

TM-8078100507

**MULTIPOINT AUDIO  
KEYLINE INTERFACE**

**MX-9350**

**OPERATION and MAINTENANCE  
MANUAL**



**SUNAIR**

3101 SW Third Avenue, Ft. Lauderdale, FL 33315-3389

## **WARRANTY POLICY**

### **GROUND AND MARINE PRODUCTS**

Sunair Electronics warrants equipment manufactured by it to be free from defects in material or workmanship, under normal use for the lesser of one (1) year from the date of installation or 15 months from date of shipment by Sunair.

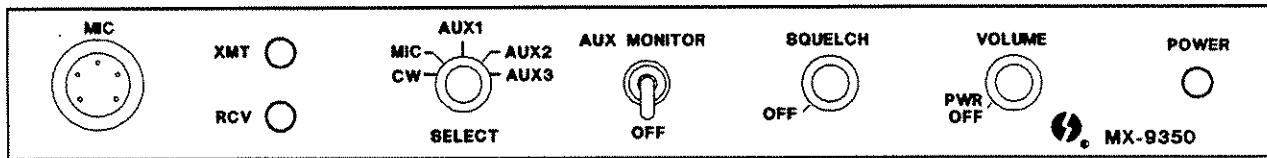
Sunair will repair or replace, at its option, any defective equipment or component of the equipment returned to it at its factory, transportation prepaid, within such warranty period. No reimbursement will be made for non-factory repair charges.

This warranty is void if equipment is modified or repaired without authorization, subject to misuse, abuse, accident, water damage or other neglect, or has its serial number defaced or removed.

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**SUNAIR ELECTRONICS, INC.**



# MX-9350

## OPERATION AND MAINTENANCE MANUAL

FIRST EDITION JUNE, 1995

## PRODUCT SERVICE:

In case of difficulty please contact the Sunair Product Service Department, between the hours of 8:00 AM and 5:00 PM Eastern Time or write to:

Product Service Dept.  
Sunair Electronics, Inc.  
3101 SW Third Avenue  
Ft. Lauderdale, FL 33315-3389  
U.S.A.

Telephone: (954) 525-1505

Fax: (954) 765-1322

e-mail: [techsupport@sunairhf.com](mailto:techsupport@sunairhf.com)

## TRAINING:

Sunair offers training programs of varying lengths covering operation, service, and maintenance of all Sunair manufactured equipment. For details please contact the Product Service Department.

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## SECTION I

### GENERAL INFORMATION

#### **1.1 SCOPE OF MANUAL**

This manual contains information necessary to install operate and maintain the MX-9350 Multiport Audio Keyline Interface. Installation information is located in Section II. Operating instructions are included in Section III. Theory of Operation is in Section IV. Section V contains maintenance and Troubleshooting guidelines. Information in this manual applies to all equipment configurations, unless otherwise stated in the text or illustrations.

#### **1.2 PURPOSE OF EQUIPMENT**

The MX-9350 is designed to provide an audio interface and keyline facility between the workstation and the operator microphone/auxiliary audio facility.

#### **1.3 GENERAL DESCRIPTION**

The MX-9350 Audio Keyline Interface Assembly provides a convenient radio transceiver audio and keyline interface for use with a Workstation. The MX-9350 provides microphone audio, keyline control receive audio and receive squelch capability. In addition to these features the MX-9350 provides a three port audio switch facility for interfacing external radio data modems or phone patch. Telephone line amplifiers are also included to compensate for line loss experienced over the telephone lines in long distance remote control systems.

## **1.4 TECHNICAL SPECIFICATIONS**

### **1.4.1 GENERAL**

**Input Power:** 115/230 VAC 50-60 Hz.

**Size:** 1.75" H x 14" W x 15" D.

**Weight:** 9 lbs.

### **1.4.2 MICROPHONE**

Suitable for use with Sunair handheld microphone and headset.

### **1.4.3 LINE COMPENSATION AMPLIFIERS**

**Receive Line Loss compensation:** -30 dB. Adjustable.

**Transmit Line Level:** -9 dBm. Adjustable.

### **1.4.4 AUXILIARY AUDIO PORTS AUX 1 through AUX 3.**

**Line Impedance:** 600 ohm

**Line Level:** 0 dBm, adjustable.

**Keyline:** Switch-to-ground.

### **1.4.5 ENVIRONMENTAL**

**Temperature Range:** -10 to +50 C.

**Humidity:** 95% at +50 C.

**Shock and Vibration:** MIL-STD-810D.

## 1.5 EQUIPMENT SUPPLIED

The following is a list of equipment, with appropriate Sunair part numbers, supplied with the MX-9350 Multi Port Audio keyline Interface.

<u>Supplied Equipment:</u>	<u>Sunair Part Numbers:</u>
Control cable assembly, Digital Interface to PC I/O, DB-15 to DB-15	8076504295
Power cord assembly, 115 VAC	8101002090
or	
Power cord assembly, 230 VAC	8101002197
Digital Interface Assembly	8078450095

## 1.6 OPTIONS

Hand Held Microphone	8076000602
Headset	1072220001
External Speaker	8078100795
CW Key	5024000094
Control cable assembly, HAL Modem to AUX ( ), DB-9 to DB-9	8110005799
Clover Modem, HAL	See Workstation manual

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## SECTION II

### INSTALLATION

#### **2.1 GENERAL**

This section contains all necessary instructions for unpacking, inspection, and, if required, reshipment of the equipment or parts. Information regarding location and mounting considerations, power requirements, and equipment interconnection is also provided.

#### **2.2 UNPACKING AND INSPECTION**

As soon as you have received your unit(s), unpack and inspect all components and accessories. Check the packing list to be sure you have received all items ordered, and that all items necessary for operation have been ordered.

**NOTE:** Be sure to retain the carton and its associated packing materials should it be necessary to reship the equipment.

Do not accept a shipment when there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage of items or any evidence of damage, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier. If concealed damage is discovered after the shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report should also be forwarded to Sunair's Product Services Department. Please be sure to include the following information for prompt service:

- a) ORDER NUMBER.
- b) MODEL AND SERIAL NUMBER.
- c) NAME OF TRANSPORTATION AGENCY.
- d) APPLICABLE DATES.

Upon receipt of this information, Sunair will make arrangements for repair or replacement.

#### **2.3 RETURN OF EQUIPMENT TO FACTORY**

The shipping carton for the MX-9350 has been designed to protect the equipment during shipment. The container and its associated packing material should be used to reship the unit.

When necessary to return equipment to Sunair for warranty or non-warranty repair, an authorization number is required. This number can be obtained from our Product Services Department:

TELEPHONE: (305) 525-1505,

FACSIMILE: (305) 765-1322.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing

material around connectors and other protrusions from the unit. Rigid cardboard should be placed at the corners of the equipment to protect against denting. DO NOT USE DUNNAGE (e.g., STYROFOAM PEANUTS) FOR PACKING PROTECTION; they may allow the unit to shift while being shipped, and, therefore, become damaged.

When returning subassemblies or components for repair or replacement, be sure to pack each separately, using suitable cushioning material.

Shipment to be made PREPAID consigned to:

**Sunair Electronics, Inc.  
Product Services Department  
3101 SW Third Avenue  
Fort Lauderdale, Florida 33315-3389  
U.S.A.**

Plainly mark with indelible ink all mailing documents as follows:

**US Goods Returned for Repair  
Value For Customs - \$ (Amt.)**

Mark ALL SIDES of the package:

**FRAGILE - ELECTRONIC EQUIPMENT!**

**NOTE:** Before shipping, carefully inspect the package to be sure it is marked properly and is securely wrapped.

## **2.4 GENERAL INSTALLATION AND MOUNTING INFORMATION**

Satisfactory operation of this equipment will depend upon the care and thoroughness taken during installation.

Before starting installation, carefully plan equipment locations to ensure that the operating environment is suitable and that adequate access for maintenance is provided.

### **2.4.1 GENERAL INSTALLATION**

Use this manual in conjunction with the Workstation and radio equipment manuals for complete installation information.

Install the Digital Interface Assembly, 8078450095 in the Workstation. Refer to the Workstation operation and maintenance manual for information on installing accessory devices. Note: Workstation(s) supplied by Sunair generally have the Digital Interface Assembly factory installed.

See Section V, Maintenance and Repair, paragraph 5.4 Digital Interface Assembly, for information on I/O Map Address switch programming and PC bus decoding of the Digital Assembly.

### **2.4.2 MX-9350 INSTALLATION**

The MX-9350 may operate with two or four wire telephone systems. Internal programmable jumpers select the operating configuration. See section 5.0 Maintenance and Repair, paragraph 5.3.1 for information on selecting two or four wire telephone operation.

Install the MX-9350 at the PC Work station site. Place the MX-9350 on top of the Workstation. Place the Workstation monitor on top of the MX-9350. See Figure 2.4.2.1 and Figure 2.4.2.2.

SUNAIR MX-9350

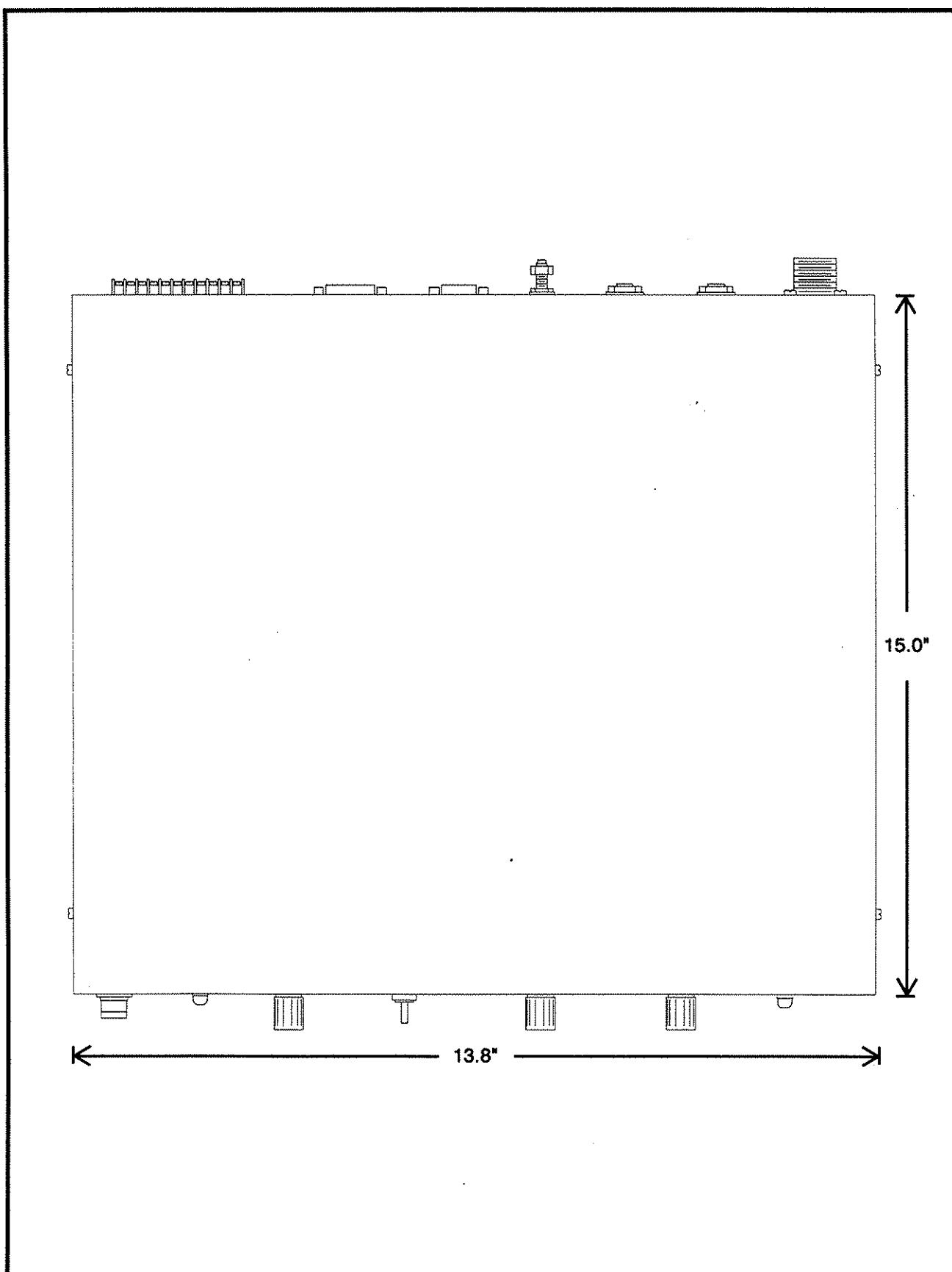


Figure 2.4.2.1 MX-9350 Outline.

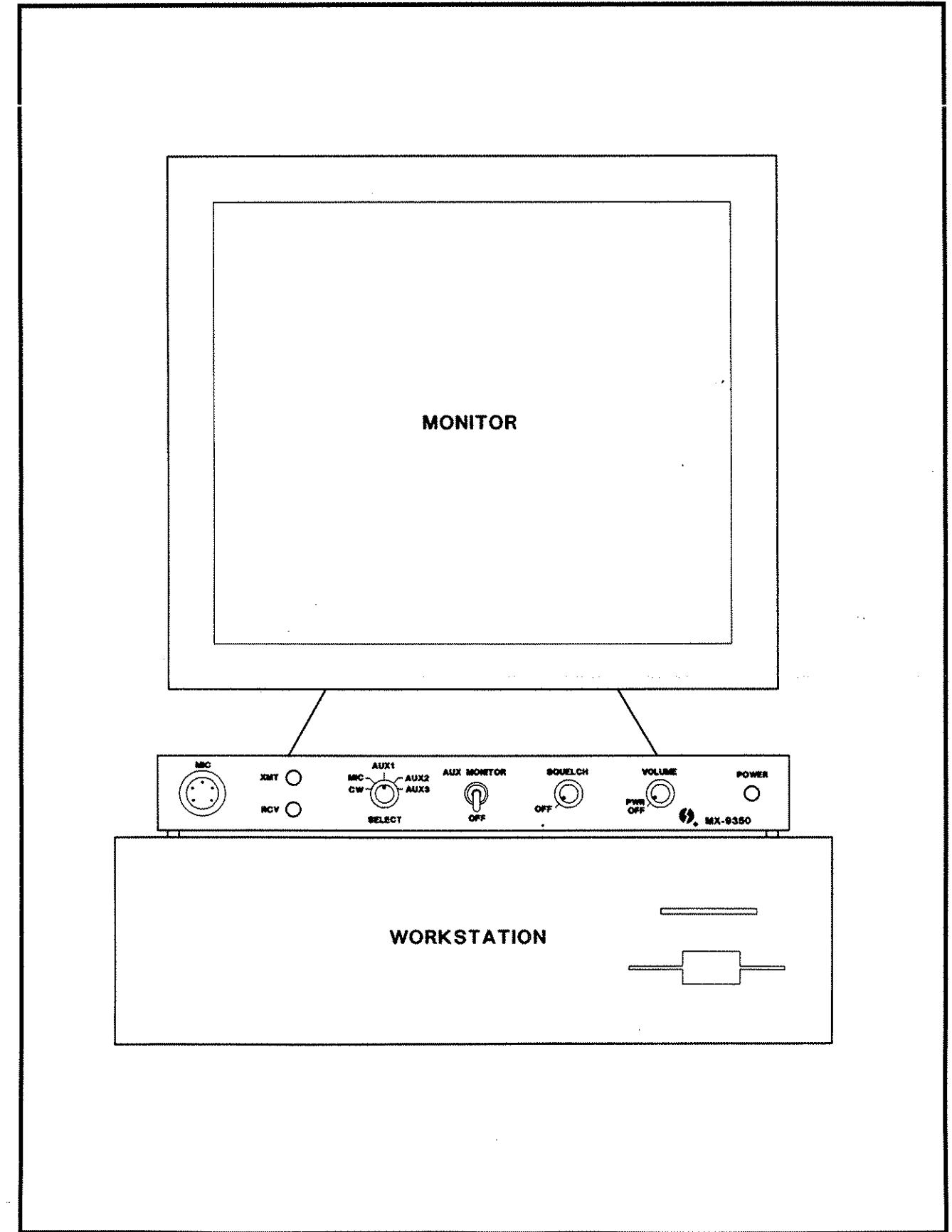


Figure 2.4.2.2 Monitor/workstation.

