flow through one half of the bridge and because it is balanced no current is induced in the remaining half, the radio set transmit side. In this way a high degree of isolation is provided between the receive and transmit circuitry in the RF-901A. As explained in the VOX paragraph, the radio set received audio is applied to the receive detector and differential amplifier circuits to disable VOX amplifier IC4 (VOX inhibit) during periods of radio set reception.

d. Audio Monitor Panel P/N 7052-1102, lA2Al and 4A2A1 In Communication Control Console bJ-512/FRC-176(V). 'There are' two Audio Monitor Panels' in each Communication Control Console. 'Each Audio Monitor Panel can monitor any (or all) of the 12 possible RF-270-5A Transceivers on either the Monitor A or Monitor B channel as long as the transceiver(s) is not in the SEND/RECEIVE mode. If any transceiver is in the SEND/RECEIVE mode, audio for that channel can be monitored on the Audio Monitor Panel SEND/RCV channel. The operator may assign any (or all) of the 12 transceivers to either the MONITOR A or MONITOR B channel as long as the Audio Keyline switch for that particular transceiver is not in the SEND/RECEIVE position.

(1) Audio Monitor Panel Indicators and Controls. The Audio Monitor Panel indicators and controls are shown in figure 2-4 and description follows:

- A1FL1 - AC power input
- A1J1 - Microphone headset input/output
- A1J2 - SEND/RECEIVE, MON A, and MON B input/output
- A1LS1 - MON A speaker
- A1LS2 - MON B speaker
- A1LS3 - SEND/RCV Speaker
- A1R1 - MON A SQUELCH
- A1R2 - MON A VOLUME
- A1R3 - MON B SQUELCH
- A1R4 - MON B VOLUME
- A1R5 - SEND/RCV SQUELCH

- A1R6 - SEND/RCV SQUELCH

(2) Audio Monitor Panel Functional Description. A detailed functional block diagram of the Audio Monitor Panel is shown in figure 2-5, the Audio Monitor Panel schematic diagram and individual schematics for subassemblies are shown in figures 6-4 thru 6-8 of this manual.

(a) SEND/RECEIVE Channel Description. The SEND/RCV AUDIO signal, from the Audio Keyline, is applied to a 600 ohm balanced input transformer T1, on SEND/RCV Audio Amplifier A2A7. Output of transformer T1 is applied to the contacts of squelch controlled relay A2A7Kl and to one side of SQUELCH control potentiometer A1R5, on the Audio Monitor Front Panel assembly. The SEND/RCV SQUELCH output from A1R5 is applied to the inverting input of voltage amplifier A2A7AR1. This amplifier has a positive feedback path through resistor A2A7R5 which provides a voltage gain of approximately 82 to 1. Capacitor A2A7C2, in the feedback path, functions as a high frequency rolloff filter to prevent the squelch circuit from tripping on noise. The output of the voltage amplifier is detected by diodes A2A7CRI and CR2 to provide a 0 to +5 Vdc input to the inverting input of voltage comparator A2A7AR2. This dc voltage can be measured at test point A2A7TPl. The input voltage to A2A7AR2 is compared to a +3 Vdc threshold level. When the input voltage exceeds the threshold, the output which is normally at +15 Vdc will drop to approximately 0 Vdc. When the output of A2A7AR2 drops to 0 Vdc, this biases transistor switch A2A7Q1 on applying a ground to the coil of relay A2A7Kl. This energizes the relay providing a path through its contacts for the SEND/RCV AUDIO signal. This signal is applied through the front panel mounted VOLUME control potentiometer AlR6 to the input of audio amplifier A2A7AR3. The output of the audio amplifier can vary from about 200 mV peak-to-peak to about two volts peak-to-peak depending on the setting of the front panel mounted VOLUME control potentiometer AlR6. An indicator A2A7DS1 is provided on the Audio Amplifier Board to indicate when audio is present. The amplified audio signal is applied to a set of contacts on the front panel mounted SPEAKERS/ HEADSET switch AlS1. When AlS1 is in SPEAKERS position, the SEND/RCV AUDIO signal is broadcast over the front panel mounted SEND/RECEIVE speaker AlLS3. When AlS1 is in HEADSET position, the SEND/RCV AUDIO signal is broadcast from the right earphone of the operator's headset.

(b) MON A Channel Description. The MON A AUDIO signal, from the Audio Keyline, is applied to a 600 ohm balanced input transformer T1, on MON A Audio Amplifier A2A4. The output of transformer TI is applied to the contacts of squelch controlled relay A2A4Kl and to one side of SQUELCH control potentiometer AlR1, on the Audio Monitor Front Panel assembly. The MON A SQUELCH output from A1R1 is applied to the inverting input of voltage amplifier A2A4ARl. This amplifier has a positive feedback path through resistor A2A4R5 which provides a voltage gain of approximately 82 to 1. Capacitor A2A4C2 in the feedback path, functions as a high frequency rolloff filter to prevent the squelch circuit from tripping on noise. The output of the voltage amplifier is detected by diodes A2A4CR1 and CR2 to provide a 0 to +5 Vdc input to the inverting input of voltage comparator A2A4AR2. This dc voltage can be measured at test point A2A4TPl. The input voltage to A2A4AR2 is compared to a +3 Vdc threshold level. When the input voltage exceeds the threshold, the output which is normally at +15 Vdc will drop to approximately 0 Vdc. When the output of A2A4AR2 drops to 0 Vdc, this biases transistor switch A2A4Ql on applying a ground to the coil of relay A2A4Kl. This energizes the relay providing a path through its contacts for the MON A AUDIO signal. This signal is applied through the front panel mounted VOLUME control potentiometer AlR2 to the input of audio amplifier A2A4AR3. The output of the audio amplifier can vary from about 200 mV peak-to-peak to about

two volts peak-to-peak depending on the setting of the front panel mounted VOLUME potentiometer AlR2. Indicator A2A4DSl is provided to indicate when audio is present. The amplified audio signal is applied to a set of contacts on the front panel mounted SPEAKERS/HEADSET switch A1S1. When AlS1 is in SPEAKERS position, the MON A AUDIO signal is broadcast over the front panel mounted MON A speaker AILS1. When A1S1 is in the HEADSET position, the MON A AUDIO signal is applied as one input to a summing network on Summing Amplifier A2A6. The other input comes from the MON B audio circuit. The combined MON A and MON B AUDIO signals are coupled across capacitor A2A6C1 to the input of audio amplifier A2A6ARl. The output of A2A6AR1 is applied through output level adjust potentiometer A2A6R5 to the left earphone on the operator's headset. The A2A6R5 output level adjust is set to provide a balanced audio level to the left and right earphones.

(c) MON B Channel Description. The MON B AUDIO signal, from the Audio Keyline, is applied to a 600 ohm balanced input transformer TI, on MON B Audio Amplifier A2A5. The output of transformer T1 is applied to the contacts of squelch controlled relay A2A5Kl and to one side of SQUELCH control potentiometer A1R3, on the Audio Monitor Front Panel assembly. The MON B SQUELCH output from AiR5 is applied to the inverting input of voltage amplifier A2A5AR1. This amplifier has a positive feedback path through resistor A2A5R5 which provides a voltage gain of approximately 82 to 1. Capacitor A2A5C2 in the feedback path functions as a high frequency rolloff filter to prevent the squelch circuit from tripping on noise. The output of the voltage amplifier is detected by diodes A2A5CRI and CR2 to provide a 0 to +5 Vdc input to the inverting input of voltage comparator A2A5AR2. This dc voltage can be measured at test point A2A5TP1. The input voltage to A2A5AR2 is compared to a +3 Vdc threshold level. When the input voltage exceeds the threshold, the output which is normally at +15 Vdc will drop to approximately 0 Vdc. When the output of A2A5AR2 drops to 0 Vdc, this biases transistor switch A2A5Q1 on applying a ground to the coil of relay A2A5K1. This energizes the relay providing a path through its contacts for the MON B AUDIO signal. This signal is applied through the front panel mounted VOLUME control potentiometer AlR4 to the input of audio amplifier A2A5AR3. The output of the audio amplifier can vary from about 200 mV peak-to-peak to about two volts peak-to-peak depending on the setting of the front panel mounted VOLUME potentiometer AlR4. Indicator A2A5DS1 is provided to indicate when audio is present. The amplified audio signal is applied to a set of contacts on the front panel mounted SPEAKERS/HEADSET switch A1Si. When A1S1 is in the SPEAKERS position, the MON B AUDIO signal is broadcast over the front panel mounted MON B speaker A1LS2. When A1SI is in the HEADSET position, the MON B AUDIO signal is applied as one input to a summing network on Summing Amplifier A2A6. The other input comes from the MON A Audio circuit. The combined MON A and MON B AUDIO signals are coupled across capacitor A2A6C1 to the input of audio amplifier A2A6AR1. The output of A2A6AR1 is applied through output level adjust potentiometer A2A6R5 to the left earphone on the operator's headset. The A2A6R5 output level adjust is set to provide a balanced audio level to the left and right earphones.

(d) Boom Microphone Pre-amplifier Channel Description. The BOOM MIC AUDIO IN signal from the boom microphone, at approximately I mV peak-to-peak, is applied to the input of a Pi filter network on the Boom Microphone Pre-amplifier Board A2A3. This filter network filters out any noise or dc that may be on the BOOM MIC AUDIO IN signal. The filtered signal is then applied to the inverting input of voltage amplifier A2A3AR2. This amplifier has a positive feedback which provides a voltage gain of approximately 26 to 1. The output of this voltage amplifier is a 40 to 50 mV peak-to-peak audio signal offset by a +6 Vdc level, which can be measured at test point A2A3TP2. This amplified audio signal is applied across a 50k ohm potentiometer,

A2A3Rll, and a 1 k ohm resistor A2A3R3, to the inverting input of voltage amplifier A2A3AR1. This voltage amplifier has a positive feedback path through resistor A2A3R2 which in conjunction with potentiometer A2A3RI1 provides a variable voltage gain of 16 to 820. The output of this amplifier is adjusted for approximately two volts peak-to-peak, which can be measured at test point A2A3TP1. A 2 Vp-p output from A2A3AR1 applied across the 600 ohm balanced output transformer A2A3T1, provides a BOOM MIC AUDIO OUT signal at approximately -10 dBm to the Audio Keyline Equipment.

(e) Headset Microphone Pre-amplifier Channel Description. The HEADSET MIC AUDIO IN signal from the boom microphone, at approximately 1 mV peak-to-peak, is applied to the input of a Pi filter network on the Headset Microphone Pre-amplifier Board A2A2. This filter network filters out any noise or dc that may be on the HEADSET MIC AUDIO IN signal. The filtered signal is then applied to the inverting input of voltage amplifier A2A2AR2. This amplifier has a positive feedback which provides a voltage gain of approximately 26 to 1. The output of this voltage amplifier is a 40 to 50 mV peak-to-peak audio signal offset by a +6 Vdc level, which can be measured at test point A2A2TP2. This amplified audio signal is applied across a 50 k ohm potentiometer, A2A2Rll, and a 1 k ohm resistor A2A2R3, to the inverting input of voltage amplifier A2A2AR1. This voltage amplifier has a positive feedback path through resistor A2A2R2 which in conjunction with potentiometer A2A2Rll provides a variable voltage gain of 16 to 820. The output of this amplifier is adjusted for approximately two volts peak-to-peak, which can be measured at test point A2A2TP1. A 2 Vp-p output from A2A2AR1 applied across the 600 ohm balanced output transformer A2A2T1 provides a HEADSET MIC AUDIO OUT signal at approximately -10 dBm to the Audio Keyline Equipment.

(f) Headset PTT (Press-to-Talk) Circuit Description. The HEADSET PTT IN signal from the operator's headset microphone is routed directly through the Audio Monitor assembly to the Audio Keyline Equipment as HEADSET PTT OUT signal.

(g) Audio Monitor Panel Power Supply Circuit Description. A 230 Vac input power is applied to line filter A1FL1 through the AC PWR INPUT connector on the rear panel of the Audio Monitor Panel. The filtered ac input power is routed through POWER ON control switch A2S2, on the front panel, to the input of power supply A2PS1. Power supply A1PS1 develops the +15 Vdc that is used on all of the Audio Monitor Panel printed circuit boards.

e. Telephone Line Application Information. The system provides telephone interface to the following types of lines:

- Two-wire battery with dial or manual service.
- Four-wire with E&M lead signaling and dial or manual service.
- Four-wire manual (ringdown) with simplexed ringing signaling.

The following subparagraphs describe the operation and interface requirements of each type of line:

(1) Two-Wire Common Battery (CB) Lines. These are standard subscriber telephone lines. The system appears as a standard key telephone instrument having

either rotary or push button dialing capability. Refer to figure 2-6 and table 2-1. Each console operator position has a push button DTMF (Dual Tone Multifrequency) dial. Converters in the console receive the DTMF signals and produce corresponding digit information in dial pulse signaling format on the two-wire line.

One or more of lines 1 through 6 can be conditioned for two-wire CB operation. Conditioning is accomplished by installation of jumper clips on block TB1 in the common equipment rack and on block TB1 in the console center bay. Note that for the latter the strapping must be done for each of the two operators.

Each of the two-wire lines can be arranged to permit dial pulsing or DTMF signaling or mixed operation. Mixed operation means that dial pulsing can be used when the line is first seized to establish an initial connection, then the converter can be released permitting DTMF dialing as necessary for further call setup or to address a remote device. Selection of dial pulsing vs STMF operation can be accomplished in two ways as follows:

(a) Normal converter operation - the converter is active at initial line seizure and can be released to permit through DTMF dialing at any time after seizure by pressing the star (*) button.

NOTE

Depressing the star (*) or the pound (#) button will drop the Converter out of the circuit.

This method can be used to manually switch from dial pulsing to DTMF operation when a line is capable of accepting DTMF signaling and/or when a remote machine is to be sent DTMF digits after the connection is established initially using dial pulsing.

NOTE

For normal converter operation the two-wire line must be connected to the system with the negative polarity side of the line connected to the R1 punching on the connecting block.

(b) DTMF Only Operation Refer to figure 2-7. The converter can be permanently disabled for any line by connecting the two-wire line in reversed polarity, that is, by connecting the positive side of the line to the R1 punching. This affects only the line or lines so connected, leaving other lines capable of normal operation as described previously. When the converter senses reversed line polarity it is reset, that is, disabled for the remainder of that line seizure period. This polarity reversal may also occur in normal operation in some switching systems in which the line polarity is automatically reversed when the called telephone answers.

Incoming calls are signaled on the two-wire CB line by bridged high level ringing. Ringing is detected by the KTU line card associated with that line. The KTU card in turn causes the console line button lamp to flash and the console common audible tone ringer to operate. If the caller abandons the attempt, the incoming call indications will cease 12 seconds after cessation of the high level ringing signal.

Once answered by pressing the flashing line button and lifting the handset off hook, the line can be put "on hold" by pressing the hold button. This releases the line button. To release the hold condition the line must be resized by pressing the line button while the handset is off hook and then hanging up the handset.

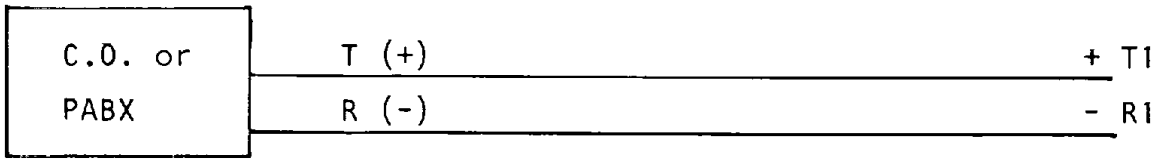


Figure 2-6. Two-Wire CB Line Connections - Typical Line 1

Table 2-1. Two-Wire CB Line Scrapping

Line	Common Rack TBI Terminals 2-3, 6-7 Row	Console TB1 Terminals 1-2, 4-5, 7-8 Rows
1	A	A, H
2	B	B, J
3	C	C, K
4	D	D, L
5	E	E, M
6	F	F, N

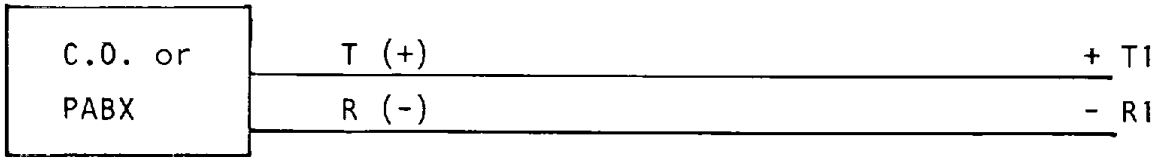


Figure 2-7. Two-Wire CB Line Connection for DTMF Signaling

(2) Four-Wire E&M Signaling Lines. The four-wire line interface provides for direct connection to a carrier/mux channel drop. The distant end may connect to a dial or manual C.O. or PABX line circuit or to another communication center console line. Refer to figure 2-8 and table 2-2.

Any of the twelve lines may be arranged for four-wire E&M operation. Lines 1 through 6 require jumper strap installation. Lines 7 through 12 are permanently wired for four-wire operation.

When the distant end is a dial switching system the console can be arranged for dial pulsing or LTMF signaling as explained in subparagraph e.1. The line polarity selection for disabling the converter is done by means of the option straps on the common bay TB1 block. When dial pulsing is used the pulses appear as "breaks" on the M lead (-48 Vdc when off hook).

Incoming calls are signaled by ground on the E lead. This may be continuous ground if from a distant trunk circuit or communication center console line or it may be

cyclic as when following the ringing cadence from a distant C.O. or PABX line circuit. Abandonment tuneout is the same as for two-wire lines.

The four-wire line must be conditioned by strapping and by setting the appropriate transmission levels on the 7441 repeater unit located in the common equipment rack.

Lines may be put on hold as explained previously for two-wire lines.

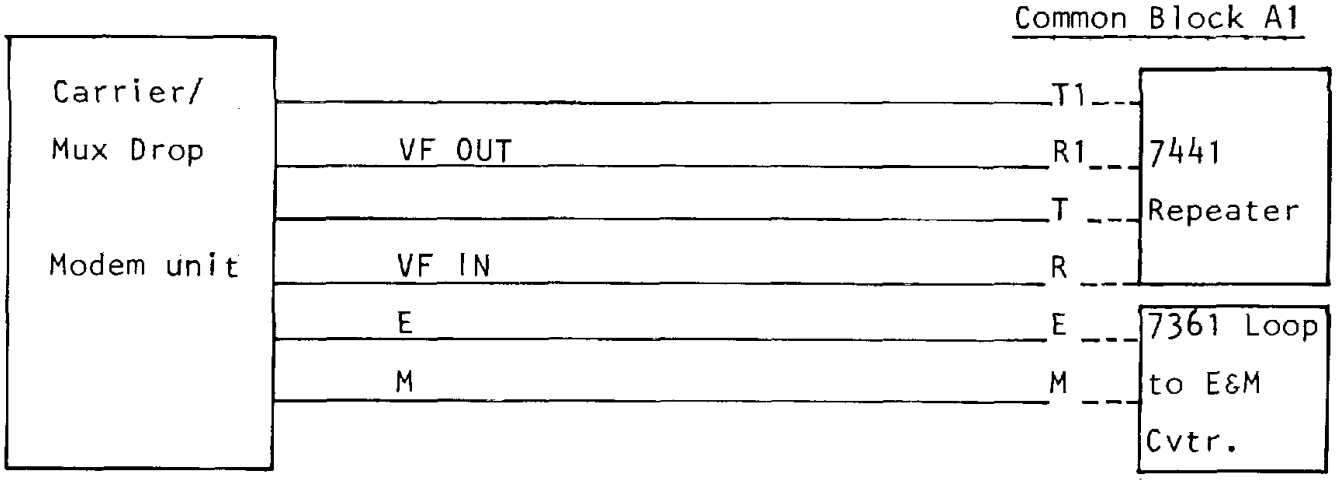


Figure 2-8. Four-Wire E & M Typical Line Connections

Table 2-2. Four-Wire E & M Line Strapping

Line	Common Rack TB1 Terminals for DP signaling 1-2,3-4,5-6,7-8	Common Rack TB1 Terminals for DTMF Signaling 1-6,2-5,3-4,7-8	Console TB1 Terminals 2-3,5-6,8-9
	Row	Row	Rows
1	A	A	A,H
2	B	B	B,J
3	C	C	C,K
4	D	D	D,L
5	E	E	E,M
6	F	F	F,N
7	H*	H	--
8	J	J	--
9	K*	K	--
10	L*	L	--
11	M*	M	--
12	N*	N	--

NOTE

*Wire-wrapped jumpers on these rows.

(3) Four-Wire, Ringdown Signaling Lines. The ringdown option provides for two-way high level ringing signaling simplexed on the four-wire lines. The transmission facility would typically be metallic pairs interconnecting with a distant manual switchboard or another communication center console line. Refer to figure 2-9 and table 2-3.

A single strap is added to that for the basic four-wire line described above in subparagraph (2) to activate the high level ringing signaling.

On outgoing calls, the system automatically sends a two-second burst of ringing voltage simplexed on the four-wire lines when the line is seized by lifting the handset from the hookswitch. Additional (re-ring) bursts can be sent by flashing the hookswitch, that is, by momentarily pressing the lever in the handset hanger cup.

Incoming calls are signaled by one or more bursts of high level ringing voltage. (Simplexed on the four-wire lines. Abandonment timeout is as described previously.)

Ringdown lines may be put on hold. This only holds local circuitry which provides a local hold lamp indication at all operator positions and precludes sending an unnecessary ringing burst when the line is picked up again. The distant end is not affected by the hold function since there is no end to end dc supervision on ringdown circuits.

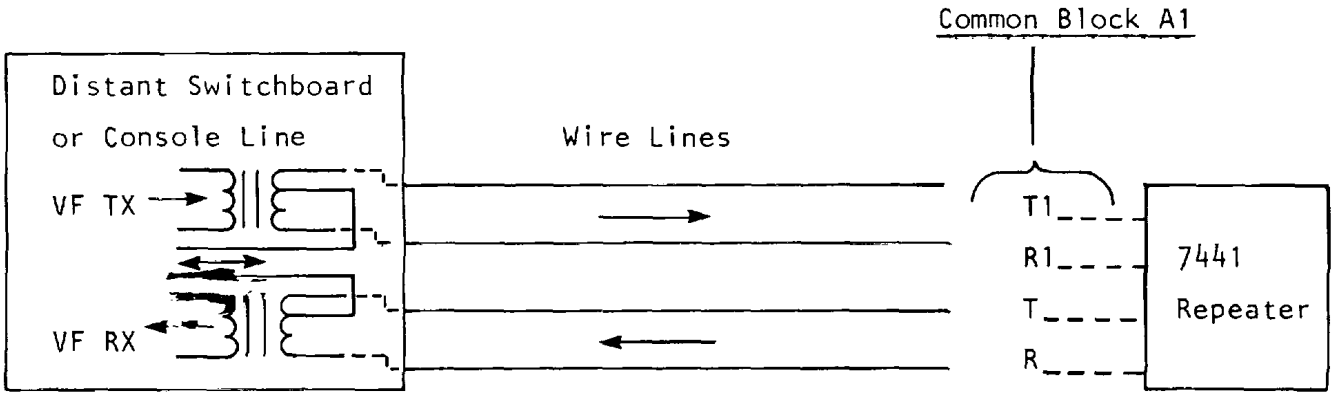


Figure 2-9. Typical Line Connection

Table 2-3. Added Jumpering for Four-Wire Simplexed Ringdown

Line	Common Rack TB1 Terminals 9-10 Row
1	A
2	B
3	C
4	D
5	E
6	F

Table 2-3. Added Jumpering for Four-Wire Simplexed Ringdown (Cont.)

Line	Common Rack TB1 Terminals 9-10 Row
7	H
8	J
9	K
10	L
11	M
12	N

(4) Telephone Switch/Dial Panel P/N 7052-0020 1A3 and 4A3 Communication Control Console OJ-512/FRC-176(V). There are two Telephone Panels in each Communication Control Console, for each console operator. See figure 2-10. Also see figure 6-10 for Telephone Switch/Dial Panel schematic.

(5) Telephone Hookswitch, Allentel - AT2154100. The Hookswitch Assembly consists of a high impact thermoplastic cup type handset hanger equipped with four form "C" switch combinations for standard seven- or nine-wire telephone hookswitch operation. The Hookswitch Assemblies used in this system are black as specified by the last two digits of the Allentel part number "00". Figure 2-11 shows installation and schematic information for the Hookswitch Assembly.

(6) Telephone Handset and Noise Cancelling Microphone. The Telephone Handsets used in this system are ITT Telecommunications Model 6900-C3. They consist of a six-wire push-to-talk handset with spade lug connectors. Figure 2-12 shows the handset and its schematic diagram. The noise cancelling microphone used in this system is a Roanwell Dynamic Confidencer Model C-505. This model is a noise-cancelling dynamic transmitter with an integral transistor amplifier that raises the output to that of the carbon T-1 transmitter used in "G" type handsets. This noise cancelling microphone is designed for use where dynamic transmitter quality and/or noise cancellation is required. It reduces the acoustical feedback in the public address and paging systems. The transistor amplifier is protected against voltage surges normally found in telephone circuits and is non-polarized. This unit has a frequency response of 300 to 4500 Hz, a noise cancellation of 18 dB average, and a distortion rate of less than 5%. Figure 2-13 shows the installation procedure for the Model C-505 Dynamic Confidencer.

(7) Telephone Shelf, Wescom Type 400-11 (2 each). The two Wescom 400-11 shelves used in the Communication Control Console house the Wescom telephone modules used in the "A" side and "B" side of the console. Wescom shelf CCC3A5A1 is connected to the CCCIA3 Telephone Switch/Dial Panel and Wescom shelf CCC3A5A2 is connected to the CCC4A3 Telephone Switch/Dial Panel. The two Wescom shelves are wired as one unit, see the wire run list in Chapter 7.

(a) Dual Line Amplifier, Wescom Type 401 3A5A1A6, 3A5A1A7, 3A5A1A9, 3A5A2A6, 3A5A2A7, 3A5A2A9, Communication Control Console OJ-512/FRC-176(V). The Wescom Type 401 dual voice frequency line amplifier provides from 10 dB loss to 36 dB gain (continuously variable) in both receive and transmit directions. The Wescom Type

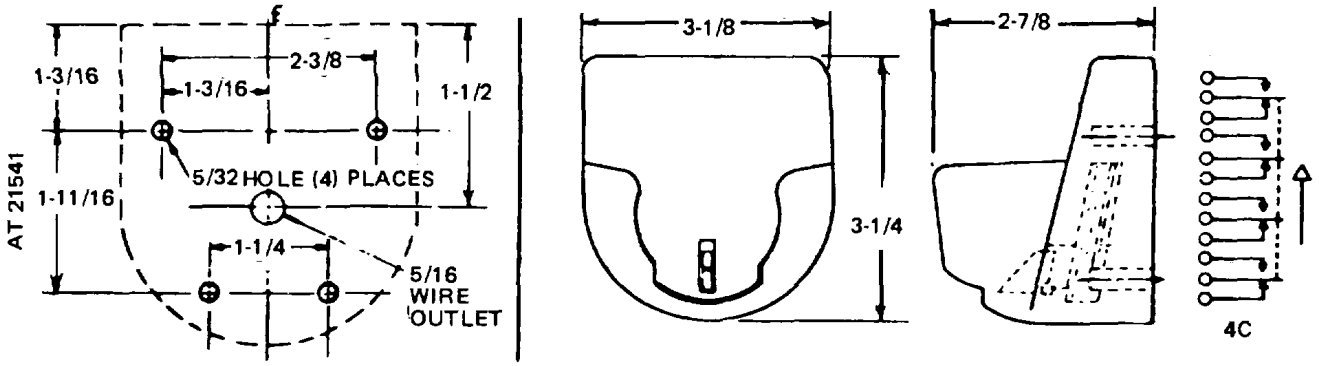


Figure 2-11. Allentel Type AT2154100 Hookswitch Assembly

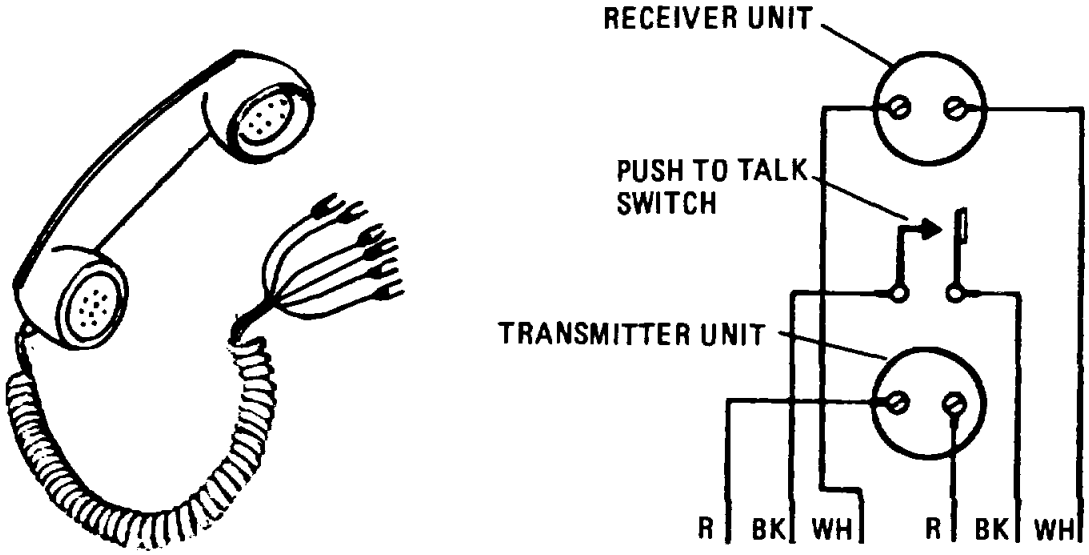
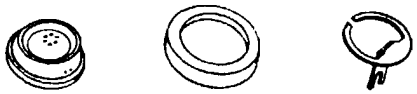


Figure 2-12. Model 6900-C3 Telephone Handset

ROANWELL CONFIDENCER® Installation Instructions

The Confidencer assembly packed in the box consists of *three* parts as illustrated below, namely:



CONFIDENCER | CONFIDENCER RING | METAL CORD HOLDER RING

INSTALLATION INSTRUCTIONS

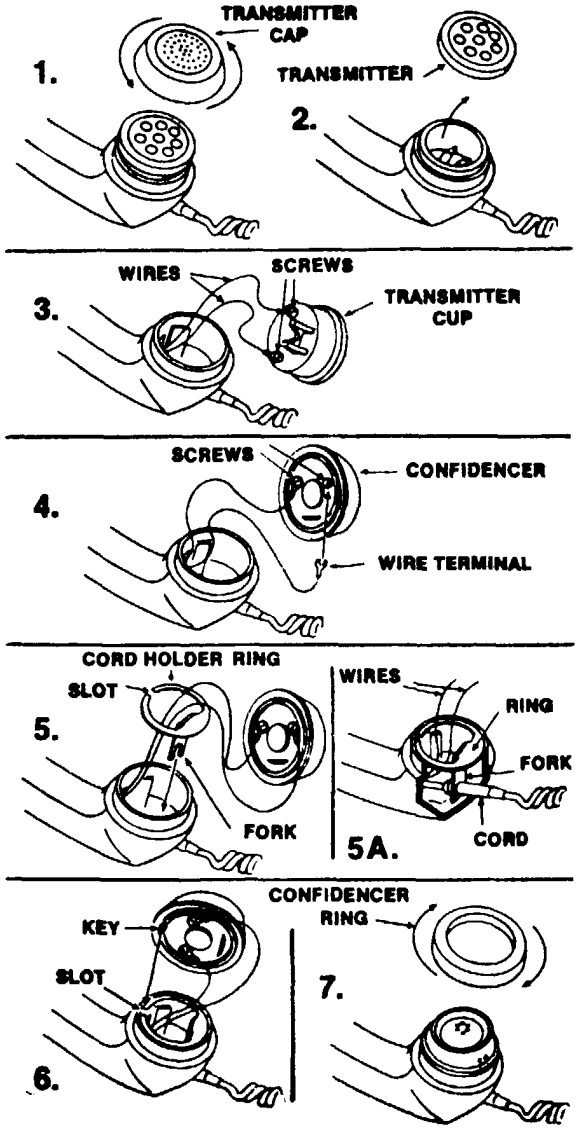
Lift the telephone handset from its cradle to remove the transmitter cap. You will, of course, immediately hear a dial tone. No electrical damage can result from leaving the phone "off-the-hook" a short while, but it does tie up a circuit; hence it is best to place something across the cradle buttons while you are installing the CONFIDENCER.

1. Unscrew and remove the transmitter cap from your telephone. (Fig. 1)

2. Lift out the transmitter (this is immediately beneath the transmitter cap you just removed) (see Fig. 2)

3. Now lift out the transmitter cup which you will find is attached to two wires held by two metal screws (Fig. 3). With a screwdriver, loosen the screws holding the two wires to the transmitter cup, and remove the transmitter cup.

   You have removed three parts from your telephone—the transmitter cap, the transmitter and the transmitter cup. These may be set aside, since they will be *replaced* by the three parts of the CONFIDENCER.



4. Loosen the screws in the CONFIDENCER. Slip the U-shaped wire terminals under the heads of the screws on the CONFIDENCER. (Either wire may be attached to either screw). Tighten screws. (Fig. 4)

5. Take the metal CORD HOLDER RING. Before inserting it in the phone, hold it with the *fork* directed *toward* the cavity in the phone as shown on Fig. 5. Now slip the two wires that you have just attached to the CONFIDENCER through the slot in the ring so that they are inside the ring, as also illustrated in Fig. 5. Now insert the metal CORD HOLDER RING in the cavity of the telephone, making sure that the *fork*
   (a) is turned downward into the cavity
   (b) straddles the cord at the exit hole. See *Figure 5a.*

6. Before installing the CONFIDENCER itself, note the position of the CONFIDENCER key, which is the little plastic rod that extends up about an eighth of an inch from the bottom edge of the CONFIDENCER. (See Fig 6). Align this key with the slot in the metal CORD HOLDER RING and insert the CONFIDENCER, making sure that the wires attached to the CONFIDENCER are tucked into the bottom of the cavity under the metal CORD HOLDER RING.

7. While holding the CONFIDENCER in place on top of the metal CORD HOLDER RING (see instruction 5) screw on the CONFIDENCER RING.

Figure 2-13. Noise-Cancelling Microphone Installation, P/N 201-000-006-6, 1HTA2Al and 5HTA2A1 In Communication Control Console, OJ-512/FRC-176(V) Schematic Diagram

401 includes both a transmit and a receive integrated circuit amplifier, impedance matching line transformers, variable equalizer and level controls, and test jacks. The Wescom Type 401 includes a voltage regulating circuit which allows the amplifiers to operate from any input voltage between -21 Vdc and -55 Vdc. Variable equalizers are provided on the input of both the transmit and receive amplifiers to compensate for the amplitude slope characteristic of a facility. Both input and output of the receive and transmit amplifiers have impedance-matching line transformers, which may be strapped for 150, 600, or 1200 ohm impedance; and center-tapped to provide a balanced simplex signaling lead.

1. Circuit Description. Refer to the schematic diagram, figure 6-13, before proceeding.

2. Transmit Amplifier. Input signals are applied from the transmit drop to the input transformer T4, which has an electrically balanced center tap for longitudinal balance. This allows the device to be used in simplex operation up to 120 mA dc. A plug-in option 4D, on the secondary of the transformer, matches the input impedances of 150, 600, or 1200 ohms. A bridging type test jack (XMT MON) and a normal through jack (XMT DROP), are located across the T4 transformer input. From the secondary of T4, signals are applied via the XMT EQLR control, adjustable equalization network, and hi-low gain switch to the amplifier input. The amplifier provides between 36 dB gain and 10 dB loss for the signal. The signal is routed from the amplifier to transformer T3. The primary winding of T3 is also provided with a plug-in option 3C, to match 150, 600, or 1200 ohm line impedances. Signals are routed through XMT LINE jack, which is bridged by a MON jack, and applied to the transmit line. The transmit line side of the Wescom Type 401 provides transient surge protection up to 1000 V.

3. Receive Amplifier. Input signals from the receive line are routed through the receive line jack, which is bridged by a MON jack, and applied to the input transformer T1 (which has an electrically balanced center tap). A plug-in option 1A, is found on the secondary of the transformer. (The matching input impedances can be set to 150, 600, or 1200 ohms). From the secondary of T1, signals are applied via the RVC EQLR control, adjustable equalization network, and hi-low gain switch to the amplifier input. The amplifier provides between 36 dB gain and 10 dB loss for the signal. The 1A option is located between the op amp and the T2 transformer, and is normally set in the ON position, this switches the voice path so that it is applied directly to the T2 transformer. The primary winding of T2 also contains a plug-in option 2B, to match 150, 600, or 1200 ohm line impedances. Signals are routed through the RCV DROP jack, which is bridged by a MON jack, and applied to the receive drop. The receive line side of the Wescom Type 401 provides transient surge protection up to 1000 V.

(b) Term Set, Wescom 443-00 3A5A1A5, 3A5A2A5 In Communication Control Console OJ-512/FRC-176(V). The Wescom 443-00 Term Set contains a 2-transformer hybrid, which is tapped for 600 or 900 ohm impedance; and a compromise network, which is used to match impedance of the 2-wire line to the impedance of the term set. The Wescom 443-00 also contains Network Build-Out (NBO) capacitors, which are used to balance the hybrid to the impedance of the 2-wire facility. A provision is included for connecting an external precision balance network. This is used when circuit requirements dictate the need for a more accurate match than can be achieved with the compromise network. There are front panel mounted (continuously-adjustable, 3-section, 0 to 30 dB) T-pads on both the transmit and receive lines, which provide a nearly constant 600 ohm impedance toward the line side. There are front

panel mounted jacks, which are used to monitor the 2-wire and 4-wire receive and transmit ports as well as a 2-wire input jack for injecting signals into the module.

1. Circuit Description. Refer to the schematic diagram, figure 6-14, before proceeding.

2. The Wescom 443-00 Term Set is designed to terminate a 2-wire drop with a 4-wire Tine or drop. When speech energy enters from the 2-wire drop (pins 47 and 41), it flows through line windings 2-3 and 4-5 of transformers T2 and T1 and the capacitors associated with A and B leads. This incoming speech energy divides equally between the secondaries of T1 and T2, inducing energy into 7-9 and 10-8 windings of each transformer. Half of this power is transferred across T1 and fed to the receive path where it is blocked by a one-way device in the connecting equipment. The other half of the input power is transferred across T-2 where T-pad attenuator (AT2) provides the proper levels for transmission to the transmitting side of the 4-wire circuit (pins 55 and 49).

3. When speech energy enters the 4-wire receive side of the module (pins 5 and 15), it is attenuated by AT1 and coupled through impedance matching capacitor (C1), to windings 7-9 and 8-10 of transformer T1. This transformer design is such that equal voltages appearing across the 2-3, 4-5, and 1-6 windings of transformer T1 results in equal currents flowing through the 2-3, 4-5, and 1-6 windings of transformer T2. Network windings 1-6 of T2 is polarized to cancel the magnetic fluxes in the windings 2-3 and 4-5 of T2. As a result, no signal is induced into the transmit side if the impedances terminating the 2-wire and compromise network are equal. Ideally, impedance of the network should exactly match the impedance of the 2-wire drop in both magnitude and phase. Half the receive energy is therefore dissipated in the compromise network and the remaining energy is transmitted to the 2-wire drop (pins 47 and 41).

4. Capacitors C5 and C11 are inserted at the midpoint of the 2-wire windings of transformer T1 and T2 to derive A and B leads for loop signaling. Leads A, B, F, D, and G are brought out at pin 56 (a wire-wrapped card connector), for developing pad control and signaling functions. In some applications, the trunk circuit opens at the midpoint of the 2-wire line for signaling and closes the connection for transmission. By opening the S1 option, a D lead is made available, thus allowing an external 2-wire signaling circuit to open and close the B and D leads.

(c) Transfer Relay Modules, Wescom 410-00, 3A5A1A1 thru 3A5A1A4, 3A5A1A8, 3A5A2A1 thru 3A5A2A4, 3A5A2A8 Communication Control Console OJ-512/FRC-176(V); 1A2A6 and 1A2A7, 1A3A7 thru lA3AlO Control Interface Group. Wescom 410-00 is a plug-in printed circuit board module which provides three independently-operated relays. The relays of the 410 can be used for loudspeaker cut-off, data transfer, and loop-back circuits. Generally, the 410-00 can be used any time a relay contact is required.

1. Circuit Description. Refer to the schematic diagram, figure 6-15, before proceeding.

2. Wescom 410-00 Transfer Relay Module contains three independent relays: relay A, relay B, and relay C. Relays A and B consist of five sets of Form C contacts and one set of Form A contacts. Relay C consists of four sets of Form C contacts and two sets of Form A contacts. Each relay coil in Wescom 410-00 is by-

passed by a non-polarized mylar capacitor. The capacitor provides transient suppression and permits each relay to be operated from a dc supply regardless of polarity.

(d) Tone to Pulse Converter, Mitel CM1625-504-701, 3A6A1 and 3A6A2 Communication Control Console OJ-512/FRC-176(V). The Mitel CM1625-504-701 Tone to Pulse Converter enables operating companies with step-by-step offices to offer TOUCH TONE telephone service. One CM1625-504-701 circuit card is used in conversion of each line finder to first selector circuit. The circuit card contains LED's, which indicate the state of TONE IN, ANI, and PULSER (outpulsing). The following list of features apply to the CM1625-504-702:

- # and * drop out
- Line reverse detection
- Audio feedback to subscriber of dial pulses °
- 24 Vdc operation @
- Outpulsing rate and interdigital pauses of lOpps/800ms @
- Four LED indicators to aid in fault location
- Time-out after off-hook
- Power down cut through
- Early line split
- Tip off-hook sensing
- Reduced sensitivity

o This feature can be disabled in the field.

@ This feature is selected by a wire strap option.

1. Circuit Description. Refer to the functional block diagram, figure 6-16, before proceeding.

2. The CM1625-504-701 Converter operates from a positive ground central office battery. The -24 Vdc is connected to pin 1 and the ground is connected to pin 6. The LINE FINDER RING signal is connected to pin 2, while the LINE FINDER TIP signal is connected to pin 5. The FIRST SELECTOR RING signal is connected to pin 3, while the FIRST SELECTOR TIP signal is connected to pin 4.

3. With the subscriber on-hook, the converter idles with a typical drain current oT 45 mA. An off-hook condition is detected by a polarity sensitive offhook detector sensing the loop current in the tip line through the 39 ohm resistor. Detection of the off-hook condition starts the time-out timer, and removes the reset signal thus enabling the converter. The first DTMF digit dialed is detected by the tone receiver, and appears at the receiver output in the form of a 4-bit code. Amplitude ratio and timing checks on the incoming digit now commence.

Approximately 40 ms after the initial detection of the DTMF digit, the steering signal switches low and as a result the 4-bit word is loaded into the data latch.

The TONE IN LED, monitoring STEERING illuminates.

4. Approximately 25 ms after the DTMF digit is removed, STEERING switches high indicating that the received digit is valid. BUTTON UP is generated, transferring the 4-bit word from the data latch to the dial pulser input. The TONE IN LED now turns off. In the case of the first DTMF digit received, the first-in first-out action of the dial pulser store causes the 4-bit word to ripple through and outpulsing commences immediately. Subsequent digit codes are stored and outpulsed in sequence. When the dial pulser acquires the valid DTMF digit, it also signals the line split circuit to operate. This same signal switches in the line current feeds to complete the circuit to the caller. Also, the outpulser closes completing a holding path to the forward equipment.

NOTE

During the split, the time-out circuit is reset and does not restart until the split closes.

5. The line split relay is energized for the duration of the digit outpulsing and remains energized if another digit is recognized during the outpulsing period. Each time another digit is recognized, the time-out circuit is restarted. If another digit is not recognized during outpulsing, line split is removed to await the detection of the next digit. At the end of the outpulsing sequence, line split is removed immediately (within 1 ms). The line current feeds are also removed each time the line split relay closes. The PULSER LED monitors the coupling between the dial pulser and the outpulser, and flashes synchronously with outpulsing. The outpulser provides holding current to the first selector through a 660 ohm terminating resistor. Optical coupling between the dial pulser and the outpulser provides a high degree of line isolation.

6. Once all digits have been outpulsed, the converter is disabled by one of the following sequences:

- If answering supervision is available when the called party answers, the reverse line detector is switched which signals a reset to the time-out and reset circuit. The converter is now disabled.

- If answering supervision is not available, or is not detected, the time-out circuit, restarted by the last split, automatically disables the converter at the end of the 20 second time-out period.

(e) 4-Wire Line Termination Module, Wescom 402-00, 3A5AlA10 and 3A5A2A10 In Communication Control Console OJ-512/FRC-176(V). Wescom 402-00 module interfaces a four-wire private line circuit with a group of up to 20 four-wire telephones connected in a conference configuration. Wescom 402-00 transforms the 600-ohm line impedance to a relatively low drop impedance to minimize the contrast in speech levels caused by changing the number of telephones involved in the conference call. Additionally, Wescom 402-00 provides sidetone to all telephones connected to the station (drop) side of the module. Sidetone allows the voice of the telephone user to be heard through the receiver of the same telephone as though using a standard 2-wire telephone. When more than one telephone is provided at the near location,

it allows the user of each near end telephone to communicate with the users of the other near end telephones as well as with the user of the far end telephone.

1. Circuit Description. Refer to the schematic diagram, figure 6-17, before proceeding.

2. Voice energy received from the distant terminal, via the facility, is adjusted to a +7 dBm transmission level by a line amplifier before entering the 402 module. Voice energy on the receive tip and ring leads enters the 402 on terminals 7 (tip) and 5 (ring) of the associated module connector and (assuming options C and D are closed) is coupled through transformer T2 and the RCV TEST jack to connector terminals 1 (tip) and 3 (ring). Terminals 1 and 3 conduct received voice energy to the station equipment connected on the drop side of the 402. This station equipment may be a single telephone connected through a 405 station circuit module. It may also be a group of up to 20 telephones, each of which must be connected through a separate 405 module to the common receive and transmit paths on the drop side of the 402. Transformer T2 has a step-down turns ratio to provide a low output impedance, permitting the parallel connection of up to 20 telephones. In doing this, T2 reduces the amplitude of the voice energy entering the 402 at a +7 dBm Transmission Level Point (TLP) to a -16 dBm transmission level for interfacing with the telephone.

3. Voice energy derived from the transmitter of the station equipment enters the 402jon connector terminals 55 (tip) and 53 (ring) and is coupled through the XMT TEST jack, transformer T1, a 9 dB pad, and options A and B (closed) to connector terminals 51 and 49. These terminals conduct voice energy to the line amplifier module which provides for amplitude adjustment to the transmission level required for interfacing with the transmit path of the 4-wire facility (typically 0 dBm). Transformer T1 has a step-up turns ratio (proceeding toward the line) to provide a low input impedance permitting the parallel connection of up to 20 telephones. The 9 dB pad, following T1 in the transmit path, provides sufficient loss to place the transmit line terminals (51 and 49) of the 402 at a -16 dB TLP. A small amount of the voice energy in the transmit path is coupled through a third winding on T1 and is passed through the SIDE TONE LEVEL control and amplifier U1. It is then coupled into the receive path (through a third winding on T2) where it appears as sidetone energy.

4. Loopback/Sealing Current Arrangement. The 402 4-Wire Line Telephone Module, arranged for loopback operation, contains optional 4020 Loopback Subassembly. In this arrangement, screw-type option switches A, B, C, and D on the 402 printed circuit board, are open and the transmit and receive voice paths to the 4wire line are completed through normally closed transfer contacts on relay LB (released) in the 4020. Relay LB is operated by applying a dc voltage to terminals 35 and 31 of the 402 (terminal 35 positive with respect to 31). In system operation, operating current for relay LB (and sealing current) is applied to the simplex leads of the line amplifier at the distant end. Simplex leads derived by the line amplifiers at the near end of the metallic facility conduct this current to the 402 module entering on terminals 31 and 35. Terminal 31 connects to the simplex lead derived from the receive path (far end transmit path) and terminal 35 connects to the simplex lead derived from the transmit path (far end receive path).

5.In the normal (no-loopback) condition, sealing current may be applied to the line. For this arrangement, option SC in the 4020 is closed and sealing current (normally 20 mA) is applied at the distant end such that terminal 31 on the

402 is positive with respect to terminal 35. Current applied in this direction reverse biases the diode in series with the coil of relay LB, preventing the operation of this relay. Simultaneously, this current is bypassed around the coil of relay LB by a second diode that is forward biased by current flow in this direction. Thus the path for sealing current is maintained while the operation of relay LB is prevented by these diodes. The 402 is arranged for loopback condition by reversing the polarity of the current applied to the simplex leads at the distant end of the metallic facility such that terminal 31 on the 402 is negative with respect to terminal 35. Current applied in this direction reverse biases the diode that bypasses the coil of relay LB while it forward biases the diode in series with the coil of relay LB. Thus relay LB operates, opening the transmit and receive paths toward the station equipment. Simultaneously, it interconnects the receive and transmit paths of the 4-wire line through a 23 dB pad placed between TLPs of +7 dB (receive) and -16 dB (transmit).

6. While relay LB is operated, a set of normally closed contacts are held open inserting a resistance lamp in series with the coil of this relay to reduce the amount of holding current drain and to compensate for variation in simplex lead resistance. Additionally, a set of normally open auxiliary contacts on relay LB provides a closure between terminals 29 and 33 on the 402 during loopback that may be used to control the illumination of a loopback indicator. The 402 is provided with a power supply regulator to supply stable, filtered outputs of -24 Vdc and -12 Vdc for powering the sidetone amplifier U1.

(f) Combination Pickup Relay and Station Circuit P/N 405-00, 3A5AlAll and 3A5A2All In Communication Control Console OJ-512/FRC-176(V). The 405-00 provides a pickup relay circuit and a 4-wire station circuit. It is always used at the station end of a circuit in conjunction with a 4-wire private line telephone or a 2wire/4-wire key telephone set similar to the Service Panel SB6615B-3. The 405-00 is normally used with a 401-00 Dual Line Amplifier, a 402-00 Line Termination Circuit, and any associated signaling equipment.

1. Circuit Description. The 405-00 is a printed circuit module used for talk battery, dialing control, push-to-talk operation,and access to a 4-wire line from a 4-wire station. Refer to the schematic diagram, figure 6-18, before proceeding.

2. The 405-00 can be conveniently split into two circuits: a pickup relay circuit and a station circuit. The pickup relay circuit consists of the pickup relays PU1 and PU2 and their associated circuitry. The station circuit consists of the push-to-talk relay (PT), the dial off-normal relay (ON), the talk battery relay (TB), and their associated circuitry.

3. Pickup Relay Circuit Description. The PU relays operate under the control of an associated station set A lead. When the associated station goes offhook, a ground is applied to the A lead, operating the PU relays. The operation of these relays causes the following actions to occur:

- The transmission and signaling leads of the associated station circuit are connected to the circuit common equipment transmission and signaling leads terminating the 4-wire line.

- A ground is provided on the RL lead for ring disable to the 409-00 (when used). Not used in this system.

- 24 Vdc is connected to the FW lead to operate the FW relay in the station set (this functions to convert the set from the standard 2wire mode to the 4-wire mode).

- Auxiliary PU relay contacts are operated to provide various functions depending on the application.

4. When push-to-talk service is not required, the PU2 relay, in conjunction with screw option S, connects ground to operate the PT relay in the station circuit. This permits a set to be used with or without push-to-talk operation depending on the user requirements. When VF (loudspeaker) signaling is used, the operated PU relays disconnect the associated speaker from the receive side of the line to mute the speaker when the station handset is off-hook.

5. Station Circuit Description. The station circuit provides talk battery to the handset, dialing control, and push-to-talk operation. The TB relay supplies talk battery and ground to the local station set through the transmit drop. The talk battery is blocked from the transmit line by capacitors C1, C2, C3,and C4. Relay TB is energized by loop current when the station is off-hook and is released by the break portions of a dial pulse train. During dialing with SS-1A applications, the TB relay converts loop dialing from the set to 1-lead signals to the SS-lA selective signaling equipment.

6. The PT relay operates in response to a ground signal supplied on the PT lead by the station set. When relay PT is operated, the transmit path is terminated on the pickup relay contacts, and since the relay is operated, the transmit drop is cut-through to the transmit line. Relay ON is energized when the station set dial is moved off-normal. When relay ON is operated, it provides a 2-lead ground corresponding to dial-off-normal. The operation of the ON relay optionally cuts through the I-lead output, when strapping option ON is utilized. Strapping option G is normally employed to provide a 1-lead ground during the station offhook interval.

f. Communication Security Equipment. This is GFE (Government Furnished Equipment), for specific information concerning Communication Security Equipment see Manual XXX-XX-XXX.

g. Tape Recorder Equipment, Revox B77-SLS. The Revox B77-SLS Tape Recorder Equipment is a two-channel tape deck which provides both record and playback capabilities and consists of two separate units: the Remote Control Unit and the Tape Transport Unit.

(1) Revox B77-SLS Indicators and Controls. The Revox B77-SLS Tape Recorder Equipment indicators and controls are shown in figure 2-14 and are described below.

(a) General Tape Transport Controls.

- POWER switch ON/OFF (1).

- Push-button SPEED 3 3/4 (2).

- Push-button SPEED 7 1/2 (3).

- Push-button REEL SIZE (4).

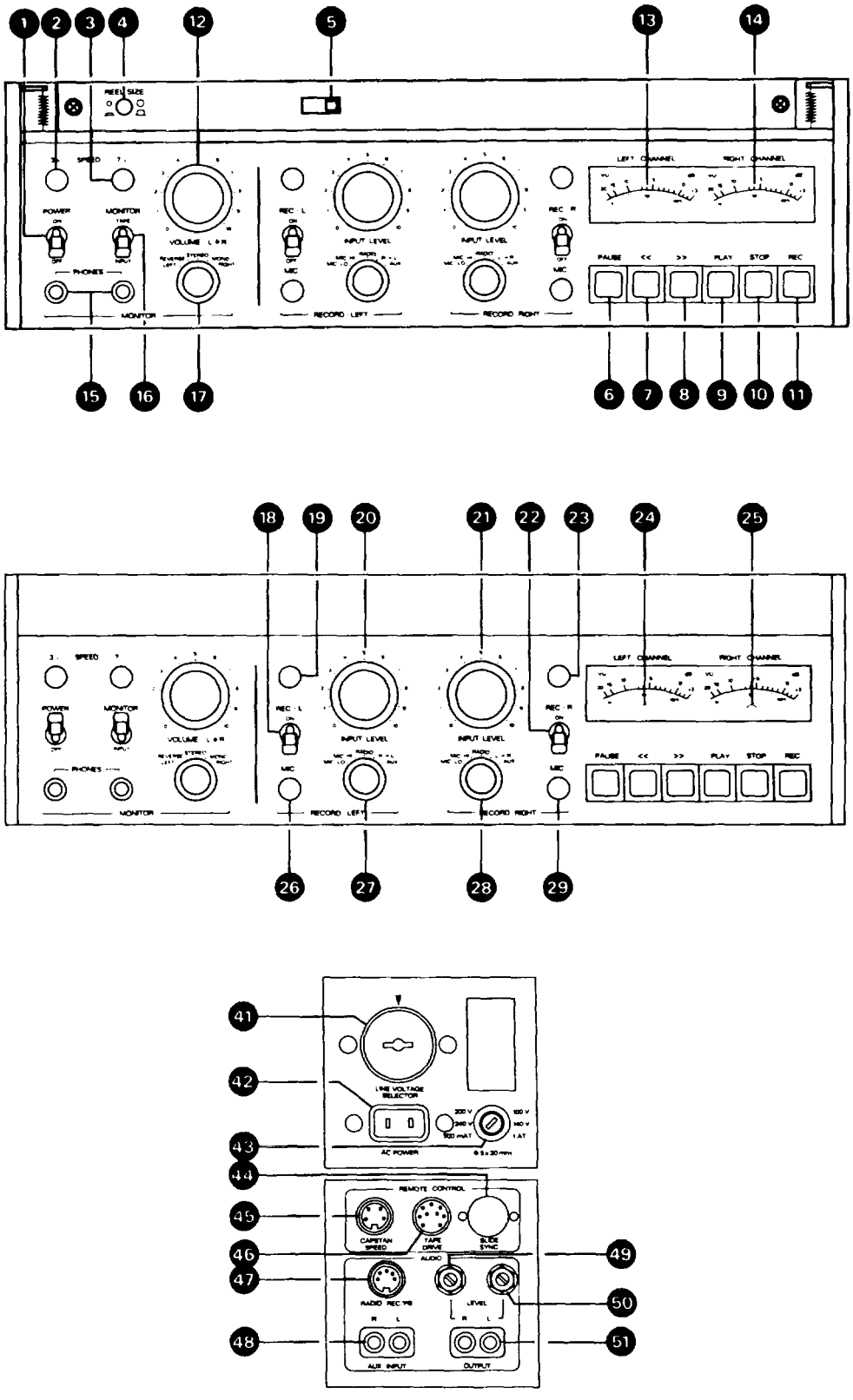


Figure 2-14. Revox B77-SLS Tape Recorder Equipment, Indicators and Controls

- Sliding button "Editor" (5).
- PAUSE (6).
- Fast rewind (7).
- Fast forward (8).
- PLAY (9).
- STOP(1O).
- RECORDING (11).

(b) Monitor Panel Reproduce Operating Controls.

- VOLUME control (12).
- Record level meter LEFT CHANNEL(13)·
- Record level meter RIGHT CHANNEL(14).
- Output PHONES (15).
- MONITOR switch TAPE/INPUT(16).
- MONITOR mode selector(17).

(c) Record Panel, Record Operating Controls.

- Record preselector REC L ON/OFF(18).
- Recording light, left channel(19).
- INPUT LEVEL control, left channel(20).
- INPUT LEVEL control, right channel(21).
- Record preselector REC R ON/OFF(22).
- Recording light, right channel (23).
- Overload indicator, left channel(24).
- Overload indicator, right channel(25).
- MICrophone input, left channel(26).
- Input selector, left channel (27).
- Input selector, right channel(28).
- MICrophone input, right channel(29).

(d) Connector Panel, AC Power.

- LINE VOLTAGE SELECTOR(41).
- AC POWER inlet (42).
- FUSE (43).

(e) Connector Panel, REMOTE CONTROL.

- Socket for slide projector (44).
- Socket for external CAPSTAN SPEED variation accessory(45).
- Socket for remote control TAPE DRIVE (46).

(f) Connector Panel, AUDIO.

- DIN socket RADIO REC/PB(47).
- Phono socket AUX INPUT (48).
- LEVEL R (right)(49).
- LEVEL L (left)(50).
- Phono sockets OUTPUT (51).

(2) Revox B77-SLS Tape Recorder Equipment Description. For complete information concerning the installation, operation, and maintenance of the Revox B77-SLS Tape Recorder Equipment, refer to the Revox B77 Service Manual and the Revox B77 Set of Schematics Manual supplied with this system.

h. Audio Keyline Equipment, P/N 7052-1200, 2A3 and 5A3 Communication Control Console OJ-512/FRC-17-6(V). The Audio/Keyline Equipment consists of an indicator/ control panel and a card cage assembly, which contains the circuitry necessary to monitor and configure up to 12 transceivers. There is an Audio/Keyline Equipment position for each console operator. The A operator position's card cage assembly has one more card shelf than does the B operator position. The extra shelf contains circuitry that is common to both positions. A detailed description of the individual circuit boards and panel which make up the Audio/Keyline Equipment is provided in the following paragraphs; while an overall functional description of the Audio/Keyline Equipment is described in Operator Position Operational Description paragraph 2-2.b.

(1) Audio/Keyline Panel, 7052-1206. There is an Audio/Keyline Panel for each console operator. This panel is used to configure up to 12 transceivers in conjunction with their associated TTYs telephones, and tape recorder.

(a) Audio/Keyline Panel Indicators and Controls. The Audio/Keyline Panel indicators and controls are shown in figure 2-15 and described below.

1. TRANSCEIVER STATUS indicators A2AlA2DS1-DS12. When illuminated, these indicators inform the operator which transceivers he is assigned.

2. SEIZED indicators A2AlA1DS13-DS24. When illuminated, these indicators show which transceivers have been seized by an operator.

3. A MONITOR indicators A2AlA2DS1-DS12. When illuminated, these indicators show which transceivers have been assigned to the Monitor A channel by an operator.

4. B MONITOR indicators A2AlA2DS13-DS24. When illuminated, these indicators show which transceivers have been assigned to the Monitor B channel by an operator.

5. Transmit/Monitor Select switches A2A1Sl-S12. These four position switches are used to select the transceivers SEIZED for Send/Receive and monitored on the A and B channels.

6. TRANSCEIVER SELECT indicator A2AlA3DSI-DS2. These indicators show which transceiver has been selected for VOICE CONTROL mode selection.

7. TRANSCEIVER SELECT switches A2A1S13A-S13B. These two 10-position thumbwheet switches select the transceiver displayed on the indicators in the 6 preceding.

8. MODE SELECT indicators A2A2A4DS1-DS6. These indicators show which VOICE CONTROL mode has been selected for the transceiver shown on the indicators in 6.

- A2A1A4DS1 = BROADCAST
- A2A1A4DS2 = MIKE
- A2A1A4DS3 = TAPE
- A2A1A4DS4 = REMOTE
- A2A1A4DS5 = RAD/RAD
- A2A1A4DS6 = TEL/RAD

9. MODE SELECT switch A2A1S14. This 7-position thumbwheel switch selects the modes shown in 8. Position 0 is the off position, no MODE SELECT indicators are on.

10. TTY SELECT indicator A2AlA5DS1. This indicator shows which TTY has been selected for TELETYPE CONTROL.

11. TTY SELECT switch A2A1S15. Using this 5-position thumbwheel switch selects which TTY the operator is controlling. Position 0 is the off position, no TTY is selected.

12. RCVR SEL indicators A2AIA5DS2-DS3. These two 7-segment displays indicate which receiver audio is connected to the TTY shown in 10.

13. RCVR SEL switches A2AlS16A-S16B. Using these two thumbwheel switches, select the receiver that is shown in 12.

14. XMTR SEL indicators A2A1A5DS4-DS5. These two 7-segment displays indicate which transmitter audio line is connected to the TTY shown in 10.

15. XMTR SEL switches A2AlS17A-17B. These two thumbwheel switches select the transmitter shown in 14.

16. TTY MONITOR SWITCH A2A1S18. This 3-position (spring loaded to the center position) switch is used to momentarily select which TTY audio will be heard on the B MONITOR speaker. When switch is up, the XMTR audio is selected, while down selects the RCVR audio.

17. PTT KEY switch A2A1S19. This momentary pushbutton switch can key the transmitter when the footswitch or the VOX is not used to key the transmitter.

18. BOOM/HDST select switch A2A1S20. Using this 2-position toggle switch selects either the BOOM microphone or the HEADSET microphone.

19. TAPE PLAYBACK LEFT/RIGHT CHANNEL select switch A2AlS21. This 2-position toggle switch selects the left or right tape recorder channel.

20. Tape Input Mode Select switch A2A1S22. Using this 4-position rotary switch selects the input source to the tape recorder channel selected by 19.

- Position 1 = REMOTE
- Position 2 = A MONITOR
- Position 3 = B MONITOR
- Position 4 = TEL

21. TAPE RECORD RIGHT CHANNEL input source select switch A2A1S23. Using this 4-position rotary switch selects the input source to the RIGHT tape recorder channel.

- Position 1 = SND/RCV
- Position 2 = A MONITOR
- Position 3 = B MONITOR
- Position 4 = TEL

22. RADIO RELAY KEY ENABLE switch A2A1S24. Using this 2-position toggle switch enables the AUDOMATIC VOX keying in the VOICE CONTROL modes 5 (RAD/RAD) and 6 (TEL/RAD).

- UP = ENABLE
- DOWN = OFF

23. VOX MNL/AUTO select switch A2A1S25. This 3-position (spring loaded to center position) switch is used to momentarily select either MNL A (MANUAL A) or MNL B (MANUAL B) VOX keying in the VOICE CONTROL modes 5 and 6.

- UP = MNL A
- CENTER - AUTO
- DOWN = MNL B

(b) Audio/Keyline Panel LED PWB Assemblies. There are seven LED Display PWB Assemblies, mounted on the Audio/Keyline front panel assembly, used to inform the operator of the Audio/Keyline Equipment status. These LED Display PWB Assemblies and their relationship to the other Audio/Keyline Equipment is shown in schematic diagram, figure 6-19.

(2) Audio/Keyline Card Cage Assembly. The A operator card cage assembly, P/N 7052-1610, has four card shelves which house the Audio/Keyline PWB's for the A side of the console. Shelf number four of the 7052-1610 card cage contains three PWB's which are common to both the A side and the B side of the console. The B operator card cage assembly, P/N 7052-1910, houses the Audio/lPWB's for the B side of the console.

(a) Audio/Keyline Card Shelf No. 1, Wescom Type 400-11. The Audio/Keyline Card Shelf No. 1 contains one 4-Wire 6-Way Conference Bridge, three Master/Slave Bridges, six Auxiliary Bridges, and one Fuse and Distribution Module. The following paragraphs provide the circuit description for each of these circuit modules.
See figure 6-20 for schematic information.

(b) 4-Wire 6-Way Conference Bridge, Wescom Type 4202-00, 5A3AlAl Communication Control Console OJ-512/FRC-176(V). The 4202-00 provides six 4-wire active conference bridges. Each port receives VF or data signals from all other ports of the bridge. Additionally, each port transmits signals to all other ports. Frontpanel-mounted transmit and receive potentiometers are provided for each bridge port. The proper adjustment of these potentiometers allows all signals on the bridge to be transmitted and received at the same level. Additional features of the 4202-00 are listed below:

- Selectable -7 dB (receive and -16 dB) transmit pads for each bridge circuit, which allows proper interface with carrier facilities.
- Can be used with voice, or data up to 9.6 kbps.
- SX leads for each transmit and receive port.
- Front-panel-mounted RCV CAL and XMT CAL jacks, for simplified alignment.
- Zero dB loss bridge, with an adjustable gain of -10 dB to +22 Db (receive-to-transmit).
- Can be powered from any input voltage between -21 and -55 Vdc.

1. Circuit Description. Refer to the schematic diagram, figure 6-22 before proceeding.

2. The 4202-00 provides summing and distribution of up to six VF or data channels. References to transmit and receive are with respect to the bridge. Thus,

when a VF or data set is transmitting, the bridge is receiving; similarly, when a VF or data set is receiving, the bridge is transmitting. All transmit line and receive line circuits for each port are identical; therefore, this circuit description is based on RCV LINE 1 and XMT LINE 1. Data or VF signals enter the 4202-00 on the RCV LINE 1 tip and ring leads (pins 1 and 2, respectively) and are transformer-coupled (via T1) to the input of operational amplifier U2-1. A -7 dB RCV PAD can be selected to provide the proper level for 4-wire carrier applications. The front-panel-mounted RCV LEVEL potentiometer, connected in the feedback loop of U2-1, provides a level adjustment of -4 dB to +12 dB. This is used to compensate for losses in the receive line. The output of U2-1 is coupled to the operational amplifiers associated with transmit lines 2, 3, and 4. Thus, all signals present at the RCV LINE 1 input appear at the XMT LINE outputs of all other ports on the bridge. At the transmit side, signals from the RCV LINES 2, 3, and 4 enter operational amplifier U2-3 and are transformer-coupled to the XMT LINE 1 tip and ring leads (pins 5 and 3, respectively). The front-panel-mounted XMT LEVEL potentiometer provides a range of -6 dB to +12 dB to compensate for line losses. A -16 dB XMT PAD can be placed in the circuit for 4-wire carrier applications. The circuit operation for RCV LINES 2, 3, and 4 is identical to the operation described for RCV LINE 1. In all cases, the signals present on a given RCV LINE are coupled to all XMT LINE ports associated with the RCV LINE port that is originating the signals.

3. Calibration Circuits. The outputs of the four operational amplifiers appear at the input of the RCV TEST AMP. This amplifier provides an impedance match for an ac voltmeter, which is plugged into the RCV CAL jack during the receive alignment. The output of the XMT TEST AMP is coupled to the inputs of the four XMT LINE operational amplifiers. The XMT TEST AMP, in conjunction with the XMT CAL jack, provides the interface for an oscillator, which is used for the transmit line.

(c) Master/Slave Bridge, Wescom Type 4204-00/03, 2A3A1A2, 2A3A1A5, 2A3A1A8, 5A3A1A2, 5A3A1A5, 5A3A1A8, Communication Control Console OJ-512/FRC-176(V). The 4204-00/03 Master/Slave Conference Bridge provides distribution from a 4-wire master port to four 4-wire slave ports. Signals entering the RCV MASTER port are distributed to each of the RCV SLAVE ports. The gain for each leg in this direction may be individually set anywhere in the range of -8 dB to +8 dB by means of a front-panel-mounted potentiometer. A push-on strapping option allows the gain of all RCV legs to be reduced by 7 dB, providing a range of -15 dB to +1 dB of gain for each RCV leg. Signals entering each of the XMT SLAVE ports are summed and appear at the XMT MASTER port. The gain for each leg in this direction may be individually set anywhere in the range of -8 dB to +8 dB by means of a front-panel mounted potentiometer. A push-on strapping option allows the gain of all XMT legs to be reduced by 16 dB, providing a range of -24 dB to -8 dB of gain for each XMT leg. All master and slave ports are provided with transformer isolation. The input impedance of the XMT SLAVE ports and the output impedances of the RCV SLAVE ports may be set to either 600 or 900 ohms by means of push-on strapping options. The output impedance of the RCV MASTER port and the input impedance of the RCV MASTER port may be set to 150, 600, or 1200 ohms by means of push-on strapping options. An SX signaling lead is derived at each port of the 4204-00/03. When suitable, optioned sealing current may be applied via the SX leads of the XMT and RCV MASTER ports. In addition to the features described above, which apply to all of the 4204-00/03 modules, test jacks and a loopback capability are provided on 4204-03 module. When a test cord is inserted into the test jack, the corresponding XMT or RCV line is disconnected from the port and access to the port is achieved via the test cord. Loopback between the XMT and RCV MASTER ports may be achieved

by applying the required polarity of battery to the SX leads of the XMT and RCV MASTER ports.

1. Circuit Description. Refer to schematic diagram, figure 6-23 before proceeding.

2. Transmit Paths. Signals which are to be summed and then appear at the XMT MASTER port, (terminals 54, 56, and 46) are applied to the XMT SLAVE ports (XMT SLAVE 1, terminals 51, 52, and 53; XMT SLAVE 2, terminals 42, 50 and 48; XMT SLAVE 3, terminals 38, 40, and 44; XMT SLAVE 4, terminals 34, 36, and 30). A given port may be accessed by means of a front-panel-mounted bantam jack. When a plug is inserted into the jack, the signal is disconnected from its associated input transformer. The input impedance of each XMT SLAVE port may be set to either 600 or 900 ohms by means of its associated options straps. A signal induced in the secondary of the XMT SLAVE port input transformer is amplified by its associated amplifier. The gain of each leg of these amplifiers is adjustable for a gain of -8 dB to +8 dB by means of its associated front-panel-mounted potentiometer. The outputs of the four amplifiers associated with the XMT SLAVE ports are summed at the input of amplifier U4. The summing point is also connected to terminal 55 to provide an input from the 4204-10/11 Auxiliary Bridge (if employed). The summed signals are buffered by U4 and then applied to the output transformer T2. The gain of U4 can be set to either -16 dB or 0 dB by means of the 12 A options straps. With the gain of U4 set for 0 dB, the total gain of a signal applied to a given XMT SLAVE port is simply the gain set on the amplifier associated with the port (-8 dB to +8 dB). With the gain of U4 set for -16 dB, the total gain of a signal applied to a given XMT SLAVE port is the gain set on the associated amplifier (-8 dB to +8 dB) minus 16 dB. Thus, by optioning U4 for -16 dB, the individual gain controls for each XMT SLAVE port have their ranges altered to -24 dB to -8 dB (instead of -8 dB to +8 dB). The output of summing amplifier U4 is applied to T2 through the 2A option straps. These option straps determine the output impedance of the XMT MASTER port and may be set for either 150, 600, or 1200 ohms. The summed signal is induced in the secondary of T2 and appears at the XMT MASTER port. A front-panel-mounted bantam jack allows access to the summed signal. When a plug is inserted into the jack, the summed signal is disconnected from the XMT MASTER line.

3.RCV Paths. The master receive signal which is to be distributed to the RCV SLAVE ports (RCV SLAVE 1, terminals 20, 22, and 27; RCV SLAVE 2, terminals 10, 16, and 14; RCV SLAVE 3, terminals 6, 8, 9; RCV SLAVE 4, terminals 4, 3, and 2) is applied to the RCV MASTER port (terminals 24, 26, and 11). Access to the master receive port can be achieved via a front-panel bantam jack. When a plug is inserted in the jack, the RCV MASTER line is disconnected from the RCV MASTER port. The master receive signal is applied to the primary input transformer T1 and induces a signal in its secondary. The 1A option straps determine the input impedance of the RCV MASTER port and may be set for either 150, 600, or 1200 ohms. The signal induced in the secondary of T1 passes through the 11A option straps to the inputs of the slave amplifiers. The signal is also connected to terminal 1 to provide an output to the 4204-10/11 Auxiliary Bridge (if employed). Each slave amplifier has a variable gain of -8 dB to +8 dB, adjustable by means of a front-panel-mounted potentiometer. With the 11 A option set to 0 dB, the total gain for the signal appearing at a RCV SLAVE port is the gain set for the associated slave amplifier. With the 11 A option set to -7 dB, the total gain for the signal appearing at a RCV SLAVE port is the gain set for the associated slave amplifier (-8 dB to +8 dB) minus -7 dB. Thus, by optioning 11 A for -7 dB, the individual gain controls for each RCV SLAVE port have their ranges altered to -15 dB to +1 dB (instead of -8 dB

to +8 dB). The signal appearing at the output of a given slave amplifier passes through impedance option straps to the primary of the associated output transformer. The 3 A to 6 A options determine the output impedances of the corresponding RCV SLAVE ports. The output impedance of each RCV SLAVE port can be set to either 600 or 900 ohms by means of these options. The RCV signal is induced in the secondary of each RCV SLAVE output transformer and appears at the associated RCV SLAVE port. The signal at each port can be accessed by means of a front-panel-mounted bantam jack. When a plug is inserted into the jack, the RCV signal is disconnected from the corresponding RCV SLAVE line.

4. Loopback Operation. When screw option SC is opened, the loopback mode is selected. When battery is applied between the RCV MASTER SX lead and the XMT MASTER SX lead, with the RCV MASTER SX lead positive, relay K2 operates. The normally open contacts of K2 enable loopback between T1 and T2, and hence between the XMT MASTER and RCV MASTER ports. At the same time, normally closed contacts of K2 disconnect the XMT and RCV MASTER ports from all of the XMT and RCV SLAVE ports. When battery is applied between the RCV MASTER SX lead and the XMT MASTER SX lead, with the XMT MASTER SX lead positive, relay K1 operates. The normally open contacts of K1 enable loopback between transformers T3 (RCV SLAVE 1) and T7 (XMT SLAVE 1). At the same time, the normally closed contacts of K1 disconnect the XMT and RCV SLAVE 1 lines from their respective ports.

5. Sealing-Current Operation. When screw option SC is closed, the sealing-current mode is selected. Positive sealing current is then applied to terminal 11, exits the 4204-00/03 on terminal 46, and passes through the equipment requiring sealing current. When SC is closed, relay K2 is bypassed, thereby disabling the master ports loopback capability.

6. Power Supply. The 4204-00/03 is equipped with a regulated power supply providing the required potentials for the unit. The power supply operates from an external input of -21 to -55 Vdc. The negative battery input, terminal 35, is connected to pin 37, the POWER INTERLOCK lead. This lead provides power to the 4204-10/11 Auxiliary Bridge (if employed). This arrangement assures that the 420400/03 and the 4204-10/11 units are always on or off together. The 4204-00/03 power supply also provides a regulated -10 Vdc potential for the 4204-10/11. This potential leaves the 4204-00/03 via terminal 33.

(d) Auxiliary Bridge, Wescom Type 4204-10/11. The 4204-10/11 Auxiliary Bridge is employed in conjunction with the 4204-00/03 Master/Slave Conference Bridge. The 4204-10/11 allows distribution from the 4-wire master port of the 4204-00/03 to five additional 4-wire master ports on the 4204-10/11. The gain of each XMT and RCV leg of the 4204-10/11 may be individually set anywhere in the range of -8 dB to +8 dB by means of a front-panel-mounted potentiometer. The pushon strapping options which allow the gains of the 4204-00/03 XMT and RCV legs to be reduced by 16 dB and 7 dB, respectively, also allow the gains of the 4204-10/11 XMT and RCV legs to be reduced by 16 dB and 7 dB, respectively. All 4204-10/11 ports are provided with transformer isolation. The input impedance of the XMT SLAVE ports and the output impedances of the RCV SLAVE ports may each be set to either 600 or 900 ohms by means of the push-on strapping options. An SX signaling lead is derived at each port of the 4204-10/11. In addition to the features described above which apply to both the 4204-10 and the 4204-11 modules, the 4204-11 is equipped with front-panel-mounted bantam test jacks, one for each port. When a test cord is inserted into a test jack, the corresponding XMT or RCV line is disconnected from the port and access to the port is achieved via the test cord.

