sunair electronics, inc.

SNR-601

HF TRANSCEIVER

OPERATION AND MAINTENANCE MANUAL

P/N 8056000704

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3101 Southwest Third Avenue, Fort Lauderdale, Florida, U.S.A. 33315-3389

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SECTION I

GENERAL INFORMATION

1.1 SCOPE

This Operation and Maintenance manual contains the necessary information to install, operate and maintain the SNR-601 Transceiver.

1.2 DESCRIPTION

The SNR-601 is a fully solid-state transceiver operating over the frequency range of 2.0000 to 17.9999 MHz in 100 Hz steps (FCC Part 90 Type Accepted from 2.000 to 12.9999 MHz only). The transceiver features direct frequency selection and twelve preset simplex channels conveniently programmable from the front panel. Provisions are included internal to the equipment to defeat the programmable feature on the front panel, allowing only those frequencies programmed into channel memory to be used. All frequencies programmed into the memory are retained for power off periods exceeding one year without replacement of internal batteries.

Modes of operation include Upper Sideband (USB), Amplitude Modulation (AM) and a Continuous Wave (CW) mode (OPTIONAL Lower Sideband available). The transceiver is designed for "voice only" operation and provides 100 Watts PEP in USB, CW or the optional LSB modes, and a 35 watt carrier power in AM. A receive only voice clarifier is included to provide maximum intelligibility when receiving transmissions from less stable transmitters. Operating frequency is displayed on a daylight viewable high intensity LED display. A small panel lamp above the clarifier control indicates when the clarifier is in use.

The SNR-601 is composed of twelve major subassemblies: (1) Motherboard 1A1A1, (2) RF Power Amplifier 1A2, (3) Audio Board 1A3, (4) Second Mixer 1A4, (5) First Mixer 1A5, (6) Synthesizer 1A6, (7) Filter Module 1A7, (8) Panel Control Board 1A8, (9) Memory Band Board 1A9, (10) Counter Demuxer Board 1A10, (11) Output Buffer Board 1A11, (12) Front Panel 1A12.

1.2.1 MOTHERBOARD 1A1A1

The Motherboard provides interconnection for the transceiver plug-in boards. Almost all interconnection within the radio is done on the motherboard, keeping wiring to an absolute minimum.

1.2.2 RF POWER AMPLIFIER 1A2

The SNR-601 contains an all solid state broadband power amplifier. Cooling is provided by a conservatively rated heat-sink at the rear of the radio. The power amplifier is rated at 100 watts peak envelope power (PEP). The power amplifier incorporates Automatic Level Control (ALC) which limits the peak power output to 100 watts and prevents increases in intermodulation distortion. The power amplifier employs circuits to protect the amplifier under excessive VSWR or other abnormal conditions.

The Voltage Regulator Subassembly 1A2A1, responsible for regulating the voltage and current levels for the different stages of the transceiver, appears to be part of the power amplifier assembly but is actually part of the Rear Panel.

1.2.3 AUDIO BOARD 1A3

This board contains the audio circuitry for both transmit and receive functions for the transceiver.

1.2.4 SECOND MIXER 1A4

The Second Mixer board includes receive and transmit bilateral amplifiers, the second mixer, the sideband and AM IF filters, AM carrier injection amplifier, and the first 2nd IF receive amplifier.

1.2.5 FIRST MIXER 1A5

The First Mixer board contains the bandpass filters used for transmit and receive to reduce harmonics and spurious signals. The receive RF amplifiers, transmitter power amplifier driver, first mixer, and first IF filter are also located on this board.

1.2.6 SYNTHESIZER 1A6

The Synthesizer generates the three local oscillator injection frequencies needed to determine the operating frequencies of the radio. The frequency standard is oven stabilized and operates at 28 MHz.

1.2.7 FILTER MODULE 1A7

The Filter Module contains the transmitter odd and even channel low pass filters, the ALC/ACC Detector board, band motor and circuitry, and the relay and interface boards for switching from transmit to receive.

1.2.8 PANEL CONTROL BOARD 1A8

The Panel Control board works in conjunction with three other digital boards, Memory Band, Counter Demuxer, and Output Buffer, to provide channel and digital control to the transceiver. The panel control board contains the multiplexing oscillator and the circuitry to control it, the multiplexing counter, the load complete detector, the display drivers, and the blanking control for the display drivers. The board also contains a small part of the transmit/receive discriminator, the bulk of which is located on the Memory Band board. Analog circuits on the Panel Control board are the clarifier oscillator, CW tone oscillator, AGC meter driver, and the speaker driver.

1.2.9 MEMORY BAND BOARD 1A9

The Memory Band board includes the balance of the load/operate discriminator, a small part of which is located on the Panel Control board. In addition, the Memory Band board contains the transmit/-receive discriminator sections that are not located on the Panel Control board. The heart of the Memory Band board is the memory circuit itself.

1.2.10 COUNTER DEMUXER BOARD 1A10

The Counter Demuxer board contains the input programming counters and the enable circuits to select the input frequencies to be loaded into the memory from the front panel. The board also includes the counter oscillator circuit used to drive the input counters, and input buffer used to multiplex the input counter information into the memory, a portion of the Input Buffer Mixing Enable Control, a portion of the Transmit Latch Enable Circuit, and the transmit latches used to store the transmitting frequencies that are demultiplexed out of the memory circuit.

1.2.11 OUTPUT BUFFER BOARD 1A11

The Output Buffer board contains the receive latches, receive buffers, input load buffers, transmit buffers, output drivers, and part of the receive latch enable circuit. The receive latch circuits are similar in operation to the transmit latch enable and transmit latch circuits on the counter demuxer board. The receive buffer, input load buffer, and transmit buffer permit selection of the frequencies from the input counter, to be sent to the synthesizer and the front panel display.

1.2.12 FRONT PANEL 1A12

The Front Panel provides controls for frequency programming, VOLUME, CLARIFIER, SQUELCH, channel selection, and coupler TUNE enable. A dimmer control allows variation of the display intensity.

1.3 TECHNICAL SPECIFICATIONS

1.3.1 GENERAL

FREQUENCY RANGE: 2.0000 to 17.9999 MHz in 100 Hz steps. FCC Part 90 Type accepted from 2.0000 to 12.9999 MHz.

NUMBER OF CHANNELS SYNTHESIZED: 160,000

NUMBER OF CHANNELS PROGRAMMABLE: Twelve (12), selected by channel switch.

FREQUENCY RESOLUTION: 100 Hz

OPERATION: Simplex

FREQUENCY STABILITY: ± 20 Hz maximum

OPERATING MODES: USB, AM, CW, (Optional LSB)

DUTY CYCLE: Continuous voice only, 25% in CW.

POWER REQUIREMENT: 27.5 VDC ± 15%, 15 amps peak.

TEMPERATURE: -30°C to +65°C operating; -55°C to +71°C non-operating.

HUMIDITY: 95% at 50°C

VIBRATION: Per MIL-STD-810B, Method 514.1, Procedure VIII, Curve V.

SHOCK: Per MIL-STD-810B, Method 516.1, Procedure 1, Figure 516.1.2, Amplitude a, Duration C.

ENCLOSURE: Per MIL-STD-108, Table II (Splashproof)

DIMENSIONS:
INCHES: 12W x 13D X 5H
CENTIMETERS: 30.48W x 33.02D x 12.70H

WEIGHT:
POUNDS: 19
KILOGRAMS: 8.607

1.3.2 RECEIVER

SENSITIVITY:
SSB: 0.5µv max, into 50 ohms for 10 db S+N/N
AM: 3.0µv max, into 50 ohms for 10 db S+N/N

SELECTIVITY:
SSB: 2150 Hz min at -6db, 6.0 Hz max at -60db
AM: 5 KHz min at -6db, 20 KHz max at -60db

AUDIO OUTPUT: 1.5 watts into 8 ohm speaker.

AUDIO DISTORTION: Less than 10%

GAIN: 10 µv nominal RF input for 1.5 watts audio out.

IF REJECTION: Not less than 60 db.

IMAGE REJECTION: Not less than 80 db.

AGC: Fast attack, slow release. Threshold, 5 µv nominal. 10 db audio change for 94db RF input change.

INTERNAL SPURIOUS RESPONSE: 99.5% below equivalent 0.2µv noise input at antenna terminals.

EXTERNAL SPURIOUS RESPONSE: 65db below 10db S+N/N reference.

1.3.3 TRANSMITTER

POWER OUTPUT:
SSB: 100 watts PEP ± 1 db
CW: 100 watts PEP ± 1 db
AM: 35 watt carrier

OUTPUT IMPEDANCE: 50 ohms

HARMONIC AND SPURIOUS SUPPRESSION: 40 db

CARRIER SUPPRESSION: 40 db minimum

UNDESIRED SIDEBAND SUPPRESSION: 50 db at 1.5 KHz

INTERMODULATION DISTORTION: 33 db below 2 tone PEP output, nominal

HUM AND NOISE LEVEL: 40 db

1.4 EQUIPMENT SUPPLIED

The following table is a list of equipment, with their Sunair part numbers, supplied with the SNR-601 Transceiver.

DESCRIPTION	SUNAIR PART NUMBER
Transceiver, SNR-601	8056000496
Operation and Maintenance Manual	8056000704
Connector Kit	8056000895
DC Power Cord Assembly	8056002995
Microphone Assembly	5024000609

1.5 OPTIONAL EQUIPMENT NOT SUPPLIED

Digital Automatic Antenna Coupler, SNR-601DAC	8096200291
Cable Assembly, SNR-601 to SNR-601DAC	8056003096
Coax Cable Assembly, RG-8	1004410026
RF Coax Cable, RG-8, where length will exceed 100 feet. SPECIFY LENGTH	0588640000
RF Coax Cable, RG-58, where length will not exceed 100 feet. SPECIFY LENGTH	0588130001
Antenna, Whip 32 Ft.	0712960007
Antenna, Whip 23 Ft. w/base	0715760009
Dipole Antenna Kit	0996240004
Longwire Antenna Kit, 75 Ft.	0999200003
Longwire Antenna Kit, 150 Ft.	0999210009
CW Key w/Phone Plug	5024000994
Service Kit	8056001298
AC Power Supply	8056200096

CAUTION

TO INSURE THAT CABLE HAS NOT BEEN DAMAGED DURING SHIPMENT, ALL CABLE ASSEMBLIES MUST BE CHECKED FOR CONTINUITY OR SHORTS, FROM PIN TO PIN, BETWEEN CONNECTORS BEFORE INITIAL RADIO OR SYSTEM POWER UP.

WARNING

CONNECTORS INSTALLED BY THE CUSTOMER MUST BE WIRED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED IN THE OPERATION AND MAINTENANCE MANUAL. THE CABLE MUST BE CONTINUITY CHECKED AFTER INSTALLATION AND PRIOR TO RADIO OR SYSTEM POWER UP.

SECTION II

INSTALLATION

2.1 GENERAL

Section II contains all necessary instructions for the unpacking, inspection, and if necessary, reshipping of damaged equipment or parts. In addition, further information regarding location and mounting considerations, power requirements, antenna and ground system hookups and final checkouts after installation 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 damaged 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, insists 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 of damage should also be forwarded to Sunair's Product Services Department. Include the following:

a) order number
b) model and serial number
c) name of transportation agency
d) applicable dates.

When Sunair receives this information, arrangements will be made for repair or replacement.

2.3 RETURN OF EQUIPMENT TO FACTORY

The shipping container for the SNR-601 has been carefully designed to protect the transceiver during shipment. The container and its associated packing materials should be used to reship the units. 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, TELEX: 51-4443, CABLE: SUNAIR, FAX: 305-765-1322.

If the original shipping container 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 coupler. Rigid cardboard should be placed at the corners of the equipment to protect against denting.

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:

U.S. GOODS RETURNED FOR REPAIR
VALUE FOR CUSTOMS-$100.00

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 the equipment will depend upon the care and thoroughness taken during installation.

2.4.1 GENERAL INSTALLATION

Carefully plan radio/coupler/antenna locations, observing the following requirements before starting installation.

a) Provide best possible RF ground for radio and coupler. Use flat copper strap 1" wide or NO. 6 or larger wire and connect to ground terminal at rear of transceiver. Leads to ground system should be as short as possible.

b) Provide separation between coupler output and the radio with its associated wiring. Coupler may be mounted up to 100 Ft. from radio if RG-58 RF cable is used, or further is RG-8 is used.

c) Antenna lead from antenna coupler to antenna must be insulated for at least 10 kv potential. The lead should not run parallel to metal fittings or other metal objects that are bonded to the system ground. The coupler should be as close to the antenna as possible, and never more than 3 ft. as this will decrease antenna efficiency.

d) If the radio is installed on a wood or fiberglass boat, approximately 10 to 12 square feet of metal surface area in contact with the water should be provided for use as an RF ground.

e) If operated on D.C. power, check for correct polarity before applying power.

f) The installation should be carefully planned beforehand in accordance with drawings on the following pages.

g) Linear amplifiers with low level modulation such as used in the SNR-601 will oscillate if the RF power output is radiated or conducted into the low level stages. Evidence of this situation is erratic power output. This is caused by too close proximity of the coupler output and antenna to the transmitter and/or inadequate RF grounds. Carefully following the above procedures will prevent this from occurring.

2.4.2 BASE STATION INSTALLATION

The transceiver is equipped with rubber feet so that it can be set directly on a table, desk or similar flat surface. The front feet are taller than the rear feet in order to tilt the transceiver at a convenient operating angle. Minimum clearances of 1 inch at the sides and 2 inches at the rear and top should be allowed to provide for adequate cooling of the rear panel heatsinks.

Figure 2.1 shows the applicable SNR-601 outline dimensions for use in the installation. Figures 2.2 and 2.3 show typical Base Station system installations. Refer to Section 2.5 for recommendations of suitable antennas.

2.5 ANTENNAS AND GROUND SYSTEMS

2.5.1 GENERAL

The SNR-601 is designed to operate into a 50 ohm resistive antenna system with a maximum voltage standing wave ratio (VSWR) of 2:1. When used with an SNR-601DAC Digital Automatic Antenna Coupler, the system will match antennas ranging from 16 foot whips to 150 foot longwires. The SNR-601DAC will also efficiently match 9 foot whip antennas at frequencies above 4 MHz.

As there are numerous types of antennas, a complete discussion is beyond the scope of this manual. Antennas for use in the 2.0 to 18.0 MHz spectrum generally fall into three categories:

a) Narrow band 50 ohm antennas
b) Random length non-resonant antennas
c) Broadband 50 ohm antennas.

Several popular antennas falling into each of the above categories are discussed in this section. For specific recommendations, consult our experienced Field Services Department.

Some general "DO's" and "DON'Ts" of antenna installation are listed below:

a) The antenna should be clear of all large objects such as trees and buildings.
b) Although the SNR-601DAC will match electrically short antennas (i.e. those under 1/8 wavelength), such antennas are not efficient radiators. If the installation permits, antennas over 1/8 wavelength long at the lowest operating frequency should be used. Antenna length generally limits system performance in vehicular applications at frequencies below 10 MHz.
c) When using whip antennas, the ground system actually forms part of the radiating system. Where space permits (such as in a base station installation) a good ground plane or radial system should be installed at the base of the antenna. See Figure 2.4.

NOTE

AN INADEQUATE GROUND SYSTEM IS MOST OFTEN RESPONSIBLE FOR DISAPPOINTING PERFORMANCE WHEN USING A WHIP ANTENNA.

d) In vehicular installations and marine installations in a metal hull ship, 1 inch wide strap or braid should be connected between the antenna coupler ground and the frame of the vehicle. The length should be as short as possible. In an installation aboard a wood or fiberglass boat, a ground plate with at least 12 square feet in contact with the water should be attached to the hull and a short, 1 inch wide strap should be connected between the coupler ground post and the plate. As previously mentioned this ground lead should be as short as possible.

2.5.2 NARROW BAND 50 OHM ANTENNAS

Typical of this type of antenna are the doublet and the inverted V illustrated in Figures 2.5 and 2.6 respectively. Their operation is efficient for only a narrow band of frequencies within approximately 2 ½% of their center frequency. The antenna coupler is NOT generally required if the above frequency span is not exceeded. Separate antennas must be erected for each small band of frequencies to be used. Both antennas exhibit somewhat directional characteristics. The direction of maximum radiation is perpendicular to the antenna wire. The inverted V antenna is particularly suitable for communication with nearby mobile stations (with vertical antennas) since a portion of the radiation is vertically polarized.

2.5.3 RANDOM LENGTH NON-RESONANT ANTENNAS

Whips and longwires are popular non-resonant antennas. The whip antenna illustrated in Figure 2.7 is often used in mobile, marine, portable or semi portable installations because its rugged and self-supporting. The antenna impedance is strongly dependent on the operating frequency, therefore an antenna coupler must be used to match the antenna to the transceiver. Best radiation efficiency will be obtained if the antenna is at least 1/8 wavelength long at the lowest operating frequency; however, this requirement may not result in a practical size antenna for low frequency operation. Thirty-five foot whip antennas offer a good compromise between practical length and good electrical performance at low frequencies. The SNR-601DAC is designed to efficiently match whip antennas of 16 foot length or greater. An efficient match may also be obtained for a 9 foot whip above 4 MHz. The whip's performance is greatly influenced by its ground system. For temporary base station installations, a minimum of four six foot long ground rods should be driven into the ground symmetrically placed around the antenna base. The rods should be bonded together with heavy strap and then connected to the antenna coupler ground by another short heavy strap. If the antenna is mounted on the roof of a building, where a short ground lead to the coupler cannot be obtained, a minimum of 4 symmetrically placed ground radials should be installed at the base of the antenna, bonded together, and connected to the antenna coupler ground post. The radials should be made of number 12 gauge wire or larger and should be at least ¼ wave long at the lowest operating frequency. The whip's radiation pattern is omnidirectional in the azimuthal plane.

The longwire antenna, illustrated in Figure , is a popular base station antenna where a wide range of operating frequencies are used. The antenna impedance varies greatly with frequency and, therefore, must be matched to the transceiver with an antenna coupler. The SNR-601DAC will efficiently match longwire antennas up to 150 foot in length. The radiation pattern of the longwire antenna is also a function of operating frequency. The two most popular length longwire antennas, 75 and 150 foot, respectively exhibit excellent low frequency radiation efficiency.

2.5.4 BROADBAND 50 OHM ANTENNAS

These are generally complex, expensive antennas requiring a large area for installation. Their use is usually limited to high performance base station installations which must operate at diverse frequencies. As this class of antennas has approximately 50 ohm input impedance over the rated band of frequencies, an antenna coupler is not required. Some common examples are:

a) Discone - a vertical antenna with an omni-directional pattern
b) Log-Periodic - a broadband antenna with a directional pattern. This antenna is often made in rotatable configurations.

Consult the Sunair Field Services Department for specific recommendations.

2.6 POWER REQUIREMENTS

2.6.1 OPERATION FROM DC POWER SOURCES

The SNR-601 is designed to operate directly from a 28 VDC power source with negative ground. The unit is provided with reverse polarity protection to prevent damage if the DC source polarity is incorrect.