### 2.4.3 CONTROL AND AUDIO CABLE INSTALLATION

Refer to Figures 2.4.3.1, 2.4.3.2 and 2.4.3.3, System Interconnect Diagrams for the interconnection of the MX-9350 to the Workstation, auxiliary audio devices and 9000 series equipment.

All interconnect cables are provided, except for the auxiliary audio devices and the telephone cables. The System Interconnect Diagram contains a schematic diagram of the Auxiliary audio connector wiring.

Figure 2.4.3.4 shows audio wiring connections to the RT-9000(A) and MD-9188A.

Refer to Figure 2.4.3.5, MX-9350 rear panel connector diagram for connector locations.

#### WORKSTATION

MX-9350 connections:

- a) CONTROL, DIGITAL CABLE: 8076504295 from Digital Interface, J1 to PC I/O, J7.
- b) CONTROL, MODEM CABLE, HAL (optional): 8110005799 from HAL Modem, J6 to AUX 1, J4.
- c) AC POWER 115 VAC or 230 VAC.  
115 VAC: 8101002090 from AC outlet to AC Power, J1.  
230 VAC: 8101002197 from AC outlet to AC Power, J1.
- d) EXTERNAL SPEAKER (optional): 8078100795 to SPKR, J2.
- e) CW KEY (optional): 5024000994 to CW, J3.

### 2.4.4 TELEPHONE LINE INSTALLATION

Refer to Figures 2.4.3.1, 2.4.3.2 and 2.4.3.3 for the interconnection of the MX-9350 and RT-9000 to the telephone lines.

A twelve position terminal strip is provided on the rear panel. Each telephone line circuit is labeled TB-1 through TB-3. A safety ground is provided with each terminal position. Refer to Figure 2.4.4.1 for telephone terminal connection example.

Installation Note: Unscrew MX-9350 terminal block screws to their maximum extension to facilitate tongue terminal installation.

#### WORKSTATION SITE

TELEPHONE LINE (four-wire operation): XMT Audio TB-1, RCV Audio TB-2.

TELEPHONE LINE (two-wire operation): XCVR Audio TB-2.

#### TRANSCEIVER SITE

RT-9000 or RT-9000A Connections:

Four-Wire Operation. Transceiver audio select A.

a) XMT Audio, J5 pins J and H (no polarity).

b) RCV Audio, J5 pins M and L (no polarity).

Two Wire Operation. J-9341 and RT-9000A or RT-9000.

a) Transceiver audio. Select audio "A".

b) Remove the cover of the J-9341 and connect the telephone line to the three position terminal block. The center position of the terminal block is ground. There is no polarity on the two telephone terminals.

c) Connect the J-9341 control cable to the RT-9000A rear apron Audio connector, J5.

Two Wire Operation. J-9342 and MD-9188A.

a) Transceiver audio. Select audio "A".

b) Remove the cover of the J-9342 and connect the telephone line to the three position terminal block. The center position of the terminal block is ground. There is no polarity on the two telephone terminals.

c) Connect the J-9342 control cable to the MD-9188A rear apron Audio A/C, connector, J2.

CAUTION: Select line audio "A" on the RT-9000 and RT-9000A before operating.

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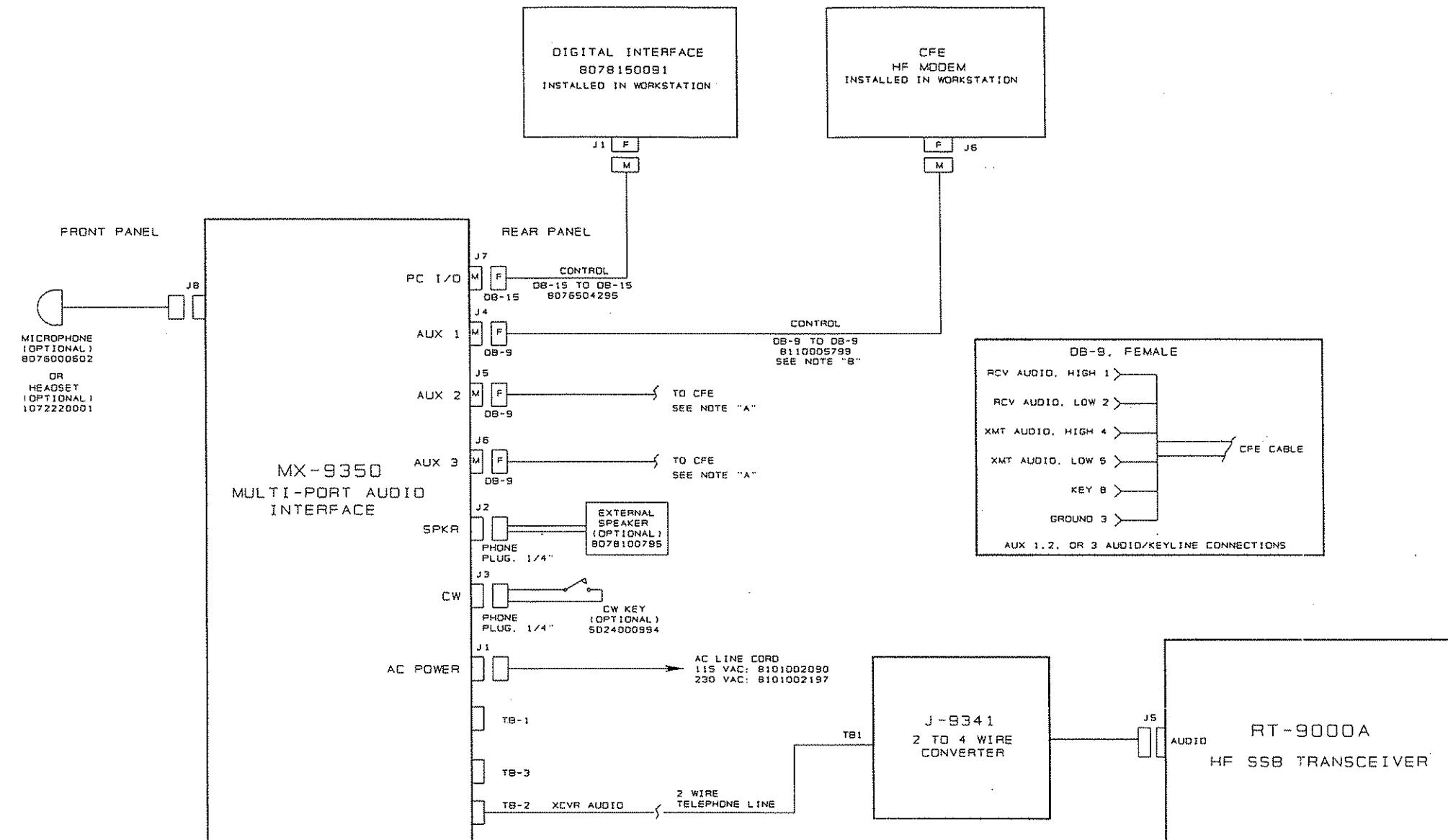
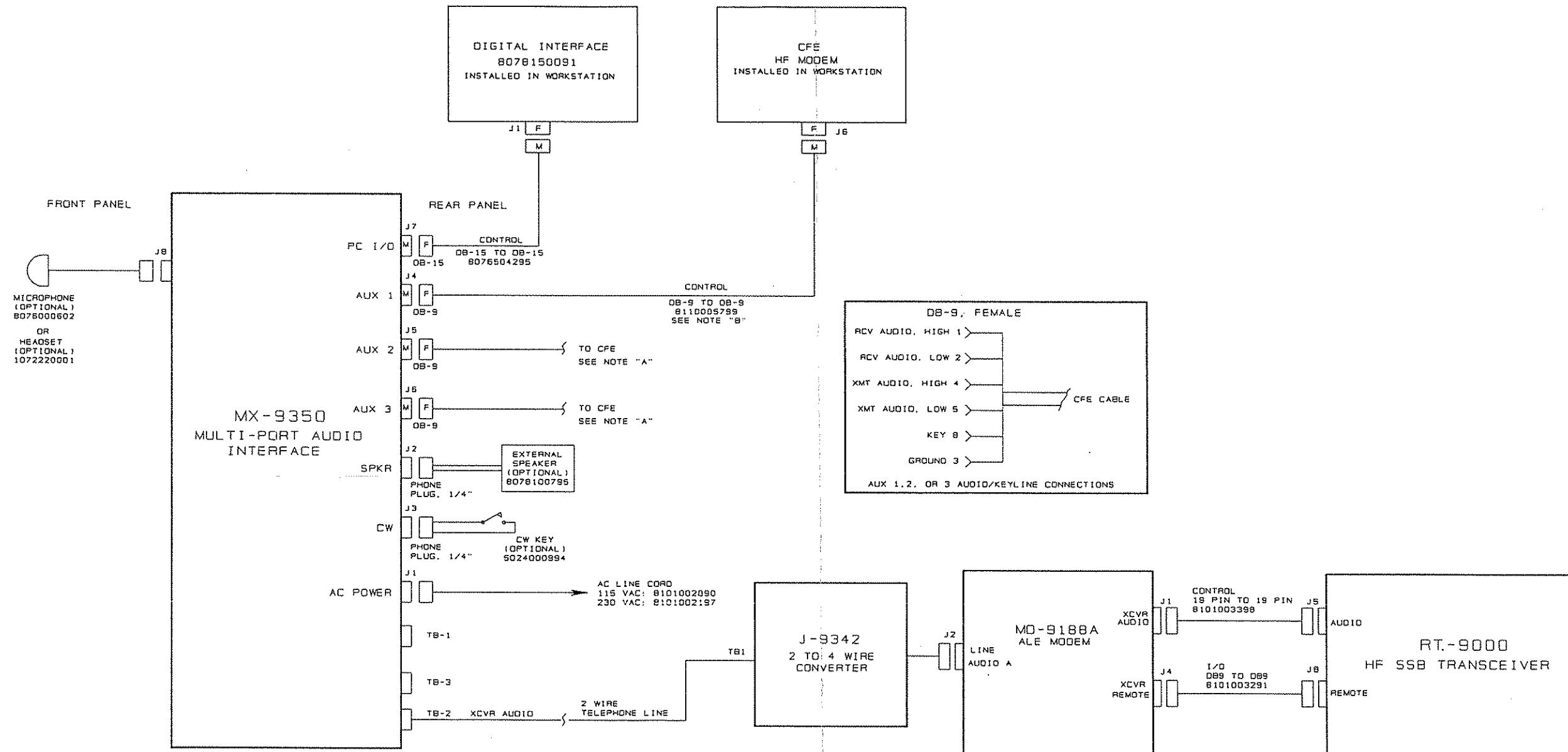


Figure 2.4.3.1 MX-9350 System Interconnect Diagram. 2 Wire Operation, RT-9000A and J-9341.

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NOTES: A) CONNECTORS FOR MX-9350 J4,5 AND 6 INCLUDED IN MX-9350 CONNECTOR KIT. CABLE AND CFE CONNECTORS MUST BE SUPPLIED BY THE CUSTOMER UNLESS OTHERWISE NOTED.  
B) SUPPLIED BY SUNAIR WHEN OFFERED WITH WINDOWS/CLOVER SYSTEM.

Figure 2.4.3.2 MX-9350 System Interconnect 2 Wire Operation: RT-9000, MD-9188A and J-9342.

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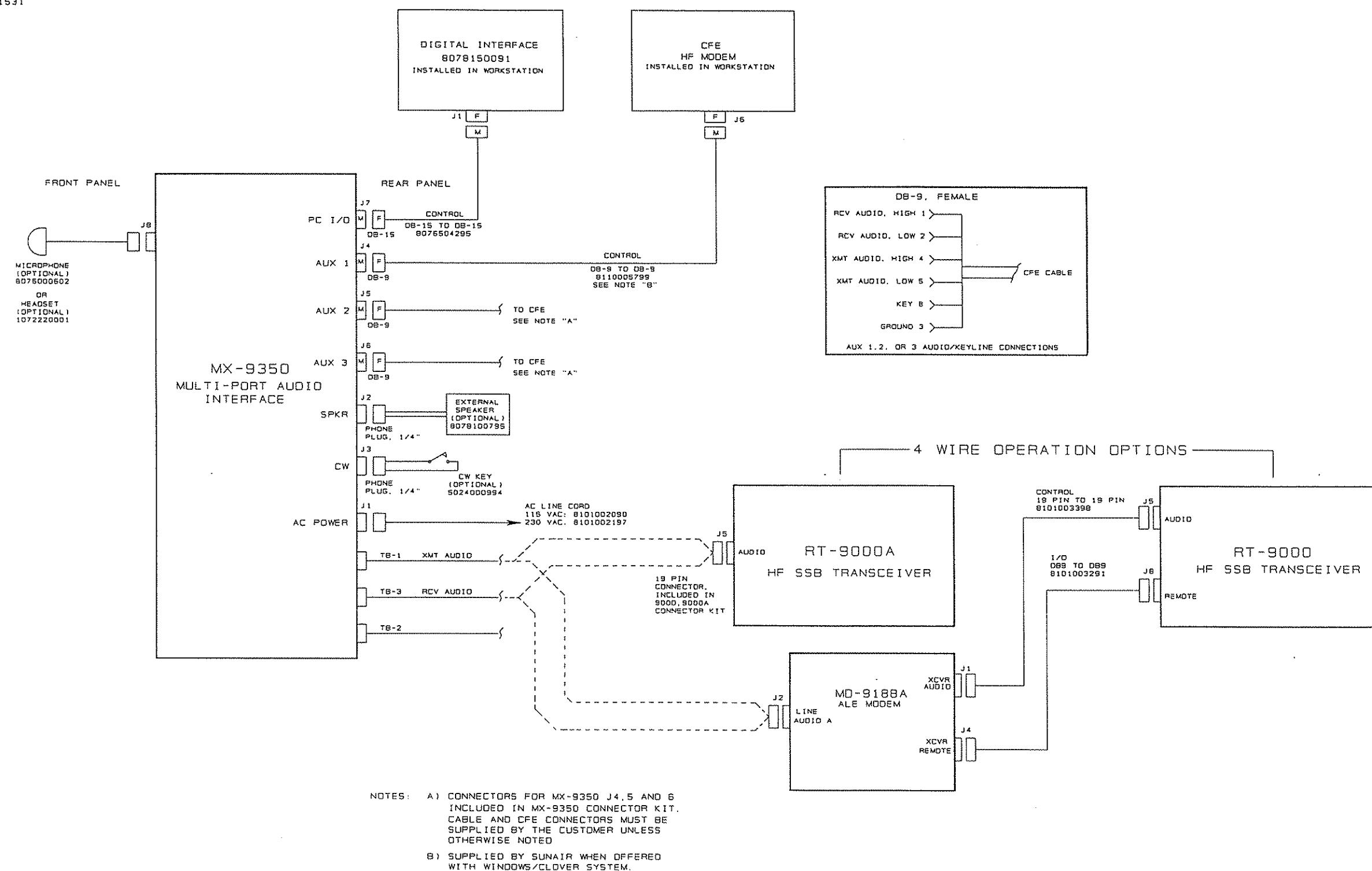


Figure 2.4.3.3 MX-9350 System Interconnect 4 Wire Operation: RT-9000A/RT-9000, and MD-9188A.