1. Circuit Description. Refer to schematic diagram, figure 6-24, before proceeding.

2. Transmit and Receive Paths. The 4204-10/11 provides five additional XMT SLAVE and RCV SLAVE ports for connection to the 4204-00/03 Master/Slave Conference Bridge. The XMT summing point on the 4204-00/03 connects to the 4204-10/11 via its terminal 55. The RCV SLAVE amplifier input bus on the 4204-00/03 connects to the 4204-10/11 via its terminal 1. The delay circuit is necessary for initialization at turn-on, or when the 4204-10/11 is plugged in with power already applied to the associated 4204-00/03. With the exception of pin assignments, the circuit description for the transmit and receive paths of the 4204-10/11 is identical to that of the corresponding sections in the 4204-00/03.

3. Power Supply. The 4204-10/11 contains a regulated power supply providing potentials for the unit. The power supply operates from -21 to -55 Vdc and -10 Vdc, both provided by the associated 4204-00/03. The -21 to -55 Vdc is obtained from terminal 37 of the 4204-00/03 and enters the 4204-10/11 on its terminal 37. The -10 Vdc is obtained from terminal 33 of the 4204-00/03 and enters the 4204-10/11 on its terminal 33.

(e) Fuse and Distribution Module, Wescom Type 4285. The 4285 Fuse and Distribution Module is a plug-in printed circuit card assembly that provides battery fusing, distribution, and fuse alarms for 12 modules installed in a 400-11 type Mounting Assembly. The 4285 module provides fusing for three separate supply voltages. Additional features of the 4285 module are listed below.

- Distribution fusing for each independent supply voltage between -21 and -56 Vdc.
- Visual alarm to indicate an open distribution fuse condition.
- External alarm input also monitored by alarm circuitry.
- Fuse alarm transfer contacts for external alarm circuits.

1. Circuit Description. Refer to figure 6-25 for schematic information.
The 4285 has three battery inputs each having a group of four fused outputs. Battery supply input voltages between -21 and -56 Vdc are applied to the 4285 at pins 32, 35, and 36; and fed through fuses Fl through F12 to 12 associated output pins. The battery supply at the output pins is distributed to associated system modules in the Type 400 Mounting Assembly. If a system module draws more current than the ampere rating of its associated fuse, the fuse will open. Whenever a fuse element opens, its spring loaded contact is allowed to close, which applies battery potential through diode CR1 to the base of transistor Q1. Transistor Q1 turns on and causes transistor Q2 to turn on, which then operates relay K1 and illuminates ALARM indicator lamp DS1. The alarm circuit remains in this condition until the open fuse is removed. Relay K1 contains two sets of transfer contacts (two pairs of normally-closed contacts, and two pairs of normally-open contacts) for use in operating an external alarm system as required. Pin 56 serves as an input for an external alarm signal. Whenever an alarm signal (-21 to -56 Vdc) is applied on pin 56, the alarm circuit is initiated to operate as described above. Lamp DS1 and relay K1 operate at a -12 Vdc potential. Zener diode CR2 is used to limit this potential to 21 V whenever the battery supply input is greater than -21 V.

(f) Audio/Keyline Card Cage Shelf No. 2. The Audio/Keyline Card Cage Shelf No. 2 contains four Decoder/Driver PWB Assemblies, four Logic Control PWB Assemblies, a Dual VOX PWB Assembly, a Common Switch PWB Assembly, and four Channel Switch PWB Assemblies. The following paragraphs provide circuit descriptions for each of these circuit modules.

(g) Audio/Keyline Decoder/Driver PWB Assembly 7052-8070. The Audio/Keyline V Decoder/Driver PWB Assembly 7052-8070 decodes a Binary Coded Decimal (BCD) input of up to five bits into nine segment select outputs and 18 device select outputs. There are four Audio/Keyline Decoder/Driver PWB Assemblies used in each operator position card cage assembly. Each of these PWBs is used in a different function of the Audio/Keyline Switch system which is described in paragraph 2-2.b. Refer to schematic diagram, figure 6-26 before proceeding.

1. Circuit Description. The following is a description of the five-bit BCD operation. In this system the BCD input comes from front-panel-mounted switches, and represents the decimal descriptive number of a TTY, a XCVR, or a TTY TX/RX channel. MSD from the switches is applied to latch U1-2 and to exclusive OR U5-5, which is used as a comparator. The other input of the OR gate comparator, U5-4, comes from the complementary output of latch U1-l. Since U1 latch has not been enabled, MSD input has not been latched through to its output. This produces a high at U5-6 which is applied to the A = B INPUT at U3-3. The four LSD inputs are applied to the four inputs of latch U2 and to the "A" inputs of magnitude comparator U3. Since U2 latch has not been enabled, the LSD inputs have not been latched through to their outputs. The true state outputs of latch U2 are connected to the "B" inputs of comparator U3. Because the LSD bits do not compare the A = B OUTPUT, U3-6 goes low triggering a one-shot at U9-1. The output of the one-shot goes low for about 700 ms and then goes high. This triggers another one-shot at U9-10. The output of the second one-shot, U9-5, goes high for about 50 ms and then goes low. This delay strobe at U9-5 is used to enable both of the bit latches at U1-13, U2-4, and U2-13; which then latches the BCD inputs. If the MSD was high, the base of transistor switch Q1 goes high biasing the transistor on. This couples a low (ground) through the transistor to the SEGSEL b output (pin 42) and to the SEGSEL a output (pin 41). If MSD was low, Q1 is not biased on and the two signals SEGSEL a and SEGSEL b remain high. The LSD complementary outputs of latch U2 are applied to the inputs of U6, a BCD to seven segment decoder/driver. Since the LSD inputs represent a decimal value from zero to nine, the seven outputs of U6 will be high or low depending upon the decimal number that is to be displayed on the seven segment display.

2. The four complementary outputs at U2-16, U2-15, U2-10, and U2-9 are applied as inputs to two 4-line to 10-line decoders, U10O and U12, through 2input NAND gates U7 and U8. The other input to the 2-input NAND gates is used to enable the four LSD inputs to either decoder (U10 or U12) and is derived from the MSD bit through logic gates U4 and U5. This ensures that only one of the decoder's outputs will be enabled at a time. The DEVICE SELECT O 9 signals are developed by the U12 decoder, and are inverted by hex inverters U13 and U14 before being sent to the applicable device. The DEVICE SELECT 10 17 signals are developed by the U10O decoder, and are inverted by hex inverter U15 before being sent to the applicable device. In this system, only 12 DEVICE SELECT signals are needed. Therefore, the last seven outputs of decoder U10 are applied as inputs to an 8-input positive NAND gate, along with the decoder board ENABLE signal from U5-8. If any invalid device number is selected, the output at U11-8 will go low turning on transistor Q2 applying +5 Vdc to the displays as the COMMON ANODE signal. This signal simply blanks

the displays whenever an invalid number is selected. The +5 Vdc Vcc voltage is derived from an externally supplied +12 Vdc by voltage regulator U16.

(h) Audio/Keyline Logic/Control PWB Assembly, 7052-8080. The Logic/Control PWB Assembly 7052-8080 contains three identical control circuits on each board. There are four Logic/Control PWBs in each operator card cage position for a total of 12 control circuits for each operator. Each control circuit provides mode and keyline switch control for one transceiver channel. The overall functional description is presented in paragraph 2-2.b, while the following paragraphs describe one control circuit on a Logic/Control PWB Assembly 7052-8080.

1. Circuit Description. Refer to schematic diagram, figure 6-28 before

2. There are 13 input signals and eight output signals associated with each channel control circuit on the Audio/Keyline Logic/Control PWB Assembly 70528080. This discussion will not reference any pin numbers, since pin numbers will be different for each channel control circuit. The output signals are listed and defined as follows:

- TSEN = TTY Send Enable
- TREN = TTY Receive Enable
- SREN = Send/Receive Enable
- BCEN = Broadcast Enable
- RREN = RAD/RAD Enable
- MBEN = Monitor B Enable
- MAEN = Monitor A Enable
- KEYLINE = Anytime the transmitter is Keyed.

All of the output signals are dependent upon certain conditions of the input signals. Each of the output signals has a specific set of conditions, except the KEYLINE signal which has eight different sets of input signal conditions. The input signals are listed and defined as follows:

- TRDIS = TTY Receive Disable
- TSDIS = TTY Send Disable
- INLK B = Interlock B
- SRDIS = Send/Receive Disable
- INLK C = Interlock C
- RRSEL = RAD/RAD Select
- XCVSEL = Transceiver Select

- BCSEL = Broadcase Select
- SRKEY = Send/Receive Key
- RRKEY = RAD/RAD Key
- TTYKEY = TTY Key
- TRSEL = TTY Receive Select
- TSSEL = TTY Send Select

3. The truth table in table 2-4, shows the logic levels necessary at each of the input signals to produce a logic level one (high) at each of the output signals.

(i) Audio/Keyline Dual VOX PWB Assembly, 7052-8110. The Dual VOX PWB Assembly 7052-8110 provides voice activated keying for two audio channels with a dual manual keying override capability. Refer to schematic diagram, figure 6-29 before proceeding.

Circuit Description. The 7052-8110 Dual VOX PWB has two identical circuits each of which detects the audio from an assigned transceiver and generates a KEYLINE signal to another transceiver. This PWB is used exclusively in the RAD/ RAD Audio/Keyline circuit where two transceivers are connected back-to-back. The operator may manually override the AUTO VOX function of either circuit by means of a switch on the Audio/Keyline Panel. This manually keys one or the other transmitter depending upon the operator's choice.

(j) Audio/Keyline Common Switch PWB Assembly, 7052-8090. The Common Switch PWB Assembly 7052-8090 is a relay switching card used to route signals to and from specific devices or functions under the control of one of the two operator positions. Most of the signal routing is within the boundary of an individual operator position, but there is some interface between the two operator positions.

1. Circuit Description. Refer to schematic diagram, figure 6-30, before proceeding.

2. VOX relay K1 is energized by a ground on the VEN (VOX Enable) signal line. When relay K1 is energized, the TK (Talk) signal line is disconnected from the SRKEY line and the SRKEY line is connected to the SRKEYI line. At the same time, the RRKEY line is connected to the RRKEYI line.

3. KL901 relay K2 is energized by a ground on the TLRD (TEL/RAD) signal line. When relay K2 is energized, the SRKEY line is connected to the KO901 line and the VEN signal line is disabled.

4. MONA relay K3 is energized by *a* ground on the MONA signal line if the TAP (Taper relay K11 is not energized. When relay K3 is energized, the MONA tip and ring lines are connected to the TAPOTT and TAPOTR lines, respectively.

5. MONB relay K4 is energized by a ground on the MONB signal line if TAP relay K11 is not energized. When relay K4 is energized, the MONB tip and ring signal lines are connected to the TAPOTT and TAPOTR signal lines, respectively.

Table 2-4. Audio/Keyline Logic/Control PWB Assembly 7052-8080, Truth Table

Input Signals

OUTPUT = H SIGNALS	TRDIS	TSDIS	INLK B	SRDIS	INLK C	RRSEL	XCVSEL	BCSEL	SRKEY	RRKEY	TTYKEY	TRSEL	TSSEL
TSEN	X	X	X	X	H	X	X	X	X	X	X	X	H
TREN	X	X	X	X	H	X	X	X	X	X	X	H	X
SREN	H	H	H	X	H	X	X	X	X	X	X	X	X
BCEN	H	H	X	H	X	X	H	L	X	X	X	X	X
RREN	H	H	X	H	X	L	H	X	X	X	X	X	X
MBEN	H	H	X	X	H	X	X	X	X	X	X	X	X
MAEN	H	H	X	X	H	X	X	X	X	X	X	X	X
KEYLINE 1	X	X	X	X	H	X	X	X	H	X	H	H	H
KEYLINE 2	H	H	H	X	H	X	X	X	X	X	H	H	H
KEYLINE 3	H	H	X	H	H	L	H	X	X	H	H	H	H
KEYLINE 4	X	X	X	X	H	X	X	X	X	X	H	H	H
KEYLINE 5	H	H	H	H	H	X	H	L	X	X	X	H	X
KEYLINE 6	H	H	H	H	H	X	H	L	X	X	X	H	X
KEYLINE 7	H	H	X	H	H	L	H	H	X	H	X	H	X
KEYLINE 8	H	H	X	H	H	X	H	L	X	X	H	H	H

H = High

L = Low

X = Don't Care

6. TELK (telephone tar) relay K5 is energized by a ground on the TLRD (TEL/RAD)-signal line. When relay K5 is energized, the TELRX signal lines are connected to the TELT signal lines and the TELR signal lines are connected to the TELTX signal lines.

7. TAPREM (Tape Remote) relay K6 is energized by a ground on the S22REM signal line if the TAP (Tape) relay K11 is not energized. When relay K6 is energized, the REMSVF (Remote Send Audio) signal lines are disconnected from the MISCAR (Miscellaneous Receive A) port on the conference bridge and are connected to the TAPOT (Tape Output) tip and ring signal lines.

8. TAPTEL (Tape to Telephone) relay K7 is energized by a ground on the S22TEL signal line. When relay K7 is energized, the TELMIKE signal lines are disconnected from TAP relay K11, TAPREM relay K6, MONB relay K4, and MONA relay K3. The TELEAR signal lines are disconnected from the S23TEL signal lines and terminated by resistor R3.

9. MIKE relay K8 is energized by a ground on the MIKESOCONT (Mike Send Output Control) signal line if the BCST (Broadcast) relay K9 is not energized. When relay K8 is energized, a ground is removed from the TAPCH1IND line and placed on the MIKIND line. The MIKES21 signal lines are disconnected from the CH1TAPIN lines and connected to the MISCBS (Miscellaneous B Send) port on the conference bridge, if the BCST relay K9, the REM relay KO1, and the TAP relay K11 are not energized. The MKX1 signal line is connected to the MKX2 signal line.

10. BCST (Broadcast) relay K9 is energized by a ground on the BCIHBMK (Broadcast Inhibit Mike) signal line. When relay K9 is energized, MIKE relay K8 is inhibited and a ground is removed from the MIKIND (Mike Indicator) signal line and placed on the BCSTIND (Broadcast Indicator) signal line. The MIKES21 input signal is disconnected from the CH1TAPIN (Channel 1 Tape Input) and connected to the MISCBS (Miscellaneous B Send) port on the conference bridge, while the MKXI signal is connected to the MKX2 signal.

11. REM (Remote) relay KIO is energized by a ground on REMSOCONT (Remote Send Output Control) signal line. When relay K10 is energized, a ground is placed on the REMIND (Remote Indicator) and the REMRVF (Remote Receive Audio) signal is connected to the MISCBS (Miscellaneous B Send) port of conference bridge if the TAP relay K11 is not energized.

12. TAP (Tape) relay K11 is energized by a ground on the TAPESOCONT (Tape Send Output Control) signal line. When relay K11 is energized, a ground is removed from the SWGND (Switch Ground) signal line and placed on the TAPIND (Tape Indicator) signal line. The MIKES21 input signal, or the BCVF (Broadcast Audio) input signal, or the REMRVF (Remote Receive Audio) input signal is removed from the MISCBS (Miscellaneous B Send) port of the conference bridge, and the TAPEOT (Tape Output) signal is connected to the MISCBS port in its place. Also when K11 is energized, +12 Vdc is removed from the coils of relays K3, K4, and K6 inhibiting those functions.

(k) Audio/Keyline Channel Switch PWB Assembly, 7052-8130. The Channel Switch PWB Assembly 7052-8130 is a relay card used to route signals of a single transceiver channel to and from specific devices or functions under the control of one of the two operator positions via a channel circuit on a Logic/Control PWB Assembly. The function of this PWB with respect to the overall system is described in paragraph 2-2.b.

1. Circuit Description. Reter to schematic diagram, figure 6-31, before proceeding.

2. The MA (Monitor A) relay K1 is energized by the MASEL signal (GND) if the MAEN signal (+12 Vdc) is available. When the relay is energized, Monitor A is not selected for this channel, the MONAVF tip and ring signals are normalled-thru the de-energized contacts of KI. When K1 is energized, the XCVRVF (T) and (R) signals are routed through the contacts of K1 to the MONAVF (T) and (R) signal lines, respectively. The MB (Monitor B) relay (K2) circuit functions similarly to the MA circuit.

NOTE

Only one of these two relay circuits can be energized at a time, because it is impossible to select both Monitor A and Monitor B for the same channel.

3. The BC (BROADCAST) relay K3 is energized by the BCEN signal (+12 Vdc) if there is a ground on the INLKB signal line. When BC relay K3 is energized, a ground is placed on the BCINVMK signal line to inhibit the microphone. A ground is also placed on the INLKC signal line and XCVRVF tip, and ring signal lines are made available to the contacts of MB relay K2.

4. The S/R relay K4 is energized by the SRSEL signal (GND) if the SREN signal (+T2 Vdc) is available. When K4 is not energized, +12 Vdc is applied to the SRDIS signal line, which allows the selection of the BROADCAST or RAD/RAD modes for the transceiver associated with this channel. Energizing relay K4, puts a ground on the SRDIS signal line, which inhibits the BROADCAST or RAD/RAD modes for the transceiver associated with this channel.

5. The R/R relay K5 is energized by the RREN (+12 Vdc) signal if there is a ground on the INLKB signal line. When relay K5 is de-energized, +12 Vdc is applied to the INLKA and INLKC signal lines. This allows the transceiver associated with this channel to be placed in the MONITOR A, MONITOR B, or SEIZED modes of operation. When the K5 relay is energized, the transceiver associated with this channel becomes the VOICE CONTROL source and a ground is placed on the INLKA and INLKC signal lines to inhibit the selection of the MONITOR A, MONITOR B, or SEIZED modes of operation.

6.When the TR relay K6 and the TS relay K7 are de-energized, +12 Vdc is applied to TRDIS and to the TSDIS signal lines to allow the selection of the BROADCAST, the RAD/RAD, or either of the MONITOR modes of operation for this particular channel. If the transceiver associated with this channel is assigned as the VOICE CONTROL source, +12 Vdc is placed on the INLKB signal line preventing either K6 or K7 relay from being energized. If the transceiver associated with this channel has not been assigned as the VOICE CONTROL source, a ground is placed on the INLKB signal line allowing this channel to be assigned to the RCVR SEL and/or the XMTR SEL TTY functions. This places *a* +12 Vdc on the TREN signal line, to energize relay K6, and/or on the TSEN signal line to energize relay K7. If either relay (K6 and/or K7) is energized, a ground is placed on the TRDIS and/or the TSDIS signal(s) to inhibit the selection of the BROADCAST, the RAD/RAD, or either MONITOR functions. Energizing either K6 or K7 connects the receiver and/or transmitter associated with this channel to the appropriate modem of the selected TTY.

(1) Audio/Keyline Card Cage Shelf No. 3. The Audio/Keyline Card Cage Shelf _ _ No. 3 contains eight channel Switch PWB Assemblies and one VF Monitor PWB Assembly. The following paragraphs provide the circuit descriptions for each of these circuit modules.

(m) Audio/Keyline Channel Switch PWB Assembly, 7052-8130. This PWB assembly is identical to the PWB assembly described in paragraph 2-2,h(k).

(n) Audio/Keyline VF Monitor PWB Assembly, 7052-8030. The Audio/Keyline VF Monitor PWB Assembly 7052-8030 is a catch-all type circuit board which contains circuitry necessary for Audio/Keyline function. The function of this PWB with respect to the overall system is described in paragraph 2-2.b.

1. Circuit Description. Refer to schematic diagram, figure 6-32, before proceeding.

2. Each operator position has an attendant headset with an earpiece and mouthpiece. Transformers T3 and T4 provide impedance matching between the earpiece, mouthpiece, and Audio/Keyline circuitry. The TLMX audio signal from the mouthpiece is coupled across capacitors C1 through C4 and sent to a 4204-10/11 Auxiliary Bridge as the TLMT signal. The output port of the bridge (TLM) is applied to the 10 k ohm side of transformer T3. The TELMIKE signal out of the 600 ohm side of T3 is sent to the Common Switch PWB Assembly for further distribution. The TELEAR signal from the Common Switch PWB Assembly is applied to 4204-10/11 Auxiliary Bridge. The TLE signal out of the 10 k side of the bridge is applied to the 10 k ohm side of transformer T4. The TLER signal out of the 600 ohm side of T4 is connected to the earpiece of the attendant headset.

3. There are two divider/combiner circuits on the VF Monitor PWB Assembly Z1 and Z2. Z1 is used to split the Send and Receive audio from the Right Tape Channel, or to combine the SMON 2 and RMON 2 audio signals into the SZ (T and R) signals for recording on the Right Tape Channel. Z2 is used to combine the SMON 1 and RMON 1 audio signals into the SRMONX signal that is sent to the Audio Monitor Assembly S/R speaker.

4. Transformer T1 provides impedance matching between the transmit audio (SRR) and the RMON amplifier that is used to produce the RMON 1 and RMON 2 audio signals. Transformer T2 is used to provide impedance matching between the TMON (R&T) signals from the front-panel-mounted TTY MONITOR switch and the TMN (R&T) signal inputs of the B Monitor Summing Amplifier.

5. The +12 Vdc and the -24 Vdc Audio/Keyline power supply voltages are applied to LEDs DS1 and DS2, respectively, to indicate that power is available in the Audio/Keyline system. Resistors R3 and R4 are used to terminate the TRM1 and TRM2 unused output ports of the 4-Wire 6-Way Conference Bridge. There are two optional attenuator circuits available for circuit attenuation located on this PWB Assembly. One consists of resistors R5-R8, while the other consists of resistors R9-R12.

(o) Audio/Keyline Card Cage Shelf No. 4 ("A" Operator Only). The Audio/ Keyline Card Cage Shelf No. 4 is a 15 position card shelf that is located in Equipment Bay No. 2, the "A" Operator side, but contains PWB's that are common to both operator positions. There are two Power Divider PWB's and one TTY switch PWB used _

in this card cage shelf. All other positions are blank. The following paragraphs provide the circuit descriptions for the PWBs in this card cage shelf.

(p) Audio/Keyline Power Divider PWB Assembly, 7052-8100. The Audio/Keyline Power Divider consists of 13 resistor packs each containing seven 100 ohm resistors. The resistors are connected to form combiner/divider networks in the audio signal paths of the Audio/Keyline assembly. There are two 7052-8100 Power Divider PWB's used in each Audio/Keyline Card Cage Assembly. One is used in the Transceiver Receive audio lines and the other is used in the Transceiver Transmit audio lines. Figure 6-33 is the schematic diagram for the Power Divider PWB, while figure 6-20 shows how the 7052-8100 Power Divider is used in the Audio/Keyline system.

(q) Audio/Keyline TTY Switch PWB Assembly, 7052-8120. The Audio/Keyline TTY Switch PWB Assembly 7052-8120 is common to both operator positions. There are four TTY modem interfaces available for each console. This allows each operator to select one TTY interface, but not the same one. The TTY Switch PWB Assembly performs this interfacing under the control of front-panel-mounted TTY selection switches at each of the console operator positions. The function of this PWB with respect to the overall system is described in paragraph 2-2.b.

1. Circuit Description. Refer to schematic diagram, figure 6-34, before proceeding.

2. If the "A" operator sets the TTY SEL switch on his Audio/Keyline Switch Panel to the 01 position, +12 Vdc is applied to the ATTYSEL 1 signal line, which turns on Darlington transistor Q2 applying a ground through the normally closed contacts of relay K2 to the coil of relay K1. This causes relay K1 to energize, locking out relay K2. Thus, the relay K2 cannot be energized even if the "B" operator selects 01 on his TTY SEL switch. This is typical of all of the other TTY interface circuits. When one operator selects a TTY the other operator is locked out. Each operator may select only one TTY at a time.

3. When relay KI is energized, the A TTY KEY line is connected to the TTY KEY line for TTY No. 1. The A TTY TX lines are connected to the MODEM 1 RCV lines and the A TTY RX lines are connected to the MODEM 1 SND lines. This is typical of all TTY interface circuits. The signal names will vary with operators and selected TTY's.

(3) Boom Microphone, Shure Model 562. The Shure Model 562 Dynamic Microphone is a noise-canceling, low-impedance unit designed specifically as a high-quality microphone for flexible gooseneck and general purpose use. It provides highly intelligible speech communication where high volume background noise is present. The microphone features smooth response, ruggedness, and is able to withstand abnormal moisture and temperature. The microphone is mounted directly on a Model G18C flexible gooseneck, which is mounted on a Model A12 mounting flange. The Model 562 microphone is connected directly to a Microphone Pre-amplifier PWB in its associated Audio Monitor Assembly. No special precautions are needed for Model 562 Microphone operation. The noise-canceling feature of the Model 562 is obtained through its shaped frequency response, directionality, and distance discrimination. The acoustical elements are designed to optimize performance in the frequency range of 100 to 6,000 Hz. This results in a substantial reduction of sounds outside the desired range, and proper control of those sounds within the desired range. The microphone rejects noise through its inherent directional properties, and discriminates against unwanted sounds arriving from a distance in favor of sounds

arriving from a near source.

(4) Headset/Microphone, Astrocom Model 10484. The Astrocom Model 10484 Headset/Microphone is used as one means of audio interface with the Audio/Keyline system. The dynamic microphone provides approximately 40 dBm of signal rejection at a distance of one inch from the mouthpiece. The Audio/Keyline SEND/RECEIVE audio is routed to the right earpiece of the headset. The combined A MONITOR and B MONITOR audio is routed to the left earpiece of the headset.

(5) Footswitch, RF-920. The RF-920 Footswitch is a single-pole, normally open (SP-NO) momentary contact only footswitch with a telephone plug and a six foot cord that is used at each console operator position to key the transmitter, if the footswitch keyline is selected.

(6) -24 Vdc Power Supply, Acopian B24GT210-230. The -24 Vdc Acopian power supply is ideally suited for applications where compact, high performance and high reliability power supplies are required. The modular construction and barrier strip interconnections provide mounting and wiring convenience and flexibility. The power supply outputs may be used floating, with either the positive or negative side grounded, and/or in series with another supply. The power supply has a built-in short circuit protection; for remote sensing of output voltage at the load is optional.

(a) Circuit Description. Refer to schematic diagram, figure 6-35, before proceeding.

(b) The ac input (115 Vac) protected by a 1/2 Amp Slo-Blo fuse Fl is coupled across stepdown transformer T1 to the input of rectifier bridge (K1-K4). The negative output of the bridge is tied directly to the negative output of the power supply. The positive output of the bridge is connected directly to the collectors of control transistors Q1 and Q2, and to the VC input (pin 7) of voltage regulator IC1 (uA723). The output of the regulator (pin 6) is connected to the base of Q2 and through resistor R3 to the base of Q1. The current limit input of the regulator (pin 10) is connected to the collector of Q1 through diode K6. As Q1 and Q2 conduct, their output is current limited and regulated by the error amplifier in the voltage regulator to produce the -24 Vdc output.

(7) +12 Vdc Power Supply, Acopian B12GT650-230. The +12 Vdc Acopian power supply is functionally identical to the -24 Vdc power supply described in paragraph 2-2.h(6).

(a) Circuit Description. Refer to schematic diagram, figure 6-36, before proceeding.

(b)The ac input (115 Vac) protected by 1 amp Slo-Blo fuse Fl is coupled across stepdown transformer T1 to the input of rectifier bridge K1-K4. The negative output of the bridge is tied directly to the negative output of the power supply. The positive output of the bridge is connected directly to the collectors of control transistors Q1 and Q2, and to the VC input (pin 7) of voltage regulator IC1 (uA723). The output of the regulator (pin *6)* is connected to the base of Q2 and through resistor R3 to the base of Q1. The current limit input of the regulator (pin 10) is connected to the collector of Q1 through diode K6. As Q1 and Q2 conduct, their output is current limited and regulated by the error amplifier in the voltage regulator to produce the +12 Vdc output.

i. Status Display Monitor Assembly, 10063-5000. The Status Display Monitor Assembly 10063-5000 provides continuous readback of status, frequency, mode, AGC, and control information for up to six individual transceivers. There are two Status Display Monitor Assemblies located in the center equipment bay of each console, providing readback data for up to 12 transceivers per console.

(1) Status Display Monitor Indicators. The Status Display Monitor indicators are shown in figure 2-16 and described below:

- ON = Yellow LED - Indicates XCVR is on.
- FAULT = Red LED - Indicates XCVR has a fault.
- RF = Yellow LED - Indicates presence of RF.
- FREQUENCY (kHz) = Six 7-Segment Displays - Indicates XCVR frequency.
- USB = Yellow LED - Indicates Upper Side-Band MODE of operation.
- LSB = Yellow LED - Indicates Lower Side-Band MODE of operation.
- FAST = Yellow LED - Indicates fast AGC mode.
- SLOW = Yellow LED - Indicates slow AGC mode.
- LOCAL = Yellow LED - Indicates that the XCVR is under local control.
- REMOTE = Yellow LED - Indicates that the XCVR can be controlled locally.
- KEY = Yellow LED - Indicates XCVR is keyed.
- UNSQUELCHED = Yellow LED - Indicates that the XCVR audio is unsquelched.

(2) Status Display Monitor Assembly Circuit Description. The Status Display Monitor Assembly is designed to interface with and display the status of up to six transceivers. Figure 6-37 is an interconnection diagram of the Status Display Monitor Assembly showing all of the intra-unit cabling interface.

(a) Display Driver PWB Assembly, 10063-5170. There are six Display Driver PWB Assemblies in each status Display Monitor Assembly; one for each transceiver

1. Circuit Description. A detailed functional block diagram of the Display Driver PWB Assembly is shown in figure 2-17, while the complete schematic diagram for that assembly is shown in figure 6-38 of this manual.

2. Six lines of transceiver status information (SLOW, FAST, LSB, USB, RF, and MlJ) are inverted by hex inverting TTL buffer U9 before being applied to LEDs on the Front Panel PWB Assembly. Five lines of transceiver status information (FAULI,

UNSQ, KEY, REM, and LOC) are inverted by hex inverting TTL buffer U8 before being applied to LEDs on the Front Panel PWB Assembly. The FAULT signal line from each transceiver is also routed to the Alarm Module PWB Assembly sonalert circuitry as the FLT ALM signal.

3. 22 lines of frequency status information are applied to hex tri-state buffers U1, U2, U3, and U4. Each of the tri-state buffers is controlled by two lines of control information developed by the 4-line to 16-line decoder U6. The outputs of the tri-state buffers are bussed together to provide four lines of input to the BCD to 7-segment latch U5. The frequency status information on the bus is determined by the control line information from U6. The seven outputs of U5 are inverted by inverting TTL Buffers (U10 and P/O U8) and applied to the bases of associated switching transistors Q7 through Q13. When the signal applied to the base of a specific transistor is negative, the transistor is biased on applying +10 Vdc to the corresponding segment control line (SEG a through SEG g). All seven segment control signals are applied to the associated Front Panel PWB display.

4. Three control line signals from the Alarm Module PWB Assembly are applied to the input of the 4-line to 16-line decoder U6. Only six lines of the 16 output signals are used to control the frequency data input tri-state buffers (U1 through U4), and supply the six inputs to hex inverting TTL buffer U7. The six control signals are inverted by U7 and applied to the bases of associated switching transistors Q1 through Q6. When the signal applied to the base of a specific transistor is positive, the transistor is biased on applying a ground to the corresponding digit control signal line (DIG 1 through DIG 6). All six-digit control signals are applied to the associated Front Panel PWB display.

(b) Alarm Module PWB Assembly, 10063-5180. There is only one Alarm Module PWB Assembly in each status Display Monitor Assembly, which is connected to each of the six Display Driver PWB Assemblies and the Front Panel PWB Assembly.

1. Circuit Description. A detailed functional block diagram of the Alarm Module PWB Assembly is shown in figure 2-18, while the complete schematic diagram for that assembly is shown in figure 6-39 of this manual.

2. Each of the six FLT ALM (FAULT ALARM) signals, one from each of the six Display Driver PWB Assemblies, are split into two signal paths. One signal path is applied directly to one input of six 2-input OR gates in U5 and U6. The other signal path is inverted by hex inverter U1, and applied to the PRESET input of six "D" type flip-flops in U2, U3, and U4. When a fault occurs in any of the six transceivers, its associated FLT ALM signal line goes low. This puts a low at one input of its OR gate, and a high at the PRESET input of its associated flipflop. When the PRESET input is high, the Q output goes low and is applied to the other input of the OR gate. This produces a low output which is applied to one input of NAND gate U7. Assuming that no other transceiver is faulted, all of the other inputs to the NAND gate U7 will be high. A low on any input of U7 causes the output to go high, biasing transistor Q1 on. This applies a ground to the negative input of the Sonalert, turning it on. Depressing the ALARM RESET pushbutton on the Status Monitor front panel, applies a ground (low) to the ALM RES signal line resetting all six of the flip-flops in U2, U3, and U4. This clears the fault and turns off the Sonalert.

3. One-sixth of hex Schmitt trigger U8 is used as an oscillator to generate a 186.6 kHz clock signal. This clock signal is divided by a 12-stage, ripple-

carry, binary counter/divider U9 to produce a 730 Hz clock, which is applied to the clock input of another binary counter U10O. Counter U1O produces three outputs: CONTROL A, CONTROL B, and CONTROL C, which are sent to all six of the Display Driver PWB's to control the multiplexing.

(c) Front Panel PWB Assembly, 10063-5150. There are six identical display circuits on the Front Panel PWB Assembly. Each display circuit is driven by one of the six Display Driver PWB Assemblies. Only one of the display circuits will be described.

1. Circuit Description. The Front Panel PWB Assembly display circuit is shown in schematic diagram, figure 6-40, no functional block diagram is necessary for this assembly.

2. A +10 Vdc signal on any one of the following status monitor signals: ON, RF, USB, LSB, FAST, SLOW, LOC, REM, KEY, UNSQ, or FAULT; will cause its corresponding LED (DS1 thru DS11, respectively) to light.

3. The LAMP TEST signal LT is generated by depressing the LAMP TEST pushbutton on the front panel. This applies a ground to the LT signal line, which is normally held high. The LT signal is routed back to all six of the Display Driver PWB Assemblies to cause all LED's and 7-segment displays on the front panel to light.

4. The ALARM RESET signal ALM RES is generated by depressing the ALARM RESET pushbutton on the front panel. This applies a ground to the ALM RES signal line, which is normally held high. The ALM RES signal is routed back to the Alarm Module PWB Assembly to reset all of the fault flip-flops, which clears the fault(s) and turns off the Sonalert.

5. The seven segment control signals (SEG a thru SEG g) are enabled (+10 Vdc applied) individually by control circuits on the associated Display Driver PWB Assembly. Segment control signals along with digit select signals (DIG 1 thru DIG 6) are utilized to produce the appropriate character on each of the 7-segment displays (DS12 thru DS17). The digit select signal (ground) determines which display will be enabled, while segment control signals (+10 Vdc) determine what character will be displayed on that particular 7-segment display. The decimal input of 7segment display DS16 is always tied to +10 Vdc so that the decimal point is always displayed.

(d) Power Supply Assembly, Power One HC12-3.4. The power supply used in the Status Display Monitor Assembly is a Power One Model HC12-3.4 power supply. It operates in this application on 230 Vac fused at 0.5 Amp. The ac power is applied to pins I and 4 input transformer T1 with pins 2 and 3 jumpered together. The line regulation is +.05% for a 10% input change. The load regulation is +.05% for a 50% load change. The output ripple is 3 mV peak-to-peak with a transient reponse of 50 microseconds for a 50% to 100% load change with a maximum deviation of less than 5% (less than 1% is typical). A complete schematic diagram of the HC12-3.4 power supply is shown in figure 6-41 of this manual.

j. Status Display Monitor J-Box, 10063-6000. There is one Status Monitor J-Box located in each 'transceiver '(AN/URC-'lO3'(V) 1) which provides the frequency, mode, ind status interface information between the transceiver and the Status Display Monitor in the Communication Control Console. The Status Display Monitor J-Box is discussed in paragraph 1-3 of the Radio Set AN/URC-103(V)l Manual TM 11-5820-893-14

and shown in the system interconnection diagram of that manual. The J-Box consists of connector box, an Interface PWB Assembly, and a power supply. Figure 2-19 shows the Status Display Monitor J-Box interconnection diagram.

(1) Status Display Monitor J-Box PWB Assembly, 10063-6080. The Status Display Monitor J-Box PWB Assembly provides amplifier and logic circuitry which effects status monitor interface between the transceiver and the Status Display Monitor Panel.

(a) Circuit Description. Refer to figure 2-19 and schematic diagram, figure 6-42 for the following circuit description.

(b) The 22 frequency readback signal lines from the Radio Set are routed directly through the J-Box and its PWB assembly to the Status Display Monitor.

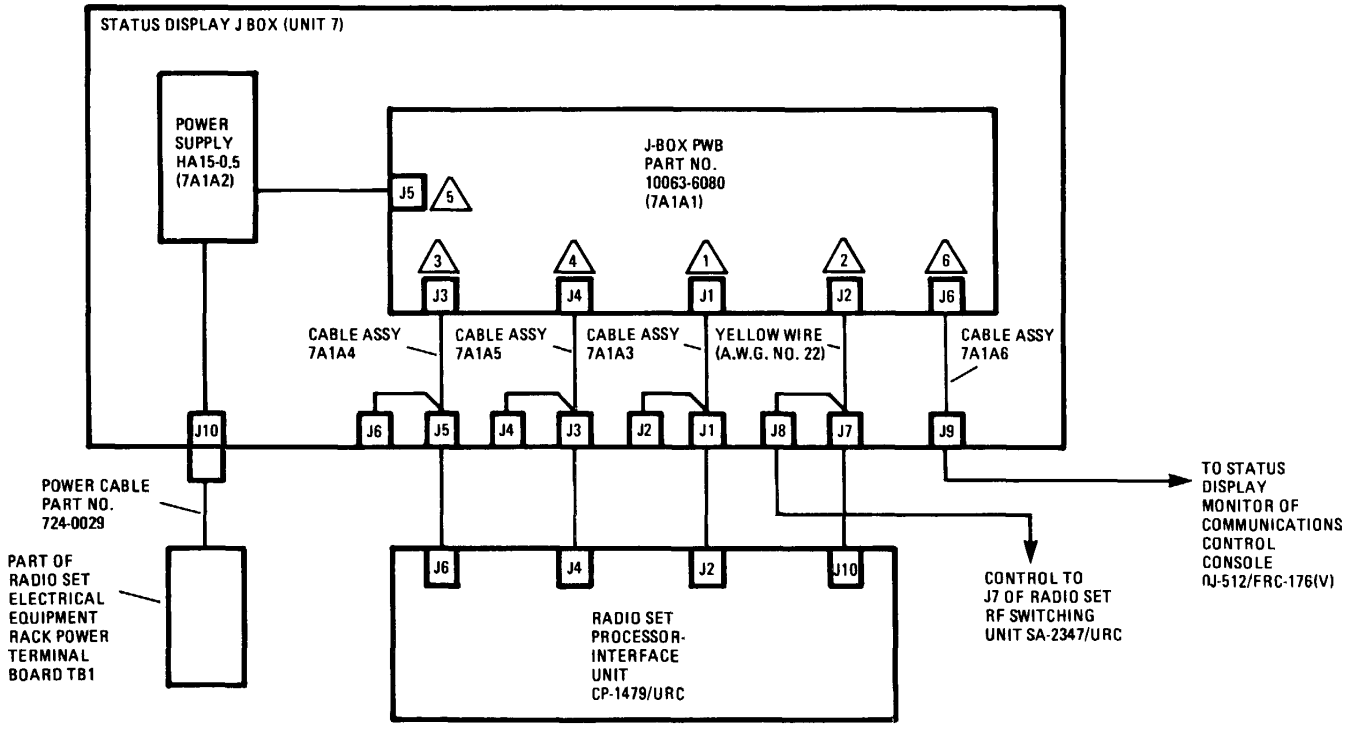
(c) The TX INHIBIT signal is buffered by part of U5 before being sent to the monitor as the FAULT signal. The (+10 Vdc) ON IND signal is inverted by part of U1 and buffered by part of U5 before being sent to the monitor as the ON signal.

(d) The FAST AGC signal is split into two signal paths on the J-Box PWB. One signal path is inverted by part of U2 and buffered by part of U5 to produce the FAST status signal to the monitor. The other signal path is just buffered by part of U5 to produce the SLOW status signal. The BUS REQ (LOC/REM) signal is also split into two signal paths on the J-Box PWB. One path is inverted by part of U1 and buffered by part of U5 to produce the REM status signal. The other signal path is just buffered by part of U5 to produce the LOC status signal. The KEY signal is inverted by part of U6 to produce the KEY status signal. The SQL BYPASS input signal is inverted by part of U2 and buffered by part of U6 to produce the UNSQ status_ signal.

(e) The three inputs: MODE A, MODE B, and MODE C, are decoded on the J-Box PWB by part of U1 and U3 to produce the USB and LSB status signals to the monitor. To get the USB status signal there has to be a high on MODE A, a low on MODE B, and a low on MODE C. To get the LSB status signal there has to be a low on MODE A, a high on MODE B, and a low on MODE C.

(f) The EXT ALC input signal is applied to the non-inverting input of a comparator amplifier, where it is compared to a reference voltage. When the input signal exceeds the reference voltage, the output goes high (+10 Vdc). This output is applied to the inverting input of another comparator amplifier, where it is compared against a reference voltage. When the input to the second comparator amplifier exceeds its reference voltage, the output of the second amplifier goes low (ground). This output is buffered by a part of U6 to produce the RF status signal.

(2)Power Supply Assembly, Power One HA15-0.5. The power supply used in the Status Display Monitor J-Box is a Power One Model HA15-0.5 power supply. It operates in this application on 230 Vac fused at 0.125 amps. Pins 2 and 3 of input transformer T1 are jumpered together. The ac power is applied to pins 1 and 4 of T1. The line regulation is +.05% for a 10% line change, while the load regulation is +.05% for a load change of 50%. The output ripple on a 2 to 15 V output is 5.0 mV peak-to-peak maximum, with a transient response of 50 ms for a 50% load change (maximum deviation is less than 5%, less than 1% is typical). A complete schematic diagram of the HA15-0.5 power supply is shown in figure 6-43. A



1. FUNCTIONS AT J1; TX INHIBIT, FAST AGC, SQL. BYPASS
2. FUNCTIONS AT J2; KEYLINE
3. FUNCTIONS AT J3; +10V (ON IND.), BUS REQ. (LOCAL/REMOTE), EXT ALC, MODE A, MODE B, MODE C
4. FUNCTIONS AT J4; FREQ. INFO. (ALL)
5. FUNCTIONS AT J5; +10V POWER INPUT
6. FUNCTIONS AT J6; FREQ. INFO. (ALL), $\overline{\text{FAULT}}$, $\overline{\text{ON}}$, $\overline{\text{FAST}}$, $\overline{\text{SLOW}}$, $\overline{\text{REM}}$, $\overline{\text{LOC}}$, $\overline{\text{KEY}}$, $\overline{\text{UNSQ}}$, $\overline{\text{USB}}$, $\overline{\text{LSB}}$, $\overline{\text{RF}}$ (NOTE: $\overline{\text{RF}}$ IS RF INDICATOR ON/OFF, NOT AN RF (RADIO FREQUENCY) LINE.

Figure 2-19. Status Display Monitor J-Box 10063-6000

k. Remote Control-Monitor Unit, C-11201/URC. The Remote Control-Monitor Unit provides each Communication Control Console operator with means of controlling each assigned Receiver-Transmitters RT-139(P)/URC, from a position at the5Communication Control Console. The Receiver-Transmitter RT-1391(P)/URC is part of the Radio Set AN/URC-103(V) l which is physically located at a distance from the console. There are two Remote Control-Monitor Units in each Communication Control Console, one for each operator position. Each unit is capable of controlling up to 99 Receiver Transmitters. This provides the console with a redundant remote control capability if one Remote Control-Monitor Unit should fail, the other one is capable of controlling all of the Receiver-Transmitters. Each Remote Control-Monitor Unit consists of a Remote Control Unit (RCU), located in the Communication Control Console, and a Local Control Unit, located in the Processor-Interface Unit CP-1479/URC which is part of the Radio Set AN/URC-103(V)l. Both the RCU and LCU are micro-processor controlled and communicate with each other over an RS-422 serial data bus. There are also RS-232 serial data bus and Modem interface capabilities between these two units. For complete information concerning the theory of operation and maintenance of the Remote Control-Monitor Unit, refer to the appropriate section of the Radio Set AN/URC-103(V)l Manual TM 11-5820-893-14.

2-3. CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V)

Control Interface Group OK-449(V)/FRC-176(V), also referred to as Common Equipment Bay (CEB), consists of two Equipment Racks mounted side-by-side. One equipment rack contains the Telephone Equipment Bay (P/N 7052-2020) which includes the following:

- Telephone Punch Block (1Al)
- Common Telephone Equipment (Telephone Card Shelves 1A2, 1A3, 1A4, and 1A5)
- DC Patch Panel (1A6)
- Audio Patch Panels 2A7 and 1A8
- Key Service Panel (1A9)
- Power Supplies (lPS1 and 1PS2)
- IDF Terminal Boards lTBl and 1TB2
- Rack Connector Panel IA1O

The second equipment rack contains the RF Patch Equipment Bay (P/N 7052-2010), and includes the RF Patch Panel Assembly (1A1), RF Patch Panel Assembly's (1A1) configuration and size are dependent upon site considerations, and Log Periodic Remote/ Control Indicators (1A2 through 1A4). The quantity of Log Periodic Remote/Control Indicators is dependent upon site configuration.

a. Telephone .Equipment Bay Functional Description. The Telephone Equipment Bay interconnection diagram is shown in figure 6-44. This equipment bay is assigned Unit 1 reference designation in Control Interface Group OK-449(V)/FRC-176(V), and contains the telephone equipment, power supplies, and patch panels necessary to interface Telephone Switch/Dial Panels (CCC1A3 and CCC4A3) with an external 2-wire

or 4-wire PBX. The Telephone Equipment Bay, CIGI, also provides patching capability for receive/transmit audio, tape player audio, TTY interface, and transmitter keylines.

(1) Radio Set AN/URC-103(V)l Interface Functional Description. An interface cable from each Radio Set, quantity is dependent upon site configuration, is connected to its interfacing jack on Rack Connector Panel CIG1A10. Since all Radio Set interfaces are similar the following discussion is for a typical Radio Set interface. Three different types of information is present on each Radio Set interface jack: Transmit (TX) and Receive Audio, Radio Set Interlocks, and Radio Set Keylines. Receive Audio from the Radio Set is applied to Audio Patch Panel CIGlA8, where the first 12 jack sets are dedicated to receive audio from each of 12 Radio Sets. It is possible to patch receive audio from any Radio Set to any of 12 Control Console RCV audio paths. Each jack set contains three jacks. The top row, called A, is receive audio from the Radio Set. The second row, called B, is normalled-thru from row A and looks to the Communication Control Console for that particular receive audio patch. Inserting a patch cord into either row A or row B breaks the normalled-thru connection. If the operator inserts the other end of the patch cord into another jack set, connections are always made from A to B or B to A and never from A to A or B to B; audio from the first jack set's Radio Set is routed through a different Communication Control Console's receive audio path. Inserting a patch cord plug or headset plug into the jack set's MONITOR jack does not break the normalled-thru connection, and can be used for troubleshooting purposes. Transmit Audio operation is similar to Receive Audio operation however, the source is from the Communication Control Console and to the Radio Set. Transmit Audio is also applied to Audio Patch Panel CIG1A8, where the second set of 12 jack sets are dedicated to the transmit audio going to each of the 12 Radio Sets. Transmit Audio patching operation is identical to the Receive Audio patching.

Radio Set Interlocks, one for each Radio Set, are used to inhibit the Radio Set Keylines so that RF cannot be applied to an antenna if someone has pulled a Transmitter-to-Antenna patch on RF Patch Panel CIG2A1 in the RF Patch Equipment Bay. The 12 INTERLOCK signals from RF Patch Panel CIG2A1 are applied through jack J1 on Rack Connector Panel CIG1AlO to pin 24 on each of the Radio Set interface jacks CIG1AlOJ12 J23.

The 12 Radio Set Keyline signals from Audio/Keyline equipment in the Communication Control Console is applied from jack CCC3A7J5 through jack J6 on Rack Connector Panel CIGlA1O to DROP input jack CIG1A8P2, of Audio Patch Panel CIG1A8. The last 12 jack sets of this patch panel are dedicated for the 12 KEYLINE signals, one for each Radio Set. It is possible to patch any KEYLINE signal to any Radio Set from this panel. Each jack set contains three jacks: A, B, and MONITOR. The top row, called A, is the LINE side, toward the Radio Set. The second row, called B, is the DROP side, toward the console. Row A is normalled-thru to row B. Inserting a patch cord into either row A or row B breaks the normalled-thru connection. If an operator inserts the other end of the patch cord, connections are always made from A to B or B to A and never from A to A or B to B; the dedicated KEYLINE signal for one Radio Set is sent to the other Radio Set. KEYLINE signals are used to key the Radio Set during different modes of console operation. Inserting a patch cord into the MONITOR jacks does not break the normalled-thru connection, and can be used for troubleshooting purposes.

The 12 Radio Set KEYLINE signals from the DROP side J2 of the Audio Patch Panel CIG1A8 are routed through a 6 by 26 IDF Block, Terminal Board CIG1TB2; to 12 indi-

vidual Radio Set Interface jacks CIGAlOJ12 - J23. See the Radio Communication Systems Manual TM 11-5895-1137-23 for individual site cabling.

(2) TTY Interface Functional Description. There are four TTY interface circuits provided for each system. Each TTY interface circuit consists of the following signals: TTY AUDIO IN (one pair), TTY AUDIO OUT (one pair), TTY RX (one pair), TTY TX (one pair), and TTY KEY (one wire). Since each TTY interface circuit is identical, only one circuit will be described. TTY AUDIO IN signals from the external Teletypewriter Unit are applied through a jack (J8, J9, J10, or J11) on Rack Connector Panel CIG1A10 to terminal board CIT1TB2, a 12 x 26 IDF Block. The signal is then routed to the LINE side jack J2, on Audio Patch Panel CIG1A8 where it is connected to the TTY AUDIO IN, row A, jack in one of the eight jack sets dedicated to TTY AUDIO. The row A jack is normalled-thru to row B jack which is connected to the DROP side jack P2, of the patch panel. The TTY AUDIO IN signal from any TTY (1-4) can be patched to any of the other TTY AUDIO IN TO CONSOLE jacks on row B using a patch cord. This breaks the normalled-thru connection and establishes a new signal path to the console. The TTY AUDIO IN MONITOR jack can be used without breaking the normalled-thru connection. The patched or not patched TTY AUDIO IN signal is routed to the console through Rack Connector Panel jack CIG lAlOJ6.

The TTY AUDIO OUT signal from the console is also routed through Rack Connector Panel jack CIGlAlOJ6 to the DROP side of Audio Patch Panel CIG1A8 and connected to row B jack dedicated to the TTY AUDIO OUT signal. Again row A is normalled-thru to row B which allows patching of any console TTY AUDIO OUT signal to any TTY Audio Out signal path. Similarly, the use of the MONITOR jack does not break the normalled-thru connection.

There are two pairs of wires for the TTY RX and TX signals which are applied through a jack (J8, J9, J10O, or J11) on Rack Connector Panel CIGlA1O to terminal board CIGlTB2. The TTY RX and TX AUDIO signals are then routed to the LINE side of Dc Patch Panel CIG1A6 and applied to the appropriate jack set in the A row of the panel. The B row and A row are normalled-thru to each other. Patching from any TTY RX line to another TTY RX line can be accomplished by patching from row A to row B. Patching from any TTY TX line to another TTY TX line can be accomplished by patching from row A to row B. Using any of the TTY RX/TX MONITOR jacks does not break the normalled-thru connection. The TTY RX and TX signals on row B of the Dc Patch Panel are connected to DROP side connector CIG1A6J2 which routes the TTY RX and TX signal back through terminal board CIG1TB2 to the appropriate jack (J8, J9, J10, or J11) on Rack Connector Panel CIG1A10. These signal lines are returned to their associated teletypewriter units over site facility furnished cables.

The TTY KEY signal for each individual TTY is generated in the Communication Control Console and applied through jack J6 of Rack Connector Panel CIG1A10 to the DROP side of Audio Patch Panel CIGIA8. Each of these TTY KEY signals is connected to its associated row B jack. Row B jacks are normalled-thru to their associated row A jack. Patching of one TTY KEY signal to another TTY can be accomplished by inserting a patch cord into a TTY KEY jack on row B and connecting the other end of the patch cord to another TTY KEY jack on row A. Using any of the TTY KEY MONITOR jacks does not break the normalled-thru connection. Row A TTY KEY jacks are connected to the LINE side connector of Audio Patch Panel CIG1A8 and routed to terminal board CIG1TB2. The four TTY KEY signals are applied to CIG1TB2 through jacks J8, J9, J1O, and J22 of Rack Connector Panel CIG1A10 to each of the teletypewriter units.

(3) Tape Audio Interface Description. The tape audio interface provides a way for the operator to reroute tape audio from either tape player (or either channel of each tape player) to the audio/keyline. Four paths, each consisting of two wires, are provided for each tape player and are described as follows. There are two paths, one each for the left (L) and right (R) tape channels, from the tape player to the audio/keyline equipment. There are two paths, one for each channel, from the audio/keyline equipment to the tape player. Each of the four paths is routed through jack J7 of Rack Connector Panel CIGlAl0 to the LINE side of Audio Patch Panel CIGIA7. The LINE side is connected to the jacks in row A dedicated to the Tape Player signals. Row A is normalled-thru to row B. Patching of one tape player channel to another channel can be accomplished by inserting a patch cord into the jack on row A and patching it to the selected audio/key switch path on row B. Any of the MONITOR jacks can be used without breaking the normalled-thru connection. The row B jacks are connected to the DROP side connector of Audio Patch Panel CIGIA7 and routed through jack J7 of Rack Connector Panel CIGlA1O to the tape players in the Communication Control Console.

(4) Telephone Interface Functional Description. Service is provided for either the 12 2-wire telephone lines or the 12 4-wire telephone lines from an external Private Branch Exchange (PBX). The 12 telephone lines within the Control Interface Group and the Communication Control Console are configured in the following way. Telephone lines one through six are set up for 2-wire operation, but are convertible to 4-wire operation by means of clip jumpers on terminal board CIGlTB1, a 12 x 26 IDF block; and on terminal board CCC3A5TB1, a 12 x 26 IDF block. A functional description of both 2-wire and 4-wire operation is provided in the following paragraphs.

(a) 2-Wire Telephone Operation Functional Description. Figure 2-20 contains a functional block diagram illustrating the 2-wire telephone operation used in the following description. In this system there are 12 telephone lines brought in from an external Private Branch Exchange (PBX). Within the system, lines one through six are set up for 2-wire operation, but can be converted to 4-wire operation by means of jumpers in the Control Interface Group terminal block CIGlTB1 and in the Communication Control Console terminal block CCC3A5TB1. Both the A and the B console operators have an attendant telephone panel through which either operator may use any of the 12 lines. For this description however, only one operator position is shown in figure 2-20. When an incoming call is placed on one of the six 2-wire telephone lines, it enters the system through the telephone punch block and is routed to a jack panel where any line may be substituted for another line using the patch cords provided with the system. After leaving the telephone patch pan |..-the 2-wire telephone line is fed to two different places in the Communication Control Console.

The 2-wire telephone line is fed through a 410 Transfer Relay to the Key Service Panel. The 410 Transfer Relay is energized by the BR signal from the Communication Control Console when an operator selects that particular telephone line. This will connect the audio through to the Key Service Panel. The Key Service Panel contains an LC400E KTU line circuit card for each telephone line. In the console, this LC400E KTU line circuit card provides for each telephone line lights, audio signaling, and intercom to the Telephone Switch/Dial Panel. An incoming call initiates a flashing light in the associated switch position on the Telephone Switch/ Dial Panel, and activates a buzzer to alert the operator. When the operator depresses the indicated telephone line pushbutton, audio is applied to a dual-tone Multiple-frequency (DTMF) to dual-pulse (DP) converter which converts the 2-wire

telephone to a 4-wire telephone. This way, the operator may answer the call on his DTMF type telephone. When radio patching, the operator selects the TEL/RAD mode on his Audio/Keyline Panel, seizes a TRANSCEIVER, and depresses the RADIO-TELEPHONE LINE pushbutton associated with incoming telephone line. This will energize a relay in the console which will pick up the second 2-wire telephone patch back in the Telephone Equipment Bay and route it to a 443-00 Termination Set in the console. The 443-00 converts the 2-wire telephone line to a 4-wire line which can be used by the radio. The two TX lines carry the caller's audio signals, while the two RX lines carry the received audio from the radio to the caller. Both TX and RX lines are amplified by a 401 Dual Line Amplifier. The RF-901A Phone Patch enables the caller to carry on a two-way conversation over the radio by keying the transmitter whenever the caller speaks. This is called VOX (Voice-operated transmitter Keyer). To use the telephone handset to talk over the radio, press the RADIO pushbutton on the Telephone Switch/Dial Panel and SEIZE a TRANSCEIVER on the Audio/Keyline Panel. Lift the telephone handset and press the Push-To-Talk (PTT) button on the handset. The transmit audio (TX) from the telephone handset is converted from DTMF (4-wire) to DP (2-wire) and routed through the Telephone Switch Dial Panel to a 405 combination Pickup Relay and Station Circuit module. The 405 allows the station line access to one 4-wire circuit. The TX output from the 405 is routed to a 402 4-wire Line Termination module, which interfaces the 4-wire line to a group of up to 20 4wire lines. The TX output of the 402 is amplified by a 401 Dual Line Amplifier and applied to the telephone input port of a 4202-00 4-wire 6-Port Bridge. One output port of the 4203-00 is connected to the Transmitter Audio input. The receive (RX) from the seized TRANSCEIVER is routed through the receive audio port of the 4202-00, amplified by the 401 and applied to the 4-wire Line Termination module. The RX audio is then applied through the pickup relay in the 405 and through the Telephone Switch/Dial Panel back to the telephone handset earpiece.

To use the INTERCOM mode, press the ICOM pushbutton on the Telephone Switch/Dial Panel and dial the single digit number corresponding to the station desired. More than one station may be paged on the intercom circuit forming a conference line.

(b) 4-Wire Telephone Operation with E&M Signaling Functional Description. Figure 2-21 is a functional block diagram of 4-wire telephone operation with E&M signaling, that will be used in the following description. As stated before, there are 12 telephone lines brought into the system from an external PBX. Lines 7 through 9 are strapped for four-wire operation with E&M signaling. Operation of only one 4-wire line will be discussed. All four-wires (2 for TX, and 2 for RX) are connected into the system through the Telephone Punch Block in the Control Interface Group, Telephone Equipment Bay. All four-wires are routed to a normalled thru Audio Patch Panel where any two TX lines can be patched to any other two TX lines, and any two RX lines can be patched to any other two RX lines. The four wires are routed through a 410 Transfer Relay module that is used to control the routing of the telephone line to either the Communication Control Console, Telephone Switch/Dial Panel or to the Radio Set AN/URC-103(V) via the RF-901A Phone Patch Panel. The 410 relay is controlled by relay in the console which is controlled by selecting a telephone line on the operator's Telephone Switch/Dial Panel. For normal telephone operation, the four-wires are applied to a 7441,2-wire to 4-Wire Repeater. -The two-wire output of the 7441 is applied to a 7361Loop to E&M Signaling module. In a 4-wire telephone system, no signaling is carried on the audio lines. Therefore, two lines specifically designated E&M carry the signaling. The 7361 converts the E&M signaling to loop signaling for use within the system, thus eliminating the need for the E&M signaling lines. The output of the 7361 is applied to the Key Service Panel which contains an LC400E KTU Line Circuit Card for each tele-

phone line. The Key Service Panel also contains an Interrupter card to provide flashing lights and ringing voltage to the Telephone Switch/Dial Panel in the console. It also contains the intercom card which provides the intercom lines to the console. An incoming call on a 4-wire line will initiate a flashing light at its corresponding Telephone Switch/Dial Panel pushbutton and ring the panel buzzer. When the operator pushes the button that is lit, the telephone audio is converted from DP to DTMF and applied to the console telephone handset. If the caller requests a radio patch, the operator pushes the corresponding RADIO-TELEPHONE LINE button, selects the TEL/RAD mode on the Audio/Keyline Panel, and seizes a TRANSCEIVER. This energizes a relay in console generating the BR signal which energizes the relay corresponding to the telephone line in the 410 Transfer Relay module in the Telephone Equipment Bay. Energizing the 410 Transfer Relay, applies the 4-wire telephone audio through another set of relay contacts, in the console, to a 401 Dual Line Amplifier. The 401 is used to balance the input/outputs to and from the RF901A Phone Patch. The RF-901A enables the caller and the called station to carry on normal telephone conversation over the selected radio by providing Voice-operated transmitter keyer (VOX) to the Transmitter. The other console telephone functions perform the same as they did in the 2-wire operation.

(c) 4-Wire Telephone Operation with Ringdown Signaling Functional Operation.

Figure 2-22 is a functional block diagram of 4-wire telephone operation with ringdown signaling, that will be used in the following description. Telephone lines 10 through 12 are strapped for ringdown signaling operation. All four wires (two for TX, and two for RX) are connected into the system through the Telephone Punch Block, in the Telephone Equipment Bay of the Control Interface Group. They are routed to a normalled-thru Audio Patch Panel where TX to TX line and RX to RX line patch can be accomplished by the console operator. The four wires are connected from the patch panel to a 410 Transfer Relay which is used to control the routing of the telephone line to either the Telephone Switch/Dial Panel or two a radio patch in the Communication Control Console.

For normal telephone operation, the four wires are applied to a 7441, 2-wire to 4wire Repeater. The 20 Hz ringdown signals SXR and SXT are picked off and applied to a 7392, 20 Hz to signaling converter. The signaling outputs of the 7392 are applied to the 4315-08, Scanner relay, and the 7052-8200, Ringing Timer, to generate the E&M signaling required by the 7361, Loop to E&M card. The TX and RX audio from the 7441 are connected to the 7361 to complete the loop. The four wire line (RX and TX audio plus E&M signaling) is connected to the Key Service Panel in which are located one LC400E KTU Line circuit card for each telephone line, an interrupter card, and an intercom card. The Key Service Panel provides flashing lights and audio signaling, and intercom to the console for each telephone line. An incoming call, from the Key Service Panel to the Telephone Switch/Dial Panel, will initiate a flashing light on its associated OPERATOR-TELEPHONE LINE pushbutton switch, and activate a buzzer to alert the operator. Depressing the pushbutton with the flashing light connects the calling line to the operator's DTMF Telephone Set through a DP to DTMF converter. The operator may now answer the call on his Telephone Set. If the caller requires a TEL/RAD patch, the operator selects the TEL/RAD mode on the Audio/Keyline Switch Panel, depresses the corresponding RADIO-TELEPHONE LINE pushbutton, and seizes an unused TRANSCEIVER. This will energize a relay in the console which connects the BR signal (+V) to the 410 Transfer Relay in the Telephone Equipment Bay of the Control Interface Group (CIG). When the 410 relay energizes, the 4-wire telephone line is rerouted to a 401 Dual Line Amplifier in the console through contacts of the line select relay. The amplified TX and RX audio lines are connected through the contacts of a channel select relay in the console

to the RF-901A Phone Patch Panel. The RF-901A Phone Patch Panel enables the caller and the called to carry on a two-way conversation over the radio by keying the transmitter whenever the caller speaks.

b. RF Patch Equipment Bay Functional Description. The RF Patch Equipment Bay, P/N 7052-2010, is part of Control Interface Group. This equipment bay is Unit 2 of the Control Interface Group and contains the RF Patch Panel Assembly CIG2A1 and the Hy-Gain Log Periodic Antenna Control/Indicators, which are described functionally in the following paragraphs.

(1) RF Patch Panel Assembly Functional Description. There are four different configurations of RF Patch Panel Assemblies used in Radio Communication System. The particular RF Patch Panel Assembly used at a given site is dependent upon the number of Radio Sets, and the number of antennas used at that particular site. Figure 2-23 shows 10 x 15 RF Patch Panel Assembly, which will be used as a typical panel for this description. The other configurations are: a 25 x 35, a 10 x 20, and 1 10 x 25. The first number in the description relates to the number of available TRANSMITTER (i.e., Radio Set AN/URC-103(V)1) jacks on the patch panel. The second number in the description relates to the number of available antenna jacks on the patch panel. Each of the antennas is connected to the rear of an ANTENNA male type jack by a facility supplied coaxial cable. The male type ANTENNA jack can then be plugged into any of the female type TRANSMITTER jacks, which are connected by UG-21B/U coaxial cables, part number 7052-7013, to the Unit 3 plug P3 of each Radio Set AN/URC-103(V)1. Each female type TRANSMITTER jack has an interlock switch attached to it. The interlock switch is wired so that when there is no ANTENNA jack plugged into the TRANSMITTER jack, a ground is applied through the normally-closed (NC) contact of the switch to the Common (C) contact to complete the INTERLOCK signal path and inhibit the transmitter. The 25 x 35 RF Patch Panel has two DUMMY LOAD jacks while all other RF Patch Panels have only one DUMMY LOAD jack. The DUMMY LOAD jack is/are connected to a one Kilowatt (1 KW) dummy load by coaxial cable(s), both of which are facility supplied. The male type DUMMY LOAD jack is normally plugged into one of the DUMMY PLUG female type jacks. For offline testing or alignment the DUMMY LOAD is plugged into the TRANSMITTER jack for the Radio Set to be aligned or tested.

(2) Log-Periodic (LP) Antenna Control/Indicator Functional Description. There are from two to four LP Antenna Control/Indicators used in the RF Patch Equipment Bay at each site. The actual number used is dependent upon the individual site configuration. The LP Antenna Control/Indicator front panel indicators and controls are shown in figure 2-24. For complete information concerning the operation and maintenance of the Hy-Gain LP Antenna Control/Indicator, refer to the Antenna Instruction Manual TM 11-5985-363-14 and Radio Communication System Manual TM 11-5985-1137-23.

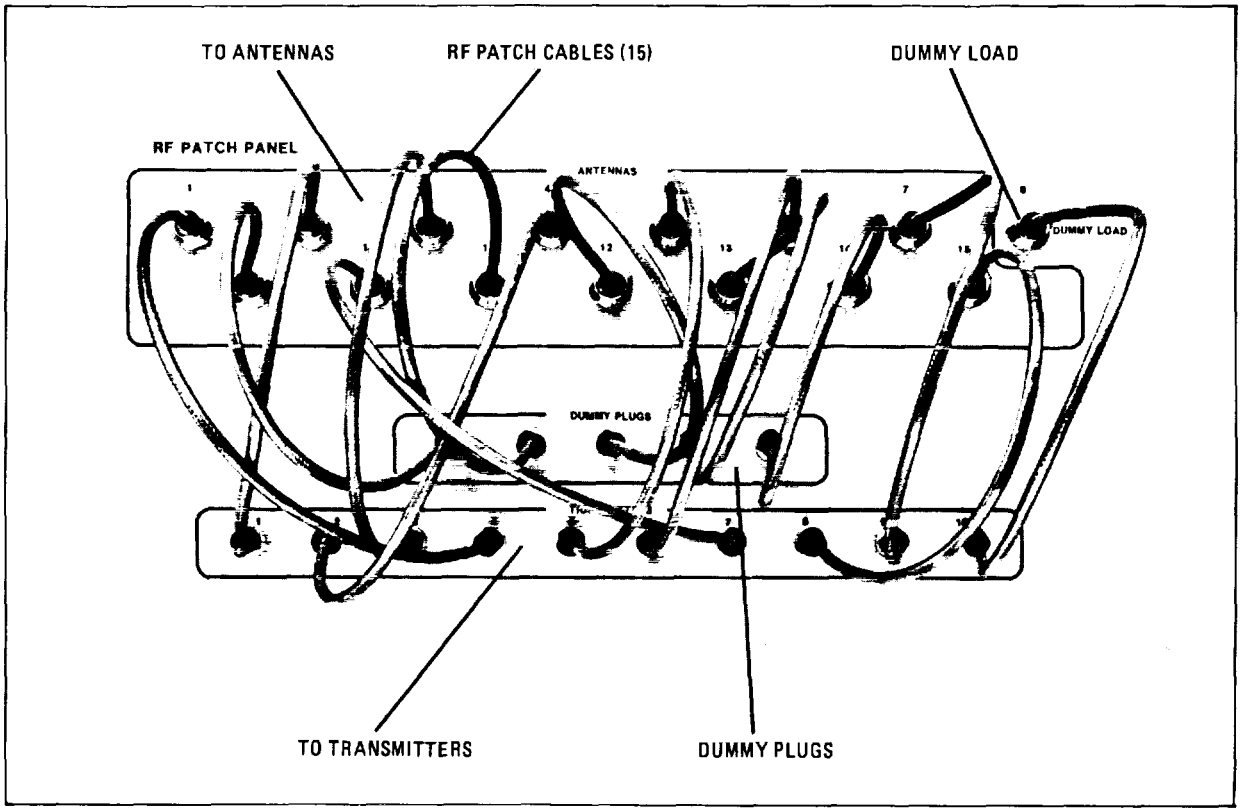


Figure 2-23. Typical RF Patch Panel Assembly

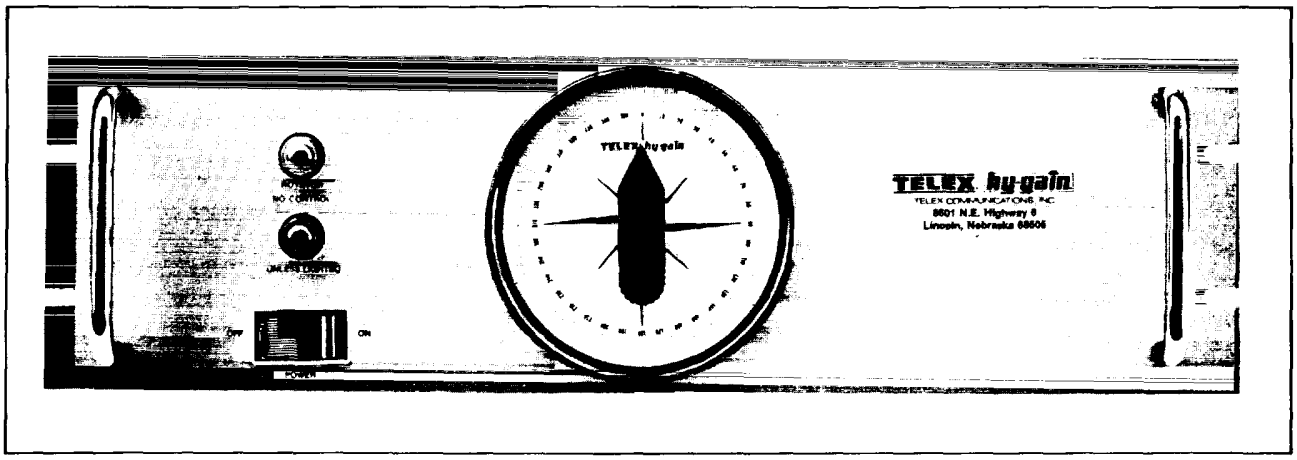


Figure 2-24. Log Periodic (LP) Antenna Control/Indicator Panel

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. SCOPE

This chapter is divided into four main sections: general, preventive maintenance, performance verification, and corrective maintenance. The general section describes: what is contained in the chapter, how it's arranged, and how to use the information. The preventive maintenance section contains cleaning and inspection procedures that are done periodically to prevent equipment degradation. The performance verification section contains tests and checks which are used to verify proper operation of the Communication Control Console and Control Interface Group equipment if it has been powered down for an extended period of time or after extensive maintenance. The performance verification tests and checks which are presented in this section are an abbreviated version of the operational procedures and checks presented in the System Operator's Manual TM 11-5895-1137-10 and in Radio Communications System Maintenance Instruction TM 11-5895-1137-23.

The largest and most complex section in this chapter is the corrective maintenance section which contains fault analysis, instructions, troubleshooting and fault isolation procedures, and alignment and adjustment procedures. Fault analysis instructions show maintenance personnel how to recognize different types of faults which will lead to a specific troubleshooting and fault isolation procedure. Alignments and adjustments restore the equipment to optimum operating conditions after maintenance. Maintenance action includes replacing adjustable subassemblies or restoring alignment to equipment due to component degradation as recognized by performance verification checks.

Section II. PREVENTIVE MAINTENANCE

3-2. PREVENTIVE MAINTENANCE

Preventive maintenance of the Communication Control Console and Control Interface Group consists of cleaning and inspection procedures done periodically. The Maintenance Allocation Chart, in Appendix A of this manual, designates who should perform an assigned maintenance activity.

3-3. CLEANING

Table 3-1 identifies the cleaning procedures required on the console and common equipment bays. The first column in the table identifies the item to be cleaned. The second column identifies the expendable material used (i.e., cleaning solution, cleaning compound, or solvent, as required). The third column identifies the recommended cleaning schedule for the item listed in column one. The fourth column is a procedure describing how to use the material to perform the cleaning task.

3-4. INSPECTION

Table 3-2 identifies the inspection procedures required on the console and common equipment bays. The first column identifies the item number. The second column of the table shows the recommended schedule for inspection. The third column describes the inspection procedure or references a test to be run. Column four describes the desired condition or action that should be taken if any abnormal conditions are found.

Table 3-1. Organizational Level Cleaning and Lubrication

Item	Expendable Material	Periodicity	Procedure
1. Tape Recorder Head	a. Isopropyl Alcohol b. Cotton Swabs	Daily	a. Clean tape recorder heads. b. Allow heads to dry before using.
2. Communication Control Console	a. Mild Detergent b. Lint-Free Cloth	Weekly	a. Wipe down all external surfaces to remove dust and stains, using a damp cloth. b. Dry all surfaces with a dry lint-free cloth.
3. Control Interface Group	a. Mild Detergent b. Lint-Free Cloth	Weekly	a. Wipe down all external surfaces using a damp cloth. b. Dry all surfaces using a dry lint-free cloth.
4. Communication Control Console	a. Dust cloth	Semi-Annually	a. Dust and vacuum inside all equipment bays of the console.
5. Control Interface Group	a. Dust cloth	Semi-Annually	a. Dust and vacuum inside all equipment bays of the cabinet.

NOTE: No Lubrication Required.

Table 3-2. Inspection Procedures

Item	Schedule	Procedure	Instruction/Remarks
1	W	Check Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) cabinets for general appearance.	Units should be clean and free of dust, dirt, and fluids.
2	M	Where possible, check for proper operation of switches switches, knobs, and controls.	Action must be positive with no looseness, binding, or scraping.
3	S	Check all external cables, connectors, and connections	All items should be free of cuts, cracks, and fraying. All connections should be secure.
4	D	Perform Operator Procedures in System Operator's Manual Radio Communications System AN/FRC-176(V) TM 11-5895-1137-10.	Report any abnormal indications to the proper maintenance facility.
5	R	Perform the Performance Verification Test in section III of this manual if the equipment has been in storage or has not been used for a period of time.	Report any abnormal indications to the proper maintenance facility.

D = Daily
W = Weekly
M = Monthly
Q = Quarterly
A = Annually
R - As Required

Section III. PERFORMANCE VERIFICATION

3-5. PERFORMANCE VERIFICATION

The performance verification procedure described in table 3-3 is used to verify proper operation of the equipment if units have been powered down for an extended period of time or after extensive maintenance. Any malfunctions or abnormal indications should be reported to the proper maintenance facility. Steps 1.0 through 1.15 of table 3-3 verifies the operation of the Remote Control-Monitor units CCC3A2 and CCC3A1, and Status Display Monitor units CCC3A1 and CCC3A3. Figure 3-1 is the test setup for step 1-9. Steps 2.0 through 2.10 verify the telephone system operation. Steps 3.0 through 3.30 verify the Audio/Keyline functions.

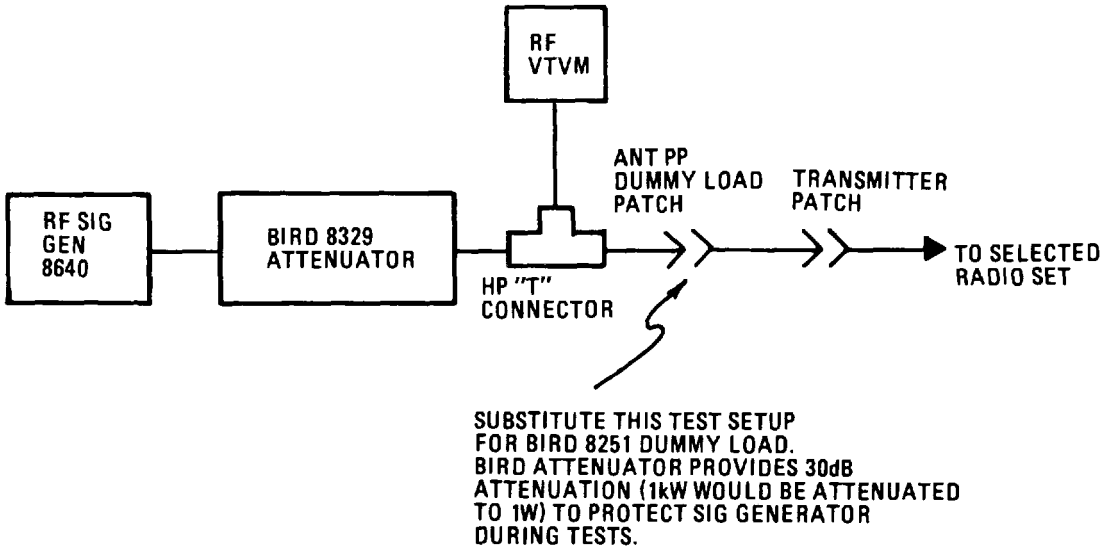


Figure 3-1. Test Setup

Table 3-3. Performance Verification Procedure for Organizational, Direct Support, and General Support Maintenance Levels

Step No	Action	Reaction
1.0	Remote Control-Monitor and Status Display Monitor Check	
1.1	At the RF-7401 Select TRANSCEIVER 01	The RF-7401 TRANSCEIVER indicator displays "01".
1.2	At the RF-7401 Select USB Mode	The Status Monitor USB LED lights.
1.3	At the RF-7401 Select LSB Mode	The Status Monitor LSB LED lights.
1.4	At the RF-7401 Select OPERATE Status	The Status Monitor ON LED lights with application of XCVR power.
1.5	At the RF-7401 Select FAST AGC	The Status Monitor FAST LED lights.
1.6	At the RF-7401 Select SLOW AGC	The Status Monitor SLOW LED lights.
1.7	At the RF-7401 Select a FREQUENCY of 11111.1	The Status Monitor FREQUENCY indicator displays 11111.1.
1.8	At the RF-7401 Select a FREQUENCY of 28888.8	The Status Monitor FREQUENCY indicator displays 28888.8.
1.9	Connect an HP-8640B using the DUMMY LOAD connector at the RF PATCH Panel, CIG2A1, as shown in figure 3-1. Set the signal generator to the last selected frequency plus 1 kHz at an output level between -30 and-50 dBm.	
1.10	At the RF-74O1 Select USB Mode	The Status Monitor USB LED lights, and the UNSQUELCHED LED light.
1.11	At Audio/Keyline Panel SEIZE Transceiver 1	At 1 kHz tone should be noted at the Audio Monitor Panel SEND/ RECEIVE speaker.
1.12a	Rotate the RF-7401 FINE TUNE control to the right (toward HI) and to the left (toward LO).	The monitored tone should decrease and then increase.
1.12b	Disconnect Signal Generator.	
1.13	Key the transmitter using either the Audio/Keyline Panel push-to-talk (PTT) switch or the foot-switch and speak into the boom microphone.	The Status Monitor KEY and RF LED should light.
1.14	Switch the LOCAL-REMOTE switch on the RF-2305 from REMOTE to LOCAL	The RF-7401 and Status Monitor Panel indicators should indicate the RF-2305 front panel setup.