The power cable used to connect the transceiver to the DC power source should be AWG #12 wire size, and should be kept to the minimum length required for the installation. The DC line fuse located on the rear apron of the transceiver is a standard 3AG 15 amp fuse.

The transceiver may be operated from any well regulated 28 VDC source, such as vehicular or marine battery with charging system, fixed station battery with solar cell charging or wind powered generator, laboratory supply for use with AC sources, or the optional Sunair PS-550, AC Power Supply.

2.6.2 OPERATION WITH PS-550 AC POWER SUPPLY

The PS-550 AC Power Supply is designed specifically for the SNR-601 in a fixed station application with 115 VAC or 230

VAC, 50-60 Hz, power sources available. The power supply has an internal switch to allow operation from either 115 or 230 VAC. Before attempting to use the power supply on 230 VAC, remove the top cover of the supply and check the switch position to be sure it is in the 230 VAC position, or serious damage to the power supply will result. (If the supply is used on 115 VAC with the switch in the 230 VAC position, the output voltage will be low and unregulated, and the "power on" pilot light will not come on.) The AC line fuse for the PS-550 is an MDL 5 Amp Slo Blo and is located on the power supply rear panel. The DC line fuse is a 15 Amp AGC type and is located on the power supply front panel.

2.6.3 WIRING DIAGRAMS

Figure 2.8 shows the cable wiring for transceiver operation for a 28 VDC source, and from the PS-550 AC Power Supply.

Figure 2.9 is the wiring diagram for Cable Assembly p/n 8056003096, which connects the SNR-601 with the SNR-601DAC. Figure 2.10 is the wiring diagram for the rear panel connectors to the motherboard 1A1A1.

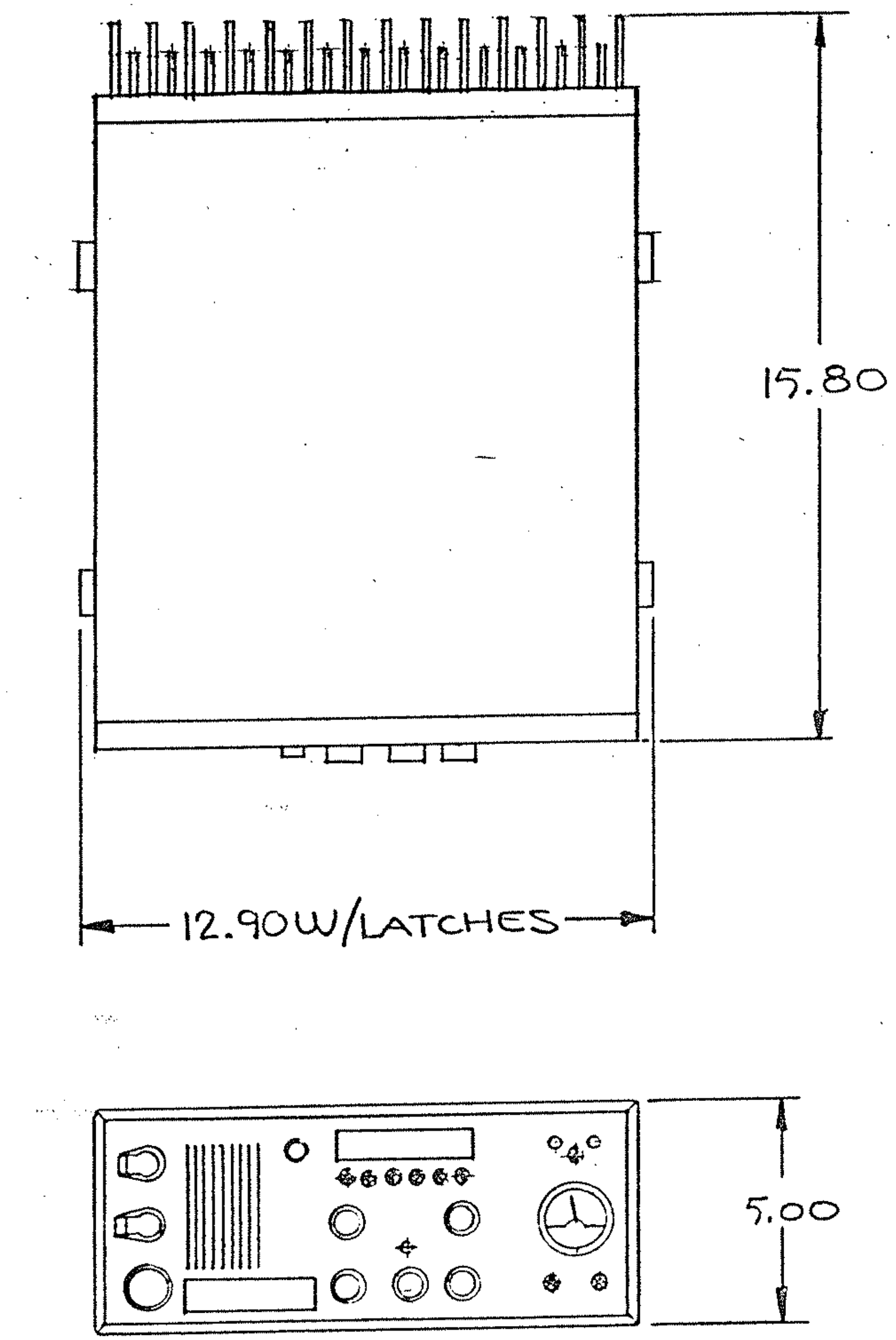


FIGURE 2.1 OUTLINE CONFIGURATION

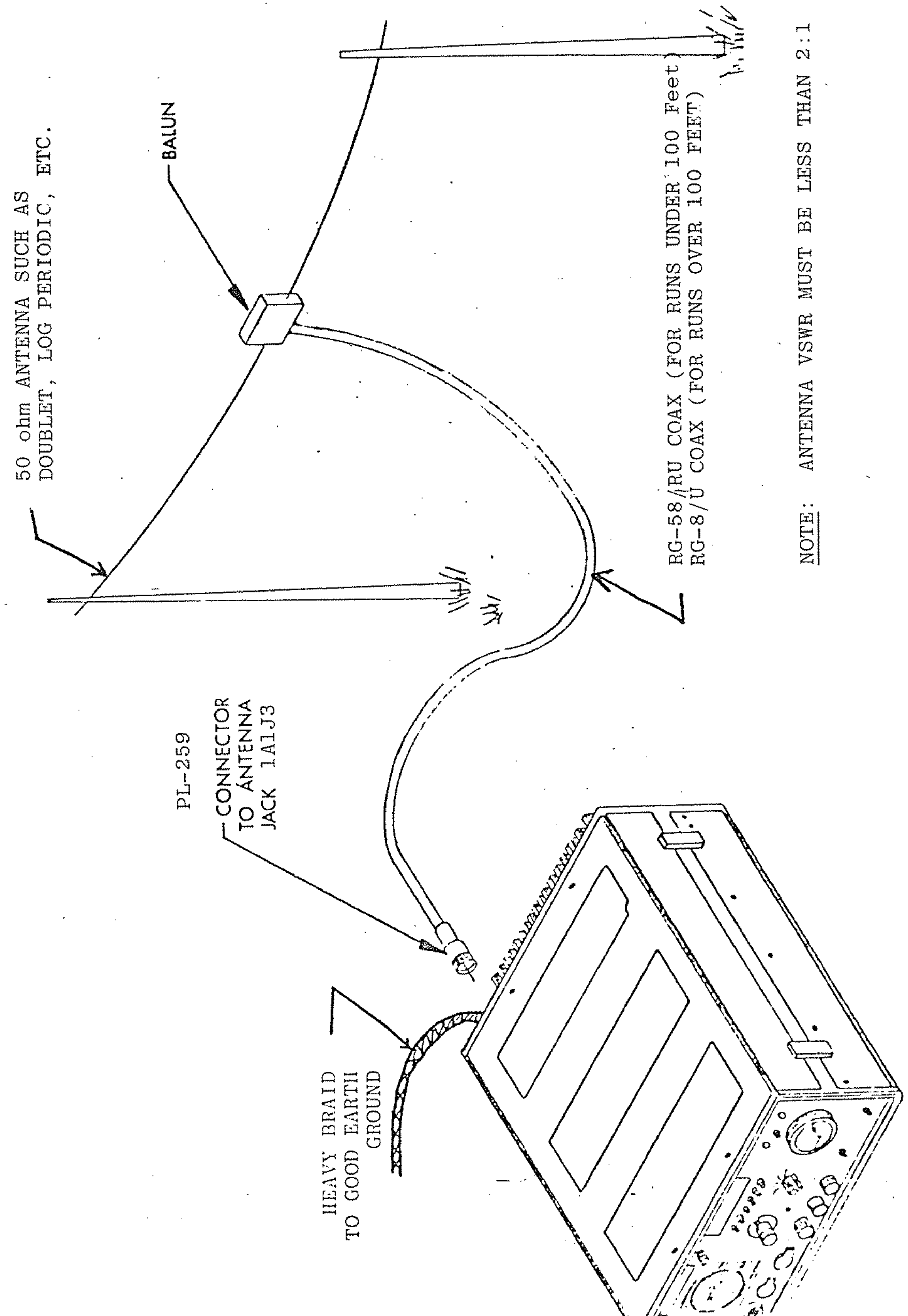


Figure 2.2 BASE STATION INSTALLATION
(50 ohm ANTENNA)

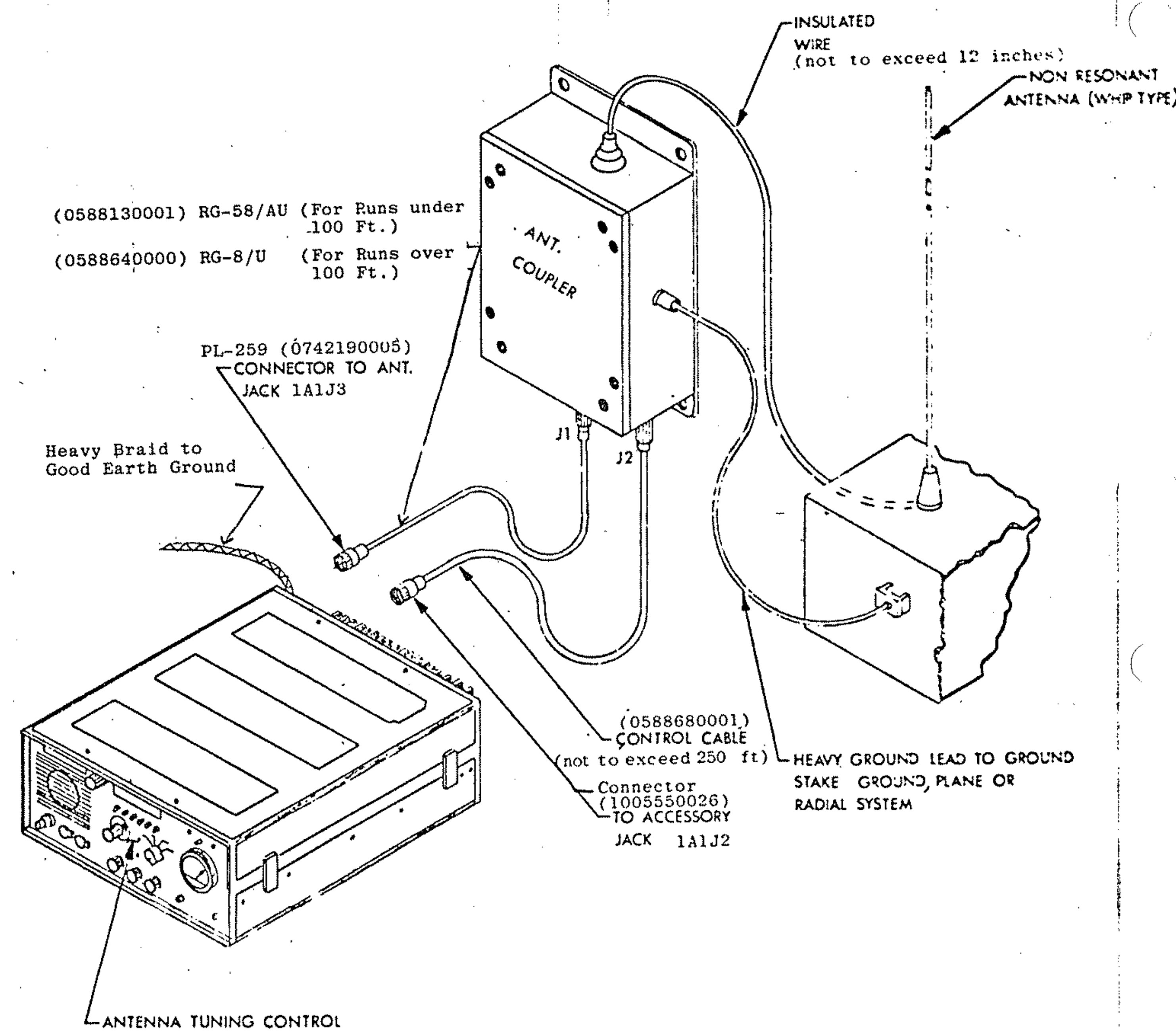


FIGURE 2.3 BASE STATION INSTALLATION (NON-RESONANT ANTENNA)