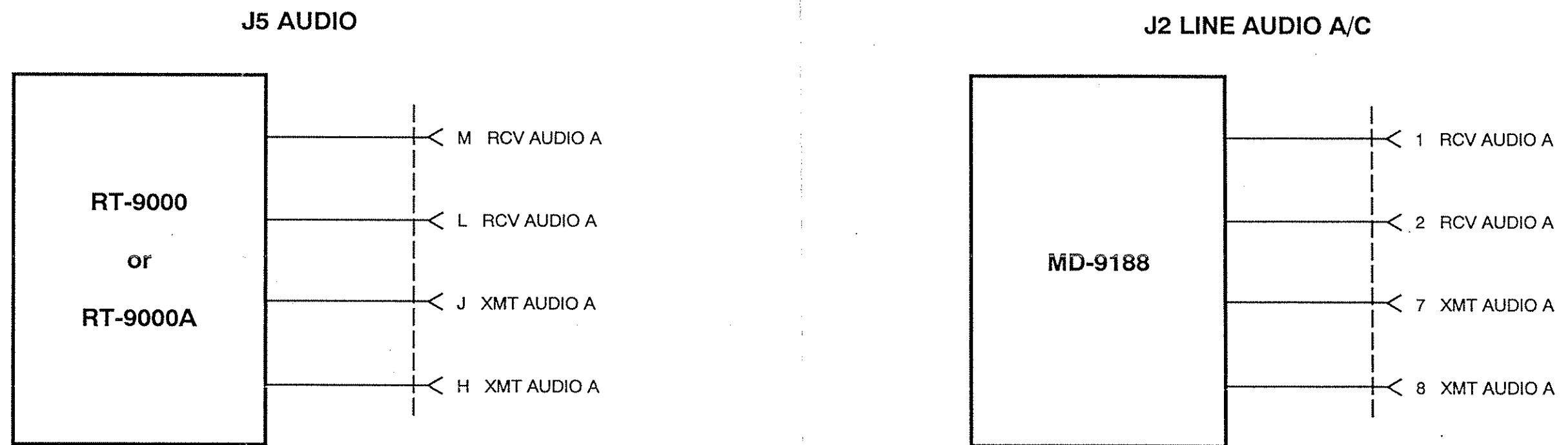


Figure 2.4.3.4 Radio and ALE Audio Connector.

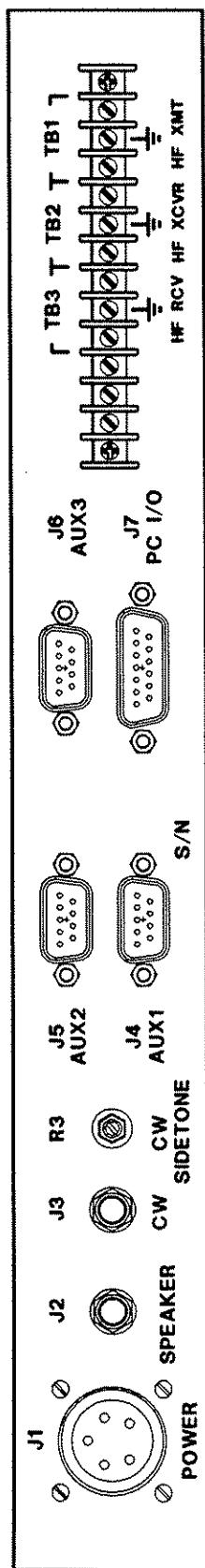


Figure 2.4.3.5 Rear Panel Diagram.

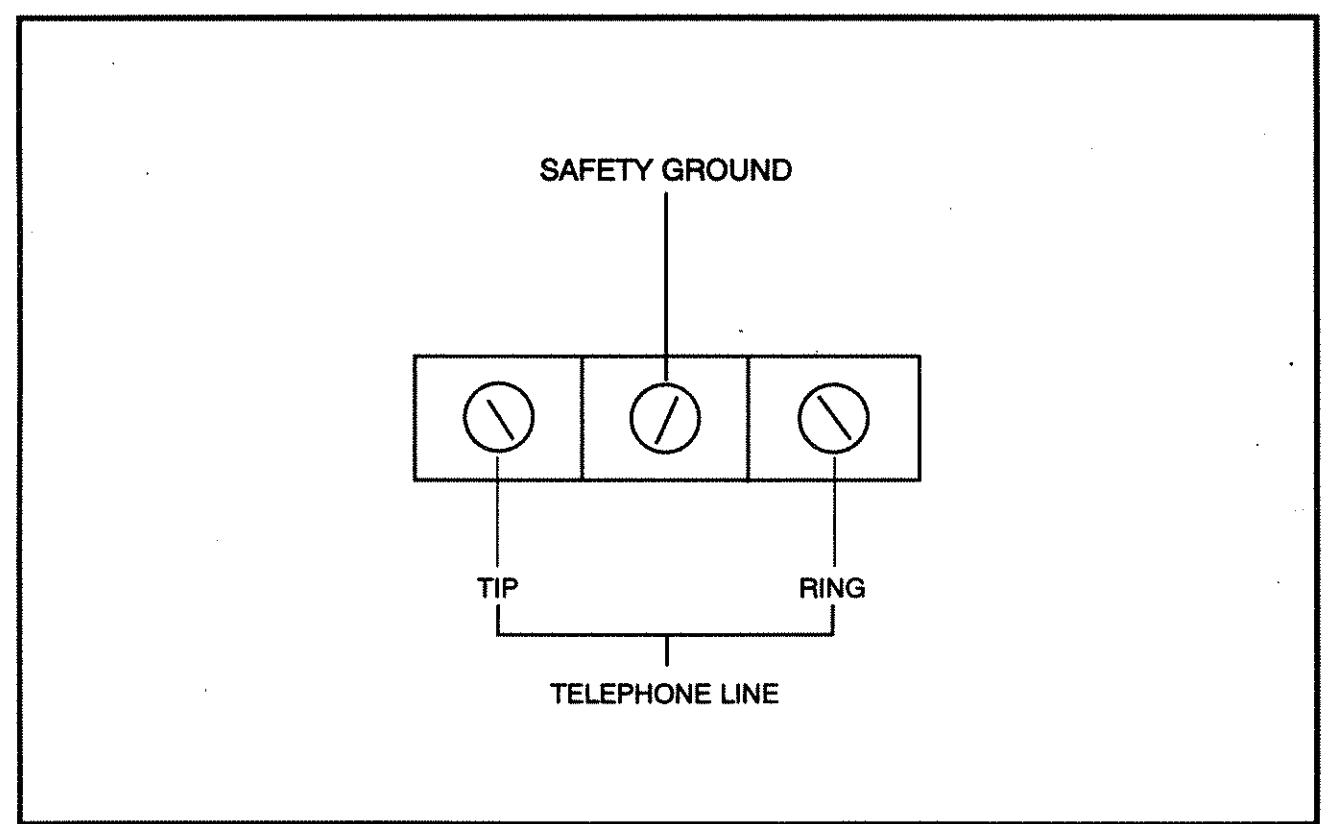


Figure 2.4.4.1 Telephone Line Connection.

## **2.5 INSTALLATION ELECTRICAL ALIGNMENT**

Figures 2.5.1 and 2.5.2 MX-9350 System Audio Interconnect Diagrams illustrate the transmit/receive data and FSK control audio. Typical audio levels are shown at each equipment input and output port. The MX-9350 is designed to compensate for line-loss experienced over the telephone lines. When properly adjusted the MX-9350 will deliver or accept 0 dBm line levels to the auxiliary audio equipment.

### **2.5.1 MX-9350 ALIGNMENT PROCEDURE**

The MX-9350 has been factory adjusted for -30 dBm on the receive line and -9-dBm out on the transmit. If these levels are not satisfactory, perform the following alignment procedure. See Figure 2.5.3, MX-9350 Adjustment Locations and 2.5.4, J-9341/2 Adjustment Locations.

- a) Remove the top cover of the MX-9350.
- b) Turn the MX-9350 power on. See Section III for location and operation of the front panel controls. The "POWER" lamp should illuminate.

**NOTE:** The following adjustments require a AC VTVM or oscilloscope.

#### **MX-9350 SYSTEM ALIGNMENT**

a) Transmit Audio: Transmit audio is factory adjusted for -9 dBm on the telephone line. Normally no further adjustments are required. If a different level is desired complete the following procedure.

1) Select a Auxiliary position, (AUX 1-3) using the front panel "SELECT" switch. Insert a 1 kHz, 0 dBm test tone on the selected auxiliary audio transmit line. (Note: If a Modem is connected to one of the Auxiliary positions it's internal test tone generator may be suitable for this test.)

2) Measure TP-2 with a AC VTVM and Adjust R15, "XMT OUTPUT LEVEL" for the desired level.

b) Receive Audio: The MX-9350 is factory adjusted for -30 dBm on the HF receive telephone line. If a different line level is required complete the following procedure.

1) Transceiver Site: Set the transceiver to 4.999 MHZ USB a 1 kHz test should be present in the receiver speaker. The receive line audio line meter should indicate 0 dBm when configured for direct wire connection or telephone line operation. If the desired levels are not obtained see the RT-9000 manual for 600 ohm receive audio level adjustment procedures.

2) MX-9350 Site: Measure TP-11 with a AC VTVM, adjust R88, "HF RECEIVE LEVEL" for 300 mv ppk/106mv rms at TP-11. If there is insufficient range in R88, additional gain can be achieved by selecting "GAIN" configuration jumpers JP4 (5:1) and JP5 (1:1). When TP-11 is properly set the "AUX 600 OHM RECEIVE" audio test point TP-7 should indicate 0 dBm. The level at TP-7 may be adjusted by R100 "RECEIVE OUTPUT LEVEL". Do not adjust R100 until the level at TP-11 has been satisfactorily achieved.

**2.5.2 J-9341 AND J-9342 ALIGNMENT PROCEDURE**

If the system includes the J-9341 or the J-9342 4-to-2 wire converter complete the following procedure.

a) Transmit Audio: Using the MX-9350 Select a Auxiliary position, ( AUX 1-3) using the front panel "SELECT" switch. Insert a 1 kHz, 0 dBm test tone on the selected auxiliary audio transmit line. (Note: If a Modem is connected to one of the Auxiliary positions it's internal test tone generator may be suitable for this test.). Select the RT-9000 transceiver Transmit Audio Meter function to "LINE AUDIO". Adjust the J-9341/42 "XMT LEVEL" control, R6 for 0 dB as indicated on the transceiver front panel display.

b) Receive Audio: Receive audio is factory adjusted for -9 dBm on the telephone line. Normally no further adjustments are required. If another level is required consult the factory.

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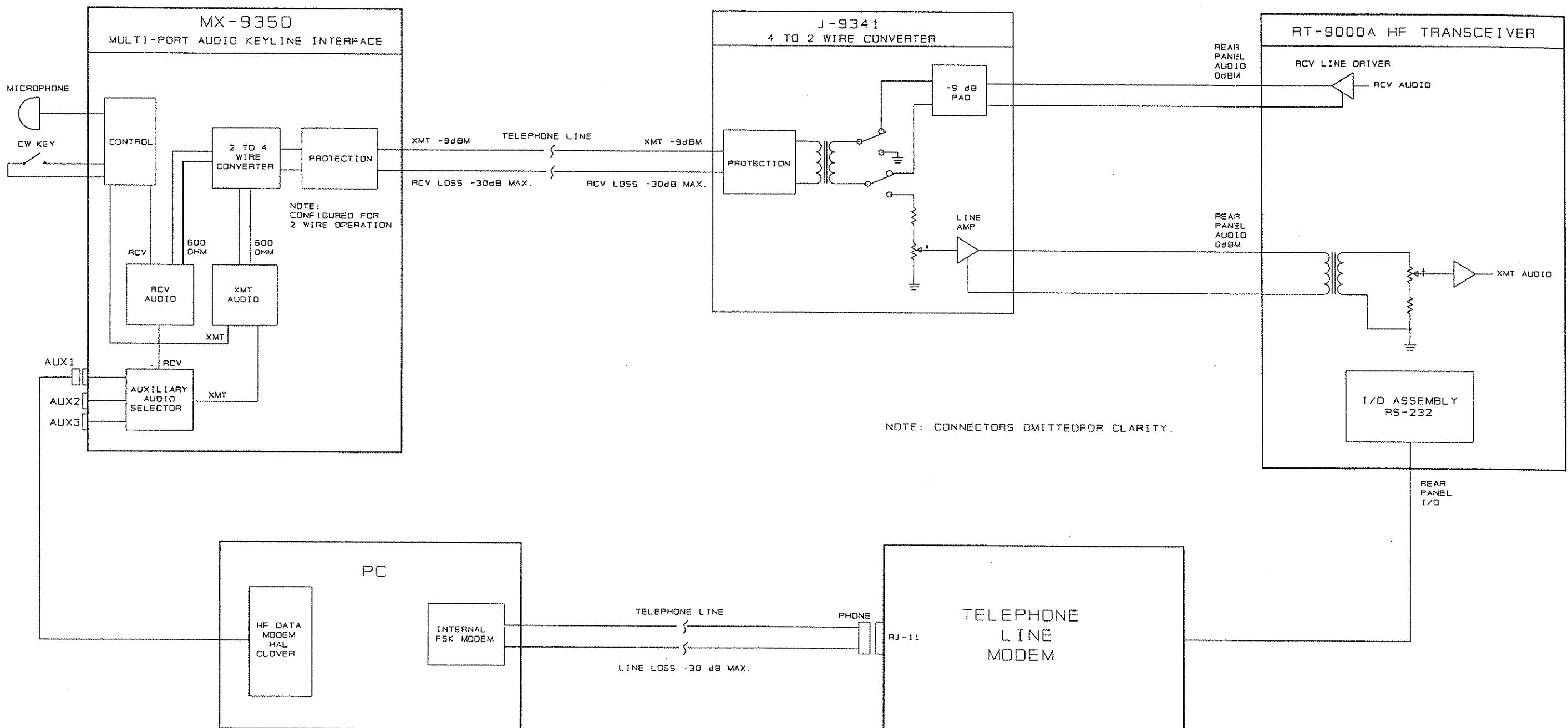


Figure 2.5.1 MX-9350 System Audio Interconnect Diagram, RT-9000A and J-9341.

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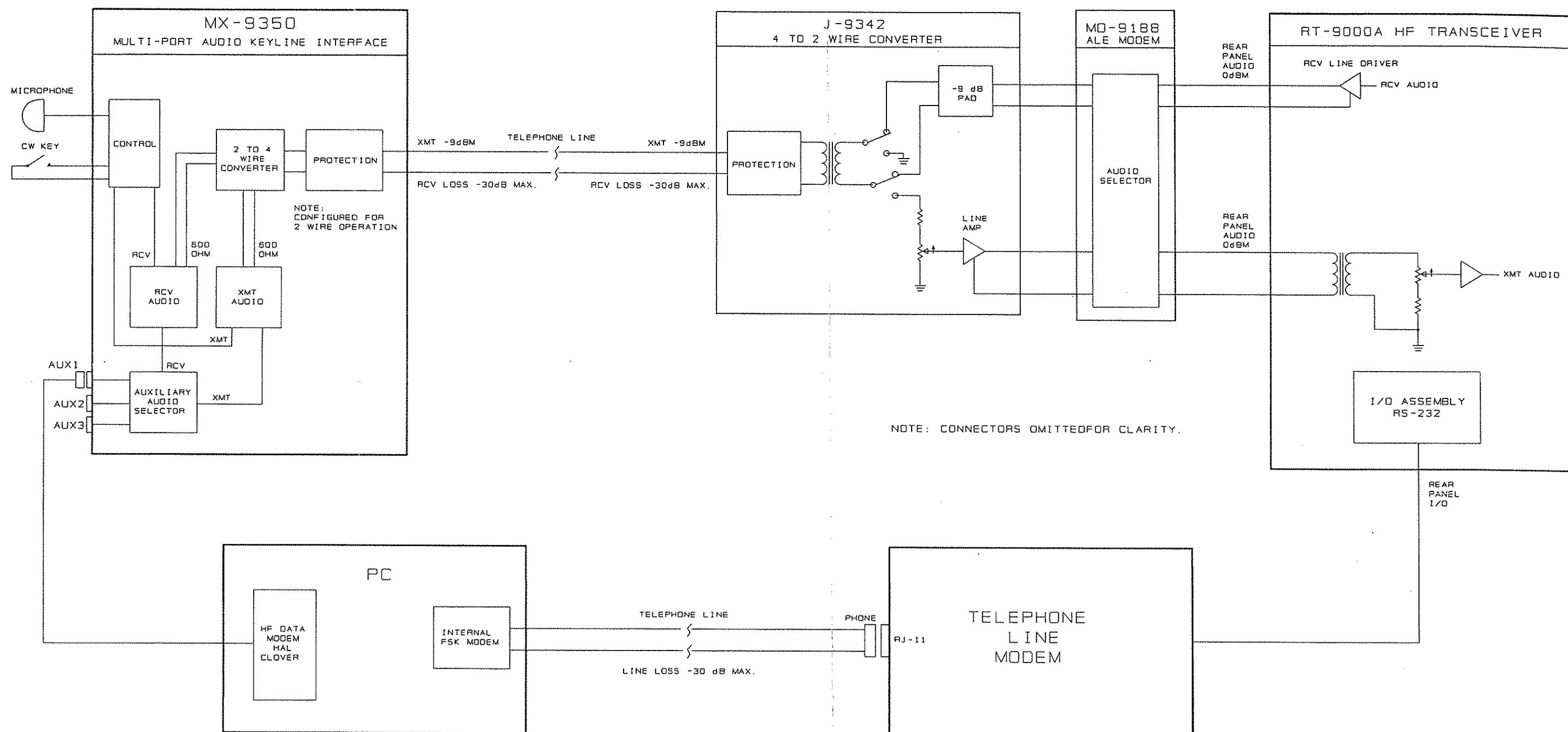


Figure 2.5.2 MX-9350 System Audio Interconnect Diagram. RT-9000, MD-9188A and J-9342.