Table 3-3. Performance Verification Procedure for Organizational, Direct Support, and General Support Maintenance Levels (Cont)

Step No	Action	Reaction
1.15	Momentarily block the air intake on the RF-110 1 kW PA with a piece of cardboard	The Status Monitor FAULT LED should light when the transmitter is keyed and an audible alarm should sound.
2.0	Telephone System Check	
2.1	Take the telephone handset OFF HOOK, select line 1 at the Telephone Switch/Dial Panel and dial a pre-arranged test number.	Note if call can be completed.
2.2	Repeat step 2.1 for all accessible lines.	Note if calls can be completed.
2.3	At the Telephone Switch/Dial Panel select ICOM and dial 1 at the keypad	A buzzer should sound at the other operator position.
2.4	Pick up the telephone handset at the other operator position.	Note if two-way talk is possible.
2.5	Dial into the Communication Control Console from an outside telephone	Note if an OPERATOR-TELEPHONE LINE indicator WINKS and the signaling bell sounds at both operator positions.
2.6	Repeat step 2.5 for all connected telephone lines.	
2.7	At the Telephone Switch/Dial Panel select RADIO. Key the telephone handset PTT switch and talk into the handset mouthpiece	The RF-901A Phone Patch TRANSMITTER KEYED LED lights and Telephone Audio Monitor Panel SEND/RECEIVE speaker.
2.8	Release the Telephone Switch/Dial Panel RADIO button.	
2.9	Dial into the console from an outside line. Answer the call at the Telephone Switch/Dial Panel and place the line on HOLD.	
2.10	At the Audio/Keyline Panel select the TEL/RAD mode (6)	Any telephone audio from the outside line should be heard on the Audio/Monitor Panel SEND/RECEIVE speaker and the RF-901A Phone Patch TRANSMITTER KEYED LED should light when triggered by the telephone audio.
3.0	Audio/Keyline Check	
3.1	At the CCC3A5 Rack Connector/Switch Panel set all of the status lamp switches to the A position	All 12 TRANSCEIVER STATUS LED's on the A Audio/Keyline Panel should light.

Table 3-3. Performance Verification Procedure for Organizational, Direct Support, and General Support Maintenance Levels (Cont)

Step No	Action	Reaction
3.2	Set all of the status lamp switches to the B position	All 12 TRANSCEIVER STATUS LED's on the B Audio/Keyline Panel should light.
3.3	Reset the status lamp switches to their proper positions	Observe that the proper TRANSCEIVER STATUS LED's are lit on the A and B Audio/Keyline Panels.
3.4	At the RF-7401 Select TRANSCEIVER 01. Select FREQUENCY 08000.0 Select USB Mode and OPERATE status	At the Status Monitor on the ON USB, SLOW, and REMOTE LED's should be lit. The FREQUENCY indicators should show 08000.0.
3.5	Set the HP-8640B Signal Generator to 8.001 MHz at an output level of approximately -40 dBm.	
3.6	At the Audio/Keyline Panel select the MIKE Mode (2). Seized Transmitter 1, set the tape recorder Rt.CH switch to the SND/RCV position. Set the mike select switch to the BOOM position.	
3.7	Check to see if all three manual key switches (PTT button, footswitch, and headset switch) will key Transmitter 1.	Status Monitor for XCVR 1 KEY LED's should light when keyed by any of the three switches.
3.8	Key Transmitter 1 and speak into the boom mike	Audio Monitor Panel SND/RCV Speaker indicates audio and Status Monitor for XCVR 1 RF LED lights.
3.9	Set the Audio/Keyline mike select switch to the HDST position. Key the headset mike switch and talk into the headset mike.	Audio Monitor Panel SND/RCV speaker indicates audio and Status Monitor for XCVR 1 RF LED lights.
3.10	Rewind the tape for the footage used on the right channel. Set the tape playback switch to the RIGHT CH. position and the A MONITOR position. Set the tape recorder to PLAY.	Note tape audio on the Monitor A speaker.
3,11	Set the tape playback switch to the B MONITOR positions	Note tape audio on the Monitor B speaker.
3.12	At the other Audio/Keyline Panel Select the REMOTE Mode (4) on the voice control switch. At the first Audio/Keyline Panel, set the tape playback switch to REMOTE position.	Note the A side tape playback audio on the B side SND/RCV Monitor speaker.

Table 3-3. Performance Verification Procedure for Organizational, Direct Support, and General Support Maintenance Levels (Cont)

Step No	Action	Reaction
3.13	Set both the A side and the B side voice control switches to zero (0).	
3.14	Set the A side voice control switch to the BROADCAST position (1). Set the TRANSCEIVER SELECT switch to 02 and SEIZE transmitter 1.	
3.15	At Audio Patch Panel CIG1A8, inject a 1 kHz tone at a -10 dBm level into the RCV to control console jack 2B.	Note 1 kHz tone on SND/RCV monitor speaker.
3.16	Alternately SEIZE the other TRANSMITTERS	Using dB meter, note that RCV AUDIO from unit 2 is fed through to corresponding XMIT AUDIO jack on Patch Panel CIG1A8.
3.17	Set the voice control switch to the TAPE position (2) with a transceiver SEIZED. The prerecorded right ch. is played back into the Audio/Keyline System.	Note the right channel tape audio on the A side SND/RCV monitor speaker.
3.18	Set the voice control switch to RAD/RAD position (5). Set the TRANSCEIVER SELECT switch to 02 and SEIZE Transceiver 1. The dummy load should be connected to Transceiver 1.	
3.19a	Tune XCVR 2 to a station broadcasting VOICE or MUSIC. The dual VOX will not trigger on a pure tone or white noise	Note the audio on A side SND/RCV monitor speaker. Status Monitor for XCVR 1 RF LED should light and the KEY LED should light.
3.19b	Switch the DUMMY LOAD to XCVR 2 and tune SCVR I for voice or music	Note the audio on the A side SND/RCV monitor speaker. Status Monitor for SCVR 2 RF LED should light and KEY LED should light.
3.20	Repeat steps 3.18 and 3.19 for the other transceivers. Be sure to move the dummy load each time.	Note same indication as 3.19a and 3.19b.
3.21	With the voice control switch in the RAD/RAD position (5). Set transceiver select switch to 01 and SEIZE XCVR 2. Use the RF-7401 to select two different frequencies for XCVR 1 and XCVR 2, where audio is present. (preferably music).	

Table 3-3. Performance Verification Procedure for Organizational, Direct Support, and General Support Maintenance Levels (Cont)

Step No	Action	Reaction
3.22	Set the radio relay key switch to the ENABLE position	The VOX A and VOX B LED's should light as the audio varies for both XCVR'sNote audio for both XCVR's on the A side SND/RCV monitor speaker.
3.23	Hold the radio relay key MNL A/ AUTO/MNL B switch to the MNL A position	VOX A LED should light and XCVR 2 status monitor KEY and RF LED's should light.
3.24	Hold the radio relay key MNL A/AUTO/ MNL B switch to the MNL B position	VOX B LED should light and XCVR 1 Status Monitor KEY and RF LED's should light.
3.25	Set the voice control switch to TEL/RAD position (6). SEIZE XCVR 1 with dummy load on XCVR 1.	
3.26	Place a call into the console from an outside line. Answer the call and place the line on HOLD. Select the corresponding RADIO PATCH switch Talk into the outside telephone	The RF-901A TRANSMITTER KEYED LED should light. The XCVR 1 Status Monitor KEY and RF LED's should light. Note audio on A side SND/ RCV monitor speaker.
3.27	Inject a simulated receive signal 1 kHz higher than the XCVR 1 frequency at a -40 dBm level at the dummy load using the HP 8640B signal generator.	Note a 1 kHz tone on the A side SND/ RCV monitor speaker and in the earpiece of the remote telephone.
3.28	At the Audio/Keyline Panel set the XCVR switch to the A MONITOR position.	Note a 1 kHz tone on the A side monitor speaker.
3.29	Set the XCVR switch to the B Monitor position	Note a 1 kHz tone on the A side B monitor speaker.
3.30	Repeat steps 3.27 thru 3.29 for all XCVR's.	

Section IV. CORRECTIVE MAINTENANCE

3-6. CORRECTIVE MAINTENANCE

Corrective maintenance for Communication Control Console and Control Interface Group consists of fault analysis, troubleshooting and fault isolation, and alignments and adjustments. The fault analysis paragraph identifies the fault areas and can be accessed by the operator running the system or from malfunctions or abnormal indications during a cleaning or inspection procedure. The fault analysis paragraph may also be accessed from the performance verification test. Once the type of fault is identified, a table will lead the maintenance personnel to troubleshooting and fault isolation charts which described how to find and fix the malfunction or identify operator errors. When an assembly is replaced that has an adjust on it, the fault and isolation charts will reference proper alignment or adjustment procedure.

3-7. FAULT ANALYSIS

Fault analysis and fault recognition in the console and common equipment bays requires a basic working knowledge of the whole Radio Communication System AN/FRC-176 (V). This knowledge is gained by becoming familiar with the information described in the System Operator's Manual TM 11-5895-1137-10, the system Maintenance Instructions TM 11-5895-1137-23, the Maintenance Instruction TM 11-5820-893-14, and chapter 2, Theory of Operation in this manual. Once the fault area is identified through system knowledge and indicators on the equipment, figure 3-2 is used to instruct the operator or maintenance personnel to a troubleshooting and fault isolation chart.

3-8. TROUBLESHOOTING AND FAULT ISOLATION

The troubleshooting and fault isolation procedures, used to analyze and isolate problems in the Communication Control Console and the Control Interface Group, are step-by-step flow diagrams which lead maintenance personnel to the proper corrective action. If an alignment or adjustment is required after replacement of a fault unit, the proper procedure will be referenced by the troubleshooting and fault isolation diagram. Figures 3-3 through 3-22 are troubleshooting and fault isolation diagrams for CCC and CIG which are referenced from fault analysis diagram figure 3-2.

3-9. ALIGNMENTS AND ADJUSTMENTS

Alignments and adjustments in the following paragraphs allow maintenance personnel to upgrade equipment performance to an optimum level in the event of degradation due to component value change or upon replacement of modules in the corrective maintenance process. When a PWB that contains an adjustable component is replaced, realignment of that PWB or its functional channel must be performed. Table 3-4 shows the relationship of modules and PWBs to the alignment procedures. There are six major alignment and adjustment procedures for the Communication Control Console and Control Interface Group: Audio/Keyline Signal Level Adjustments, paragraph 3-11; Tape Recorder Input/Output Level Adjustments, paragraph 3-12; Audio Monitor Signal Level Adjustments, paragraph 3-13; Telephone Signal Level Adjustments, paragraph 3-13; Telephone Signal Level Adjustments, paragraph 3-14; +12 Vdc Power Supply Adjustment, paragraph 3-15; and -12 Vdc Power Supply Adjustment paragraph 3-16.

3-10. AUDIO/KEYLINE SIGNAL LEVEL ADJUSTMENTS

Tables 3-5 through 3-18 are the Audio/Keyline Signal Level Adjustment Procedures for both the A side and the B side of the Communication Control Console. Figure 3-23 shows both the CCC2A3A1 and the CCC5A3A1 Audio/Keyline Wescom shelves, used in the Communication Control Console; and the CIG1A7 and CIG1A8 Audio Patch Panels, in the telephone equipment bay of the Control Interface Group. Figures 3-24 through 3-31 contain like information applicable to the Bann Site only. Figure 3-32 shows the Wescom 415 Test Extender Board used in alignment procedures for all sites except the Bann Site.

a. Test Equipment Required. The following test equipment is used in the Audio/Keyline Signal Level Adjustments:

* Audio Oscillator, AN/URM-127
* VTVM, ME-303A/U (Note 1)
* Wescom 415 Test Extender
* Transmission Test Set, HP 3551A

NOTE

Make terminated measurements with the VTVM unless otherwise instructed.

Table 3-4. Module or PWB Location to Alignment or Adjustment Procedure

Module or PWB Location	Alignment Procedure Reference
CCC1A2A2	Paragraph 3-12a.
CCC1A2A3	Paragraph 3-12b.
CCC 1A2A6	Paragraph 3-12c.
CCCIPS1	Paragraph 3-16
CCC1PS2	Paragraph 3-15
CCC2A3AlAl	Paragraph 3-13, Table 3-9, 3-10
CCC2A3A2A2	Paragraph 3-13, Table 3-5, 3-6, 3-11
CCC2A3A1A3	Paragraph 3-13, Table 3-5, 3-6
CCC2A3AIA4	Paragraph 3-13, Table 3-5, 3-6
CCC2A3A1A5	Paragraph 3-13, Table 3-6, 3-7
CCC2A3A1A6	Paragraph 3-13, Table 3-6, 3-11
CCC2A3A1A7	Paragraph 3-13, Table 3-6
CCC2A3A1A8	Paragraph 3-13, Table 3-6, 3-8
CCC2A3A1A9	Paragraph 3-13, Table 3-6, 3-11
CCC2A3AIA10	Paragraph 3-13, Table 3-6
CCC2A3A2A9	Paragraph 3-13,
CCC3A5AlA6	Paragraph 3-14,
CCC3A5A1A7	Paragraph 3-14,
CCC3A5A1A9	Paragraph 3-14,
CCC3A5A2A6	Paragraph 3-14
CCC3A5A2A7	Paragraph 3-14
CCC3A5A2A9	Paragraph 3-14
CCC4A2A2A2	Paragraph 3-12a.

Table 3-4. Module or PWB Location to Alignment or Adjustment Procedure (Cont)

Module or PWB Location	Alignment Procedure Reference
CCC4A2A2A3	Paragraph 3-12b.
CCC4A2A2A6	Paragraph 3-12c.
CCC4PS1	Paragraph 3-16
CCC4PS2	Paragraph 3-15
CCC5A3AlAl	Paragraph 3-13, Table 3-16, 3-17, 3-18
CCC5A3A1A2	Paragraph 3-13, Table 3-12, 3-13
CCC5A3AlA3	Paragraph 3-13, Table 3-12, 3-13
CCC5A3A1A4	Paragraph 3-13, Table 3-12, 3-13
CCC5A3A1A5	Paragraph 3-13, Table 3-13, 3-14
CCC5A3AlA6	Paragraph 3-13, Table 3-13, 3-18
CCC5A3A1A7	Paragraph 3-13, Table 3-13
CCC5A3A1A8	Paragraph 3-13, Table 3-13, 3-15
CCC5A3AlA9	Paragraph 3-13, Table 3-13, 3-18
CCC5A3AlA10	Paragraph 3-13, Table 3-13.

CCC = Communication Control Console OJ-512/FRC-176(V)
CIG = Control Interface Group OK-449(V)/FRC-176(V)

Table 3-5. Transmit Gain Setup Adjustment (Operator A) for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
1	1	SEIZED	2A3A2A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B1	RCV Gain 1 2A3A1A2	Zero +1 dB
2	2	SEIZED	2A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B2	RCV Gain 2 2A3A1A2	Zero +1 dB
3	3	SEIZED	2A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B3	RCV Gain 3 2A3A1A2	Zero +1 dB
4	4	SEIZED	2A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B4	RCV Gain 2A3A1A2	Zero +1 dB
5			2A3A1A3 (4204-10)			RCV Gain 1 2A3A1A3 RCV Gain 1 (Maximum ccw)	
6	5	SEIZED	2A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B5	RCV Gain 2 2A3A1A3	Zero +1 dB
7	6	SEIZED	2A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B6	RCV Gain 3 2A3A1A3	Zero +1 dB
8	7	SEIZED	2A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B7	RCV Gain 4 2A3A1A3	Zero +1 dB
9	8	SEIZED	2A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL	RCV Gain 5 2A3A1A3	Zero +1 dB

Table 3-5. Transmit Gain Setup Adjustment (Operator A) for Audio/Keyline Card Cage, P/N 7052-1610,2A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
10	9	SEIZED	2A3AlA4 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B9	RCV Gain 2 2A3A1A4	Zero +1 dB
11	10	SEIZED	2A3AlA4 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B1O	RCV Gain 3 2A3A1A4	Zero +1 dB
12	11	SEIZED	2A3A1A4 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B11	RCV Gain 4 2A3A1A4	Zero +1 dB
13	12	SEIZED	2A3A1A4 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL CONSOLE B12	RCV Gain 5 2A3A1A4	Zero +1 dB

Table 3-6. Receive Gain Adjustment (Operator A) for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
1	1	SEIZED	2A3A1A2	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B1	2A3A1A2 XMT M Jack	XMT Gain 1 2A3A1A2	Zero +1 dB
2	2	SEIZED	2A3A1A2	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B8	2A3A1A2 XMT M Jack	XMT Gain 2 A3AlA2	Zero +1 dB
3	3	SEIZED	2A3A1A2	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B3	2A3A1A2 XMT M Jack	XMT Gain 3 2A3A1A2	Zero +1 dB
4			2A3A1A3			2A3A1A3 XMT Gain 1 (Maximum ccw)	
5	4	SEIZED	2A3A1A2	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B4	2A3A1A2 XMT M Jack	XMT Gain 4 2A3A1A2	zero ± dB
6	5	SEIZED	2A3A1A3	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B5	2A3A1A3 XMT M Jack	XMT Gain 2 2A3A1A3	Zero +1 dB
7	6	SEIZED	2A3A1A3	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B6	2A3A1A3 XMT M Jack	XMT Gain 3 2A3A1A3	Zero +1 dB
8	7	SEIZED	2A3A1A3	Audio Patch Panel 1A8, RCV TO CON-	2A3A1A3 XMT M Jack	XMT Gain 4 2A3A1A3	Zero +1 dB
9	8	SEIZED	2A3A1A3	Audio Patch Panel 1A8, RCV TO CON TROL CONSOLE B8	2A3A1A3 XMT M Jack	XMT Gain 5 2A3A1A3	Zero +1 dB

Table 3-6. Receive Gain Adjustment (Operator A) for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
10	--	----	2A3A1A4	------	------	2A3A1A4 XMT GAIN 1 (Maximum ccw)	-----
11	10	SEIZED	2A3A1A4	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B9	2A3A1A4 XMT M Jack	XMT Gain 2 2A3AhA4	Zero +1 dB
12	10	SEIZED	2A3A1A4	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B10	2A3A1A4 XMT M Jack	XMT Gain 3 2A3A1A4	Zero +1 dB
13	13	SEIZED	2A3A1A4	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B11	2A3A1A4 XMT M Jack	XMT Gain 4 2A3A1A4	Zero +1 dB
14	12	SEIZED	2A3A1A4	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B12	2A3A1A4 XMT M Jack	XMT Gain 5 2A3A1A4	Zero +1 dB
15	1	A MONITOR	2A3A1A5	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE BI1	2A3A1A5 XMT M Jack	XMT Gain 1 2A3A1A5	-10 +1 dB
16	2	A MONITOR	2A3A1A5	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B2	2A3A1A5 XMT M Jack	XMT Gain 2 2A3A1A5	-10 +1 dB
17	3	A MONITOR	2A3A1A5	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B3	2A3A1A5 XMT M Jack	XMT Gain 3 2A3AIA5	-10 +1 dB
18	4	A MONITOR	2A3A1A5	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B4	2A3A1A5 XMT M Jack	XMT Gain 4 2A3A1A5	-10 +1 dB

Table 3-6. Receive Gain Adjustment (Operator A) for Audio/Keyline Card Cage. P/N 7052-1610, 2A3 In communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
19	--	----	2A3A1A6	------	------	2A3A1A6 XMT Gain 1 (Maximum ccw)	
20	5	A MONITOR	2A3A1A6	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B5	2A3A1A6 XMT M Jack	XMT Gain 2 2A3A1A6	-10 +1 dB
21	6	A MONITOR	2A3A1A6	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B6	2A3A1A6 XMT M Jack	XMT Gain 3 2A3A1A6	-10 +1 dB
22	7	A MONITOR	2A3A1A6	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B7	2A3A1A6 XMT M Jack	XMT Gain 4 2A3A1A6	-10 +1 dB
23	8	A MONITOR	2A3A1A6	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B8	2A3A1A6 XMT M Jack	XMT Gain 5 2A3A1A6	-10 +1 dB
24	--	------	2A3A1A7	-------	------	XMT Gain 1 2A3A1A7 XMT Gain 1 (Maximum ccw)	-----
25	9	A MONITOR	2A3A1A7	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B9	2A3A1A7 XMT M Jack	XMT Gain 2 2A3A1A7	-10 +1 dB
26	10	A MONITOR	2A3A1A7	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE BO10	2A3A1A7 XMT M Jack	XMT Gain 3 2A3A1A7	-10 +1 dB

Table 3-6. Receive Gain Adjustment (Operator A) for Audio/Keyline Card Cage. P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
27	11	A MONITOR	2A3A1A7	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B11	2A3A1A7 XMT M Jack	XMT Gain 4 2A3A1A7	-10 +1 dB
28	12	A MONITOR	2A3A1A7	Audio Patch Panel 1A8X RCV TO CON-TROL CONSOLE B12	2A3A1A7 XMT M Jack	XMT Gain 5 2A3A1A7	-10 +1 dB
29	1	B MONITOR	2A3A1A8	Audio Patch Panel lA8, RCV TO CON-TROL CONSOLE B1	2A3A1A8 XMT M Jack	XMT Gain 1 2A3A1A8	-10 +1 dB
30	2	B MONITOR	2A3A1A8	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B2	2A3A1A8 XMT M Jack	XMT Gain 2 2A3A1A8	-10 +1 dB
31	3	B MONITOR	2A3A1A8	Audio Patch Panel lA8, RCV TO CON-TROL CONSOLE B3	2A3A1A8 XMT M Jack	XMT Gain 3 2A3A1A8	-10 +1 dB
32	4	B MONITOR	2A3A1A8	Audio Patch Panel lA8, RCV TO CON-TROL CONSOLE B4	2A3A1A8 XMT M Jack	XMT Gain 4 2A3A1A8	-10 +1 dB
33	--	------	2A3A1A9	------	------	2A3A1A9 XMT Gain (Maximum ccw)	
34	5	B MONITOR	2A3A1A9	Audio Patch Panel lA8, RCV TO CON-TROL CONSOLE B5	2A3A1A9 XMT M Jack	XMT Gain 2 2A3A1A9	-10 +1 dB
35	6	B MONITOR	2A3A1A9	Audio Patch Panel lA8, RCV TO CON-TROL CONSOLE B6	2A3A1A9 XMT M Jack	XMT Gain 3 2A3A1A9	-10 +1 dB

Table 3-6. Receive Gain Adjustment (Operator A) for Audio/Keyline Card Cage, P/N 7052-1610, 2A3
In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
36	7	B MONITOR	2A3A1A9	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE 87	2A3A1A9 XMT M Jack	XMT Gain 4 2A3A1A9	-10 +1 dB
37	8	B MONITOR	2A3A1A9	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B8	2A3A1A9 XMT M Jack	XMT Gain 5 2A3A1A9	-10 +1 dB
38	--	------	2A3A1A10O	------	------	2A3AlAlO ------ XMT Gain 1 (Maximum ccw)	
39	9	B MONITOR	2A3A1A10O	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B9	2A3A1AlO XMT M Jack	XMT Gain 2 2A3A1A1O	-10 +1 dB
40	10	B MONITOR	2A3A1A10	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B10	2A3A1A10 XMT M Jack	XMT Gain 3 2A3AIA1O	-10 +1 dB
41	11	B MONITOR	2A3A1A10	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE B11	2A3AlA10 XMT M Jack	XMT Gain 4 -10 +1 dB 2A3A1A1O	
42	12	B MONITOR	2A1A1AlO	Audio Patch Panel 1A8, RCV TO CON-TROL CONSOLE 812	2A3A1A1OXMT M Jack	XMT Gain 5 2A3AIA10	-10 +1 dB

Table 3-7. Transmit Gain Adjustments 2A3A1A5, for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
1---	------	2A3AA5				2 1A3AA5 --- RCV Gain 1 (Maximum ccw)	
2	------_	2A3A1A5	------	------		2A3A1A5 RCV Gain 3 (Maximum ccw)	---
3	---	------	2A3A1A5	2A3A1A5 RCV M Jack	2A3A1A5 RCF Jack	2A3A1A5 RCV Gain 2	-4 (+1)
4	---	------	2A3A1A5	2A3A1A5 RCV M Jack	2A3A1A5 RCV 4 Jack	2A3A1A5 RCV Gain 4	-4 (+1)

Table 3-8. Transmit Gain Adjustments 2A3A1A8, for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 2A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 2A3A1A2, Using HP3551A Test Set +6dBm 1 kHz Signal Applied To	RCV Term HP 3551A Connect At	Make adjustment At	Normal Indicator (dBm)
1	1	SEIZED	2A3A1A8	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B1	2A3A1A8 RCV 2 Jack	2A3A1A8 RCV Gain 2	-4 (+1)
2	1	SEIZED	2A3A1A8	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B1	2A3A1A8 RCV 4 Jack	2A3A1A8 RCV Gain 4	-4 (+1)
3	--	---	2A3A1A8	------	------	2A3A1A8 RCV Gain 1 (Maximum ccw)	---
4	--	---	2A3A1A8	------	------	2A3A1A8 RCV Gain 3 (Maximum ccw)	

Table 3-9. Transmit Gain Adjustments 2A3A1A1, for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel Select Switch	At 2A2 Panel Set Voice Control Trans Set Switch To	At 2A2 Panel Mode Select To	Signal Subassembly	Using HP 3551A zero dBm, 1 kHz RCV Term Applied To	Connect HP 3551A Adjustment At (Note 1)	Make (dBm) At	Normal Indicator
1	---	---		2A3AlA1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 1 and 2	2A3A1A1 RCV CAL (Note 3)	2A3AlAl RCV 1	Zero
2	-	--01	5(RAD/RAD MODE)	2A3A1A1 (Inserted into Wescom 415 Test Extender)	Audio Patch 2A3AlA1 Panel 1A8, RCV TO CON-TROL CON-SOLE B1	2A3AlA1 RCV CAL (Note 3)	Zero RCV 2	
3	---			2A3A1A1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 22 and 24 (Note 2) & 3)	2A3Al1A1 RCV CAL (Notes 2	2A3Al1A1 RCV 3	Zero
4	---	---	---	2A3AlAl (Inserted into Wescom 415 Test Extender)	---		2A3A1A1 RCV 4 Maximum ccw	
5	---			2A3AlA1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 46 and 48 (Note 2)	2A3A1A1 RCV Cal (Notes 2 & 3)	2A3A1A1 RCV 6	Zero
6	---			2A3A1A1 (Inserted into Wescom Test Extender)	Test Extender pins 55 and 56 (Note 2)	2A3A1A1 RCV Cal (Notes 2 & 3)	2A3A1A1 RCV 6	Zero

NOTES:
1. MAKE TERMINATED MEASUREMENTS WITH HP 3551A UNLESS OTHERWISE INSTRUCTED.
2. APPLY -10 dBm, 1 kHz SIGNAL FOR STEPS (3), (5), and (6).
3. TEST CABLE PAMONA P/N 2977-3-30.

Table 3-10. Receive Gain Adjustments 2A3AlA1, for Audio/Keyline Card Cage, P/N 7052-1610, 2A3 in Communication Control Console OJ-512/FRC-176(V)

Step	At 2A2 Panel Transceiver Seize Switch Set To	At 2At Panel Mode Select Switch Set To	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal Applied To	Connect HP 3551A At	Make adjustment At	Normal Indicator (dBm)
1	---	- -	2A3A1Al (Inserted into Wescom 415 Test Extender)	2A3A1A1 XMT CAL pins 5 & 3	Test Extender	XMT 1	+6 +1 dB
2	ALL OFF (Up position)	0	2A3AlAl (Inserted into Wescom 415 Test Extender)	2A3A1Al XMT CAL	Test Extender pins 4 & 7 (Note 1	XMT 2	+6 +1 dB
3	ALL OFF (Up position) (Note 3)	0	2A3A1A1 (Inserted into Wescom 415 Test Extender)	2A3A1Al XMT CAL	Test Extender pins 8 & 6	XMT 3	-10 +1 dB
4	ALL OFF (Up position)	0	2A3A1A1 (Inserted into Wescom 415 Test Extender)	2A3AlAl XMT CAL	Test Extender pins 51&53 (Note 1)	XMT 4	-10 +1 dB
5						XMT 5 (Maximum ccw)	
6	---	---	2A3A1Al (Inserted into Wescom 415 Test Extender)	2A3A1A1 XMT CAL	Test Extender pins 13&11 (Note 1)	XMT 6	-10 +1 dB

NOTES: 1. MAKE TERMINATED MEASUREMENTS WITH HP 3551A UNLESS OTHERWISE INSTRUCTED.
2. MAKE UNTERMINATED (RCV BRIDGE) MEASUREMENT WITH HP 3551A.
3. TURN RF-901A PHONE PATCH OFF.

Table 3-11. Transmit Gain Setup Adjustments (Operator A) for Audio/Keyline Card Cage 2A3 In Communication Control Console OJ-512/FRC-176(V)

Step	At 2A2 Panel Transceiver Seize Switch Set To	At 2At Panel Mode Select Switch Set To	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal Applied To	Connect HP 3551A At	Make adjustment At	Normal Indicator (dBm)
1	ALL OFF (Up position)	0	2A3A1A2 Jack +6 dBm +1 dB, 1 kHz	2A3A1A2 RCV M RCV 1 Jack	2A3A1A4 RCV 1 Gain RCV 1 Gain	2A3A1A4	Zero +dB
2	---	--- 2A3A1A6	---	---	2A3A1A6	---	
3	XCVR 1 to MON A	0	2A3A1A6	Audio Patch Panel CIG1A8 RCV TO CONTROL CONSOLE Jack B1	2A3A1A6 RCV 2 Jack	2A3A1A6 RCV 2 Gain	-10 +ldB
4	XCVR 1 to MON A	0	2A3A1A6	Audio Patch Panel CIG1A8 RCV TO CONTROL CONSOLE Jack B1	2A3A1A6 RCV 3 Jack	2A3A1A6 RCV 3 Gain	-10 +ldB
5	---	--- 2A3A1A6	---	---	2A3A1A6 RCV 4 Gain Max i mum ccw	---	
6	---	--- 2A3A1A6	---	---	2A3A1A6 RCV 5 Gain Max i mum ccw		
7	---	--- 2A3A1A9	---	---	2A3A1A9 RCV 1 Gain Max i mum ccw		
8	SCVR 1 to MON A	0	2A3AlA9 CIG1A8 RCV TO CONTROL CONSOLE Jack Bl1	Audio Patch Panel RCV 2 Jack	2A3A1A9 RCV 2 Gain	2A3A1A9	-10 +ldB

Table 3-11. Transmit Gain Setup Adjustments (Operator A) For Audio/Keyline Card Cage 2A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	At 2A3 Panel Transceiver Seize Switch Set To	At 2A2 Panel Mode Select Switch Set To	Subassembly	Using HP 3551A Apply Signal To	Connect HP 3551A RCV Term Input At	Make Adjustment At	Normal Indicator (dBm)
9	XCVR 1 to MON A	0	2A3A1A9	Audio Patch Panel CIG1A8 RCV TO CONTROL CONSOLE Jack B1	2A3A1A9 RCV 3 Jack	2A3A1A9 RCV 3 Gain	-10 +1dB
10			2A3A1A9			2A3A1A9 RCV 4 Gain Maximum ccw	
11			2A3A1A9			2A3A1A9 RCV 5 Gain	

Table 3-12. Transmit Gain Setup Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj PWB Location Subassembly	At 5A3A1A2 Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
1	1	SEIZED	5A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL Jack B1	5A3A1A2 RCV Gain 1	Zero +1 dB
2	2	SEIZED	5A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL Jack B2	5A3A1A2 RCV Gain 2	Zero +1 dB
3	3	SEIZED	5A3A1A2 (4204-00)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL Jack B3	5A3A1A2 RCV Gain 3	Zero +1 dB
4	4	SEIZED	5A3A1A2	RCV M Jack	Audio Patch Panel 1A8 XMT OUT FROM CONTROL Jack B4	5A3A1A2 RCV Gain 4	Zero +1 dB
5	--	---	5A3A1A3	---	----	5A3A1A3 RCV (Maximum Gain 1 ccw)	---
6	5	SEIZED	5A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8 XMT OUT FROM CONTROL Jack B5	5A3A1A3 RCV Gain 2	Zero +1 dB
7	6	SEIZED	5A3A1A3(4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL Jack B6)	5A3A1A3 RCV Gain 3	Zero +1 dB
8	7	SEIZED	5A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel 1A8, XMT OUT FROM CONTROL Jack B7)	5A3AlA3 RCV Gain 4	Zero +1 dB

Table 3-12. Transmit Gain Setup Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 in Communication Control Console OJ-512/FRC-176 (V) (Cont)

Indicator Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz To	Signal Applied HP 3551A At	Make RCV Term Connect At	Normal Adjustment (dBm)
9	8	SEIZED	5A3A1A3 (4204-10)	RCV M Jack	Audio Patch Panel XMT OUT FROM CONTROL Jack B8	1A8,5A3A1A3 RCV Gain 5	Zero +1 dB
109	SEIZED	5A3A1A4	RCV M Jack (4204-10)	Audio Patch Panel IA8,	XMT OUT FROM CONTROL Jack B9	5A3A1A4 RCV Gain 2	Zero +1 dB
1110	SEIZED	5A3A1A4	RCV M Jack (4204-10)	Audio Patch Panel 1A8,	XMT OUT FROM CONTROL Jack B1O	5A3A1A4 RCV Gain 3	Zero +1 dB
1211	SEIZED	5A3A1A4	RCV M Jack (4204-10)	Audio Patch Panel 1A8,	XMT OUT FROM CONTROL Jack B11	5A3A1A4 RCV Gain 4	Zero +1 dB
1312	SEIZED	5A3A1A4	RCV M Jack (4204-10)	Audio Patch Panel 1A8,	XMT OUT FROM CONTROL Jack B12	SA3A1A4 RCV Gain 5	Zero +1 dB

Table 3-13. Receive Gain Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
		SEIZED	5A3A1A2	Audio Patch Panel IA8,RCV TO CONTROL CONSOLE B1	5A3A1A2 XMT M Jack 5A3A1A2	XMT Gain 1	Zero +1 dB
		SEIZED	5A3A1A2	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B2	5A3A1A2 XMT M Jack 5A3A1A2	XMT Gain 2	Zero +1 dB
		SEIZED	5A3A1A2	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B3	5A3A1A2 XMT M Jack 5A3A1A2	XMT Gain 3	Zero +1 dB
4	--	---	5A3A1A3	------	------	XMT Gain1 (Maximum ccw)	---
5	4	SEIZED	5A3A1A2	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B4	5A3A1A2 XMT M Jack	XMT Gain 4 5A3A1A2	Zero +1 dB
6	5	SEIZED	5A3A1A3	Audio Patch Panel lA8,RCV TO CONTROL CONSOLE B5	5A3A1A3 XMT M Jack 5A3A1A3	XMT Gain 2	Zero +1 dB
7	6	SEIZED	5A3A1A3	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B6	5A3A1A3 XMT M Jack	XMT Gain 3	Zero +1 dB
8	7	SEIZED	5A3A1A3	Audio Patch Panel 1A8, RCV TO CONTROL CONSOLE B7	5A3A1A3 XMT M Jack	XMT Gain 4 5A3A1A3	Zero +1 dB
		SEIZED	5A3A1A3	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B8	5A3A1A3 XMT M Jack	XMT Gain 5 5A3A1A3	Zero +1 dB

Table 3-13. Receive Gain Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
10---		---	5A3A1A4	---------	5A3A1A4	--- XMT Gain 1 (Maximum cw)	
119	SEIZED	5A3A1A4	Audio Patch Panel	5A3A1A4 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B9	XMT Gain 2	Zero +1 dB 5A3A1A4	
1210	SEIZED	5A3A1A4	Audio Patch Panel	5A3A1A4 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B1O	XMT Gain 3	Zero +1 dB 5A3A1A4	
1311	SEIZED	5A3A1A4	Audio Patch Panel	5A3A1A4 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B11	XMT Gain 4	Zero +1 dB 5A3A1A4	
1412	SEIZED	5A3A1A4	Audio Patch Panel	5A3A1A4 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B12	XMT Gain 5	Zero +1 dB 5A3A1A4	
151	B MONITOR	5A3A1A5	Audio Patch Panel	5A3A1A5 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B1	XMT Gain 1	-10 +1 dB 5A3A1A5	
162	B MONITOR	5A3A1A5	Audio Patch Panel	5A3A1A5 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B2	XMT Gain 2	-10 +1 dB 5A3AIA5	
173	B MONITOR	5A3A1A5	Audio Patch Panel	5A3A1A5 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B1	XMT Gain 3	-10 +1 dB 5A3A1A5	
184	B MONITOR	5A3A1A5	Audio Patch Panel	5A3A1A5 XMT M Jack 1A8,RCV TO CONTROL C0NSOLE B4l	XMT Gain 4	-10 +I dB 5A3A1A5	

Table 3-13. Receive Gain Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176 (V) (Cont)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
19			5A3A1A6			5A3A1A6 XMT Gain 1 (Maximum ccw)	
--	---	-		------	------		
205	B MONITOR	5A3A1A6	Audio Patch Panel	5A3A1A6 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B5	XMT Gain 2	-10 +1 dB 5A3A1A6	
216	B MONITOR	SA3A1A6	Audio Patch Panel	5A3A1A6 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B6	XMT Gain 3	-10 +1 dB 5A3A1A6	
227	B MONITOR	5A3A1A6	Audio Patch Panel	5A3A1A6 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B7	XMT Gain 4	-10 +1 dB 5A3A1A6	
238	B MONITOR	5A3A1A6	Audio Patch Panel	5A3A1A6 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B8	XMT Gain 5	-10 +1 dB 5A3A1A6	
24--	----	5A3A1A7	------	------	5A3A1A7	--- XMT Gain 1 (Maximum ccw)	
259	B MONITOR	5A3A1A7	Audio Patch Panel	5A3A1A7 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B9	XMT Gain 2	-10 +1 dB 5A3A1A7	
2610	B MONITOR	5A3A1A7	Audio Patch Panel	5A3A1A7 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B1O	XMT Gain 3	-10 +1 dB 5A3A1A7	
2711	B MONITOR	5A3A1A7	Audio Patch Panel	5A3A1A7 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B11	XMT Gain 4 -10 +1 dB	5A3A1A7	

Table 3-13. Receive Gain Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
2812	B MONITOR	5A3A1A7	Audio Patch Panel	5A3A1A7 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B12	XMT Gain 5	-10 +1 dB 5A3A1A8	
291	B MONITOR	5A3A1A8	Audio Patch Panel	5A3A1A8 AMT M Jack 1A8, RCV TO CONTROL	XMT Gain1	-10+1 dB	
CONSOLE B1							
30	2	B MONITOR	5A3A1A8	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B2	5A3A1A8 XMT M Jack	XMT Gain 2 5A3A1A8	-10 +1 dB
313	B MONITOR	5A3A1A8	Audio Patch Panel	5A3A1A8 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B3	XMT Gain 3	-10 +1 dB 5A3A1A8	
324	B MONITOR	5A3A1A8	Audio Patch Panel	5A3A1A8 XMT M Jack 1A8,RCV TO CDNTROL CONSOLE B4	XMT Gain 4 -10 +1 dB	5A3A1A8	
33--	---	5A3A1A9	------	------	5A3A1A9	XMT Gain 1 (Maximum ccw)	
345	B MONITOR	5A3A1A9	Audio Patch Panel	5A3A1A9 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B5	XMT Gain 2	-10 +1 dB 5A3A1A9	
356	B MONITOR	5A3AlA9	Audio Patch Panel	5A3A1A9 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B6	XMT Gain 3	-10 +1 dB	
367	B MONITOR	5A3AlA9	Audio Patch Panel	5A3AlA9 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B7	XMT Gain 4 -10 +1 dB	5A3A1A9	

Table 3-13. Receive Gain Adjustments (Operator B) for Audio/Keyline Card Cage, P/N 7052-1910 5A3 In Communication Control Console OJ-512/FRC-176(V) (Cont)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
378	B MONITOR	5A3A1A9	Audio Patch Panel	5A3A1A9 XMT M Jack 1A8,RCV TO CONTROL CONSOLE B8	XMT Gain 5	-10 +1 dB 5A3A1A9	
38--	---	5A3A1A1O	------	------	5A3A1A10	--- XMT Gain 1 (Maximum CW)	
399	B MONITOR	5A3A1A10O	Audio Patch Panel	5A3A1A1O XMT M Jack 1A8,RCV TO CONTROL CONSOLE B9	XMT Gain 2	-10 +1 dB 5A3A1A1O	
4010	B MONITOR	5A3A1A1O	Audio Patch Panel	5A3A1A1O XMT M Jack 1A8,RCV TO CONTROL CONSOLE B1O	XMT Gain 3	-10 +1 dB 5A3A1AlO	
4111	B MONITOR	5A3A1AlO	Audio Patch Panel	5A3A1A1O XMT M Jack 1A8,RCV TO CONTROL CONSOLE B11	XMT Gain 4	-10 +1 dB 5A3A1AlO	
4212	B MONITOR	5A3A1A1O	Audio patch Panel	5A3A1A1O XMT M Jack 1A8,RCV TO CONTROL CONSOLE B12	XMT Gain 5	-10 +1 dB 5A3A1A10	

Table 3-14. Transmit Gain Adjustments 5A3A1A5, for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj. PWB Location Subassembly	At 5A3A1A2, Using HP 3551A +6 dBm, 1 kHz Signal Applied To	RCV Term Connect HP 3551A At	Make Adjustment At	Normal Indicator (dBm)
1 --	-----	---------	5A3A1A5	------	--------	5A3A1A5 RCV Gain 1 (Maximum ccw)	-------
2	---	------	5A3A1A5	------	------	5A3A1A5 RCV Gain 3 (Maximum ccw)	---
3 ---	------		5A3A1A5	5A3A1A5 RCV M Jack	5A3A1A5 RCV 2 Jack	5A3A1A5 RCV Gain 2	-4 (+1)
4 ---	------		5A3A1A5	5A3A1A5 RCV M Jack	5A3A1A5 RCV 4 Jack	5A3A1A5 RCV Gain 4	-4 (+1)

Table 3-15. Transmit Gain Adjustments 5A3A1A8, for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	XCVR Audio Channel	At 5A2 Panel Transceiver Seize Switch Set To	Gain Adj PWB Location Subassembly	Using HP 3551A Test Zero dBm, 1 kHz Signal Applied To	Connect At	Make Adjustment At	Normal Indicator (dBm)
1	1	SEIZED	5A3A1A8	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B1	5A3A1A8 RCV 2 Jack	5A3A1A8 RCV Gain	-4 (+1)
2	1	SEIZED	5A3A1A8	Audio Patch Panel 1A8,RCV TO CONTROL CONSOLE B1	5A3A1A8 RCV 4 Jack	5A3A1A8 RCV Gain	-4 (+1)
3	--	---	5A3A1A8	------	------	5A3A1A8 RCV Gain 1 (Maximum ccw)	--
4	**--**	---	5A3A1A8	------	------	5A3A1A8 RCV Gain 3 (Maximum ccw)	---

Table 3-16. Transmit Gain Adjustments 5A3A1A1, for Audio/Keyline Switch Panel P/N 7052-1200, 2A2 and 5A2 In Communication Control Console OJ-512/FRC-176(V)

Step	RF-901A Off/ Manual Vox Switch	At 5A2 Panel Set Voice Control Trans-ceiver Select	At 5A2 Panel Mode Select Switch Set	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal	Connect HP 3551A RCV Term	Make Adjustment	Normal Indication
1	---	---	---	5A3A1A1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 1 & 2	5A3AlA1 RCV CAL (Note 3)	5A3A1A1 RCV 1	Zero
2	---	01	5(RAD/RAD MODE)	5A3A1A1 (Inserted into Wescom 415 Test Extender)	Audio Patch Panel 1A8, RCV TO CON-TROL CON-SOLE B1	5A3A1A1 RCV CAL (NOTE 3)	5A3A1Al RCV 2	Zero
3	---	---	---	5A3AIA1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 22 & 24(Note 2)	5A3AlA1 RCV CAL (Notes 2 & 3)	5A3A1A1 RCV 3	Zero
4	---	---	---	5A3A1A1 (Inserted into Wescom 415 Test Extender)	---	---	5A3A1A1 RCV 4 (Maximum ccw)	
5---	---	---		5A3A1A1 (Inserted into Wescom 415 Test Extender)	Test Extender pins 46 & 48(Note 2)	5A3A1A1 RCV CAL (Notes 2 & 3)	5A3A1A1 RCV 5	Zero
6	---	---	---	5A3A1Al (Inserted into Wescom 415 Test Extender)	Test Extender pins 55 & 56(Note 2)	5A3A1A1 RCV CAL (Notes 2 & 3)	5A3A1A1 RCV 6	Zero

NOTES: 1 MAKE TERMINATED MEASUREMENTS WITH HP 3551A UNLESS OTHERWISE INSTRUCTED.
2 APPLY -10 dBm, 1 kHz SIGNAL FOR STEPS (3), (5), and (6).
3 TEST CABLE PAMONA P/N 2977-3-30.

Table 3-17. Receive Gain Adjustments 5A3A1A1, for Audio/Keyline Card Cage, P/N 7052-1910, 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	At 5A2 Panel Transceiver Seize Switch Set To	At 5A2 Panel Mode Select Switch Set to	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal Applied To	Connect 3551A At	Make Adjustment At	Normal Indication (dBm)
1	---	---	5A3A1A1 (Inserted into Wescom 415 Test Extender)	5A3A1A1 XMT CAL	Test Extender pins 5 & 3 (Note 2)	XMT 1	+6 +1 dB
2	ALL OFF (Up position)	0	5A3AlAl (Inserted into Wescom 415 Test Extender)	5A3A1Al XMT CAL	Test Extender pins 4 & 7 (Note 1)	XMT 2	+6 +1 dB
3	ALL OFF (Up position)	0	5A3A1Al (Inserted into Wescom 415 Test Extender)	5A3A1Al XMT CAL	Test Extender pins 8 & 6(Note 1)	XMT 4	-10 +1 dB
4	ALL OFF (Up position	0	5A3A1A1 (Inserted into Wescom 415 Test Extender)	5A3A1A1 XMT CAL	Test Extender pins 51 & 53(Note i)	XMT 4	-10 +1 dB
5	---	---	5A3A1A1	---	---	XMT 5 (Maximum CCW)	
6	---	---	5A3A1A1	5A3A1A1	Test Extender pins 13 & 11 (Note 1)	XMT 6	-10 +1 dB

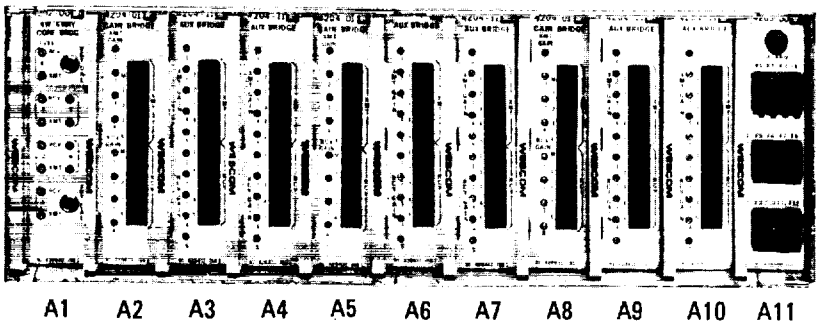
Table 3-18. Transmit Gain Setup Adjustments (Operator A) for Audio/Keyline Card Cage 5A3 In Communication Control Console OJ-512/FRC-176(V)

Step	At 5A2 Panel Transceiver Seize Switch Set To	At 5A2 Panel Mode Select Switch Set to	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal Applied To	Connect 3551A At	Make Adjustment At	Normal Indication (dBm)
1	ALL OFF (Up position)	0	5A3A1A2 +6 dBm ±1 dB,1 kHz	5A3A1A2 RCV MJack	5A3A1A4 RCV 1 Jack	5A3A1A4 RCV 1 Gain	Zero +1 dB
2	---	---	5A3A1A6	------	------	5A3A1A6 RCV 1 Gain Maximum ccw	---
3	XCVR 1 to MON A	0	5A3A1A6	Audio Patch Panel CIG1A8 RCV TO CON-TROL CONSOLE Jack B1	5A3A1A6 RCV 2 Jack	5A3A1A6 RCV 2 Gain	-10 +1 dB
4	XCVR 1 to MON A	0	5A3A1A6	Audio Patch Panel CIG1A8 RCV TO CON-TROL CONSOLE Jack B1	5A3A1A6 RCV	5A3A1A6 RCV 3 Jack	-10 +1 dB 3 Gain
5	---	---	5A3A1A6	------	------	5A3A1A6 RCV 4 Gain Maximum ccw	---
6	---	---	5A3A1A6	------	------	5A3A1A6 RCV 5 Gain Maximum ccw	
7	---	---	5A3A1A9			5A3A1A9 RCV 1 Gain Maximum ccw	
8	XCVR 1 to MON A	0	5A3A1A9 CIG1A8 RCV TO CON-TROL CONSOLE Jack B1	Audio Patch Panel	5A3AlA9 RCV 2 Jack	5A3A1A9 RCV 2 Gain	-10 +1 dB

Table 3-18. Transmit Gain Setup Adjustments (Operator A) for Audio/Keyline Card Cage 5A3 °In Communication Control Console OJ-512/FRC-176(V) (Cont)

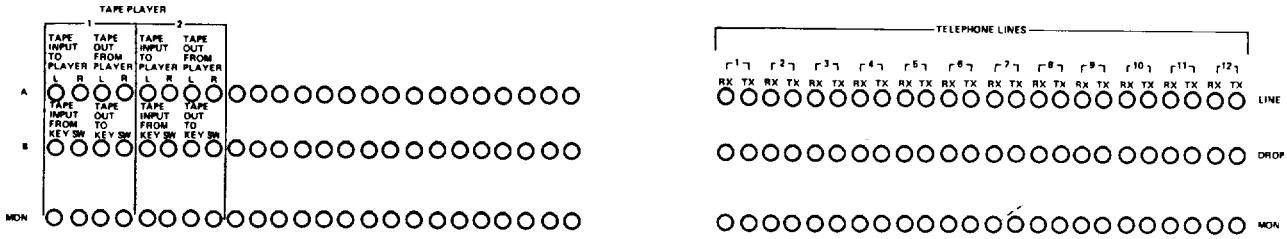
Step	At 5A2 Panel Transceiver Seize Switch Set To	At 5A2 Panel Mode Select Switch Set to	Subassembly	Using HP 3551A Zero dBm, 1 kHz Signal Applied To	Connect 3551A At	Make Adjustment At	Normal Indication (dBm)
9	XCVR 1 to MON A	0	5A3A1A9	Audio Patch Panel CIG1A8 RCV TO CONTROL CONSOLE Jack B1	5A3A1A9 3 Jack	RCV5A3A1A9 RCV 3 Gain	-10 +1 dB
10	---	---	5A3A1A9	------	------	5A3A1A9 RCV 4 Gain Maximum ccw	
11	---	---	5A3A1A9	------	------	5A3A1A9 RCV 5 Gain Maximum ccw	

COMMUNICATIONS CONTROL CONSOLE
2A3A1 AND 5A3A1 CARD CAGE ASSY



P/O CONTROL INTERFACE GROUP

AUDIO PATCH 1A7



AUDIO PATCH 1A8

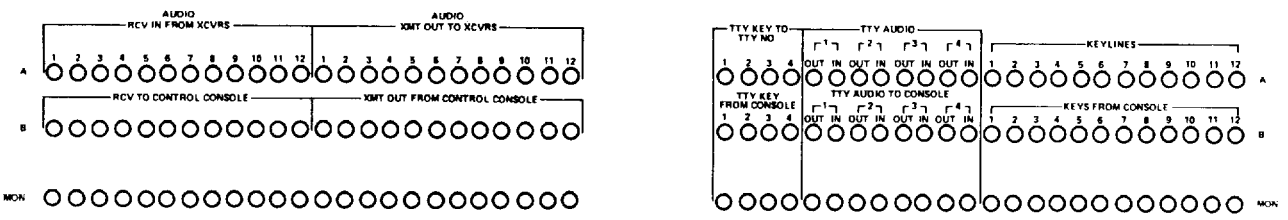


Figure 3-23. Card Cage In Communication Control Console OJ-512/FRC-176(V) and Audio Patch Panel 1A7 and 1A8 In Control Interface Group OK-449(V)/ FRC-176(V)

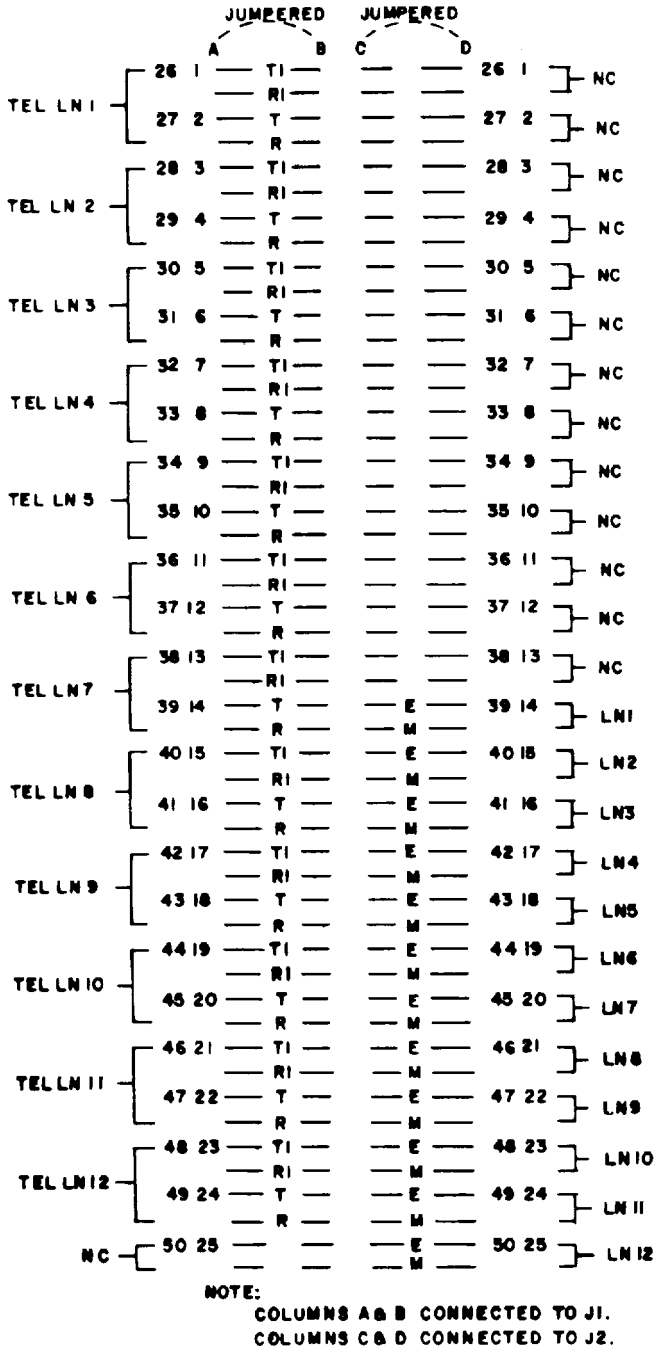


Figure 3-24. Control Interface Group OK-449(V)/FRC-176(V) - Telephone Equipment Bay - Telephone Punch Block 1A1 Function Details (Bann Site Only)

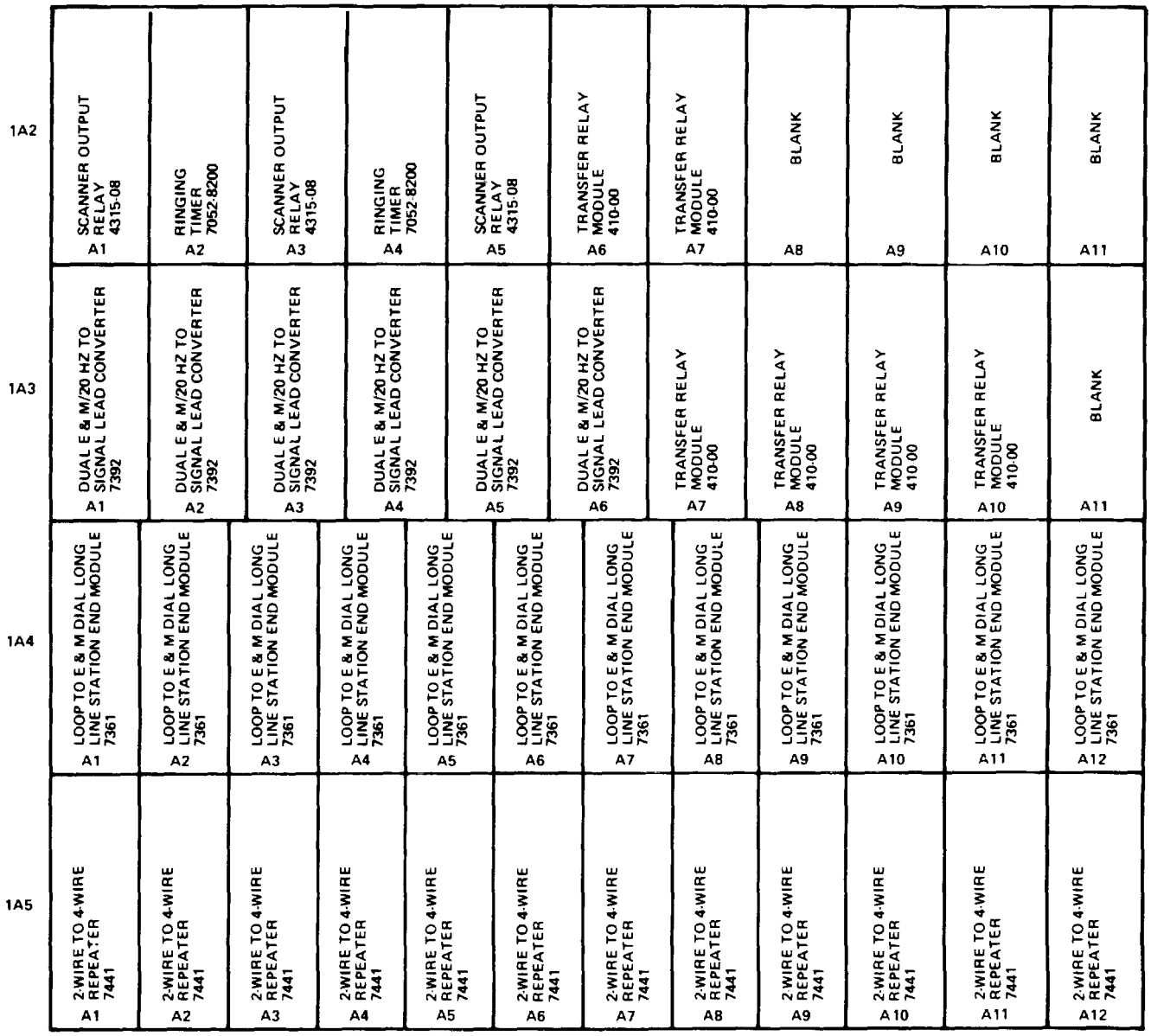


Figure 3-25. Control Interface Group OK-449(V)/FRC-176(V) - Telephone Equipment Bay - Telephone Card Cage Shelves 1A2, 1A3, 1A4, and 1A5 Function Details (Bann Site Only)

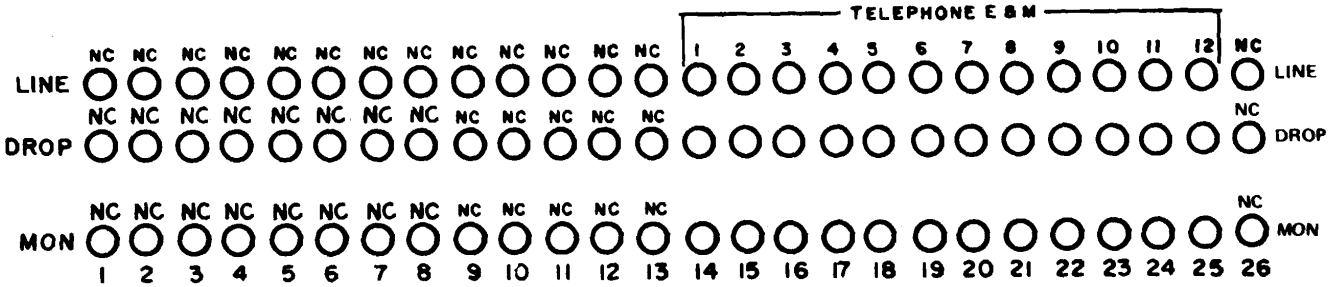


Figure 3-26. Control Interface Group OK-449(V)/FRC-176(V) - Telephone Equipment Bay - Dc Patch Panel 1A6 Function Details (Bann Site Only)

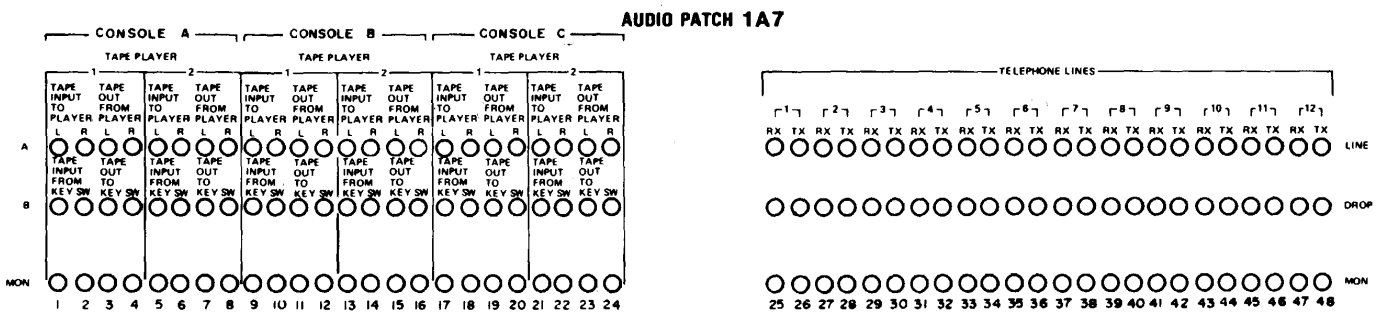


Figure 3-27. Control Interface Group OK-449(V)/FRC-176(V) - Telephone Equipment Bay - Audio Patch Panel 1A7 Function Details (Bann Site Only)

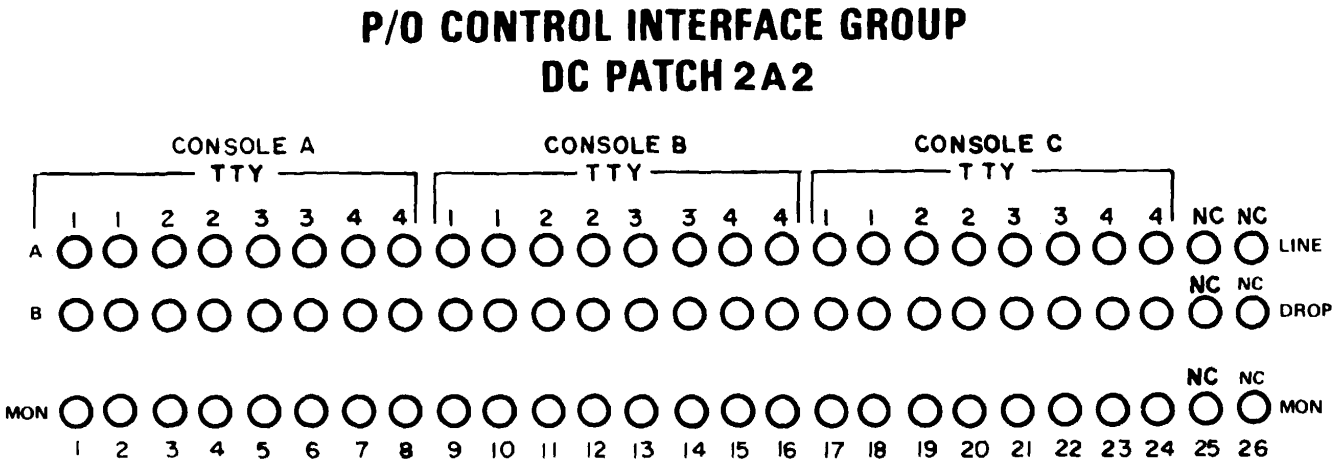


Figure 3-28. Control Interface Group OK-449(V)/FRC-176(V) - RF Equipment Bay - Dc Patch Panel 2A2 Function Details (Bann Site Only)

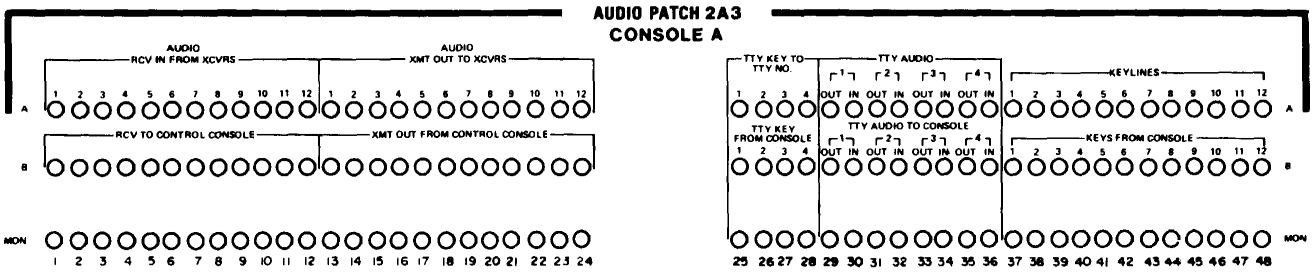


Figure 3-29. Control Interface Group OK-449(V)/FRC-176(V) - RF Equipment Bay - Audio Patch Panel 2A3 (Console A) Function Details (Bann Site Only)

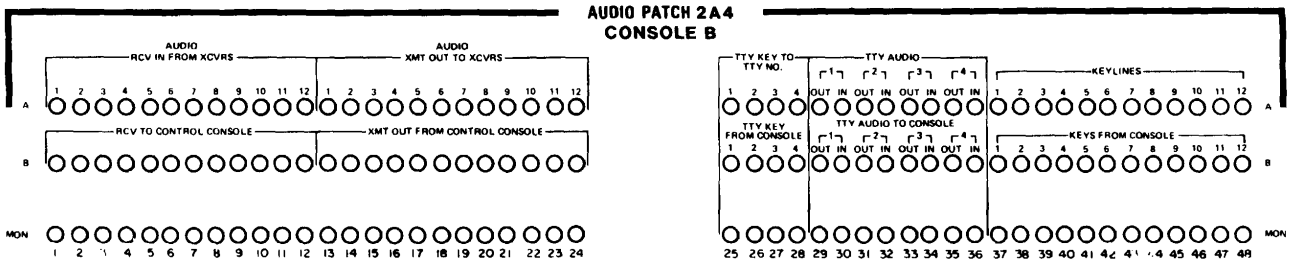


Figure 3-30. Control Interface Group OK-449(V)/FRC-176(V) - RF Equipment Bay - Audio Patch Panel 2A4 (Console B) Function Details (Bann Site Only)

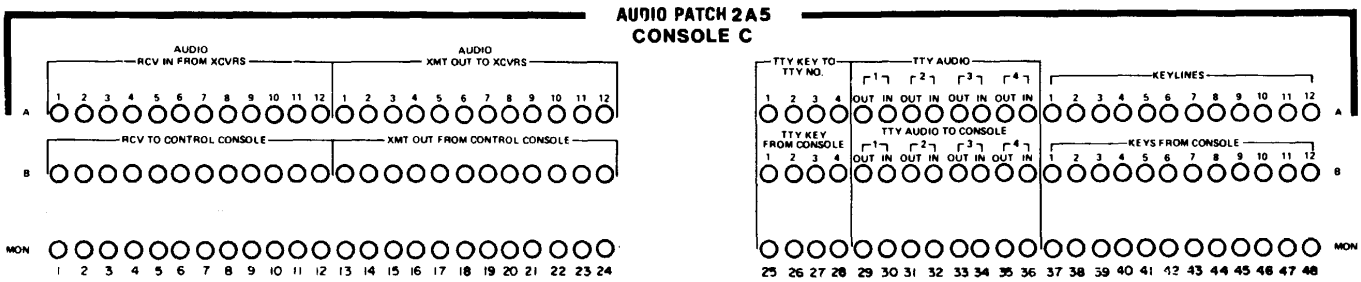


Figure 3-31. Control Interface Group OK-449(V)/FRC-176(V) - RF Equipment Bay - Audio Patch Panel 2A5 (Console C) Function Details (Bann Site Only)

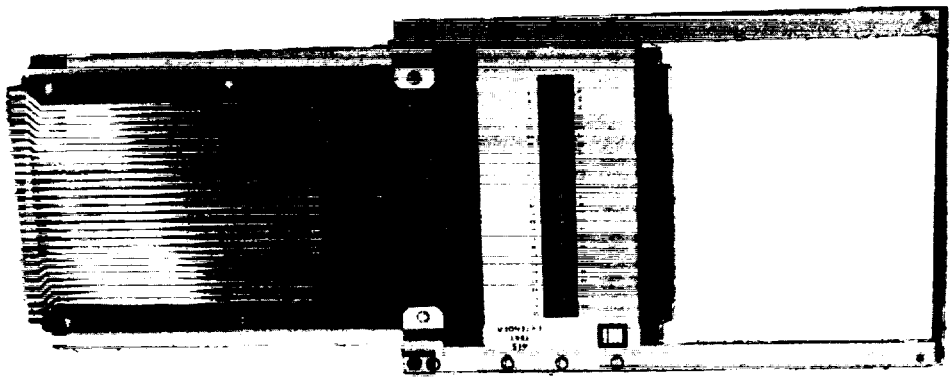


Figure 3-32. Wescom 415 Test Extender

3-11. TAPE RECORDER INPUT/OUTPUT LEVEL ADJUSTMENTS

Figures 3-32 through 3-44 are the Tape Recorder Input/Output Level Adjustment procedures for both tape recorders in the Communication Control Console.

Test equipment required:

* Audio Voltmeter
* Audio Generator
* Blank Tape (Ampex 600 series or equivalent)

a. Reference Level Adjustment.

(1) Adjust indicated operating controls on Tape Control Panel for record as per figure 333.

(2) Slide Tape Transport from rear of Console.

(3) Load Tape Transport with blank tape.

(4) Connect audio voltmeter to Audio Patch Panel CIG1A7 Tape out from Player L A3 jack (see figure 323).

(5) Rotate left channel INPUT LEVEL control maximum cw (see figure 333).

(6) Connect audio generator to Audio Patch Panel CIG1A7 Tape Input to PLAYER L Al jack (see figure 323).

(7) Select frequency of 1 kHz on audio generator and adjust generators level until reading of 10 dBm (+1 dBm) (242 mV) is obtained on the audio voltmeter.

Turn POWER switch ON.

(8) Depress PLAY and REC pushbuttons to run tape (see figure 333).

(9) Stop tape after approximately 30 seconds and rewind.

(10) Adjust operating controls on Tape Control Panel for PLAYBACK and set switch to STEREO as shown in figure 325. Set MONITOR switch to TAPE. PLAYBACK as per figure 336.

(11) Depress PLAY pushbutton to run tape.

(12) Monitor audio voltmeter connected to left tape output.

(13) Adjust trim pot REPR LEVEL L (figure 334) to obtain an output level of 10 dBm +1 dB (242 mV) on the audio voltmeter.

(14) Repeat procedure for right channel, moving the audio voltmeter to ClG1A7 A4 and the audio operator to CIG1A7 A2 (see figure 323).

(15) Adjust trim pot REPR LEVEL R to obtain an output level of 10 dBm +1 dBm (242 mV) (see figure 336).