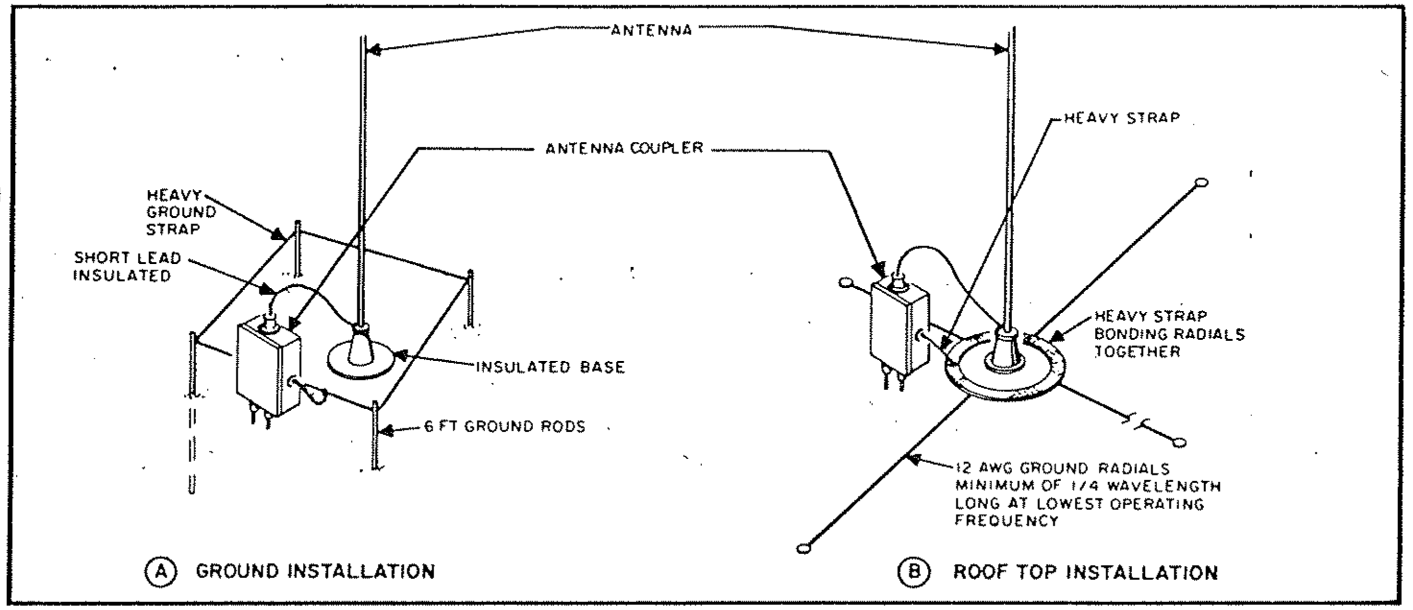


Figure 2.4 WHIP ANTENNA INSTALLATION

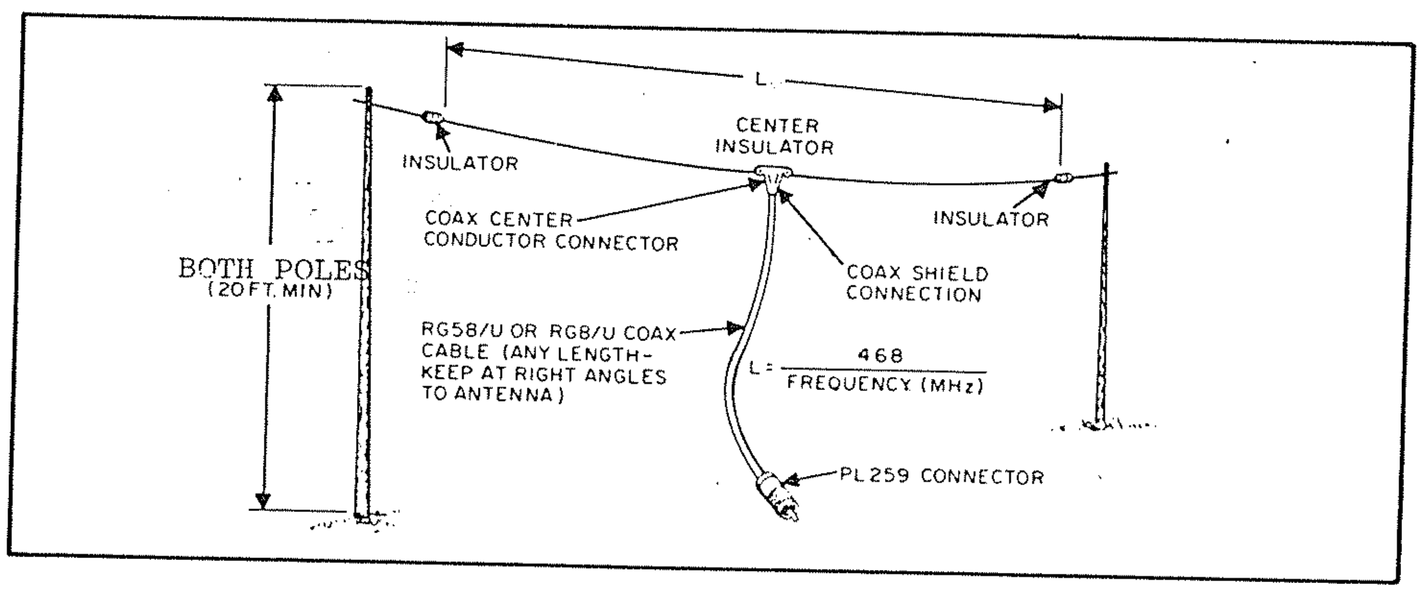


Figure 2. 5 DOUBLET ANTENNA INSTALLATION

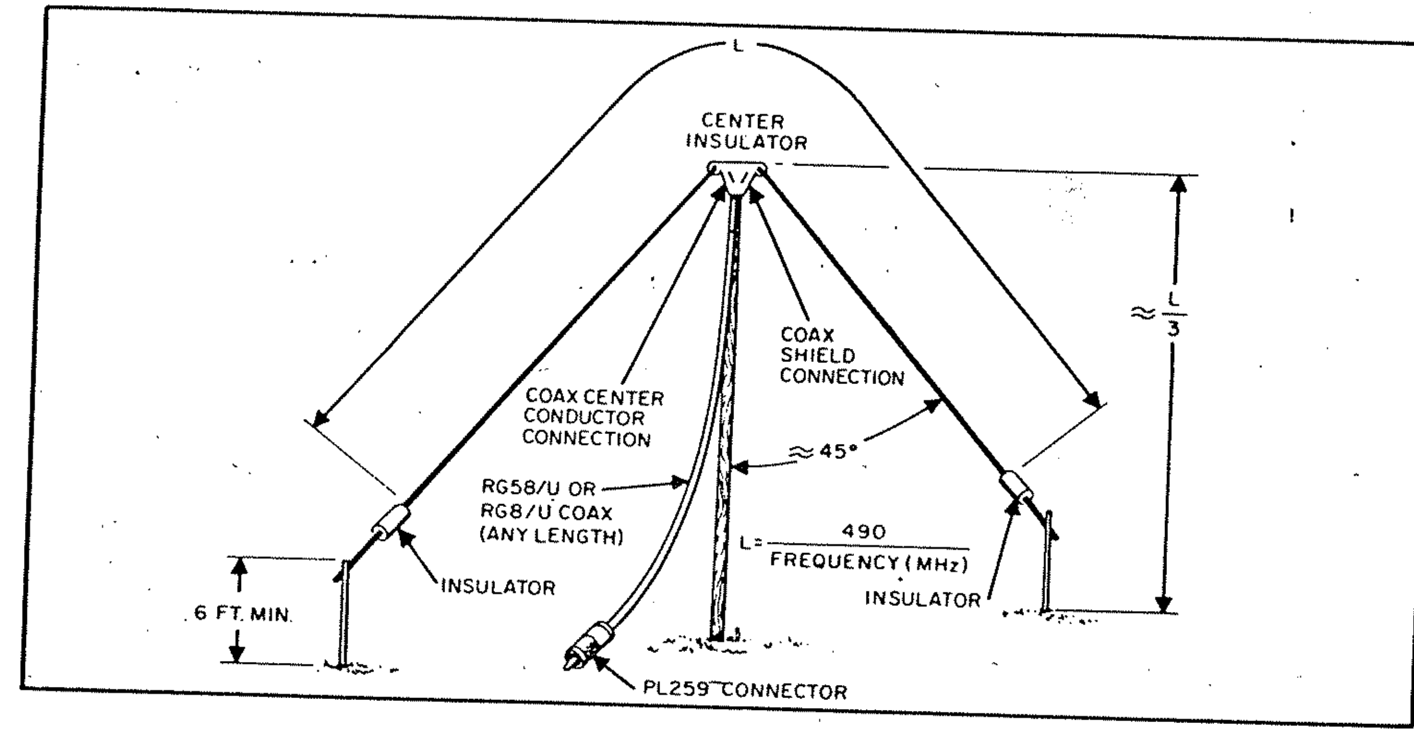


Figure 2.6 INVERTED 'V' ANTENNA INSTALLATION

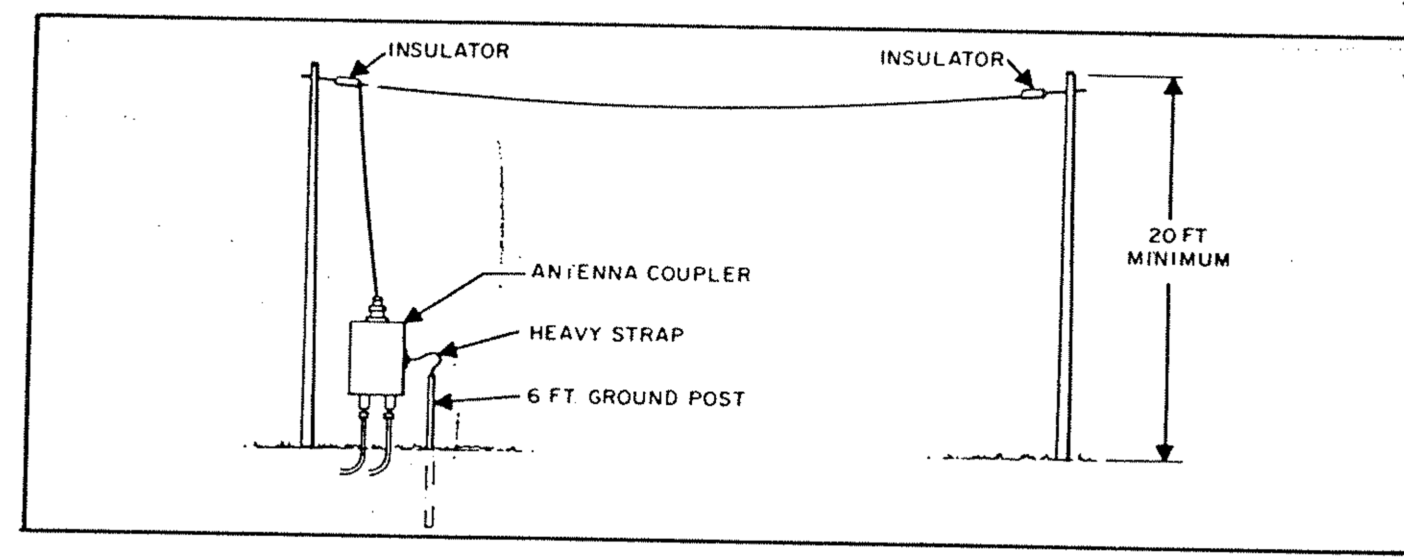
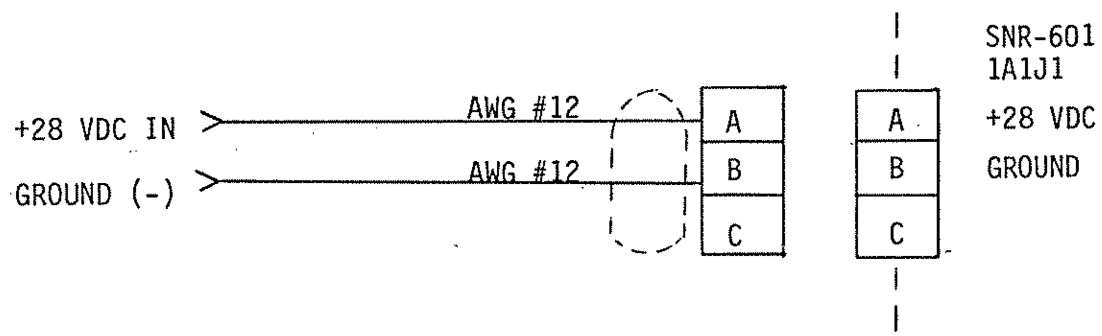


Figure 2.7 LONG WIRE ANTENNA INSTALLATION

OPERATION FROM DC SOURCE CABLE WIRING DIAGRAM



OPERATION FROM PS-550 AC POWER SUPPLY CABLE WIRING DIAGRAM

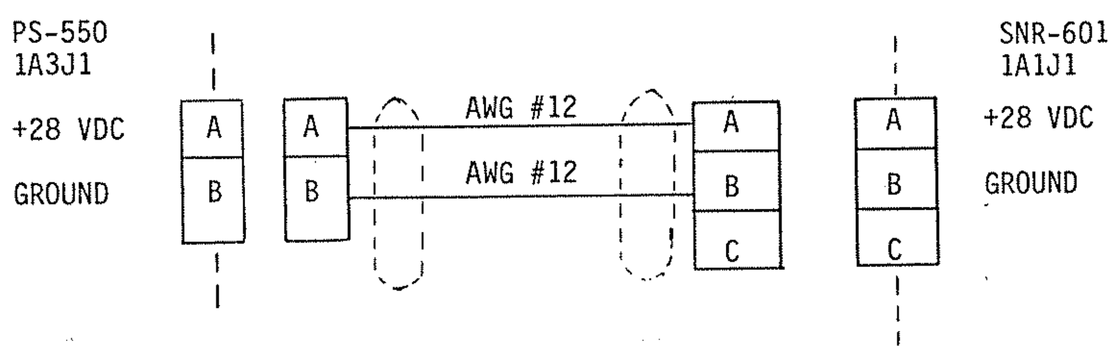


FIGURE 2.8 CABLE WIRING FROM POWER SOURCES

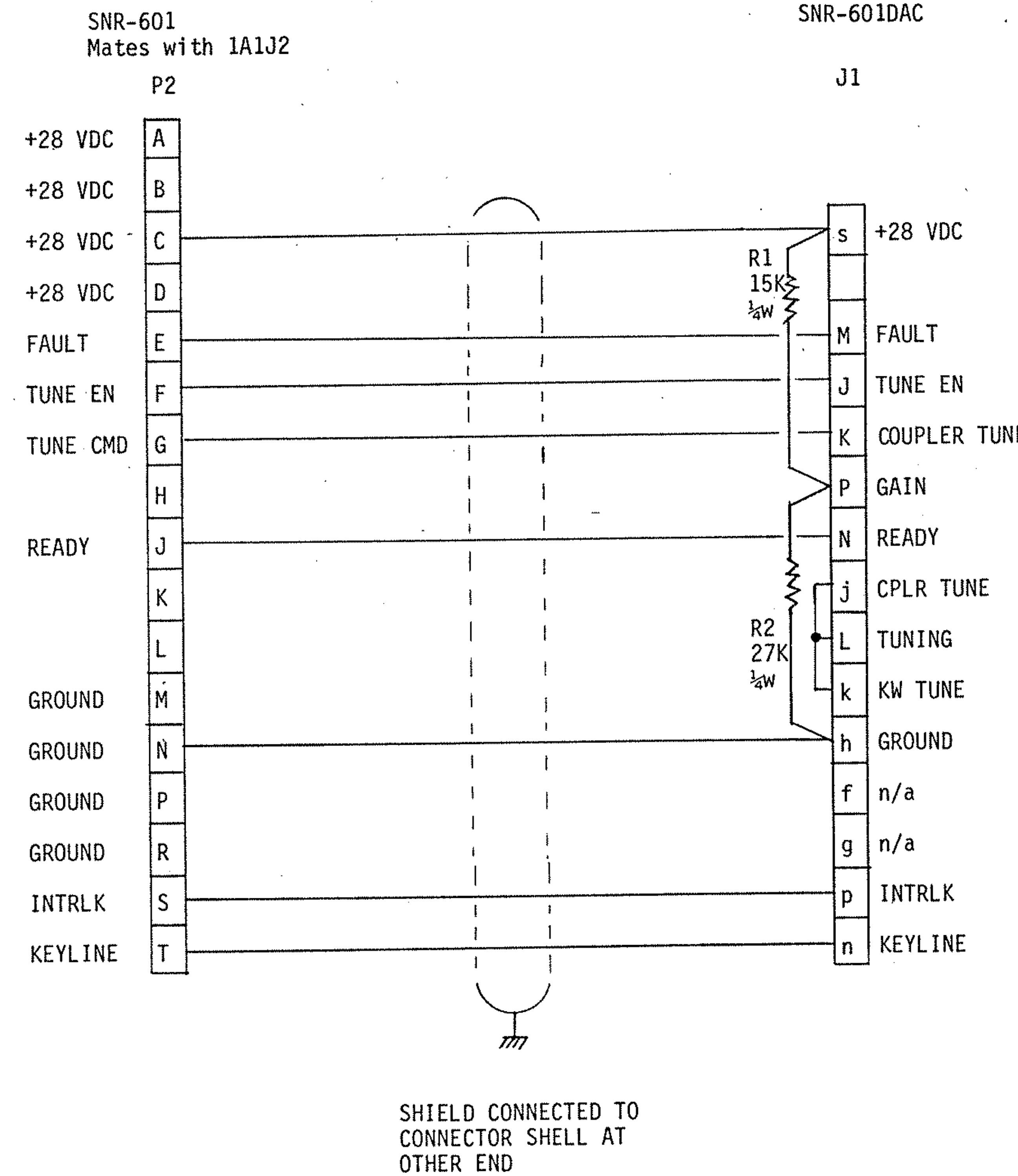


FIGURE 2.9 CABLE ASSY DIAGRAM p/n 8056003096

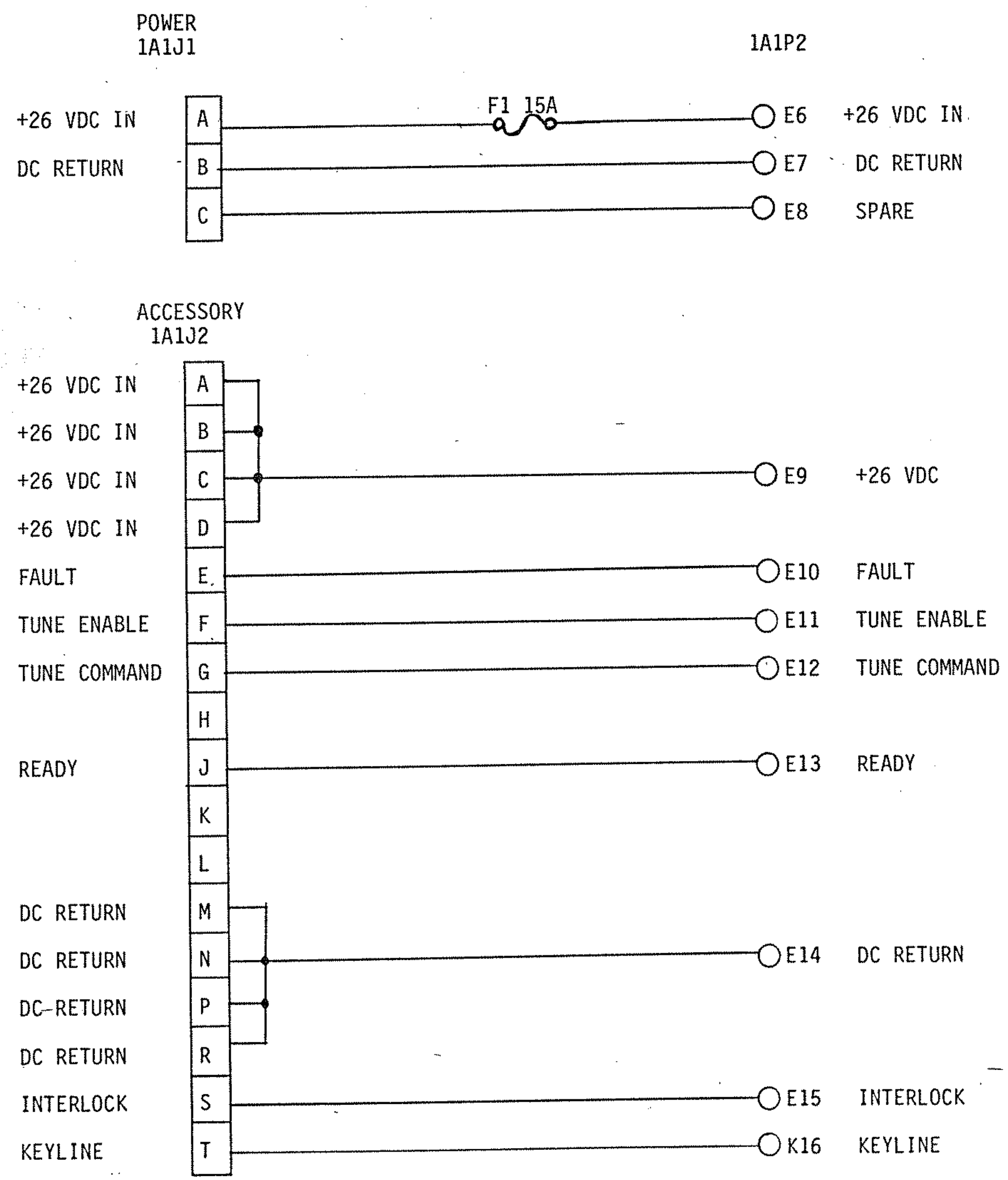


FIGURE 2.10 REAR PANEL WIRING TO MOTHERBOARD 1A1A1

SECTION III

OPERATION

3.1 GENERAL

This section provides instructions required for the proper operation of the SNR-601 Transceiver.

3.2 OPERATING CONTROLS

MIC CONNECTOR (J1)	For connection of a dynamic microphone with built-in push-to-talk (PTT) switch.
PHONE JACK (J2)	Accepts standard ¼ inch 2 circuit plug from headphones. Automatically disconnects speaker when in use.
KEY JACK (J3)	Accepts standard ¼ inch plug from CW telegraph key.
VOLUME/OFF (R4, S8)	VOLUME: Controls level of audio signal to the speaker and the phone jack.
	OFF: Disconnects primary power from transceiver.
CLARIFIER (R5, S9)	When pulled out, disables third LO clarifier oscillator. Produces 5.6 MHz with a frequency variation of ± 150 Hz for use in clarifying received speech only.
CLARIFIER INDICATOR LIGHT (CR3)	Yellow light on when clarifier circuitry in use.
SQUELCH CONTROL (R9)	FULLY CCW: 30 to 50 μv received signal required to break squelch open.
	FULLY CW: Squelch circuit completely open.
CHANNEL CONTROL (S1)	Selects programmable channels 1 through 12 for operation.
MODE SWITCH (S10)	LSB: (Optional) Selects the Lower Sideband mode of operation.
	AM: Selects the Amplitude Modulation mode of operation.
	USB: Selects the Upper Sideband Mode of operation.

	CW: Selects the Continuous Wave mode of operation.
	LOAD: Allows for loading of receive and transmit frequencies on the channel selected by the Channel Control (S1).
LOAD REC (S11)	When depressed, will load receive frequency shown on display into the channel selected by the Channel Control (S1). (NOTE: will not load frequency if MODE switch is not in the load position.)
LOAD XMT (S12)	a) When depressed, will load transmit frequency shown on display into the channel selected by the Channel Control (S1). (NOTE: will not load frequency if MODE switch is not in the load position.)
	b) With the MODE switch in either LSB (optional), AM, USB, or CW, when depressed, will display the transmit frequency loaded in the channel selected by the Channel Control (S1). This allows for checking of the frequency without having to key the transmitter.
DIM CONTROL (R3)	Controls the intensity of the LED frequency readout on the display.
FREQUENCY DISPLAY (1A12A1)	Indicates frequencies selected by either the Channel Control (S1) or channels 1 through 12, on the frequency that has been entered by the six (6) frequency set buttons S2 through S7.
FREQUENCY SET BUTTONS (S2 thru S7)	Each button, when depressed and held, will run through number 0 to 9 (exception is the 10 MHz button). When button is released, the last number past will show on the frequency display 1A12A1. These buttons are used to manually set the frequency which is then loaded as a receive or transmit frequency on programmable channels 1 through 12.
PUSH TO TUNE (S13)	When depressed will allow for the tuning of the SNR-601DAC, if being used.
READY LIGHT (CR1)	This green light will be illuminated when the SNR-601DAC is being used, and is tuned to the selected frequency.