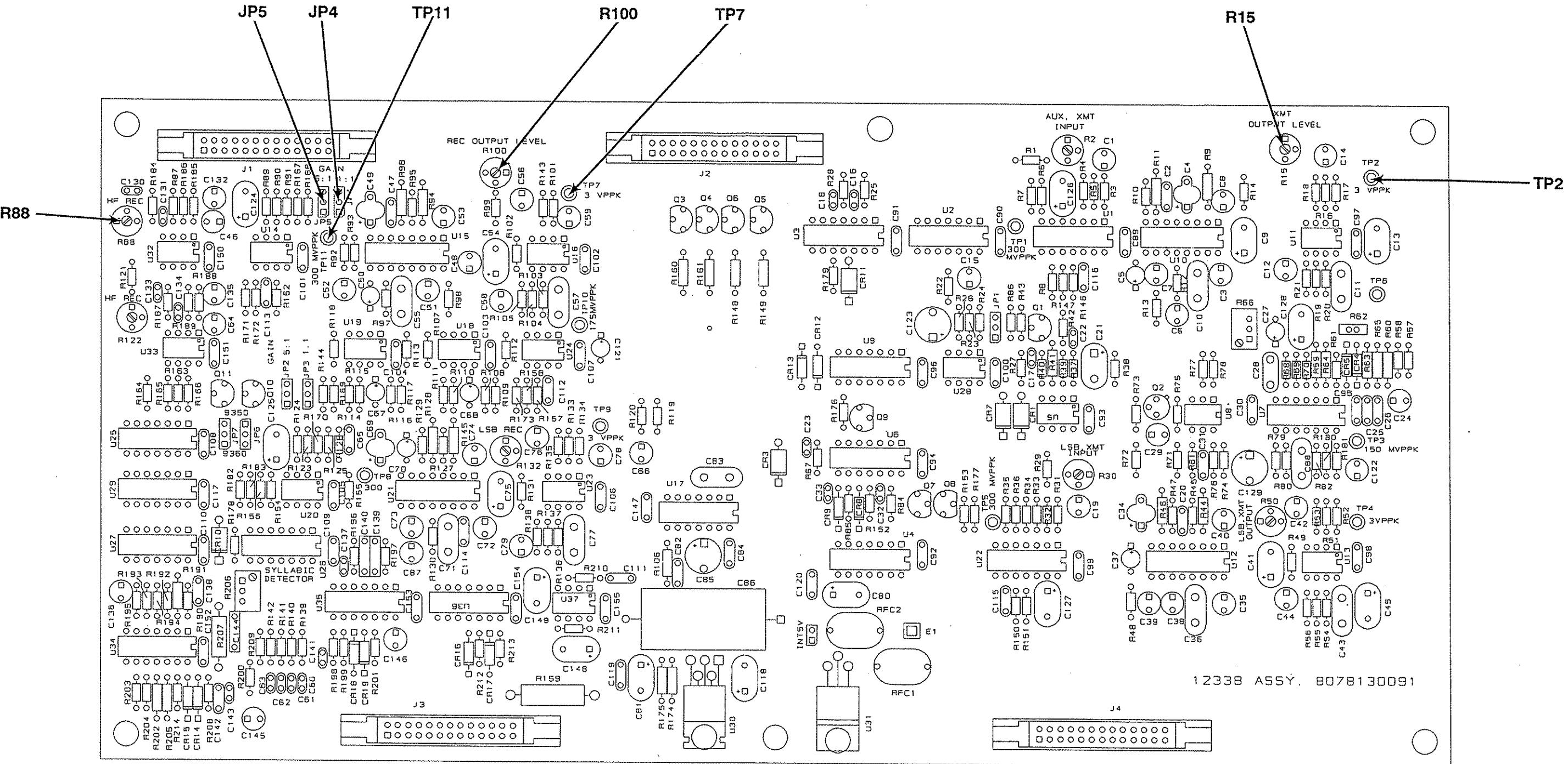


Figure 2.5.3 Adjustments and Test Point Location.

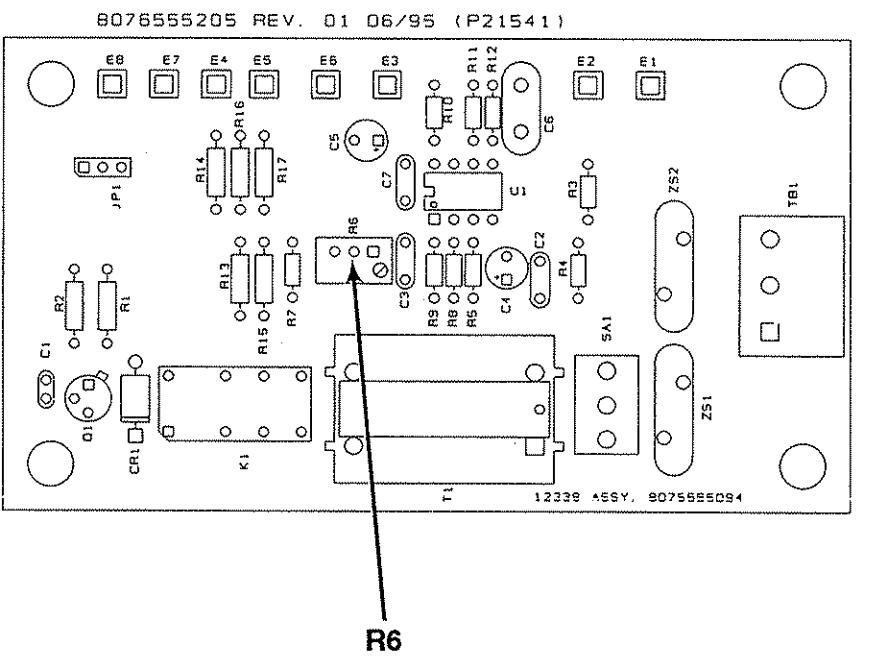


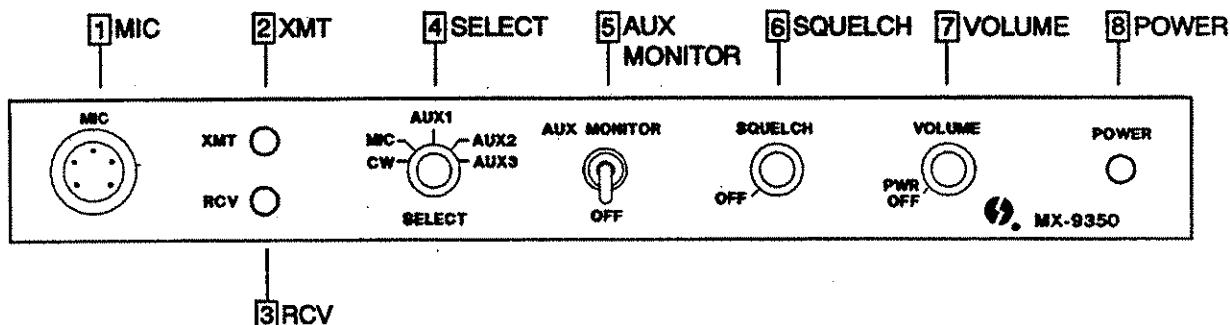
Figure 2.5.4 J-9341/2 Adjustment Location.

## SECTION III

## OPERATION

**3.1 GENERAL**

This section describes the location and use of the MX-9350 front panel controls and indicators. Refer to Figure 3. 1.

**[1] MIC**

The 'MIC' position provides a five-position audio connector, U-1 83/U for microphone audio and keyline.

Sunair handheld microphone assembly PN: 8076000602 is suitable for use in this location.

The microphone connector pins are defined as:

- A: Mic Audio Return
- D: Mic Audio
- C: PTT
- B: Handset Audio
- E: CW Keyline

**[2] TRANSMIT LAMP**

The 'TRANSMIT' lamp (red) will illuminate when the front panel microphone PTT is enabled or any of the rear panel Auxiliary keylines are activated.

**[3] RECEIVE LAMP**

The 'RECEIVE' lamp (amber) will illuminate when the system is in receive.

**[4] SELECT**

The 'SELECT' switch selects the desired operating function. CW enables the CW transmit and sidetone monitor. MIC enables the Microphone audio facility. AUX1-3 enables one of the three Auxiliary audio facilities. When an Auxiliary position is enabled the MIC and CW positions are disabled.

**[5] AUX MONITOR**

The AUX monitor switch permits the operator to monitor the transmit and receive audio activity appearing on the selected Auxiliary position.

#### [6] SQUELCH CONTROL

When this control is in the fully counter-clockwise position the equipment is unsquelched. To enable the squelch, turn the control clockwise to the desired threshold (signal level to unsquelch receiver). The greater the clockwise setting of the control, the greater the signal level required to open the squelch.

#### [7] VOLUME CONTROL

When this control is in the full counter clockwise position, the equipment is off. To apply power, turn the control clockwise. Once on, the audio signal level to the external speaker or microphone headset facility are initially at minimum. Greater speaker audio is achieved by advancing the volume control clockwise to a comfortable listening level.

#### [8] POWER LAMP

The 'POWER' indicator lamp(amber) will illuminate when the power switch is in the on position.

### **3.2 RPC-9286 WORKSTATION OPERATION**

#### **3.2.1 GENERAL**

The RPC-9286 Workstation provides full function remote control of the RT-9000A HF SSB transceiver equipped with Automatic Link Establishment ALE capability.

The RPC-9286 Workstation provides RS-232 operation directly from the workstation or RS-422/ RS-485 using an external converter. No operating controls, adjustments or programming are required to operate the converter.

The RPC-9286 is also supplied with a MX-9350 Audio Keyline Interface. The MX-9350 provides an operator microphone/ auxiliary audio interface facility between the Workstation and the HF SSB transceiver. Refer to the MX-9350 Audio Keyline Interface manual for installation and operating information.

#### **3.2.2 RPC-9286 OPERATION**

##### **3.2.2.1 Starting the Program**

- a) Turn the Workstation power switch "ON". The RPC-9286 must be running in MSDOS mode to start the program. To start the program type "REMOTE" and press the "ENTER" key.
- b) When the program begins, the Start-Up screen will display a message asking the operator to enter a radio ID or press ENTER to View/ Edit/ Create List.
- c) Pressing ENTER will display the RADIO ID list. The RADIO ID list may be edited if desired. The RADIO ID may be any alphanumeric combination up to fifteen characters long. The code or address is listed in the first column. All addresses must begin with a dollar sign which is to be followed by the letter T and two decimal digits. The digits must match the address of the equipment to be controlled. Equipment type must be transceiver.
- d) To return to the Start-Up screen, press ESC.
- e) Enter a valid Radio ID from the list displayed in 3.2.2.1 c.

**NOTE:** The ID's are not case sensitive. Upper or lower case may be used.

When a valid ID is entered, the program will attempt to establish communications with the radio equipment. A message will be displayed "INITIALIZING SYSTEM - PLEASE WAIT". If contact is not established, a display will appear asking:

PRESS "ENTER" TO RETRY.  
 PRESS "\$" TO CHANGE ID.  
 PRESS "ESC" TO EXIT THE PROGRAM.

If communications is not established check the following:

- The HF SSB Transceiver I/O port is properly configured to communicate with the Workstation. The transceiver address should be the same as the address selected 3.2.2.1 c.
- The Workstation for proper COM port configuration .

If communications is successfully established the radio control screen will be displayed. Press F7 to take control of the system.

The control data shown on the computer screen and on the radio should be complementary; the computer will show LOCAL when the radio shows RMT and the radio shows LCL when the computer shows REMOTE.

A menu is displayed below the operating screen. The key commands are not case-sensitive, so that either lower or upper case characters may be entered.

### **3.2.2.2 Operating the Program**

The transceiver is controlled by pressing various keys on the workstation keyboard. This program cannot be operated with a Mouse.

#### **3.2.2.2.1 RADIO OPERATING MENU**

**ALT X: Program Exit.** Press the Alt key and the X key simultaneously to exit program

**A: AGC.** Toggles AGC, Fast, Medium and Slow.

**B: BFO.** Turns BFO ON or OFF. When the BFO is ON increment or decrement the BFO frequency using the Up and Down arrows. BFO is NOT active in AM or Manual Frequency control.

**C: Channel.** Selects the Channel number. Enter the desired channel number using the numeric keypad or number keys. Ensure that the **NUM LOCK** is on.

**L: Load Simplex.** Transfers the Workstation channel data into the radio's EEPROM. Enter the desired frequency using the numeric keypad or number keys. Ensure that the numeric keypad lock is on.

**X: Load XMT.** Loads transmit frequency only in half-duplex operation.

**T: Cplr Tune.** Tunes the automatic antenna coupler.

**I: Radio ID.** Allows operator to select another radio.

**M: Mode.** Toggle function, selects **USB**, **LSB**, **CW** and **CW narrow** and **AM**.

**INC/DEC:** Up and Down arrows. Increment or decrement channels or BFO offset.

**W: Meter.** Selects transmit or receive meter functions. Press Q or ESC to exit this screen.

**P: Power.** Selects the transmitter operating RF output power. Toggle function. The power meter scale automatically scales.

**K: Keyline.** Toggles the transmitter keyline. When keyed the display upper right hand corner indicates "KEYED"

**\*: ALE.** Enables Automatic Link Establishment (ALE) Function.

**ESC: Escape.** This causes the bottom menu to change to a menu of Function keys. The functions are listed below:

### 3.2.2.2.2 RADIO OPERATION FUNCTION KEY MENU

**F1: List Channels.** Displays a list of all channel data stored in the workstation channel file. These data are not necessarily identical to the data in the transceiver's EEPROM. See F2 and F3 for additional information.

**F2: Down Load Channels.** Causes the transceiver to send data for all 128 channels to the workstation. This function should be used when a new workstation is installed, to ensure that the transceiver's EEPROM and the workstation's channel data file agree.

**F3: Upload Channels.** Causes the data in the workstation's channel data file to be transferred into the transceiver's EEPROM. This function should be used when a new transceiver is placed in service.

**F4: List ID's.** Causes a list of equipment ID's to be displayed and allows the list to be edited.

**F5: Scan.** Permits the transceiver to scan consecutive channels between any two channel numbers selected by the operator.

**F6: Bite.** Causes the transceiver to exercise its built-in test function. The completion of the test is reported by the radio.

**F7: Control.** Causes control of the transceiver to switch from the workstation to the transceiver front panel.

**F8: Manual.** Causes the transceiver to switch from channel operation to manual control of the frequency by means of the up or down arrows.

**F9: LPX.** Link-Plus, Link expansion and compression module (optional).

**F10: Preselector.** Allows switching of the Preselector IN and OUT and switching of the Preselector gain to HIGH or LOW as desired.

**ESC: Menu.** Returns display to the original condition.

### 3.2.2.2.3 ALE OPERATING MENU

**S: Start Sound.** Selects the ALE Sound function.

**T: Sound Interval.** Allows the operator to select the Sound interval period.

### 3.2.2.2.4 ALE OPERATION FUNCTION KEY MENU

**F1 : Change Self ID.** When this key is pressed, a list of call slots and equipment call ID's for the net is displayed. The Self ID slot number is displayed beneath the ID list, followed by the Self ID. There are two ways to change the self ID; a new slot may be selected using the up/down arrows, or a new ID may be entered using the keyboard. In the PC workstation, as in the RT-9000, the selfID is defined as the CallID which is stored in the radio's slot. The ID is automatically changed when <ENTER> is pressed.

**F2 : Change Call ID.** Works identically to F1, except that it is the Call ID which is changed. The Call ID identifies the radio which will be called when Tx Scan is selected.