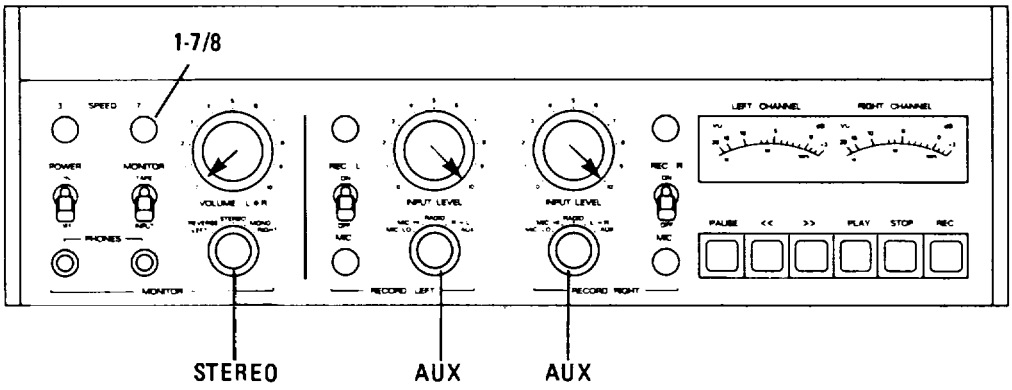


Figure 3-33. Reference Level Settings

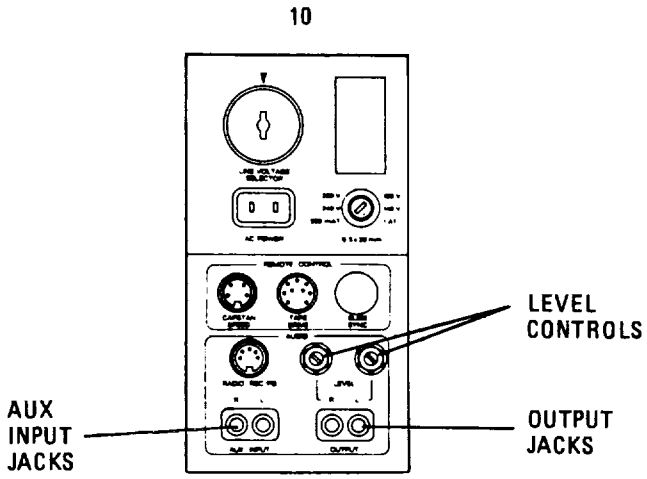


Figure 3-34. Tape Recorder Rear Panel Controls and Connectors

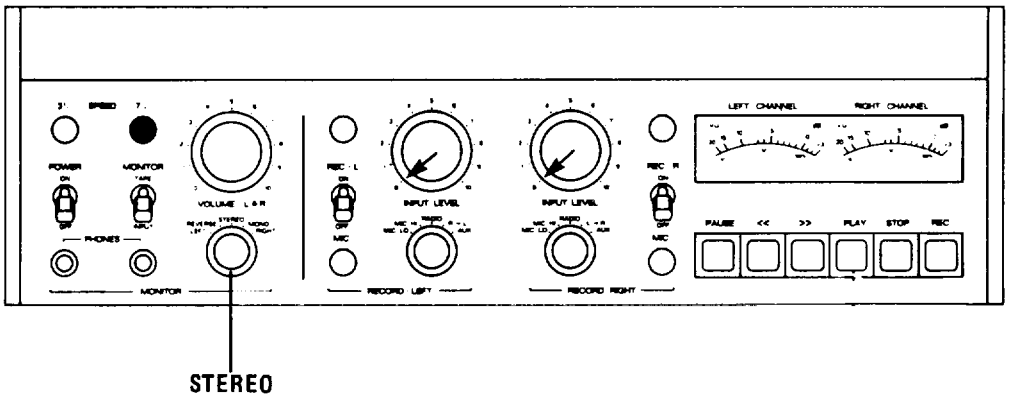


Figure 3-35. Tape Recorder in Playback Mode

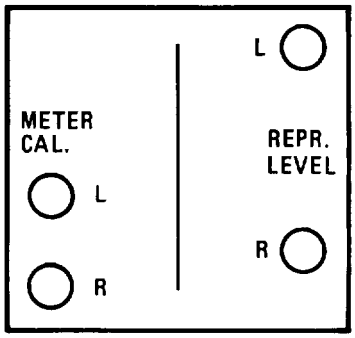


Figure 3-36. Trim Pots REPR LEVEL L & R
(at bottom left of Tape Control Chassis)

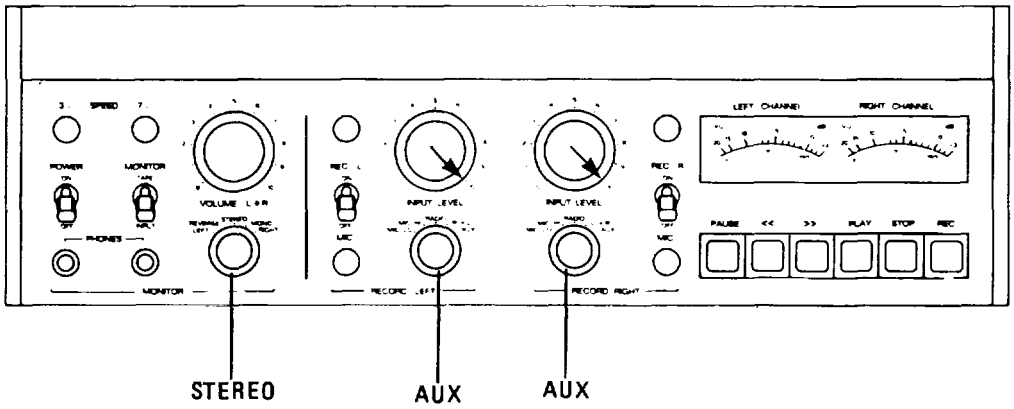


Figure 3-37. Controls Set for VU Meter Calibration

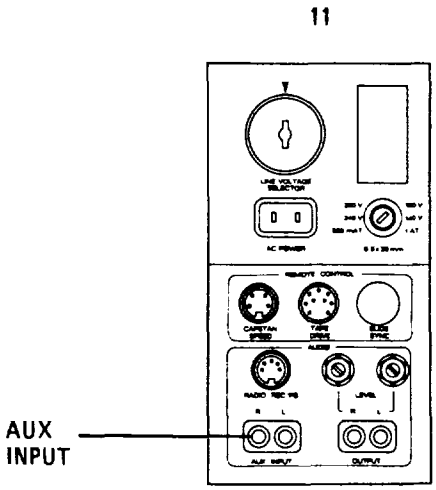


Figure 3-38. AUX INPUT on Rear Panel

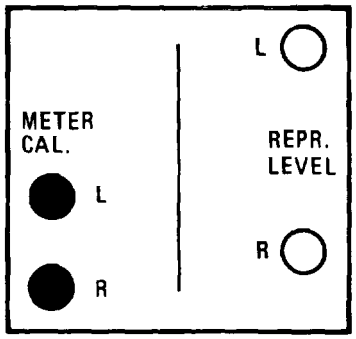


Figure 3-39. METER CAL. Controls (on bottom of Tape Control Panel)

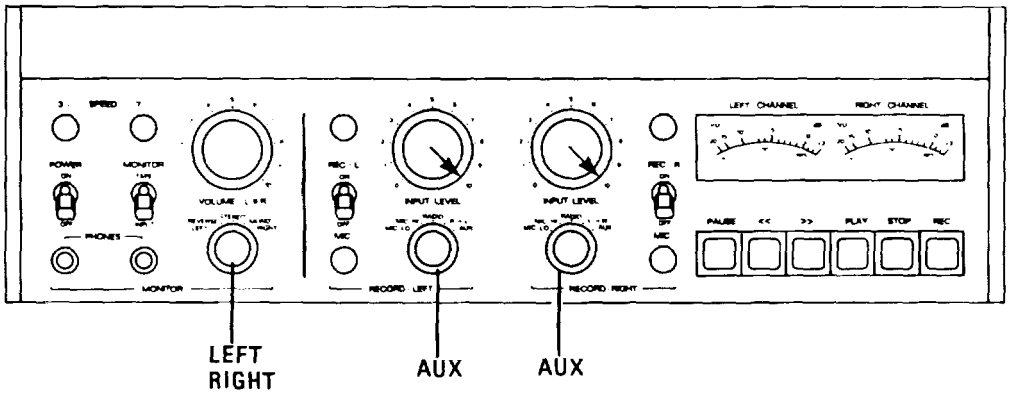


Figure 3-40. Controls Set for Bias Adjustment

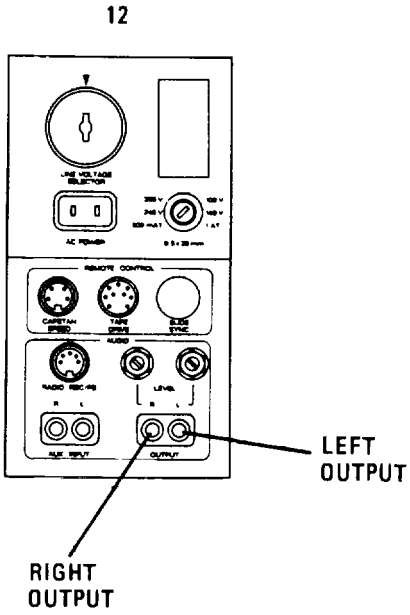


Figure 3-41. Left and Right Audio Output

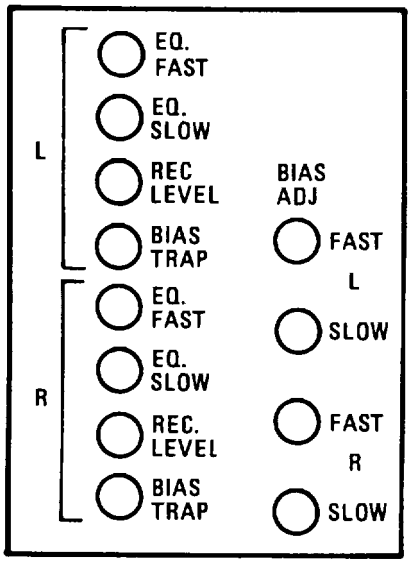


Figure 3-42. Bias Adjustment Controls

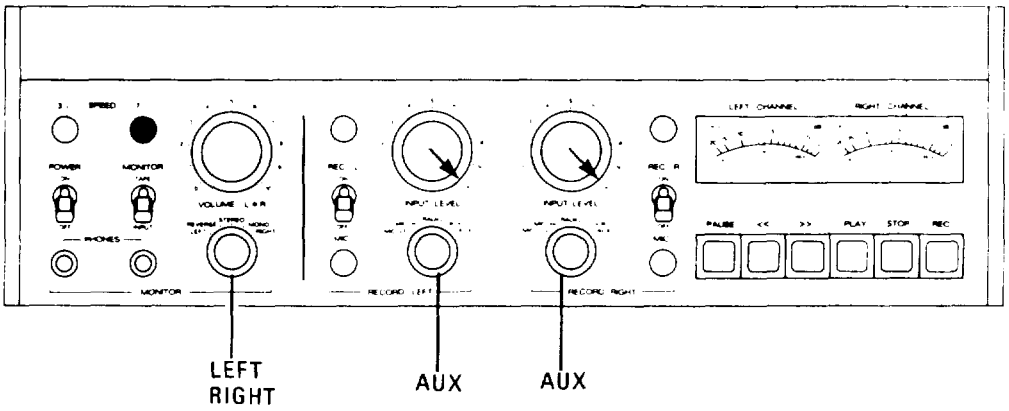


Figure 3-43. Control Settings for Recording Equalization

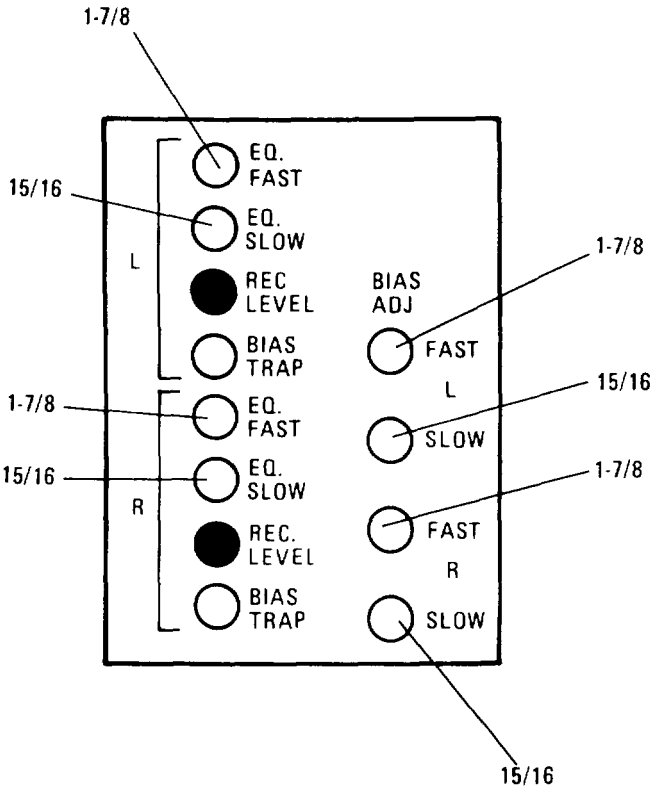


Figure 3-44. Recording Equalization Controls (On bottom of Tape Control Assembly)

b. VU Meter Calibration

(1) Adjust indicated operating controls as per figure 3-37.

(2) Connect audio generator to CIG1A7 Al for left channel and to A2 for right channel.

(3) Set generator to 1 kHz at 0 dBm (77.5 mV).

(4) Adjust potentiometers METER CAL L & R (figure 3-39) to obtain a 0 VU deflection on the respective VU meter.

c. Bias. Adjustment

(1) Set indicated operating controls as per figure 3-40.

(2) Connect audio voltmeter to tape recorder L or R,. respectively, at the Audio Patch Panel CIG1A7 A3 for left and A4 for right.

(3) Connect audio generator to the Audio Patch Panel CIG1A7 Al for left and A2 for right (see figure 3-44).

(4) Select frequency of 10 kHz and adjust to level of 20 dB below 0 VU on audio generator.

(5) Load recorder with blank tape and run tape in the recording mode.

(6) Rotate BIAS ADJ potentiometers (LEFT, RIGHT, FAST, SLOW) to fully ccw position (see figure 3-42).

(7) While monitoring signal level on audio voltmeter, rotate BIAS ADJ controls until signal level reaches maximum (mode selector switched to either LEFT or RIGHT as required).

(8) After reaching maximum, continue rotating respective trim pot slowly in clockwise direction until 10 kHz output signal has dropped by 6 dB.

d. Recording Equalization Adjustment. (FAST for 1-7/8 speed, SLOW for 15/16 speed)

(1) Set indicated operating controls as per figure 3-43. (Mode selector at LEFT).

(2) Connect audio voltmeter to Audio Patch Panel CIG1A7 A3 jack (see figure 3-23).

(3) Connect audio generator to Audio Patch Panel CIG1A7 Al jack. Adjust audio generator to 300 to 3500 Hz at -10 dB.

(4) Load recorder with blank tape AUX run in the recording mode.

(5) While recording the 300 to 3500 Hz signal, adjust left channel the trim pots EQ SLOW 15/16, FAST 1-7/8 (see figure 3-43) until the signal level at the recorder's output falls within the range from 0 dB to +1 dB relative to 1 kHz (77.5mV).

(6)Turn mode selector to RIGHT and repeat procedure for right channel with the audio generator connected to Audio Patch Panel CIG1A7 A2 and the audio voltmeter connected to CIG1A7 A4 (see figure 3-23).

3-12. AUDIO MONITOR SIGNAL LEVEL ADJUSTMENTS

Figures 3-45 and 3-46 are the Audio Monitor Signal Level Adjustment procedures for both Audio Monitors in the Communication Control Console.

Test equipment required:

- Audio Voltmeter
- Signal Generator (audio)
- J1 Test Connector, AMPHENOL
- J2 Test Connector, AMPHENOL

a. Headset Microphone Pre-amp Adjustment.

(1)Connect signal generator to pins 4 and 5 of connector J1 (see figure 3-45), using test connector.

(2)Connect audio voltmeter to pins 19 and 20 of connector J2 through test connector.

(3)Select 1 kHz tone or signal generator. Set level at -60 dB.

(4)Adjust R11 on Headset PWB A2 (figure 3-46) to obtain a -10 dB reading on the audio voltmeter.

b. Boom Microphone P re-amp Adjustment.

(1)Connect signal generator to pins 17 and 18 on J2 (figure 3-45).

(2)Connect audio voltmeter to pins 15 and 16 of J2.

(3)Select 1 kHz tone on signal generator. Set level at -50 dB.

(4)Adjust R11 on Boom Microphone PWB A3 (figure 3-45), to obtain a -10 dB reading on the audio voltmeter.

c. Summing Amplifier Adjustment.

(1)Set Transceiver SEIZE switch on Audio/Keyline Switch Panel to Monitor A or Monitor B position.

(2)Using Monitor A or Monitor B Audio as a source, adjust Monitor A or Monitor B, and SND/RCV Volume controls to mid-range. Adjust R5 on Summing Amplifier PWB A6 (figure 3-45) to obtain balanced listening level in left earpiece of headset as compared to the right earpiece. (Right earpiece audio is obtained by setting a TRANSCEIVER SEIZE switch to the SEIZE position).

3-13. TELEPHONE SIGNAL LEVEL ADJUSTMENTS

Table 3-19 through 3-51 are Telephone Signal Level Adjustment procedures for both the "A" side and the "B" side of Communication Control Console. Figure 3-47

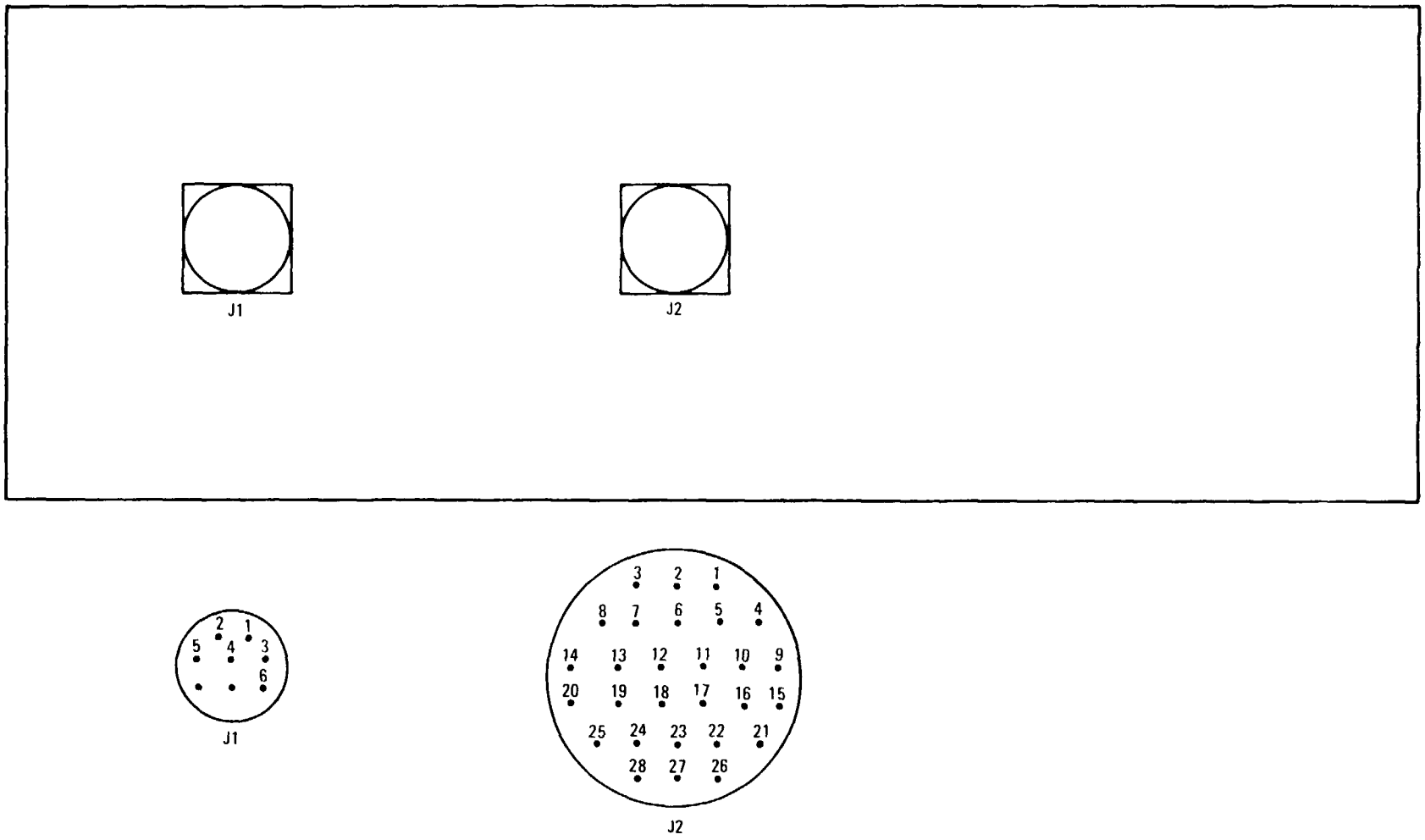


Figure 3-45. Rear Panel Connections-Audio Monitor Panel

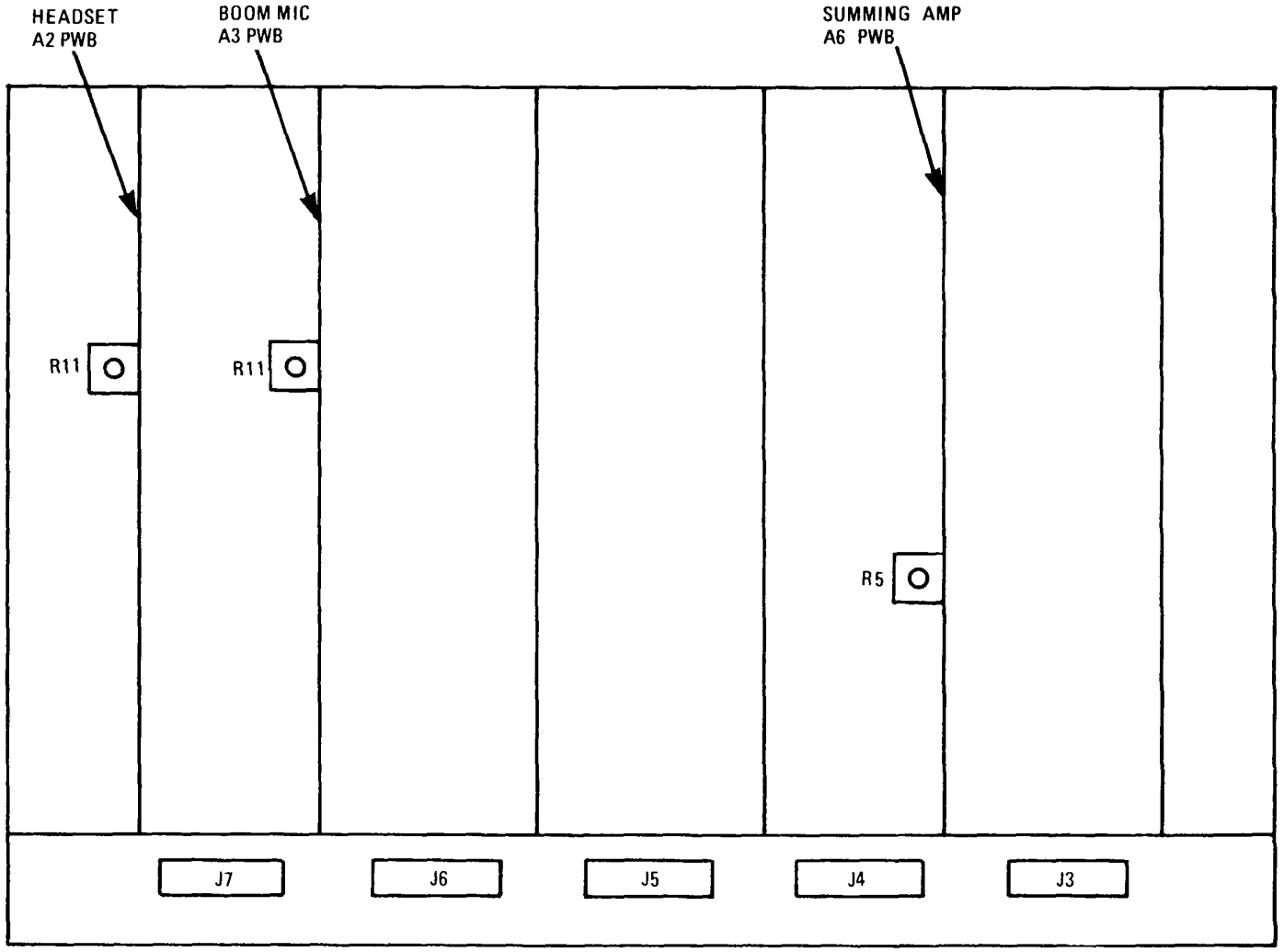


Figure 3-46. Audio Monitor Panel PWBs and Adjusting Controls

contains test configurations for the Control interface Group and Console Telephone Equipment, while figure 3-48 gives component locations for 3A5A1Al-A4 and A8, and 3A5A2A1-A4 and A8 Transfer Relay 24 V.

Test equipment required:

- Audio Oscillator, AN/URM-127
- VTVM, ME-303A/U
- Transmission Test Set HP 3551A

Table 3-19. Telephone Signal Level Adjustments

Step	Connect VTVM	Normal Indication
1	1PS1 Terminal Strip	+48 V
	NOTE Ensure 1 PS1 terminal strip cover is replaced after obtaining measurement.	
2	1PS2 Terminal Strip RB and RG AB and AG BB and BG LB and LG (upper) LB and LG (lower) BZ and BZG	105 Vac 105 Vac -24 V -24 V 10 Vac 10 Vac 20 Vac
3	A2J1-35	-48 V
4	A4J12-L	-48 V
5	A3J6-9	105 Vac
6	A4J1-H	105 Vac
7	A9RB	105 Vac
8	A5J12-L	-48 V
9	A9AB	-24 V
10	A2J6-37	-24 V
11	A3J7-17	-24 V
12	A9BB	-24 V
13	A3J7-12	10 Vac
14	A2J6-32	10 Vac

Table 3-19. Telephone Signal Level Adjustments (Cont)

Step	Connect VTVM	Normal Indication
15	A9LB (upper	10 Vac
16	TB1CW-13	10 Vac
17	A3J7-14	10 Vac
18	A2J7-32	10 Vac
19	A9LB(lower)	10 Vac
20	A2Jll-5	20 Vac

Table 3-20. Communication Control Console Telephone Equipment Power Check

Step	Connect VTVM	Normal Indication
1	TB2-2, 3 (reference frame ground)	-24 V
2	TB3-2, 3 (reference frame ground)	-24 V
3	J5-1, 4 (unplug converter)	-24 V
4	AlJl-17	-24 V
5	A1J6-35	-24 V
6	A2J1-17	-24 V
7	A2J6-35	-24 V
8	TB1CW-13 (reference frame ground)	10 Vac
9	AlJl1-11 (reference frame ground)	10 Vac
10	A2J1-l1 (reference frame ground)	10 Vac

Table 3-21. Operator A Relay Check 3A5A1A1 In Communication Control Console OJ-512/FRC-176(V)

Step	Action	Relay Energized
1	Strap 2W-4W options on communications control console shelves at TB1 for 4W operation.	-
2	Press RADIO-TELEPHONE LINE switches as follows:	-
	1	A
	2	B
	3	C
	4	A
	5	B
	6	C
	7	A
	8	B
	9	C
	10	A
	11	B
	12	C

Table 3-22. Operator B Relay Check 3A5A2A1 In Communication Control Console OJ-512/FRC-176(V)

Step	Action	Relay Energized
1	Strap 2W-4W options on communications control console shelves at TB1 for 4W operation.	
2	Press RADIO-TELEPHONE LINE switches as follows:	
	1	A
	2	B
	3	C
	4	A
	5	B
	6	C
	7	A
	8	B
	9	C
	10	A
	11	B
	12	C

Table 3-23. Operator A Telephone Equipment Bay Relay Check 1A3A7 thru 1A3A10 in Control Interface Group OK-449(V)/FRC-176(V)

Step	Action	Relay Energized
1	Strap 2W-4W options on telephone equipment bay shelves at TB1 for 4W operation.	
2	Press RADIO-TELEPHONE LINE switches as follows:	
	1	A
	2	B
	3	C
	4	A
	5	B
	6	C
	7	A
	8	B
	9	C
	10	A
	11	B
	12	C

NOTE: RADIO-TELEPHONE and OPERATOR-TELEPHONE LINE switches will light when RADIO-TELEPHONE LINE switches are pressed.

Table 3-24. Operator B Telephone Equipment Bay Relay Check 1A3A7 thru 1A3A1O In Control Interface Group OK-449(V)/FRC-176(V)

Step	Action	Relay Energized
1	Strap 2W-4W options on telephone equipment bay shelves at TB1 for 4W operation.	
2	Press RADIO-TELEPHONE LINE switches as follows:	
	1	A
	2	B
	3	C
	4	A
	5	B
	6	C
	7	A
	8	B
	9	C
	10	A
	11	B
	12	C

NOTE: RADIO-TELEPHONE and OPERATOR-TELEPHONE LINE switches will light when RADIO- TELEPHONE LINE switches are pressed.3-115

Table 3-25. Operator A Communications Control Console 3A5A1A8 Relay B Check

Step	Action	Relay Energized
1	Press RADIO-TELEPHONE LINE switches as follows:	
	1	B
	2	B
	3	B
	4	B
	5	B
	6	B
	7	B
	8	B
	9	B
	10	B
	11	B
	12	B

Table 3-26. Operator B Communications Control Console 3A5A2A8 Relay B Check

Step	Action	Relay Energized
1	Press RADIO-TELEPHONE LINE switches as follows:	
	1	B
	2	B
	3	B
	4	B
	5	B
	6	B
	7	B
	8	B
	9	B
	10	B
	11	B
	12	B

Table 3-27. Operator A 3A5A1A7 Four-Wire Radio/Telephone Line Test

Step	Action	Telephone line	0 dbm, 1 kHz Signal Applied To CIG Punch Block 1A1 Pair Number	Connect HP3551A RCV Term At The CCC3A5A1A7 Jack	Make Adjustment At CCC3A5A1A7	Normal Indication
1	a) Set 3A5A1A7 Line Amplifier RCV LO-HI switch Al to LO. (A-Side power) b) Set 3A5A1A7 Line Amplifier XMT LO-HI switch S2 to LO position.					
2	Set 3A5A1A7 XMT EQUAL maximum ccw					
3	(Note 1)	1	1	XMT LINE	LEVEL XMT	ZERO +1 dB
4	(Note 1)	2	3	XMT LINE	-	ZERO +1 dB
5	(Note 1) EQUAL maximum ccw.	3	5	XMT LINE	-	ZERO +1 dB
6	(Note 1)	4	7	XMT LINE	-	ZERO +1 dB
7	(Note 1)	5	9	XMT LINE	-	ZERO +1 dB
8	(Note 1)	6	11	XMT LINE	-	ZERO +1 dB
9	On Panel CCC1A3 radio telephone line	7	13	XMT LINE	-	ZERO +1 dB
10	Select RAD/TEL Line 8	8	15	XMT LINE	-	ZERO +1 dB
11	Select RAD/TEL Line 9	9	17	XMT LINE	-	ZERO +1 dB
12	Select RAD/TEL Line 10	10	19	XMT LINE	-	ZERO +1 dB
13	Select RAD/TEL Line 11	11	21	XMT LINE	-	ZERO +1 dB
14	Select RAD/TEL Line 12	12	23	XMT LINE	-	ZERO +1 dB
15	Set 3A5A1A7 RCV EQUAL maximum ccw					

Table 3-27. Operator A 3A5A1A7 Four-Wire Radio/Telephone Line Test (Cont)

Step	Action	Telephone line	0 dbm, 1 kHz Signal Applied To CIG Punch Block 1A1 Pair Number	Connect HP3551A RCV Term At The CCC3A5A1A7 Jack	Make Adjustment At CCC3A5A1A7	Normal Indication
16	(Note 1)	1	RCV LINE	2	LEVEL RCV	ZERO
17	(Note 1)	2	RCV LINE	4	-	ZERO
18	(Note 1)	3	RCV LINE	6	-	ZERO
19	(Note 1)	4	RCV LINE	8	-	ZERO
20	(Note 1)	5	RCV LINE	10	-	ZERO
21	(Note 1)	6	RCV LINE	12	-	ZERO
22	Select RAD/TEL Line 7	7	RCV LINE	14	-	ZERO
23	Select RAD/TEL Line 8	8	RCV LINE	16	-	ZERO
24	Select RAD/TEL Line 9	9	RCV LINE	18	-	ZERO
25	Select RAD/TEL Line 10	10	RCV LINE	20	-	ZERO
26	Select RAD/TEL Line 11	11	RCV LINE	22	-	ZERO
27	Select RAD/TEL Line 12	12	RCV LINE	24	-	ZERO

NOTES:

1 Do this test only if the applicable line is strapped for 4-wire operation.

2. Make terminated measurements with HP3551A unless otherwise instructed.

Table 3-28. Operator B3A5A2A7 Four-Wire Radio/Telephone Line Test (see figure 2-16)

Step	Action	Telephone line	0 dbm, 1 kHz Signal Applied To CIG Punch Block 1A1 Pair Number	Connect HP3551A RCV Term At The CCC3A5A1A7 Jack	Make Adjustment At CCC3A5A1A7	Normal Indication
1	a) Set 3A5A2A7 Line Amplifier RCV LO-HI switch S1 to LO. (B-Side Power) b) Set 3A5A2A7 Line Amplifier XMT LO-HI					
2	Set 3A5A2A7 XMT					
3	(Note 1)	1	1	XMT LINE	LEVEL XMT	ZERO +1 dB
4	(Note 1)	2	3	XMT LINE	LEVEL XMT	ZERO +1 dB
5	(Note 1)	3	5	XMT LINE	-	ZERO +1 dB
	(Note 1)	4	7	XMT LINE	-	ZERO +1 dB
7	(Note 1)	5	9	XMT LINE	-	ZERO +1 dB
8	(Note 1)	6	11	XMT LINE	-	ZERO +1 dB
9	At CCC4A3 Select RAD/TEL Line 7	7	13	XMT LINE	-	ZERO +1 dB
10	Select RAD/TEL Line 8	8	15	XMT LINE	-	ZERO +1 dB
11	Select RAD/TEL Line 10	9	17	XMT LINE	-	ZERO +1 dB
12	Select RAD/TEL Line 10	10	19	XMT LINE	-	ZERO +1 dB
13	Select RAD/TEL Line 11	11	21	XMT LINE	-	ZERO +1 dB
14	Select RAD/TEL Line 12	12	23	XMT LINE	-	ZERO +1 dB
15	Set 3A5A2A7 RCV EQUAL					
16	(Note 1) maximum ccw	1	RCV LINE	2	LEVEL RCV	ZERO +1 dB

Step	Action	Telephone line	0 dbm, 1 kHz Signal Applied To CIG Punch Block 1A1 Pair Number	Connect HP3551A RCV Term At The CCC3A5A1A7 Jack	Make Adjustment At CCC3A5A1A7	Normal Indication
17	(Note 1)	2	RCV LINE	4	-	ZERO +1 dB
18	(Note 1)	3	RCV LINE	6	-	ZERO +1 dB
19	(Note 1)	4	RCV LINE	8	-	ZERO +1 dB
20	(Note 1)	5	RCV LINE	10	-	ZERO +1 dB
21	(Note 1)	6	RCV LINE	12	-	ZERO +1 dB
22	Select RAD/TEL Line 7	7	RCV LINE	14	-	ZERO +1 dB
23	Select RAD/TEL Line 8	8	RCV LINE	16	-	ZERO +1 dB
24	Select RAD/TEL Line 9	9	RCV LINE	18	-	ZERO +1 dB
25	Select RAD/TEL Line 10	10	RCV LINE	20	-	ZERO +1 dB
26	Select RAD/TEL Line 11	11	RCV LINE	22	-	ZERO +1 dB
27	Select RAD/TEL Line 12	12	RCV LINE	24	-	ZERO +1 dB

NOTES:

1. Do this test only if the applicable line is strapped for 4-wire operation.
2. Make terminated measurements with HP3551A unless otherwise instructed.

Table 3-29. Operator A Outgoing Call Test (Only on Four-Wire Lines)

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	Remove handset from holder.		
2	a) Press OPERATOR-TELEPHONE LINE 1 switch	LN1-M	1) OPERATOR-TELEPHONE LINE 1 switch lit. 2) Telephone equipment bay KTU Assembly 1A9A2DSl lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN1-M	Ten pulses at 10 pps.
3	a) Press OPERATOR-TELEPHONE LINE 2 switch	LN2-M	1) OPERATOR-TELEPHONE LINE 2 switch lit. 2) Telephone Equipment Bay lA9A3DS1 lit. 3) -48 v
	b) Press DTMF keypad O key c) Press handset holder hook switch.	LN2-M	Ten pulses at 10 pps.
4	a) Press OPERATOR-TELEPHONE LINE 3 switch	LN3-M (C1G1A1 Pair 3 M LEAD)	1) OPERATOR-TELEPHONE LINE 3 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A4DS1 lit. 3) -48 v
	b) Press DTMF keypad O key c) Press handset holder hook switch.	LN3-M	Ten pulses at 10 pps.
5	a) Press OPERATOR-TELEPHONE LINE 4 switch	LN4-M	1) OPERATOR-TELEPHONE LINE 4 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A5DS1 lit. 3) -48 v

Table 3-29. Operator A Outgoing Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
6	a) Press OPERATOR-TELEPHONE LINE 5 switch	LN5-M	1) OPERATOR-TELEPHONE LINE 5 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A6DS1 lit. 3) -48 v
	b) Press DTMF keypad O key	LN5-M	Ten pulses at 10 pps.
	c) Press handset holder hook switch	--	
7	a) Press OPERATOR-TELEPHONE LINE 6 switch	LN6-M	1) OPERATOR-TELEPHONE LINE 6 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A7DS1 lit. 3) -48 v
	b) Press DTMF keypad O key	LN6-M	Ten pulses at 10 pps.
	c) Press handset holder hook switch.		
8	a) Press OPERATOR-TELEPHONE LINE 7 switch	LN7-M	1) OPERATOR-TELEPHONE LINE 7 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A8DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key	LN7-M	Ten pulses at 10 pps.
	c) Press handset holder hook switch.	--	
9	a) Press OPERATOR-TELEPHONE LINE 8 switch	LN8-M	1) OPERATOR-TELEPHONE LINE 8 switch lit. 2) Telephone Equipment Bay KTU Assembly 1AgA9DS1 lit. 3) -48 V
	b) Press DTMF keypad O key	LN8-M	Ten pulses at 10 pps.
	c) Press handset holder hook switch.		

Table 3-29. Operator A Outgoing Call Test (Only on Four-Wire Lines)(Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
10	a) Press OPERATOR-TELEPHONE LINE 9 switch	LN9-M	1) OPERATOR-TELEPHONE LINE 9 switch lit. 2) Telephone Equipment Bay KTU Assembly' 1A9AlODS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN9-M	Ten pulses at 10 pps.
11	a) Press OPERATOR-TELEPHONE LINE 10 switch	LN1O-M	1) OPERATOR-TELEPHONE LINE 10 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A11DSl lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN10-M	Ten pulses at 10 pps.
12	a) Press OPERATOR-TELEPHONE LINE 11 switch	LN11-M	1) OPERATOR-TELEPHONE LINE 11 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A12DS1 lit. 3) -48 V
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN11-M	Ten pulses at 10 pps.
13	a) Press OPERATOR-TELEPHONE LINE 12 switch	LN12-M	1) OPERATOR-TELEPHONE LINE 12 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A13DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN12-M	Ten pulses at 10 pps.

Table 3-30. Operator B Outgoing Call Test (Only on Four-Wire Lines)

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	Remove handset from holder.		
2	a) Press OPERATOR-TELEPHONE LINE 1 switch	LN1-M	1) OPERATOR-TELEPHONE LINE 1 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A2DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN1-M	Ten pulses at 10 pps.
3	a) Press OPERATOR-TELEPHONE LINE 2 switch	LN2-M	1) OPERATOR-TELEPHONE LINE 2 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A3DSl lit. 3) -48 v
b) Press c) Press switch.	DTMF keypad O key handset holder hook	LN2-M --	Ten pulses at 10 pps. --
4a) Press	OPERATOR-TELEPHONE LINE 3 switch	LN3-M	1) OPERATOR-TELEPHONE LINE 3 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A4DS1 lit. 3) -48 V
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN3-M	Ten pulses at 10 pps.
5	a) Press OPERATOR-TELEPHONE LINE 4 switch	LN4-M	1) OPERATOR-TELEPHONE LINE 4 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A5DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key, c) Press handset holder hook switch.		

Table 3-30. Operator B Outgoing Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
6	a) Press OPERATOR-TELEPHONE LINE 5 switch	LN5-M	1) OPERATOR-TELEPHONE LINE 5 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A6DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN5-M	Ten pulses at 10 pps.
7	a) Press OPERATOR-TELEPHONE LINE 6 switch	LN6-M	1) OPERATOR-TELEPHONE LINE 6 switch lit. 2) Telephone Equipment Bay KTU Assembly lA9A7DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN6-M	Ten pulses at 10 pps.
8	a) Press OPERATOR-TELEPHONE LINE 7 switch	LN7-M	1) OPERATOR-TELEPHONE LINE 7 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A8DS1 lit. 3) -48 V
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN7-M	Ten pulses at 10 pps.
9	a) Press OPERATOR-TELEPHONE LINE 8 switch	LN8-M	1) OPERATOR-TELEPHONE LINE 8 switch lit. 2) Telephone Equipment Bay KTU Assembly lAgA9DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN8-M	Ten pulses at 10 pps.

Table 3-30. Operator B Outgoing Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
10	a) Press OPERATOR-TELEPHONE LINE 9 switch	LN9-M	1) OPERATOR-TELEPHONE LINE 9 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9AlODS1 lit. 3) -48 v
	b) Press DTMF keypad O key c) Press handset holder hook switch.	LN9-M	Ten pulses at 10 pps.
11	a) Press OPERATOR-TELEPHONE LINE 10 switch	LN10-M	1) OPERATOR-TELEPHONE LINE 10 switch lit. 2) Telephone Equipment Bay KTU Assembly lA9AllDS1 lit. 3) -48 V
	b) Press DTMF keypad O key c) Press handset holder hook switch.	LN10-M --	Ten pulses at 10 pps.
12	1) Press OPERATOR-TELEPHONE LINE 11 switch	LN11-M	1) OPERATOR-TELEPHONE LINE 11 switch lit. 2) Telephone Equipment Bay KTU Assembly lA9A12DS1 lit. 3) -48 v
	b) Press DTMF keypad 0 key c) Press handset holder hook switch.	LN11-M	Ten pulses at 10 pps.
13	a) Press OPERATOR-TELEPHONE LINE 12 switch	LN12-M	1) OPERATOR-TELEPHONE LINE 12 switch lit. 2) Telephone Equipment Bay KTU Assembly 1A9A13DS1 lit. 3) -48 V
	b) Press DTMF keypad 0 key c) Press handset holder hook switch	LN12-M	Ten pulses at 10 pps.

Table 3-31. Operator A Incoming Call Test (Only on Four-Wire Lines)

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	a) Connect LN1-E to ground Momentarily ground E Lead M(Note 1)	LNI-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 1 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 1 switch. Remove handset from holder.	LNI-M	1) -48 V
	c) Press handset holder hook switch.	LN1-M	1) Zero Volts
2	a) Connect LN2-E to ground (Note 1t)	LN2-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 2 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 2 switch. Remove handset from holder.	LN2-M	1) -48 V
	c) Press handset holder hook switch.	LN2-M	1) Zero Volts
3	a) Connect LN3-E to ground (Note 1)	LN3-M ground	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 3 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 3 switch. Remove handset from holder.	LN3-M	1) -48 V
	c) Press handset holder hook switch.	LN3-M	1) Zero Volts
4	a) Connect LN4-E to ground (Note 1)	LN4-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 4 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 4 switch. Remove handset from holder.	LN4-M	1) -48 V
	c) Press handset holder hook switch.	LN4-M	1) Zero Volts

Note 1. Momentarily Ground E Lead.

Table 3-31. Operator A Incoming Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
5	a) Connect LN5-E to ground (Note 1)	LN5-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 5 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 5 switch. Remove handset from holder.	LN5-M	1) -48 V
	c) Press handset holder hook switch.	LN5-M	1) Zero Volts
6	a) Connect LN6-E to ground (Note 1)	LN6-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 6 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 6 switch. Remove handset from holder.	LN6-M	1) -48 V
	c) Press handset holder hook switch.	LN6-M	1) Zero Volts
7	a) Connect LN7-E to ground (Note 1)	LN7-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 7 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 7 switch. Remove handset from holder.	LN7-M	1) -48 V
	c) Press handset holder hook switch.	LN7-M	1) Zero Volts
8	a) Connect LN8-E to ground (Note 1)	LN8-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 8 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 8 switch. Remove handset from holder.	LN8-M	1) -48V
	c) Press handset holder hook switch.	LN8-M	1) Zero Volts

Table 3-31. Operator A Incoming Call Test (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
9	a) Connect LN9-E to ground (Note 1)	LN9-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 9 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 9 switch. Remove handset from holder.	LN9-M	1) -48 V
	c) Press handset holder hook switch.	LN9-M	1) Zero Volts
10	a) Connect LN1O-E to ground (Note 1)	LNIO-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 10 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 10 switch. Remove handset from holder.	LNIO-M	1) -48 V
	c) Press handset holder hook switch.	1N10-M	1) Zero Volts
11	a) Connect LNII-E to ground (Note 1)	LN11-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 11 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 11 switch. Remove handset from holder.	LN11-M	1) -48 V
	c) Press handset holder hook switch.	LN11-M	1) Zero Volts
12	a) Connect LN12-E to ground	LN12-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 12 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 12 switch. Remove handset from holder.	LN12-M	1) -48 V
	c) Press handset holder hook switch.	LN12-M	1) Zero Volts

Table 3-32. Operator B Incoming Call Test (Only on Four-Wire Lines)

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	a) Connect LN1-E to ground (Note 1)	LN1-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 1 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 1 switch. Remove handset from holder.	LN1-M	1) -48 V
	c) Press handset holder hook switch.	LN1-M	1) Zero Volts
2	a) Connect LN2-E to ground (Note 1)	LN2-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 2 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 2 switch. Remove handset from holder.	LN2-M	1) -48 V
	c) Press handset holder hook switch.	LN2-M	1) Zero Volts
3	a) Connect LN3-E to ground (Note 1)	LN3-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 3 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 3 switch. Remove handset from holder.	LN3-M	1) -48 V
	c) Press handset holder hook switch.	LN3-M	1) Zero Volts
4	a) Connect LN4-E to ground (Note 1)	LN4-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 4 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 4 switch.	LN4-M	1) -48 V
	c) Press handset holder hook switch.	LN4-M	1) Zero Volts

NOTE 1. Momentary Ground E Lead.

Table 3-32. Operator B Incoming Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
5	a) Connect LN5-E to ground (Note 1)	LN5-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 5 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 5 switch. Remove handset from holder.	LN5-M	1) -48 V
	c) Press handset holder hook switch.	LN5-M	1) Zero Volts
6	a) Connect LN6-E to ground (Note 1)	LN6-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 6 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 6 switch. Remove handset from holder.	LN6-M	1) -48 V
	c) Press handset holder hook switch.	LN6-M	1) Zero Volts
7	a) Connect LN7-E to ground (Note 1)	LN7-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 7 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 7 switch. Remove handset from holder.	LN7-M	1) -48 V
	c) Press handset holder hook switch.	LN7-M	1) Zero Volts
8	a) Connect LN8-E (Note 1)	LN8-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 8 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 8 switch. Remove handset from holder.	LN8-M	1) -48 V
	c) Press handset holder hook switch.	LN8-M	1) Zero Volts

Table 3-32. Operator B Incoming Call Test (Only on Four-Wire Lines) (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
9	a) Connect LN9-E to ground (Note 1)	LN9-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 9 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 9 switch. Remove handset from holder.	LN9-M	1) -48 V
	c) Press handset holder hook switch.	LN9-M	1) Zero Volts
10	a) Connect LN1O-E to ground	LN10-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 10 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 10 switch. Remove handset from holder.	LN10-M	1) -48 V
	c) Press handset holder hook switch.	LN1O-M	1) Zero Volts
11	a) Connect LN11-E (Note 1)	LNII-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 11 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 11 switch. Remove handset from holder.	LN11-M	1) -48 V
	c) Press handset holder hook switch.	LN11-M	1) Zero Volts
12	a) Connect LN12-E to ground	LN12-M	1) Audible alarm sounds. 2) OPERATOR-TELEPHONE LINE 12 switch flashes. 3) Zero Volts
	b) Press OPERATOR-TELEPHONE LINE 12 switch.	LN12-M	1) -48 V
	c) Press handset holder hook switch.	LN12-M	1) Zero Volts

Table 3-33. Operator A Four-Wire Ringdown Control Check Connect Ringdown Option Straps to All Twelve Lines. Plug In Telephone Equipment Bay A2J1-5 and A3J1-6.

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	a) -- b) Press OPERATOR-TELEPHONE LINE 1 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN1 R1 and T1 -- --	-- 105 Vac for two seconds.
2	a) -- b) Press OPERATOR-TELEPHONE LINE 2 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN2 R1 and T1 -- --	-- 105 Vac for two seconds.
3	a) -- b) Press OPERATOR-TELEPHONE LINE 3 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN3 R1 and T1 -- --	-- 105 Vac for two seconds.
4	a) -- b) Press OPERATOR-TELEPHONE LINE 4 switch. Remove handset from holder. c) Press handset holder hook	TEL LN4 R1 and T1 -- --	-- 105 Vac for two seconds.
5	a) -- b) OPERATOR-TELEPHONE LINE 5 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN5 RI and TI -- --	-- 105 Vac for two seconds. --
6	a) -- b) Press OPERATOR-TELEPHONE LINE 6 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN6 R1 and T1 -- --	-- 105 Vac for two seconds.

Table 3-33. Operator A Four-Wire RIngdown Control Check Connect Ringdown Option Straps to All Twelve Lines. Plug In Telephone Equipment Bay A2J1-5 & A3J1-6 (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
7	a) -- b) Press OPERATOR-TELEPHONE LINE 7 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN7 R1 and T1 -- --	-- 105 Vac for two seconds.
8	a) -- b) Press OPERATOR-TELEPHONE LINE 8 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN8 R1 and T1 -- --	-- 105 Vac for two seconds.
9	a) -- b) Press OPERATOR-TELEPHONE LINE 9 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN9 R1 and T1 -- --	-- 105 Vac for two seconds.
10	a) -- b) Press OPERATOR-TELEPHONE LINE 10 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN10 R1 and T1 -- --	-- 105 Vac for two seconds.
11	a) -- b) Press OPERATOR-TELEPHONE LINE 11 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN11 R1 and T1 -- --	-- 105 Vac for two seconds.
12	a) -- b) Press OPERATOR-TELEPHONE LINE 12 switch. Remove handset from holder. c) Press handset holder hook switch.	TEL LN12 R1 T1 -- --	-- 105 Vac for two seconds.

Table 3-34. Operator A Incoming Four Wire Ringdown Test

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	a) Apply 105 Vac at TEL LN1 RI and T1	Access 105 Vac at CIG1A9 RG & RG1 for approximately 10 seconds.	OPERATOR-TELEPHONE LINE 1 switch lit.
	b) Remove 105 Vac		OPERATOR-TELEPHONE LINE 1 switch extinguishes after approximately 12 seconds.
2	a) Apply 105 Vac at TEL LN2 R1 and T1	--	OPERATOR-TELEPHONE LINE 2 switch lit.
	b) Remove 105 Vac		OPERATOR-TELEPHONE LINE 2 switch extinguishes after approximately 12 seconds.
3	a) Apply 105 Vac at TEL LN2Ri and T1	--	OPERATOR-TELEPHONE LINE 3 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 3 switch extinguishes after approximately 12 seconds.
4	a) Apply 105 Vac at TEL LN 4 R1 and T1	--	OPERATOR-TELEPHONE LINE 4 switch lit.
	b) Remove 105 Vac		OPERATOR-TELEPHONE LINE 4 switch extinguishes after approximately 12 seconds.
5	a) Apply 105 Vac at TEL LN5 R1 and T1	--	OPERATOR-TELEPHONE LINE 5 switch lit.
	b) Remove 105 Vac		OPERATOR-TELEPHONE LINE 5 switch extinguishes after approximately 12 seconds.
6	a) Apply 105 Vac at TEL LN6 R1 and T1	--	OPERATOR-TELEPHONE LINE 6 switch lit.
	b) Remove 105 Vac switch extinguishes after approximately 12 seconds.		OPERATOR-TELEPHONE LINE 6
7	a) Apply 105 Vac at TEL LN7 R1 and T1	--	OPERATOR-TELEPHONE LINE 7 switch lit.
	b) Remove 105 Vac		OPERATOR-TELEPHONE LINE 7 switch extinguishes after approximately 12 seconds.

Table 3-34. Operator A Incoming Four-Wire Ringdown Test (Cont)

Step	Action	Connect VTVM At	Normal Indication (dBm)
8	a) Apply 105 Vac at TEL LN8 RI and T1 b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 8 switch lit. OPERATOR-TELEPHONE LINE 8 switch extinguishes after approximately 12 seconds.
9	a) Apply 105 Vac at TEL LN9 R1 and T1 b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 9 switch lit. OPERATOR-TELEPHONE LINE 9 switch extinguishes after approximately 12 seconds.
10	a) Apply 105 Vac at TEL LN10 R1 and TI b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 10 switch lit. OPERATOR-TELEPHONE LINE 10 switch extinguishes after approximately 12 seconds.
11	a) Apply 105 Vac at TEL LN11 R1 and T1 b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 11 switch lit. OPERATOR-TELEPHONE LINE 11 switch extinguishes after approximately 12 seconds.
12	a) Apply 105 Vac at TEL LN12 RI and T1 b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 12 switch lit. OPERATOR-TELEPHONE LINE 12 switch extinguishes after approximately 12 seconds.

Table 3-35. Operator B Incoming Four-Wire Ringdown Test

Step	Action	Connect VTVM At	Normal Indication (dBm)
1	a) Apply 105 Vac at TEL LN1 R1 and T1	--	OPERATOR-TELEPHONE LINE 1 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 1 switch extinguishes after approximately 12 seconds.
2	a) Apply 105 Vac at TEL LN2 R1 and T1	--	OPERATOR-TELEPHONE LINE 2 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 2 switch extinguishes after approximately 12 seconds.
3	a) Apply 105 Vac at TEL LN3 R1 and T1	--	OPERATOR-TELEPHONE LINE 3 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 3 switch extinguishes after approximately 12 seconds.
4	a) Apply 105 Vac at TEL LN4 R1 and T1	--	OPERATOR-TELEPHONE LINE 4 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 4 switch extinguishes after approximatly 12 seconds.
5	a) Apply 105 Vac at TEL LN5 R1 and T1	--	OPERATOR-TELEPHONE LINE 5 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 5 switch extinguishes after approximately 12 seconds.
6	a) Apply 105 Vac at TEL LN6 R1 and T1	--	OPERATOR-TELEPHONE LINE 6 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 6 switch extinguishes after approximately 12 seconds.
7	a) Apply 105 Vac at TEL LN7 R1 and T1	--	OPERATOR-TELEPHONE LINE 7 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 7 switch extinguishes after approximately 12 seconds.

Table 3-35. Operator B Incoming Four-Wire Ringdown Test

Step	Action	Connect VTVM At	Normal Indication (dBm)
8	a) Apply 105 Vac at TEL LN8 RI and T1	--	OPERATOR-TELEPHONE LINE 8 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 8 switch extinguishes after approximately 12 seconds.
9	a) Apply 105 Vac at TEL LN9 R1 and T1	--	OPERATOR-TELEPHONE LINE 9 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 9 switch extinguishes after approximately 12 seconds.
10	a) Apply 105 Vac at TEL LN10 RI and T1	--	OPERATOR-TELEPHONE LINE 10 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 10 switch extinguishes after approximately 12 seconds.
11	a) Apply 105 Vac at TEL LN11 R1 and T1	--	OPERATOR-TELEPHONE LINE 11 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 11 switch extinguishes after approximately 12 seconds.
12	a) Apply 105 Vac at TEL LN12 R1 and T1	--	OPERATOR-TELEPHONE LINE 12 switch lit.
	b) Remove 105 Vac	--	OPERATOR-TELEPHONE LINE 12 switch extinguishes after approximately 12 seconds.

Table 3-36. Four-Wire Ringdown Receive Line Gain Adjustments

Step	dBm, 1 kHz Signal Applied To	Subassembly Control Interface Group	Connect VTVM At	Make Adjustment At	Normal Indication (dBm)
1	TEL LN1 T1 and R1	1A5A1	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
2	TEL LN2 T1 and Ri	1A5A2	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
3	TEL LN3 T1 and R1	1A5A3	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
4	TEL LN4 T1 and R1	1A5A4	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
5	TEL LN5 T1 and R1	1A5A5	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
6	TEL LN6 T1 and R1	1A5A6	2W-4W Repeater T and R Jacks	RCV LEVEL	***-1*** +.5 dB
7	TEL LN7 T1 and R1	1A5A7	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
8	TEL LN8 T1 and R1	1A5A8	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
9	TEL LN9 T1 and R1	1A5A9	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
10	TEL LN10 T1 and R1	1A5A10	2W-4W Repeater T and R Jacks	RCV LEVEL	***-1*** +.5 dB
11	TEL LN11 T1 and R1	1A5A11	2W-4W Repeater T and R Jacks	RCV LEVEL	-1 +.5 dB
12	TEL LN12 T1 and R1	1A5A12	2W-4W Repeater T and R Jacks	RCV LEVEL	***-1*** +.5 dB

Table 3-37. Four-Wire Ringdown Transmit Line Gain Adjustments

Step	dBm, 1 kHz Signal Applied To	Subassembly Control Interface Group	Connect VTVM At	Make Adjustment At	Normal Indication (dBm)
1	2W-4W Repeater T and R Jacks (Bridging	1A5A1	TEL LN1 T and R	XMT LEVEL	-1 +.5 dB
2	2W-4W Repeater T and R Jacks (Bridging Measurements)	1A5A2	TEL LN2 T and R	XMT LEVEL	-1 +.5 dB
3	2W-4W Repeater T and R Jacks (Bridging Measurements)	1A5A3	TEL LN3 T and R	XMT LEVEL	-1 +.5 dB
4	2W-4W Repeater T and R Jacks (Bridging Measurements)	1A5A4	TEL LN4 T and R	XMT LEVEL	-1 +.5 dB
5	2W-4W Repeater T and R Jacks (Bridging Measurements)	1A5A5	TEL LN5 T and R	XMT LEVEL	-1 +.5 dB
6	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5A6	TEL LN6 T and R	XMT LEVEL	-1 +.5 dB
7	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5A7	TEL LN7 T and R	XMT LEVEL	-1 +.5 dB
8	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5A8	TEL LN8 T and R	XMT LEVEL	-1 +.5 dB
9	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5A9	TEL LN9 T and R	XMT LEVEL	-1 ***+.5*** dB

Table 3-37. Four-Wire Ringdown Transmit Line Gain Adjustments (Cont)

Step	dBm, 1 kHz Signal Applied To	Subassembly Control Interface Group	Connect VTVM At	Make Adjustment At	Normal Indication (dBm)
10	2W-4W Repeater T and R Jacks (Bridging Measurement)	lA5AO10	TEL LN10 T and R	XMT LEVEL	-1 +.5 dB
11	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5AII	TEL LN11 T and R	XMT LEVEL	-1 +.5 dB
12	2W-4W Repeater T and R Jacks (Bridging Measurement)	1A5A12	TEL LN12 T and R	XMT LEVEL	-1 +.5 dB

Note 1: Connect Transmission Test Set HP3551A "SEND" to 7441 "'T & "'R" jacks. Next connect the REC BRDG to the 7441 "T & "R" jacks. Adjust the HP3551A output for O dBm, 1 kHz. Disconnect the REC BRDG from the 7441. Change the HP3551A to REC TERM and connect it to CIGRIA Punch Block Pair for the Line under test.

Table 3-38. Transmission Talk Test

Step	Action	Normal Indication
1	a) Patch 1A7 Audio Patch Panel RX1 to TX2 and TX1 to RX2.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 1 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 2 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 2 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
2	a) Patch 1A7 Audio Patch Panel RX2 to TX3 and TX2 to RX3.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 2 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 3 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 3 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
3	a) Patch 1A7 Audio Patch Panel RX3 to TX4 and TX3 to RX4.	
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE **3** switch at operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 4 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 4 switch at Operator B position.	Communication between Operator A and Operator B positions is possible
4	a) Patch 1A7 Audio Patch Panel RX4 to TX5 and TX4 to RX5.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 4 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 5 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 5 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.

Table 3-38. Transmission Talk Test (Cont)

Step	Action	Normal Indication
5	a) Patch 1A7 Audio Patch Panel RX5 to TX6 and TX5 to RX6.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 5 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 6 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 6 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
6	a) Patch 1A7 Audio Patch Panel RX6 to TX7 and TX6 to RX7.	
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 7 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 7 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 7 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
7	a) Patch 1A7 Audio Patch Panel RX7 to TX8 and TX7 to RX8.	--
	b) Remove handset from holder at Operation A position. Press OPERATOR-TELEPHONE LINE 7 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 8 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 8 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
8	a) Patch 1A7 Audio Patch Panel RX8 to TX9 and TX8 to RX9.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 8 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 9 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 9 switch at Operator B position.	Communication between Operator A and Operator B positions is possible

Table 3-38. Transmission Talk Test (Cont)

Step	Action	Normal Indication
9	a) Patch 1A7 Audio Patch Panel RX9 to TX1O and TX9 to RXIO.	
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 9 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 10 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 10 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
10	a) Patch 1A7 Audio Patch Panel RX10 to TX11 and TX10 to RX11.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 10 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 11 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 11 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.
11	a) Patch 1A7 Audio Patch Panel RX11 to TX12 and TX11 to RX12.	--
	b) Remove handset from holder at Operator A position. Press OPERATOR-TELEPHONE LINE 11 switch at Operator A position.	Operator A and Operator B OPERATOR-TELEPHONE LINE 12 switch lit.
	c) Remove handset from holder at Operator B position. Press OPERATOR-TELEPHONE LINE 12 switch at Operator B position.	Communication between Operator A and Operator B positions is possible.

Table 3-39. Operator A Relay 3A5A1A8A

Step	Action	Normal Indication
1	Connect ringdown option straps for two-wired operation for lines one through six.	--
2	Press RADIO-TELEPHONE LINE 1 switch.	Relay 3A5A1A8A operates
3	Press RADIO-TELEPHONE LINE 2 switch.	Relay 3A5A1A8A operates.
4	Press RADIO-TELEPHONE LINE 3 switch.	Relay 3A5A1A8A operates.
5	Press RADIO-TELEPHONE LINE 4 switch.	Relay 3A5A1A8A operates.
6	Press RADIO-TELEPHONE LINE 5 switch.	Relay 3A5A1A8A operates.
7	Press RADIO-TELEPHONE LINE 6 switch.	Relay 3A5A1A8A operates.

Table 3-40. Operator B Relay 3A5A2A8A Check

Step	Action	Normal Indication
1	Connect ringdown option straps for two-wired operation for lines one through six.	--
2	Press RADIO-TELEPHONE LINE 1 switch.	Relay 3A5A2A8A operates.
3	Press RADIO-TELEPHONE LINE 2 switch.	Relay 3A5A2A8A operates.
4	Press RADIO-TELEPHONE LINE 3 switch.	Relay 3A5A2A8A operates.
5	Press RADIO-TELEPHONE LINE 4 switch.	Relay 3A5A2A8A operates.
6	Press RADIO-TELEPHONE LINE 5 switch.	Relay 3A5A2A8A operates.
7	Press RADIO-TELEPHONE LINE 6 switch	Relay 3A5A2A8A operates.

Table 3-41. Operator A 3A5A1A6 Two-Wire Radio/Telephone Line Test

Step	Action	Select Radio/ Telephone Line at 1A3	0 dBm, 1 kHz Signal Applied To CIGlA1 Punch Block Pair or To CCC3A5A1A6 Jack	Connect HP3551A Rec Term to CCC 3A5A1A6 Jack or To CIG1A1 Punch	Make Adjustment At CCC3A5A1A6	Normal Indication (dBm)
1	a) Set 3A5A1A6 Line Amplifier RCV LO-HI switch 51 to LO. b) Set 3A5AIA6 Line Amplifier XMT LO-HI switch S2 to LO.					
2	Set 3A5A1A6 XMT EQUAL maximum ccw.	--	--	--	--	--
3	--	1	1	XMT LINE	LEVEL XMT	ZERO +1 dB
4	--	2	3	XMT LINE	--	ZERO +1 dB
5	--	3	5	XMT LINE	--	ZERO +1 dB
6	--	4	7	XMT LINE	--	ZERO +1 dB
7	--	5	9	XMT LINE	--	ZERO +1 dB
8	--	6	11	XMT LINE	--	ZERO +1 dB
9	Set 3A5A1A6 RCV EQUAL maximum ccw.	--	--	-	--	--
10	--	1	RCV LINE	1	LEVEL RCV	ZERO +1 dB
11	--	2	RCV LINE	3	--	ZERO +1 dB
12	--	3	RCV LINE	5	--	ZERO +1 dB
13	--	4	RCV LINE	7	--	ZERO +1 dB
14	--	5	RCV LINE	9	--	ZERO +1 dB
15	--	6	RCV LINE	11	--	ZERO +1 dB

Table 3-42. Operator B 3A5A2A6 Two-Wire Radio/Telephone Line Test

Step	Action	Select Radio/ Telephone Line at 1A3	0 dBm, 1 kHz Signal Applied To CIGlA1 Punch Block Pair or To CCC3A5A1A6 Jack	Connect HP3551A Rec Term to CCC 3A5A1A6 Jack or To CIG1A1 Punch	Make Adjustment At CCC3A5A1A6	Normal Indication (dBm)
1	a) Set 3A5A2A6 Line Amplifier RCV LO-HI switch 51 to LO. b) Set 3A5A2A6 Line Amplifier XMT LO-HI switch S2 to LO.					
2	Set 3A5A2A6 XMT EQUAL maximum ccw.					
3	--	1	1	XMT LINE	LEVEL XMT	ZERO +1 dB
4	--	2	3	XMT LINE	--	ZERO +1 dB
5	--	3	5	XMT LINE	--	ZERO +1 dB
6	--	4	7	XMT LINE	--	ZERO +1 dB
7	--	5	9	XMT LINE	--	ZERO +1 dB
8	--	6	11	XMT LINE	--	ZERO +1 dB
9	Set 3A5A2A6 RCV EQUAL maximum ccw.	--	--	--		
10	--	1	RCV LINE	1A1-1	LEVEL RCV	ZERO +1 dB
11	--	2	RCV LINE	1A1-3	--	ZERO +1 dB
12	--	3	RCV LINE	1A1-5	--	ZERO +1 dB
13	--	4	RCV LINE	1A1-7	--	ZERO +1 dB
14	--	5	RCV LINE	1A1-9	--	ZERO +1 dB
15	--	6	RCV LINE	1A1-11	--	ZERO +1 dB

Table 3-43. Operator A Two-Wire Telephone Line Test

Step	Action	Normal Indication
1	a) Dial OPERATOR-TELEPHONE LINE 1 from outside line telephone	OPERATOR-TELEPHONE LINE 1 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 1 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 1 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 1 switch.	
	e) Dial outside line telephone via DTMF keypad.	Outside line telephone line rings.
2	a) Dial OPERATOR-TELEPHONE LINE 2 from outside line telephone	OPERATOR-TELEPHONE LINE 2 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 2 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 2 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 2 switch.	
	e) Dial outside line telephone via DTMF keyboard.	Outside Line telephone line rings.
3	a) Dial OPERATOR-TELEPHONE LINE 3 from outside line telephone	OPERATOR-TELEPHONE LINE 3 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 3 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 3 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 3 switch.	
	e) Dial outside line telephone via DTMF keypad.	Outside line telephone line rings.
4	a) Dial OPERATOR-TELEPHONE LINE 4 from common-battery telephone	OPERATOR-TELEPHONE LINE 4 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 4 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 4 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE -4 switch.	
	d) Dial outside line telephone via DTMF keyboard.	Outside line telephone rings.

Table 3-43. Operator A Two-Wire Telephone Line Test (Cont)

Step	Action	Normal Indication
5	a) Dial OPERATOR-TELEPHONE LINE 5 from outside line telephone	OPERATOR-TELEPHONE LINE 5 switch lit. Sonalert activated.
	b) Press HOLD switch flashes.	OPERATOR-TELEPHONE LINE 5 switch
	c) Hang up outside line telephone extinguishes.	OPERATOR-TELEPHONE LINE 5 switch
	d) Press OPERATOR-TELEPHONE LINE 5 switch.	
	e) Dial outside line telephone via DTMF keypad.	Outside Line telephone line rings.
6	a) Dial OPERATOR-TELEPHONE LINE 6 from outside line telephone	OPERATOR-TELEPHONE LINE 6 switch lit. Sonalert activated.
	b) Press HOLD switch flashes.	OPERATOR-TELEPHONE LINE 6 switch
	c) Hang up outside line telephone extinguishes.	OPERATOR-TELEPHONE LINE 6 switch
	d) Press OPERATOR-TELEPHONE LINE 6 switch.	--
	e) Dial outside line telephone via DTMF keyboard.	Outside line telephone rings.

Table 3-44. Operator B Two-Wire Telephone Line Test

Step	Action	Normal Indication
1	a) Dial OPERATOR-TELEPHONE LINE 1 from outside line telephone	OPERATOR-TELEPHONE LINE 1 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 1 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 1 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 1 switch.	
	e) Dial outside line telephone via DTMF keypad.	Outside line telephone line rings.
2	a) Dial OPERATOR-TELEPHONE LINE 2 from outside line telephone	OPERATOR-TELEPHONE LINE 2 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 2 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 2 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 2 switch.	
	e) Dial outside line telephone via DTMF keyboard.	Outside line telephone line rings.
3	a) Dial OPERATOR-TELEPHONE LINE 3 from outside line telephone	OPERATOR-TELEPHONE LINE 3 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 3 switch flashes.
	c) Hang up outside line telephone	OPERATOR-TELEPHONE LINE 3 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 3 switch.	
	e) Dial outside line telephone via DTMF keyboard.	Outside line telephone line rings.
4	a) Dial OPERATOR-TELEPHONE LINE 4 from outside line telephone	OPERATOR-TELEPHONE LINE 4 switch lit. Sonalert activated.
	b) Press HOLD switch	OPERATOR-TELEPHONE LINE 4 switch flashes.
	c) Hangup outside line telephone	OPERATOR-TELEPHONE LINE 4 switch extinguishes.
	d) Press OPERATOR-TELEPHONE LINE 4 switch.	
	e) Dial outside line telephone via DTMF keyboard.	Outside line telephone line rings.

Table 3-44. Operator B Two-Wire Telephone Line Test (Cont)

Step	Action	Normal Indication
5	a) Dial OPERATOR-TELEPHONE LINE 5 from outside line telephone b) Press HOLD switch c) Hang up outside line telephone d) Press OPERATOR-TELEPHONE LINE 5 switch. e) Dial outside line telephone via DTMF keyboard.	OPERATOR-TELEPHONE LINE 5 switch lit. Sonalert activated. OPERATOR-TELEPHONE LINE 5 switch flashes. OPERATOR-TELEPHONE LINE 5 switch extinguishes. Outside line telephone line rings.
6	a) Dial OPERATOR-TELEPHONE LINE 6 from outside line telephone b) Press HOLD switch c) Hang up outside line telephone d) Press OPERATOR-TELEPHONE LINE 6 switch. e) Dial outside line telephone via DTMF keyboard.	OPERATOR-TELEPOHONE LINE 6 switch lit. Sonalert activated. OPERATOR-TELEPHONE LINE 6 switch flashes. OPERATOR-TELEPHONE LINE 6 switch extinguishes. Outside line telephone line rings.

Table 3-45. Intercom Test

Step	Action	Normal Indication
1	a) Press Operator A ICOM switch Press 2 on Operator A DTMF keypad. b) Communicate with Operator B via handset	Bell at Operator B position rings. Communication is possible between Operator A and Operator B.

Table 3-46. Lamp Test

Step	Action	Normal Indication
1	Connect Operator A J13-7 to Operator A J13-6	All Operator A OPERATOR-TELEPHONE LINE switches lit.
2	Connect Operator A J13-7 to Operator A J13-18	All Operator A OPERATOR-TELEPHONE LINE switches lit.
3	Connect Operator B J14-7 to Operator B J14-6	All Operator B RADIO-TELEPHONE LINE switches lit.
4	Connect Operator B J14-7 to Operator B J14-18	All Operator B OPERATOR-TELEPHONE LINE switches lit.

Table 3-47. Combination Pickup Relay and Station Circuit Test

Step	Action	Normal Indication
1	a) Install 405 card on extender Press Operator A RADIO-TELEPHONE LINE switch. Remove Operator A LINE switch. Remove Operator A handset from holder	1) Relay 3A5A1A111PU1 and relay 3A5A1A11PU2 operate. 2) 1A3 telephone switch/dial panel four-wire relay operates.
	b) Press push-to-talk switch on Operator A handset.	1) Relay 3A5A1A11PT operates.
	c) Press 5-5-5 on Operator A DTMF keypad.	1) Relay 3A5A1A11TB pulses.
	d) Speak into handset present at J11-13, 15.	1) Audio output from handset is
	e) Apply 0 dBm, 1 kHz signal at J11-33, 39	1) 0 dBm, 1 kHz signal is audible at handset.
2	a) Press Operator B RADIO-TELE-PHONE LINE 1 switch. Remove Operator B handset from holder.	1) Relay 3A5A2A11PU1 and relay 3A5A2A11PU2 operate. 2) 4A3 telephone switch/dial panel four-wire relay operates.
	b) Press push-to-talk switch on Operator B handset.	1) Relay 3A5A2A11PT operates.
	c) Press 5-5-5 on Operator B DTMF keypad.	1) Relay 3A5A2A11TB pulses.
	d) Speak into handset present at J11-13, 15.	1) Audio output from handset is
	e) Apply 0 dBm, 1 kHz signal at J11-33, 39	1) 0 dBm, 1 kHz signal is audible at handset.

Table 3-48. Four-Wire Line Termination Test

Step	Action	Normal Indication
1	Speak into Operator A handset Adjust 3A5A1A10 SIDE TONE LEVEL for desired sidetone level in earpiece of Operator A handset.	Sidetone Output is audible in earpiece of Operator A handset.
2	Speak into Operator B handset Adjust 3A5A2A10 SIDE TONE LEVEL for desired sidetone level in earpiece of Operator B handset.	Sidetone output is audible in earpiece of Operator B handset.

Table 3-49. 401 Card

Step	Action	Normal Indication
1	a) Set 3A5A1A9 XMT LO-HI switch S2 to HI. b) Set 3A5A1A9 RCV LO-HI switch S1 to LO.	
2	a) Connect VTVM for terminated measurement at J13-3, 15. b) Speak into Operator A handset. Adjust 3A5A1A9 LEVEL XMT.	Nominal zero dBm.
3	a) Apply 0 dBm, 1 kHz signal at J13-4, 16. Adjust 3A5A1A9 LEVEL RCV.	O dBm
4	Set 3A5A1A9 XMT EQUAL maximum ccw ccw.	--
5	Set 3A5A1A9 RCV EQUAL maximum cCW.	
6	a) Set 3A5A2A9 XMT LO-HI switch S2 to HI. b) Set 3A5A2A9 RCV LO-HI switch S1 to LO.	
7	a) Connect VTVM for terminated measurement at J14-3, 15. b) Speaker into Operator B handset. Adjust 3A5A2A9 LEVEL XMT.	Nominal zero dBm
8	a) Apply 0 dBm, I kHz signal at J14-4, 16. Adjust 3A5A2A9 LEVEL RCV.	O dBm
9	Set 3A5A2A9 XMT EQUAL maximum ccw.	--
10	Set 3A5A2A9 RCV EQUAL maximum ccw.	

Table 3-50. Operator A Transfer Relay 24V Assemble Relay C Check

Step	Action	Normal Indication
1	Remove handset from holder Press RADIO-TELEPHONE LINE 1 switch.	Relay 3A5A1A8C operates.
2	Press RADIO-TELEPHONE LINE 2 switch.	Relay 3A5A1A8C operates.
3	Press RADIO-TELEPHONE LINE 3 switch.	Relay 3A5AlA8C operates.
4	Press RADIO-TELEPHONE LINE 4 switch.	Relay 3A5A1A8C operates.
5	Press RADIO-TELEPHONE LINE 5 switch.	Relay 3A5A1A8C operates.
6	Press RADIO-TELEPHONE LINE 6 switch.	Relay 3A5AIA8C operates.
7	Press RADIO-TELEPHONE LINE 7 switch.	Relay 3A5AlA8C operates.
8	Press RADIO-TELEPHONE LINE 8 switch.	Relay 3A5AlA8C operates.
9	Press RADIO-TELEPHONE LINE 9 switch.	Relay 3A5AlA8C operates.
10	Press RADIO-TELEPHONE LINE 10 switch.	Relay 3A5AlA8C operates.
11	Press RADIO-TELEPHONE LINE 11 switch.	Relay 3A5A1A8C operates.
12	Press RADIO-TELEPHONE LINE 12 switch.	Relay 3A5AlA8C operates.

Table 3-51. Operator B Transfer Relay 24V Assembly Relay C Check

Step	Action	Normal Indication
1	Remove handset from holder Press RADIO-TELEPHONE LINE 1 switch.	Relay 3A5A2A8C operates.
2	Press RADIO-TELEPHONE LINE 2 switch.	Relay 3A5A2A8C operates.
3	Press RADIO-TELEPHONE LINE 3 switch.	Relay 3A5A2A8C operates.
4	Press RADIO-TELEPHONE LINE 4 switch.	Relay 3A5A2A8C operates.
5	Press RADIO-TELEPHONE LINE 5 switch.	Relay 3A5A2A8C operates.
6	Press RADIO-TELEPHONE LINE 6 switch.	Relay 3A5A2A8C operates.
7	Press RADIO-TELEPHONE LINE 7 switch.	Relay 3A5A2A8C operates.
8	Press RADIO-TELEPHONE LINE 8 switch.	Relay 3A5A2A8C operates.
9	Press RADIO-TELEPHONE LINE 9 switch.	Relay 3A5A2A8C operates.
10	Press RADIO-TELEPHONE LINE 10 switch.	Relay 3A5A2A8C operates.
11	Press RADIO-TELEPHONE LINE 11 switch.	Relay 3A5A2A8C operates.
12	Press RADIO-TELEPHONE LINE 12 switch.	Relay 3A5A2A8C operates.