FAULT LIGHT (CR2)

a) This red light will be illuminated when the SNR-601DAC is being used and is not tuned to the selected frequency, or there is another problem between the transceiver and the coupler.

b) Light may be illuminated momentarily during initial keyup if coupler has not been tuned to the selected frequency.

METER (M1)

a) Reflects the strength of the received signal. Will show movement with a minimum signal of 2 to 3 μv. Full scale deflection, 100,000μv.

b) Reflects the relative forward output power in the transmit mode.

3.3 FREQUENCY LOADING

1) Select a channel with the Channel Control for the frequency to be loaded.

2) Rotate the Mode switch to the LOAD position.

3) If a frequency 10 MHz or higher is desired, push the button under the 10 MHz position on the frequency display until a 1 appears then quickly release the button. Next, push the button under the 1 MHz position and hold until the desired number appears then quickly release. Repeat this for the 100 KHz, 10 KHz, 1 KHz and 100 Hz positions.

4) When the desired frequency is displayed, push the LOAD REC and the LOAD XMT buttons. (**NOTE:** If a different frequency is desired for transmitting, push only the LOAD REC button in this step, and then repeat step 3 for the transmit frequency. Pushing the LOAD XMIT button will load the displayed frequency for transmit only. When using different frequencies for receive and transmit on one channel, the frequencies must both be in the same filter band or the receive frequency must be within 10% of the band edge of the transmit frequency filter band. The transceiver's filter module will always switch to the transmit frequency band. Because of filter attenuation, reception in a different filter band is generally not satisfactory. The transceiver's filter module is divided into the following frequency bands: Band 1 is 2.0000 - 2.9999 MHz; Band 2 is 3.0000 to 3.9999 MHz; Band 3 is 4.0000 to 5.9999 MHz; Band 4 is 6.0000 to 8.9999 MHz; Band 5 is 9.0000 to 12.9999 MHz; Band 6 is 13.0000 to 17.9999 MHz.)

5) Return Mode switch to the desired position (Optional LSB, AM, USB or CW). Loading is complete. (**NOTE:** The display will show the receive frequency when the transceiver is in the receive mode, and the transmit frequency will be shown when in the transmit mode. If the operator desires to check the transmit frequency without actually transmitting, simply push the LOAD XMIT button when in one of the operating modes and the frequency will be displayed.

3.4 OPERATING INTO A 50 OHM ANTENNA

Connect the 50 ohm antenna (or dummy load) to the transceiver. Connect a microphone to 1A1J1 or a CW key to 1A1J3.

a) Turn the Volume Control fully counterclockwise (CCW). Turn the Squelch Control clockwise (CW).

b) Set the Mode Switch for the desired operating mode (optional LSB, AM, USB or CW).

c) Turn Dim Control fully clockwise (CW). This is the bright or daytime position. (Fully counterclockwise (CCW) is off.)

d) Set the channel control to desired channel.

e) Set the volume control for a comfortable listening level.

f) In USB or optional LSB modes, key the microphone. Speak into the microphone and observe the front panel meter, M1. Meter should indicate upscale on voice peaks.

g) In AM, key the microphone. Note carrier level (approx. 30 to 40 watts when not talking) on meter. When talking, the meter will "bounce" slightly with voice peaks.

h) In CW, the level of sidetone to the transmit section is preset at the factory. Automatic switching of the transceiver from receive to transmit will occur when the key is depressed. In addition, a sidetone (approx. 1 KHz) should be audible from the speaker whenever the key is depressed. (The sidetone level may be readjusted internally, if desired.)

NOTE

> When communicating in CW with a station keying its carrier, rather than a 1 KHz sidetone as in the SNR-601, it may be necessary to decrease the SNR-601 frequency by 1 KHz. When communicating between SNR-601's or similar synthesized equipment, no correction is necessary.

3.5 OPERATION WITH THE SNR-601DAC

a) Select a frequency in the 2 to 3 MHz range. Set MODE switch to AM.

b) Depress the TUNE pushbutton. The FAULT lamp will extinguish and the READY LAMP will come on after a short delay. (RF power will be shown on the meter in both FWD and REF positions.)

c) When the MIC is keyed in AM mode, forward power will be evident on the meter with the meter switch in the FWD position, but virtually nothing read in the REF position, indicating minimum reflected power.

d) Select a frequency in the 12 to 18 MHz range. Depress the TUNE pushbutton. When the READY lamp illuminates, key the MIC in AM and check forward and reflected power.

3.6 CLARIFIER OPERATION

When receiving a signal from a transmitter with synthesized frequency control, it is seldom necessary (or desirable) to use the Clarifier receiver tuning control, and it should be left in its "in" position. When receiving signals from non-synthesized transmitting equipment, some error in their transmitted frequency may exist. Pull out the Clarifier, yellow light will come on, and adjust for the clearest signal. Approximately ± 150 Hz range is provided around the set frequency.

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

The discussion of the SNR-601 will be presented in twelve parts: Synthesizer Board, First Mixer Board, Second Mixer Board, Audio Board, Panel Control Board, Memory Band Board, Counter Demuxer Board, Output Buffer Board, Front Panel, Motherboard, Filter Module, and RF Power Amplifier.

4.1.1 OVERALL BLOCK DIAGRAM

Figure 4.1 shows an overall block diagram of the transceiver. Discussion of the various functions and circuits is presented in the following sections.

4.2 SYNTHESIZER BOARD 1A6

Refer to Figure 5.18

This board contains the frequency standard and all frequency generating circuitry in the transceiver.

4.2.1 GENERAL

The Synthesizer generates the three local oscillator injection frequencies needed to determine the operating frequency of the radio. The frequency standard is oven stabilized and operates at 28 MHz, which is the second local oscillator frequency. The third local oscillator frequency is 5.6 MHz which is derived by dividing the 28 MHz reference by 5.

The first L.O. is obtained from the 28 MHz reference by digital phase lock loop techniques. The frequency accuracy of the radio is therefore determined solely by the accuracy of the frequency standard. The voltage controlled oscillator (VCO) supplying the first LO is a phase locked oscillator covering the frequency range of 35.6000 to 51.5995 MHz in 100 Hz steps. The exact frequency of the oscillator is given by: $F = (33.6000 + F_0)$MHz, where F = 1st LO, F_0 = dialed frequency. On receive, the first LO is used to convert the incoming signal to the 1st intermediate frequency (IF) of 33.6 MHz. The second LO converts this frequency down to 5.6 MHz, the second IF. The third LO mixes in a product detector with the 2nd IF to detect the modulation of the incoming signal.

4.2.2 SECOND LO AMPLIFIER

The 28 MHz reference from the frequency standard is a TTL square wave pulse train so it must be filtered to remove harmonics. The reference is applied to Q5 where it is amplified and filtered by C18, L5 and C25, L6. Q2 and Q3 make up a complementary emitter follower power amplifier to provide output at greater than 0 dbm. C22 adjusts the LO output to the proper mixing level.

4.2.3 THIRD LO AMPLIFIER

The third LO amplifier obtains its input from the divider, U2. The 2.8 MHz pulse is amplified by Q6, whose drain is tuned (C26, L7) to the second harmonic, 5.6 MHz. The 5.6 MHz is further filtered by C13, L4 and applied to the output through emitter follower Q1. C16 adjusts the LO output to the proper level. Q4 is a gate which turns off the third LO amplifier during AM receive to prevent heterodynes.

4.2.4 REFERENCE FREQUENCY DIVIDER CHAIN

The purpose of the reference frequency divider chain is to provide the division of 280,000 which is necessary to generate a 100 Hz reference signal from the 28 MHz oscillator. U3 is a dual decade counter that divides the frequency standard by 100. U3 and U4 are up/down counters connected to divide by 28 in the following manner: the devices are connected as down counters with their load inputs connected together to the borrow output of U4. Circuit U4 is clocked by the borrow output of U3. The data input lines are connected to load a 2 (0010) into U4 and an 8 (1000) into U3 each time the load line goes low. The devices count down until an underflow occurs, causing the borrow line of U4 to go low. This loads 28 into the counters, the borrow line rises, and the cycle repeats. The borrow line of U4 is the divide by 28 output, which is connected to the input of U5, another dual decade counter. U5 divides the signal by 100, delivering a 100 Hz reference frequency to the phase detector, U9.

4.2.5 VCO

The VCO is a standard Colpitts configuration consisting of FET Q10 with tank circuit L8, L9, CR2, C45. CR2 is a varicap and determines the frequency of operation by the DC voltage across it. Diodes CR3, CR4, CR5 limit the amplitude of oscillation to prevent conduction in CR2. Integrated circuits U19 and U21 amplify the VCO output and provide isolation. Final amplification of the VCO signal to approximately +7 dbm is provided by Q11. C62, C65, C66, L17 form a low pass harmonic filter. C68, L18 is a shunt trap tuned to the frequency of the second LO (28 MHz).

4.2.6 PHASE DETECTOR AND LOOP FILTER

Phase detector U9 compares the frequency and phase of the VCO signal, after it has been divided by the programmable divider, with that of the 100 Hz reference. If the VCO phase leads that of the reference, pin 13 of U9 goes from its normally high state to a low state, turning on current source, Q9. If the phase lags that of the reference, pin 2 goes from its normally high state to a low state, turning on current source, Q8. Source Q8 charges the loop filter capacitors, C38, C39, C40, C43, and causes the voltage on CR2 to rise and increase the frequency of the VCO.

Current source Q9 discharges the loop capacitors and causes the VCO frequency to decrease. The use of current sources allows the loop gain to remain constant while the voltage on CR2 varies over a range of 2 to 8 volts as is necessary to determine the proper VCO frequency. The phase locked loop dynamic characteristics are determined by a passive loop filter, C38, R37, C39, R38, C40, R40, C43.

4.2.7 PROGRAMMABLE DIVIDER

The programmable divider determines the VCO frequency in the locked loop. When the loop is locked, the output of this divider is always the same as the reference frequency (100 Hz), while the input (VCO) frequency is 100 Hz multiplied by the division factor. To allow use of relatively slow divider circuits (U6, U10, U14, U18, U20, U22) while keeping the 100 Hz reference frequency, a high speed dual-modulus prescaler is required. Integrated circuits U13, U17, and U23 form a dual-modulus prescaler which divides the VCO frequency by 100 or 101.

The programmable divider consists of six synchronous decade down counters whose operation is similar to that of U3 and U4 in the reference divider chain. The VCO frequency is numerically equal to the BCD data used to program the divider. Thus, to produce a VCO frequency of 43.4681 MHz, U6 is loaded with a 4 (0100) U10 with a 3 (0011), U14 with a 4 (0100), U18 with a 6 (0110) U20 with an 8 (1000), and U22 with a 1 (0001).

Because of the operation of the dual modulus prescaler, the programmable divider is broken into two groups: the most significant group (MSG) consisting of U6, U10, U14 and U18; and the least significant group (LSG) consisting of U20 and U22. The groups are clocked in parallel by the divide by 100/101 output (pin 11 of U13). Two NAND gates in U23 are cross coupled to form a SET-RESET flip-flop. The $\overline{Q}$ output of the flip-flop appears on pins 3 and 4 of U23 and is connected to the load lines of U20 and U22 (pin 11). Assume that the flip-flop is reset so that the Q output is low. This inhibits U20 and U22 by holding their load lines low. At the same time, U17 and U13 divide by 100 because pin 10 of U17 is held high by the $\overline{Q}$ output of the flip-flop. When the MSG underflows, the low pulse on pin 1 of U23 causes pins 3 and 4 to go high, enabling the LSG of the programmable divider. Simultaneously, pins 2 and 6 of U23 go low, causing U17 and U13 to divide by 101. When the LSG underflows, a low level pulse appears on pin 5 of U23 and resets the flip-flop, so the prescaler divides by 100 again and U20 and U22 are inhibited until the next cycle. To summarize: the dual modulus prescaler divides by 101 for the duration of the count programmed in the LSG, and divides by 100 for the duration of the count programmed in the MSG minus the count in the LSG.

Since the BCD data input to the synthesizer board is numerically equal to the received and transmitted frequency, a number representing the first intermediate frequency (33.6 MHz) must be added to the input data to obtain the correct number for the programmable divider. The function of U7, U11, U12, U15, and U16 is to add 336 to the input data for the three most significant digits. The actual addition is done in four bit binary full adders U7, U11, and U15. The purpose of U12 and U16 is to correct the output sum to BCD instead of binary. Adder U7 needs no correction because its output is always a 3, 4, or 5. The output of U11 needs the following corrections: if the input is 0 through 5 (0000 through 0101), a 3 (0011) is added; if the input is 7 through 9 (0111 through 1001), a 9 (1001) is added; if the input is 6 (0110) without a carry from the previous stage, a 3 (0011) is added; if the input is 6 with a carry, 9 (1001) is added. The correction for U11 is made by U12 and Q7.

Correction for adder U15 is made as follows: if the input is 0 through 3 (0000 through 0011), a 6 (0110) is added; if the input is 4 through 9 (0100 through 1001), 12 (1100) is added. This correction is made by U16.

4.2.8 28 MHz OVEN STANDARD A1

The 28 MHz oven standard A1 operates from regulated 18 VDC and is designed to provide on-frequency operation over a temperature range of -46°C to +85°C. The frequency stability of the standard is 1 part per million. Warm up time is typically less than two minutes to full stability.

4.2.9 VOLTAGE REGULATORS

Two voltage regulators are included on the synthesizer board for isolation and stability. Regulator U8 regulates the 18 VDC input to 12 VDC for use by the VCO and its associated circuitry. Regulator U1 receives approximately 8 VDC from the transceiver motherboard and regulates it to 5 VDC for use by all of the digital circuitry.

4.3 FIRST MIXER BOARD 1A5

Refer to Figure 5.17

4.3.1 GENERAL

The First Mixer Board contains six band pass filters used on receive and transmit to reduce harmonics and spurious signals. The receiver rf amplifier, transmitter power amplifier driver, first mixer, and first IF filter are also located on this board. The bandpass filters and the receive or transmit functions are all diode switched.

4.3.2 Band Pass Filters

The band pass filters are divided into six bands; 2-3 MHz, 3-4 MHz, 4-6 MHz, 6-9 MHz, 9-13 MHz and 13-18 MHz. The filters are of an elliptical design for minimum passband ripple and maximum skirt selectivity. The appropriate filter is selected by a ground on its control line. The receiver input and transmitter output are switched with low distortion PIN diodes to prevent receiver cross modulation. Both input and output are transformer coupled to provide superior isolation and to eliminate ground "loop" currents.

4.3.3 DELAYED AGC

Transistor Q1 operates with PIN diode CR15 to provide a delayed AGC front end rf attenuator. Since the resistance of a PIN diode is proportional to the current flowing through it, i.e. high current gives low forward resistance and low current gives a large forward resistance, it can be made to attenuate the rf signal to the receiver rf amplifier under strong signal conditions.

Q1 receives its base voltage from the AGC line, which is high (approximately 8V) at no signal, and is low (approximately 1.5V) at strong signal conditions. So under normal receiving conditions, Q1 is saturated allowing maximum current to flow through CR15 (low forward resistance). As the signal increases, the AGC voltage decreases to hold the audio output constant, until at very high input levels the AGC has decreased to where Q1 no longer is saturated. From this point on, as the signal input increases, the current through Q1 and CR15 decreases, which increases the forward resistance of CR15, attenuating the signal level to the receiver rf amplifier Q3.

In transmit, the AGC voltage remains high, providing a current sink for CR16 through saturated Q1.

4.3.4 BROADCAST FILTER

The rf signal passing through CR15 on receive is filtered by C60, L43, C62, C64, L45, C65, C67, L46, C69 and C70. This network is a high pass filter with a cutoff frequency below 2 MHz to eliminate potential interference from broadcast stations. T1 matches the rf amplifier (Q3) input impedance to the 50 ohm characteristic impedance of the broadcast band filter.

4.3.5 RECEIVER RF AMPLIFIER Q3

The rf amplifier is a dual gate MOSFET with protective diodes built into the input gate to prevent burnout under moderate overload. The input signal is applied to gate 1 (pin 3) and the amplified signal is taken from the drain (pin 1) through transformer T5. The source (pin 4) is biased positively to 3.6V by CR18, to increase the dynamic gain range obtained by varying the voltage on gate 2 (pin 2). The rf amplifier transistor can now be practically cut off when gate 2 voltage is taken to zero. Gate 2 receives its voltage from the AGC line, which varies between +8V at no signal to +1.5V for a very strong signal.

The output of T5 passes through CR19 to the input of the first mixer, X1. CR19 is turned on by the +12R line in receive, through L50, and applies approximately 11 volts across R39. Since the +12T line is at ground during receive, diode CR20 is reversed biased and turned off. During transmit, +12R goes to ground, allowing CR20 to turn on, turning CR19 off.

4.3.6 FIRST MIXER AND FIRST IF FILTER

X1 is a doubly balanced mixer which combines the input signal with the first local oscillator (LO) to provide predominantly sum and difference frequencies. The balanced mixer is used to minimize the number of mixing products because of its inherent ability to virtually eliminate the even harmonics of the mixing frequencies and their sums and differences, as well as the mixing frequencies themselves. Therefore, the primary mixer output is LO1 plus the rf signal and LO1 minus the rf signal. The first LO is variable between 35.6 MHz and 51.5999 MHz, corresponding to 2.0 to 17.9995 MHz selected by the frequency control circuits. In the SNR-601, the difference frequency is selected and a first IF of 33.6 MHz was chosen to minimize spurious frequencies within the transceiver. Note that at the lowest frequency of operation, 2.0 MHz, the sum and difference frequencies in the mixer output are 4 MHz apart making it a simple task to remove the sum frequency with a narrow band crystal filter, FL1. FL1 is matched to 50 ohms in and out with matching networks L51, C84 and C85, L52.

4.3.7 TRANSMIT WIDEBAND AMPLIFIER

The transmit signal from X1 is amplified by Q4 and Q2 and passed through a lowpass filter C58, C59, L41, C61, C63, L44, C66 to the band pass filters through CR16. The exciter output is taken from T2. R34 adjusts the overall system transmit gain to the proper level. The gain of Q4 is controlled externally by the power amplifier (PA) current automatic level control (ALC) to prevent PA overdrive.

4.4 SECOND MIXER BOARD 1A4

Refer to Figure 5.16

4.4.1 GENERAL

The Second Mixer Board includes receive and transmit bilateral amplifiers, the second mixer, the sideband and AM IF filters, AM carrier injection amplifier, and the first, second IF receive amplifier.

4.4.2 FIRST IF BILATERAL AMPLIFIER

Dual gate MOSFETS Q1 and Q2 form a bilateral amplifier at the first IF, 33.6 MHz. In receive, the first IF is impedance matched from 50 ohms by T1 to the gate 1 (pin 2) of Q1. The output is taken from the drain (pin 1) and stepped down to 50 ohms through T2. In receive, Q1 is turned on by the +12R through R2 to gate 2 (pin 2) and Q2 is turned off by ground on the ALC (V) line through R12. CR1 sets the source voltage for both transistors at 3.6V to provide the dynamic attenuation range (see para. 4.3.5). In transmit, +12R goes to ground shutting off Q1, and Q2 is turned on and gain controlled by the ALC (V) voltage. This stage limits the transmitter output to the level set by the ALC control and also reduces output to a safe level in case an output short or open circuit is detected.