**F3 : Change Scan Gp.** This will allow the operator to select one of the ten scan groups to be scanned in Rx or Tx Scan. Each scan group contains 10 channels; numbers 0 through 9 of the particular decade corresponding to the scan group.

**F4 : Start Rx Scan.** This causes the radio to initiate its RX Scan function. There may be a delay as the radio transfers all call ID's to the ALE processor. When the radio begins to scan, a message "Receive ALE" will be displayed and will remain displayed until the scan function is terminated or the radio links with another station.

**F5 : Start Tx Scan.** This causes the radio to call the station whose identification is displayed as the Call ID. While the radio is scanning, a "Transmit ALE" message is displayed.

**F6 :Change Net ID.** This key allows the Net ID to be changed. The new ID is entered using the keyboard.

**F7 :Net Call.** This directs the radio to initiate a Net Call. During the calling process, the message "CALLING NET STATIONS" is displayed. At the end of the call, the message "TX SCAN TERMINATED" is displayed.

**F8 : All Call.** This directs the radio to call all stations in communication range. During the calling process, the message "CALLING ALL STATIONS" is displayed. At the end of the call, the message "TX SCAN TERMINATED" is displayed.

**F9 : Exit ALE.** This key terminates the ALE functions and restores the normal operating screen to the display.

**S : Start Sound.** This key directs the RT-9000 to execute the sounding process. During the sounding process, the message "SOUNDING" is displayed. At the end of the call, the message "TX SCAN TERMINATED" is displayed.

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## SECTION IV

### THEORY OF OPERATION

#### **4.1 GENERAL**

The theory of operation is presented in four sections:

- 1) Rear Panel Assembly.
- 2) Audio Assembly.
- 3) Front Panel Assembly.
- 4) Power Supply Assembly.

The MX-9350 and MX-9360 use a common Audio assembly for each unit. The USB transmit and receive section of this assembly are used with the MX-9350. The LSB transmit and receive sections are not used in the MX-9350.

Refer to the MX-9350 block diagram, Figure 4.1.1 and schematics in Section V.

#### **4.2 REAR PANEL ASSEMBLY**

The Rear Panel assembly provides a wire interface facility to the rear panel connector apron. The assembly also contains the auxiliary audio switch relays, keyline selector switches, telephone line coupling transformers and protection circuits.

Relays K1-K3 select auxiliary audio from the rear apron audio connectors J4, and 6. The selected audio is routed to interface transformers T3 and T4. The interface transformer audio is supplied to the audio assembly by connector P1 and P2.

Auxiliary keyline control is selected when any one of the auxiliary audio relays is enabled. The auxiliary keyline is ORed by optocouplers U1, 2 and 3 the keyline output of the optocouplers is supplied to the audio assembly by connector P2.

Line coupling transformers T1 and T2 and associated telephone line protection circuitry couple the MX-9350 to the telephone lines. When configured for four-wire operation transformer T1 supplies transmit audio to the HF transceiver and transformer T2 accepts receive audio from the HF transceiver. When configured for two-wire operation transformer T1, relay K4 and FET Q1 provide a two-to-four wire converter.

### 4.3 AUDIO ASSEMBLY

The Audio assembly provides telephone loss compensation amplifiers, 600 ohm auxiliary transmit and receive amplifiers, keyline level translator, microphone amplifier, CW oscillator, squelch and speaker driver. The Audio assembly may operate single channel transceive or dual channel full duplex operation. Single channel operation is available in the MX-9350 and dual channel operation is available in the MX-9360. The following discussion refers to the MX-9350 single channel transceive operation.

#### 4.3.1 RECEIVE AUDIO

HF receive audio supplied by the telephone line is level adjusted by "RCV LEVEL" control R88 and amplified by amplifier U32-A and U14-A. The output of U14-A is supplied to line compressor U15 which maintains the HF receive audio at a constant level. The leveled output is supplied to level control R100, "RECEIVE OUTPUT LEVEL". R100 is normally adjusted for 0 dBm out on the 600 ohm Auxiliary line driver amplifier. U16-A and U16-B provide the Auxiliary 600 ohm line driver amplifier.

#### 4.3.2 RECEIVE MONITOR AUDIO

The HF receive audio and HF receive Auxiliary audio can be monitored at the loud speaker or headset audio facility. Receive audio from buffer amplifier U14-B is routed by audio switch facility U25-A, D, U29-A, B and control logic U26-A, B and U27. The switched audio is supplied to audio summing amplifier U18-B and U24-B. The output of U24-B is supplied to the volume control high-side contact and the input to the squelch detector circuitry. The wiper output of the volume supplies audio to the speaker driver amplifier, U17. The output of U17 drives the rear panel speaker jack and the front panel headset facility.

#### 4.3.3 RECEIVE AUDIO SQUELCH

The squelch circuit is a true Syllabic type which operates on voice characteristics and rejects other types of receive audio, such as noise, data, etc. The receiver audio is sampled and amplified by buffer amplifier U34-A. The amplified audio is supplied to limiter U34-B which squares the audio signal. The squared audio is applied to one shot, U35-A and U35-B. The output of the one shot is filtered by loss-pass filter R198, 200, C141, C143 and U34-D. The filtered output of U34-D is the FM signal content that appears in human speech. This signal is applied to the full-wave rectifier, U34-C. The output of U34-C triggers the audio switch timer composed of U35-D and U35-C. When the timer is triggered, audio switch U36-A is enabled which permits audio to appear in the rear panel speaker and front panel headset facility.

#### 4.3.4 TRANSMIT AUDIO

HF transmit audio supplied by the auxiliary modem or front panel microphone facility. The auxiliary modem audio is level adjusted by "AUX INPUT LEVEL" control R2 and buffered by amplifier U1-A and controlled by switch U2-A, B and U1-B. The output of U1-B is supplied to line compressor U10 which maintains the HF transmit audio at a constant level. The leveled output is supplied to level control R15, "XMT OUTPUT LEVEL". R15 is normally adjusted for -9 dBm out on the telephone line. U11-A and U11-B are configured for telephone, 600 ohm line driver service.

Microphone audio is amplified by amplifier U28-A and is controlled by audio switch U2-D. The output of switch U2-D, U2-B and U2-C couples the microphone audio to buffer amplifier U1-B.

CW audio is generated by Wein bridge oscillator, U7-A and audio switch U7-B, C and U8. The output of U7-C is amplified by U7-D and sidetone buffer amplifier U24-B. Switch U29-A couples the CW audio to the speaker driver. The output of U7-C and switch U9-A places CW audio in the transmit audio path.

#### **4.3.5 POWER SUPPLY REGULATOR**

Switch +12 VDC is applied to low-drop-out regulator U30. U30 regulates the +12 VDC to 10 VDC. All amplifier, half-rail supplies, switch and logic functions are powered by the +10 VDC supply with the exception of the +5 VDC required by the PC I/O functions.

An auxiliary +5 VDC regulator is provided if +VDC is not available from the PC. This power supply is enabled by connecting jumper "INT5V".

#### **4.4 FRONT PANEL ASSEMBLY**

The Front Panel assembly provides a wire interface facility to the controls, switches and indicators located on the front panel. The Front Panel assembly interfaces to the Audio assembly by connectors.

#### **4.5 POWER SUPPLY ASSEMBLY**

The power supply assembly supplies regulated +12 VDC to all MX-9350 assemblies. The power supply operates from 90 VAC to 240 VAC. The power supply is a commercial-off-the-shelf assembly and contains no user serviceable components.

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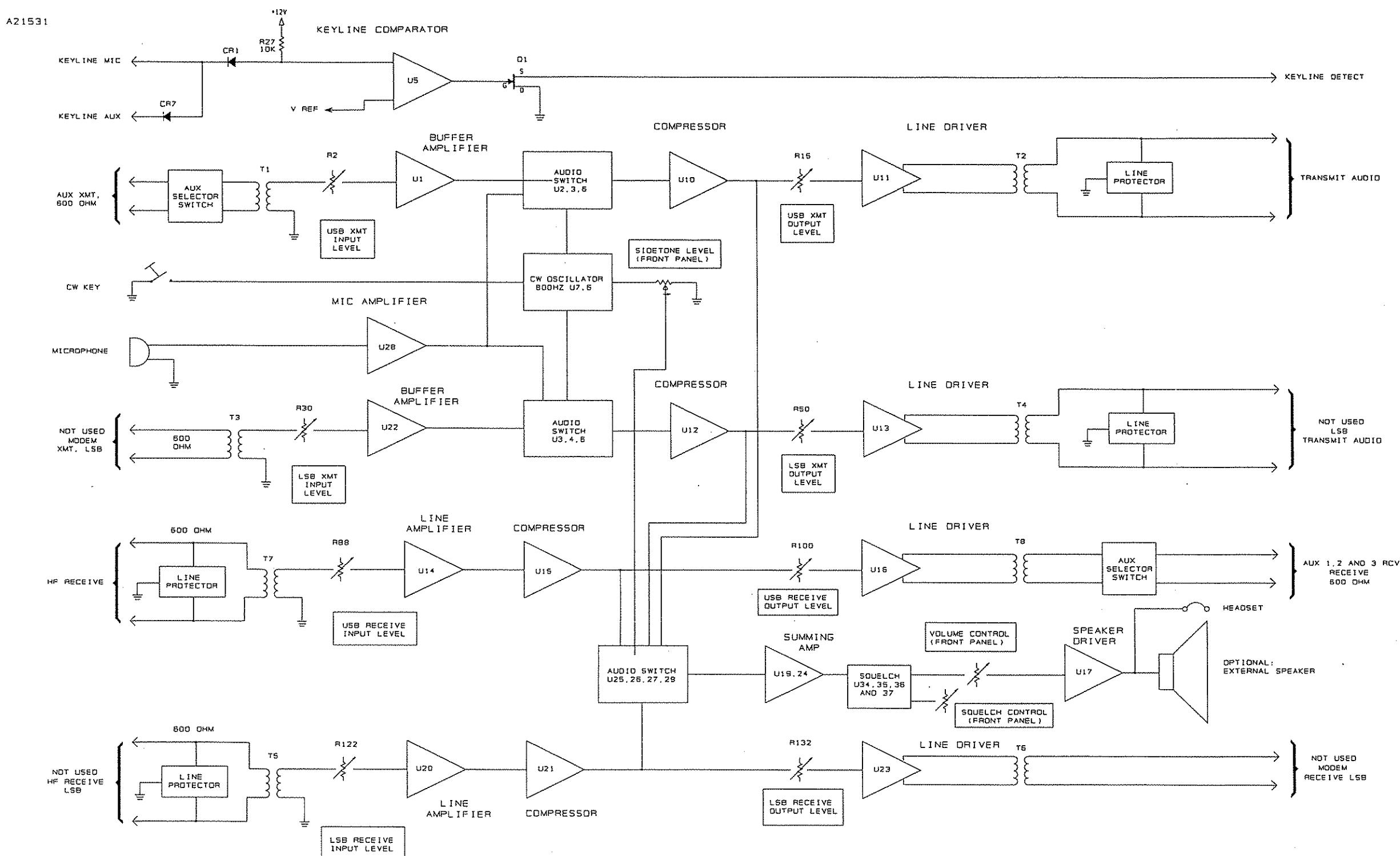


Figure 4.1.1 MX-9350 Block Diagram.

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## SECTION V

### MAINTENANCE AND REPAIR

#### 5.1 GENERAL

This section provides procedures for maintenance and repair of the MX-9350.

The following adjustments should be accomplished with the MX-9350 disconnected from the telephone lines.

#### 5.2 DISASSEMBLY

Procedures for the disassembly of the MX-9350 are given in the following paragraph.

##### 5.2.1 TOP COVER REMOVAL

- a) Remove the number six pan head screws, (quantity 6) from the left and right side of the top cover.
- b) Remove the top cover.

#### 5.3 ALIGNMENT, MX-9350

Refer to Figures 5.3.1 and 5.3.2 for the location of components, controls and adjustments.

The MX-9350 utilizes the USB transmit and receive circuitry of the Audio assembly. The LSB transmit and receive circuitry are not required for operation of the MX-9350 and can be ignored.

The Front Panel Assembly does not require alignment.

##### 5.3.1 TWO OR FOUR WIRE TELEPHONE OPERATION

The Two or Four wire configuration jumpers are located on the Rear Panel Assembly. See Figure 5.3.1.1 for location and selection of these jumpers.

Two Wire Operation: Place JP1, 2 and 3 in the 2W position.

Four Wire Operation: Place JP1, 2 and 3 in the 4W position.

##### 5.3.2 POWER SUPPLY, AUDIO ASSEMBLY

a) +12 VDC: Turn the front panel "VOLUME/POWER" switch to the "ON" position. Measure the power supply DC input voltage at the input terminal of voltage regulator U30. (Junction of U30, "IN" and C110. It should measure +12 VDC, +5%.

b) +10 VDC: Measure the output pin of voltage regulator, U30 (junction of U30, "OUT" and C81). It should measure +10 VDC, +5%.

c) Half-Rail Supplies: Measure the junction of C66 and R120 it should measure +5VDC, +5%. repeat this measurement at C21 and R37 it should also measure +5VDC, +5%.

### 5.3.3 AUDIO LEVEL, RECEIVE

- a) Depending on the MX-9350 telephone line configuration, (two or four wire operation) insert a 1 kHz test tone on the rear panel terminal strip at the expected line level. Typical telephone line levels may be -30 to -10 dBm.
- b) Measure TP-11 and adjust R88, "RECEIVE INPUT LEVEL" for 300 mv ppk.
- c) Measure TP-7 and adjust R100, "RECEIVE OUTPUT LEVEL" for 3V ppk. This will deliver 0 dBm to the rear panel Auxiliary Audio positions.

### 5.3.4 AUDIO LEVEL, TRANSMIT

- a) Select one of the Auxiliary audio positions, (example "AUX-1") and insert a 1 kHz, 0 dBm test tone on the auxiliary transmit audio position.
- b) Ground the selected Auxiliary audio, keyline.
- c) Terminate the rear panel terminal strip "XMT" or "XCVR" position depending on system configuration with a 600 ohm load. Two 1200 Ohm, 0.25 watt resistors in parallel are suitable for this.
- d) Measure TP1 and adjust R2, "AUX XMT INPUT LEVEL" for 300 mv ppk.
- e) Measure TP2 and adjust R15, "XMT OUTPUT LEVEL" for V ppk, -9 dBm.
- f) Remove the audio and keyline from the selected Auxiliary transmit position.

### 5.3.5 FRONT PANEL MICROPHONE LEVEL

- a) Inject a 1 KHz test tone at -20 dBm into the front panel microphone connector. See Figure 5.5.1 for MIC connector wiring information.
- b) Enable the Microphone keyline.
- c) Measure TP1. TP1 should measure 300 mv ppk.

### 5.3.6 CW OSCILLATOR LEVEL

- a) Enable the CW key.
- b) Measure TP6 and adjust R66, "OSCILLATOR LEVEL" for 1 V ppk.
- c) Measure TP3, it should measure 150 mv ppk.
- d) Disable the CW key. The signal at TP3 should be reduced by at least -40 dB.