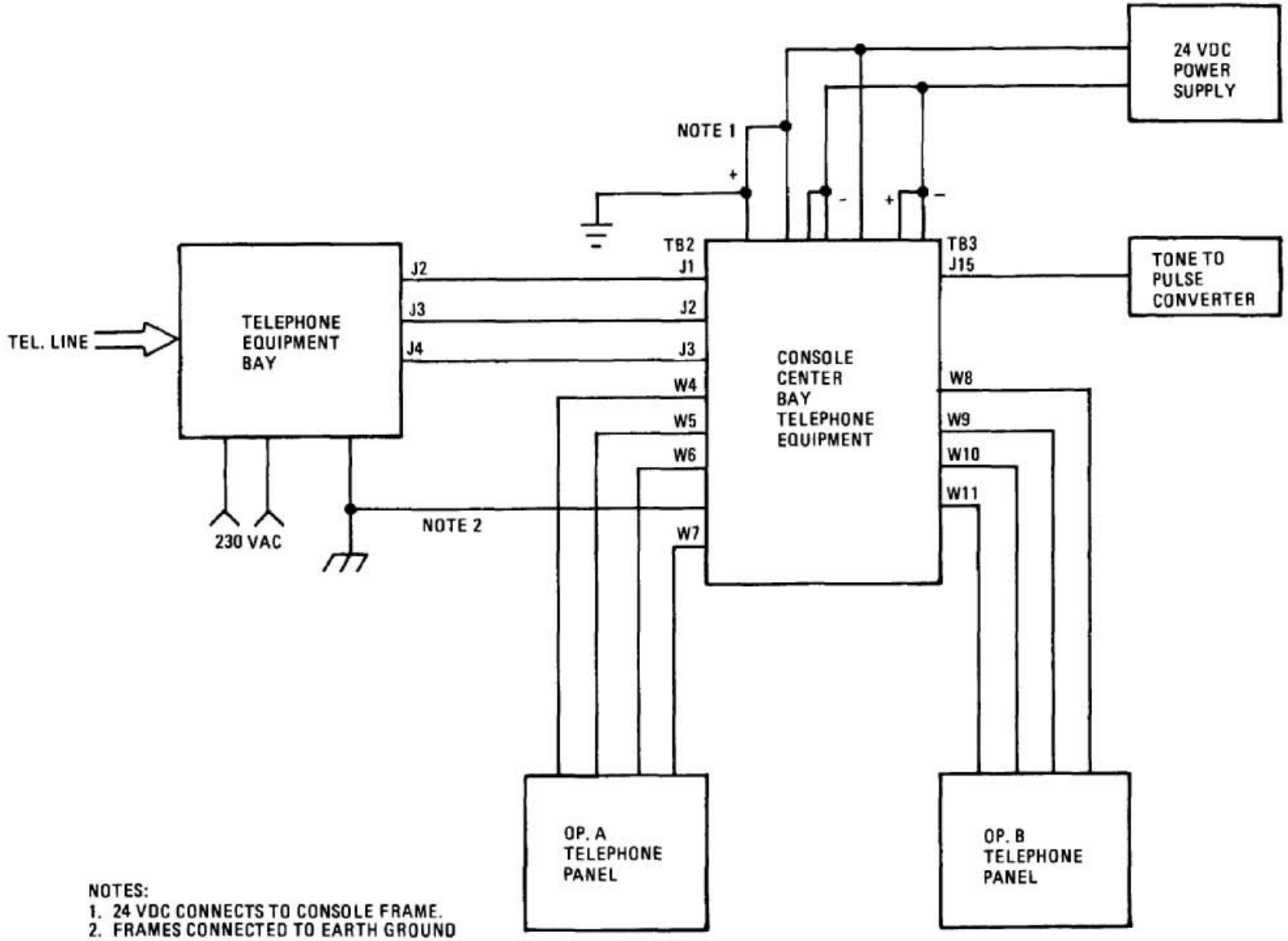


Figure 3-47. Control Interface Group and Console Telephone Equipment Test Configurations

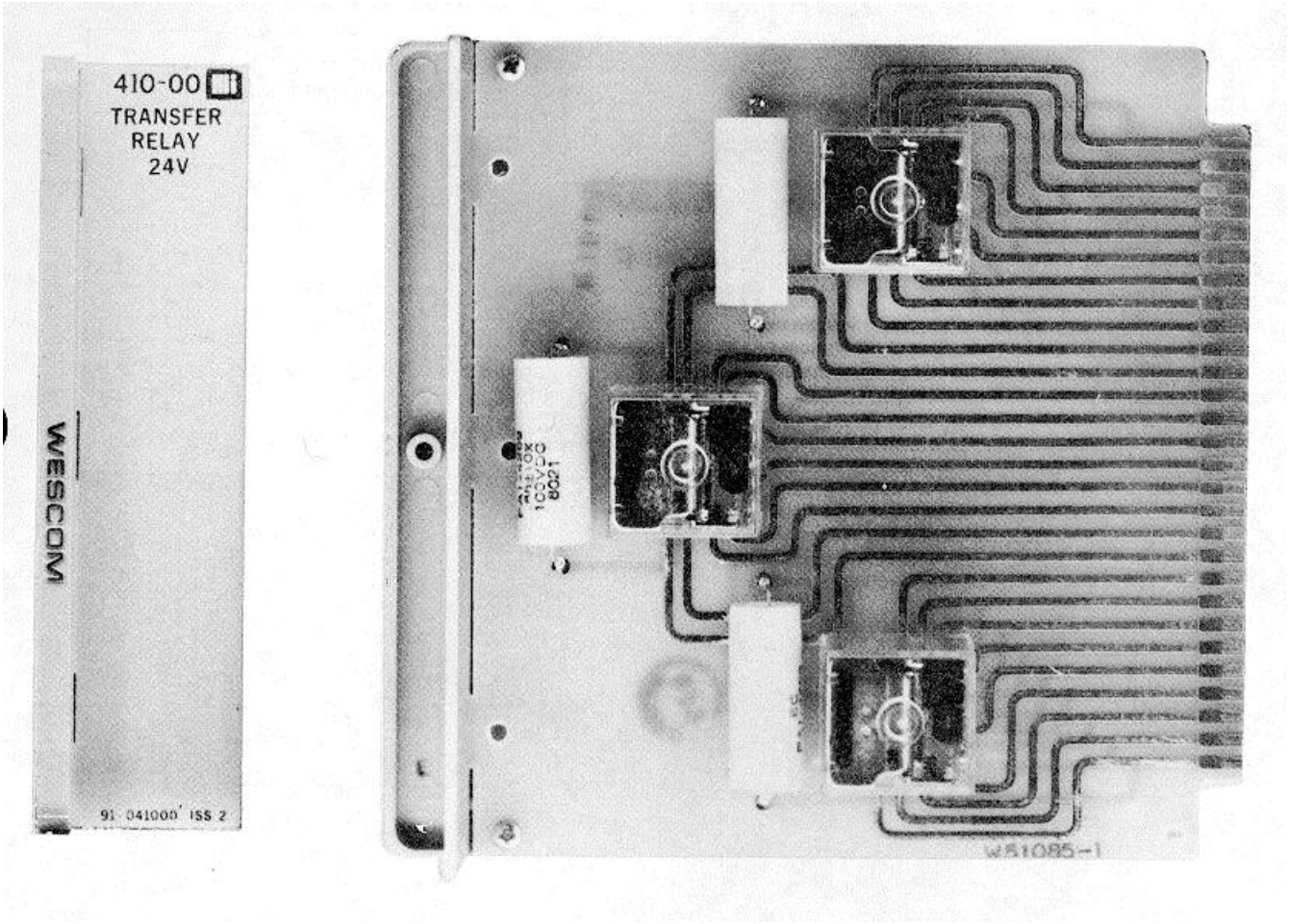


Figure 3-48. 3A5A1A1-A4 and A8, and 3A5A2A1-A4 and A8 Transfer Relay 24V Component Locations

3-14. +12 VDC POWER SUPPLY ADJUSTMENT

Table 3-52 is the adjustment procedure for both +12 Vdc power supplies in the Communication Control Console.

3-15. -24 VDC POWER SUPPLY ADJUSTMENT

Table 3-53 is the adjustment procedure for both +24 Vdc power supplies in the Communication Control Console.

Table 3-52. +12 Vdc Power Supply Adjustment

Step	Assembly/ Subassembly	Test Point and/ or Adjustment	Normal Indication
1	CCC1PS2	Connect VTVM to TB1 + & - adjust voltage adjust	+12 Vdc +.5 Vdc
1	CCC4PS2	Connect VTVM to TB1 + & - adjust voltage adjust	+12 Vdc +.5 Vdc

Table 3-53. -24 Vdc Power Supply Adjustment

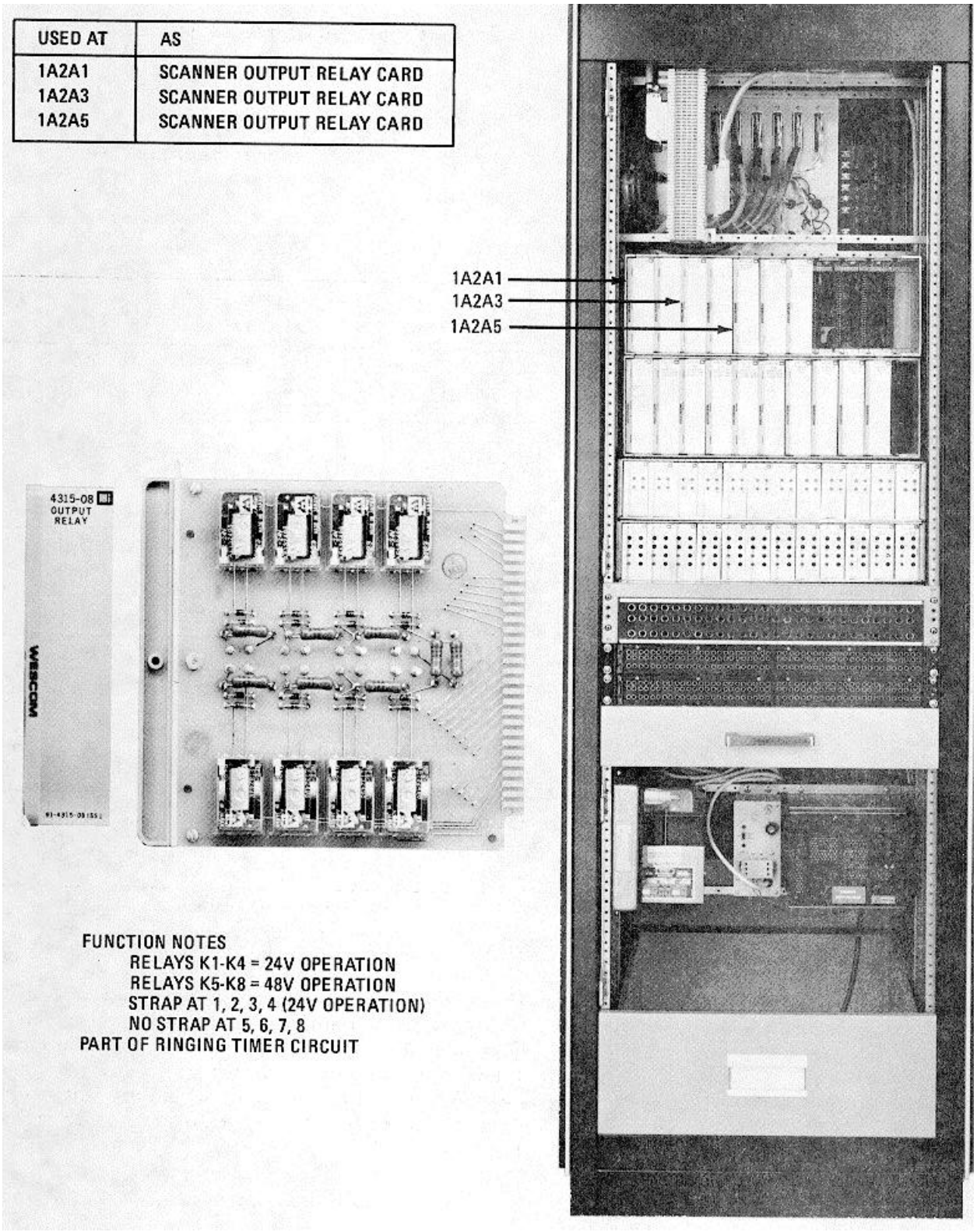
Step	Assembly/ Subassembly	Test Point and/ or Adjustment	Normal Indication
1	CCC1PS1	Connect VTVM to TB1 + & - adjust voltage adjust	-24 Vdc +.5 Vdc
2	CCC4PS1	Connect VTVM to TB1 + & - adjust voltage adjust	-24 Vdc +.5 Vdc

3-16. SUBASSEMBLY SUPPORT INFORMATION

Figures 3-49 through 3-70 give support information for Console and Common Equipment Bay subassemblies Wescom units with 7052-XXXX numbers have been modified for use in this system. Figures for these units are included in numerical order by the 7052 prefix part number. All unmodified units follow in numerical order by their Wescom designator. When units are replaced, verify strapping or other option selection modifications are completed as shown prior to installation. Table 3-54 is a tabular listing of these assemblies.

7052-7100
WESCOM 4315-0 OUTPUT RELAY ASSEMBLY

USED AT	AS
1A2A1	SCANNER OUTPUT RELAY CARD
1A2A3	SCANNER OUTPUT RELAY CARD
1A2A5	SCANNER OUTPUT RELAY CARD



FUNCTION NOTES
RELAYS K1-K4 = 24V OPERATION
RELAYS K5-K8 = 48V OPERATION
STRAP AT 1, 2, 3, 4 (24V OPERATION)
NO STRAP AT 5, 6, 7, 8
PART OF RINGING TIMER CIRCUIT

Figure 3-49. Output Relay Assembly

7052-7101
WESCOM 7392 DUAL E&M/20 TO SIG LEAD CONVERTER

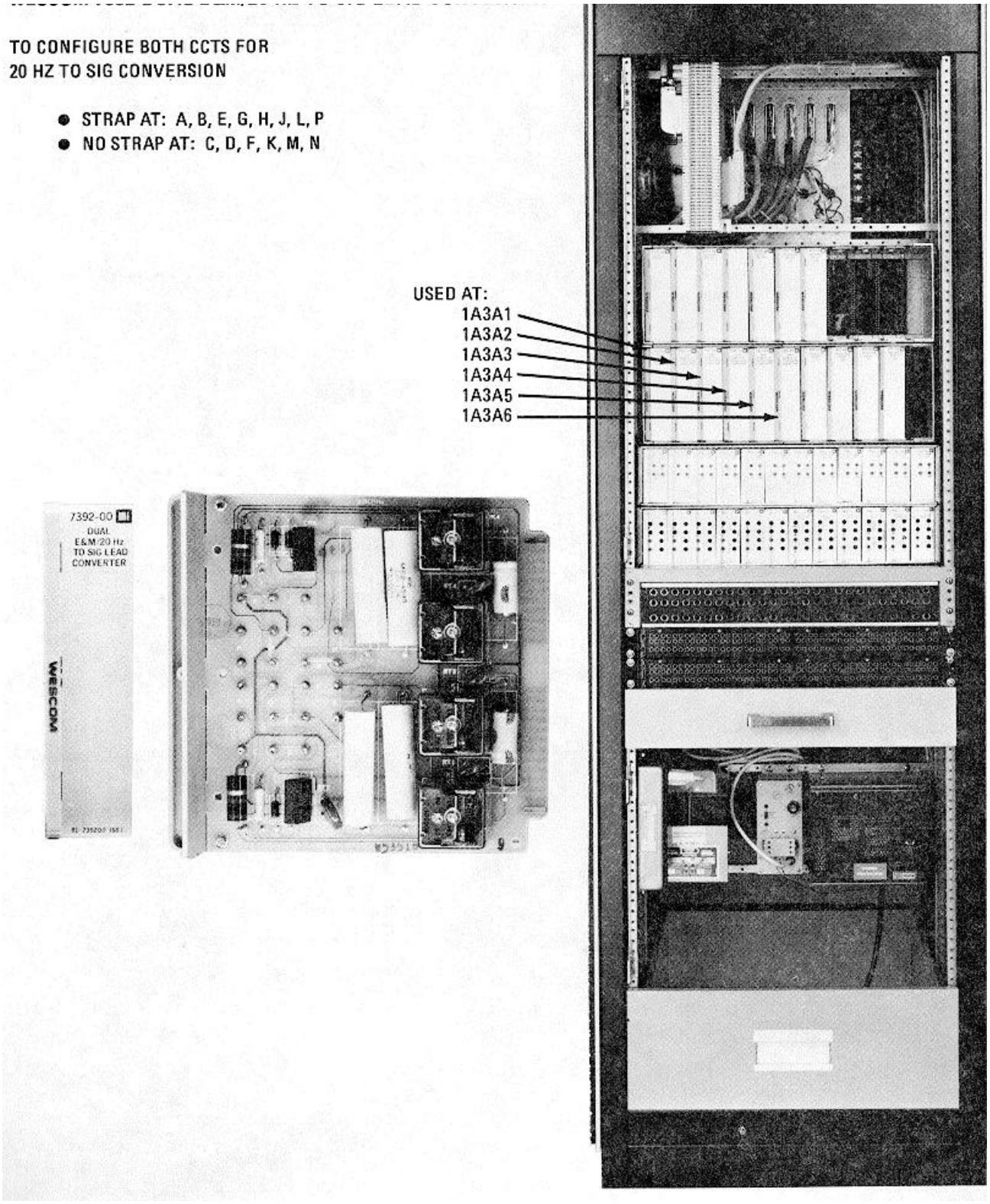


Figure 3-50. Dual E&M/20 Hz to Sig Lead Converter

7052-7102
LOOP TO E&M DIAL LONG LINE STATION END MODULE
WESCOM 7361-00

SETUP

SRG: OPEN (UP 1 TURN)
LS: CLOSED (DOWN)
S1: NORMAL
S2: GRD BUSY

PURPOSE

GROUNDED RING GEN
LOOP START
NORMAL T-R POLARITY
E-LEAD GROUNDED WHEN BUSY

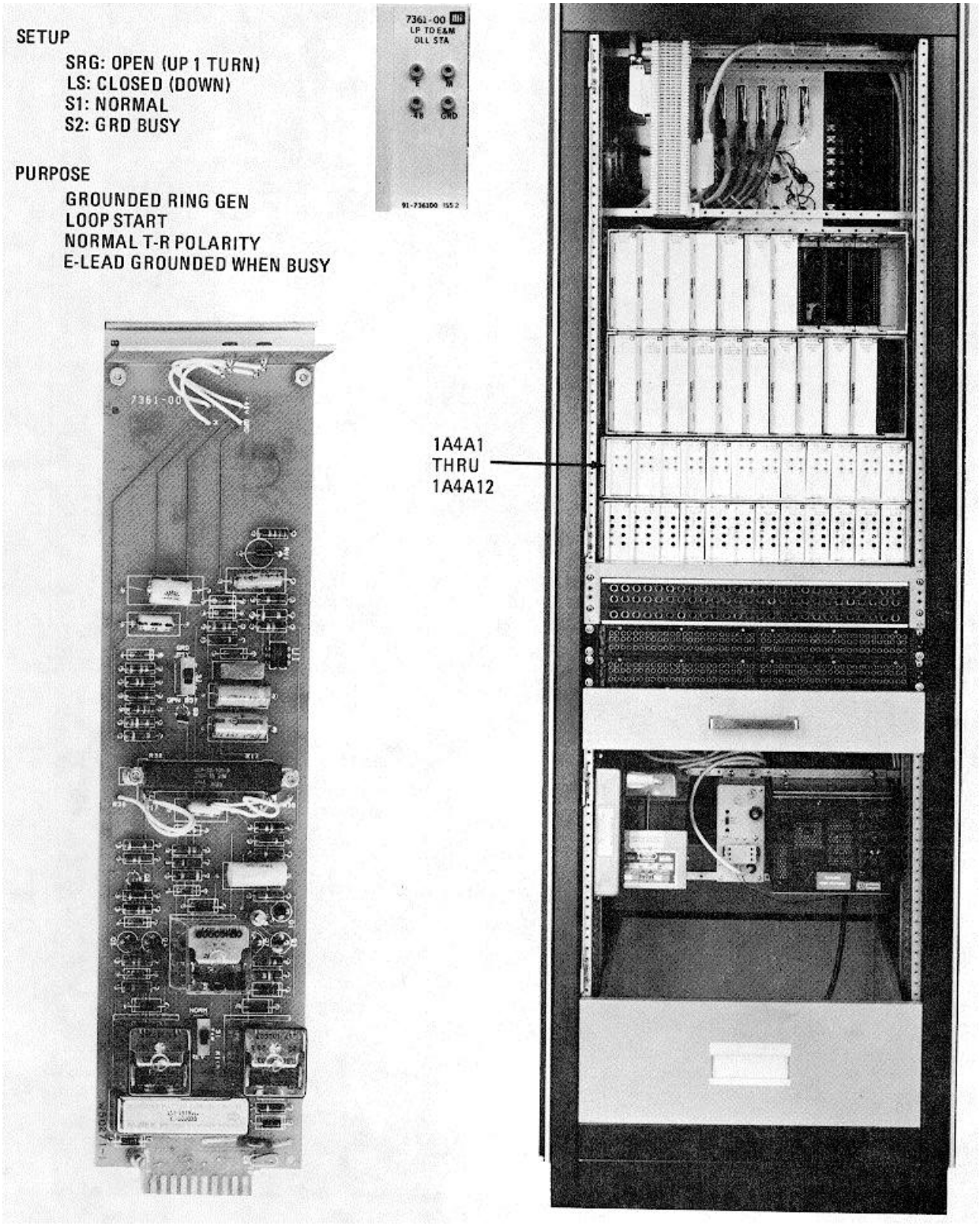


Figure 3-51. Loop to ESM Dial Long Line Station End Module

7052-7103
2W TO 4W CONVERTER

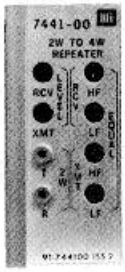
- LINE LEVEL AMPLIFICATION
- LEVEL SETTING

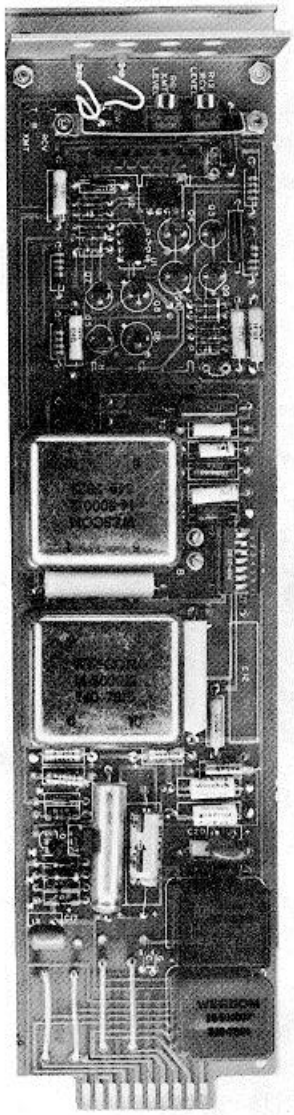
SETUP

SCREW A: CLOSED (DOWN)
SCREW B: CLOSED (DOWN)
STRAP AT POSITIONS E AND F
SW1 = ON
SW2 = ON
SW3 THRU SW7 = OFF

PURPOSE

NO EQUALIZER
600 OHM 4W LINE IMPEDANCE
AC COUPLING ACROSS A & B LEAD
NO PLUG IN PRECISION BAL NET
NO BUILD-OUT CAPACITORS





1A5A1
THRU
1A5A12

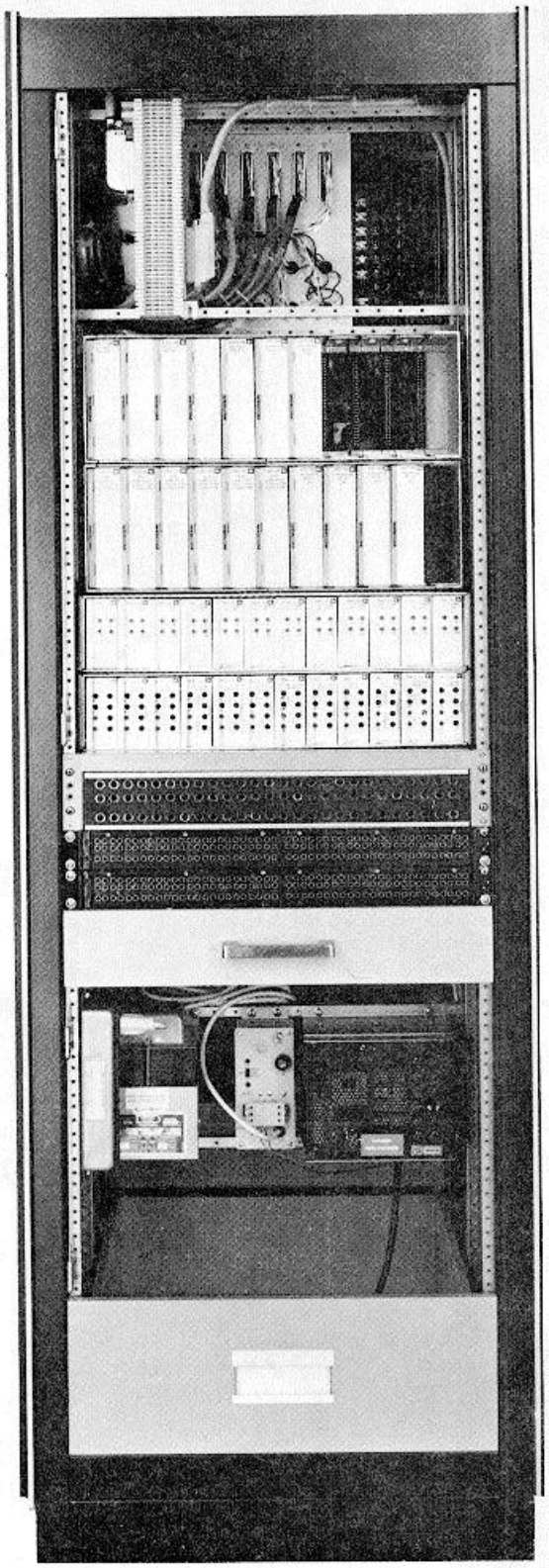
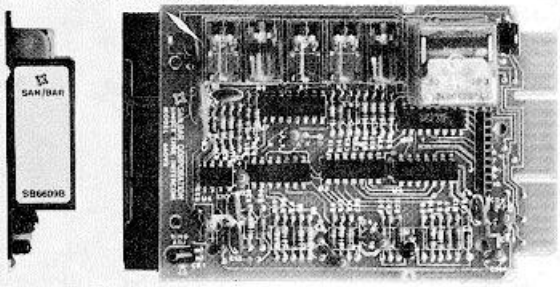


Figure 3-52. Two-Wire to Four-Wire Converter

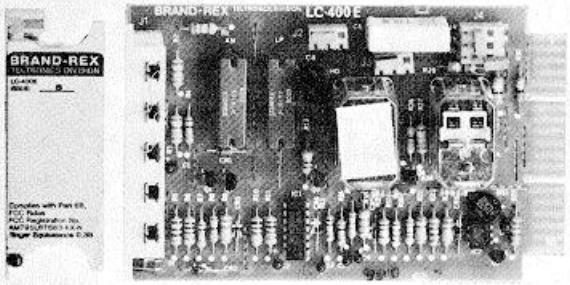
7052-7104 SAN BAR 6606B LAMP & RINGING INTERRUPTER
7052-7105 TELTRONICS LC400E LINE CARD
SAN BAR 6609B SINGLE LINK TO STATION

1A9 KEY SERVICE PANEL
SUBASSEMBLY DETAIL

1A9A1
SINGLE LINK-TO-STATION INTERCOM CARD
SAN BAR 6609B



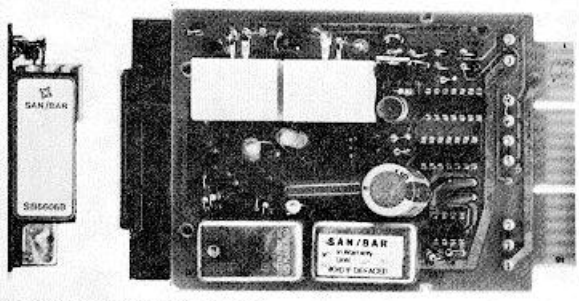
1A9A2 THRU 1A9A13
KEY SYSTEM LINE CARDS



LINE CARD OPTION STRAPPING

STRAP AT	PURPOSE
(Y) J1, 7-10 (W) J1, 5-8	WINKING LAMP ON HOLD INTERRUPTED RINGING
JUMPER PLUG AT	**PURPOSE**
(ZD) J2, 12-13 (ZD) J3, 21-22 (BR) J4, 14-15	100 MS HOLD BRIDGE RELEASE 100 MS HOLD BRIDGE RELEASE BRIDGED RINGING

1A9A15
LAMP AND RINGING INTERRUPTER
SAN BAR 6606B



STRAP AT POS D (TERM 5 TO 6)
PURPOSE: CONTINUOUS GENERATOR

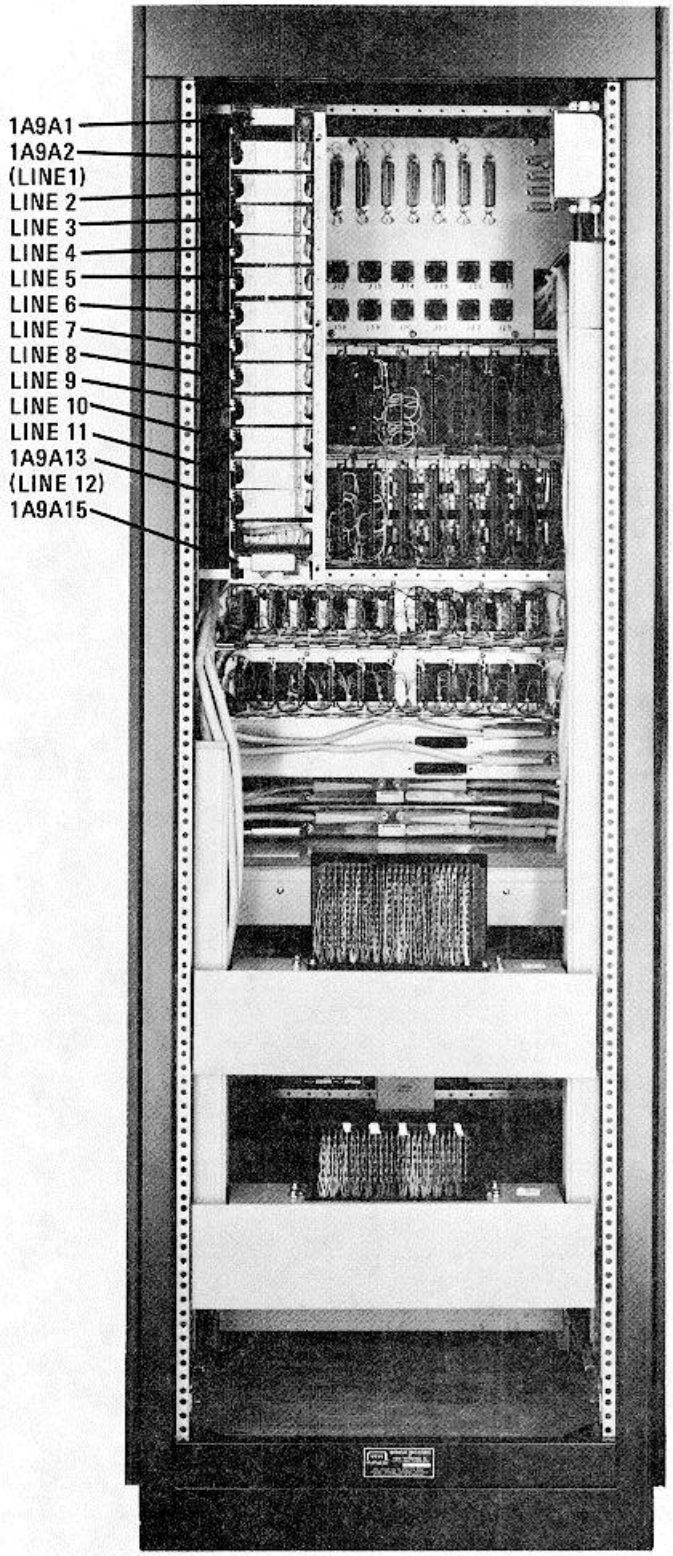


Figure 3-53. Lamp and Ringing Interrupter

7052-7106
WESCOM 443-00 TERM SET

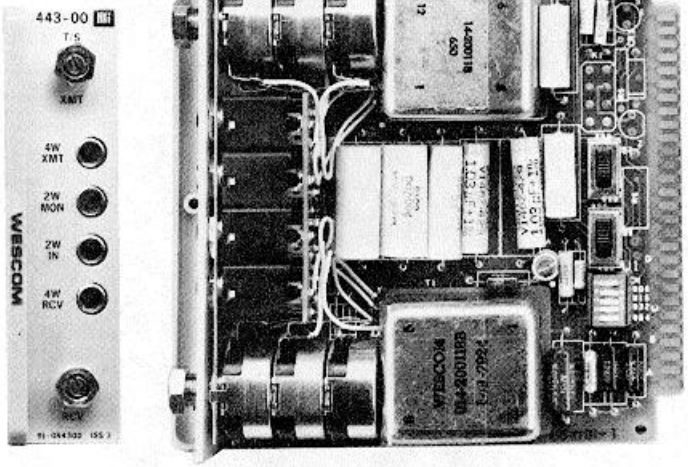
- 2W TO 4W CONVERTER

SETUP

SCREW S1 CLOSED (DOWN)
SCREW A CLOSED (DOWN)
SWITCH U1 S1 OFF
S2 OFF
S3 OFF
S4 OFF
S5 ON
S6 600
S7 600
AT1 RCV PAD FULL CW
AT2 XMIT PAD FULL CW

PURPOSE

A-B LEAD CAPACITOR
NO ILT RELAY
NO BUILD-OUT CAPACITORS
COMPROMISE NETWORK
600 OHM IMPEDANCE-ALL LINES
NO ATTENUATION IN 4W LINES



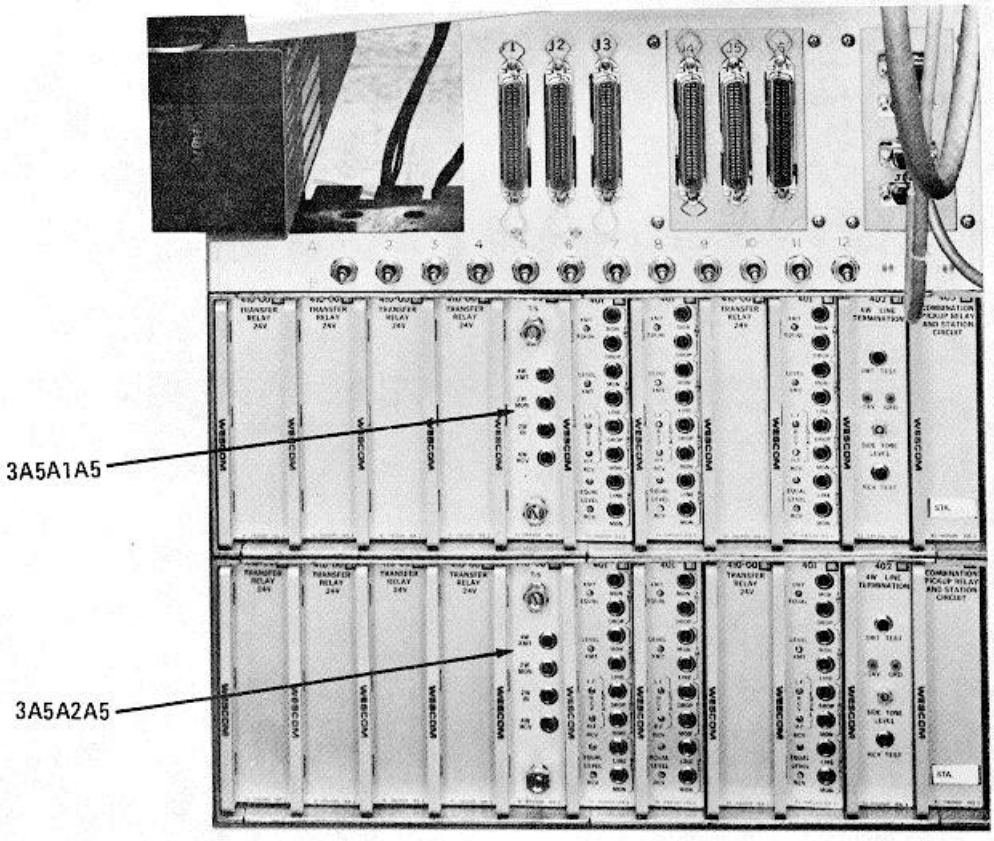


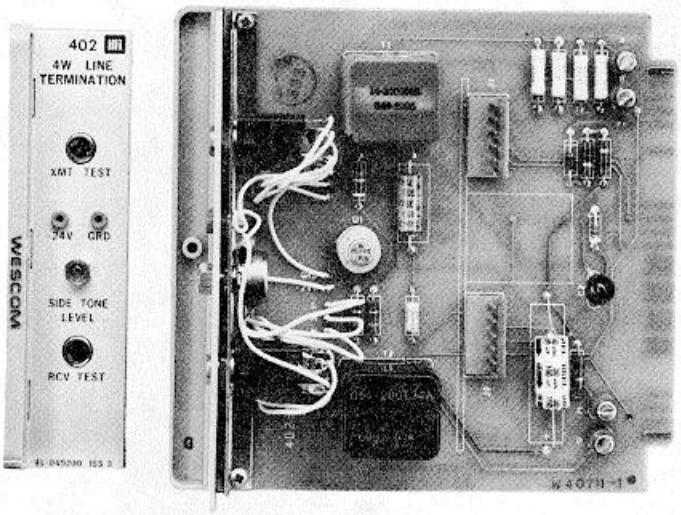
Figure 3-54. Term Set

7052-7107
WESCOM 402 4W LINE TERMINATION

- IMPEDANCE MATCH
- SIDETONE CCT

SETUP
SCREWS A, B, C, D
CLOSED (DOWN)

PURPOSE
NO LOOPBACK



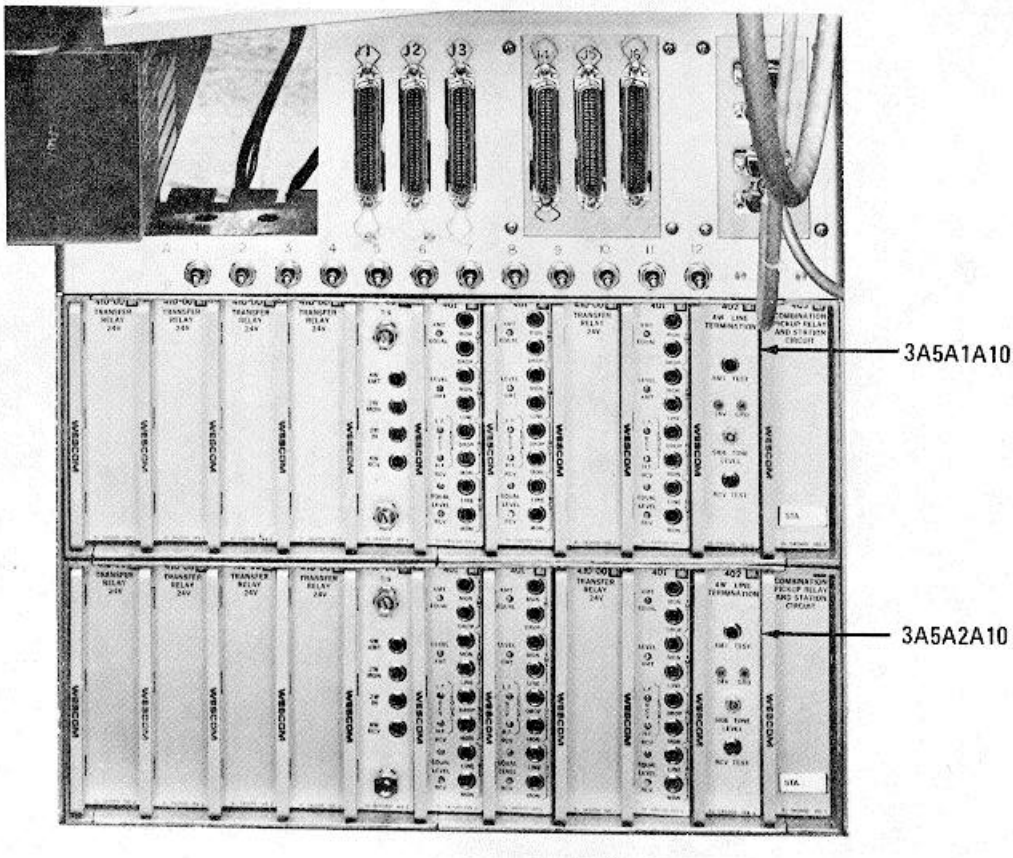


Figure 3-55. Four-Wire Line Termination

7052-7108
WESCOM 405 COMBINATION PICKUP RELAY AND STATION CIRCUIT

- 4-WIRE TEL LINE CCT
- STRAP AT G ONLY

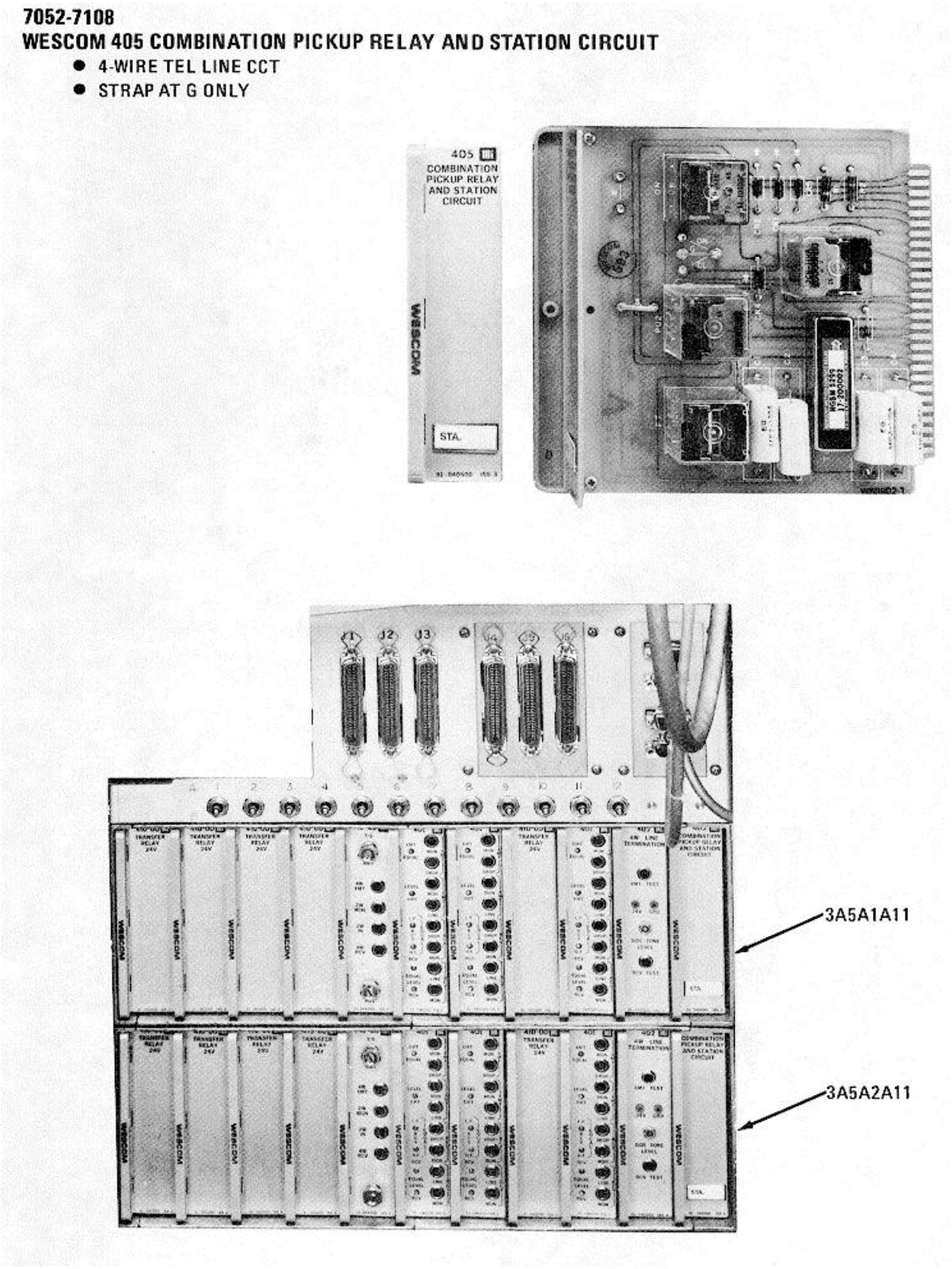


Figure 3-56. Combination Pickup Relay and Station Circuit

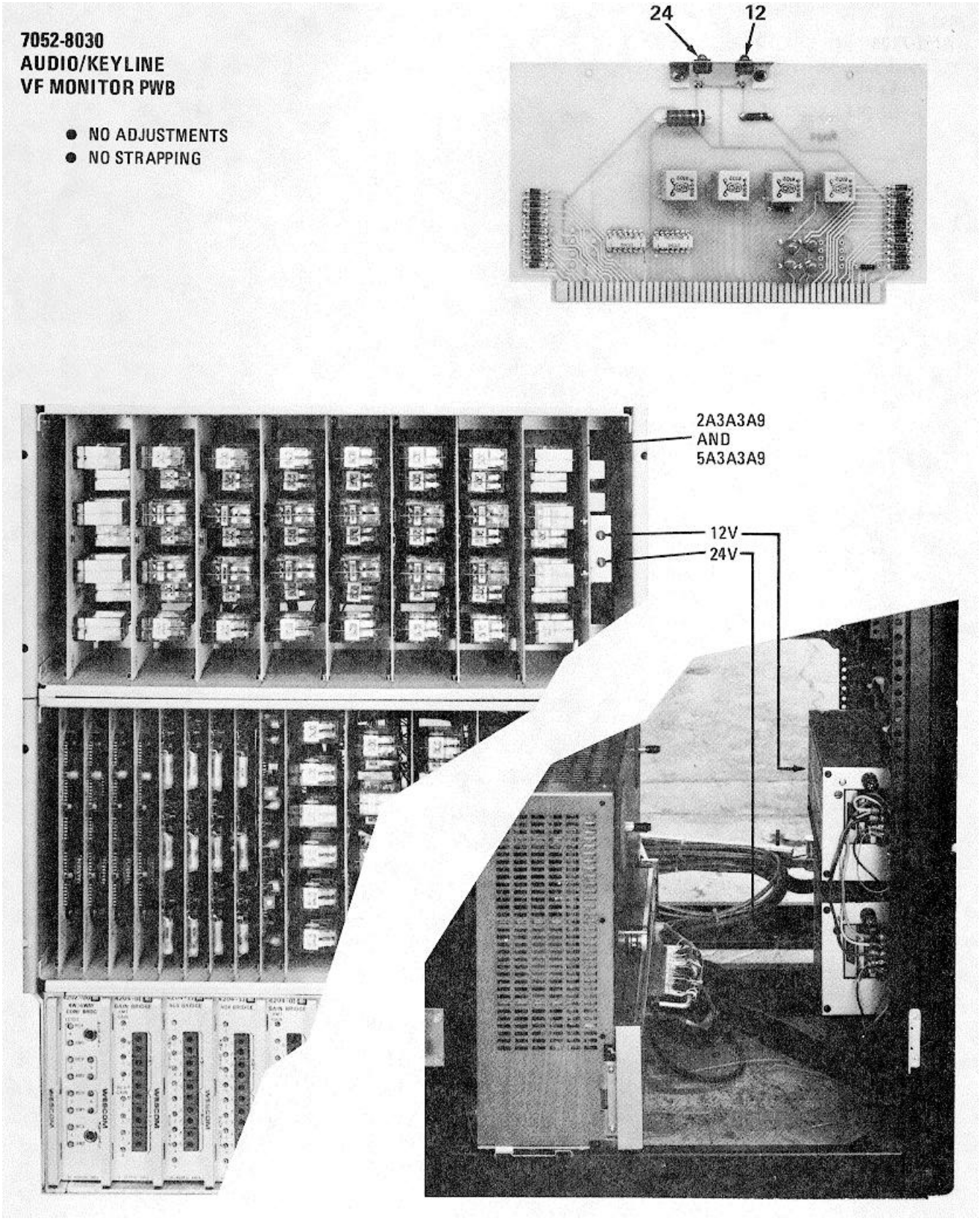
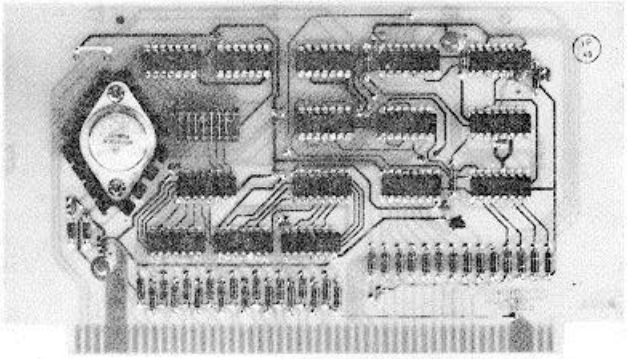


Figure 3-57. Audio/Keyline VF Monitor PWB

7052-8070
AUDIO/KEYLINE DECODER DRIVER

- NO ADJUSTMENTS
- NO STRAPPING



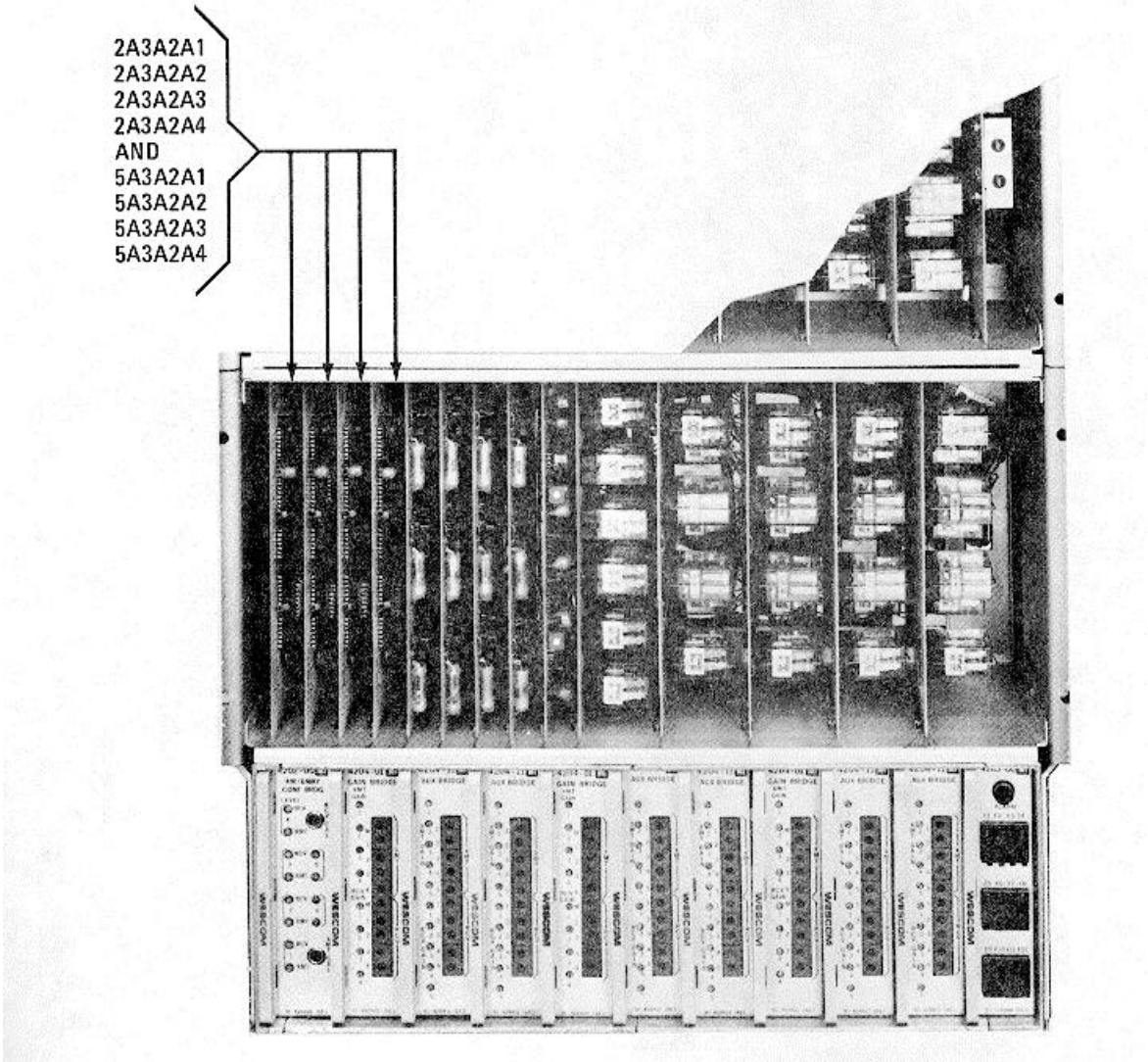
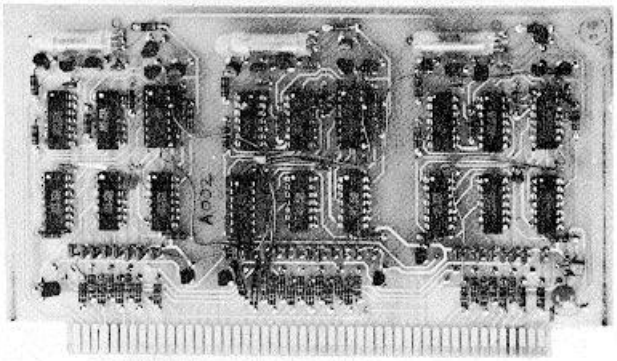


Figure 3-58. Audio/Keyline Decoder Driver

7052-8080
AUDIO/KEYLINE LOGIC CONTROL PWB

- NO ADJUSTMENTS
- NO STRAPPING



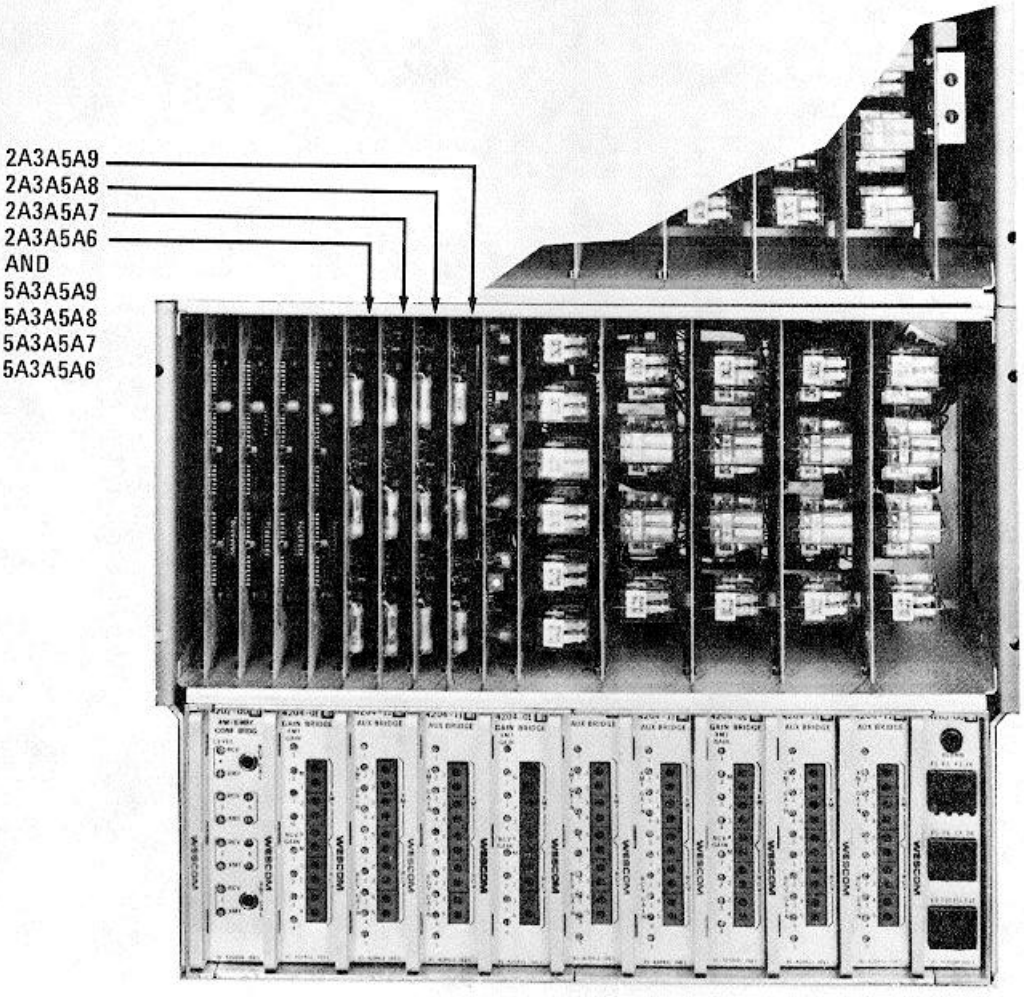
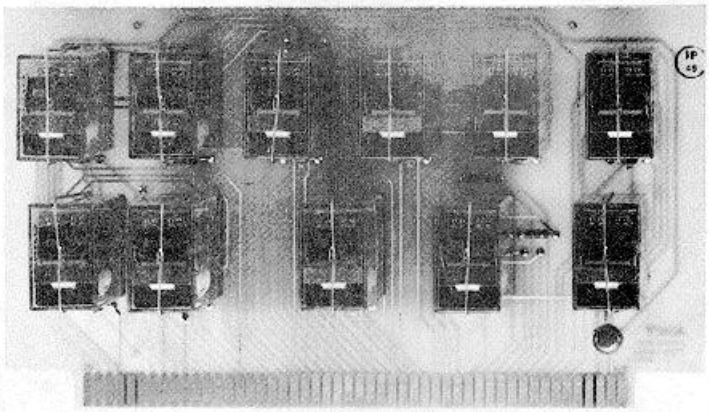


Figure 3-59. Audio/Keyline Logic Control PWB

7052-8090
AUDIO KEYLINE
COMMON SWITCH

- NO ADJUSTMENTS
- NO STRAPPING



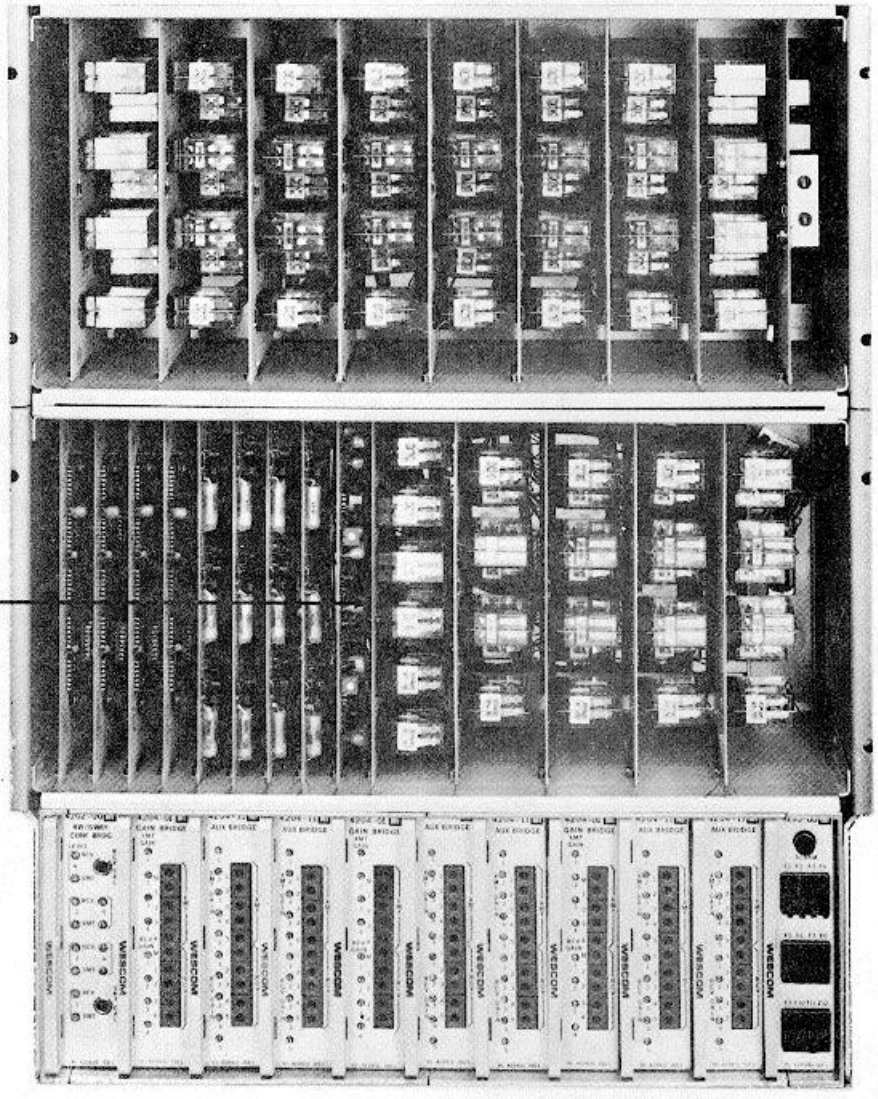
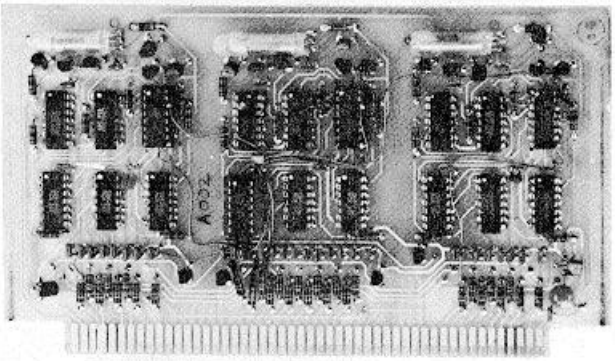


Figure 3-60. Audio/Keyline Common Switch

7052-8080
AUDIO/KEYLINE LOGIC CONTROL PWB

- NO ADJUSTMENTS
- NO STRAPPING



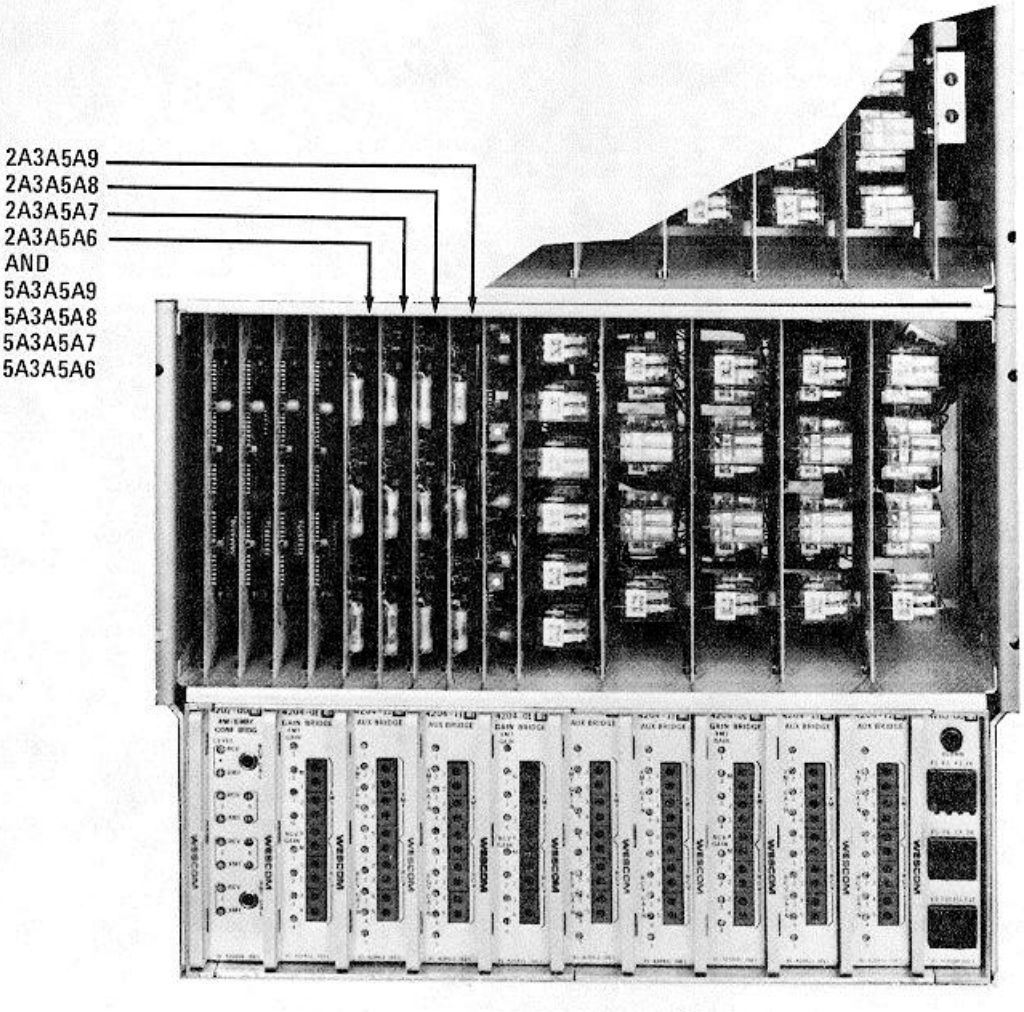


Figure 3-61. Audio/Keyline Power Divider

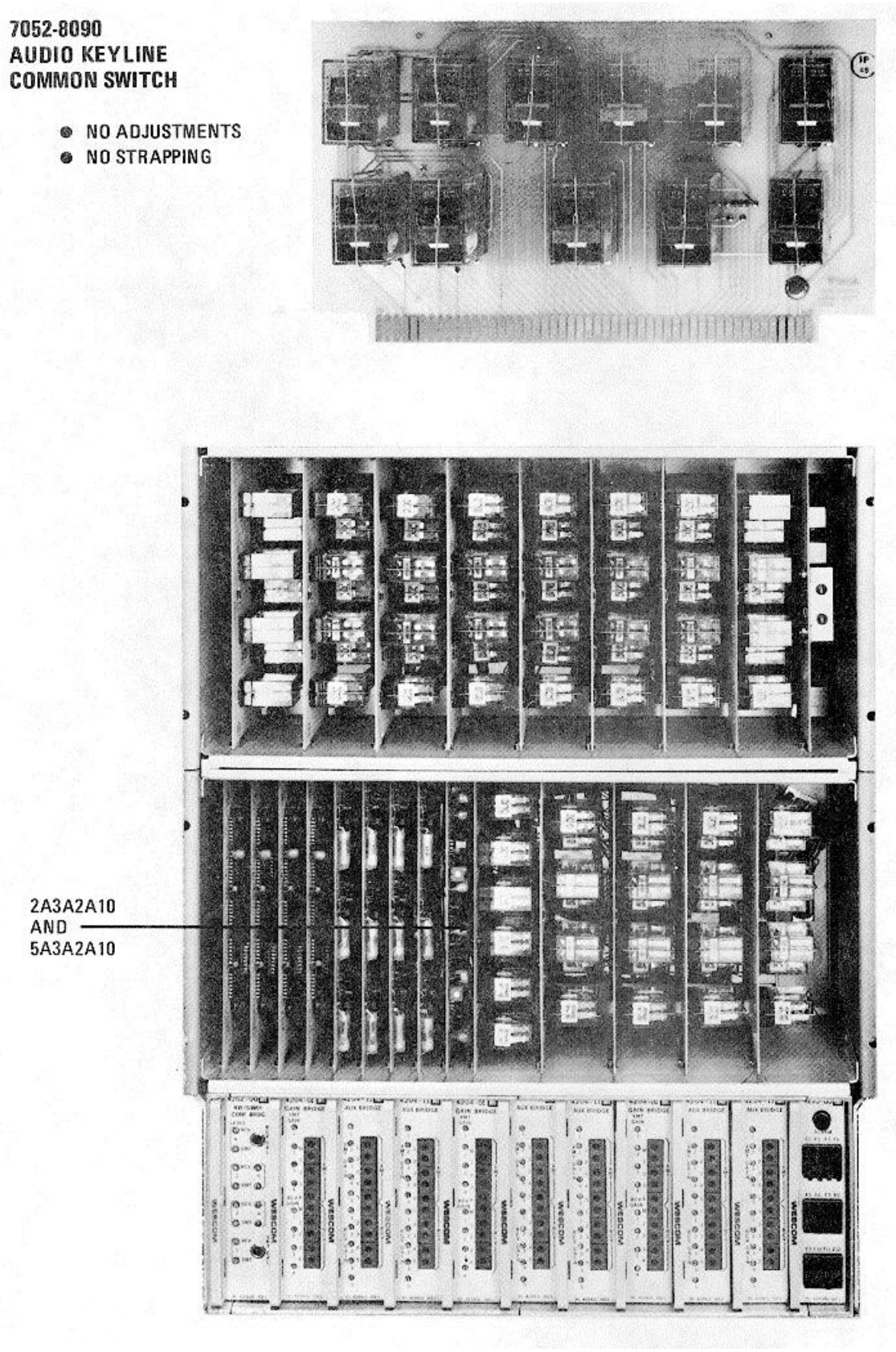


Figure 3-62. Audio/Keyline Power Divider

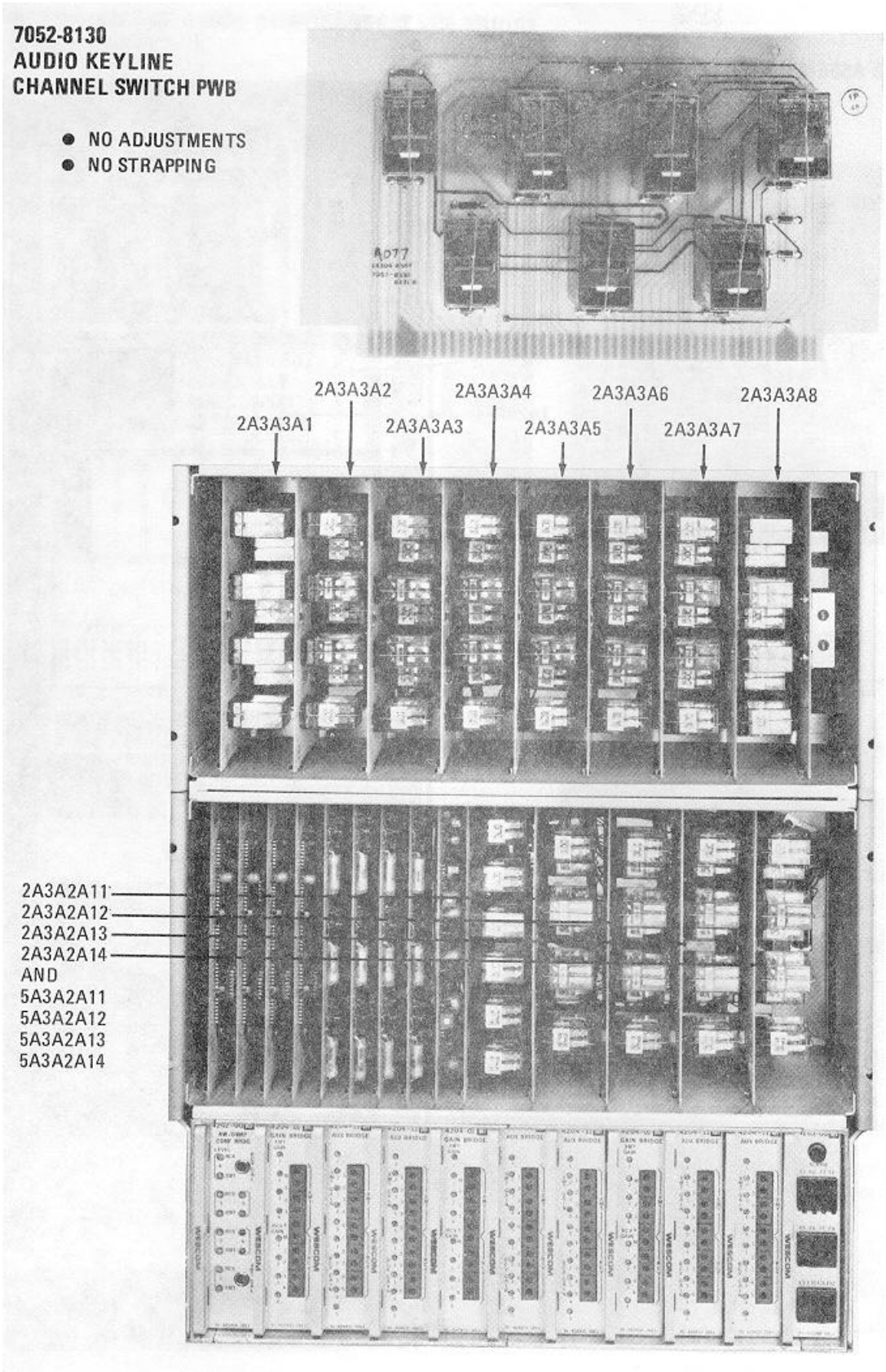


Figure 3-63. Audio/Keyline Channel Switch PWB

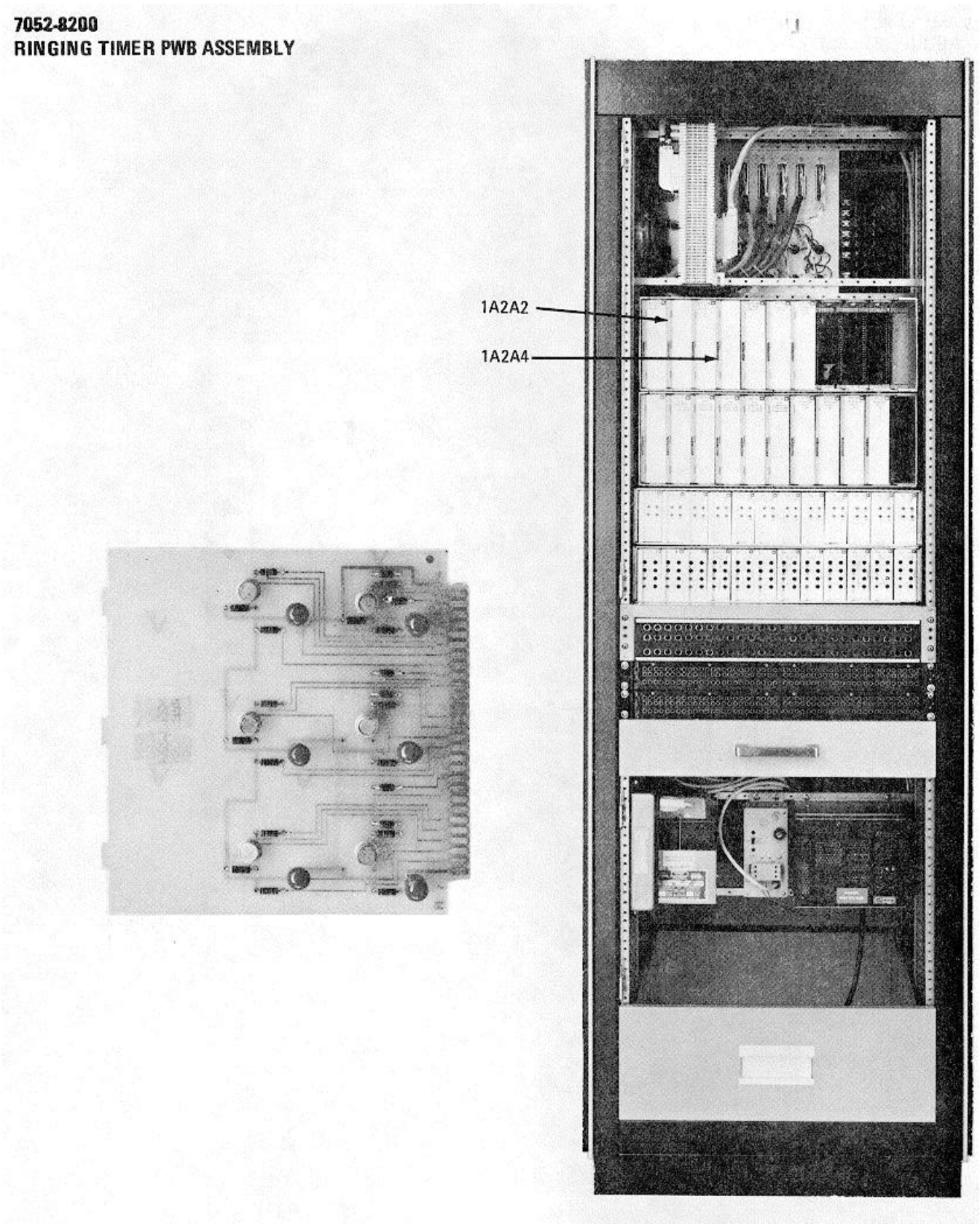


Figure 3-64. Ringing Timer PWB

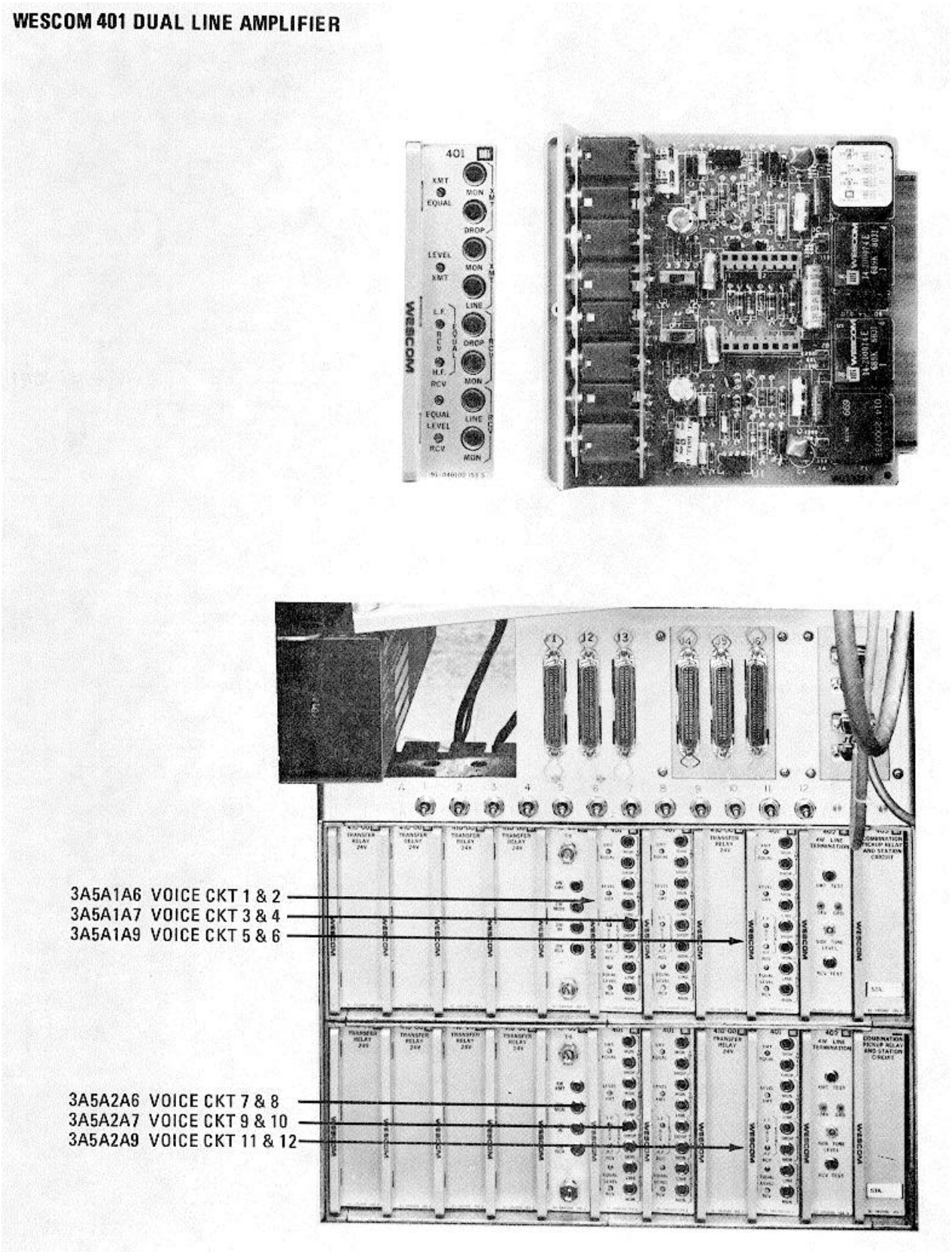


Figure 3-65. Dual Line Amplifier

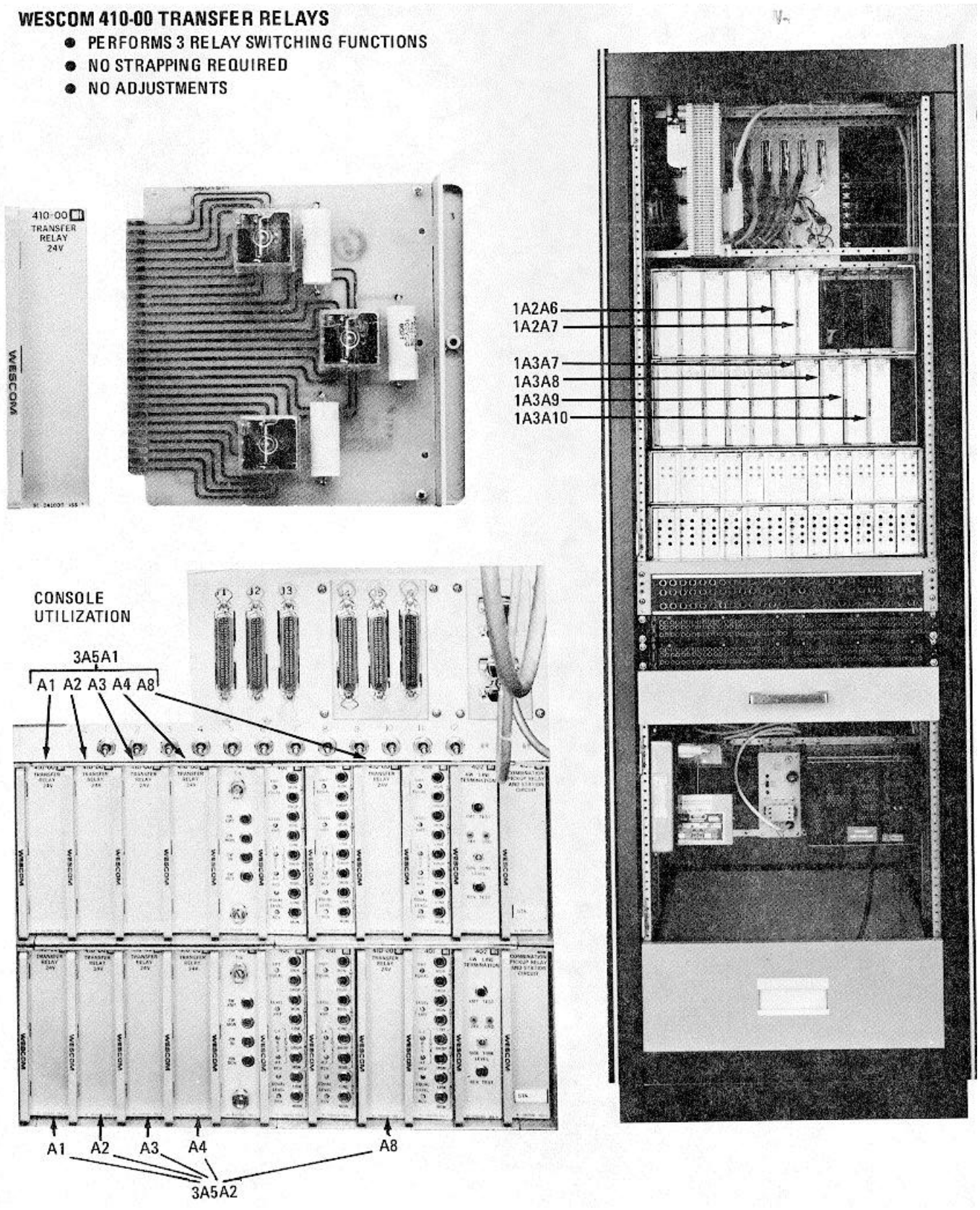
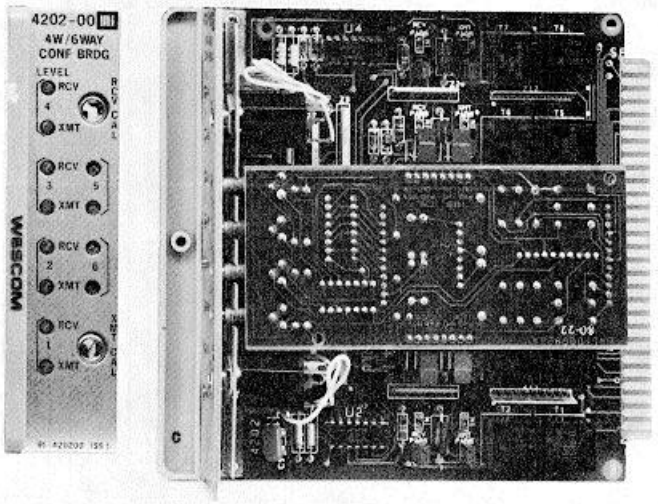


Figure 3-66. Transfer Relays

WESCOM 4202-00 4-WIRE 6-WAY CONFERENCE BRIDGE (SHEET 1 OF 2)

NOTE

THE 4-WIRE, 6-WAY CONFERENCE BRIDGE IS THE CENTRAL ELEMENT IN ALL OPERATING MODES. SEE SHEET TWO OF TWO FOR SUPPORT INFORMATION. OPERATING MODE FLOW DIAGRAMS SHOW FUNCTIONAL RELATIONSHIPS.