4.4.3 SECOND MIXER

The second mixer, X1, is doubly balanced and is identical to the unit used on the first mixer board. The mixer combines the 33.6 MHz first IF with 28.0 MHz from the second LO to get the second IF, 5.6 MHz, which is the difference frequency. The sum frequency, 61.6 MHz, is removed by the 5.6 MHz filters.

4.4.4 SECOND IF BILATERAL AMPLIFIER

Q3 and Q4 form a bilateral amplifier to amplify in both receive and transmit directions. Q4 amplifies in receive, and Q3 amplifies in transmit. During receive, the +12R line turns on Q4, CR2, and CR4 allowing the signal to go from T3 to the filters. In transmit mode Q4, CR2, and CR4 are turned off and Q3, CR3 and CR5 are turned on by the +12T line. If AM is selected, carrier at 5.6 MHz is injected into the base of Q3 through C19.

4.4.5 AM CARRIER INJECTION AMPLIFIER

When AM transmit is selected, Q5 and gate CR18 are turned on to allow 5.6 MHz to be injected into amplifier Q3. The amount of carrier is adjusted by R32 to provide 95% modulation at the audio frequency of maximum response with maximum audio level, to insure that 100% modulation cannot be exceeded. During sideband operation, Q5 is turned off to prevent carrier leakage. Diodes CR18, CR19 form a gate to further prevent carrier leakage.

4.4.6 DIODE GATE AND IF FILTERS

The 5.6 MHz receive signal from Q4 is fed to the junction of diodes CR6, CR7, and CR8. Diodes CR6 and CR9 form the input of FL1, the USB filter, CR7 and CR10 form a gate for the AM filter, FL2 and CR8 and CR11 form a gate for the LSB filter FL3. The diode gates are repeated at the filter outputs and operate as follows: assume the USB mode is selected, a +12VDC voltage is applied to pin 4 of 1A4P2. This turns on CR25, CR6 and CR15. Using the input gate (CR6, CR9) as an example, current flows through L5, CR6, and R25. A voltage of approximately 11 volts exists across R25 as a result, which turns off CR7 and CR8. CR9 is also turned off because the cathode is more positive (+12V) than the anode (+4V). So the signal is allowed to pass into the filter. At the same time, the other filter gates are turned off. Using CR7 and CR10 as example, CR10 is conducting (+4V on the anode with a path to ground through L6, R28 for the cathode). This shorts to ground any signal leakage through CR7, and CR7 is turned off with +4V on the anode and +11V on its cathode.

The input and output gates for the other filters operate in a similar manner. Diodes CR22 through CR26 prevent interaction with the other control circuits. CR20 and CR21 switch between receive and transmit.

4.4.7 FIRST 5.6 MHZ RECEIVE IF AMPLIFIER

Integrated circuit U1 is a transistor array making up the first 5.6 MHz receive IF amplifier. U1A and U1B are connected as a cascade amplifier with AGC capability through the base of U1A (pin 4). The output of U1B (pin 8) is impedance matched to 50 ohms by emitter follower U1C and is ground loop isolated by transformer T4.

4.4.8 TRANSCEIVER DISABLE GATES

When a frequency is selected beyond the capability of the transceiver, i.e. below 2.0 MHz or above 17.9995 MHz, a +12VDC signal appears at pin P of 1A4P1. This voltage turns on Q6 through R4 and Q7 through R9. Q6 shunts the AGC line to ground, disabling the receiver, and Q7 shunts the ALC line to ground, disabling the transmitter.

4.5 AUDIO BOARD 1A3

Refer to Figure 5.15

4.5.1 GENERAL

This board contains the receiver detectors and all audio processing circuitry for both transmit and receive functions.

4.5.2 SECOND 5.6 MHZ IF AMPLIFIER

Integrated circuit U1 is a transistor array which makes up the second 5.6 MHz IF Amplifier stage plus two emitter followers: one (U1D) to feed the SSB AM detectors, and one (U1C) to feed the AGC detectors. U1A and U1B are connected in cascade with AGC capability through the base (pin 12) of U1B. R4 adjusts the overall receive gain for the proper AGC characteristics.

4.5.3 AGC DETECTOR

Integrated circuit U2 contains an AGC amplifier (U2A), detector (U2B), and emitter follower (U2D). Detection is accomplished by the emitter-base junction of U2B, with CR7 equalizing the load for amplifier U2A. When U2B conducts, the collector (pin 1) is pulled down toward ground, causing CR8 to conduct, discharging C30 rapidly, providing a fast attack. When the signal disappears, even momentarily as between words on SSB, U2B ceases to conduct and the collector returns to +12VDC, shutting off CR8. Capacitor C30 charges slowly through R45, providing the slow decay characteristic. Because the forward conduction voltage (and hence the AGC threshold) of the U2B base emitter junction changes with temperature, a differential amplifier configuration is used. Transistor U2C provides bias to U2B that is proportional to its emitter junction voltage, cancelling out the variation in the junction of U2B. Transistor U2D provides a low output impedance to feed the AGC to the first and second 5.6 MHz IF amplifiers, the rf amplifier, and the front end attenuator. AGC voltage may be read at the test point TP1.

4.5.4 PRODUCT DETECTOR AND ENVELOPE DETECTOR

Integrated circuit U3 contains the transistors used in the product and envelope detectors. The product detector U3A, U3B and U3C combines the 5.6 MHz IF signal from emitter follower U1D with the third local oscillator signal, 5.6 MHz. U3B amplifies the third LO signal and injects it into the detector where the audio components are detected. The rf components are removed by C40. The product detector is turned on only in USB or LSB modes by voltages on connector 1A3P2 pin 4 or pin 6. Diodes CR1 and CR2 are used to prevent interaction between the +12LSB and +12USB lines.

The envelope detector consists of a high gain IF amplifier U3D and a detector U3E. Transistor U3D drives the detector with a large signal for best linearity. U3E is biased almost at cutoff so it can detect amplitude variations. The rf components are removed by capacitor C54. The envelope detector is turned on in the AM mode by the +12 AMR voltage on pin 5 of 1A3P2.

4.5.5 VOLUME CONTROL

Transistor Q4 is a dual gate MOSFET which has gain control capability by variation of DC voltage on its gate 2 (pin 2). Diodes CR12, CR13 and CR14 provide a bias to the source (pin 4) so that gate 2 may be taken negative with respect to the source, providing a total dynamic range of about 80 db.

4.5.6 600 OHM LINE DRIVER

The output from the volume control stage feeds the receive audio potentiometer, R116, which controls overall receiver audio output. The line driver, U4, is a conventional push-pull multi-stage amplifier feeding output transformer T3. The output transformer provides 600 ohm audio to the speaker driver circuitry on the Panel Control Board 1A8. A sidetone from the CW oscillator on the Panel Control Board is provided on pin K of 1A3P1 as an additional input to the line driver. The sidetone level is adjustable on the Panel Control Board.

4.5.7 SQUELCH

The audio from the product and envelope detectors is also fed to the amplifier U7A which supplies audio to the squelch circuit. Potentiometer R110 adjusts the "fail safe" squelch break point with the squelch control on the front panel set fully CCW, so that an incoming signal of 30 to 50 µv will always break the squelch.

Transistors U7B and U7C are a high gain cascade audio amplifier with audio passband narrowed and centered around 1 KHz to minimize interference from high and low frequency external noise sources. The amplified audio is detected by CR15 and CR16 and the dc voltage applied to the base (pin 12) of U7D. When this stage conducts, the base of Q5 is taken to ground causing it and Q6 to cease conduction, opening the squelch. Squelch is accomplished by turning off the volume control stage with transistor Q6. When no audio is present (and the unit has been set to squelch), transistors Q5 and Q6 both conduct, shutting off the volume control.

The squelch control (on the front panel), when turned fully CW, supplies a bias to the squelch circuit to keep it open when not required. C82 and R131 establish a "hold" time constant to keep the squelch between words.

Transistor Q3 receives its base voltage from the AGC circuit and applies a dc voltage proportional to signal strength to the squelch control line. This insures that strong signals will break the squelch regardless of the control setting.

4.5.8 MICROPHONE AMPLIFIER AND SPEECH COMPRESSOR

Operational amplifier U6 is used as a high gain microphone amplifier which, by controlling the conduction of FET Q7 acts as a very tightly controlled speech compressor. The microphone audio is detected by CR10, CR11 and fed to the gate of Q7. This in turn determines the conduction resistance across the source and drain of Q7, shunting feed back resistor R75. This changes the amplifier feedback decreasing the gain and holding the amplifier output constant. Transistor U5C, the sidetone amplifier, is not used in this transceiver. Microphone excitation voltage is present at the microphone input.

4.5.9 BALANCED MODULATOR

The balanced modulator is a full ring of hot carrier diodes with provisions for resistive and reactive balance. The third LO is amplified by Q2 and fed as a current source to the carrier balance potentiometer, R34. A coarse carrier balance is made with R34, then a final balance is made using variable capacitor C26.

Audio from the microphone amplifier is applied to the bridge by emitter follower U5A. SSB audio level is adjusted by SSB Audio control R58. In AM operation, U5B is turned on shunting a portion of the proper level for 100% modulation. This level is adjusted with AM MOD LEVEL control R56.

Transistor Q1 amplifies the double sideband suppressed carrier output from transformer T2 and supplies it to the second mixer board for unwanted sideband removal.

4.6 PANEL CONTROL BOARD 1A8

Refer to Figure 5.24

4.6.1 GENERAL

The Panel Control Board works in conjunction with three other digital boards, Memory/Band, Counter/Demuxer, and Output Buffer, to provide channel and digital control to the transceiver. The Panel Control Board contains the multiplexing oscillator and the circuitry to control it. The multiplexing counter, the load complete detector, and blanking control for the display drivers. The board also contains a small part of the transmit/-receive discriminator, the bulk of which is located on the Memory Band board, and a small part of the load/operate discriminator, the balance of which is found on the Memory Band board.

Analog circuits included on the Panel Control board are the clarifier oscillator, CW tone oscillator, AGC meter driver, and the speaker driver.

The following are general notes on multiplexing and demultiplexing of data in the SNR-601.

4.6.2 LOADING

Loading is instigated by selecting the Load Mode on the front panel. Following that, each loading counter is run until the front panel display contains the desired loading frequency. When the desired loading frequency is apparent in the display, the input buffers will also contain this desired loading frequency. When either the load receive or the load transmit pushbuttons are pushed, in any order, loading will occur. This loading action consists of multiplexing the counter information, which is stored in the input buffers, into memory locations pointed to by the multiplexing counter as it steps from least significant digit to most significant digit. The channel switch also points to the group of memory locations to store the six digits of input frequency being multiplexed into the memory from input buffers. Now, the input frequency has been stored in the memory locations pointed to by the channel switch and multiplexing counter as it steps from least significant digit to most significant digit.

When the loading operation is complete, the load mode is exited by the mode switch from the load position. This automatically causes the contents, of memory pointed to by the channel switch, to be demultiplexed from the memory into the receive latches and the transmit latches.

Consequently, any time the LOAD mode is terminated, the contents of the receive frequency location in memory, and the transmit frequency location in memory pointed to by the channel switch, will be demultiplexed into the receive latches, and the transmit latches respectively. The synthesizer can then see the receive frequency or the transmit frequency in real time as it is contained in the receive latches or transmit latches.

4.6.3 CHANGING CHANNELS

During operation, any time a new channel is selected, the act of changing channels also causes automatic demultiplexing of the receive and transmit information pointed to by the new channel location of the channel switch. This will occur in such a way as to load the contents of receive frequency starting at least significant digit and ending with the most significant digit. This is followed by demultiplexing the contents of the transmit frequency location into the transmit latches in the same manner. Consequently, any time the channel is changed, the new channel will point at a new pair of frequencies, both transmit and receive, which will then tumble out of memory, digit by digit, into their respective latches.

4.6.4 POWER UP

During the turn-on of the SNR-601, a similar demultiplexing activity occurs as it did during the changing of channels. When "power up" occurs, the receive and transmit frequencies stored in the memory and pointed to by the channel switch will be demultiplexed out of the memory into the respective receive and transmit latches. The demultiplexing again starts with the least significant digit of the receive latch, and ends with the most significant transmit latch.

4.6.5 DEMULTIPLEXING CLARIFICATION

Demultiplexing can occur from memory into the receive and transmit latches during three different occasions. First, demultiplexing will occur at the end of loading when a mode other than load mode is selected; second, it will occur any time a new channel is selected, and third, it occurs from memory to the latches on initial application of power. The multiplexing counter, during demultiplexing, actually controls the demultiplexing operation by pointing to the least significant digit of receive frequency storage, followed by the second least significant digit of receive frequency storage, all the way up through the most significant digit of the transmit frequency storage. As the multiplexing counter points to each respective digit of frequency stored in memory, that information appears on the output of memory where it is driven into its appropriate latch. (The multiplexing counter points to the proper latch as well as to each consecutive frequency location.)

4.6.6 TRANSMIT/$\overline{\text{RECEIVE}}$ DISCRIMINATOR

Schmitt trigger U1D inverts and buffers the keyline signal for use by additional circuitry on the Memory Band Board. In the receive mode (unkeyed) the output P1 pin B23 will be low, going high whenever the transmitter is keyed.

4.6.7 LOAD/OPERATE DISCRIMINATOR

The load/operate discriminator consists of Schmitt trigger inverters U3A, U3B and U1A, through switch S1. S1 provides a means for disabling the Load function from the front panel to prevent unauthorized channel frequency modification, where desired. With S1 closed and the MODE switch in the LOAD position, +12 is present at S1. This voltage is reduced to an appropriate logic level (4.4V) by R9 and R16, and is inverted three times by U3A, B and U1A, finally appearing as a low logic level at P1 pin B24. In any non LOAD mode, P1 pin B24 will be high logic level. This signal is used by additional circuitry on the Memory Band board.

4.6.8 OSCILLATOR CONTROL

The oscillator control circuit consists of 2-input AND gate U6A, Schmitt trigger inverters U3C, U3D, U3E, and U3F, standard inverters U4A, U4B, U4C, and U4D, 4-input AND gates U5A and U5B, and flip-flop U8B. The output of U8B (pin 13) is used to control the multiplexing oscillator U9. If pin 10 of U8 (the reset function) is low, the output of U8B will go high permitting the oscillator to run, whenever a positive going transition is detected on pin 11. Since all inputs to U5A are normally high, pin 11 of U8B will also be high but will not allow the output to go high until a low to high transition occurs. The positive going transition is accomplished by pulsing any of the inputs to U5A low for a short period, then allowing them to return to the normal high state.

The reset pin (pin 10 of U8B) must be low to allow U8B to be set from its clock input, pin 11. All of the inputs to U5B are normally high, so its output is normally high, then is inverted in U4D to give a reset command. Upon initial power application to the unit, the Power Clear signal on P1 pin B25 will remain low for about ½ second. Then, through U3C and U4B, pin 11 of U5B is held low for this period before being allowed to go high, resetting the flip-flop U8B. This allows initial power-on transients to dissipate before enabling the system. At about the same time, a pulse is generated by U4A and U3F to clock the oscillator control and allow the oscillator to run, permitting frequency initialization. The operating signal on P1 and B17 is high any time loading is not occurring. If, in LOAD mode, either Load Receive or Load Transmit pushbutton is depressed, the operating signal will go low, and through U4C and U3D, will supply a negative pulse to pin 2 of U5A, allowing the oscillator to run. The pulse duration is approximately 400 microseconds as established by C18, R18.

When the LOAD mode is selected, U6A is driven to a low state, but U3B remains high.

When the LOAD mode is exited, U6A goes positive, pulsing U3E low for 400 microseconds as established by C17, R17, and allows the multiplexing oscillator to run, supplying the frequency in memory to the receive and transmit latches. The fourth method for setting flip-flop U8B comes from a network designed to detect channel changes, allowing new frequency information for the newly selected channel to be transferred from memory into the transmit and receive latches. Network R15, R7, and C9 detects changes in the least significant digit of the BCD channel information from the front panel. Schmitt trigger inverter U1B then supplies a positive or negative voltage that has been "debounced" to U4F and U6B. If a positive output is supplied to U6B, a negative pulse about 400 microseconds is applied through U7F to U6D which will reset U8B. This negative pulse also is applied through U4E, U7E, and U7D so that when the pulse returns positive, a negative going pulse is generated to allow U8B to clock and let the multiplexing oscillator run. Similarly, if a negative output is supplied to U4F, a negative pulse of about 400 microseconds is applied through U7B to U6D, allowing the above cycle to run. The flip-flop is also reset through pin 9 of U5B by the LOAD COMPLETE detector, U10C and U7C, which generates a 400 microsecond negative pulse when the proper number of multiplexing counts has been detected.

4.6.9 MULTIPLEXING OSCILLATOR

The multiplexing oscillator is made up of timer U9 and inverter U2E. The oscillator runs any time U9 pin 4 is high, and is off whenever pin 4 is low. The output of U9 (pin 3) is a rectangular pulse train with its frequency established by R25, R26, and C29. The output initially goes high and is inverted by U2E before being applied to counter U11.

4.6.10 MULTIPLEXING COUNTER

The multiplexing counter circuit consists of binary counter U11, inverters U2F, U10A, U10B, and U10D, and Schmitt trigger inverter U7A. U2F and U7A generate the LOAD PULSE signal used on the memory band board. The inverted oscillator output from U2E drives U2F positive, generating a negative 400 microsecond pulse from U7A which is sent to the memory band board where it loads information from the input into the memories during the LOAD cycle, and demultiplexes data from the memory to the receive and transmit latches. As the multiplexing oscillator U9 runs, each positive going transition on U11 pin 2 causes the counter to increment by one count, (NOTE: the counter was initially cleared on power-up through its pin 1 via U6C). It is also cleared each time a channel pulse is detected from U6D.

As the counter increases via the clock input, the outputs at pins 14, 13, 12, and 11 increase in a binary progression, starting at 0000 and filling at 1111. The next clock pulse causes all outputs to return to 0000. The high to low transition on pin 11 (the most significant bit) will trigger the load complete detector, resetting the oscillator control and stopping the oscillator.

Inverters U10, U10B, and U10D are buffer inverters used to isolate their respective signals from perturbations on other boards.

4.6.11 LOAD COMPLETE DETECTOR

Inverters U10C, U10E, and U10F, and Schmitt trigger inverter U7C make up the load complete detector. Whenever, U11 pin 11 makes a high low transition (a full count) U10C generates a positive pulse which generates a negative 400 microsecond pulse at the output of U7C to reset the oscillator control. The negative pulse at the output of U7C is buffered by U10E and U10F and sent to the memory band board as the RESET PULSE, where it terminates the frequency loading sequence in the LOAD Mode.