#### 5.4 DIGITAL INTERFACE ASSEMBLY

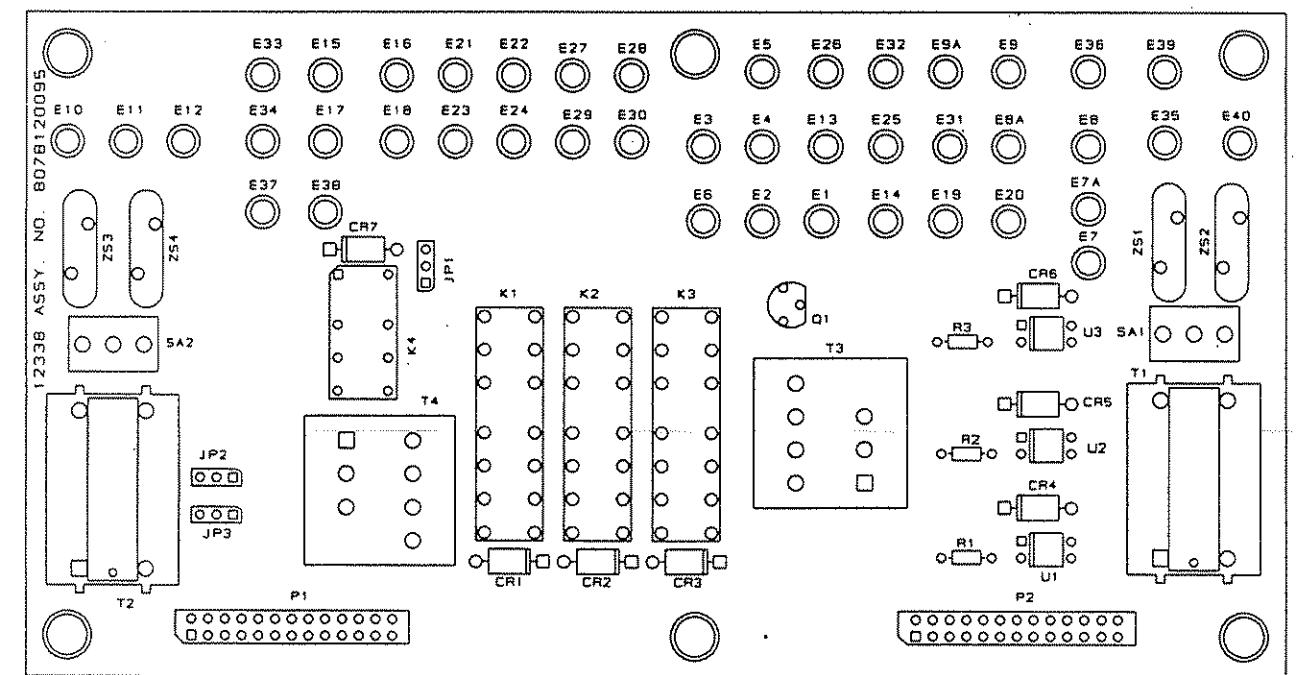
The Digital Interface Assembly for the MX-9350 or the MX-9360 system is configured to operate in a Workstation at address 300 HEX. Set programming switch SW1 positions 1 and 2 "OFF" and positions 3, 4, 5 and 6 "ON". The keyline will be read from the port, and the T/R indicators should be written to the port.

In the absence of any keyline activity, the value read from this port should be 3EH (62 decimal). Bit 0 is permanently tied low on the pc board and can serve to indicate that the board is present. The Microphone keyline is Bit 7, and the CW key is Bit 6. Each of these indicates the keyed condition by a high on the appropriate bit.

Outputs to the port are for controlling the Transmit and Receive LED's. In receive, Bit 7 should be high and Bit 5 should be low. In transmit Bit 7 should be low and Bit 5 should be high.

#### 5.5 SCHEMATICS AND PARTS LISTS

The following pages contain schematics and parts lists for the MX-9350.



Select either 2 or 4 wire only at JP1-3.

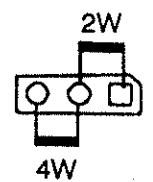
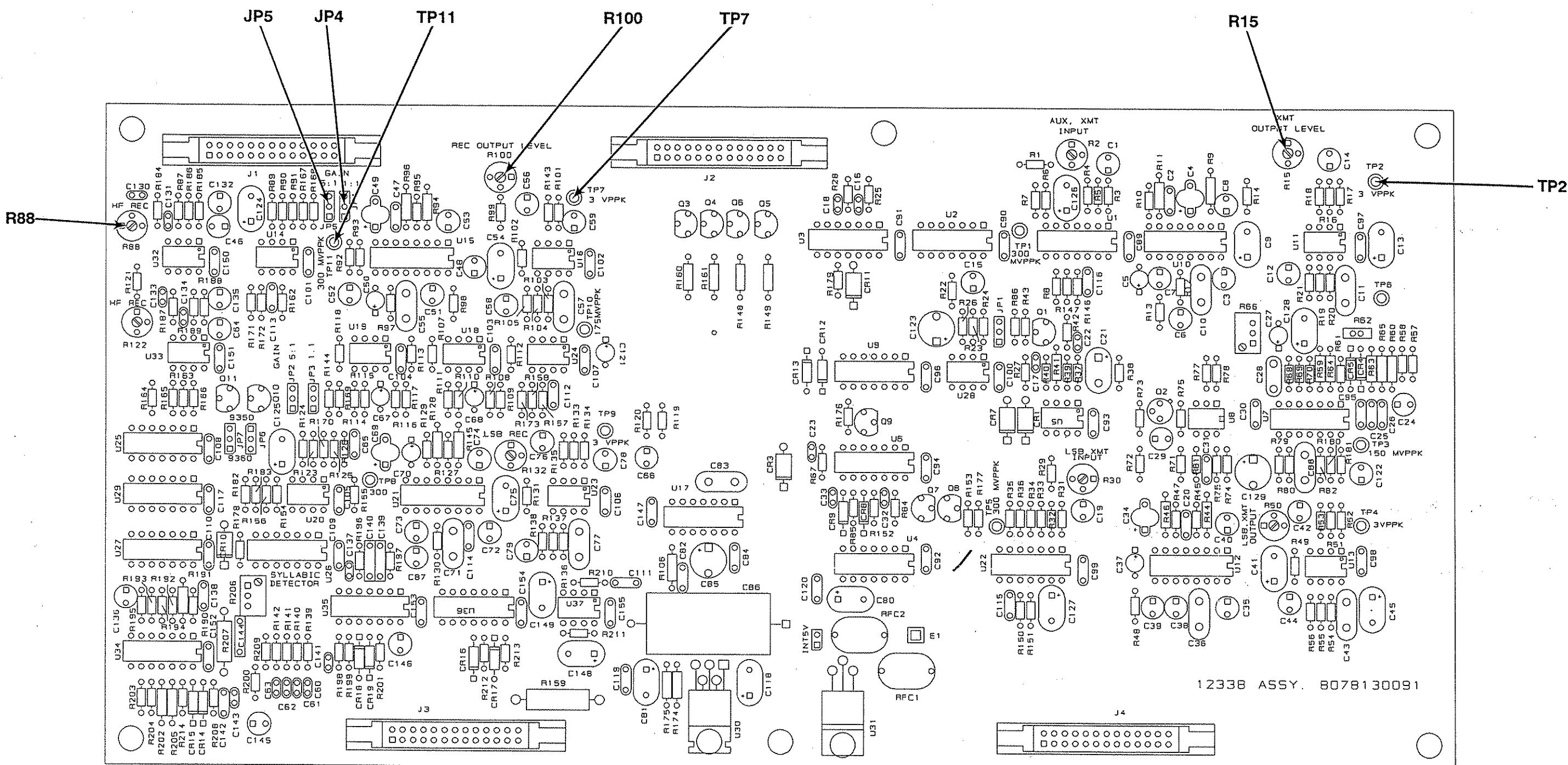


Figure 5.3.1 MX-9350 Two or Four Wire Configuration Jumpers.



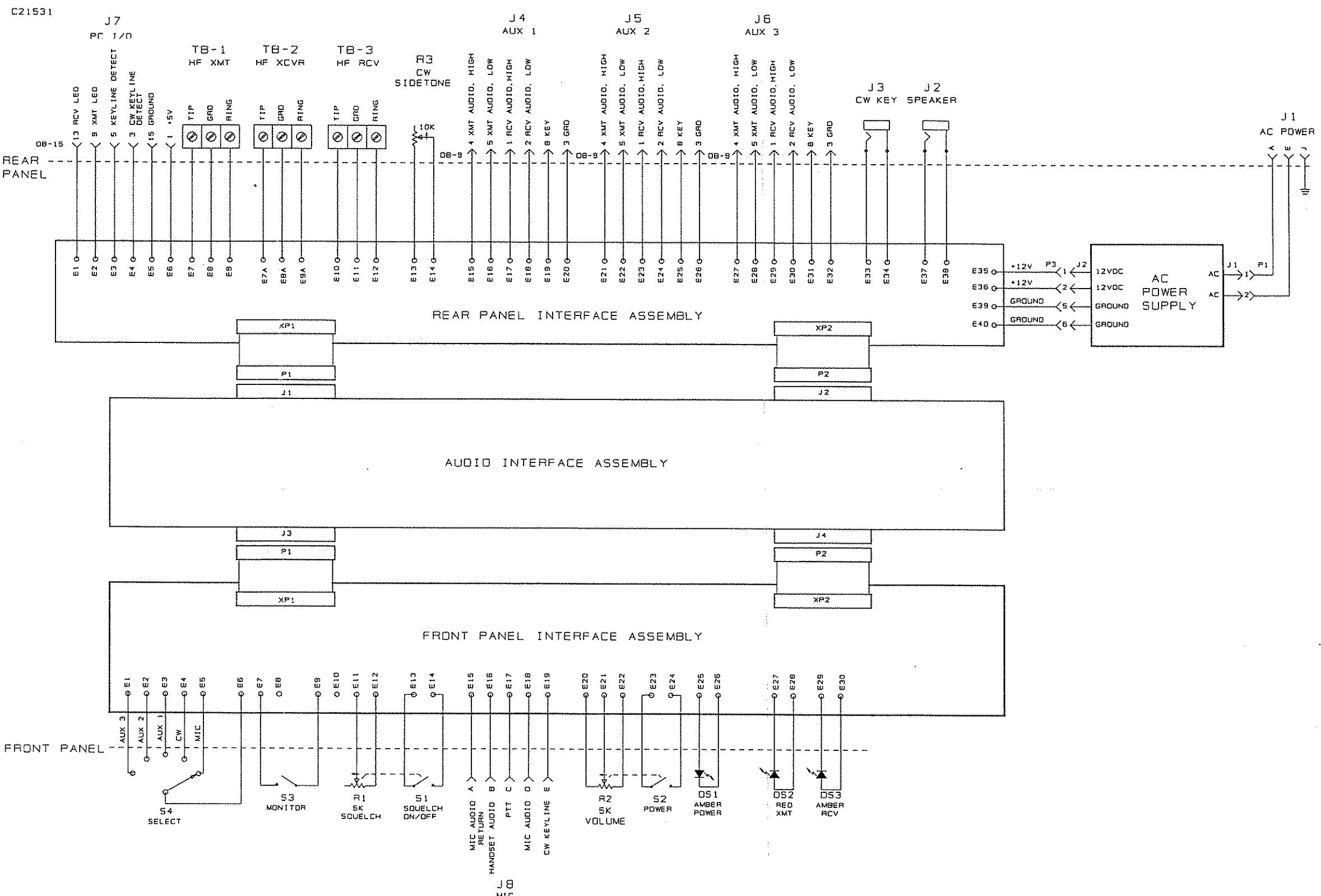


Figure 5.5.1 Chassis Wiring.

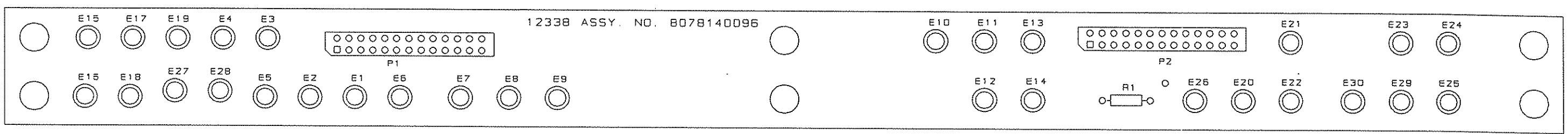


Figure 5.5.2 Front Panel Assembly.