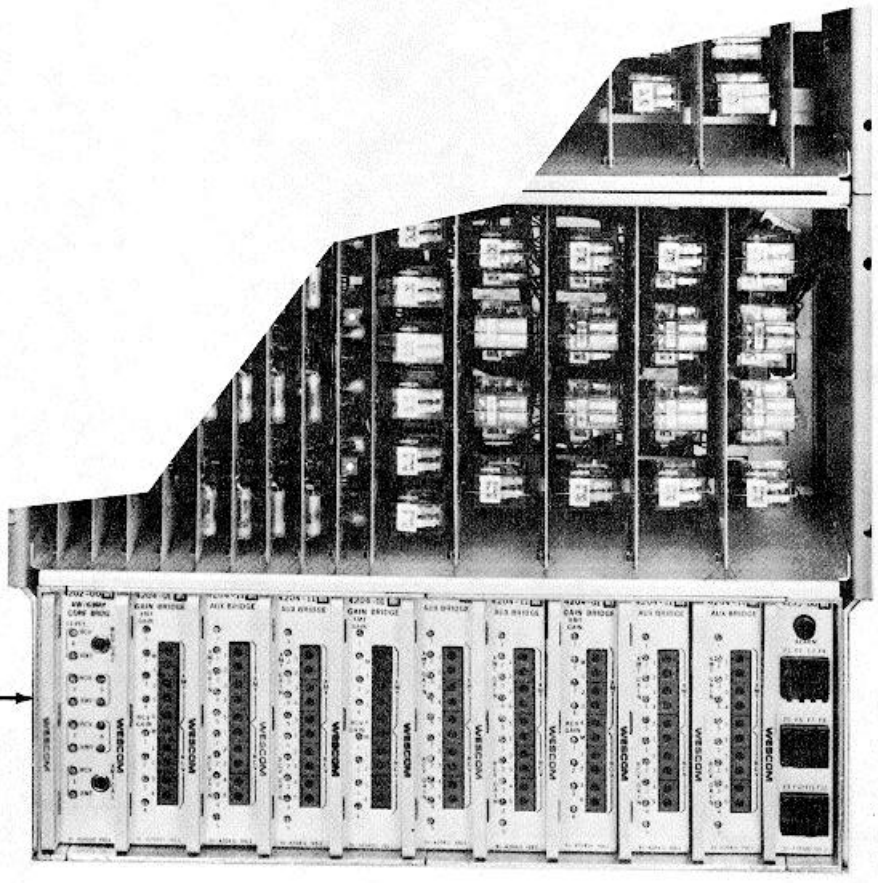
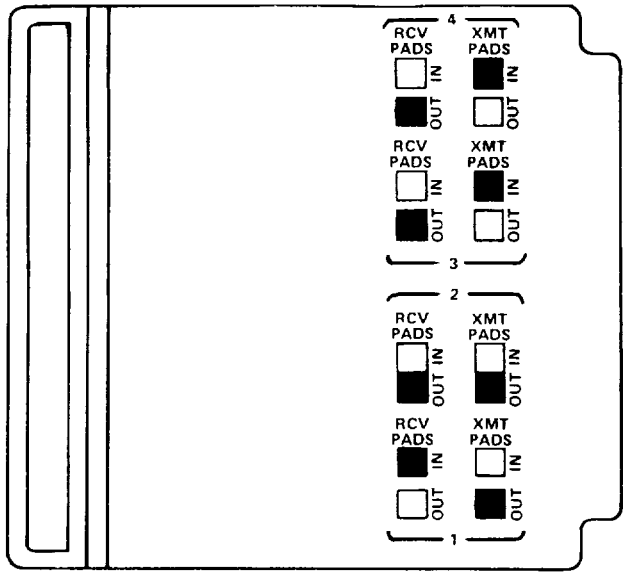
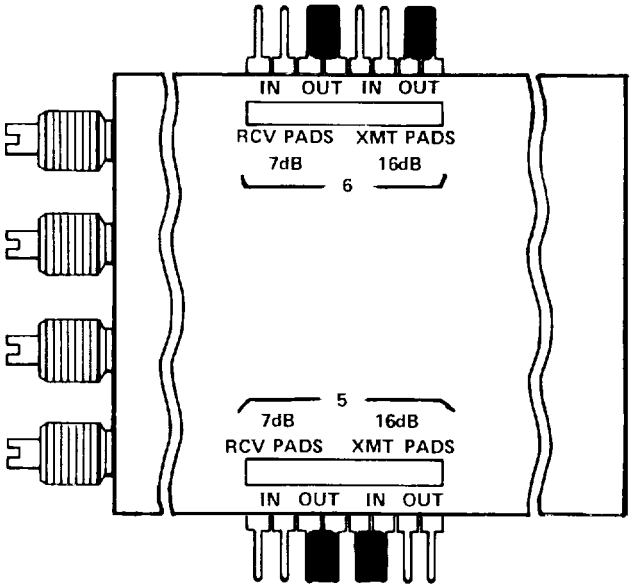


Figure 3-67. Four-Wire 6-Way'Conference Bridge (1 of 2)

WESCOM 4202-00 4-WIRE 6-WAY CONFERENCE BRIDGE (SHEET 2 OF 2)

LINE	LEAD		PIN
1	Tip	RCV	1
	Ring		2
	Tip	XMT	5
	Ring		3
2	Tip	RCV	10
	Ring		12
	Tip	XMT	4
	Ring		7
3	Tip	RCV	22
	Ring		24
	Tip	XMT	8
	Ring		6
4	Tip	RCV	26
	Ring		28
	Tip	XMT	51
	Ring		53
5	Tip	RCV	46
	Ring		48
	Tip	XMT	40
	Ring		39
6	Tip	RCV	55
	Ring		56
	Tip	XMT	13
	Ring		11





NOTE

DIAGRAMS SHOW OPTIONS SELECTED FOR CIRCUITS ONE THRU SIX

Figure 3-67. Four-Wire 6-Way Conference Bridge (2 of 2)

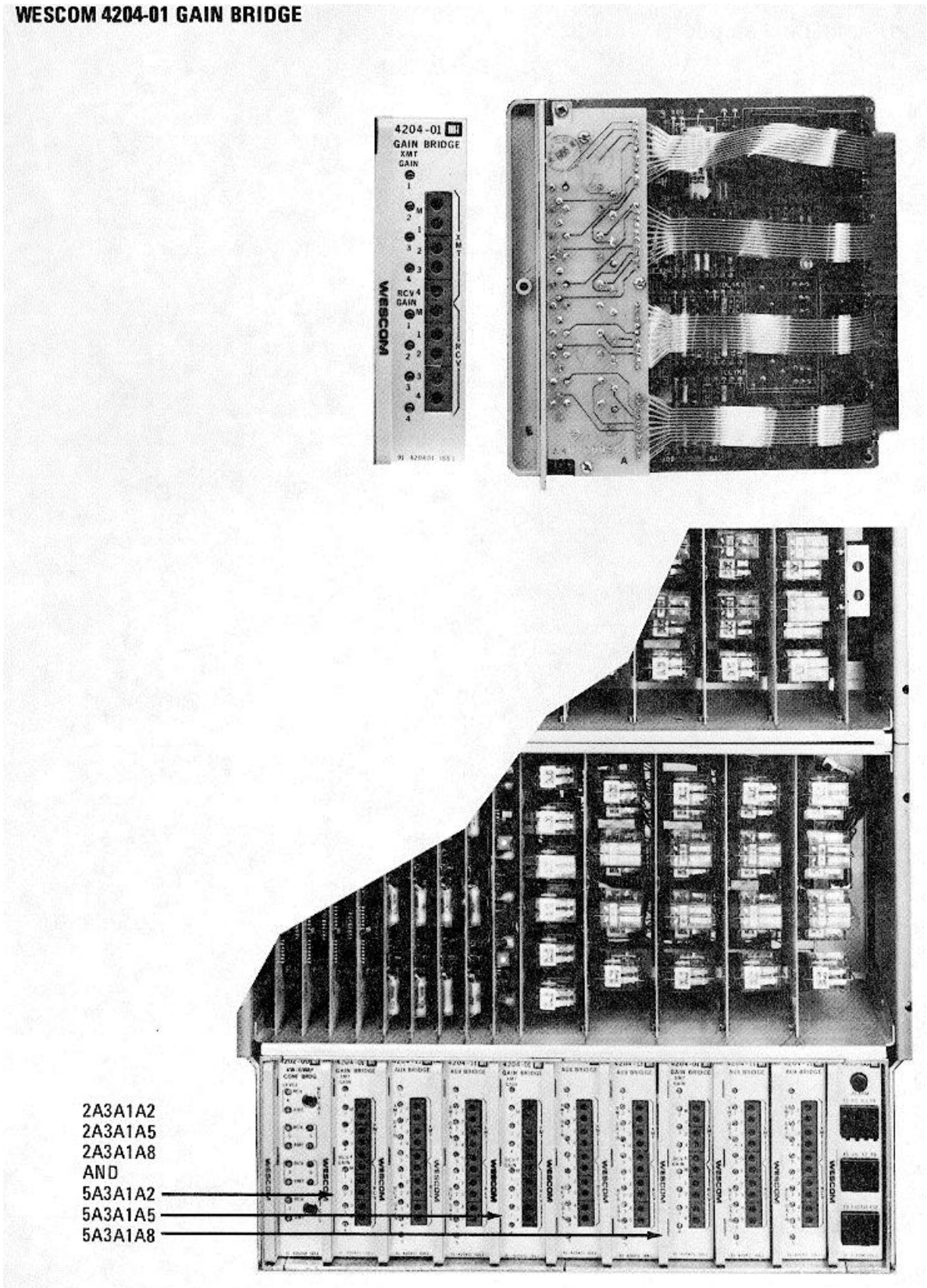


Figure 3-68. Gain Bridge

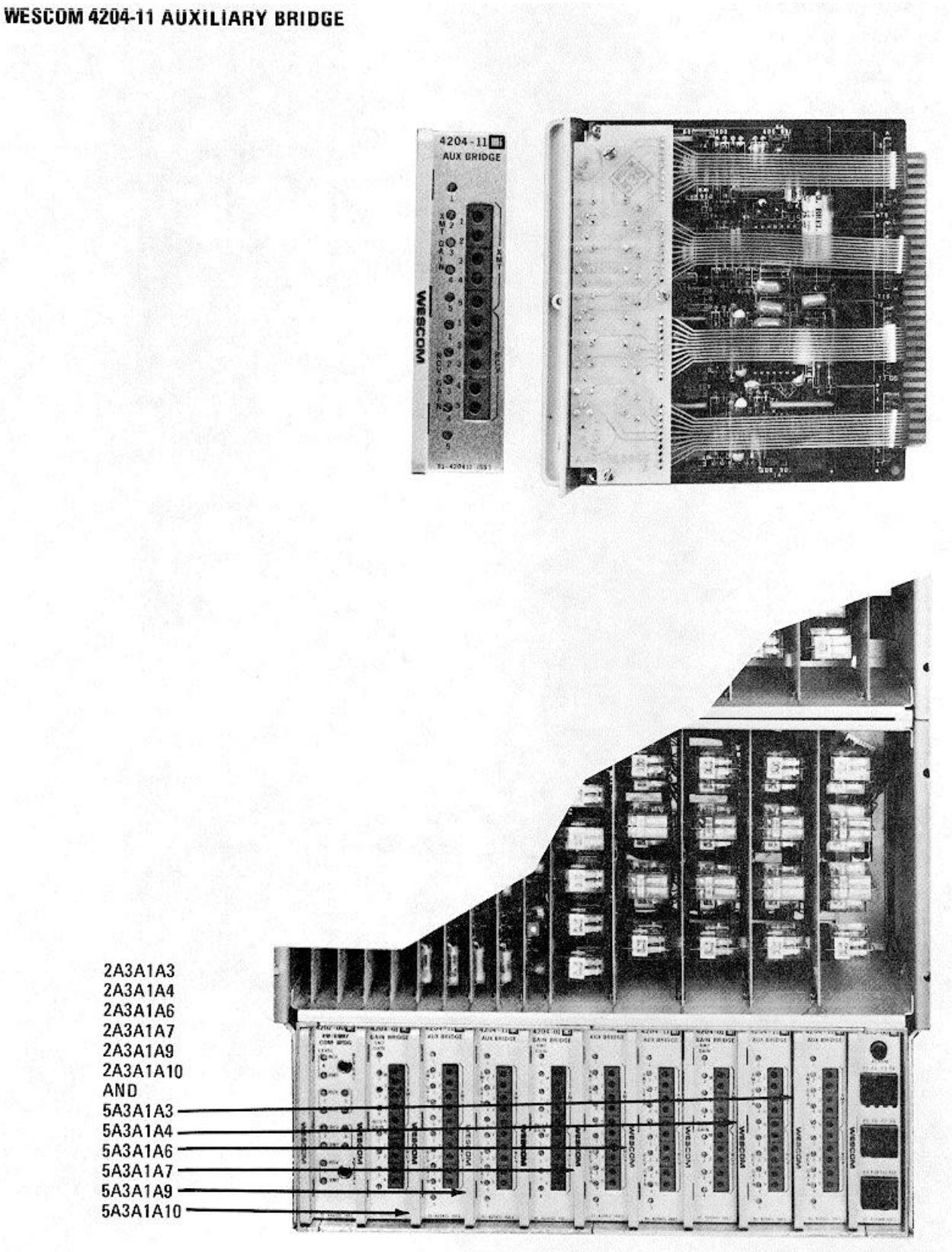


Figure 3-69. Auxiliary Bridge

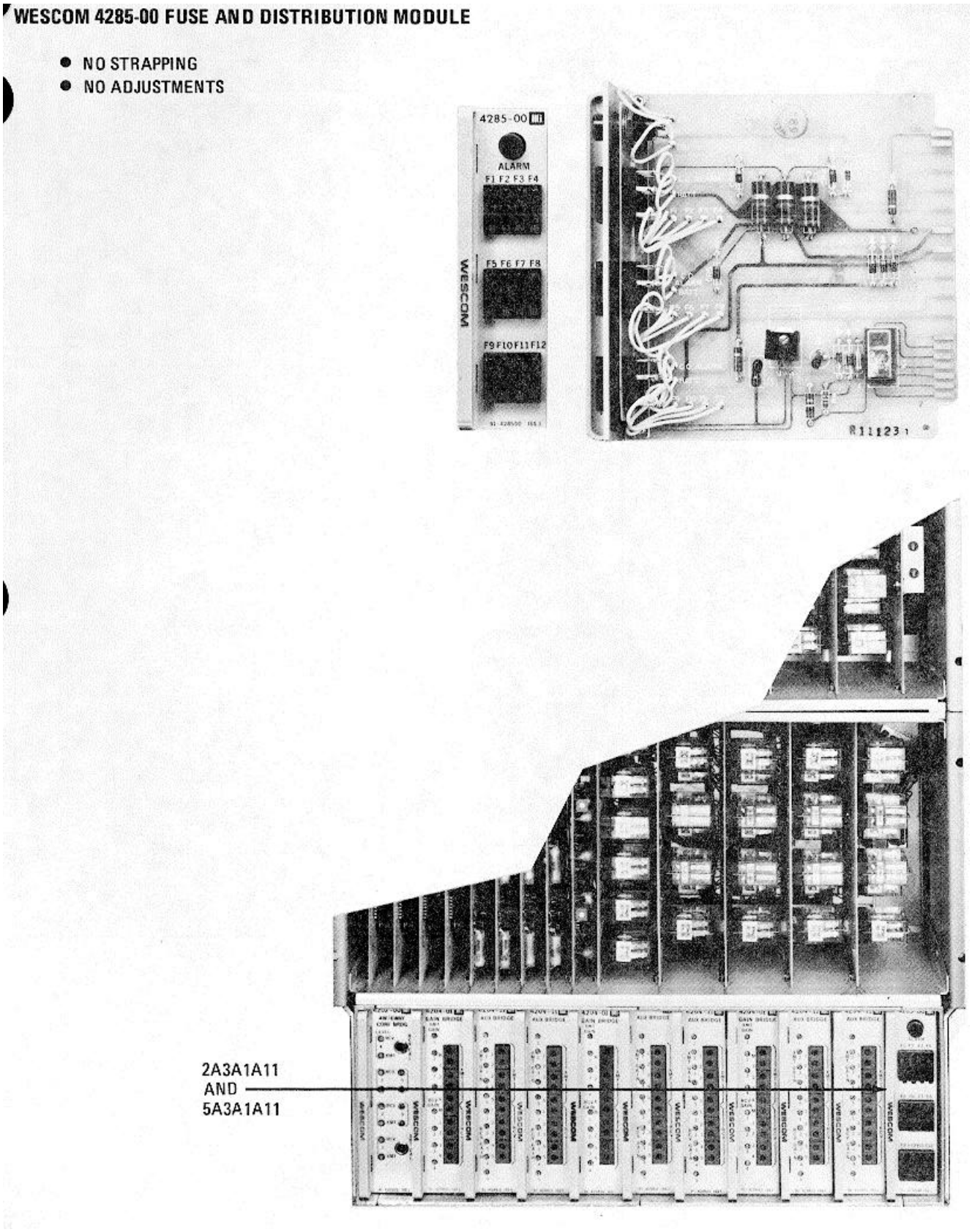


Figure 3-70. Fuse and Distribution Module

Table 3-54. Subassembly Support Diagrams

Figure.	Number	Name
3-49	4315-08	Output Relay Assembly
3-50	7392	Dual E&M/20 Hz to Signal Lead Converter
3-51	7361-00	Loop to E&M Dial Long Line Station End Module
3-52	7441-00	2-Wire to 4-Wire Converter
3-53	6606B	Lamp and Ringing Interrupter
3-53	LC400E	Line Card
3-53	San Bar 6609B	Single Link to Station
3-54	443-00	Term Set
3-55	402	4-Wire Line Termination
3-56	405	Combination Pickup Relay and Station Circuit
3-57	7052-8030	Audio/Keyline VF Monitor PWB
3-58	7052-8070	Audio/Keyline Decoder Driver
3-59	7052-8080	Audio/Keyline Logic Control PWB
3-60	7052-8090	Audio/Keyline Common Switch
3-61	7052-8100	Audio/Keyline Power Divider
3-62	7052-8110	Audio/Keyline Dual Vox PWB
3-63	7052-8130	Audio/Keyline Channel Switch PWB
3-64	7052-8200	Ringing Timer PWB
3-65	Wescom 401	Dual Line Amplifier
3-66	Wescom 410-00	Transfer Relays
3-67	Wescom 4203-00	4-Wire, 6-Way Conference Bridge
3-68	Wescom 4204-01	Gain Bridge
3-69	Wescom 4204-11	Auxiliary Bridge
3-70	Wescom 4285-00	Fuse and Distribution Module

CHAPTER 4
PREPARATION FOR RESHIPMENT

4-1. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) AND CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) GENERAL

Console Units in the Communication Control Console and Equipment Racks in the Control Interface Group are not normally replaceable. Units and subassemblies can be removed for storage or replacement as described in the following paragraphs.

4-2. DISASSEMBLY AND REMOVAL OF UNITS AND SUBASSEMBLIES

The following provides information for disassembly and removal of units and subassemblies.

Always remove primary power from units being removed prior to disassembly.

a. Communication Control Console OJ-512/FRC-176(V).

(1) Removal of Slide-Mounted Units. The following units are mounted on slides and can be removed by disconnecting power cords and other electrical cables. Remove Phillips-head screws that secure assemblies to rack. Extend assemblies on their slides. Release slide latches and remove the following units.

- Audio Monitor Panel
- Status Monitor Panel
- Remote Control-Monitor Unit

(2) Removal of Non-Slide Mounted Units. The following console mounted units can be removed by disconnecting power cords, electrical cables, and removing Phillips-head screws. Lift the following assemblies from console when electrical and mechanical connections have been released:

- RF-901A Phone Patch Panel
- Telephone Switch/Dial Panel
- Headset/Lamp Test Panel
- Tape Control Unit
- Audio/Keyline Switch Panel

(3) Removal of Subassemblies. The following subassemblies can be removed from the front of the console by disconnecting power cords, electrical cables, and removing Phillips-head screws. Lift the following subassemblies from console when released:

NOTE

Some subassemblies listed below contain additional instructions which must be observed.

- Power Supply
- Tape Transport Assembly - Extend equipment on slides. Release slide latches and remove two connector plugs.
- Tape Recorder Matching Transformer Assembly - Unsolder eight connecting wires. Remove connector plugs.

(4) Removal of Subassemblies from Rear. The following subassemblies can be removed from rear of the Console Unit by disconnecting power cords and electrical cables and removing Phillips-head screws.

NOTE

Some subassemblies listed below include additional instructions which must be observed.

- Digital Clock
- -12 Vdc Power Supply PS1 and +12 Vdc Power Supply PS2 - Power supplies are mounted on a common plate. Remove plate's securing hardware to gain access to securing hardware of power supply.

(5) Removal of Card Assemblies. Remove the card assemblies by disconnecting primary power and unplugging them.

b. Control Interface Group OK-449(V)/FRC-176(V).

(1) Removal of Units and Subassemblies from Telephone Equipment Bay. The following units and subassemblies are mounted in the Telephone Equipment Bay and can be removed by disconnecting power cords and electrical cables and removing Phillips-head screws. Lift assembly from Telephone Equipment Bay.

NOTE

Some subassemblies listed below include additional instructions which must be observed.

- 240/120 Step down Transformer
- Dc Patch Panel Assembly

•A Audio Patch Panel C2)

• SANBAR SB6613B-002 117V 60 Hz Power Supply - Remove 12 spade lugs.

•Power Supply - Remove two spade lugs.

(2) Removal of Card Assemblies from Telephone Equipment Bay. Wescom and Brand-Rex card assemblies are removed by disconnecting primary power and unplugging.
(3) Removal of Units and Subassemblies from RF Patch Equipment Bay.
(a) RF Patch Panel. The RF Patch Panel is mounted in the RF Patch Equipment Bay and can be removed by disconnecting antenna connector at rear of unit. Disconnect interlock interface cable and remove Phillips-head screws. Lift unit from shelf.
(b) Antenna Control Panel(s). The Antenna Control Panel is mounted in the RF Patch Equipment Bay and can be removed by disconnecting antenna control connections and seven connector wires at rear of the unit. Remove Phillips-head screws and lift unit from shelf.

4-3. PACKAGING OF SENSITIVE OR FRAGILE COMPONENTS

Packaging of disassembled and removed units and subassemblies is done at specially located repackaging centers. Therefore, no special instructions apply.

4-4. MOUNTING AND SECURING UNITS AND SUBASSEMBLIES

The following provides information for mounting and securing units and subassemblies.

a. Communication Control Console OJ-512/FRC-176(V).

(1) Installation Slide-Mounted Units. The following units are mounted on slides. Release the slide mechanism at both sides of the unit and install on slides. Push unit inward until it is flush with the front of the Console Unit. Secure unit with Phillips-head screws. Attach electrical cables and connect primary power.

- Audio Monitor Panel
- Status Monitor Panel
- Remote Control-Monitor Unit

(2) Installation of Non-Slide Mounted Units. The following units are mounted in the Console Unit by lifting into position and installing them so that they are flush with front of Console Unit. Secure unit with Phillips-head screws. Attach electrical cables and connect primary power.

- RF-901A Phone Patch Panel
- Telephone Switch/Dial Panel

- Headset/Lamp Test Panel

- Tape Control Unit

- Audio/Keyline Switch Panel

(3) Installation of Subassemblies. The following subassemblies are mounted in the Console Unit. Secure unit with Phillips-head screws. Attach electrical cables and connect primary power.

NOTE

Some subassemblies listed below include additional instructions which must be observed.

- Power Supply
- Tape Transport Assembly - Extend equipment on slides. Release slide latches and remove two connector plugs.
- Tape Recorder Matching Transformer Assembly - Unsolder eight connecting wires. Remove connector plugs.

(4) Installation of Subassemblies From Rear. The following units are mounted at the rear of the Console Unit. Secure unit with Phillips-head screws. Attach electrical cables and connect primary power.

NOTE

Some subassemblies listed below include additional instructions which must be observed.

- Digital Clock

- -12 Vdc Power Supply PS1 and +12 Vdc PS2 - Power Supplies are mounted on a common plate. Secure common plate hardware before mounting power supplies.

(5) Installation of Card Assemblies. Install card assemblies by plugging into position.

b. Control Group. PK--449(V)/FRC-.176(V).

(1) Installation of Units and Subassemblies in the Telephone Equipment Bay. The following units and subassemblies are mounted in the Telephone Equipment Bay by lifting into position and installing. Secure unit or subassembly with Phillips-head screws. Attach electrical cables and connect primary power.

NOTE

Some units and subassemblies listed below include additional instructions which must be observed.

- 240/120 Step down Transformer
- Dc Patch Panel
- Audio Patch Panel (2)
- SANBAR SB6613B-002 117V 60 Hz Power Supply - Remove 12 spade lugs.
- Power Supply - Remove two spade lugs.

(2) Installation of Card Assemblies in the Telephone Equipment Bay. Install Wescom and Brand-Rex card assemblies by plugging into position.

(3) Installation of Units and Subassemblies in the RF Patch Equipment Bay.

(a) RF Patch Panel. The RF Patch Panel is mounted in the RF Patch Equipment Bay. Secure unit with Phillips-head screws. Attach the electrical cables and connect primary power.

(b) Antenna Control Panel(s). The Antenna Control Panel is mounted in the j RF Patch Equipment Bay. Secure unit with Phillips-head screws. Attach electrical cables and connect primary power.

4-5. SHIPMENT AND UNLOADING

Shipment and unloading of units and subassemblies is done at specially located repackaging centers. Therefore, no special instructions apply.

CHAPTER 5
STORAGE

5-1. COMMUNICATION CONTROL CONSOLE OJ-512/FRC-176(V) AND CONTROL INTERFACE GROUP OK-449(V)/FRC-176(V) GENERAL

Units and subassemblies can be removed for storage. When storing a unit or subassembly, the following environmental requirements for temperature and relative humidity ranges should be observed.

Temperature:	+32 to 1220F (O to 500 C)
Relative Humidity:	0 to 95%

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with Special Mailing List.

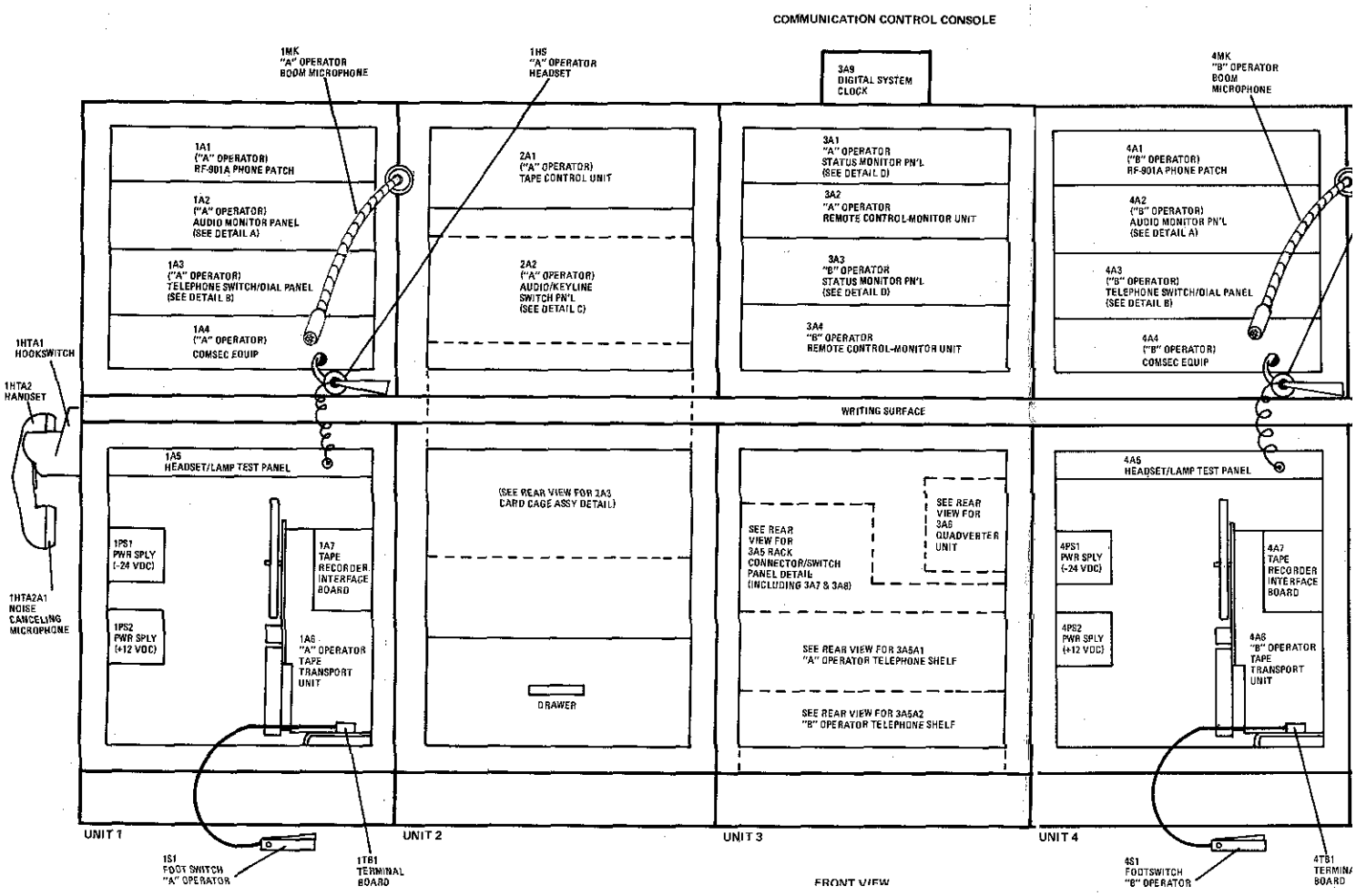


Figure 1-1. Communication Control Console OJ-512/FRC-176(V)
(Sheet 1 of 3)

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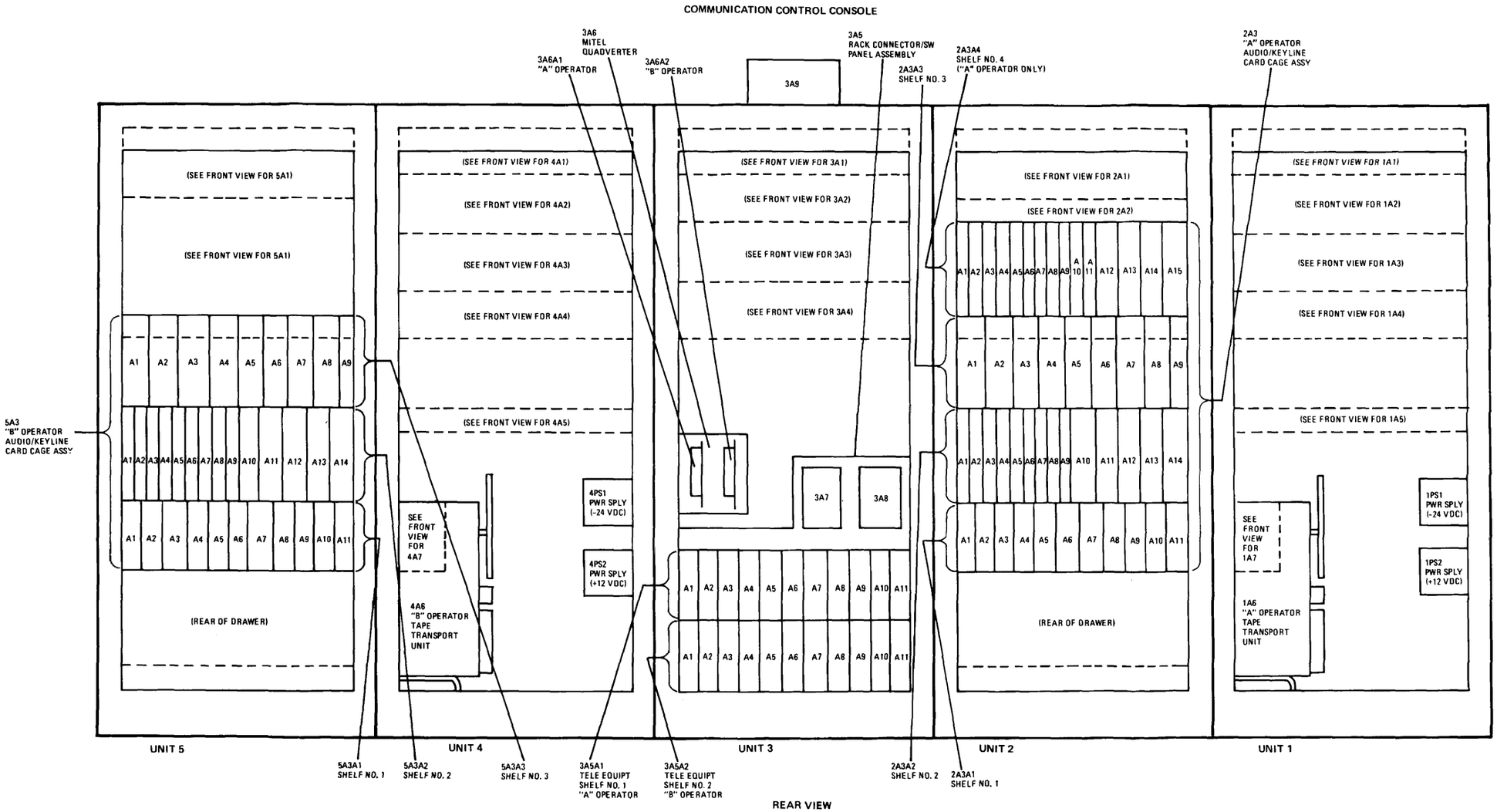
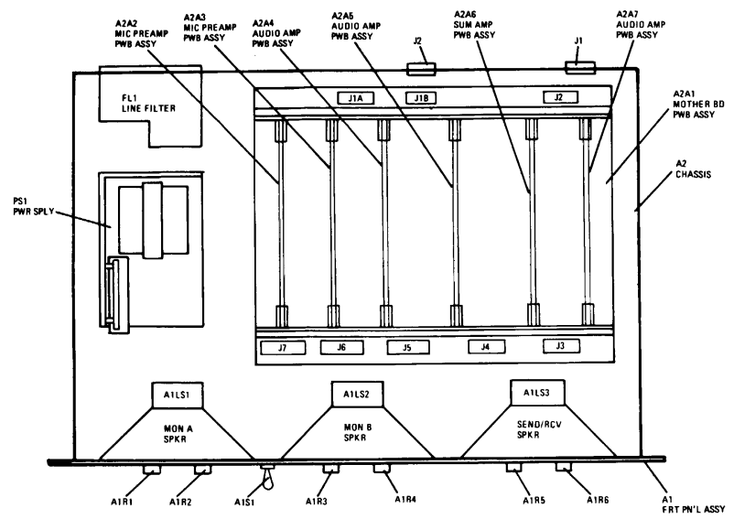
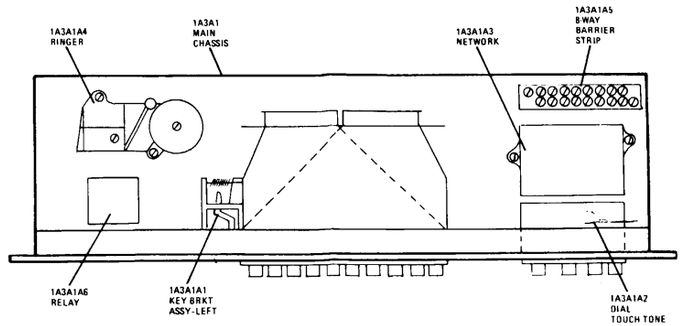


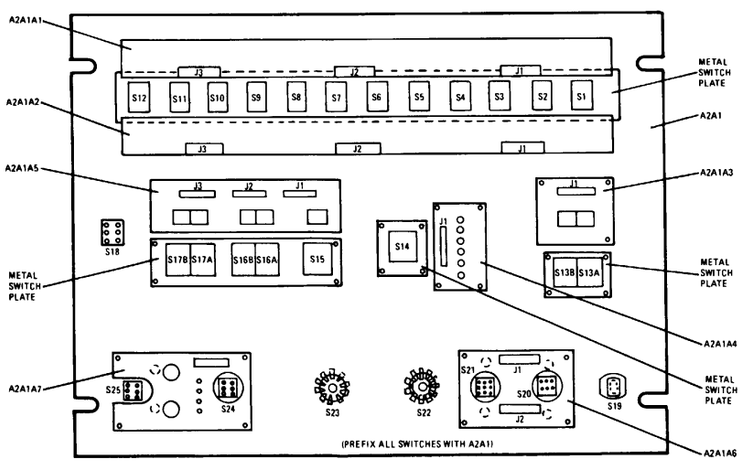
Figure 1-1. Communication Control Console OJ-512/FRC-176(V)
(Sheet 2 of 3)



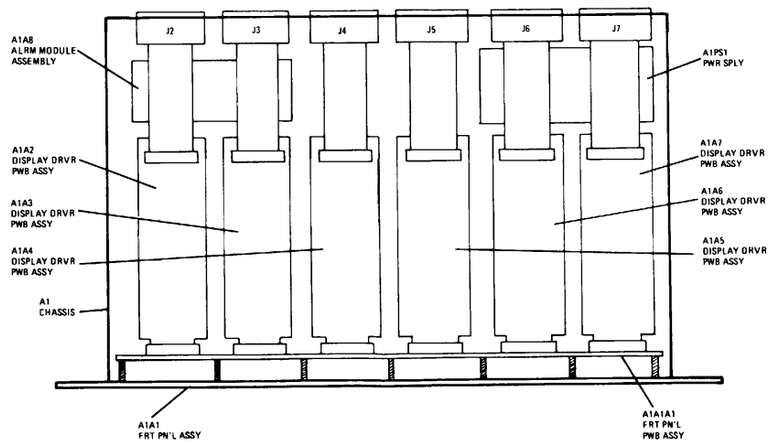
DETAIL "A" AUDIO MONITOR PANEL ASSEMBLY (TOP VIEW)



DETAIL "B" TELEPHONE SWITCH/DIAL PANEL ASSEMBLY (TOP VIEW)



DETAIL "C" AUDIO/KEYLINE SWITCH PANEL ASSEMBLY (REAR VIEW)



DETAIL "D" STATUS MONITOR PANEL ASSEMBLY (TOP VIEW)

Figure 1-1. Communication Control "- Console OJ-512/FRC-176(V)
(Sheet 3 of 3)

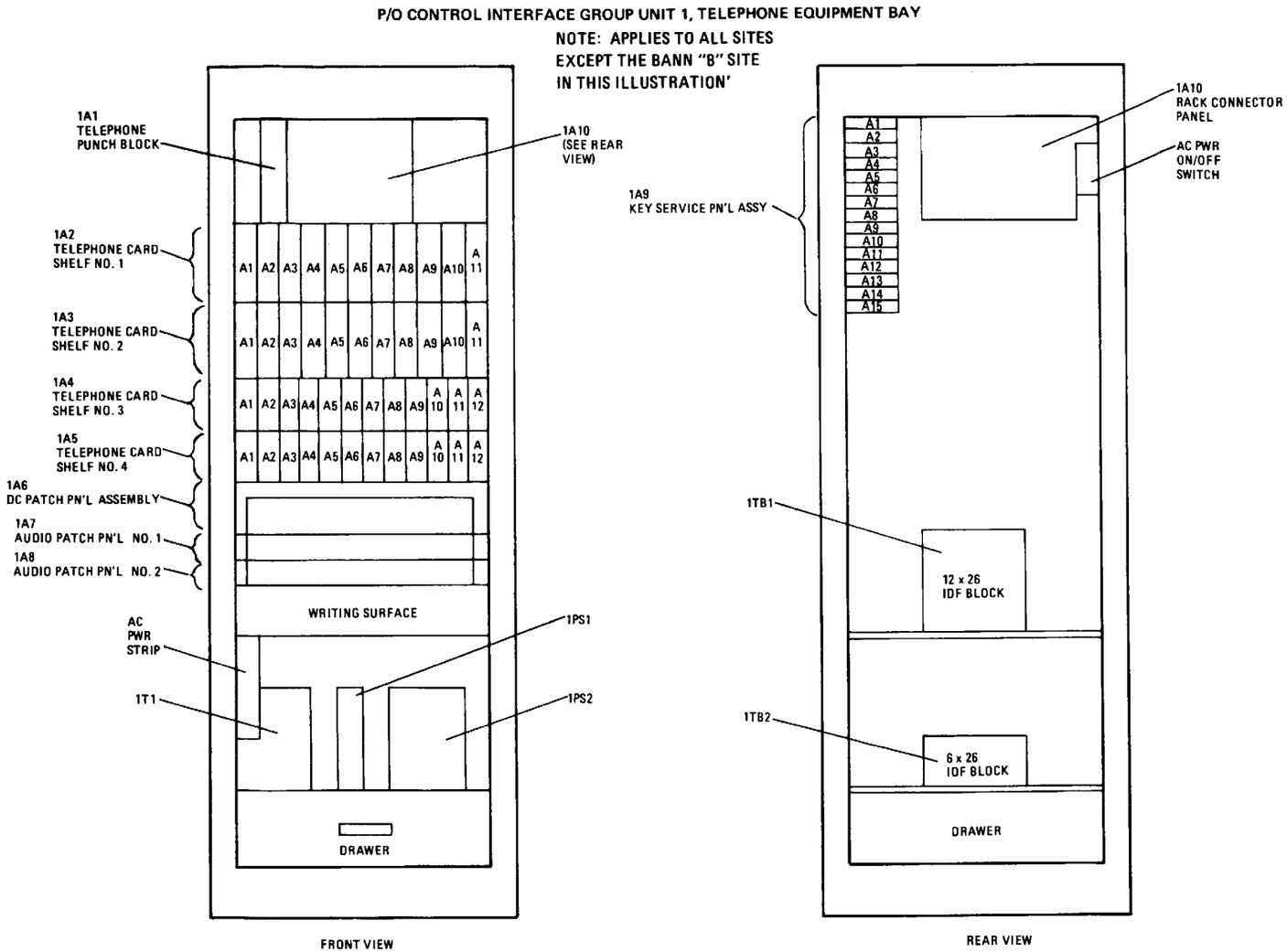


Figure 1-2. Control Interface Group OK-449 (V) /FRC-1I 76(V)
(Sheet 1 of 5)

P/O CONTROL INTERFACE GROUP UNIT 2, RF PATCH EQUIPMENT BAY

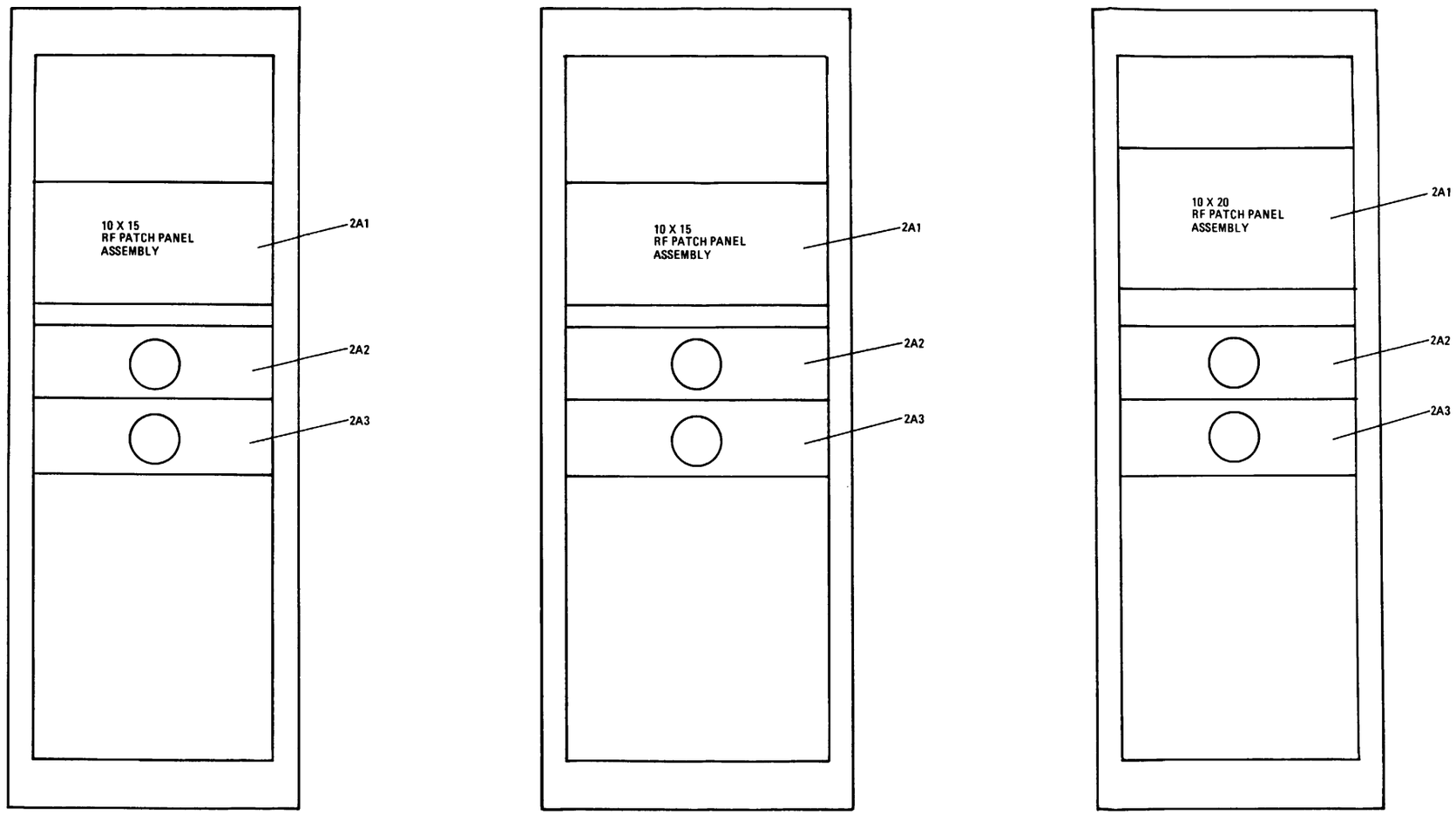


Figure 1-2. Control Interface Group OK-449(V)/FRC-176(V)
(Sheet 3 of 5)

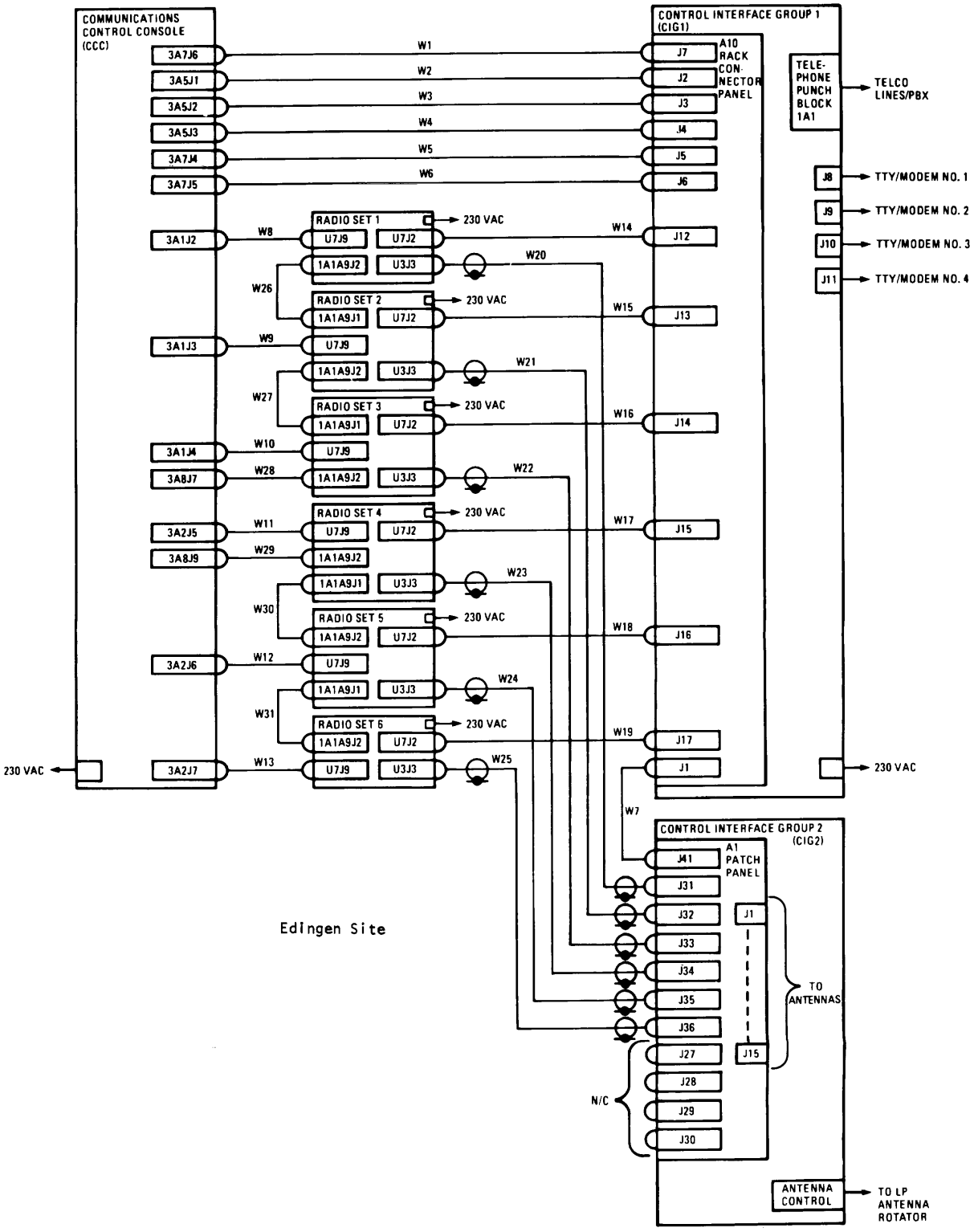


Figure 1-3. Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) Interconnection Diagrams
(Sheet 1 of 6)

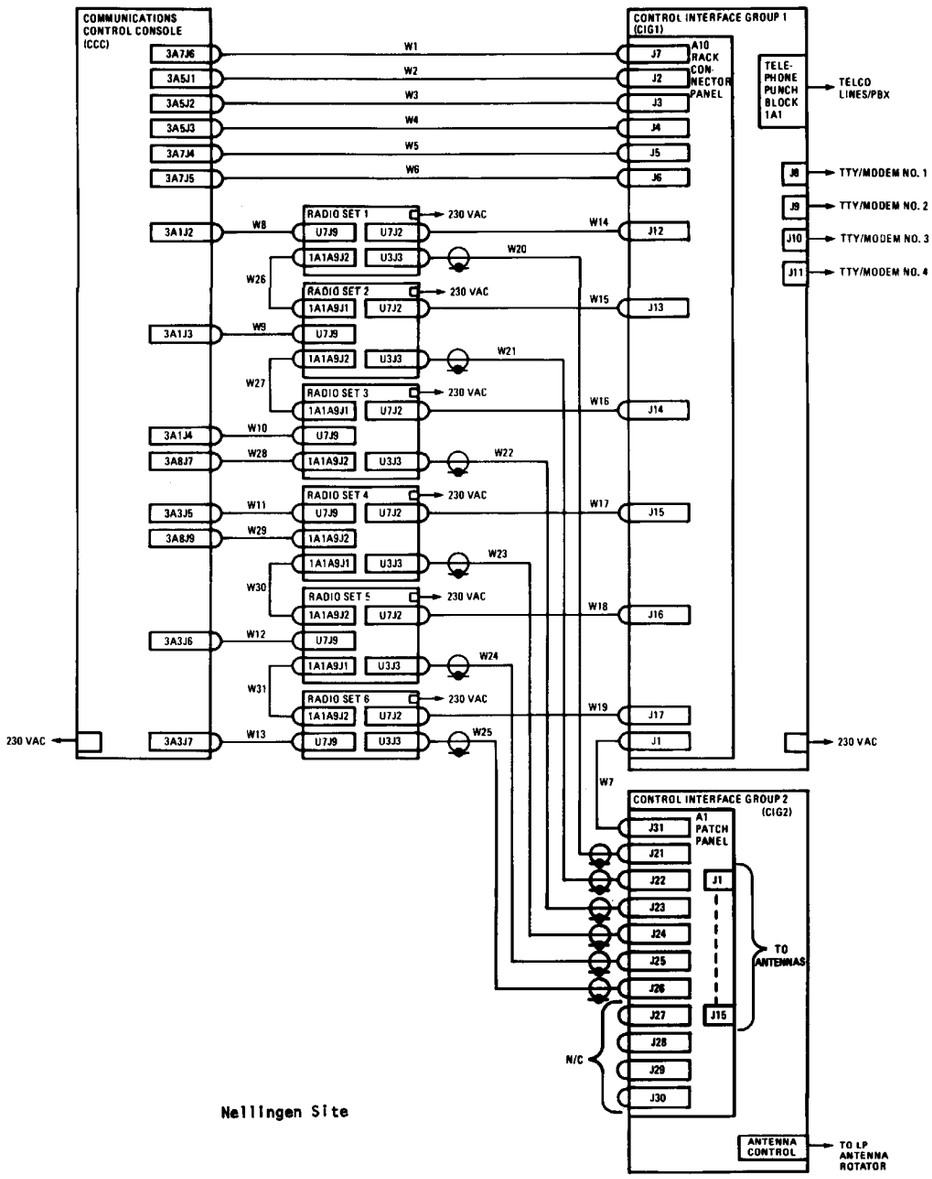


Figure 1-3. Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(v) Interconnection Diagrams
(Sheet 2 of 6)

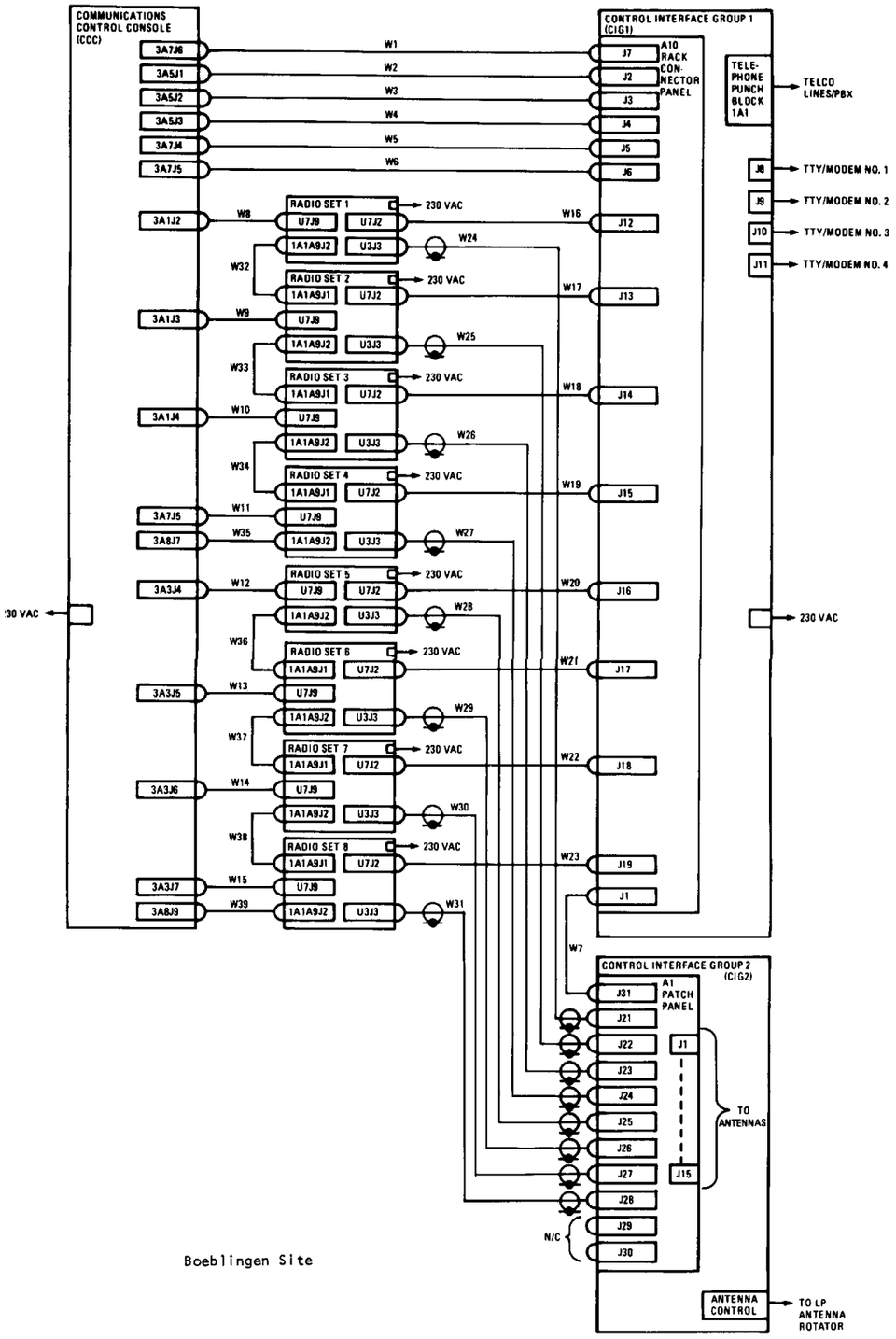


Figure 1-3. Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) Interconnection Diagrams
(Sheet 3 of 6)

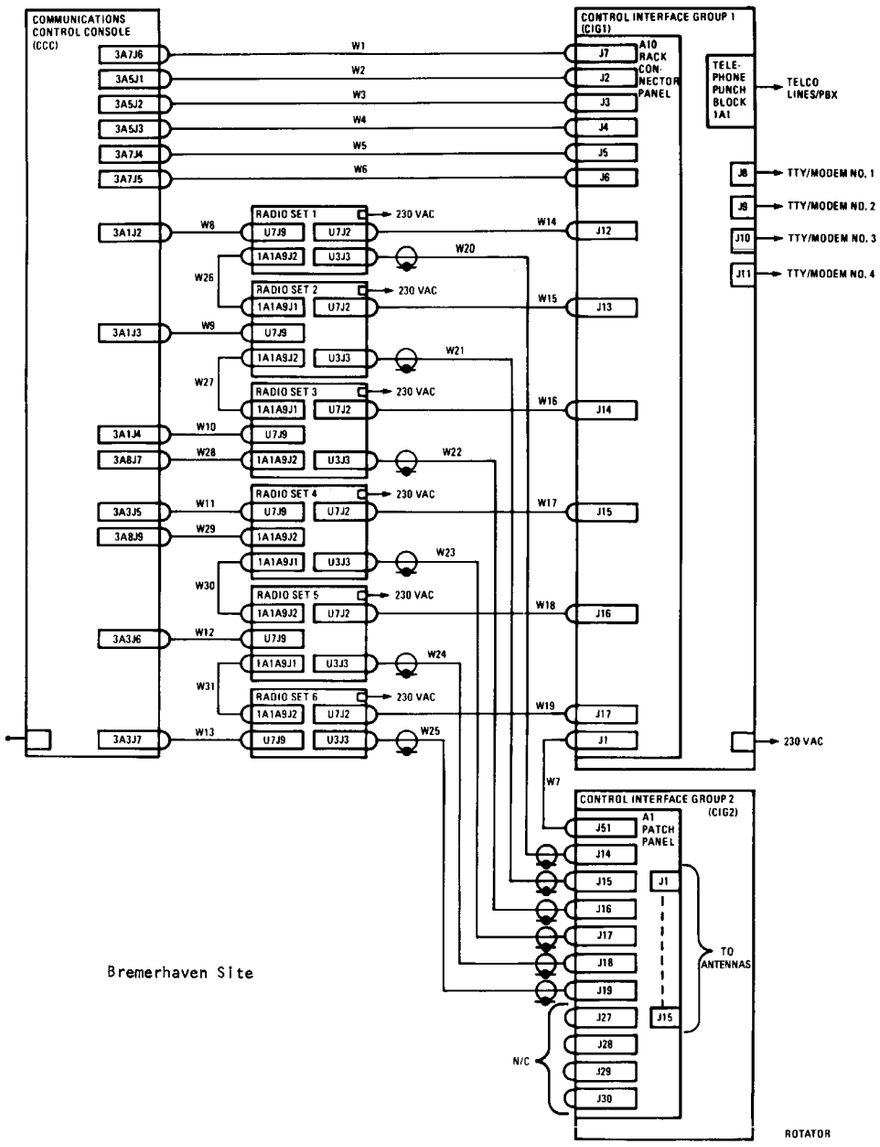


Figure 1-3. Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) Interconnection Diagrams
(Sheet 4 of 6)

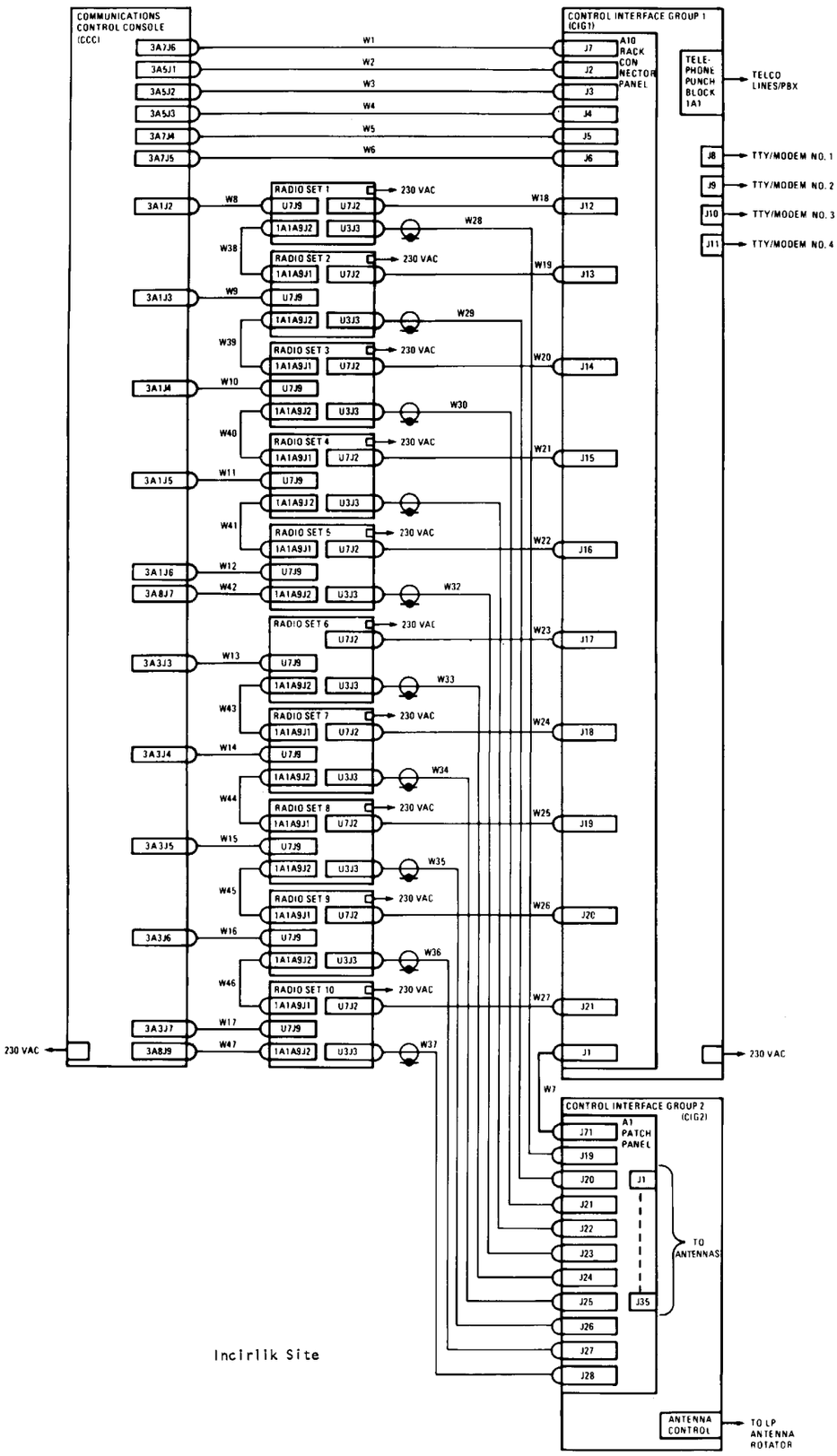


Figure 1-3. Communication Control Console OJ-512/FRC-176(V) and Control Interface Group OK-449(V)/FRC-176(V) Interconnection Diagrams
(Sheet 5 of 6)

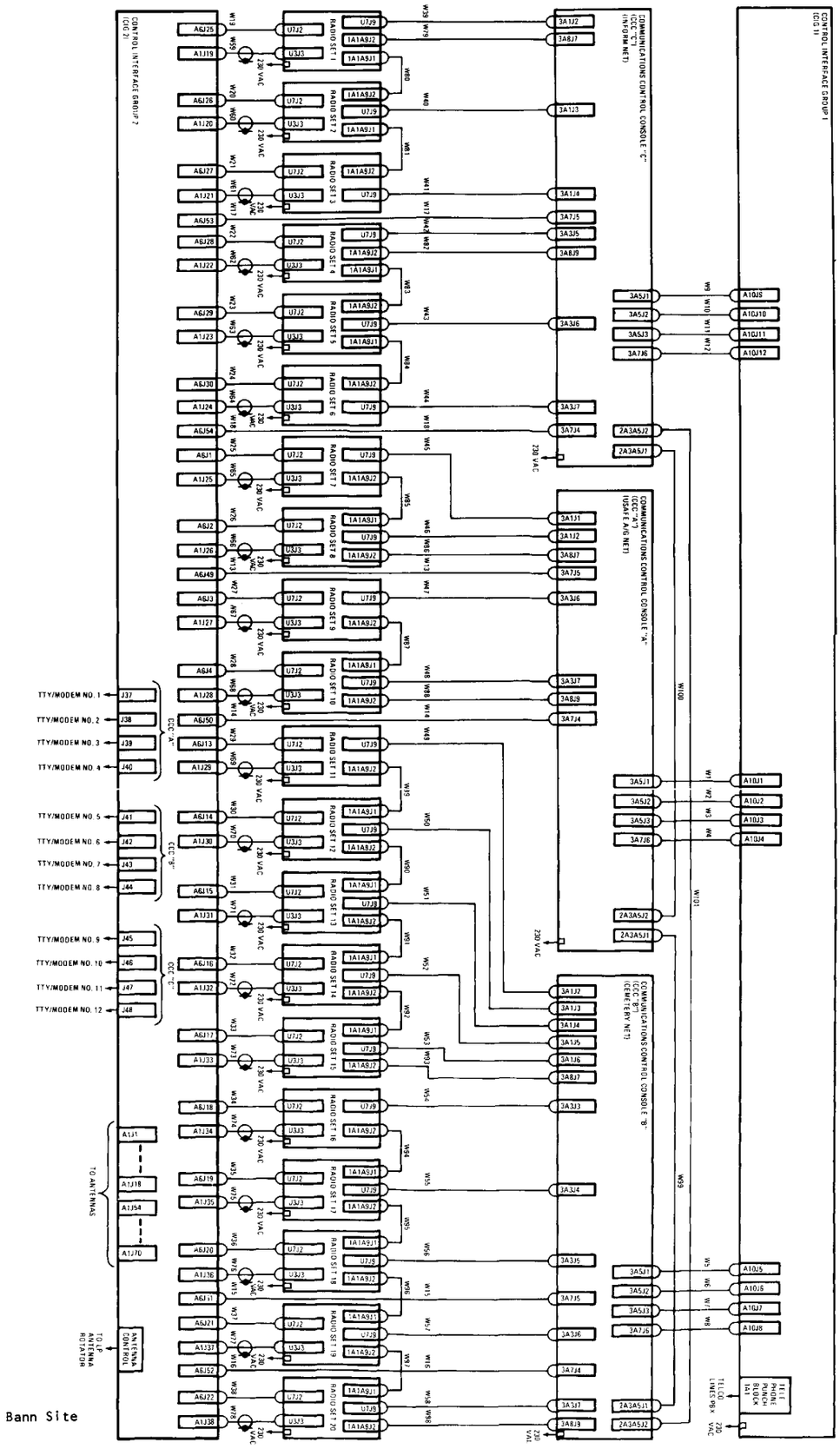


Figure 1-3. Communication Control Console OJ-512/FRC-176 (V) and Control Interface Group OK-449(V)/FRC-176 (V) Interconnection Diagrams
(Sheet 6 of 6)

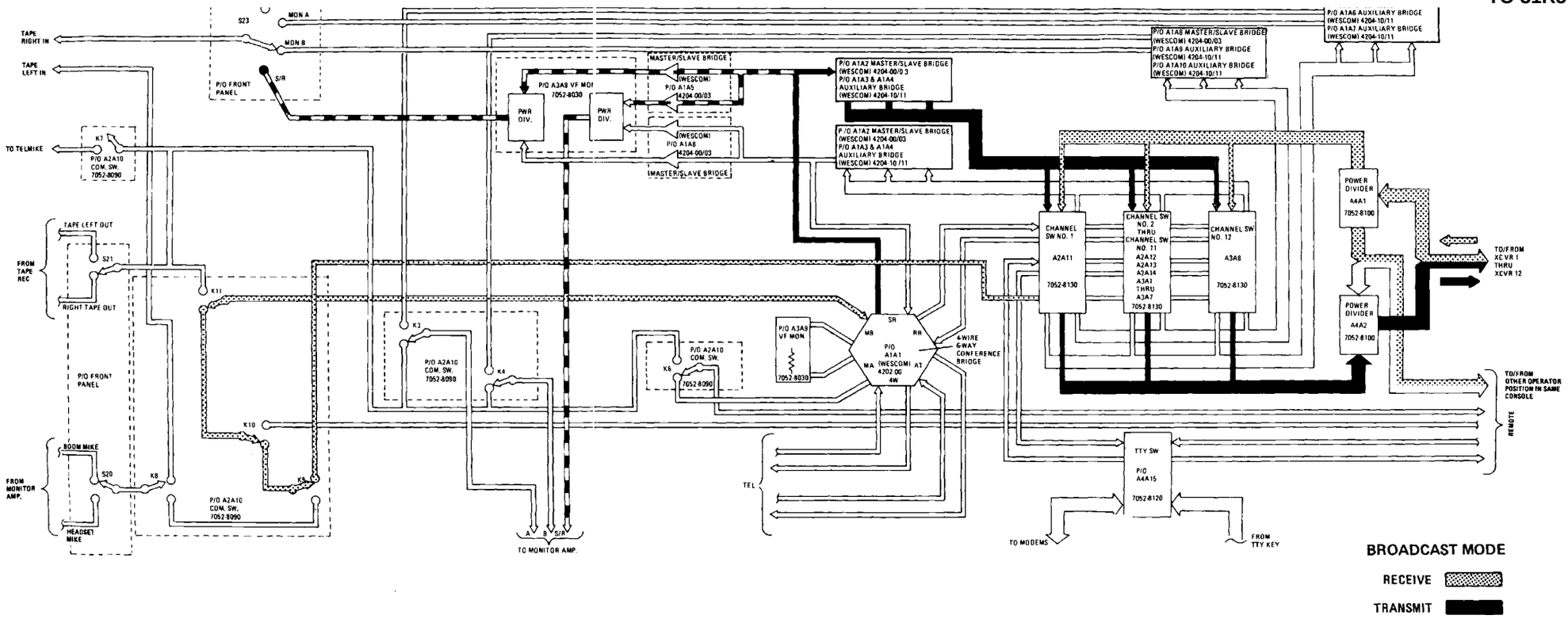


Figure 2-1. Communication Control Console OJ-512/FRC-176(V) Functional Block Diagram (Sheet 1 of 6)