4.6.12 CHANNEL CHANGE DETECTOR

The channel change detector consists of Schmitt trigger inverters U1B, U1C, U1E, and U1F, and inverters U2A, U2B, U2C, and U2D. The purpose of the channel change detector is to respond each time a channel change is made. The channel switch information is complemented binary, where 1111 represents binary 0000, 1110 represents 0001, and so forth. The Schmitt trigger inverters with their respective RC input networks serve as "debouncing" filters for the channel switch. The outputs are reinverted and buffered for use on the memory band board.

4.6.13 BLANKING CONTROL

The blanking control consists of transistors Q8 and driver U12A. Transistor Q8 is driven from the load mode signal to disable the blanking control during the LOAD mode. When in the operate mode, any out-of-range frequency will cause the blanking oscillator on the memory band board to operate, pulsing the driver on and off at a slow rate. The driver output, pin 3, is connected to the blanking inputs of all the display drivers as well as to driver U12B, to make all digits pulse on and off when an illegal condition is detected. In normal operation, within band, the blanking oscillator output is low, disabling the blanking control.

4.6.14 DISPLAY DRIVERS

Display drivers U13, U14, U15, U16, and U17, and driver U12B make up the display driver which convert the BCD programming information to seven segment display requirements. For instance, a binary 0111 would turn on the appropriate segments to display a decimal "7".

Since the most significant digit (tens) on the display can only be a 0 (blank) or a 1, driver U12B merely turns on the two individual display segments giving "1" whenever the 10 MHz 2^0 line goes high. At all other times when the selected frequency is below 10 MHz, the first digit is blanked.

4.6.15 CLARIFIER OSCILLATOR

The clarifier oscillator is a variable crystal oscillator operating at the 3rd LO frequency, 5.6 MHz. When the clarifier is in operation (knob pulled out), Q1, Q2 and Q7 are energized, and the 3rd LO from the synthesizer is disabled. This circuit allows a frequency variation of approximately ±150 Hz around 5.6 MHz to clarify received speech quality. The clarifier oscillator is disabled in transmit mode so that transmit frequency stability is dependent upon the synthesizer and frequency standard only.

The oscillator, Q1, is controlled in frequency by crystal Y1. Variation of the frequency is accomplished by varying the capacitance across the crystal via varactor CR13. As the voltage impressed on CR13 cathode is varied, the capacitance changes, altering the oscillator frequency. For maximum stability, the voltage to the oscillator is regulated by Q7.

Transistor Q2 provides isolation between the oscillator and the radio to prevent "pulling" the frequency with changing radio conditions.

4.6.16 CW TONE OSCILLATOR

Transistor array U19 is connected as an audio phase shift oscillator, with component values chosen to give a frequency of approximately 1 KHz. The frequency is determined by the "Twin T" notch filter C73, C74, C76, R91, R92, and R93. The oscillator is turned on by grounding pin A10 of 1A8P2, causing transistor Q3 and Q4 to conduct, grounding the keyline and keying the transceiver. When the CW key is removed from ground, capacitor C71 and resistor R86 hold Q3 and Q4 on for approximately ¾ seconds. This prevents the keyline relay from dropping out between normal CW characters and words, but automatically returns the transceiver to "receive" after a key up of approximately ¾ second. Diode CR16 keeps the tone oscillator from being energized during normal keyline operation.

Since the tone oscillator output is high impedance, an emitter follower is required to drive the low impedance balanced modulator. A sidetone from the oscillator is sent out Pin B7 of 1A8P2 to the audio board for monitoring purposes. The sidetone level is adjustable by R99.

4.6.17 AGC METER DRIVER

Transistor Q6 is a D.C. amplifier which drives the "S" meter proportionally to AGC voltage to give relative received signal strength information. Its threshold is set so that the meter movement begins when a signal of approximately 2 or 3 µv is received, and provides full-scale meter deflection for a 100,000 µv signal.

4.6.18 SPEAKER DRIVER

The speaker driver integrated circuit, U18, is capable of supplying in excess of 1.5 watts of audio to the speaker at very low levels. The speaker audio is disabled during transmit, except for CW mode to allow monitoring the tone.

initially goes high and is inverted by U2E before being applied to counter U11.

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As the counter increases via the clock input, the outputs at pins 14, 13, 12, and 11 increase in a binary progression, starting at 0000 and filling at 1111. The next clock pulse causes all outputs to return to 0000. The high to low transition on pin 11 (the most significant bit) will trigger the load complete detector, resetting the oscillator control and stopping the oscillator.

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4.6.19 DISPLAY DISABLE

Switch SW2 allows the seven segment display to be totally disabled following channel programming, to reduce battery drain or prevent the operator from knowing the actual frequencies of operation. The switch disables the display dimmer, blanking the display.

4.7 MEMORY BAND BOARD 1A9

Refer to Figure 5.25

4.7.1 GENERAL

The Memory Band Board includes the balance of the load/operate discriminator, a small part of which was on the panel control board. In addition, the memory band board contains the transmit/receive discriminator sections that were not on the Panel Control Board. The heart of the Memory Band Board is the memory circuit itself. A read/write control circuit is included to permit writing information into the memory. A power down memory enable circuit and a battery power switch circuit are also required to support the powering requirements and the enabling requirements of the memory circuit. In addition, a band decoder circuit is provided to decoder the frequency selected into a selection of the proper filter band for that frequency. The band decoder circuit is supported by the band limit drivers and the blanking oscillator which runs when an out of limit frequency is detected. Three additional circuits are partially contained in the Memory Band Board. The first of these is the Input Buffer Multiplexing Enable Control, part of which is on the Counter Demuxer. The second circuit contained partially on the Memory Band Board and partially on the Counter Demuxer Board is the Transmit Latch Enable Circuit. And third, the Receive Latch Enable Circuit is partially contained on the Memory Band Board, with the other part located on the Output Buffer Board.

4.7.2 LOAD/OPERATE DISCRIMINATOR

The load/operate discriminator circuit consists of Schmitt trigger inverters U10C, U10E, U13E, U16E, U19E and U19F, standard inverters U4A, U4B, U4C, U4D, U4E, U4F, U7A and U7B, flip-flops U5A, U5B, U8A and U8B, 3-input AND gates U14B and U14C, 2-input AND gate U2C, and 2-input OR gates U11A, U11B, U11C, and U11D.

The operate mode signal on P1 pin M is inverted in U16E to become $\overline{\text{OPERATE MODE}}$. So during LOAD mode, OPERATE will be low and $\overline{\text{OPERATE MODE}}$ will be high, setting flip-flops U5A and U5B so they may be clocked.

All four flip-flops are reset on power-up by means of the POWER CLEAR signal, which is high for one half second whenever power is initially turned on. The resets are applied through U11A, U11C and U11D. Flip-flop U5A is set in LOAD mode by the LOAD RECEIVE pushbutton on the front panel. Depressing this button causes P2 pin A to go low and U19E pin 10 to go high, clocking U5A and supplying a high to U14C through U5A pin 1. This causes a positive going clock pulse at U8B pin 11, making pin 13 go high (LOAD RECEIVE MODE) and pin 12 go low. When pin 12 goes low, U14B and U14C are disabled by U10F through U2C and U4E. The high state on pin 13 of U8B provides a LOADING signal from U11B which goes to the input buffer multiplexing enable control, and makes the OPERATING signal from U7A go low, telling the panel control board that loading is being accomplished. Similarly, the LOAD TRANSMIT pushbutton sets U5B through U19F, in turn providing a high through U14B to clock U8A making pin 1 go high (LOAD XMIT MODE) and pin 2 go low. When pin 2 goes low, it also disables U14B and U14C. This insures that once loading has started for either transmit or receive frequencies, depressing the other pushbutton will not disrupt the loading operation.

When the loading operation triggered by pushing either pushbutton is complete, the RESET PULSE from the panel control board resets U8A or U8B through U11A, allowing further loading to occur. The reset gives a high on U8B pin 12 and U8A pin 2, which gives a time delayed positive state to U14C pin 12 and U14B pin 3, through U2C, U4E, and U10F. When U8B pin 13 goes low, indicating completion of receive frequency loading, a positive reset pulse is sent to U5A pin 4 through U4C, U10E, U4B and U11D. Similarly, when U8A pin goes low, indicating completion of transmit frequency loading, a positive reset pulse is sent to U5B pin 10 through U4D, U10C, U4A, and U11C. When all loading has been completed, the LOADING signal from U11B goes low and the operating signal from U7A goes high.

In the Load/Operate Discriminator, both receive and transmit circuits contain two flip-flops each, a primary flip-flop and a buffer flip-flop. If load receive is occurring and the LOAD TRANSMIT pushbutton is depressed, the primary transmit load flip-flop can set, but the buffer flip-flop will not set until the load receive operation is complete, and vice versa.

The OPERATE MODE signal from U16E is reinverted and buffered by U14F as OPERATE MODE, then is inverted and buffered by U7B and sent to the output buffer board as LOAD MODE. This signal will be high any time the LOAD position on the MODE switch is selected and will be low for all other MODE positions.

4.7.3 TRANSMIT/RECEIVE DISCRIMINATOR

The TRANSMIT/RECEIVE discriminator circuit consists of AND gates U2A and U2B, NOR gates U23A and U23B, Schmitt trigger inverter U16D, and standard inverter U7F. The KEYLINE signal on P1 pin L will be low in receive and high in transmit (i.e., keyline closed). The purpose of the discriminator is to discern between keyline open or closed and to enable the receive frequency information into the synthesizer when the keyline is not depressed, and the transmit frequency information into the synthesizer when the keyline is depressed. In receive, the ENABLE RECEIVE BUFFERS signal on P1 20 will be high via U2B when in OPERATE mode (and LOAD TRANSMIT pushbutton is not depressed). When the keyline is depressed, the ENABLE REC BUFFER line will go low and the ENABLE XMIT BUFFER on P1 pin 19 will go high via U2A, also only in OPERATE mode.

In normal OPERATE mode, the transmit LOAD pushbutton may be depressed to observe the transmit frequency stored in the transmit latches for the channel selected. This allows verification of the transmit frequency without actually keying the transmitter.

4.7.4 MEMORY

The memory circuit consists of Random Access Memory (RAM) U1, Schmitt trigger inverters U13A, U13B, U13C, U16A, U16B, U16C, U16F, U19A, U19B, U19C, and U19D, standard inverter U7E, and buffers U20A, U20B, U20C, and U20F. The RAM is a 256 word by 4 bit device. Most of the other elements in the circuit are there to buffer the memory from transients generated outside the memory band board itself. The Schmitt triggers U19A-D provide a buffer for the data input lines from the counter demuxer board. Note that the Schmitt triggers do invert the data so memory storage is actually inverted BCD. Output buffers U20A, B, C, and F do not reinvert the memory contents, so this data must be complemented when it reaches the counter demuxer and output buffer boards to return to BCD format.

The Schmitt trigger inverters U13A, B, and C, and F protect the memory from external loads and buffer the addresses from the panel control board. Data on P1 pins R, P, S, and T, represents inverter channel switch information, which when inverted by the Schmitt triggers, becomes true BCD (Channel 1 is actually binary "0" and channel 12 is actually binary "11"). U1 pin 1, which is address A3, is driven from the READ/$\overline{\text{WRITE}}$ control circuitry by a signal called Transmit Counter Address. This signal is high when transmit information is being loaded or demultiplexing out of memory. It is low if receive information is being stored in memory or being multiplexed out. Pins 2, 3 and 4 of U1 are addresses A2, A1, and A0, respectively. These addresses provide a BCD representation of the significance of the digit addressed, where 000 represents the least significant digit and 101 represents the most significant digit. The multiplexing counter provides an increasing binary sequence as it multiplexes or demultiplexes information to or from memory to provide the proper selection of digits, from least significant to most significant.

The A2 information on P1 pin H is inverted by U13A and goes elsewhere on the board as $\overline{\text{A2}}$. This is then further inverted back to A2 to select conditions complementary to those selected by A2.

4.7.5 READ/$\overline{\text{WRITE}}$ CONTROL

The READ/$\overline{\text{WRITE}}$ Control circuit is comprised of Schmitt trigger inverters U10A, U10B, U13D, and U13F, standard inverter U7D, 3-input AND gates U14A and U17C, and a 2-input AND gate U2D. $\overline{\text{LOAD PULSE}}$ on P1 pin J is a 400 microsecond negative going pulse which occurs on negative transitions of the counter clock in the Multiplexing Counter circuit. Recall that the counter itself incremented on positive transitions, so that these 400 microsecond pulses are placed midway between counts from one binary number to the next in the Multiplexing counter. These negative pulses are inverted to positive pulses by U13F and can be transferred through U14A or U17C if the other inputs to those AND gates are high. U14A pin 1 operates from the LOAD RECEIVE MODE signal which is high during the time it takes to load receive frequencies. U14A pin 2 is driven from the RECEIVE COUNTER ADDRESS through U13D and U7D. This signal, generated on the Panel Control board, is high during the first 8 counts of the binary sequence from the Multiplexing counter. So, if the LOAD RECEIVE pushbutton is depressed, U14 pins 1 and 2 will be high for the first eight counts and the positive load pulses will be passed through U14A, inverted by U10A, and through U2D to provide 8 low going pulses 400 microseconds wide, in the middle of each address concedent with the load pulse itself. During the second 8 counts of the Multiplexing counter, the RECEIVE COUNTER ADDRESS will be low and the pulses will not pass through. Similarly, when the LOAD TRANSMIT pushbutton is depressed, the pulses will appear during the second 8 counts of the multiplexing counter, writing the transmit data into memory.

4.7.6 POWER DOWN MEMORY ENABLE

The power down memory enable circuit consists of Schmitt trigger inverter U10D, standard inverter U7C, buffer U20E, and transistors Q2 and Q3. During initial power turn on, the input to U10D (pin 9) will begin low as the +5 VDC supply comes up to regulation, charging C22 thru R33. Approximately one-half second after power turn-on U10D will conduct applying a low state to U7C and Q2 through buffer U20E. Initially, the high state on U10D pin 8 causes a low output from U7C called $\overline{\text{POWER CLEAR}}$, which is used on the counter demuxer and panel control boards to initialize certain flip flops or counters. This low for one-half second insures that any active device connected to that signal will be properly reset as the power is applied. After the time constant has passed, U7C goes high allowing the affected circuits to operate normally. On initial power turn-on, Q2 is turned on, effectively shorting the memory chip enable 2 (U1 pin C2) to ground for ½ second, disabling the memory to allow transients to dissipate. When U10D pin 8 goes low, Q2 is turned off to allow the memory to function normally.

When power is first applied, transistor Q3 sees +5 VDC applied to its base and

+12VDC applied to its emitter through CR6. CR6 is a 3V zener diode which drops the emitter voltage to 9V. So Q3 is saturated and applies approximately 4V to the memory to enable it.

When power is turned off, Q3 acts as a power down protection circuit. The radio power regulators are connected so that the source for the 5 VDC regulator is the 12VDC regulated output, so the 5V will remain regulated for a period of time as the +12V decays. When power turn off occurs, the 12V on the cathode of CR6 starts to decay. When this voltage reaches about 8V (5V on the emitter), both the emitter and base will be at the same +5V potential and Q3 will turn off, grounding pin CE2 through R45. As the 12V supply decays further to approximately 7V, the 5V supply will start to drop out of regulation. But, the memory has already been disabled so false information generated by devices on the 5VDC line will not alter the memory's data contents.

4.7.7. BATTERY POWER SWITCH

When no power is applied to the radio, a means must exist to supply voltage to the memory so it can retain the stored information. Batteries BT1 and BT2 are used for this purpose. Since the memory draws extremely low currents in the inactive state (on the order of 10^{-8} amperes), the battery life in this application is roughly 3 to 5 years before replacement. Transistor Q4 acts as a switch to apply battery voltage to the memory whenever the radio power is off. With power off, Q4 is not active, so it represents a drain to source short circuit, applying the battery voltage to the memory. When the power is applied, the 12V on the transistor gate turns off Q4 and allows the radio to supply 5 VDC power to the memory. Capacitor C30 is used to keep power on the memory during transitions between radio power and battery power. The memory current requirements are so low, that if the batteries are removed for replacement, C30 will keep the memory alive for periods of 24 hours or more.

4.7.8 INPUT BUFFER MUXING ENABLE CONTROL

This circuit consists of two 3-input AND gates U17A and U17B. The purpose of the circuit is to provide an input for the least significant and most significant sections of the input buffer muxing enable circuitry on the counter demuxer board. The least significant section controls the loading of the least significant four digits of the input counters into memory, and the most significant section controls the loading of the two most significant digits of the input counters into memory.

The LOADING signal from the load/operate discriminator goes high any time loading is being done from the input counter into memory.

The $\overline{\text{OPERATE MODE}}$ signal from U16E is high any time the circuit is not in the operate mode, i.e., in the LOAD mode. The signal on U17A pin 1 is called $\overline{\text{A2}}$ and is high during the first four counts of the multiplexing counter, low during the second four counts, high for the third four counts, and low for the last four counts. The signal on U17B pin 4 is the complement of the one described above and is called A2. It is low during the first four counts, high during the second four, etc. The first four counts and the third four counts allow loading the last significant four digits into memory, so that if both LOAD RECEIVE and LOAD TRANSMIT pushbuttons were pushed simultaneously, the data would be loaded into both transmit and receive memory locations, i.e., a Simplex channel. Similarly, the second four counts are redundant with the fourth for the same reason. If only one button were pushed, then one of the groups of two enables would not allow writing into memory because the Read/$\overline{\text{Write}}$ control circuit would prevent the writing operation.

4.7.9 RECEIVE LATCH ENABLE

The receive latch enable circuit consists of two 4-input AND gates U15A and U15B plus additional circuitry on the output buffer board. The Receive Counter Address line from U17D will be high during the first 8 counts of the 16 count sequence from the multiplexing counter. The LOAD PULSE signal, a 400 microsecond positive pulse situated in the middle of the multiplexing counter address, occurs 16 times during the running of the counter. The OPERATE MODE signal from U4F is high whenever the MODE switch is not in the LOAD position. U15A pin 2 is tied to A2 which is high during the first and third four counts from the multiplexing counter, U15B pin 12 is connected to A2 and is high during the second and fourth four counts. So U15A enables the receive latches for the four least significant digits. The two remaining digits from the last group do nothing and are discarded.

4.7.10 TRANSMIT LATCH ENABLE

This circuit consists of 4-input AND gates U18A and U18B, and other circuitry on the counter demuxer board. The transmit latch enable circuit operation is nearly identical to that of the receive latch enable circuit, except that operation occurs during the third and fourth groups of four multiplexer load pulses. U18A enables the transmit latches for the four least significant digits, and U18B enables the transmit latches for the two most significant digits. The remaining two digits in the last group are discarded by circuitry on the Counter Demuxer board.

4.7.11 BAND DECODER

The band decoder processes information from the transmit latches to provide selection of the correct transmit and receive filters for the desired frequency. U21, a 32 word by 8 bit Programmable Read Only Memory (PROM), takes the transmit information from the 1 MHz and 10 MHz latches in five addressing inputs and supplies outputs on seven discrete lines. Output pins 1 through 6 supply data to band switch drivers for bands 1 through 6 respectively. Pin 7 supplies data to the LIMIT driver to disable the transceiver when illegal or out of band frequencies are selected. Band 1 is selected for any 2 MHz frequency, Band 2 for any 3 MHz frequency, Band 3 for any 4 or 5 MHz frequency, Band 4 for any 6, 7, or 8 MHz frequency, Band 5 for any 9, 10, 11, or 12 MHz frequency, and Band 6 for any 13, 14, 15, 16, or 17 MHz frequency. Any combination of non-BCD information on the input pins will cause pin 7 to go high, disabling the radio.