A21511

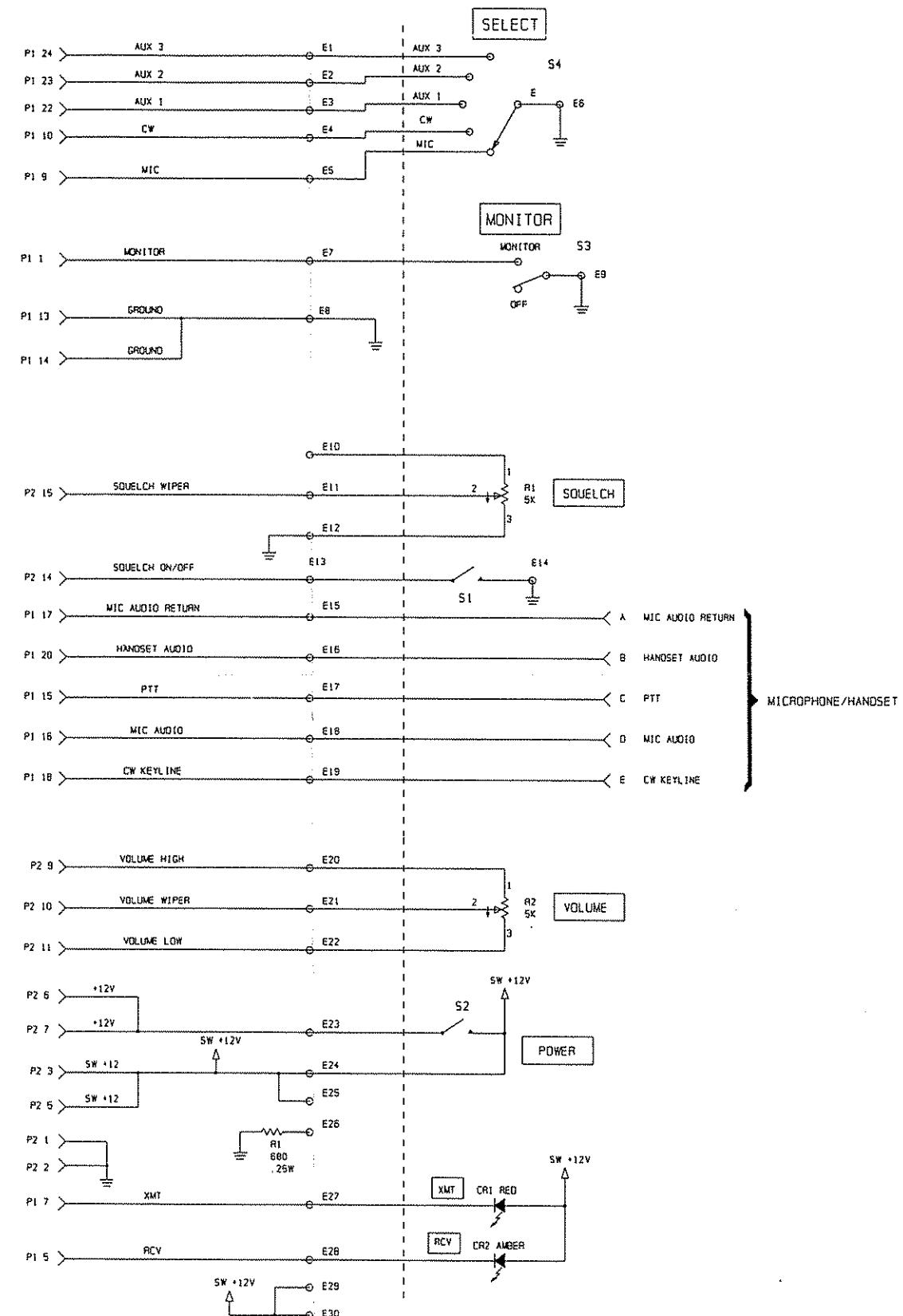


Figure 5.5.3 Front Panel Assembly

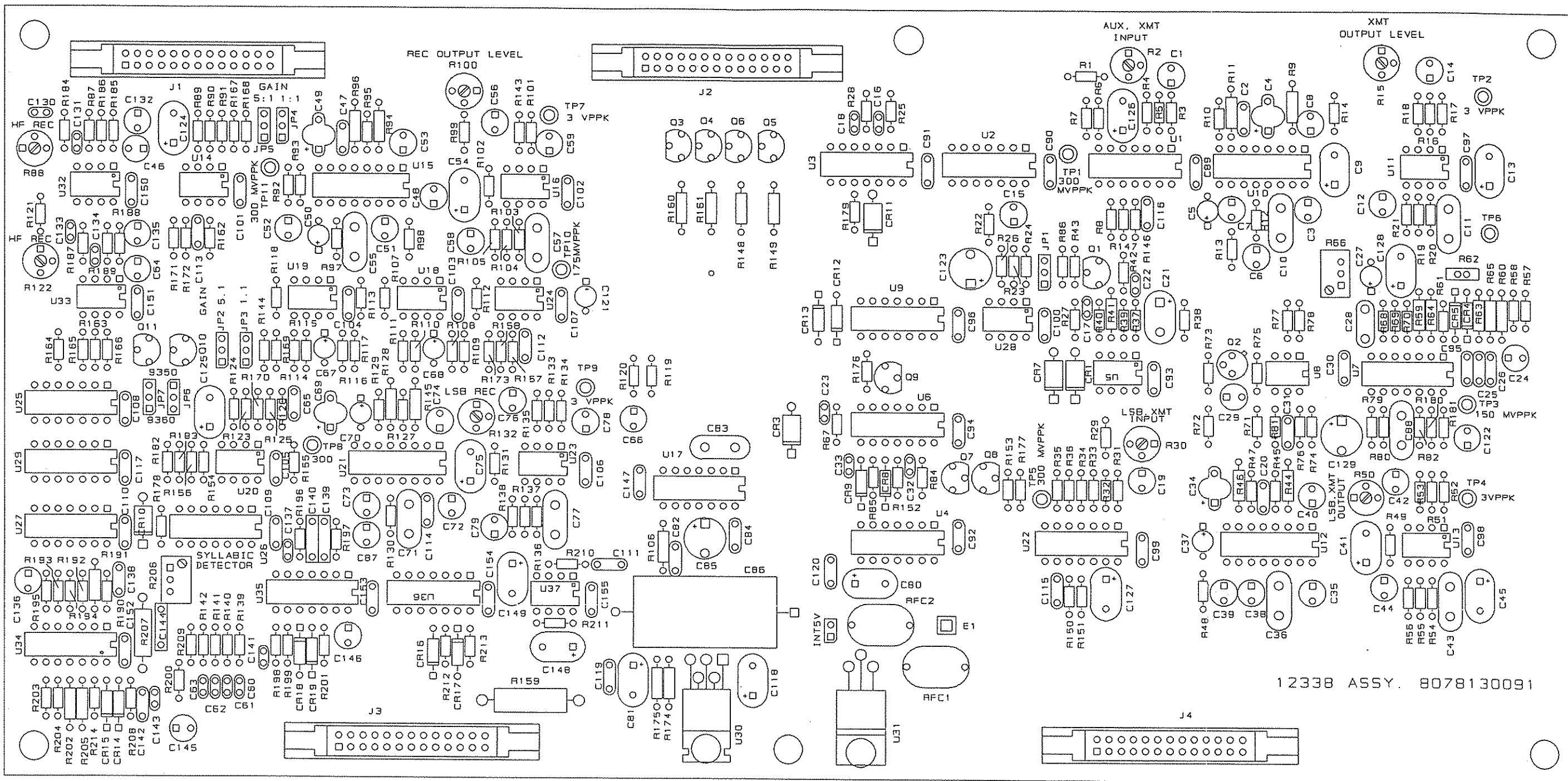
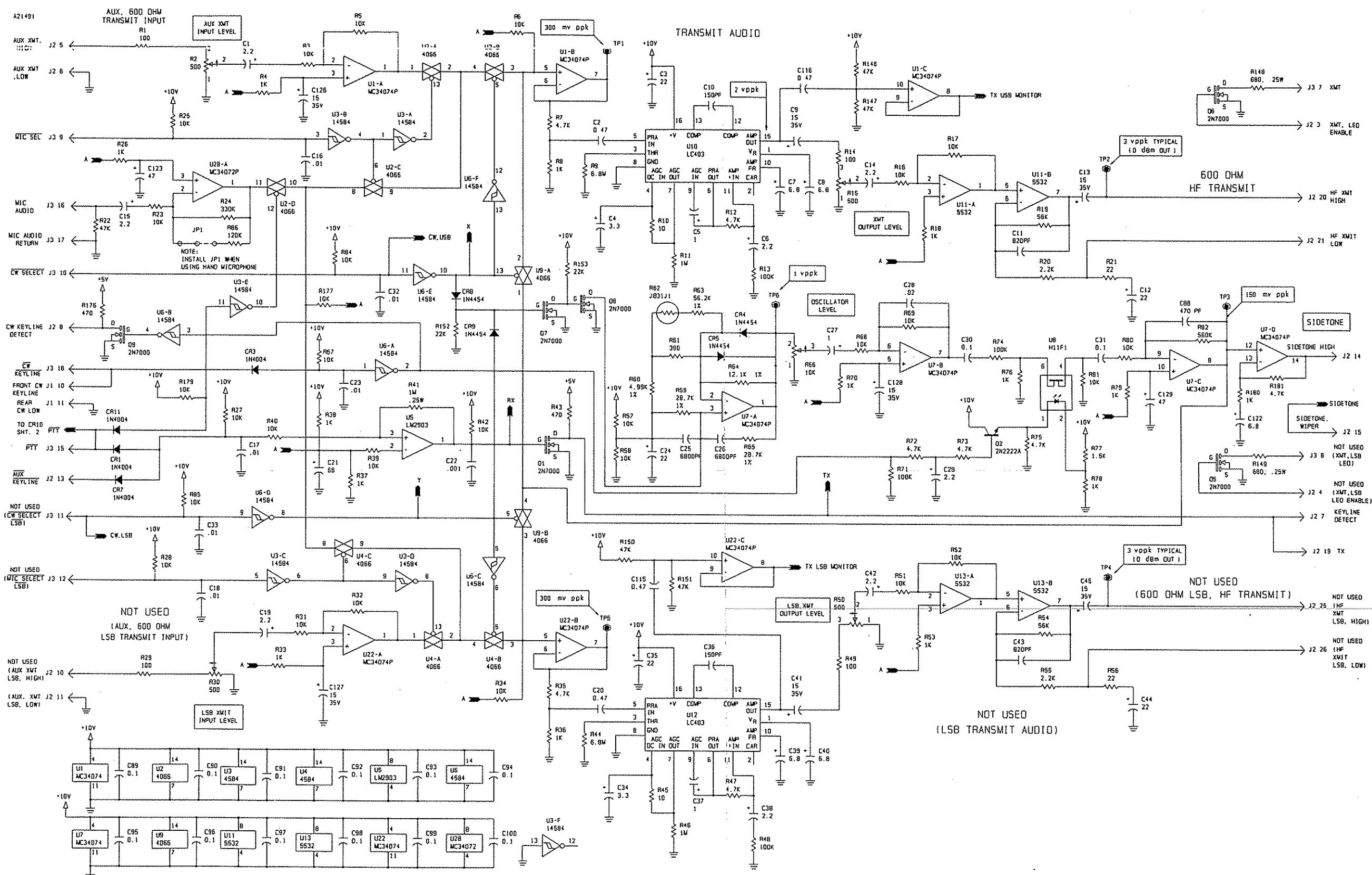


Figure 5.5.4 Audio Interface Assembly.



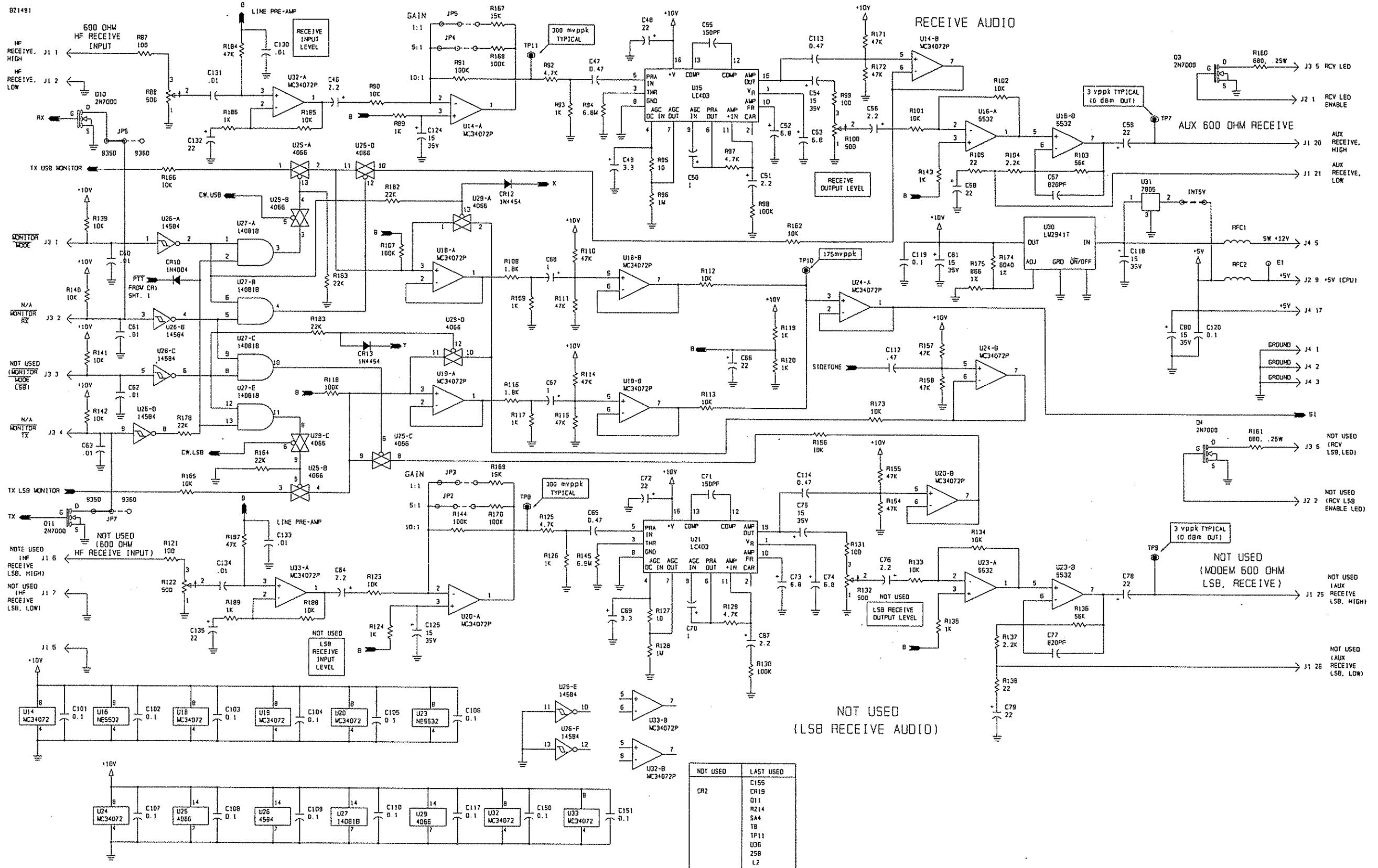


Figure 5.5.6 Audio Interface Assembly.

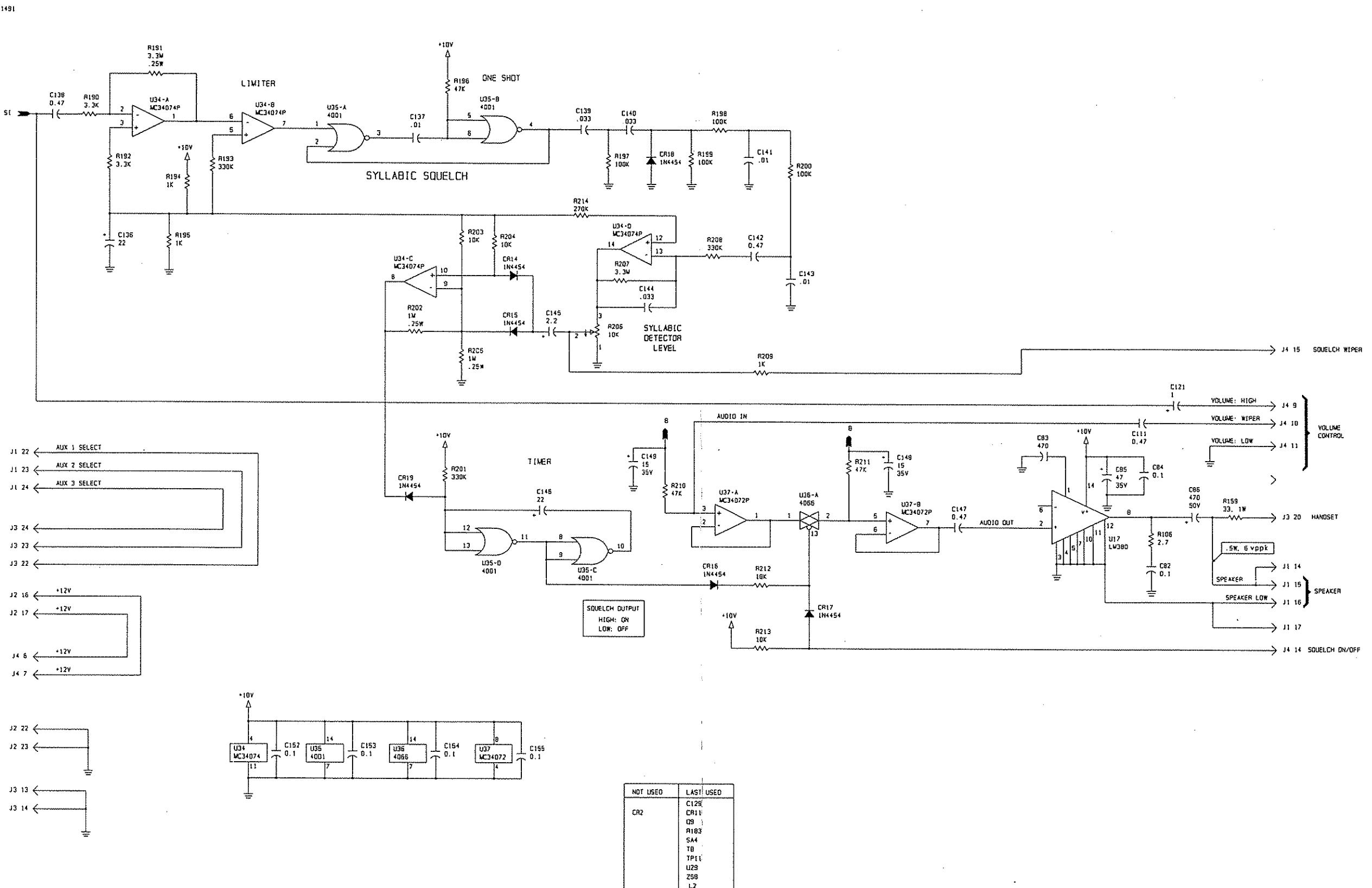


Figure 5.5.7 Audio Interface Assembly.

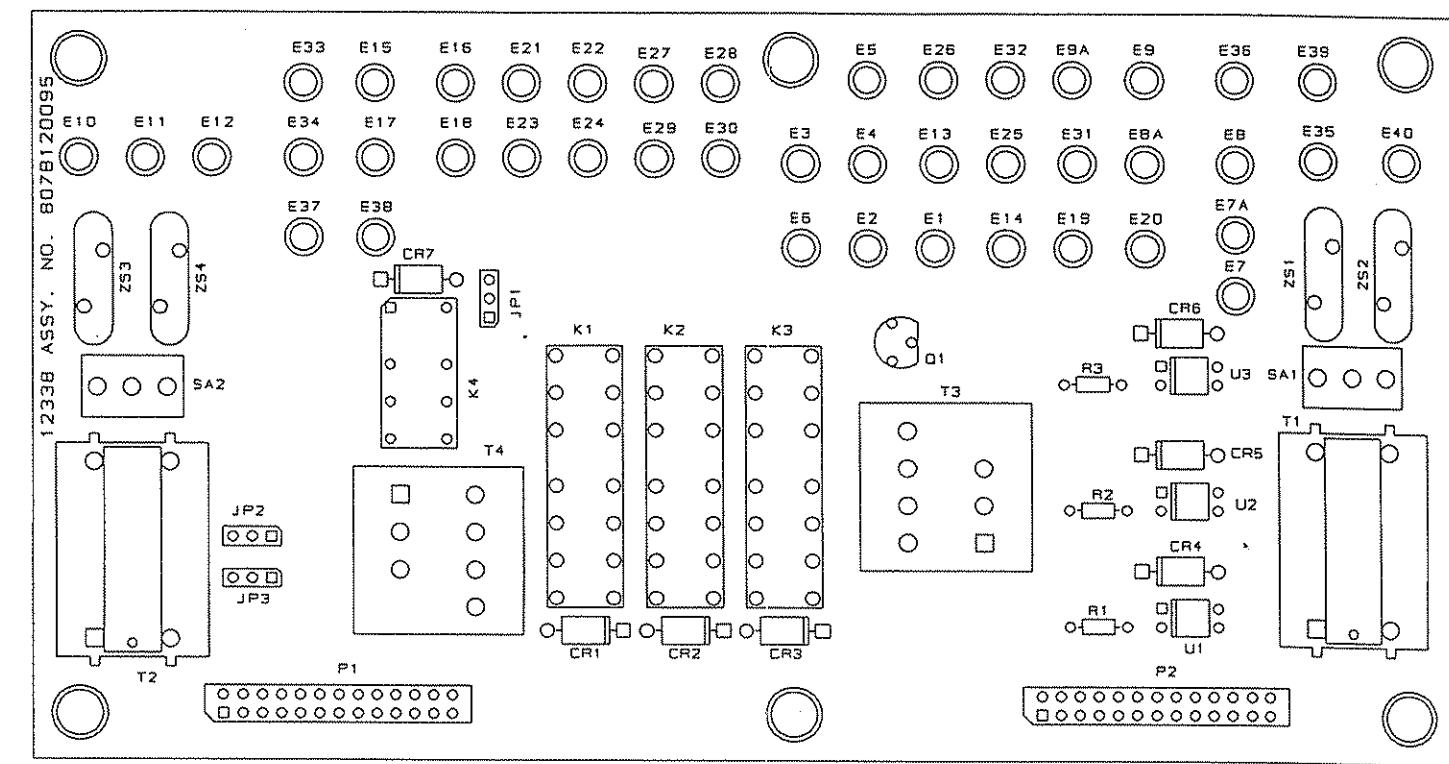


Figure 5.5.8 Rear Panel Assembly.