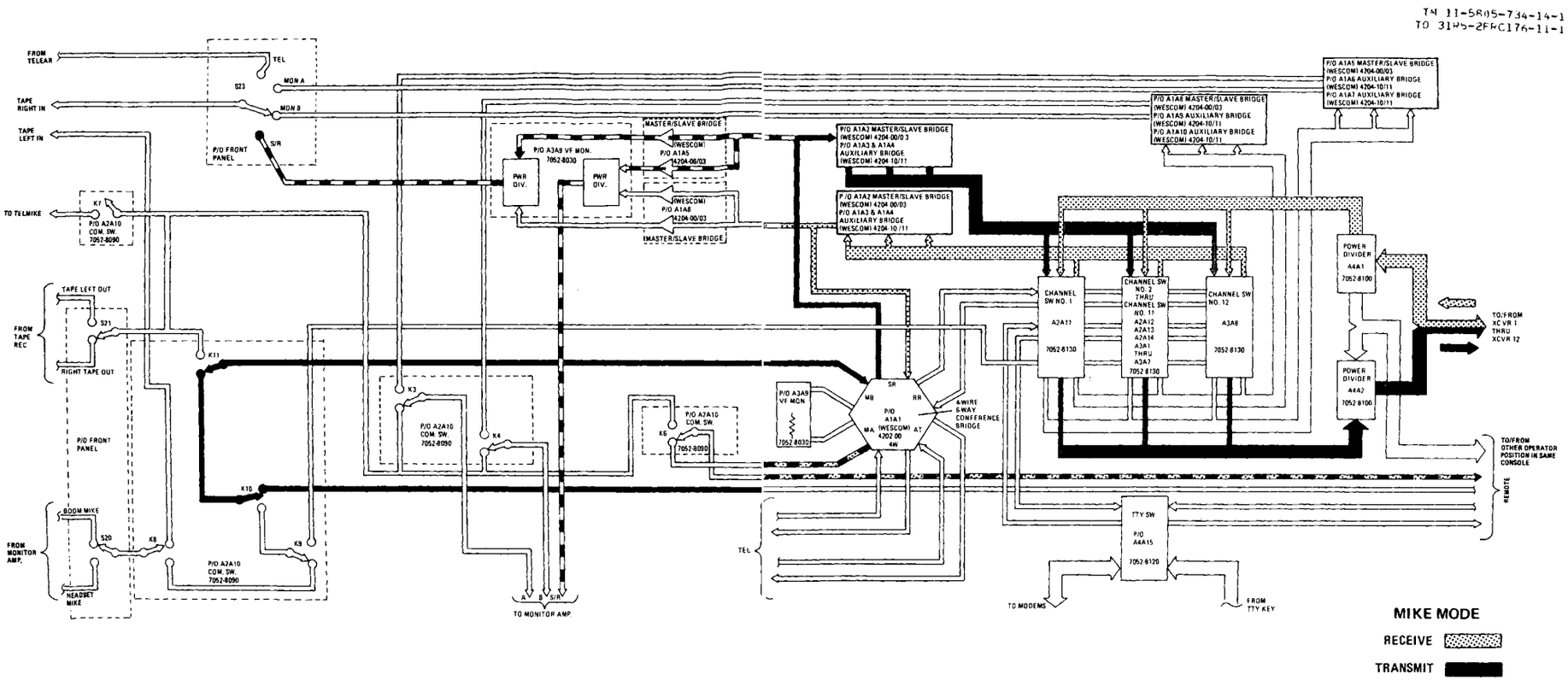


Figure 2-1. Communication Control Console-0J-512/FRC-176 Functional Block Diagram (Sheet 2 of 6)

2-5/(2 of 6)

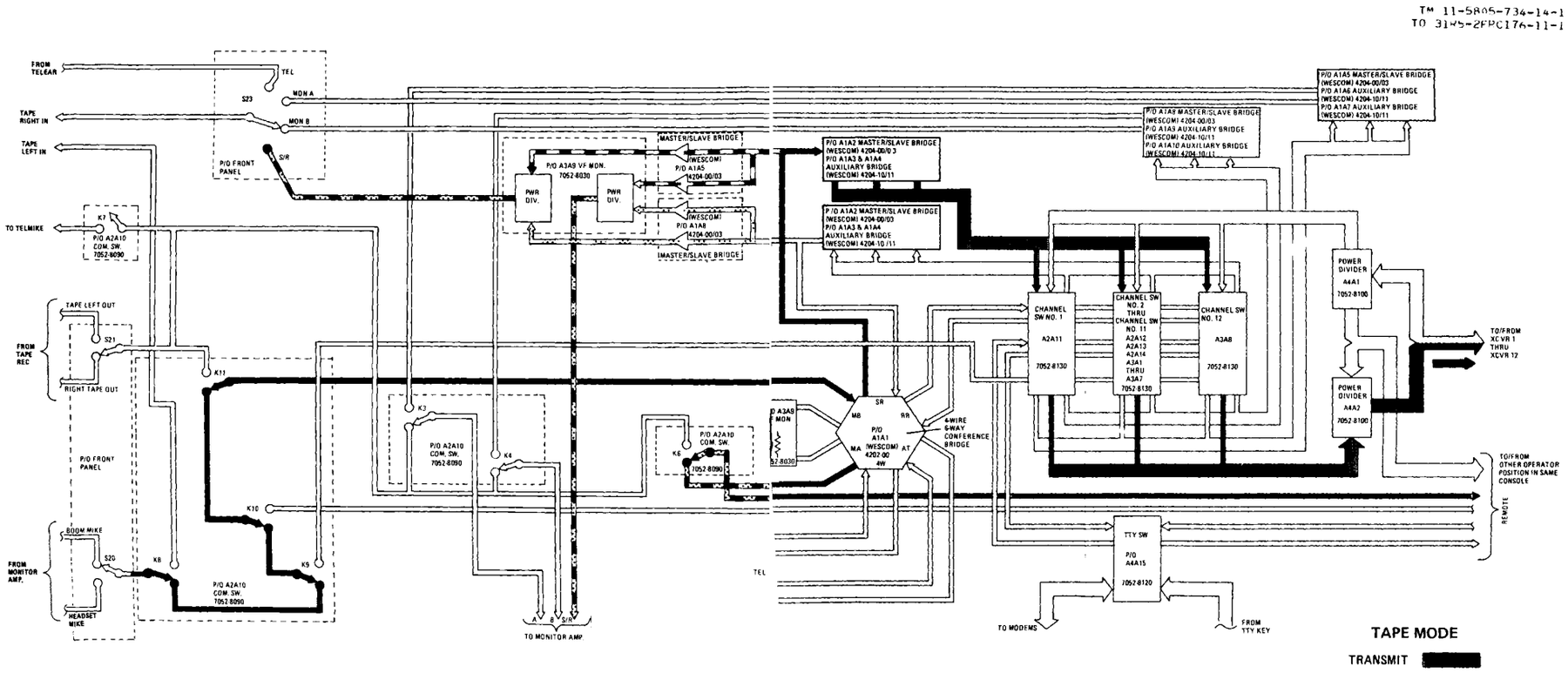


Figure 2-1. Communication Control Console 0J-512-/FRC-176(V) (Sheet 3 of 6)

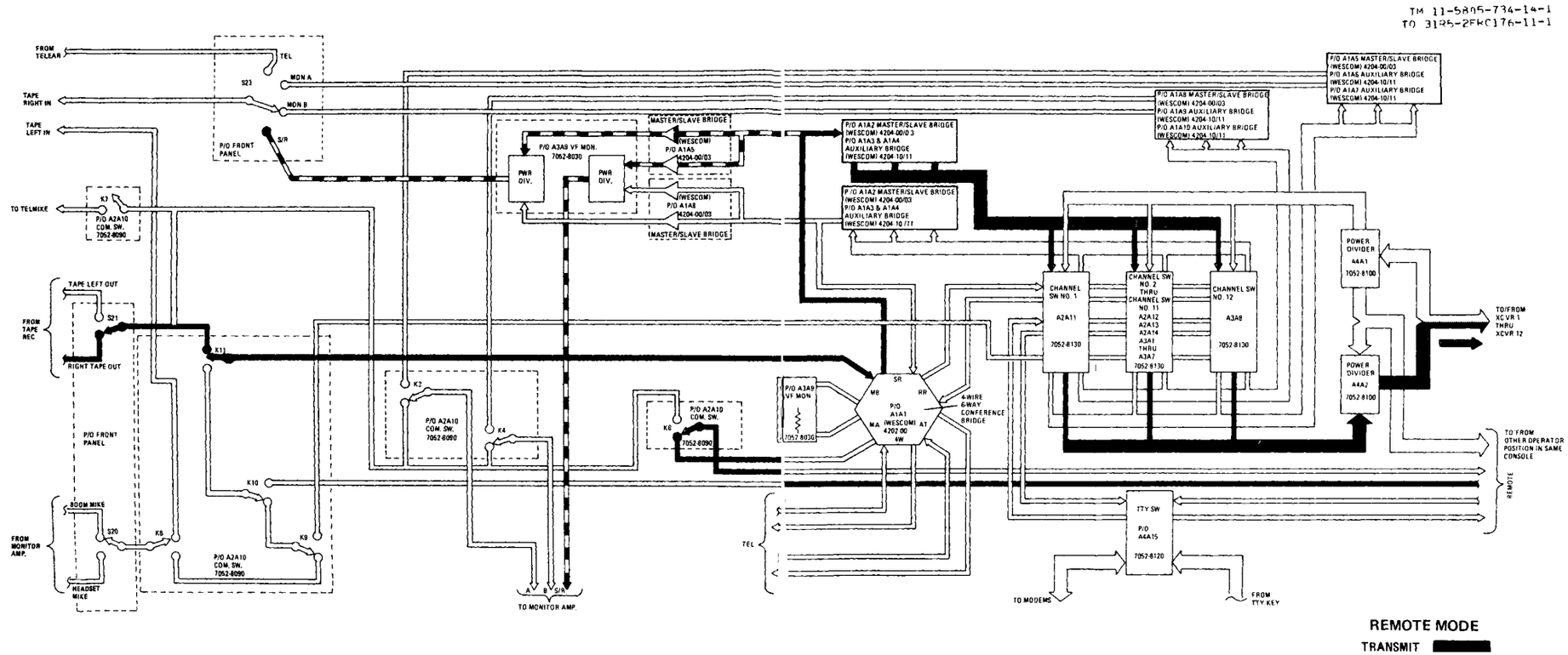


Figure 2-1. Communication Control Console 0J-512/Frc-176 (v) Functional Block Diagram (Sheet 4 of 6)

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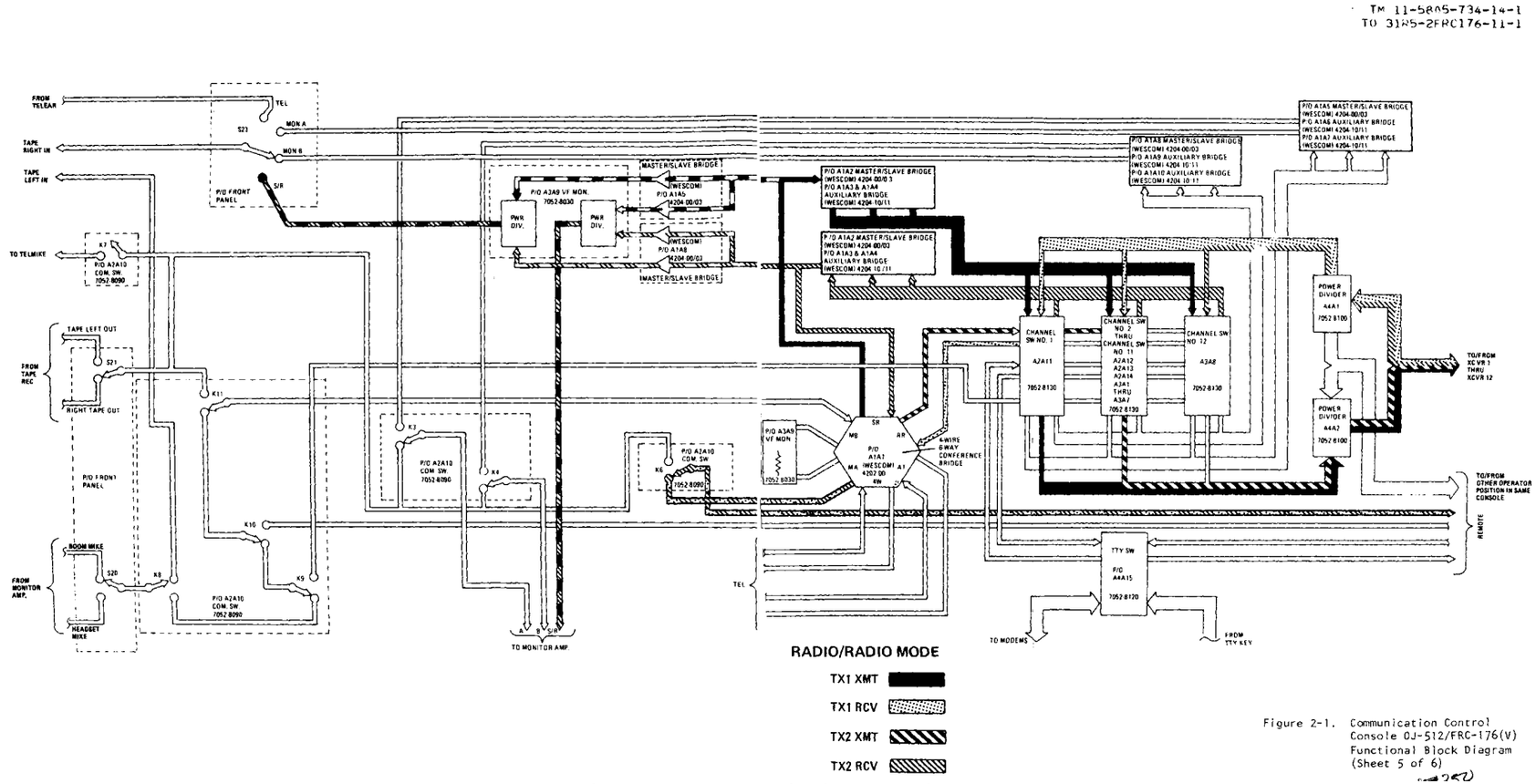


Figure 2-1. Communication Control Console OJ-512/FRC-176(V) Functional Block Diagram (Sheet 5 of 6)

Figure 2-1. Communication Control Console 0J-512-/FRC-176(v) Functional Block Diagram (Sheet 5 of 6)

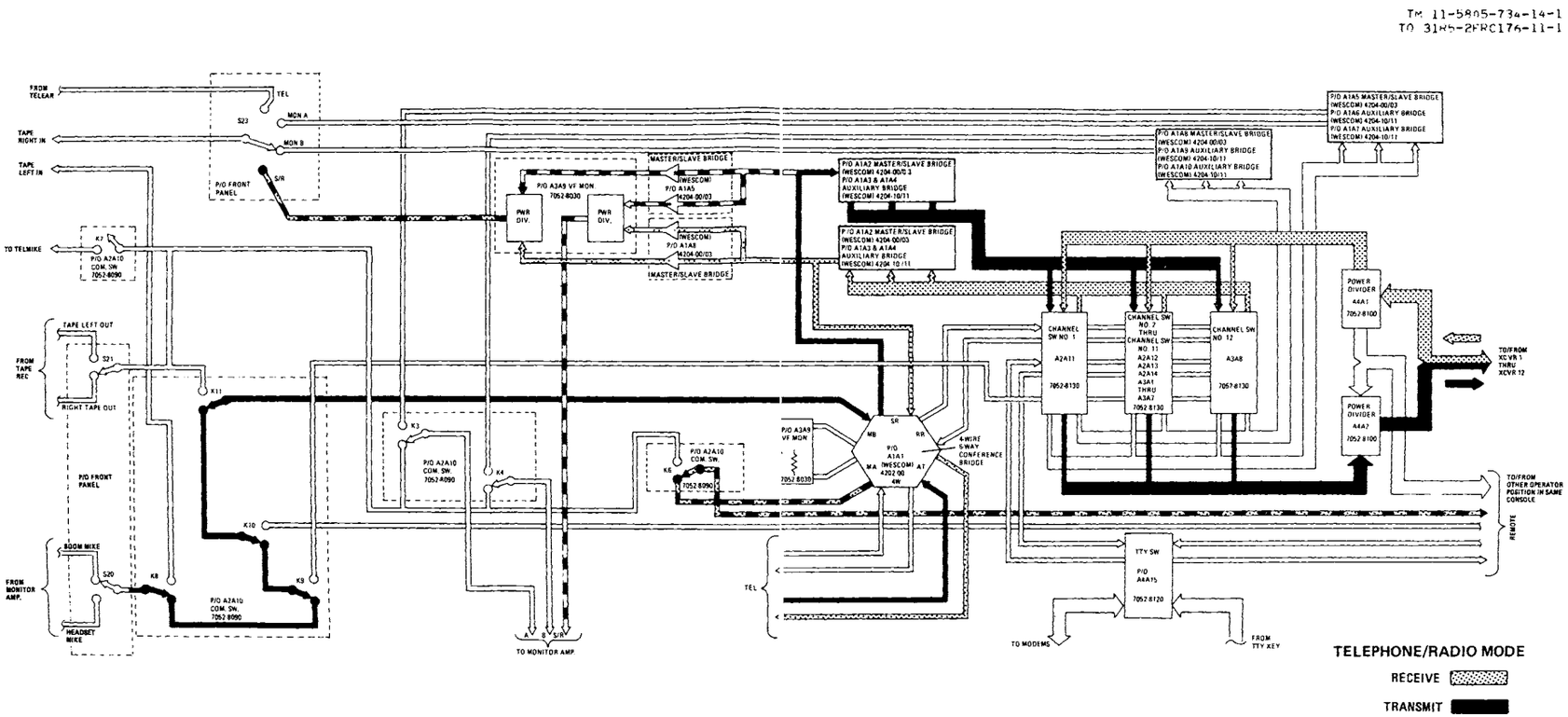


Figure 2-1. Communication Control Console 0J-512/FRC-176 (v) Function Block Diagram (Sheet 6 of 6)

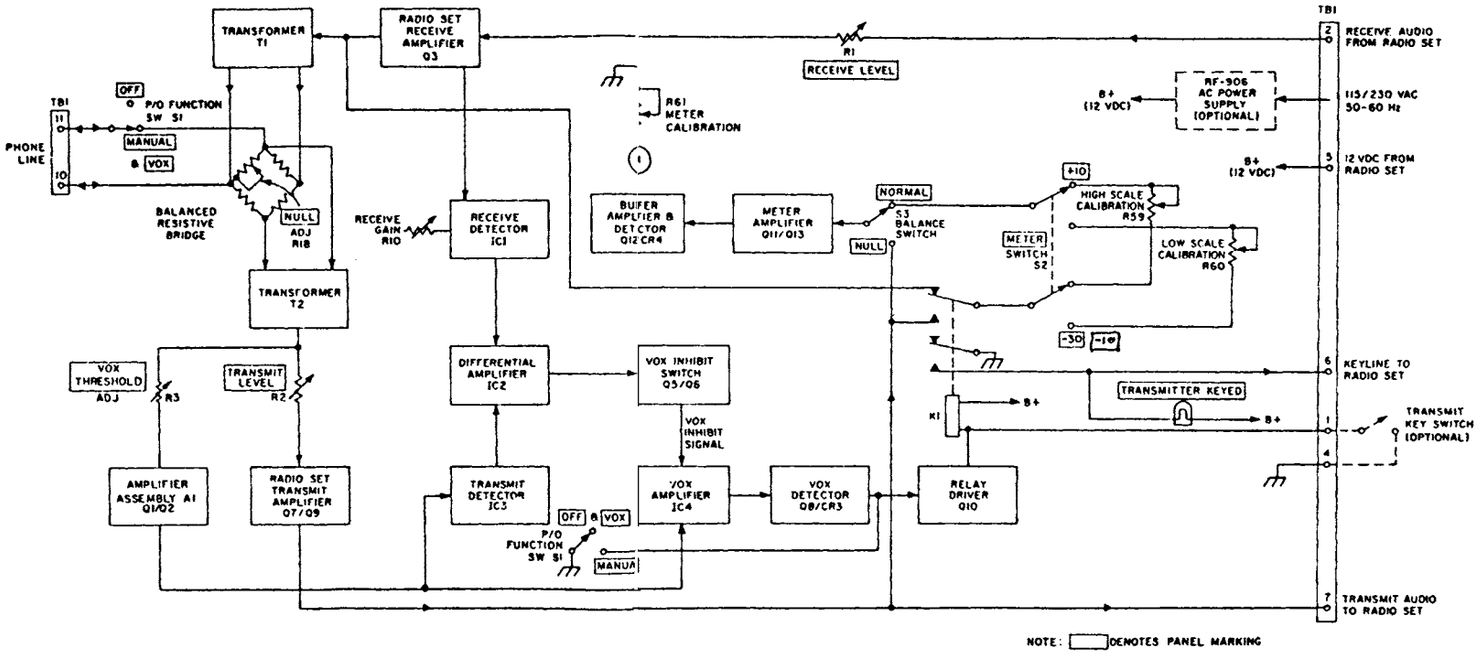


Figure 2-2. Phone Patch Panel RF-901A
Simplified Block Digram

Ref Desig	Control or Indicator	Function
1	Meter	With Balance switch set at NORMAL: a. During periods of radio reception indicates the audio level being applied to the phone lines from the radio set receiver. b. During periods of radio set transmission, indicates the audio level being applied to the transmitter for modulation from the phone line. With Balance switch set at NULL: a. Indicates level of audio signal from radio set for null adjustment of resistor bridge.
2	METER	Provides for either a high range scale (-10 to +10 dB) when set at +10 or a low range scale (-10 to -30 dB) when set at -30 on the front panel meter.
3	RECEIVE LEVEL Control	Adjusts the level of the audio signal being applied to the phone lines. Normally set for a 0 dBm output as indicated by the meter.
4	TRANSMIT LEVEL Control	Adjusts the level of the audio signal being applied to the radio set transmitter from the phone lines. Normally set for 100% modulation of voice peaks.
5	TELEPHONE ON light	Indicates, when illuminated, that dc power is supplied and the Function switch is in one of the two operating modes.
6	Function Switch	Position — Function OFF — Disconnects both the radio set (audio, keyline, and +12V) and the telephone lines from the RF-901A unit. VOX — Energizes the RF-901A circuitry to provide telephone interface with the receive and transmit circuitry of the radio set. MANUAL — Disconnects the radio set keyline from the RF-90O1A VOX circuitry. Normally used when manual keying is required by the operator using the RF-920 Transmit Foot Switch or if the radio set is equipped with an internal VOX feature.
7	TRANSMITTER KEYED light	Indicates, when illuminated, that the radio set is being keyed by the RF-901A.
8	VOX Threshold Control	Provides continuous adjustment of the VOX threshold level from -25 dBm to -5 dBm depending on the level of the received signal on the four wire side (radio set).
	Balance Switch (rear panel)	When set at NULL, provides a signal to the meter for balancing the input/output resistive bridge NORMAL position provides for monitoring of input and output audio levels by the meter.

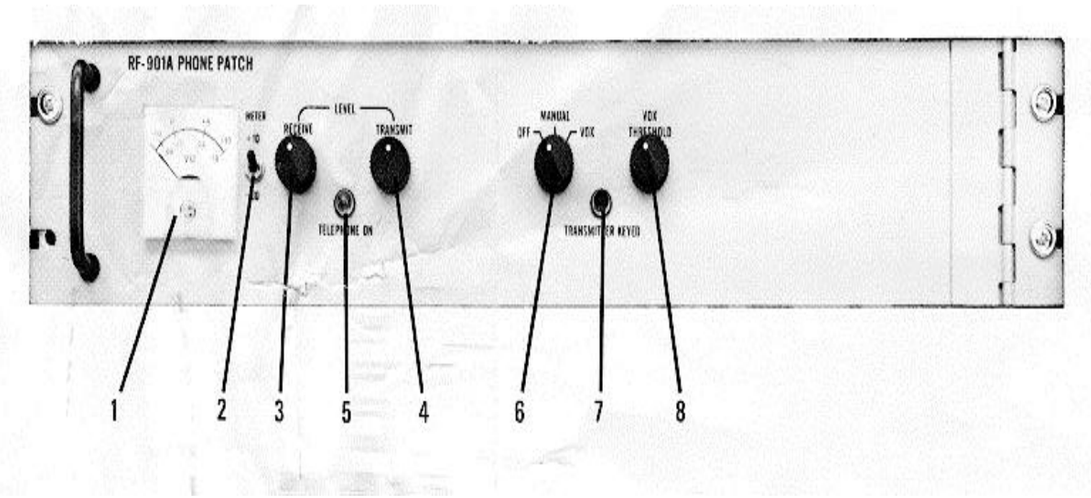


Figure 2-3. RF-901A Phone Patch 1A1 and 4A1 Communication Control OJ-512/FRC-176(V) Controls and Indicators

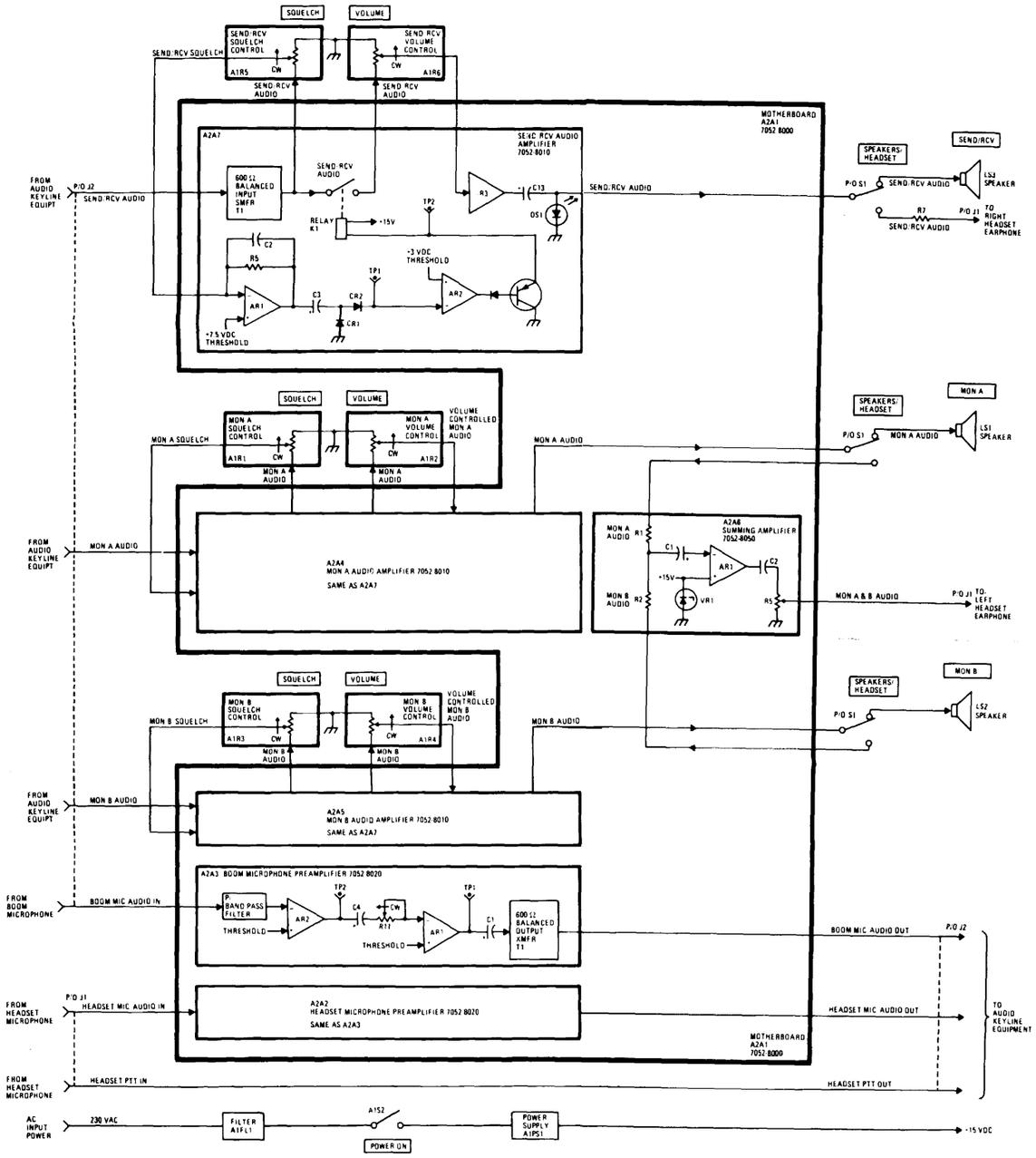


Figure 2-5. Audio Monitor Panel, P/N 7052-1102, 1A2A1 and 4A2A1 in Communication Control Console OJ-512/FRC-176(V) Functional Block Diagram

Ref Desig	Control or Indicator	Function
1	ON Indicator	When illuminated, indicates that power is applied to transceiver.
2	FAULT Indicator	When illuminated, indicates a fault in the trans-cei ver.
3	RF Indicator	When illuminated, indicates RF output from the transceiver.
4	FREQUENCY Readout	Provides readout in kHz of transceiver frequency.
5	USB Indicator	When illuminated, indicates that transceiver is in USB mode.
6	LSB Indicator	When illuminated, indicates that transceiver is in LSB mode.
7	FAST AGC Indicator	When illuminated, indicates FAST AGC operation.
8	SLOW AGC Indicator	When illuminated, indicates SLOW AGC operation.
9	LOCAL Indicator	When illuminated, transceiver is set for local control, Console operator cannot key transceiver.
10	REMOTE Indicator	When illuminated, transceiver is set for remote control (Console).
11	KEY	When illuminated, indicates that transceiver is keyed.
12	UNSQUELCHED	When illuminated, indicates that transceiver is in unsquelched condition.
13	LAMP TEST Button	When pressed, applies power to all indicator lights in Status Monitor Unit, Lamp Test control also activates SONALERT in console.
14	ALARM RESET Button	Silences SONALERT alarm which has been activated by fault in transceiver. FAULT indicator 2 remains illuminated after SONALERT alarm is shut off.

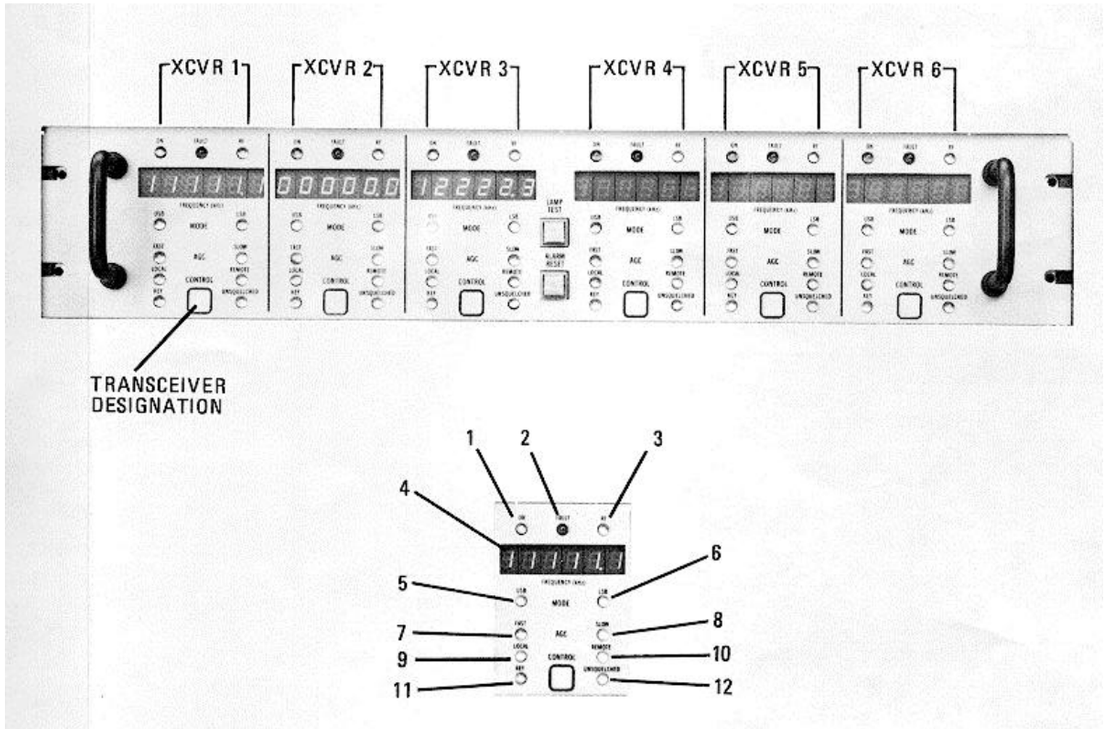
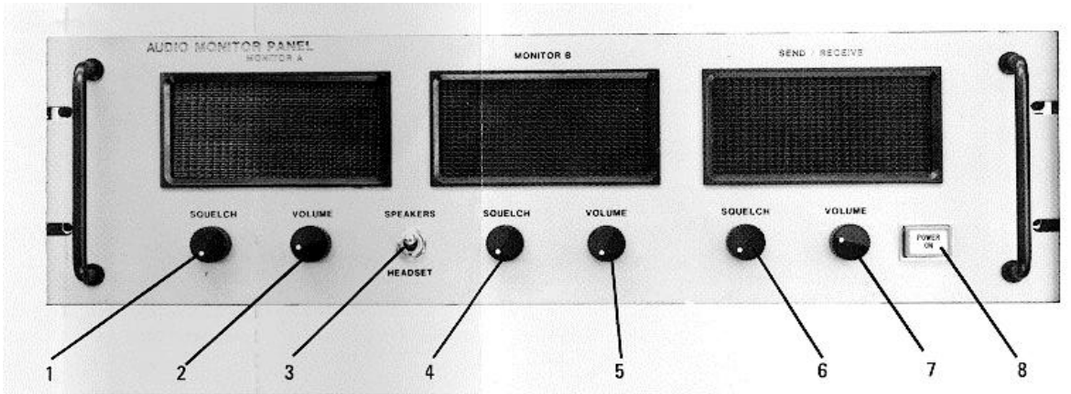


Figure 2-16. Status Display Monitor Indicators and Controls

Ref Desig	Control or Indicator	Function
1	SONALERT	Provides audible indication of an incoming call.
2	Radio Patch Switches (12)	Connects telephone line to transceiver.
3	RLS (Release)	Disconnects Radio Patch switches.
4	Trunk Connect	Connects operator to any of 12 trunk lines.
5	HOLD	Enables operator to place calling party on hold.
6	RADIO	Enables operator to talk over transceiver using handset.
7	ICOM (Intercom)	Enables operator to use handset for intercom functions.
8	Keypad	Contains telephone and AUTOVON entry keys.
9	AUTOVON	Keys used to access AUTOVON circuits.
10	Rotary Dial Bypass	When pressed, key bypasses tone-to-rotary dial converters. Allows operator to access tone (DTMF) central exchanges.



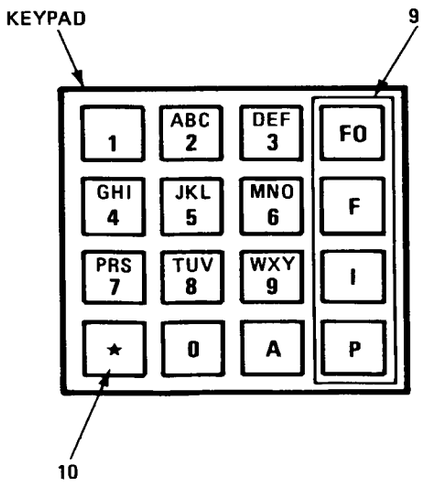


Figure 2-10. Telephone Switch/Dial Panel P/N 7052-0020, 1A3 and 4A3 Communication Control Console OJ-512/ FRC-176(V) Indicators and Controls (Sheet 2 of 2)

Ref Desig	Control or Indicator	Function
1	SQUELCH Control (MONITOR A)	Controls MON A audio squelch level
2	VOLUME Control (MONITOR A)	Varies level of MON A audio.
3	SPEAKERS/HEADSET Switch	Selects MON A audio, MON B audio, or SEND/RECEIVE audio for routing to panel speakers or to headset.
4	SQUELCH Control (MONITOR B)	Controls MON A audio squelch level.
5	VOLUME Control (MONITOR B)	Varies level of MON B audio.
6	SQUELCH Control (Send/Receive)	Controls SEND/RECEIVE audio squelch level.
7	VOLUME Control (Send/Receive)	Varies level of SEND/RECEIVE audio.
8	POWER ON/OFF Switch	Controls ac power input to the Audio Monitor.

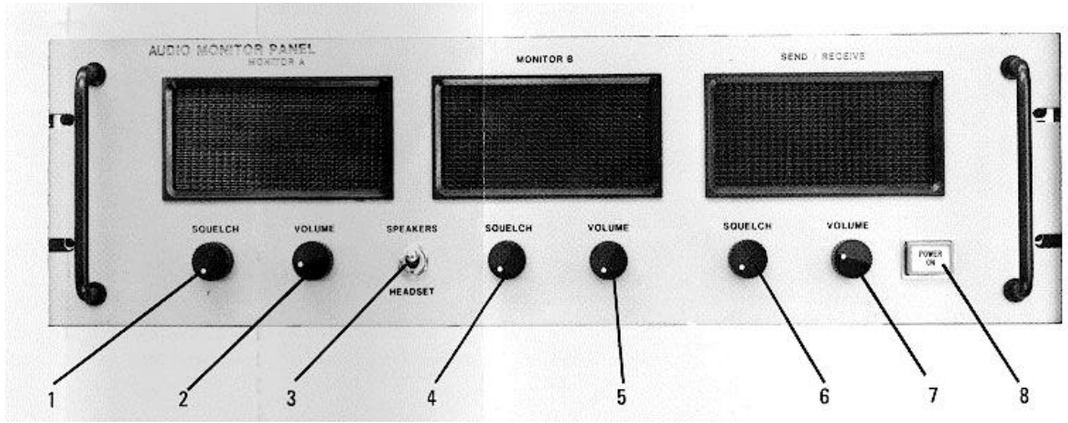


Figure 2-4. Audio Monitor Panel, P/N 7052-1102, lA2Al and 4A2A1 In Communication Control Console OJ-512/ FRC-176(V) Indicators and Controls

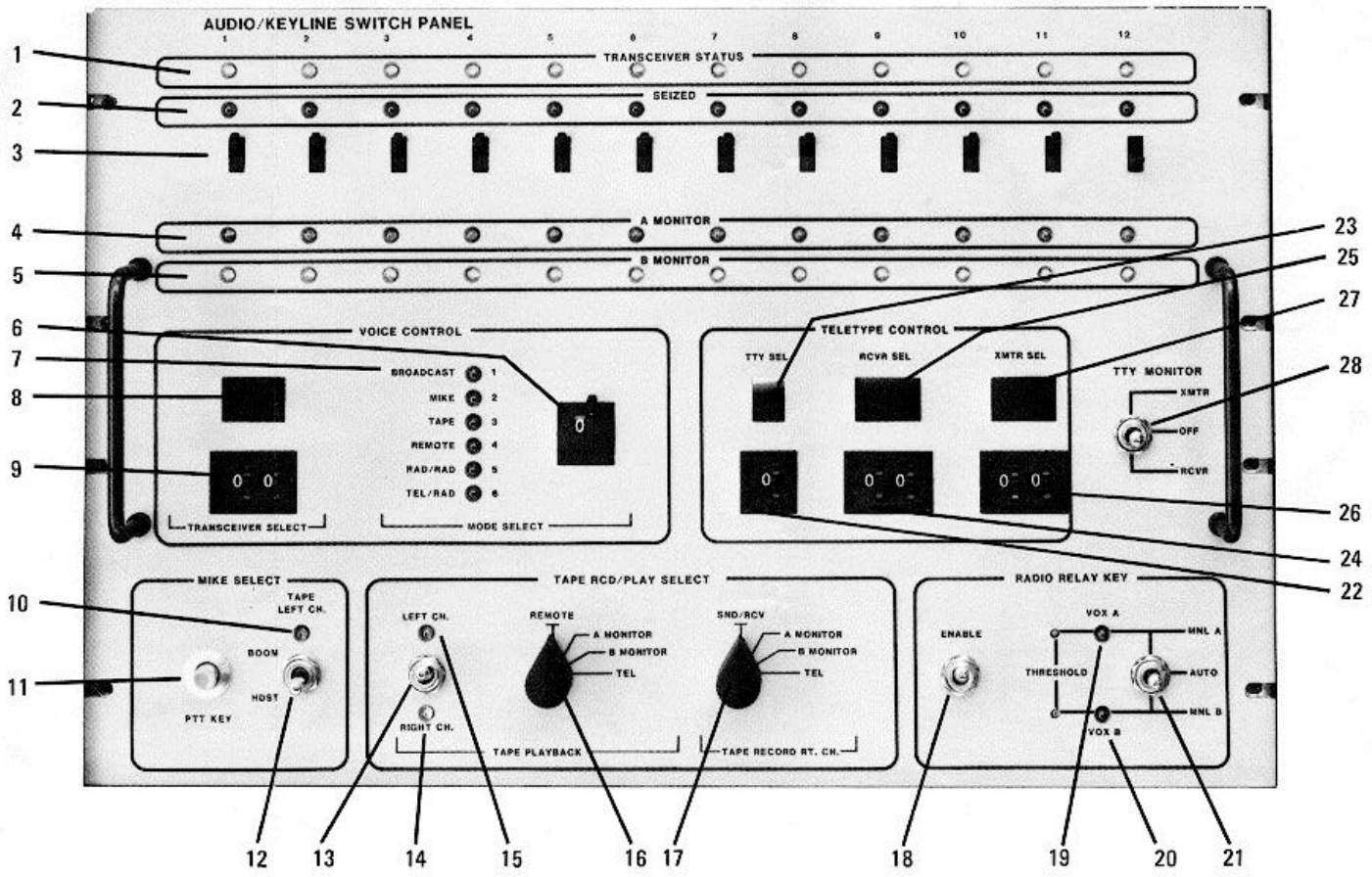


Figure 2-15. Audio/Keyline Switch Panel, P/N 7052-1200, 2A2 and Communication Control Console 0J-512/ FRC-176 (V) Indicators and Controls (Sheet 2 of 2)

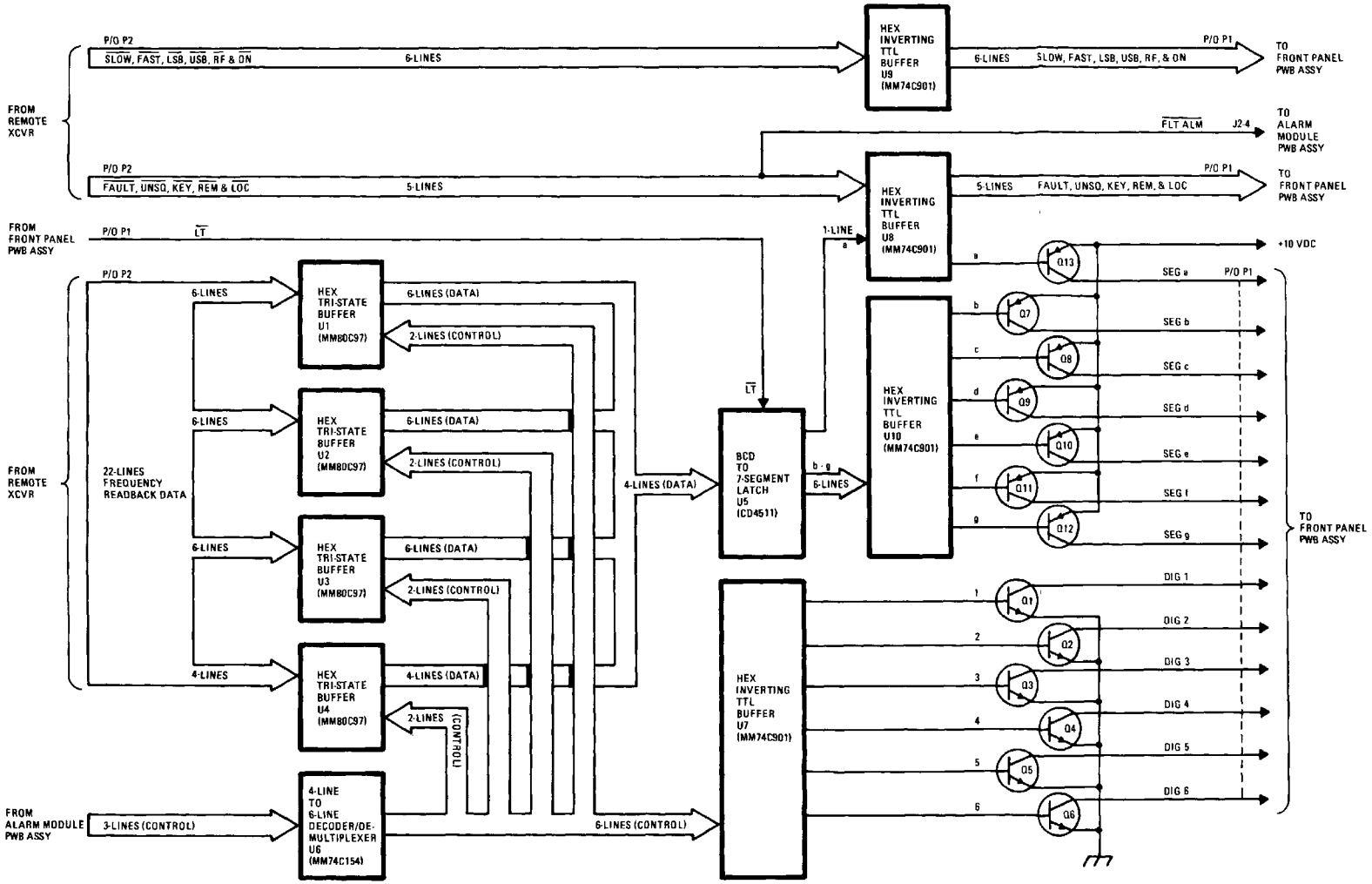


Figure 2-17. Display Driver PWB Assembly Functional Block Diagram

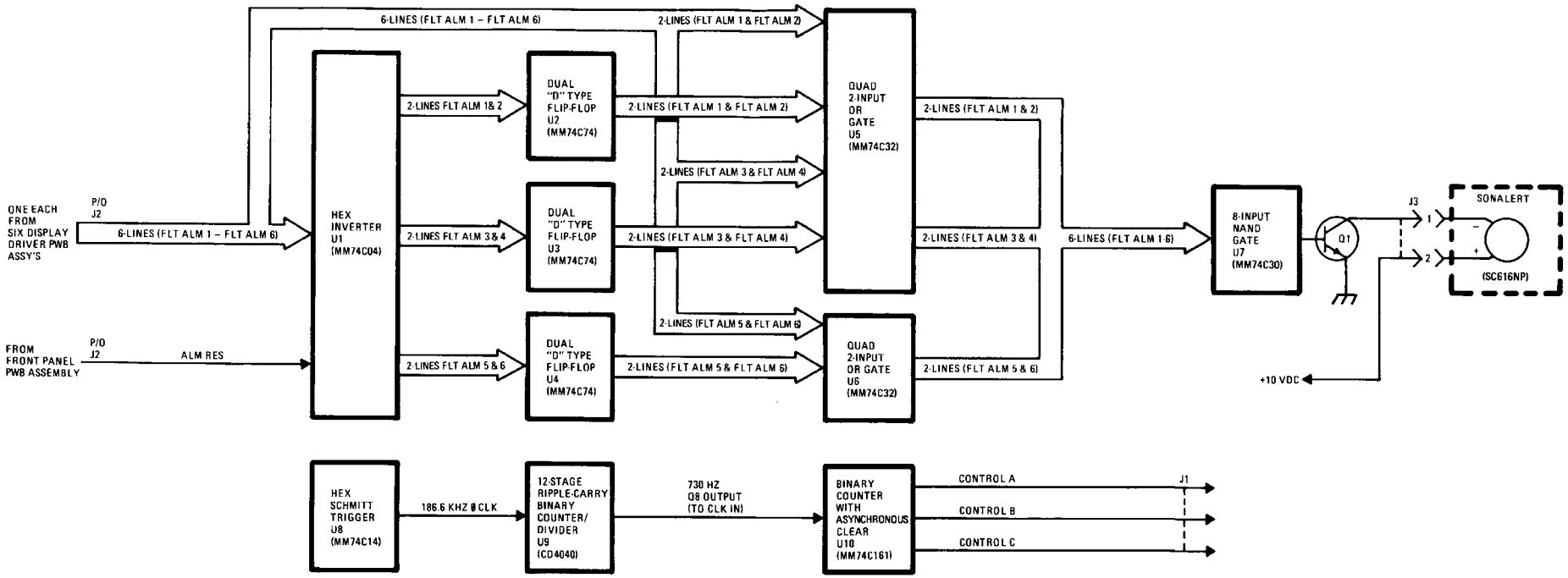


Figure 2-18. Alarm Module PWB Assembly, Functional Block Diagram

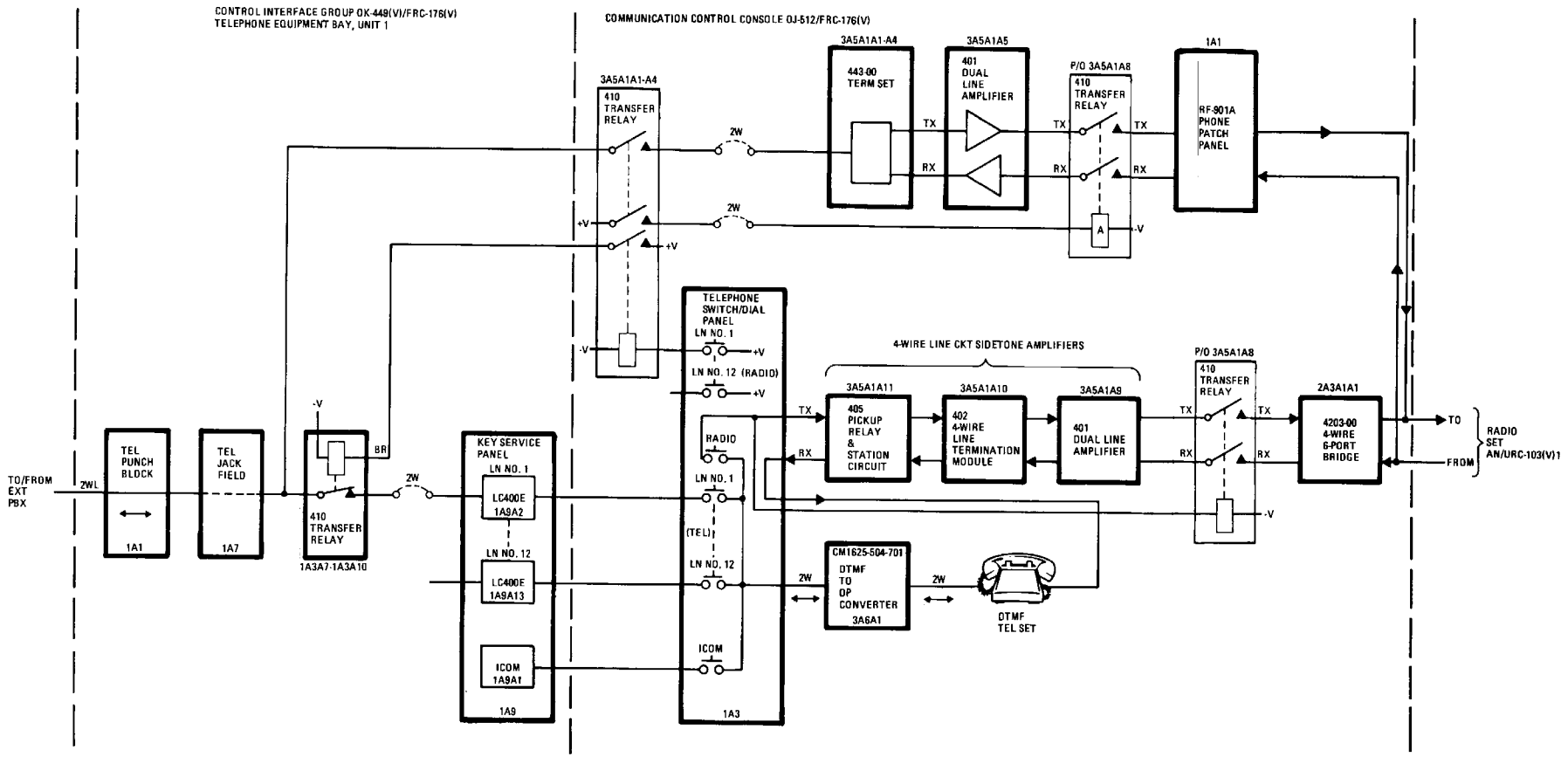


Figure 2-20. Two-Wire Telephone Operation, Functional Block Diagram

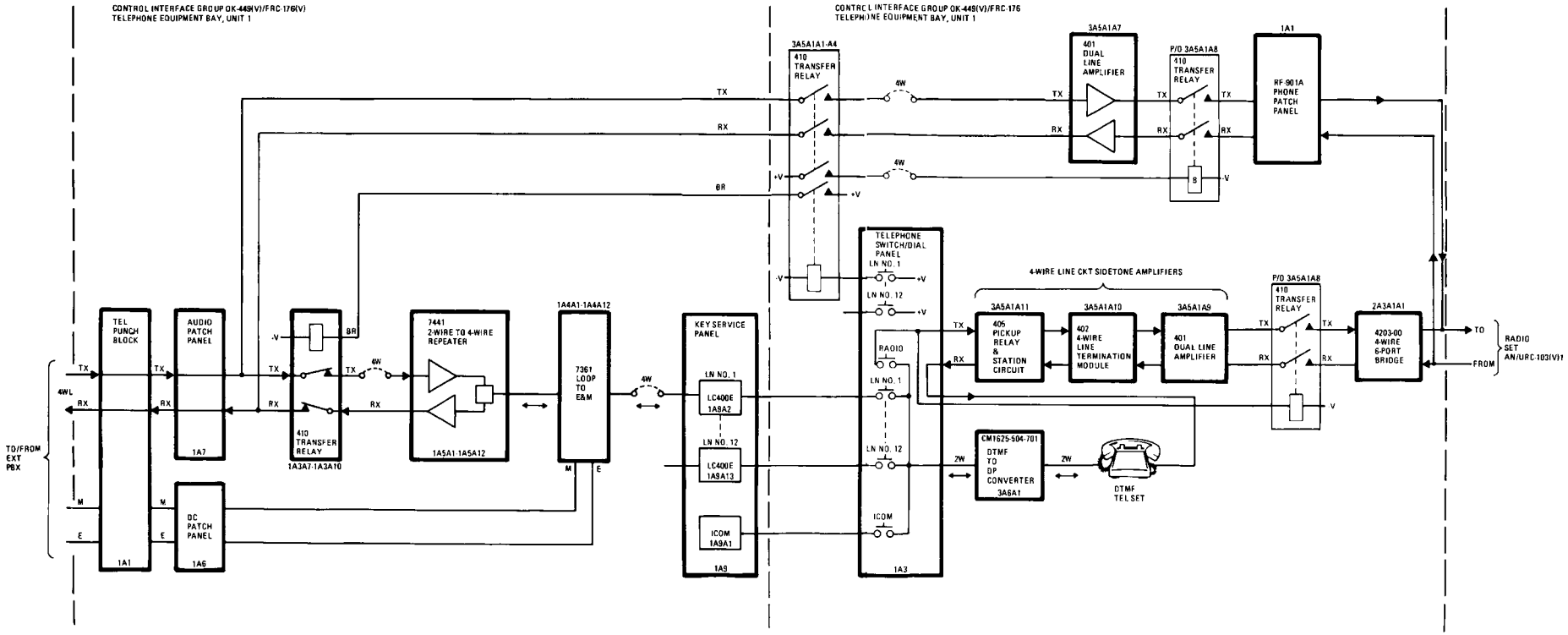


Figure 2-21. Four-Wire Telephone Operation with E&M Signaling, Functional Block Diagram

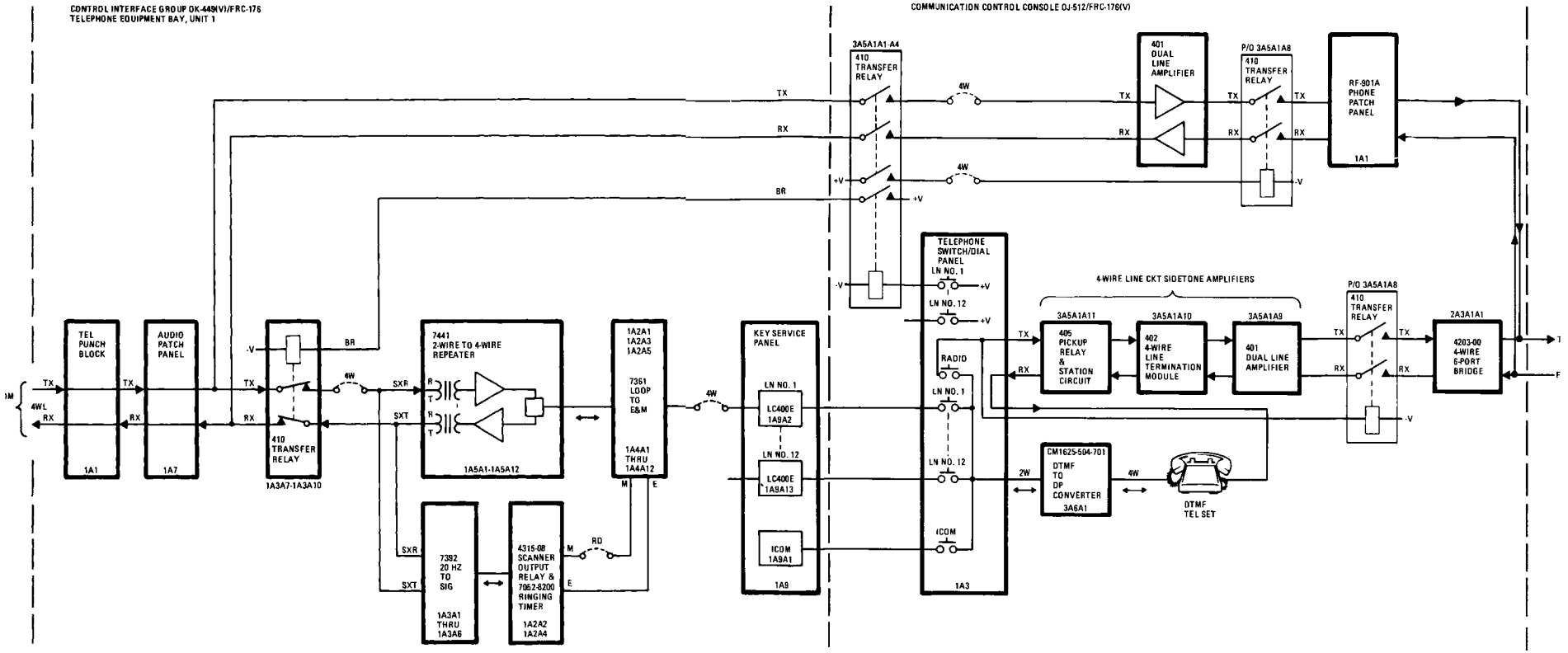


Figure 2-22. Four-Wire Telephone Operation with Ringdown Signaling, Functional Block Diagram

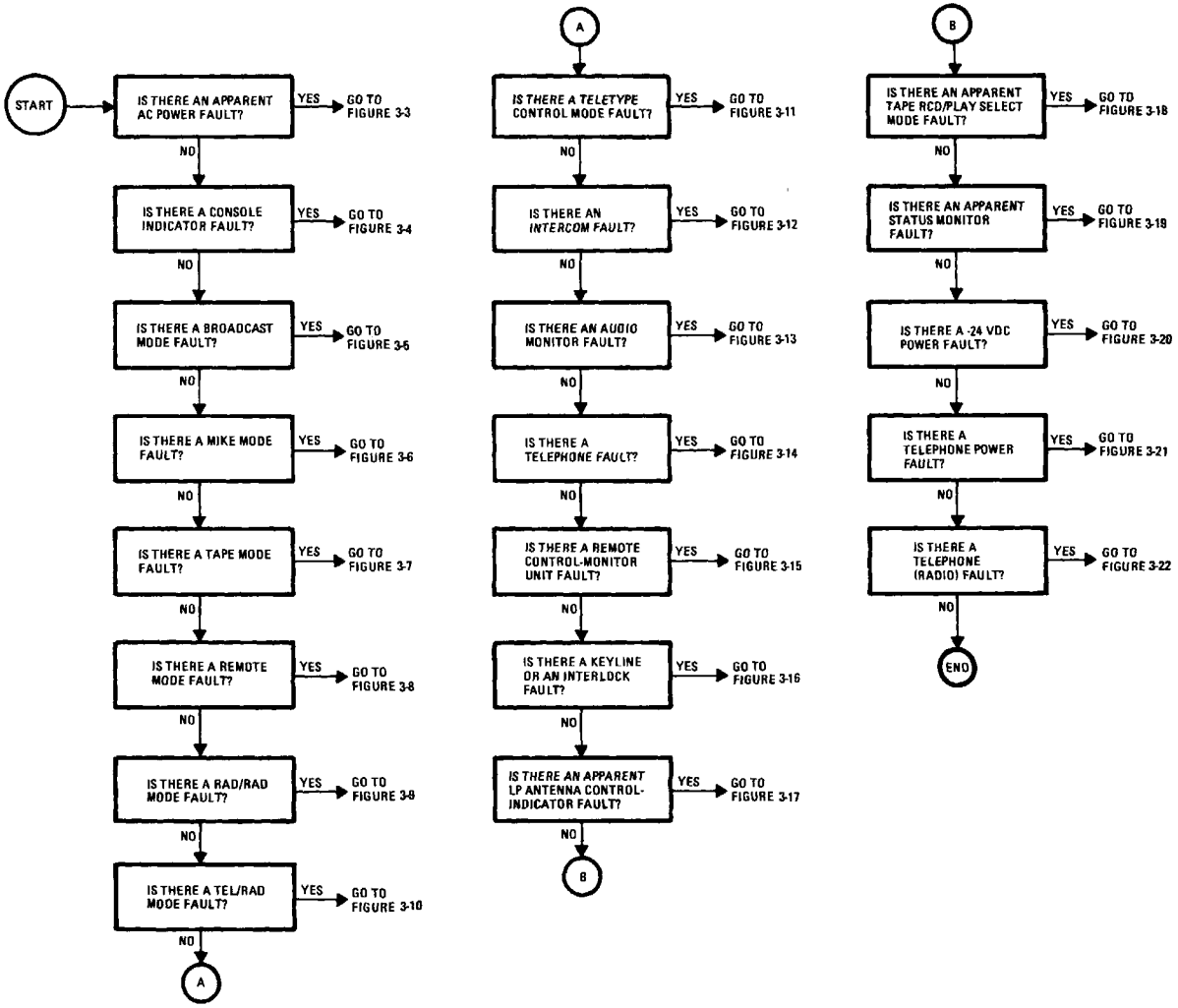


Figure 3-2. Communication Control Console OJ -512/FRC - 176(V) and Control Interface Group OK-449(V)/FRC-176(V) Fault Analysis Diagram

Ref. Desig.	Control or Indicator	Function
1	TRANSCEIVER STATUS Indicator	When illuminated, indicates transceiver has been selected for operation.
2	SEIZED Indicator	Lights when TRANSCEIVER SEIZE switch is in number two position (SEIZED).
3	TRANSCEIVER SEIZE Switch	A four-position switch used to monitor receiver portion of transceiver.
4	A MONITOR Indicator	Lights when TRANSCEIVER SEIZE switch is in number three (A MONITOR) position.
5	B MONITOR Indicator	Lights when TRANSCEIVER SEIZE switch is in number four (B MONITOR) position.
6	VOICE CONTROL Mode SELECT Switch	Selects any one of six VOICE CONTROL modes: 1. BROADCAST 2. MICROPHONE 3. TAPE 4. REMOTE 5. RADIO TO RADIO 6. TELEPHONE TO RADIO
7	VOICE Mode Indicator	Indicator lights when corresponding VOICE CONTROL mode is selected.
8	TRANSCEIVER SELECT Readout Indicator	Provides numerical readout of transceiver selected in VOICE CONTROL in Broadcast and RAD/RAD modes.
9	TRANSCEIVER SELECT Switch	Selects transceiver for broadcast source when 6 is set to BROADCAST. Also seizes one of two transceivers for RAD/RAD patch.
10	TAPE LEFT CH Indicator	When illuminated, indicates that operator comments are being recorded on TAPE LEFT CH. When light goes out, send and receive traffic is recorded on right channel.
11	PTT (Push-to-Talk)	Provides operator with manual keyline control of Radio Set.
12	BOOM/HDST Switch	Allows operator to select boom microphone or head-set microphone.
13	Tape Channel Select Switch	On playback mode, selects either left channel (operator's comments) or right channel (send/receive traffic).
14	RIGHT CH Indicator	Lights when Tape Channel Select switch is in right channel (send/receive) position.
15	LEFT CH Indicator	Illuminates when Tape Channel Select switch is in left channel (operator comment) position.

Ref. Desig.	Control or Indicator	Function
16	Tape Playback Mode Selector Switch	Selects any one of four playback modes. • REMOTE • A MONITOR • B MONITOR • TELEPHONE
17	Tape Record Select Switch	Selects any of four record modes. • SEND/RECEIVE • A MONITOR • B MONITOR • TELEPHONE
18	ENABLE Switch	When in ON (up) position, switch enables console VOX circuitry. Used in RAD/RAD mode to permit two transceivers to key each other automatically.
19	VOX A Indicator	When in manual keyline mode (ENABLE switch off) indicator illuminates when operator keys Transceiver A.
20	VOX B Indicator	When in manual keyline mode (ENABLE switch off) indicator illuminates when operator keys Transceiver B.
21	AUTO Switch	When in manual keyline mode (ENABLE switch off) switch is used to key manually either Transceiver A or Transceiver B.
22	TTY SEL Switch	Selects any one of four teletype machines.
23	TTY SEL Readout	Provides numerical readout of TTY machine selected.
24	RCVR SEL	Selects transceiver receiver for TTY operation. Operating either RCVR SEL or SMTR SEL switches automatically overrides VOICE CONTROL modes and places console in TTY mode.
25	RCVR SEL Readout	Provides numerical readout of receiver selected.
26	XMTR SEL Switch	Selects transceiver transmitter for TTY operation. Operating either RCVR SEL or XMTR SEL switches automatically overrides VOICE CONTROL modes and places Console in TTY mode. (Normal range transceiver is used for both send and receive, but functions may be divided between different transceivers.)
27	XMTR SEL Readout	Provides numerical readout of transmitter selected.
28	TTY MONITOR Switch	When in TTY mode, allows operator to monitor XMTR TTY audio or RCVR TTY audio by holding switch in either position.

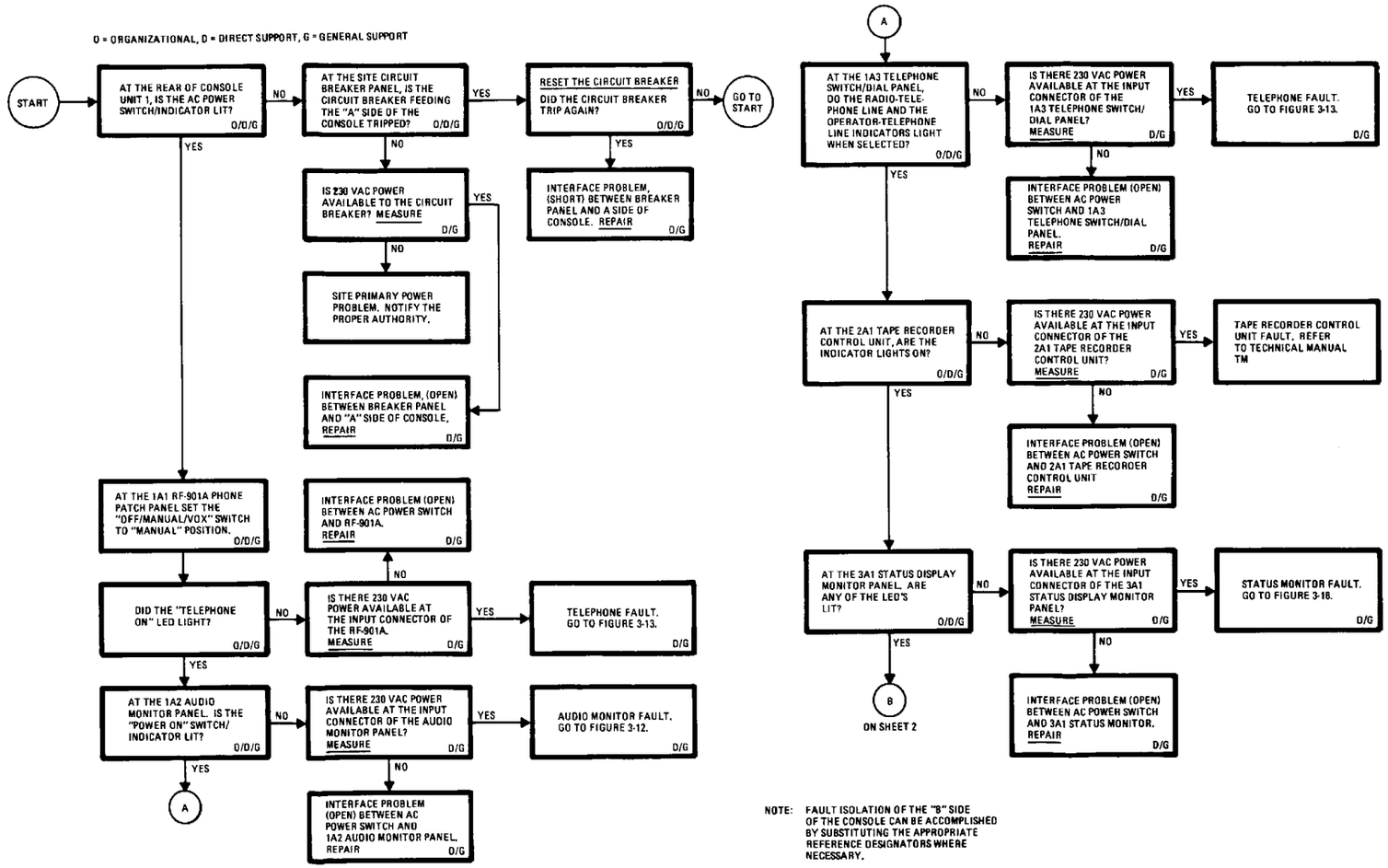


Figure 3-3 . Ac Power Troubleshooting and Fault Isolation Diagram (Sheet 1 of 2)

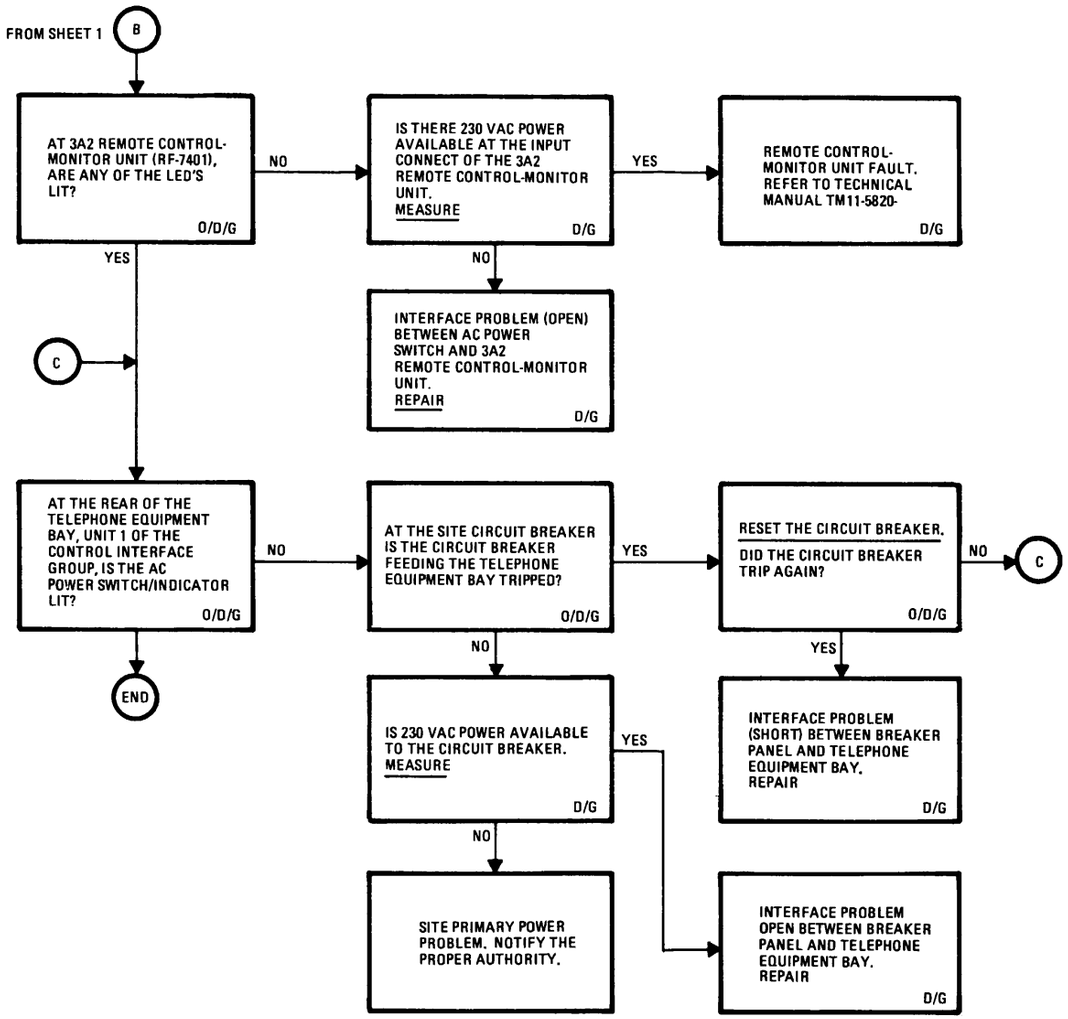
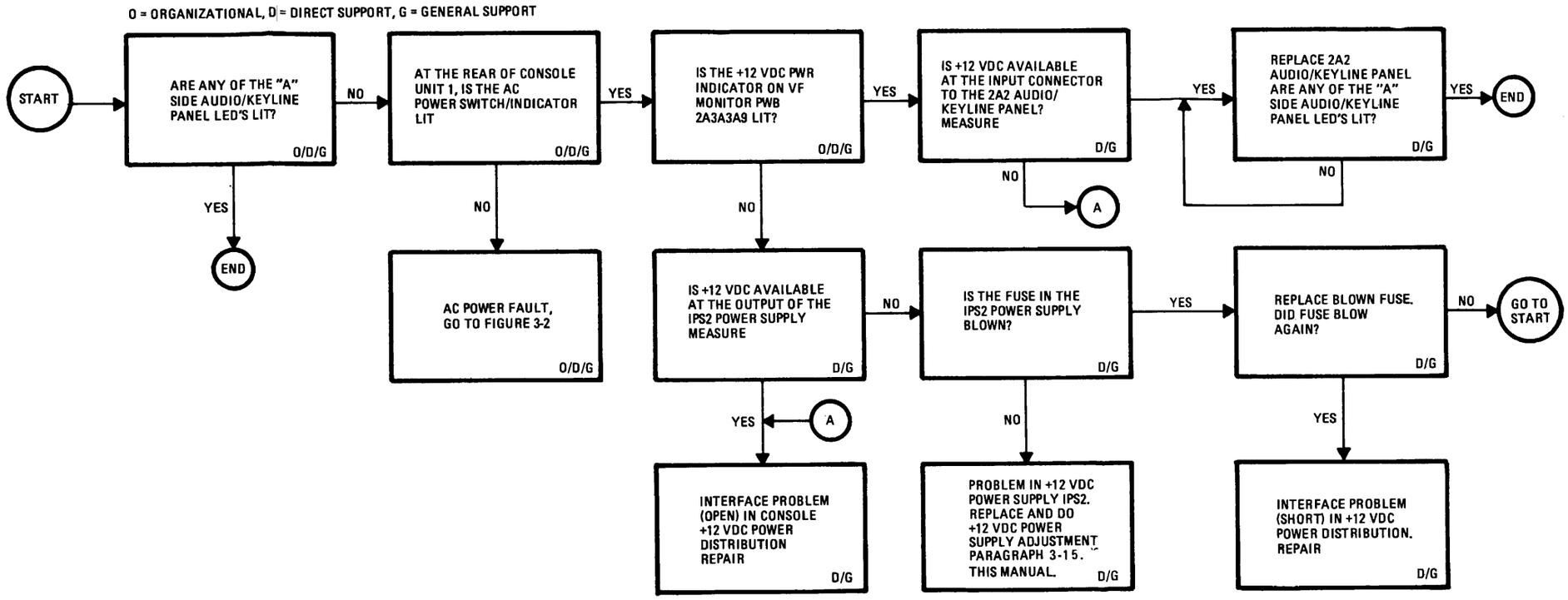


Figure 3-3. Ac Power Troubleshooting and Fault Isolation Diagram
(Sheet 2 of 2)



NOTE: FAULT ISOLATION OF THE "B" SIDE OF THE CONSOLE CAN BE ACCOMPLISHED BY SUBSTITUTING THE APPROPRIATE REFERENCE DESIGNATOR WHERE NECESSARY.