4.7.12 BAND LIMIT DRIVERS

The band limit drivers are U3A, U3B, U6B, U9A, U12A, U12B and transistors Q5 and Q1. One input of each driver package is tied high so that the other input controls the output. Whenever a band is selected by the PROM, the appropriate driver input will go high and the output line will be pulled to ground, selecting the proper filter.

When out of band frequencies are selected (below 2 MHz, or 18, 19 MHz) U6B will be energized, turning on Q1 and applying +12V to the LIMIT line in the radio, disabling both the transmitter and receiver.

An additional transistor, Q5, is attached to the collector output of U6B and is driven from the signal called $\overline{\text{OPERATE MODE}}$, which is high any time the radio is on in the operate mode. When the LOAD mode is selected, this signal turns on Q5 which turns on Q1 applying +12V to the LIMIT line, disabling the unit until loading is complete.

4.7.13 BLANKING OSCILLATOR

The blanking oscillator consists of timer U22 and buffer U20D. The oscillator is disabled except when an illegal or out of band frequency is selected. A high from U21 pin 7 allows C11 to charge through R11 and R12 and the pulsing output (approximately 1 Hz) on U22 pin 3 is buffered by U20D and is sent to the blanking control on the Panel Control Board to turn the display on and off. The oscillator will continue to run until a legal frequency is stored in the transmit latches.

4.8 COUNTER DEMUXER BOARD 1A10

Refer to Figure 5.26

4.8.1 GENERAL

The Counter Demuxer board contains input programming counters and enable circuits used to select input frequencies to be loaded in the memory from the front panel, a counter oscillator circuit to drive the input counters, and input buffer which is used to multiplex the input counter information into the memory, a portion of the Input Buffer Mixing Enable Control, a portion of the Transmit Latch Enable Circuit, and the transmit latches used to store the transmitting frequencies that are demultiplexed out of the memory circuit.

4.8.2 COUNTER OSCILLATOR

The counter oscillator circuit consists of timer U1 and associated components. The timer is connected so that the output is a continuous pulse train at approximately 2 Hz. The high state lasts for slightly less than ½ a second, with the low pulse lasting about 100 µsecs. The counter oscillator drives the input counters to give two digits change per second.

4.8.3 INPUT COUNTERS AND ENABLE CIRCUIT

This circuit is comprised of counters U2A, U2B, U3A, U3B, U4A and U4B, and Schmitt trigger inverter U18E. The input to the Schmitt trigger, $\overline{\text{POWER CLEAR}}$, is low for one half second after the power is turned on to reset all the counters to their zero output state. After the one half second low $\overline{\text{POWER CLEAR}}$, this will go high and allow the counters to function normally as long as the radio is on. The counter input enable pins go to their respective digit pushbuttons located directly beneath the appropriate digit on the front panel display. Since a high state is required on the input enable to allow the counters to operate, the pushbutton switches are wired normally closed and connected to ground. When a button is then pushed, the ground is removed and the pull up resistor on the enable input supplies the high state.

Each counter produces a full range of BCD outputs from 0 through 9 before rolling over to 0 and repeating the count. Each counter operates independently of all the other counters, so that the digit controlled by each counter can be displayed on the front panel when in the LOAD mode. The 10 MHz counter is connected only to the Q0 output of U2B so the left most digit only cycles between a blank and a "1". Depressing a counter button allows the displayed number to advance until the button is released, giving the desired number.

The counter outputs are isolated from the output buffer board by buffers U19A through F, U20A through F, U21A through F, and U22D, E, and F.

4.8.4 INPUT BUFFER CIRCUIT

The input buffer circuit includes tri-state buffers U5A and B, U6A and B, U7A and B and U8A and B. The output BCD pins of all of the counter buffers are tied in parallel, least significant bit to least significant bit through most significant to most significant bit. These six groups of 4 BCD outputs create the parallel 4-bit data bus called Data 1, Data 2, Data 4 and Data 8. The information on the buses is dependent on the set of tri-state buffers enabled during any given period of time, while all other tri-state buffers are in their high impedance output state. To enable the contents of the 100 Hz counter, U8A pin 1 must be low while all other enables must be high. To enable the 1 KHz information, U7B pin 15 and U8B pin 15 (tied in parallel) must be low while all other buffer enables are high, and so on. So, by sequentially grounding the 100 Hz enable through the 10 MHz enable, each counter output can be placed on the data bus sequentially from least significant digit to most significant digit.

4.8.5 INPUT BUFFER MUXING ENABLE CONTROL

This circuit is comprised of dual binary to 1 of 4 decoders U9A and U9B, and Schmitt trigger inverters U17C and U17F. Both U9A and U9B are driven by A0 and A1 signals, which are functions of the Q1 and Q2 outputs of the multiplexing counter on the Panel Control Board. During the 16 count multiplexing counter output, A0 will be high 8 times and low 8 times. A1 runs at half the speed of A0 so will be low 4 times and high 4 times during the counting sequence. Since only one decoder may be on at a time, the undesired decoder is shut off by the ENABLE pin, U9 pin 1 or pin 15 through Schmitt trigger inverters U17C and F, using the data from the Least Significant Input Demuxer and the Most Significant Input Demuxer circuits on the Memory Band board. So, during the four least significant digits, U9A will enable through U17F, and for the two most significant digits, U9B is enabled through U17C.

The frequency data is enabled twice during the 16 count multiplexing sequence whenever either load pushbutton is depressed. The READ/WRITE circuit on the memory board determines which memory section the data is to be entered into. If the RECEIVE LOAD pushbutton was depressed, only the first 8 digits of the 16 digit sequence would be enabled for storage into memory. If the TRANSMIT LOAD pushbutton was depressed, only the second 8 digits of the 16 digit sequence would be stored.

4.8.6 TRANSMIT LATCH ENABLE

The transmit latch enable circuit includes dual binary to 1 of 4 encoders U10A and U10B, and Schmitt trigger inverters U17A, U17B, U17D, and U17E. The operation of this circuit is very similar to that just described for the Input Buffer Muxing Enable Control. The LS transmit latch demuxer signal from the Memory Band board is group of four positive, 400 microsecond wide, pulses which occur during the 9th through 12th address outputs of the multiplexing counter on the Panel Control Board. This signal drives U10B enable on pin 15 through U17D during the above times. The MS Transmit Latch Demuxer signal is also an identical group of four pulses which occur during the last four outputs of the Multiplexing counter. This signal drives U10A enable on pin 1 through U17F during the last four counts.

As each pulse is fed to U10B during the 9th through 12th digit sequence, the output ports increment one at a time to enable first the 100 Hz transmit latch, then the 1 KHz transmit latch, then the 10 KHz transmit latch, and so on up to the 10 MHz transmit latch. The pulses occur in the middle of specific transmit memory locations, so the information present at those memory locations is transferred to the transmit latches.

4.8.7 TRANSMIT LATCHES

The transmit latch circuit consists of 4-bit latches U11, U12, U13, U14, U15, and U16 and Schmitt trigger inverters U18A, U18B, U18C, and U18F. The Schmitt triggers act merely as buffers for the data from memory as it enters the latches. The latches are enabled from their clock inputs, pin 5, so that when the clock input goes low, the data on the input to the latches is entered into the latch. Then, when the clock port returns high, this data is permanently held in the latch until another clock pulse occurs on pin 5. Only one clock port is energized at a time in sequence of least significant digit to most significant digit. So as the data stream comes from the memory, it is channeled into the appropriate transmit latch. In this way, the bit stream has been converted to a parallel format for use by the synthesizer and the front panel display when the keyline is depressed.

4.9 OUTPUT BUFFER BOARD 1A11

Refer to Figure 5.27

4.9.1 GENERAL

The Output Buffer board contains the receive latches, receive buffers, input load buffers, transmit buffers, output drivers, and part of the receive latch enable circuit. The receive latch enable and receive latch circuits are similar in operation to the transmit latch enable and transmit latch circuits on the Counter Demuxer board. The receive buffer, input load buffer, and transmit buffer permit selection of the frequencies stored in the latches on the input frequency from the input counter, to be sent to the synthesizer and the front panel display.

4.9.2 RECEIVE LATCH ENABLE

The receive latch enable circuit consists of binary to 1 of 4 decoders U18A and U18B, and Schmitt trigger inverters U16A, U16C, U16D, and U16E. The LS Receive Latch Demuxer Signal from the Memory Band board is a group of four positive, 400 microsecond wide, pulses which occur during the first four address outputs of the multiplexing counter. This signal drives the U18B $\overline{\text{ENABLE}}$ on pin 15 through U16E during the first four pulses. U18B decodes these pulses to enable, in turn, the 100 Hz receive latch through the 100 KHz receive latch.

The MS Receive Latch demuxer signal is a group of four pulses, the same as above, which occur during the 5th through 8th address outputs of the multiplexing counter. This signal drives the U18A $\overline{\text{ENABLE}}$ on pin 1 through U16C during this time. U18A decodes these pulses to enable, in turn, the 1 MHz receive latch and the 10 MHz receive latch. The two remaining pulses are not used. The pulses occur in the middle of specific receive memory locations, so the information present at those memory sites is transferred to receive latches.

4.9.3 RECEIVE LATCHES

The receive latch circuit is comprised of 4-bit latches U19, U20, U21, U22, U23, and U24, and Schmitt trigger inverters U17B, U17C, U17D, and U17E. The Schmitt triggers buffer the memory data into the latches. These latches, as the transmit latches on the Counter Demuxer board, are enabled from their pin 5 clock inputs. When the clock input goes low, the data on the input to the latch is entered into the latch. Then, when the clock input returns high, the data is held in the latch until another clock pulse occurs on its pin 5. Only one clock port at a time is energized in a sequence of least significant digit through most significant digit.

As the data stream comes from memory, it is channeled into the appropriate receive latch. So the data stream is, in this way, converted to a parallel format for use by the synthesizer and front panel display.

4.9.4 RECEIVE BUFFER

The receive buffer consists of tri-state buffers U9A, U10A and B, U11A and B, U12 and Schmitt trigger inverter U16B. The Schmitt trigger is tied to the enable inputs of the receive tri-state buffers. When the enable ports are low, the units act as buffers transferring the input logic levels to their respective outputs. when the enable ports are high, all of the tri-state buffer outputs go into a high impedance state so the output lines are not loaded.

The Schmitt trigger U16B is controlled by the Enable Receive Buffers signal which originates on the Memory Band board. This signal is high whenever the radio is in the operate mode, and neither the keyline nor the LOAD TRANSMIT pushbutton is depressed.

4.9.5 INPUT LOAD BUFFER

The input load buffer is comprised of tri-state buffers U5, U6, U7, U8, and U9, and Schmitt trigger inverter U16F. The input to U16F originates on the Memory Band board and is called LOAD MODE. This signal is high whenever the MODE switch is in the LOAD position, enabling the tri-state buffers. When the tri-state buffers are turned on, the counters on the Counter Demuxer board are transferred to the common data bus which controls the synthesizer and the front panel display. When load mode is not selected, these tri-state buffers present a high impedance to the data bus to eliminate loading of the lines.

4.9.6 TRANSMIT BUFFER

The transmit buffer is made up of tri-state buffers U8A, U13, U14 and U15, and Schmitt trigger inverter U17F. The input to U17F is driven by the Enable Transmit Buffers signal, which is generated on the Memory Band board. This signal is high whenever the radio is in the operate mode and either the keyline or the LOAD TRANSMIT pushbutton is depressed. When energized, the tri-state buffers transfer the data on the transmit latch outputs to the common data bus line to control the synthesizer and the front panel display. When not enabled, the tri-state buffers revert to a high impedance state to eliminate loading on the data bus.

4.9.7 OUTPUT DRIVERS

The tri-state low power Schottky TTL drivers, U1, U2, U3 and U4 require very low currents at their inputs for proper operation, making them capable of being driven by CMOS devices and still providing adequate output current to control the synthesizer and the TTL inputs on BCD to 7 segment display drivers located on the Panel Control board.

4.10 MOTHER BOARD 1A1A1

Refer to Figure 5.12

4.10.1 GENERAL

The mother board provides interconnection for the transceiver plug-in boards. Almost all interconnection within the radio is done on the motherboard, keeping wiring to an absolute minimum. Inductor L1 and capacitor C6 (sheet 2) filter the incoming DC line to remove transients or conducted audio frequencies. Transistor Q1 (Sheet 1) is in the display dimmer amplifier used to control the intensity of the LED Display.

4.11 FRONT PANEL 1A12

Refer to Figure 5.28

4.11.1 GENERAL

The front panel provides all control to the transceiver for frequency programming, VOLUME, CLARIFIER, SQUELCH, channel selection, and coupler TUNE enable. A dimmer control allows variation of the display intensity from fully on to fully off.

4.12 DISPLAY BOARD 1A12A1

Refer to Figure 5.29

The Display board contains six 7-segment LED display packages. These displays are high intensity to provide daylight visibility.

4.13 FILTER MODULE 1A7

Refer to Figure 5.19

The Filter Module contains the transmitter low pass filters and switching circuit and interface board.

4.13.1 FILTER ASSEMBLY

The Filter Assembly includes the odd

channel filter board (1A7A3), the even channel filter board (1A7A2), the ALC/ACC detector board (1A7A4), and the channel motor and its control circuitry.

4.13.2 ODD CHANNEL BOARD 1A7A3

Refer to Figure 5.22

The Odd Channel board contains the elliptical low pass filters for bands 1, 3, and 5. Band 1 operates from 2 to 3 MHz, Band 3 operates from 4 to 6 MHz, and Band 5 operates from 9 to 13 MHz.

4.13.3 EVEN CHANNEL BOARD 1A7A2

Refer to Figure 5.21

The Even Channel filter board contains the elliptical low pass filters for bands 2, 4, and 6. Band 2 operates from 3 to 4 MHz, Band 4 operates from 6 to 9 MHz, and Band 6 operates from 13 to 18 MHz.

4.13.4 ALC/ACC DETECTOR BOARD 1A7A4

Refer to Figure 5.23

This board contains three detectors: the voltage automatic level control (ALC) detector to limit transmitter voltage output; the automatic carrier control (ACC) detector used to keep the AM carrier level constant; the reflected power detector to protect the power amplifier in the event of a short or open circuit on the output. Capacitor C1 compensates the ALC detector for changes due to frequency. This is normally set at the factory and should not require readjustment in the field.

Capacitor C5 adjusts the balance on the reflected power bridge to provide zero output when the load is a pure 50 ohm resistive load. This detector has no effect on radio operation until the VSWR exceeds 2:1. Above this point, it rapidly decreases drive to the power amplifier to keep transistor power dissipation within safe limits.

4.13.5 MOTOR CONTROL BOARD 1A7A5

Refer to Figure 5.19

This board contains the open-seeking wafer S1A, which controls the RF filter band motor, the motor control relay K1, and a motor hash filter, C1, C2 and L1.

4.13.6 RELAY BOARD 1A7A6

Refer to Figure 5.19

This board contains the Transmit/Receive antenna switchover relay K2.

4.13.7 INTERFACE BOARD 1A7A1

Refer to Figure 5.20

The Interface board contains the ALC and ACC control circuits and the main transmit/receive relay K1. This relay switches all necessary voltages when the radio goes from receive to transmit.

Transistor Q1 is the ACC tailoring amplifier which removes the modulation from the detector signal and supplies a DC voltage proportional to average transmitted power. This voltage is inverted by Q2 and fed to Q5. Transistor Q5 conducts through R22, reducing the voltage output on 1A7A1 P2 pin M which controls the gain of transmit IF amplifier 1A4Q2 on the Second Mixer board, 1A4. Inputs from the reflected power detector and the power amplifier VSWR detector also act on Q5 to reduce transmitter gain. The ACC control circuits are energized only in AM transmit mode.

Transistor Q3 and Q4 are current amplifiers for the voltage ALC circuit. Output from the voltage ALC detector charges capacitor C3 rapidly through Q3 and Q4. Between syllables and words, C3 must discharge through R18 and R19, giving a slow decay. The ALC voltage turns on transistor Q8 which conducts through R22, reducing the gain of transmit amplifier 1A4Q2. The emitter-base junction voltage of Q8 is temperature compensated by Q6 to provide constant transmitter output over the temperature range of -46°C to +55°C. Transistor Q7 shuts off the ALC during AM operation to prevent interaction with the ACC. ALC may be monitored at the test point TP1.

Transistor Q9 receives its base input from the current ALC detector on the power amplifier. If the current exceeds a preset level, Q9 is turned on, controlling the gain of 1A5Q4 on the First Mixer board 1A5. A prebias is placed on the base of Q9 during receive to shut down 1A5Q4 during T/R switching, eliminating transients in the output. CR5 charges C6 to 12 VDC during receive. Then upon switching to transmit, C6 must discharge through R27, keeping Q9 turned on for approximately 10msec.

The Interface Board plugs into the filter assembly and subsequently plugs into the Motherboard.

4.14 RF POWER AMPLIFIER 1A2

Refer to Figure 5.13

4.14.1 GENERAL

The power amplifier consists of three push-pull stages; predriver, driver and output. The predriver amplifies the 10 milliwatt exciter output to approximately 1 watt, the driver amplifies this to the 10 watt level, and the output stage amplifies to the 100 watt level.

4.14.2 PREDRIVER, DRIVER AND POWER AMPLIFIER

Input from the exciter is connected to 1A2J1 by a coaxial cable from the Motherboard. Transformer T1 converts the single ended exciter input to push-pull, to drive predriver transistor Q1 and Q2. Bias for the predriver (for AB2 operation) is taken from CR1, which is in a forward conduction state. C2, L6, R4 and C3, L7, R5 are feedback networks for gain stabilization. The driver Q3 and Q4 is driven push-pull through T2, and obtains its bias from CR2 and associated circuitry. R10, C10 and R12, C11 are feedback networks for gain stabilization. The output stage Q5 and Q6, is fed push-pull through T4 and obtains its bias from CR3. R23 allows the bias voltage to be varied to provide the optimum no-signal idle current for minimum cross-over and intermodulation distortion in the output stage. All bias lines are tied together and are energized only in transmit mode to minimize receive power dissipation. The push-pull output from Q5 and Q6 is transformed to single ended output at 50 ohms by T6.

4.14.3 CURRENT ALC DETECTOR

Transistor Q7 monitors the voltage across resistor R24, which is proportional to the current drawn by the amplifier (primarily the output stage). The values of R18 and R19 have been chosen to cause Q7 to conduct heavily when a current of 10.5 amperes flows through R24. When Q7 conducts, a voltage appears across R33. This voltage is connected to the Interface board 1A7A1 where it controls the gain of the power amplifier driver on the First Mixer Board 1A5.