A2150

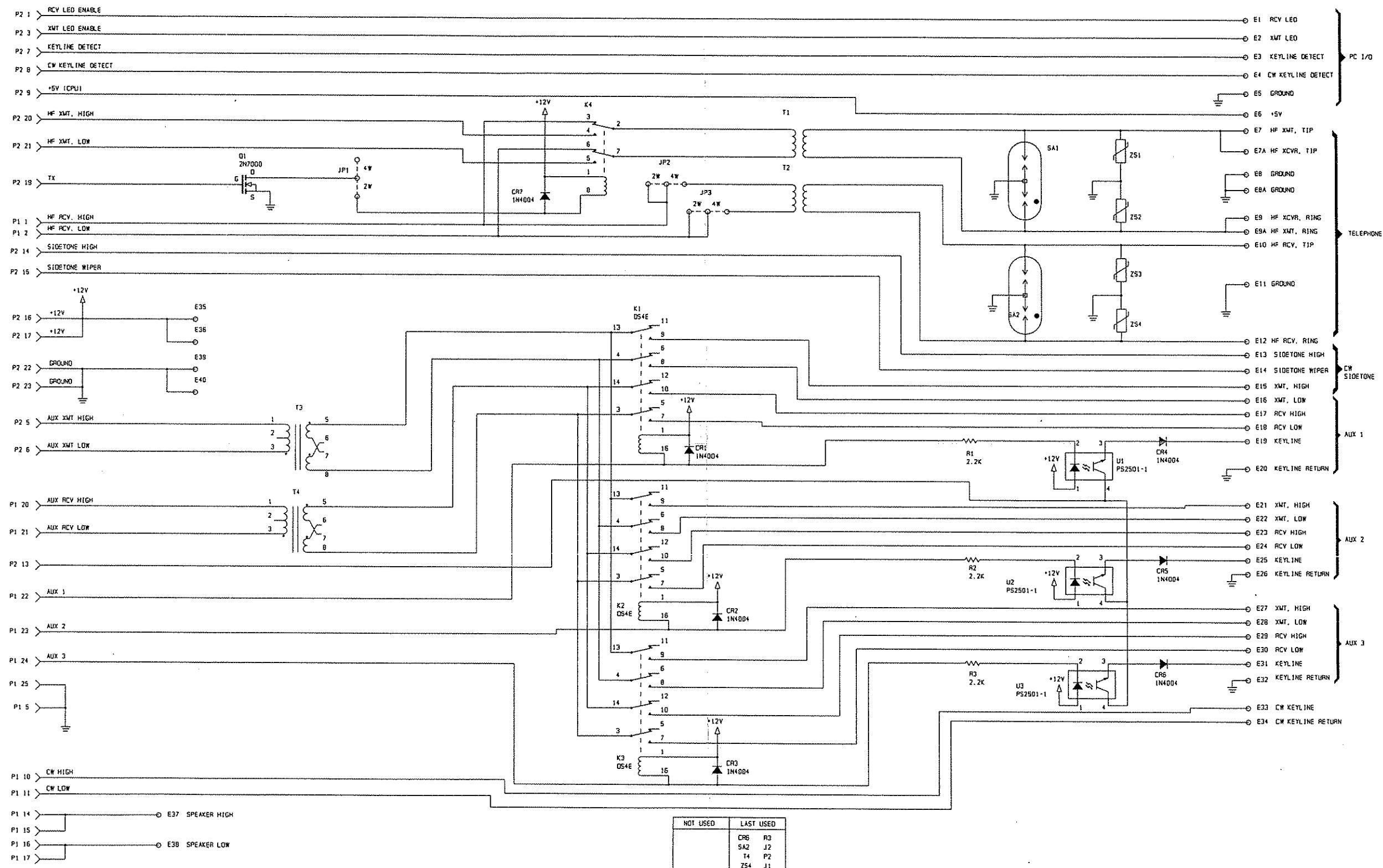


Figure 5.5.9 Rear Panel Assembly.

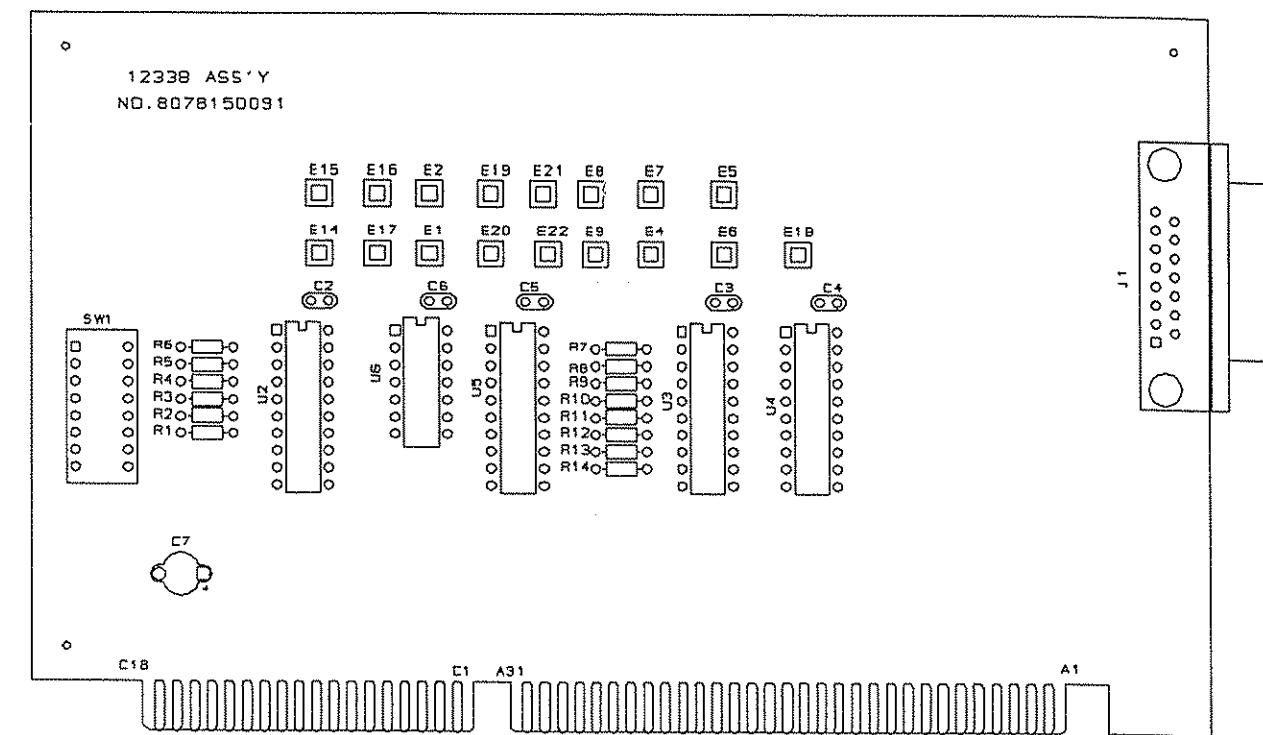


Figure 5.5.10 Digital Interface Assembly.

A21521

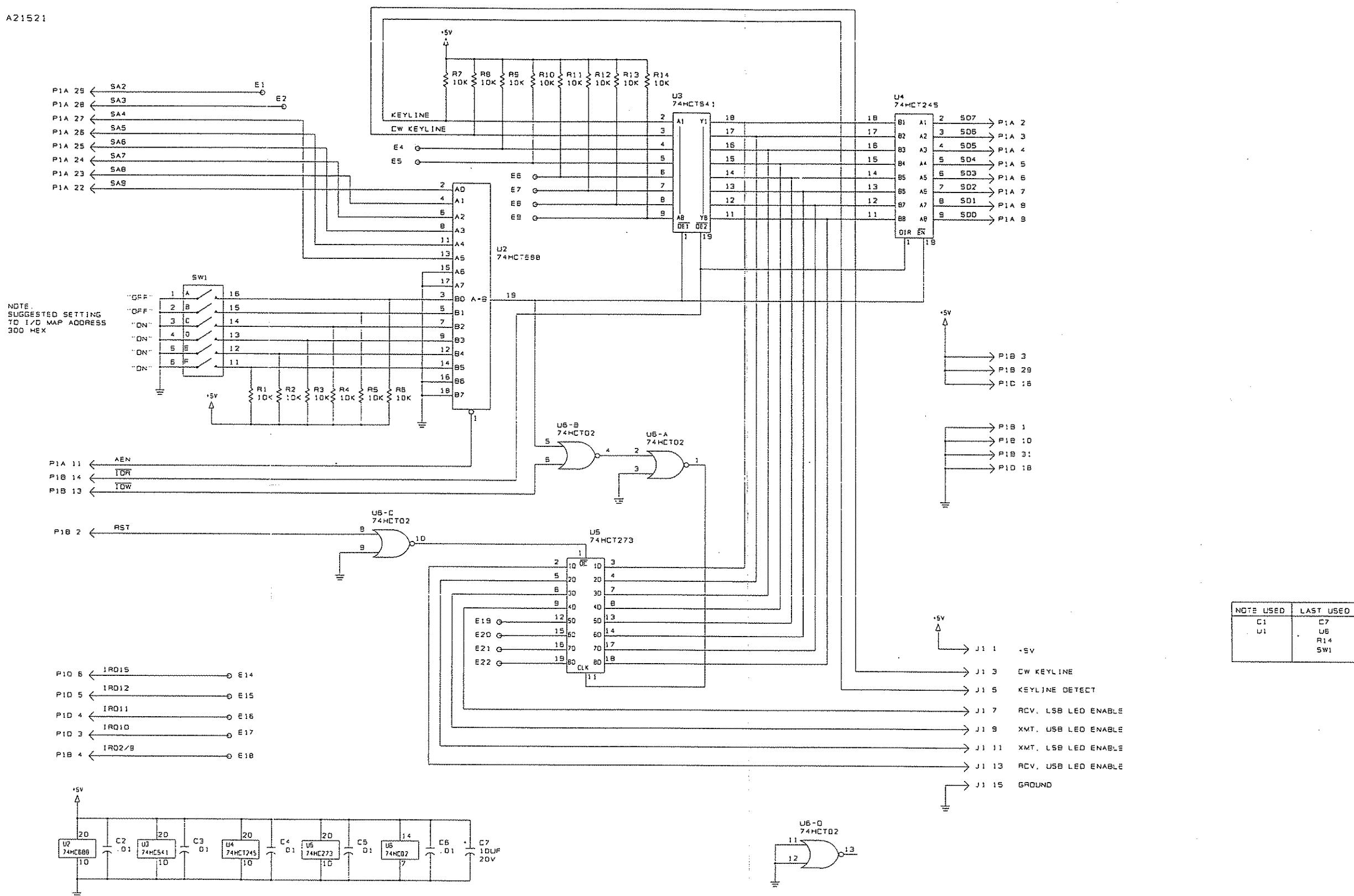
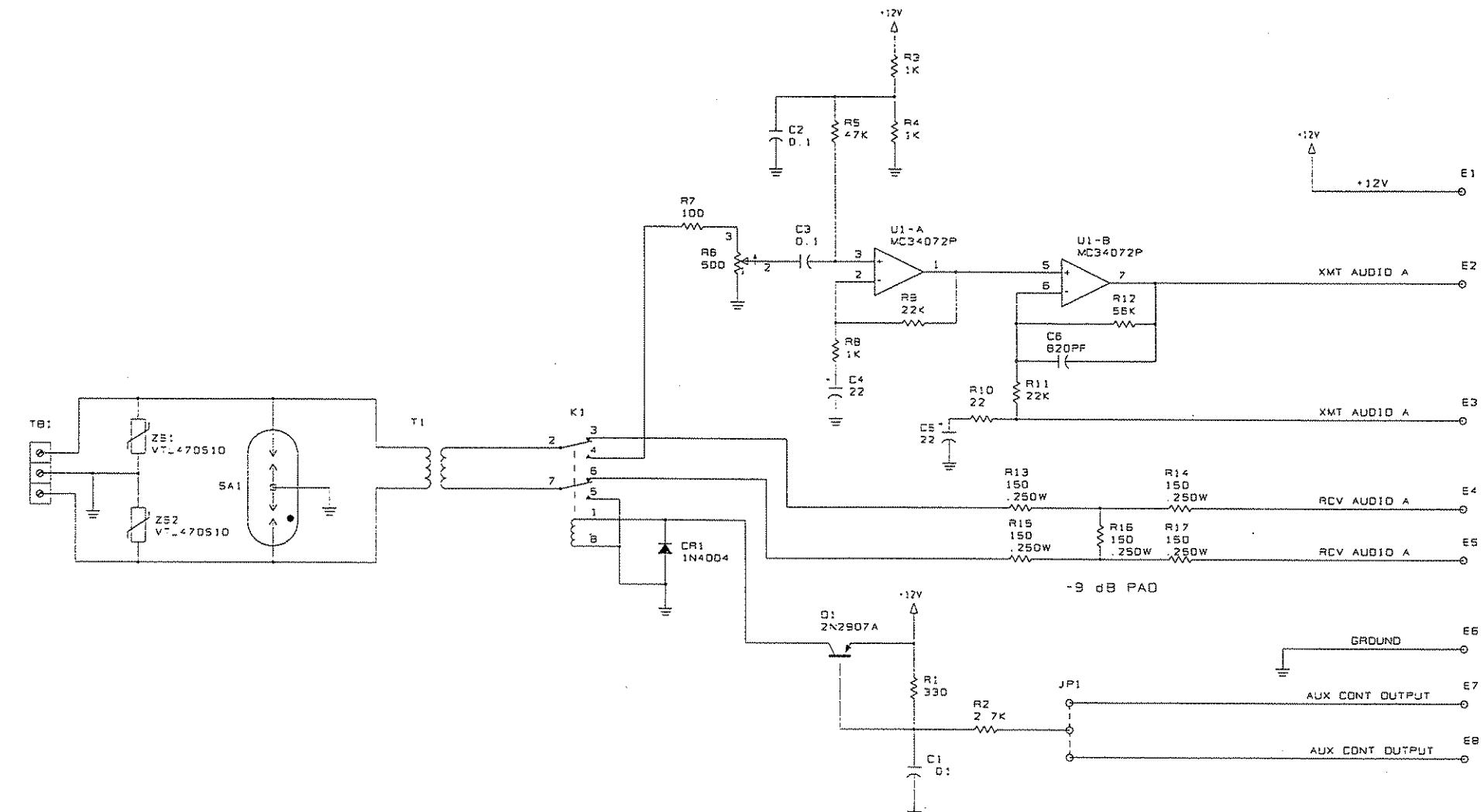


Figure 5.5.11 Digital Interface Assembly.

A21541



NOT USED	LAST USED
	C7 JP1 K1 Q1 R17 SA1 TB1 T1 U1 ZS2