Figure 3-4 . Console Indicator Troubleshooting and Fault Isolation Diagram v

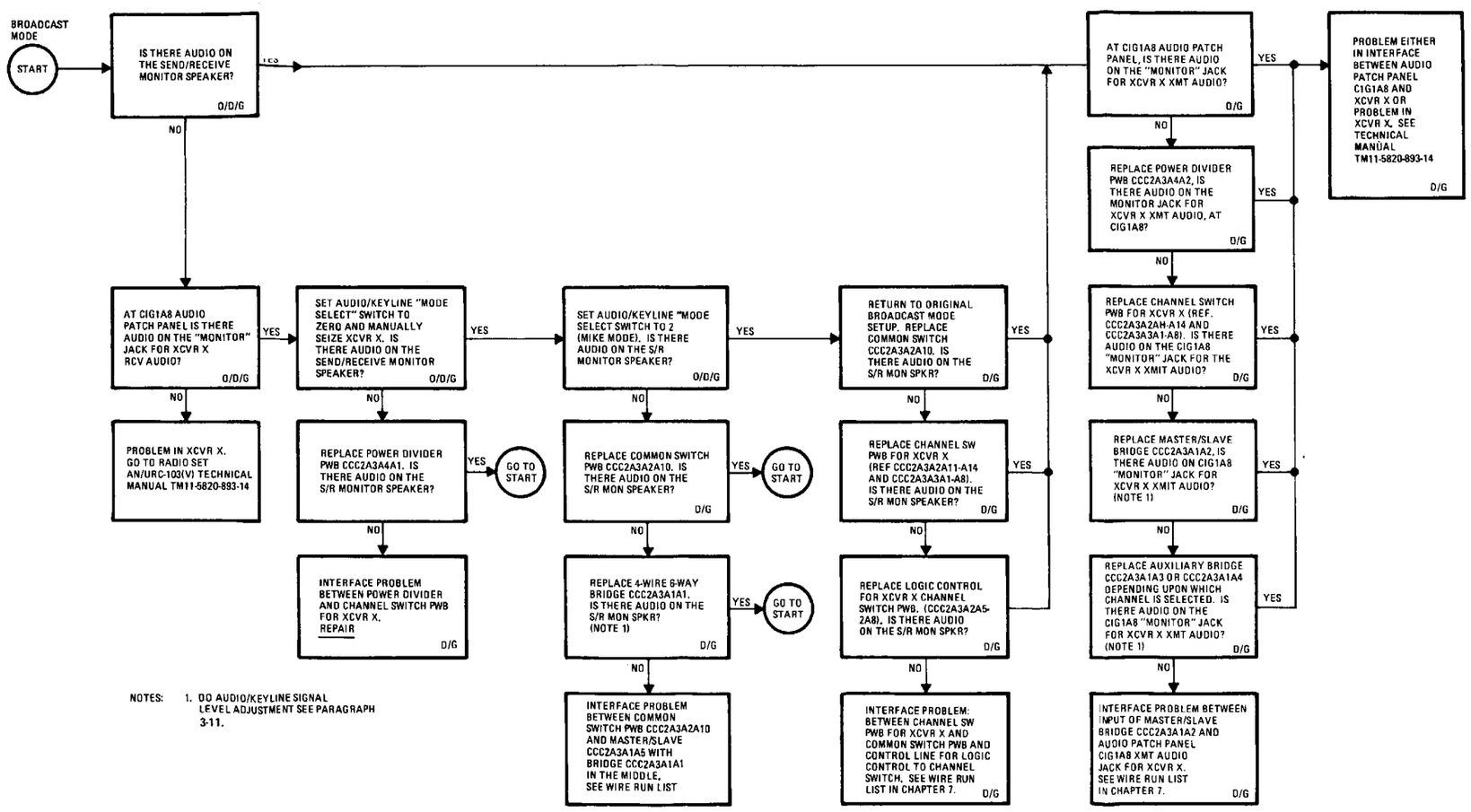


Figure 3-5. BROADCAST Mode Trouble shooting and Fault Isolation Diagram

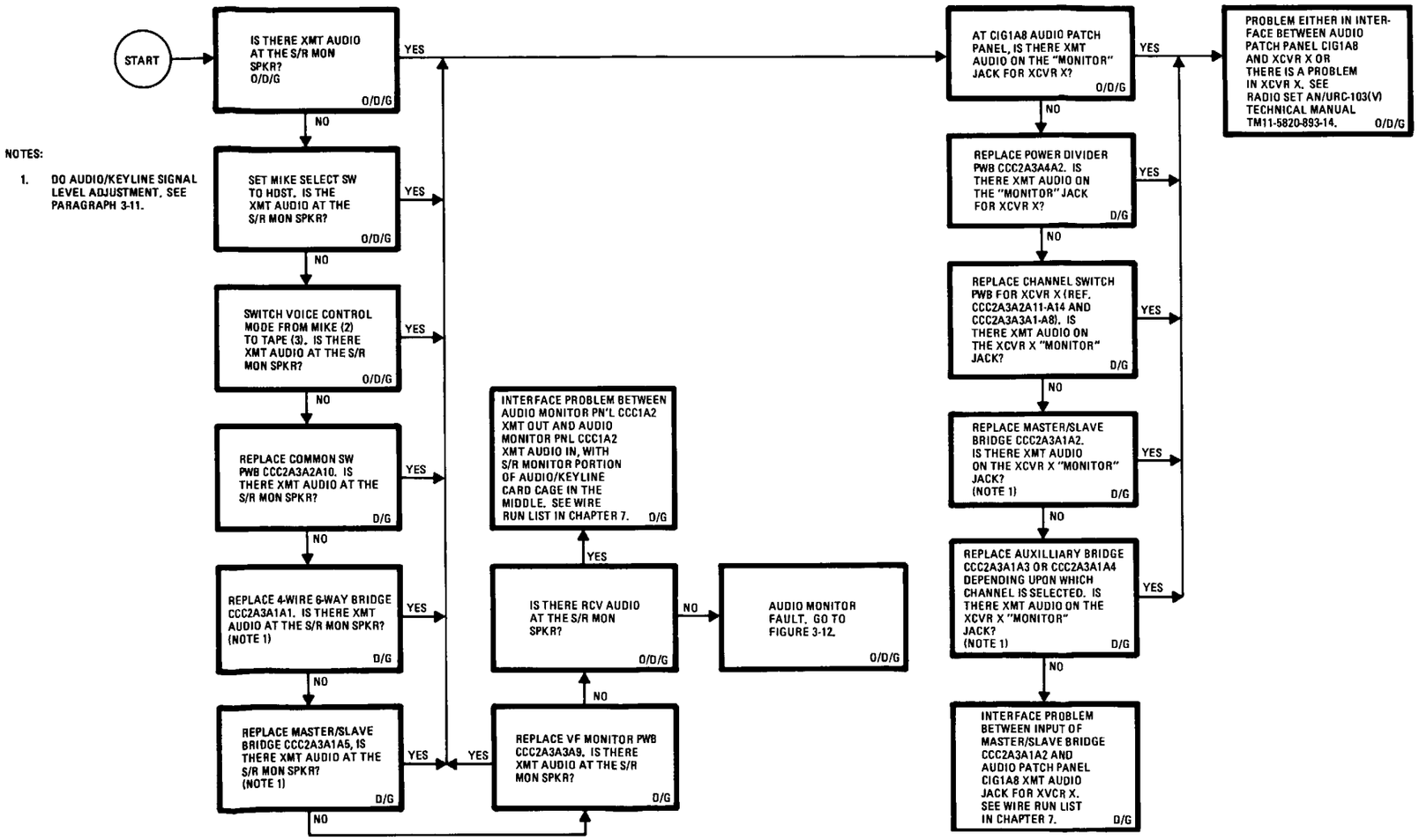


Figure 3-6. MIKE Troubleshooting and Fault Diagram

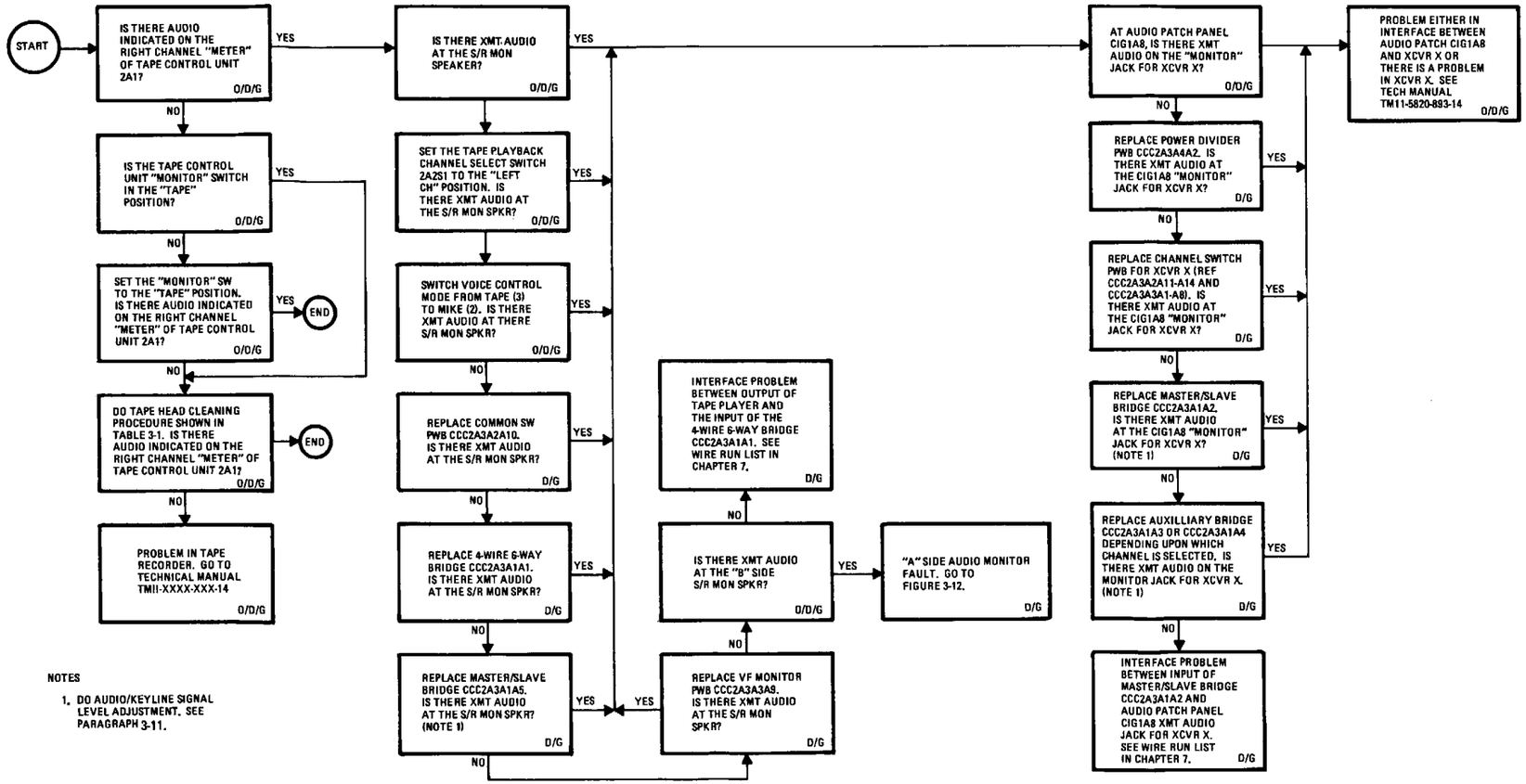


Figure 3-7 . TAPE Mode Troubleshooting and Fault Isolation Diagram

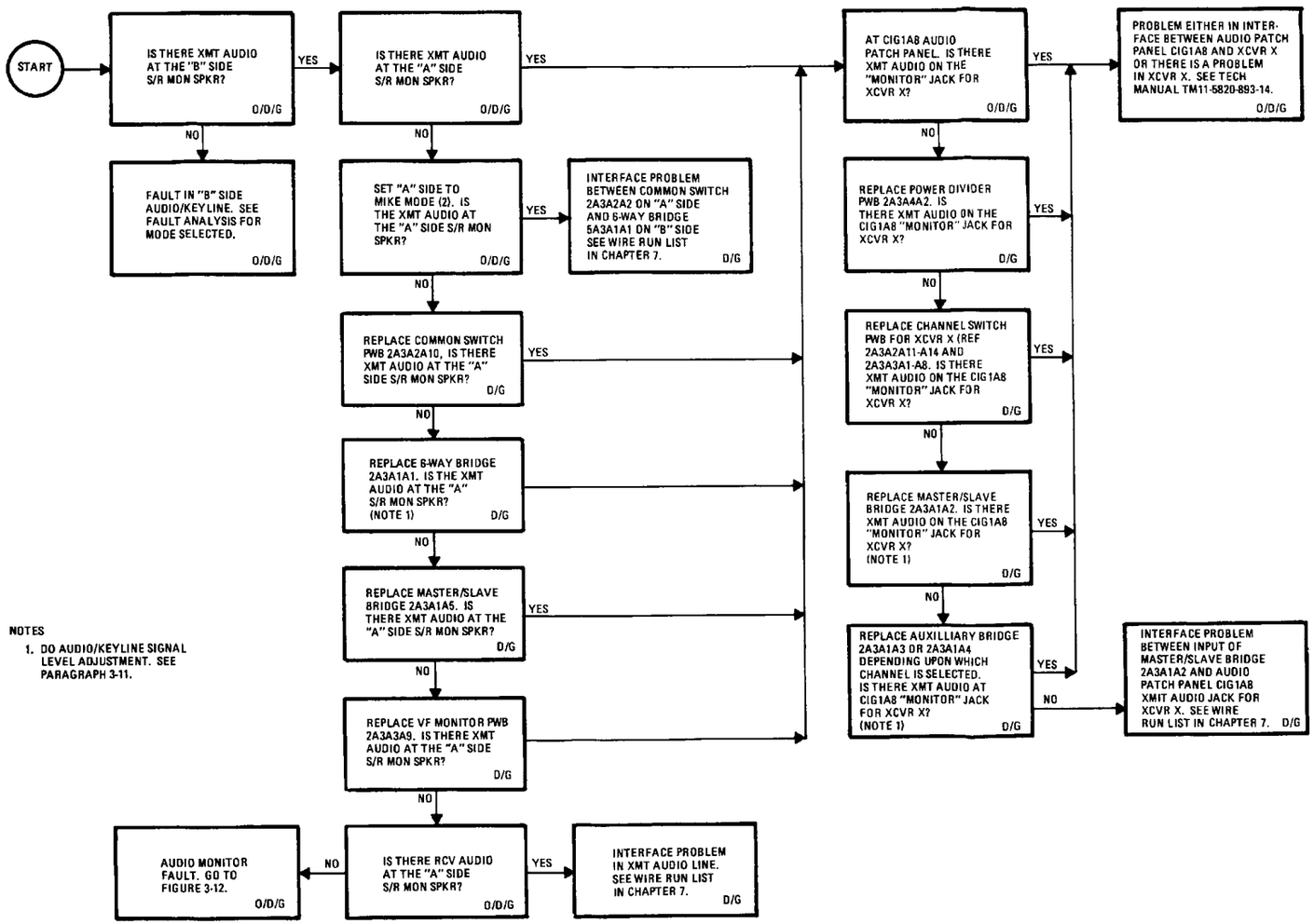


Figure 3-8. REMOTE Mode Troubleshooting and Fault Isolation Diagram

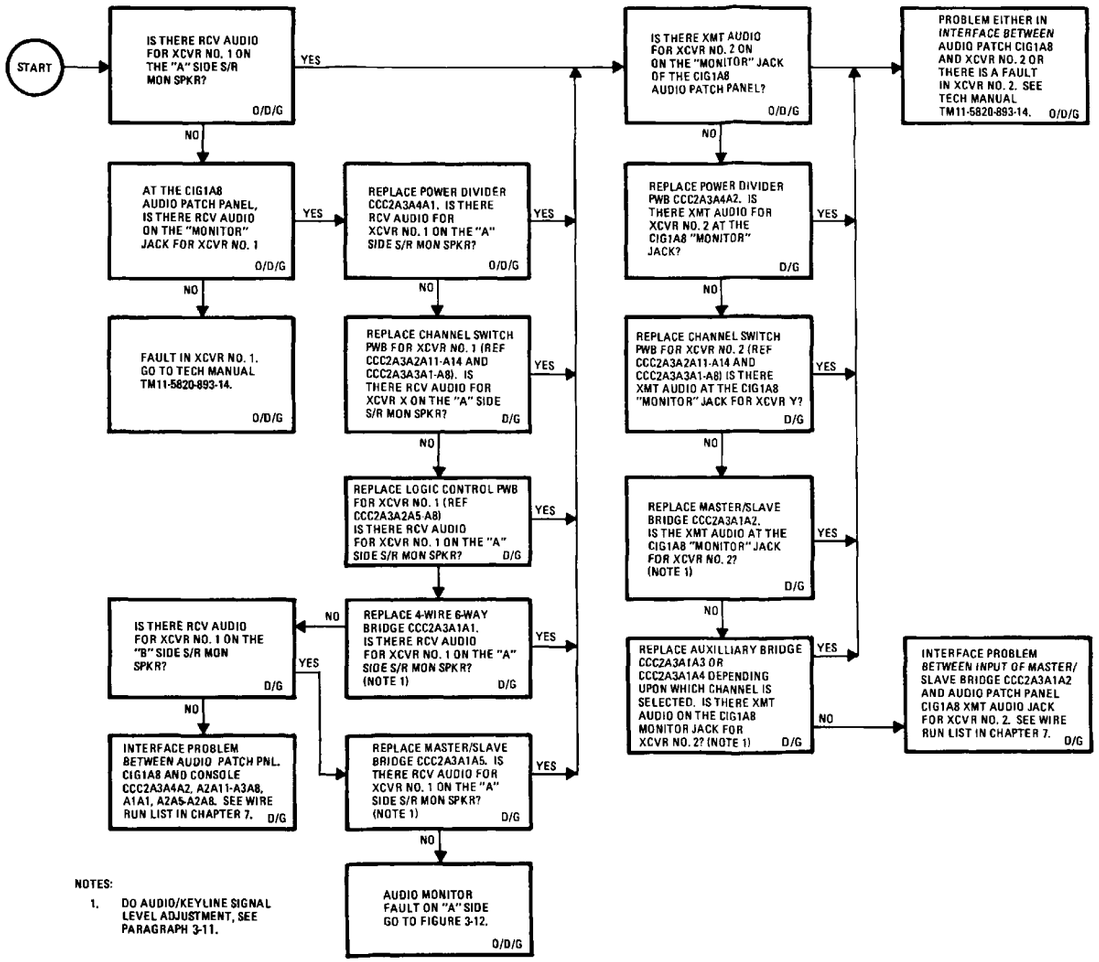


Figure 3-9. RAD/RAD Troubleshooting and Fault Isolation Diagram (Sheet 1 of 2)

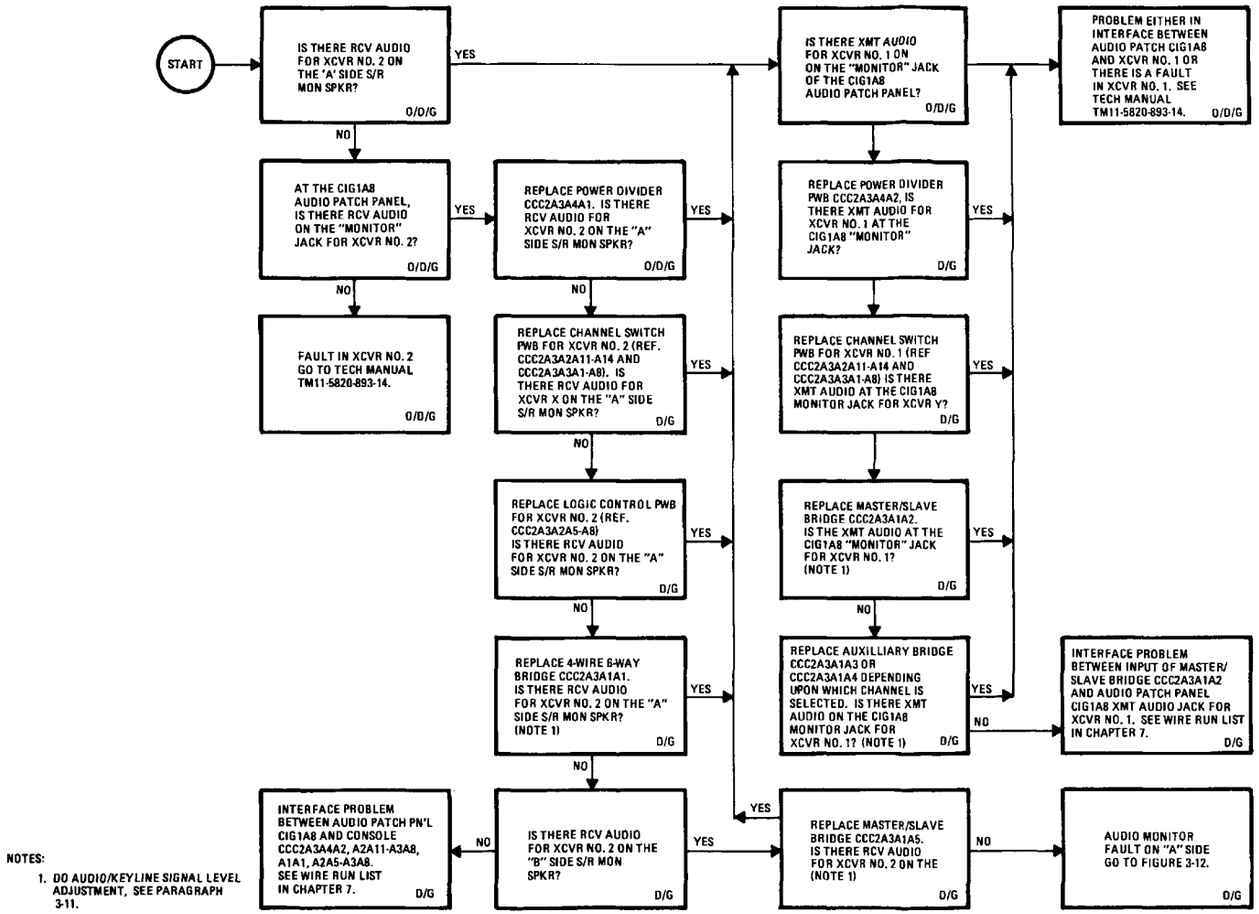


Figure 3-9. RAD/RAD Troubleshooting and Fault Isolation Diagram (Sheet 2 of 2)

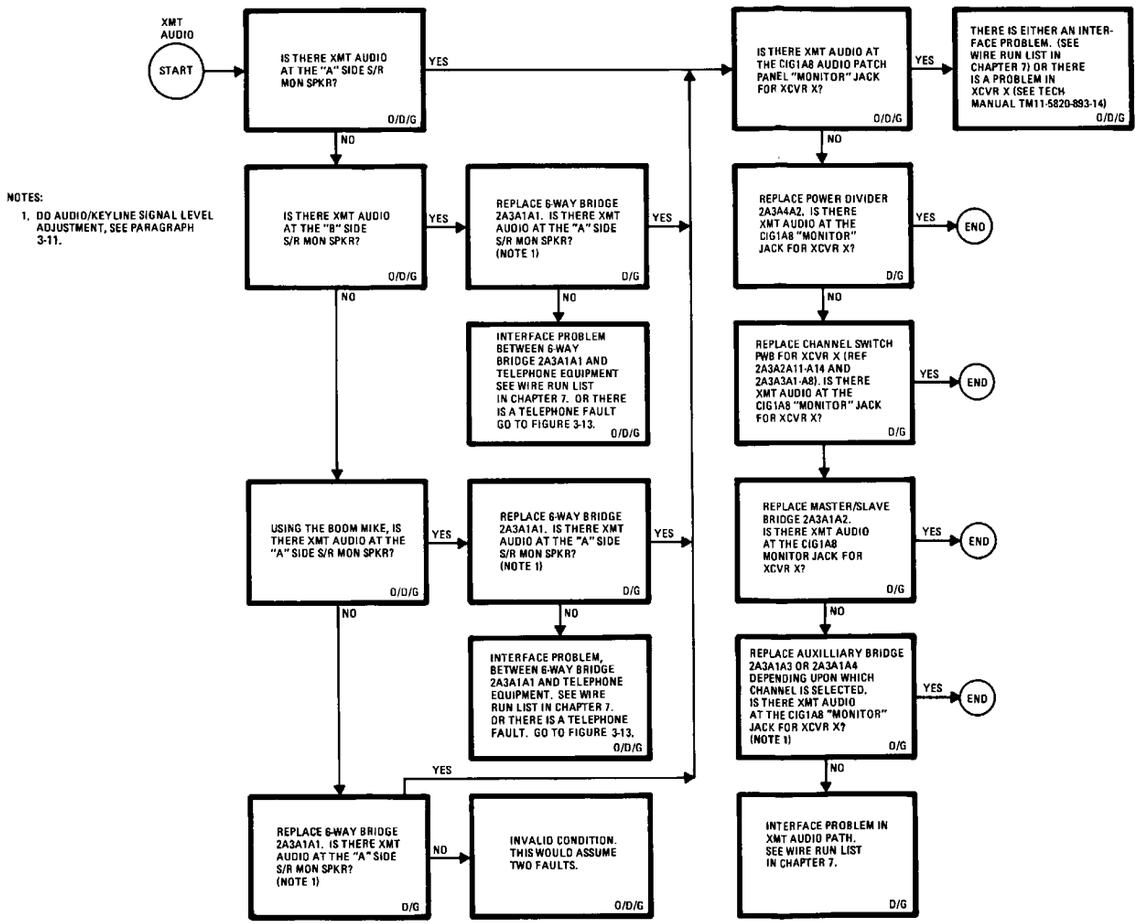


Figure 3-10. TEL/RAD Mode Troubleshooting and Fault Isolation Diagram (Sheet 1 of 2)

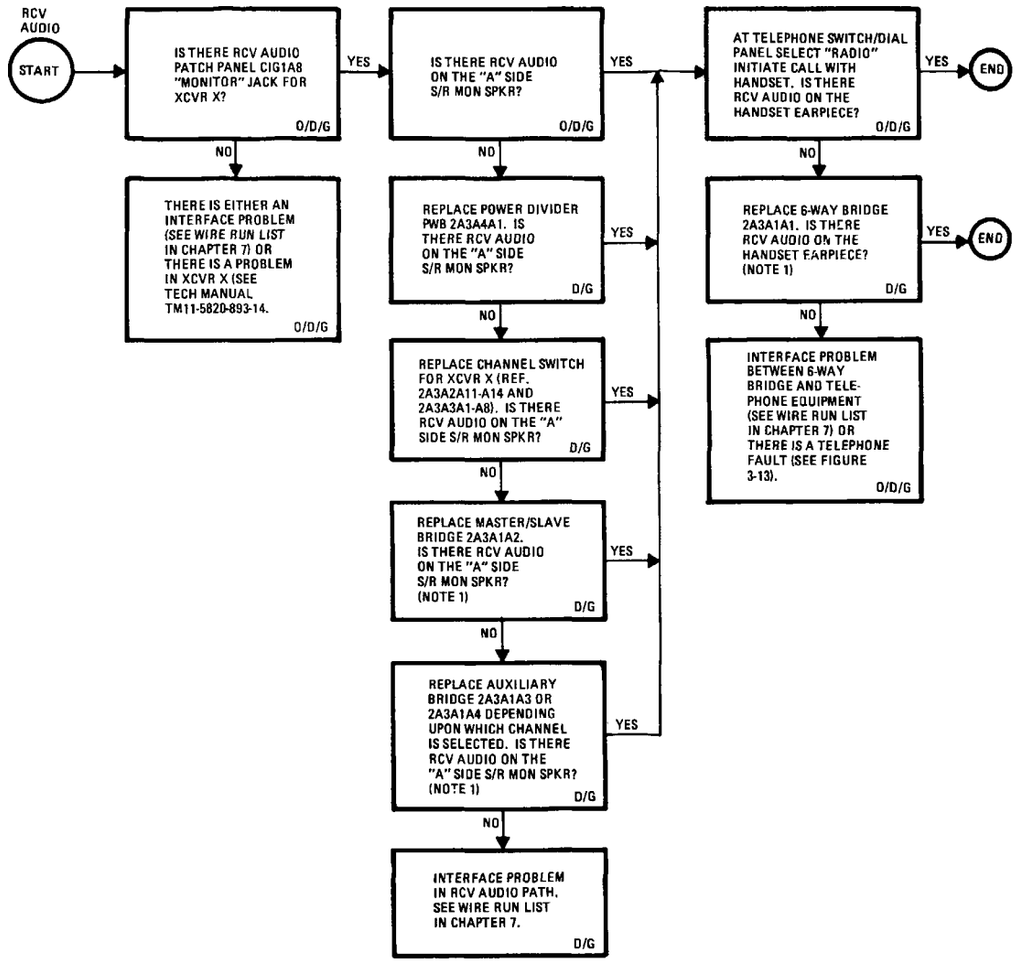


Figure 3-10. TEL/RAD Mode Troubleshooting and Fault Isolation Diagram (Sheet 2 of 2)

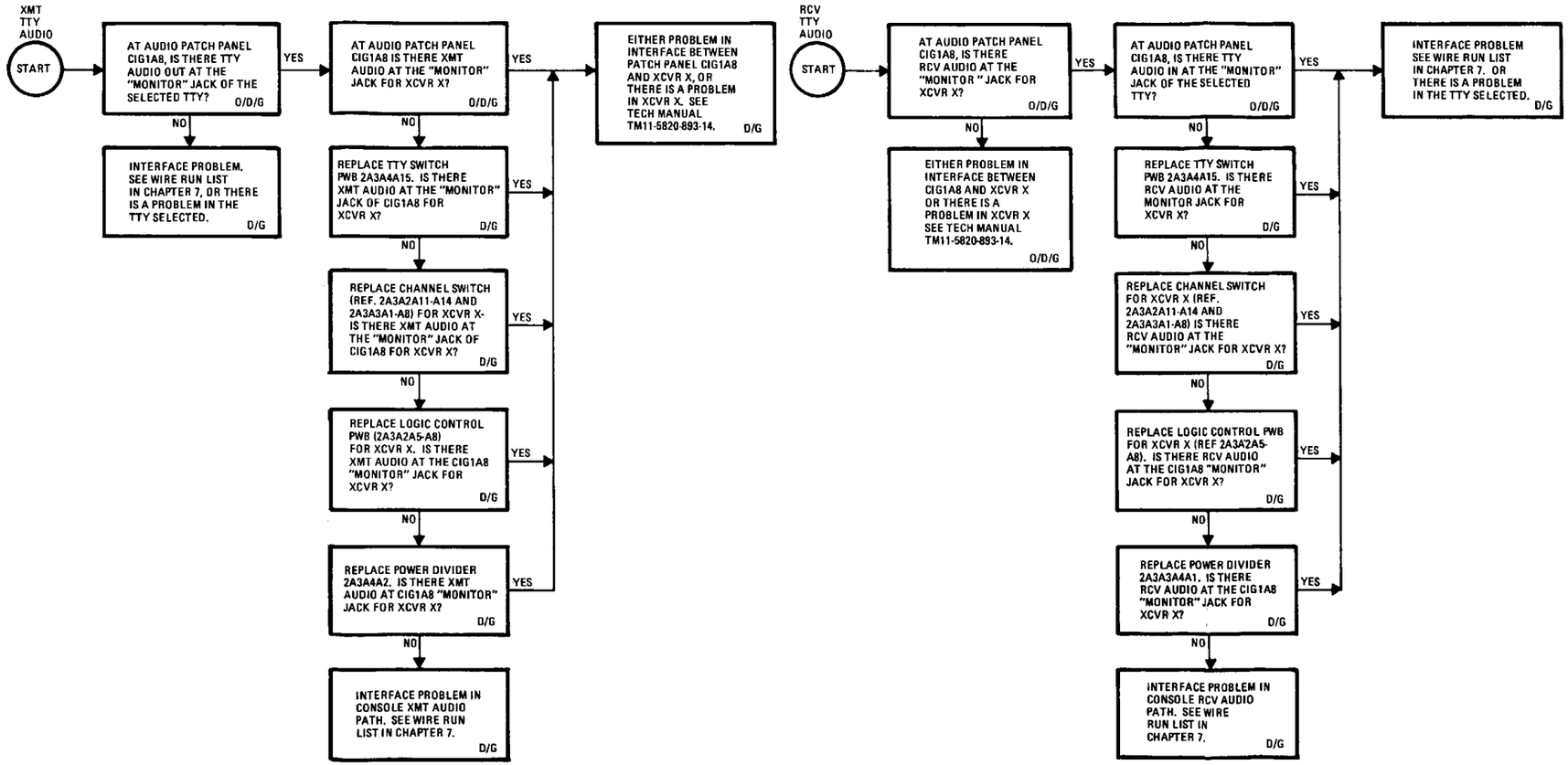


Figure 3-11. Teletype Control Mode Troubleshooting and Fault Isolation Diagram

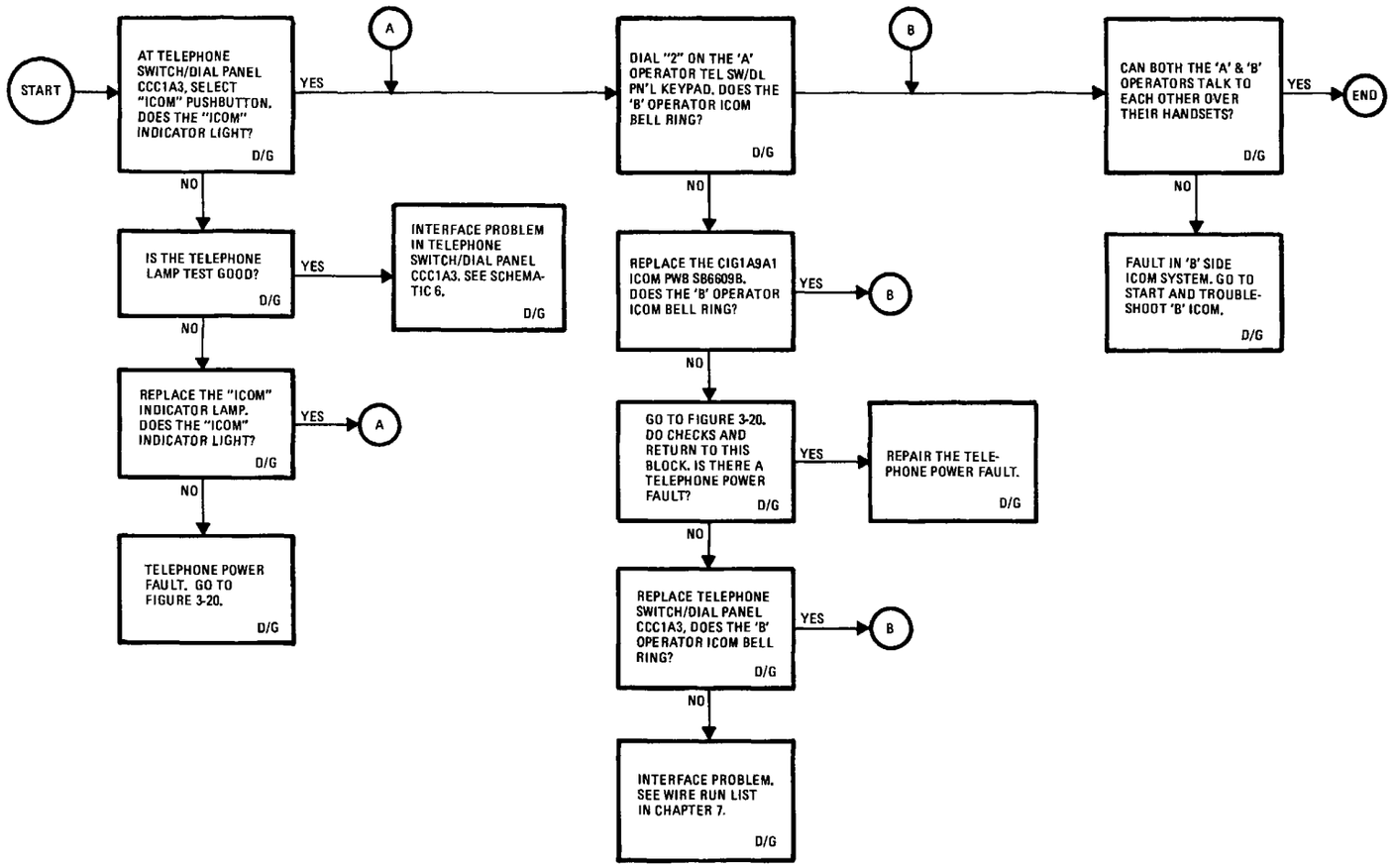


Figure 3-12. Telephone Intercom Troubleshooting and Fault Isolation Diagram

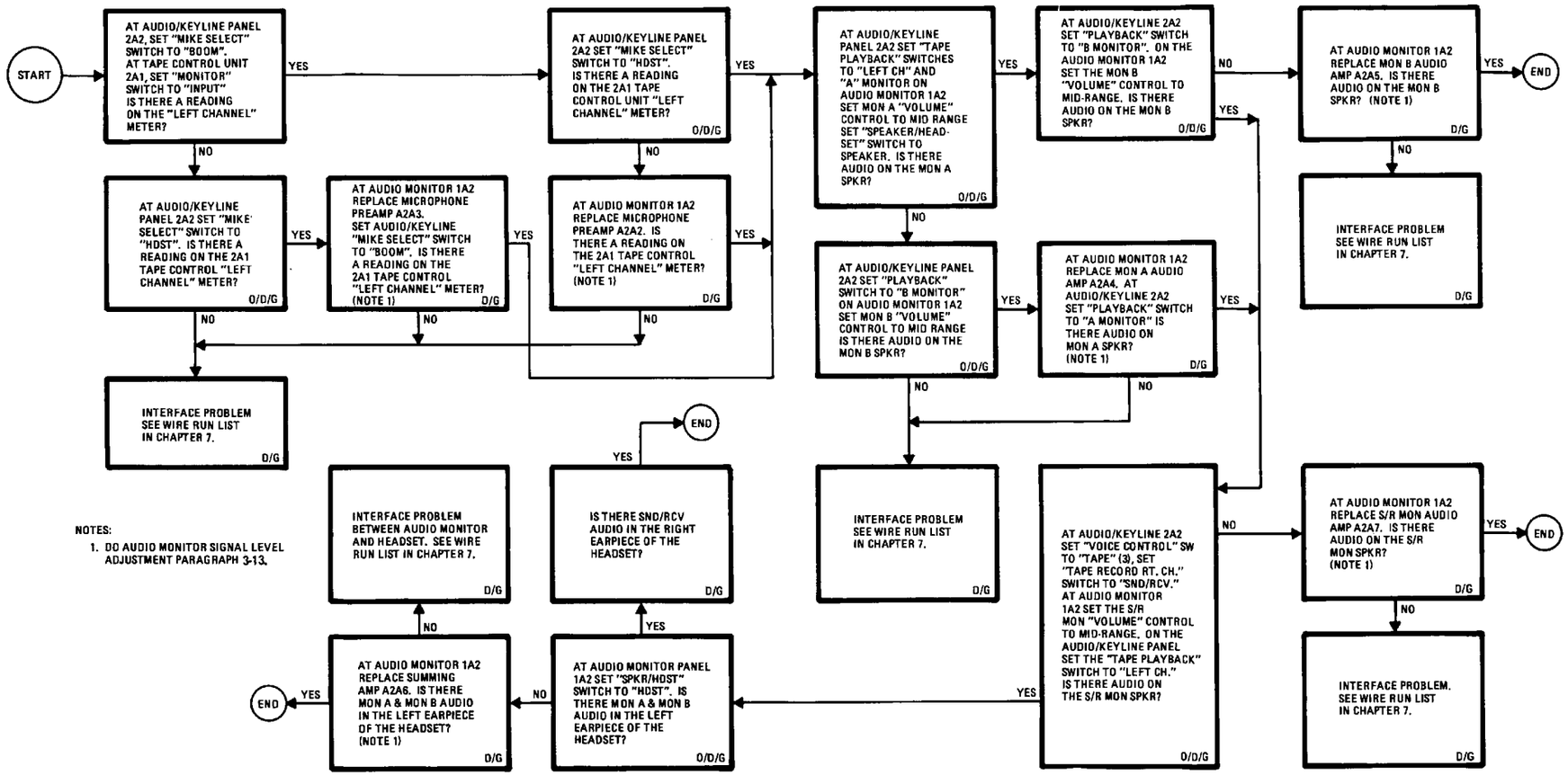


Figure 3-13. Audio Monitor Troubleshooting and Fault Isolation Diagram

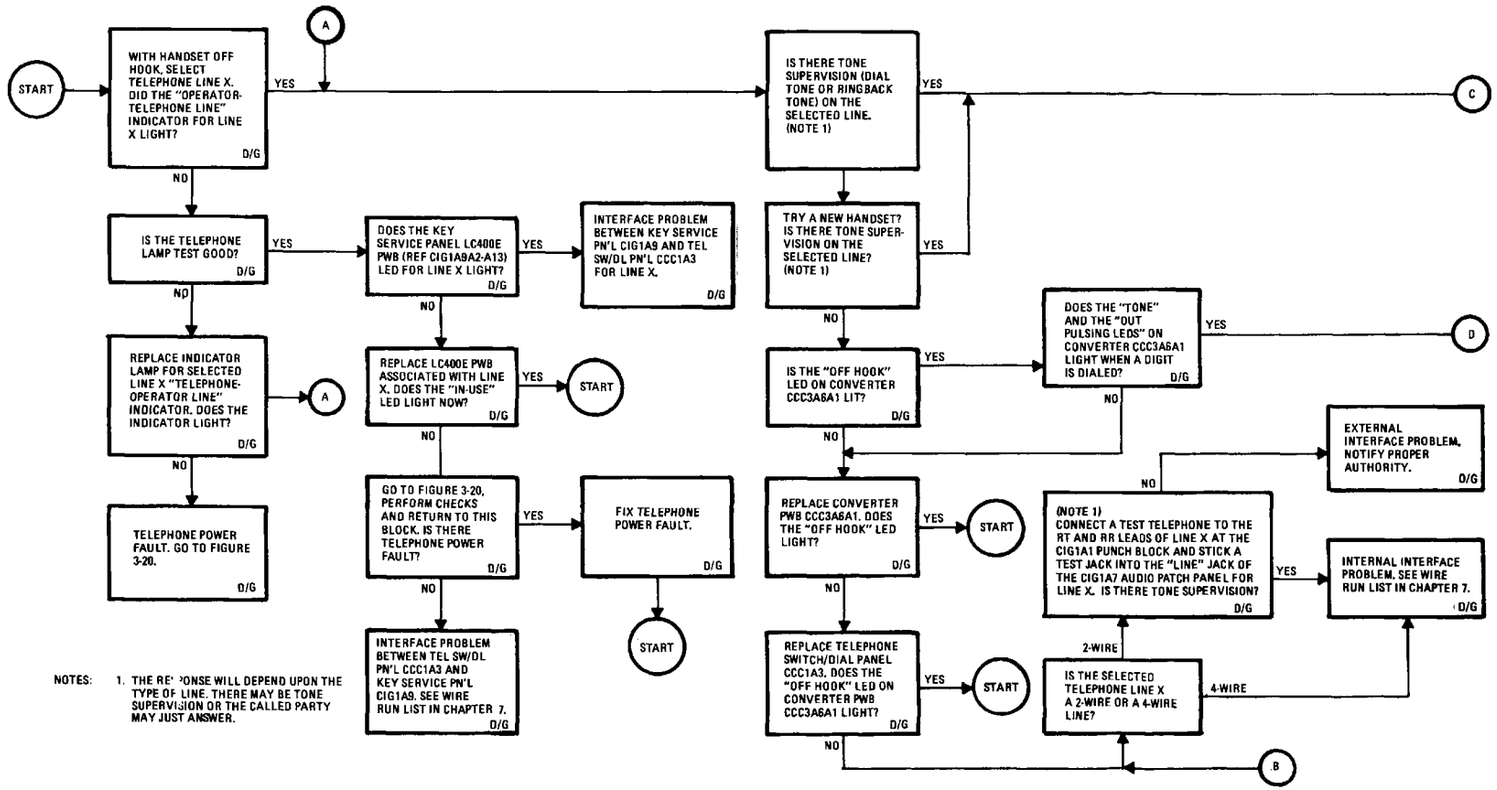


Figure 3-14. Telephone Troubleshooting and Fault Isolation Diagram (Sheet 1 or 2) Age

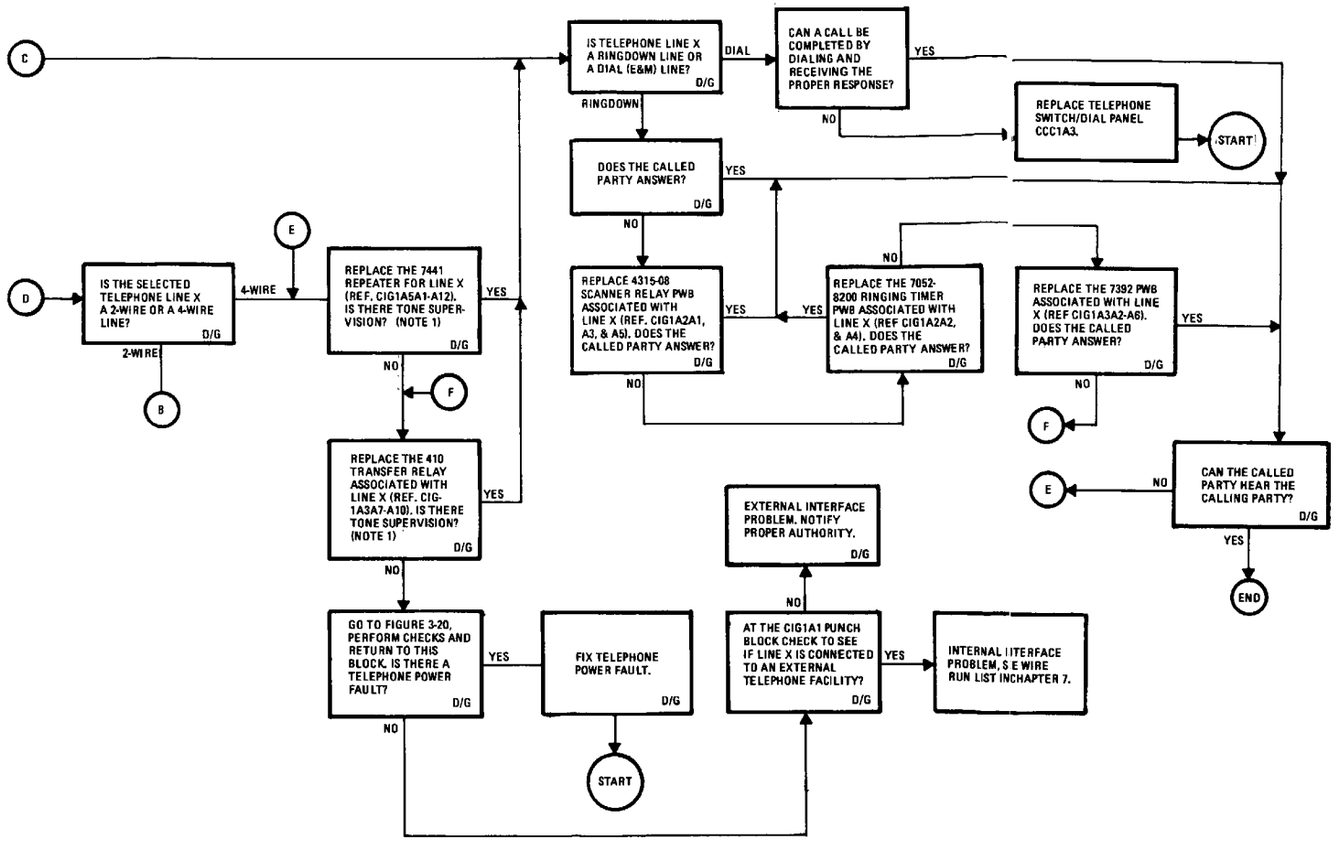


Figure 3-14. Telephone Troubleshooting and Fault Isolation Diagram (Sheet 2 of 2)

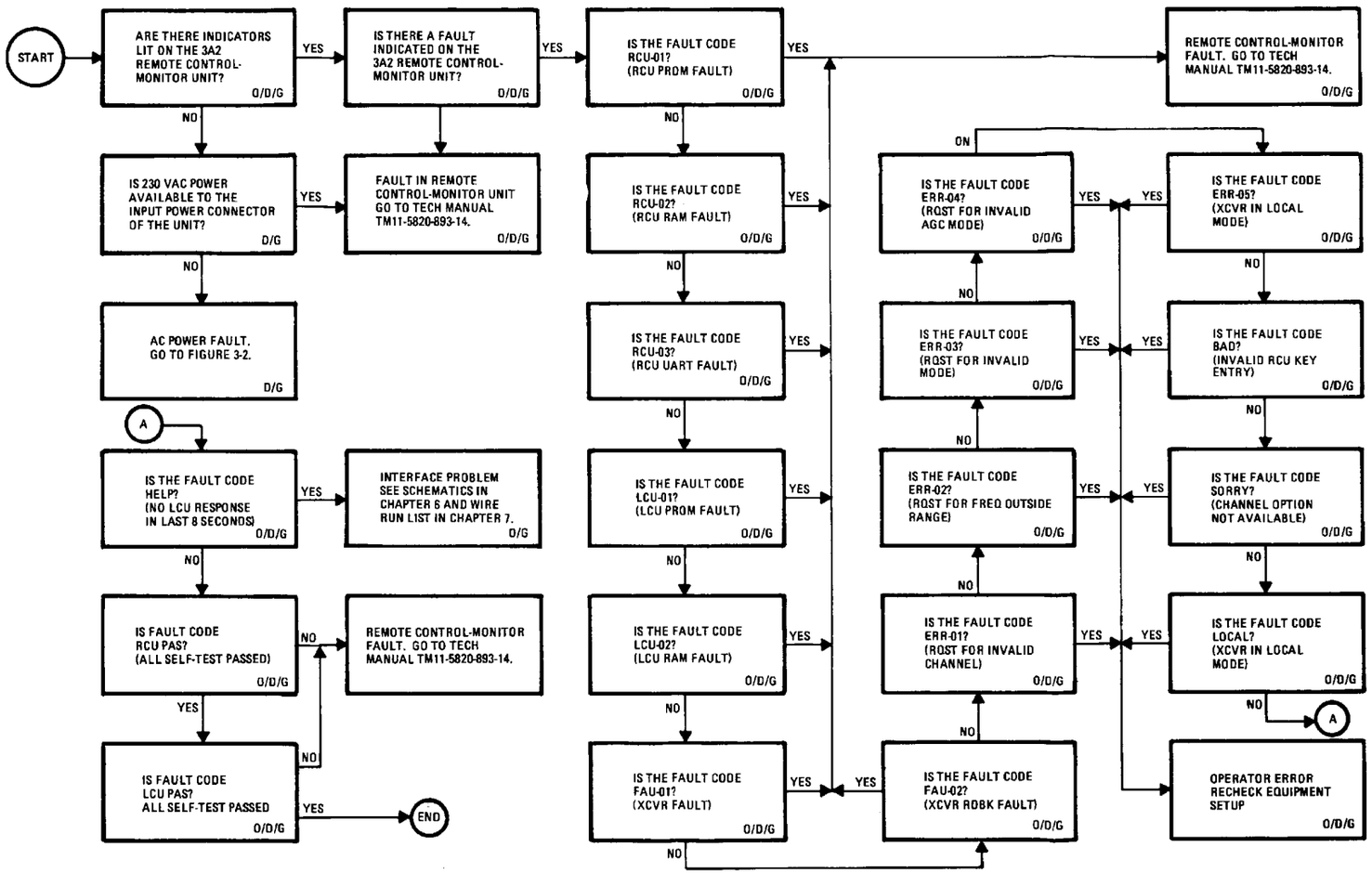


Figure 3-15. Remote Control-Monitor Troubleshooting and Fault Isolation Diagram

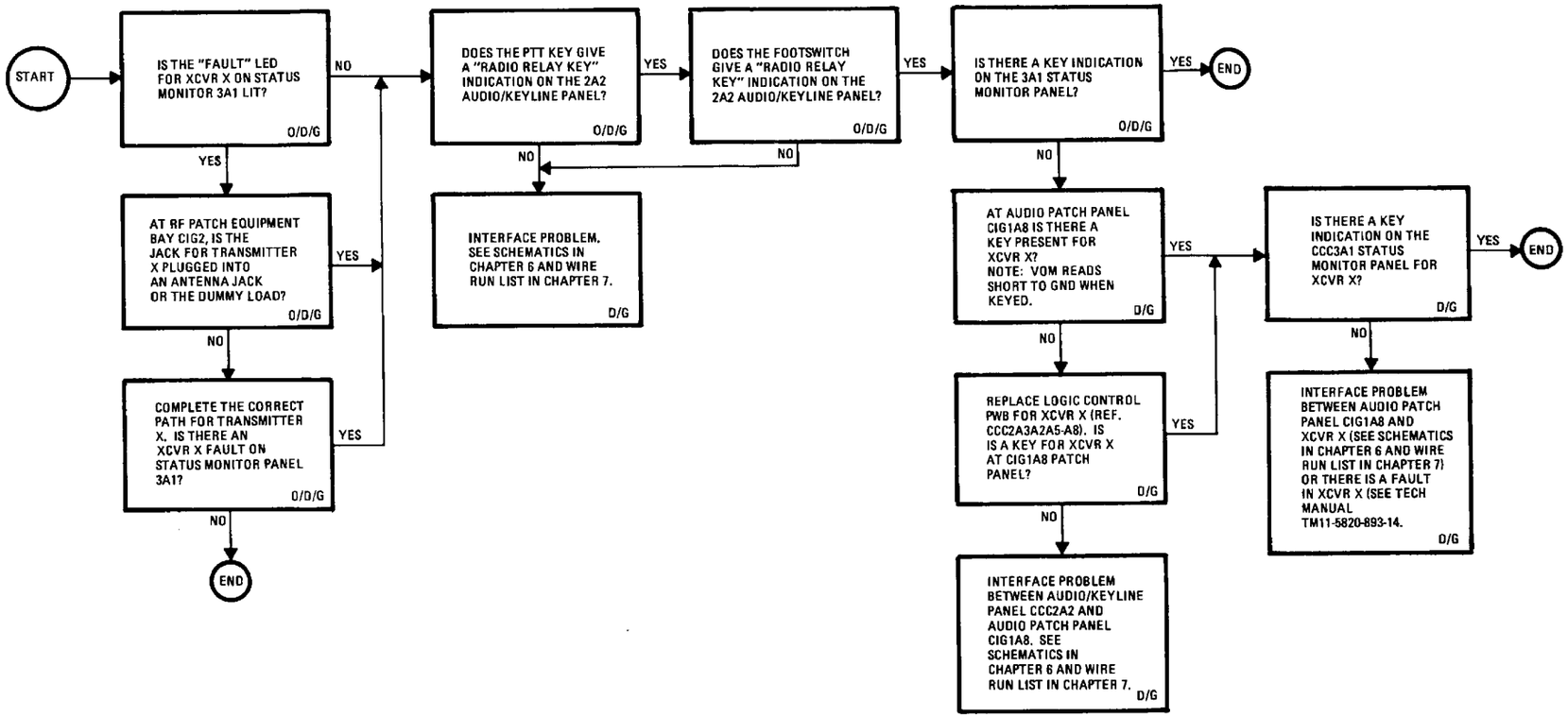


Figure 3-16. Keyline and Interlock Troubleshooting and Fault Isolation Diagram

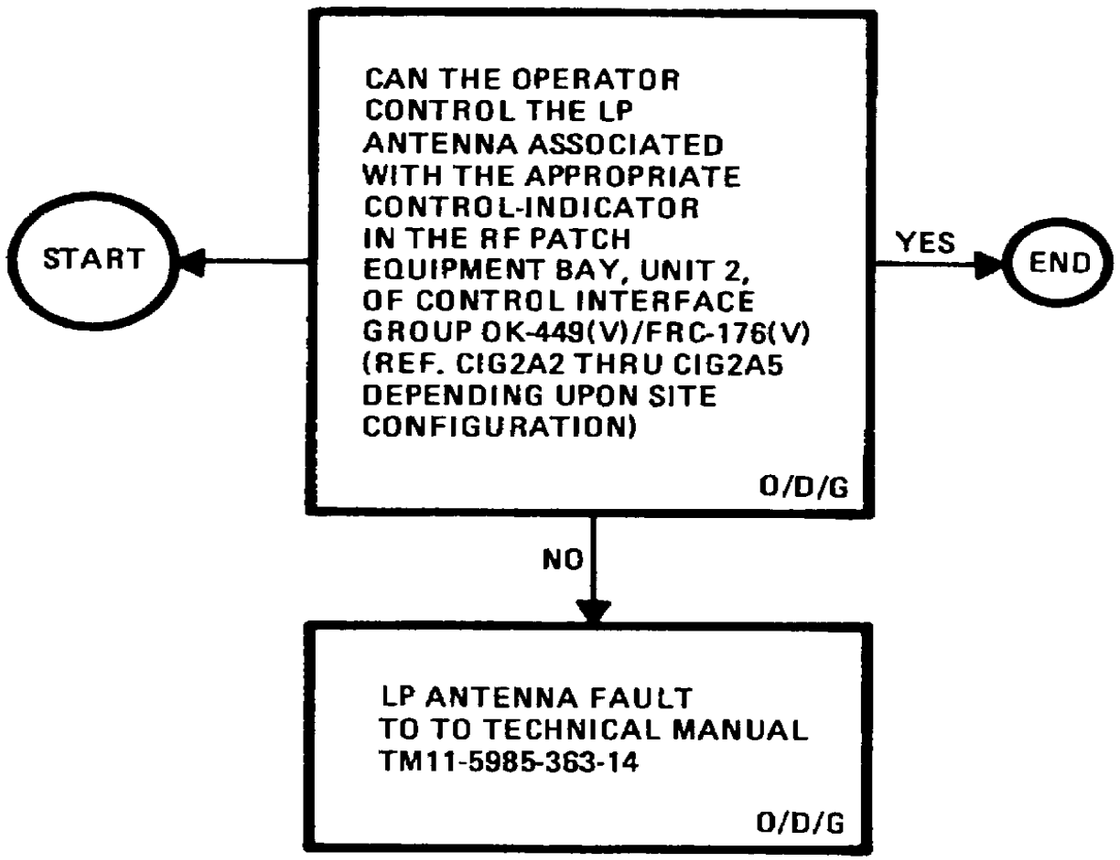


Figure 3-17. LP Antenna Control-Indicator Troubleshooting Fault Isolation Diagram

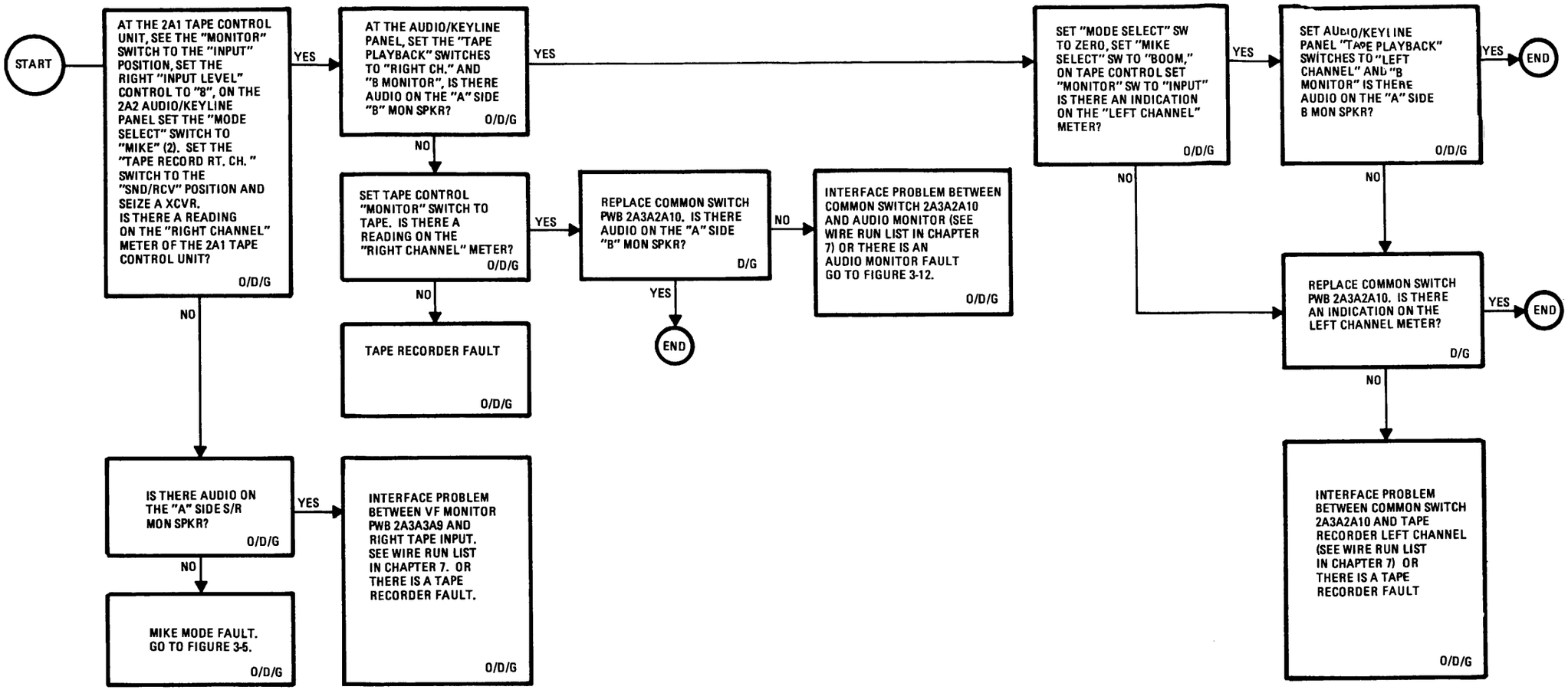


Figure 3-18. Tape RCD/PLAY Select Troubleshooting and Fault Isolation Diagram

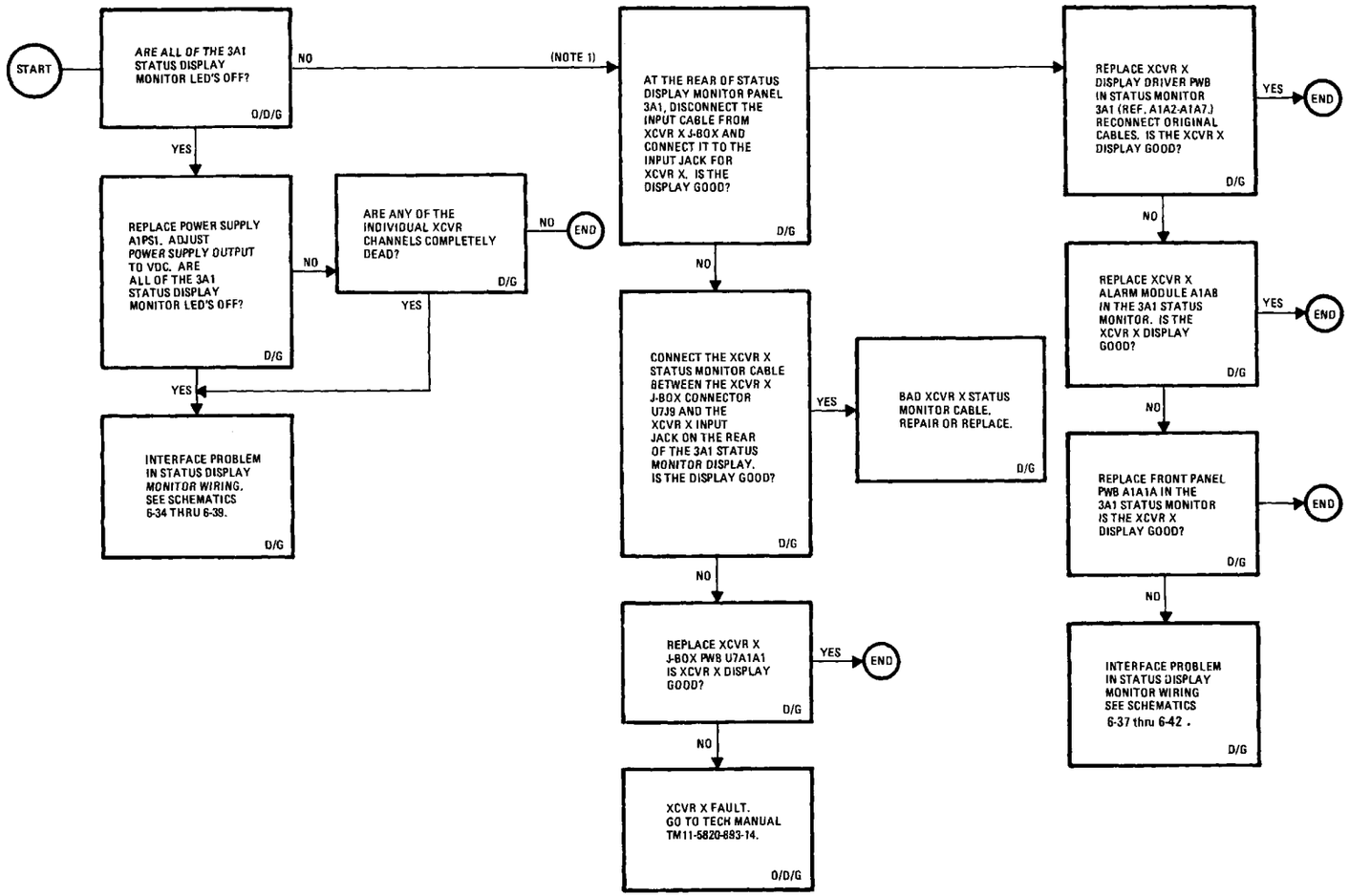


Figure 3-19. Status Display Monitor Troubleshooting and Fault Isolation Diagram

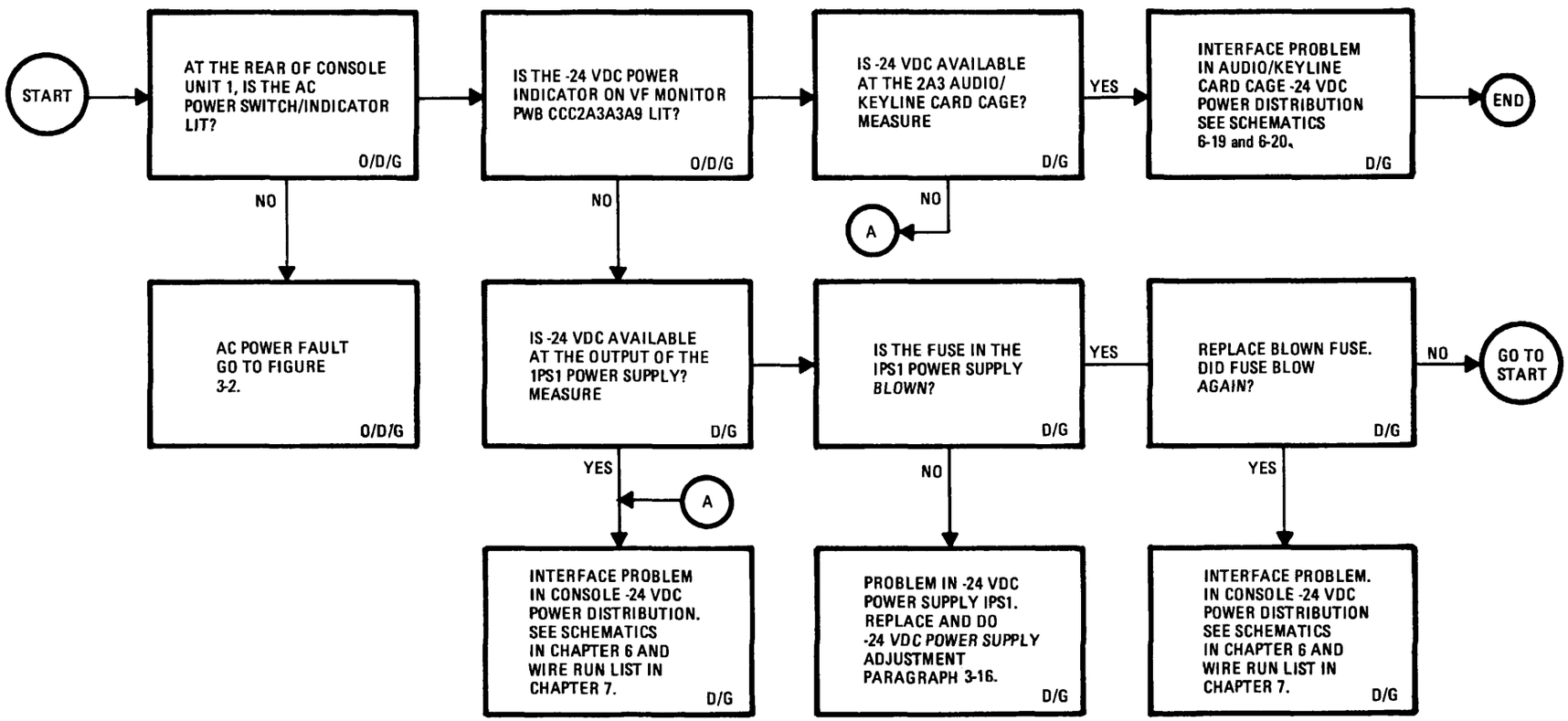


Figure 3-20. -24 Vdc Power Troubleshooting and Fault Isolation Diagram

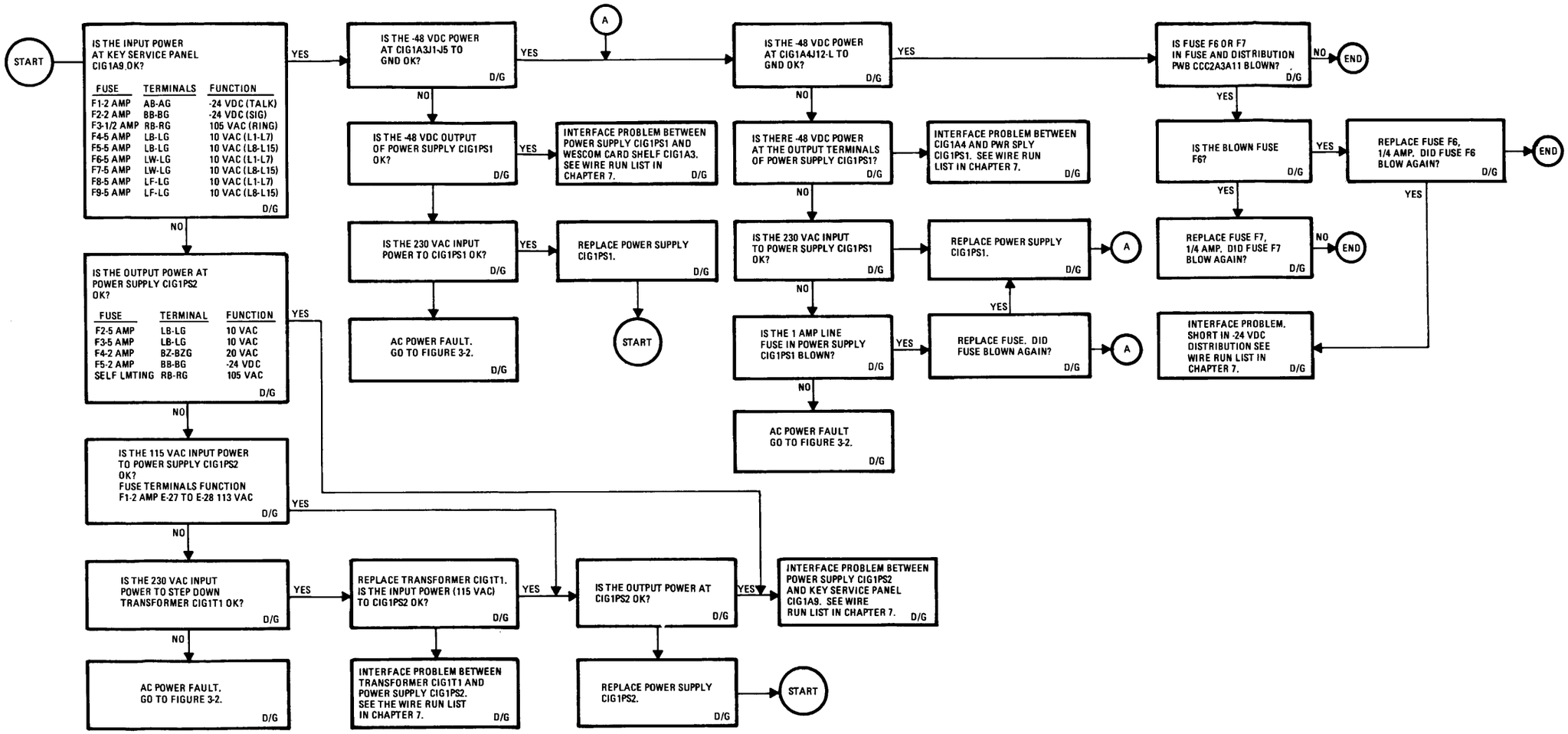


Figure 3-21. Telephone Power Troubleshooting and Fault Isolation Diagram

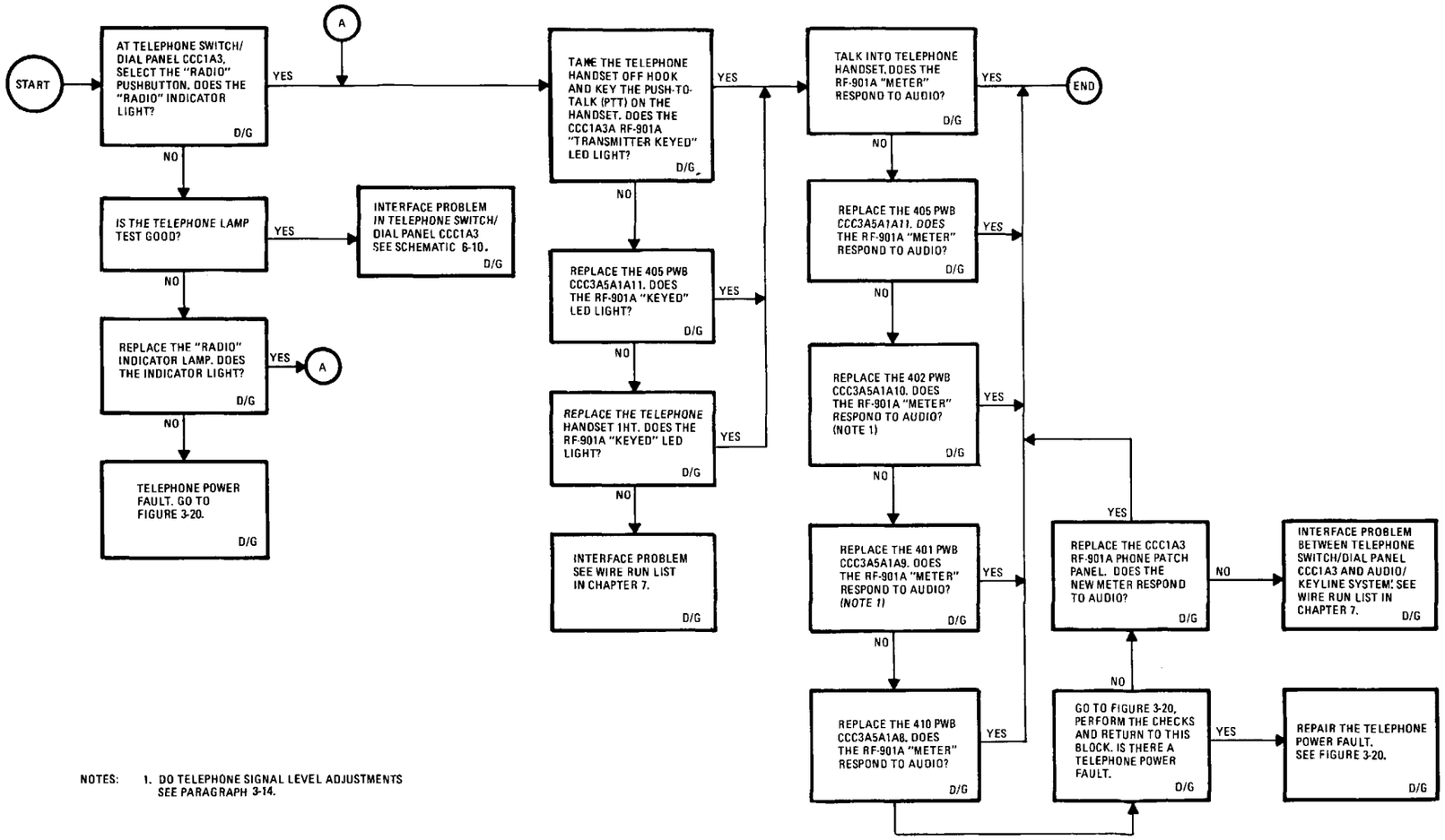


Figure 3-22. Telephone (Radio) Troubleshooting and Fault Isolation Diagram

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