4.14.4 VSWR ALC DETECTOR

A detector circuit, C26, R30, R31, CR4, C28, is coupled to the collector of Q6 to monitor peak collector voltage. If the voltage should exceed 70V peak (normally caused by high VSWR to the PA itself), the voltage appearing at pin D of the PA power connector causes the VSWR ALC amplifier on the Interface board 1A7A1 to reduce the transmit IF gain (on the Second Mixer Board) to within safe limits on the output transistor collectors.

4.15 VOLTAGE REGULATOR SUBASSEMBLY 1A2A1

Refer to Figure 5.14

The 18V regulator U1, and its high current pass element Q8, the 12 V regulator U2, and its high current pass element Q9, and the 5 V regulator U3, are all physically mounted on the heatsink. The 18V regulator U1 and Q8, is limited to approximately 5 amps, which effectively limits the current in the low level stages of the transceiver.

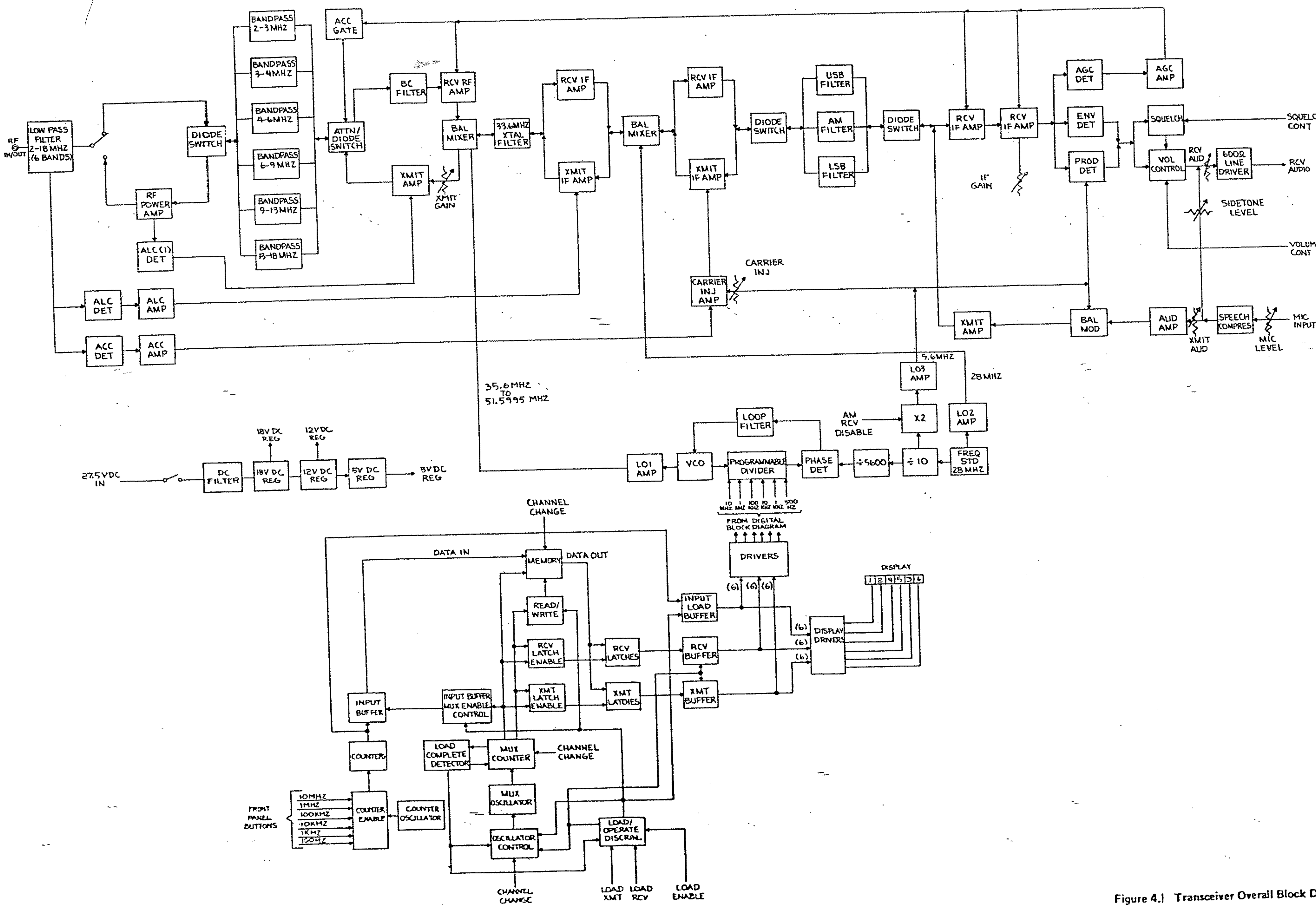


Figure 4.1 Transceiver Overall Block Diagram

SECTION V

MAINTENANCE AND REPAIR

5.1 GENERAL

This section provides test procedures for routine maintenance and evaluation of overall performance. A fault analysis table is included to aid the repairman in isolating a fault to the defective printed circuit board or subassembly.

5.2 PREVENTATIVE MAINTENANCE

The equipment should be periodically inspected internally for loose or damaged components; kinked, frayed or broken wires; and loose hardware. All cable connections should be checked for mating.

5.3 COVER REMOVAL

To expose the plug-in printed circuit cards, remove the top cover. To do this, remove four (4) screws, unsnap two fasteners on each side of unit, and list off cover.

To expose the motherboard, remove the bottom cover. To do this, remove 14 screws from sides and bottom, and lift off cover.

5.4 PERFORMANCE TEST

5.4.1 GENERAL

The intent of these test procedures is to provide an alignment procedure and sequence for the SNR-601.

5.4.2 TESTS

Preliminary adjustments and tests begin with section 5.4.5.

5.4.3 TEST EQUIPMENT REQUIRED

a) VOM (Volt Ohm Meter).
b) Voltmeter
c) RF Voltmeter
d) RF Sampling Network
e) Oscilloscope
f) Oscilloscope X10 probe
g) Oscilloscope Probe Tip Adapter
h) Frequency Counter
i) Audio Signal Generator
j) RF Signal Generator
k) Rf Dummy Load
l) IN-Line RF Fuse
m) Power Cord
n) Extender cards
o) Microphone
p) CW Key (shorted plug), refer to Figure 5.5
q) 150 Audio Load, refer to Figure 5.6
r) Mic Key (shielded), refer to Figure 5.7.

5.4.4 FIGURES AND ILLUSTRATIONS

Figures 5.1 thru 5.11 will assist you in the procedures to follow.

5.4.5 PRELIMINARY ADJUSTMENTS

a) Set the following transceiver front panel controls as follows:

DIM: Fully CW
CHANNEL: 1
MODE: LOAD
VOLUME: Fully CCW
CLARIFIER: Center of rotation and pushed in.
SQUELCH: Fully CW

b) Insure that S1 and S2 located on the Panel Control Board are not in the "DISABLE" position.

c) Preset the following pots:

1A3R90: Fully CW
1A4R32: Fully CW
1A5R34: Set Fully CW and then back-off approximately 10° CCW.

5.4.6 INITIAL POWER UP

a) Energize transceiver by turning VOLUME control CW.
b) Frequency display readouts may partially come "ON".
c) Measure the following voltages on the motherboard:

J18-B: 11.2 to 12.8 VDC
J18-C: 27.5 to 28.2 VDC
J18-E: 4.8 to 5.2 VDC
J18-F: 12.5 to 13.5 VDC
J18-H: 17.5 to 18.5 VDC

5.4.7 FRONT PANEL DIGITAL DISPLAY

a) Display Counter Sequencing

1. Set mode switch to LOAD. Transceiver front panel meter will go to FULL SCALE.
2. Press the 10 MHz button (directly under the 10 MHz display). Display will cycle between BLANK and 1. Release the 10 MHz button.
3. Press the 1 MHz button. Display will increment from 0 to 9 and will repeat(cycle count sequence one time). Release 1 MHz button.
4. Repeat step 3. for the remaining four frequency buttons.
5. Set mode switch to CW. S Meter will return to minimum.
6. Press the 10 MHz, 1 MHz, 100 KHz, 1 KHz and .1 KHz frequency buttons. Display should not change.

b) Display Disable

1. Set 1A8S1 Display Disable Switch to DISABLE. Display will go off. Return switch to normal.

c) Dimmer Control

1. Rotate the DIM control on the front panel fully CCW. Display will go out.
2. Slowly rotate the DIM control CW. Display will gradually increase in intensity.

5.4.8 FREQUENCY LOADING AND MEMORY FUNCTIONS

a) Memory Loading
1. Set the mode switch to LOAD. Set the channel switch to 1.
2. Enter 01000.0 into the display. Momentarily press LOAD REC button.
3. Enter 02000.0 into the display. Momentarily press LOAD XMIT button.
4. Enter 03000.0 into the display.
5. Set the mode switch to CW. Display will read 01000.0.
6. Press LOAD XMIT button. Display will read 02000.0.
7. Release LOAD XMIT button. Display will return to 01000.0.

b) Load Disable

1. Set the mode switch to LOAD. Display will read 03000.0.
2. Set 1A8S2 Load Disable Switch to DISABLE. Display will change 01000.0.
3. Momentarily press the 10 MHz, 1 MHz, 100 KHz, 10 KHz, 1 KHz, and .1 KHz buttons. Display does not change.
4. Momentarily press the LOAD REC button. Display should not change.
5. Momentarily press the LOAD XMIT button. Display will momentarily change to 02000.0.
6. Return 1A8S2 Load Disable Switch to normal. Display may change to some undetermined readout.
7. Set the mode switch to CW. Display will read 01000.0.
8. Momentarily press LOAD XMIT button. Display will momentarily read 02000.0 and return to 01000.0.

c) Low Frequency Limit

1. Set the channel switch to 2. Set the mode switch to LOAD. Enter 01000.0 into the display. Momentarily press LOAD XMIT button.
2. Set the mode switch to CW. Display will BLINK.

NOTE

The out of frequency range display blinking will occur when a frequency of 1.9999 MHz or lower, or 18.0000 MHz or higher is loaded into the XMIT memory and the transceiver set to the CW, AM, USB, or LSB mode.

d) HIGH FREQUENCY LIMIT

1. Set the channel switch to 3. Set the mode switch to LOAD. Enter 18000.0 into the display. Momentarily press LOAD XMIT button.
2. Set the mode switch to CW. Display will BLINK.

e) MEMORY RETENTION (POWER OFF)

1. Set mode switch to CW. Set channel switch to 1. Display will read 01000.0.
2. Deenergize transceiver for about 30 seconds. Reenergize transceiver. Display will read 01000.0. Press LOAD XMIT button. Display will read 02000.0. Release LOAD XMIT button.

5.4.9 CHANNEL PRESETS

a) Set the mode switch to LOAD.

b) Load the following frequencies into the transceiver memory:

CH1	02000.0KHz RX	02998.0KHz TX
CH2	03000.0KHz RX	03998.0KHz TX
CH3	04000.0KHz RX	05998.0KHz TX
CH4	06000.0KHz RX	08998.0KHz TX
CH5	09000.0KHz RX	12998.0KHz TX
CH6	13000.0KHz RX	17998.0KHz TX
CH7	17995.0KHz RX	17995.0KHz TX
CH8	02185.0KHz RX	02185.0KHz TX
CH9	02185.5KHz RX	02185.5KHz TX
CH10	05805.0KHz RX	05805.0KHz TX
CH11	16969.6KHz RX	16969.6KHz TX
CH12	09696.9KHz RX	09696.9KHz TX

c) Enter 00000.0 into display.

d) Set the mode switch to USB.

e) Check all the frequencies loaded into memory.

NOTE

With the channel switch on channel 1, the REC frequency is displayed, pressing the LOAD XMIT button will display the channel 1 XMIT frequency 02998.0KHz.

5.4.10 FREQUENCY STANDARD CALIBRATION AND L.O. FREQUENCIES AND LEVELS

NOTE

For the LO frequency and voltage level measurements, connect the frequency counter to the oscilloscope (vertical output) and use the probe tip adapter.

a) Set the transceiver to USB mode and channel 1 (02000.0/02998.9KHz)

b) Frequency Standard and Second L.O.

1. Measure the second LO frequency (frequency standard) and voltage level at E40 (bottom side of motherboard). The second LO frequency should be 28 MHz $\pm$ 2 Hz, if necessary, adjust (1A6) frequency standard to bring the second LO to within $\pm$ 2 Hz.

NOTE

Do not attempt to calibrate frequency standard unless transceiver has been energized for at least 5 minutes prior to making any adjustments.

2. Record frequency, 28 MHz $\pm$ 2 Hz. Record voltage level, 450mv p/p to 550mv p/p.

c) Third L.O.

1. Measure the third L.O. frequency and voltage level at E30 (bottom side of the motherboard).
2. Frequency, 5.6 MHz $\pm$ 1 Hz. Record voltage level, 300mv p/p to 500mv p/p.

d) First L.O.

1. Measure the First L.O. frequency and voltage level at E46 (bottom side of motherboard).
2. Frequency, 35.6 MHz $\pm$ 3 Hz. Record voltage level, 0.7v p/p to 1.5v p/p.

5.4.11 RECEIVER ALIGNMENT

Connect transceiver and test equipment as shown in Figure 5.4.

5.4.12 IF GAIN ADJUSTMENT (AGC SETTING)

a) Connect transceiver and test equipment as shown in Figure 5.4.

b) Set the RF Generator to 17.995MHz, AM, 1 KHz @ 30% modulation, 250mv.

c) Set the transceiver to AM, channel 7 (17995.0 KHz), squelch fully CW. Place assembly 1A3 on an extender card, and volume fully CW.

d) Peak the RF Generator frequency for maximum transceiver audio output.

e) Adjust the transceiver volume control for 0 db of audio output.

f) Decrease the RF Generator output level to 5.0µv.

NOTE

Continue peaking the RF Generator frequency for maximum audio output while decreasing the RF Generator output level.

1. Adjust 1A3R4 for an 8 db decrease of transceiver audio output.
2. Remove assembly 1A3 from the extender card and replace into radio.

5.4.13 AF GAIN ADJUSTMENT

a) Set the RF Generator to 2.186 MHz, CW, 10µv.

b) Set the transceiver to USB, channel 8 (02185.0 KHz), volume control fully CW.

c) Peak the RF Generator frequency for maximum transceiver audio output.

d) Adjust 1A3R16 for 2.5vrms min. of transceiver audio output.

5.4.14 CLARIFIER OPERATION AND FREQUENCY RANGE

a) Set the RF Generator to 2.186 MHz, CW, 10µv.

b) Set the transceiver to USB and channel 8 (02185.0 KHz).

c) Using the transceiver volume control, set the transceiver audio output level to 2.5 vrms.

d) Slowly vary the RF generator frequency until the transceiver audio output frequency is 1 KHz.

e) Pull out the clarifier knob:

1. Clarifier lamp will come on. Transceiver audio output frequency on frequency counter should read between 930 to 1070 Hz.
2. Rotate the clarifier control fully CW. Transceiver audio output frequency on frequency counter should increase by 75 Hz or more.
3. Rotate the clarifier control fully CW. Transceiver audio output frequency on frequency counter should decrease by 75 Hz or more from the reading of step 1.
4. Push in the clarifier control knob.

5.4.15 BANDWIDTH AND BANDPASS RIPPLE MEASUREMENTS

a) USB Bandwidth Measurement

1. Set the RF Generator to 2.186 MHz, CW, 0.5µv.
2. Set the transceiver to USB and channel 8 (2185.0 KHz).
3. Peak the RF Generator frequency for maximum transceiver audio output. Using the transceiver volume control, set the audio output level -10db.
4. Find the upper 6 db point by slowly increasing the RF Generator frequency until the audio output level drops by 6 db. Record the frequency of the upper 6 db point.
5. Find the lower 6 db point by slowly decreasing the RF Generator until the audio output level drops by 6 db. Record the frequency of the lower 6 db point.
6. The USB bandwidth is 2.2 KHz minimum and is the difference between the frequencies recorded in step 4 and 5. Record the USB bandwidth.

b) USB Bandpass Ripple Measurement

1. Slowly vary the RF Generator frequency between the upper and lower 6 db points, while observing the audio output level.
2. The variation from minimum to maximum audio output level (excluding the two 6 db end points) is the bandpass ripple and must not exceed 5.0 db.
3. Record the USB bandpass ripple.

c) LSB Bandwidth Measurement (OPTIONAL)

1. Set the RF Generator to 2.184 MHz, CW, 0.5µv.
2. Set the transceiver to LSB and channel 8 (2185.0 KHz).
3. Peak the RF Generator frequency for maximum transceiver audio output. Using the transceiver volume control, set the audio output level to -10db.
4. Find the upper 6 db point and record frequency on frequency counter.
5. Find the lower 6 db point and record frequency on frequency counter.
6. The LSB bandwidth is 2.2 KHz minimum and is the difference between the frequencies recorded in steps 4 and 5. Record LSB bandwidth.

d) LSB Bandpass Ripple Measurement (OPTIONAL)

1. Slowly vary the RF Generator frequency between the upper and lower 6 db points, while observing the audio output level.
2. The variation from minimum to maximum audio output level (excluding the two 6 db end points) is the bandpass ripple and must not exceed 5.0 db.
3. Record the LSB bandpass ripple.

e) AM Bandwidth Measurement

1. Set the RF Generator to 2.185 MHz, AM, 1 KHz @ 30%, 3.0µv.
2. Set the transceiver to AM and channel 8 (2185.0 KHz).
3. Peak the RF Generator frequency for maximum transceiver audio output. Using the transceiver volume control, set the audio output level to -10db.
4. Find the upper 6 db point. Record the RF Generator frequency.
5. Find the lower 6 db point. Record the RF Generator frequency.
6. The AM bandwidth is 5 KHz minimum and is the difference between the frequencies recorded in step 4 and 5. Record the bandwidth.

5.4.16 RECEIVE FREQUENCY RESPONSE AND SIGNAL TO NOISE MEASUREMENTS

a) Set the RF Generator to 2.001 MHz, CW, 0.5µv.

1. Set the transceciver to USB and channel 1 (02000.0/2.998.0 KHz).
2. Using the transceiver volume control, set the audio output level to -10db.
3. Disconnect the RF cable from the RF Generator. The audio output level

will drop off by 10 db or more.
4. Reconnect the RF cable to the RF Generator.

b) Set the RF Generator to 2.999 MHz.

1. Set the transceiver to USB.
2. Press the LOAD XMIT BUTTON, transceiver will display 02998.0.
3. With the LOAD XMIT button depressed, use the transceiver volume control to set the audio output level to -10db.
4. With the LOAD XMIT button depressed, disconnect the RF cable from the RF Generator. The audio output level will drop off by 10 db or more.
5. Release the LOAD XMIT button and reconnect the RF cable to the RF Generator.

5.4.17 ADJACENT SIDEBAND REJECTION (OPTIONAL)

a) LSB Rejection

1. Set the RF Generator to 2.187MHz, CW, 0.5µv.
2. Set the transceiver to USB and channel 9 (02185.5 KHz).
3. Using the transceiver volume control, set the transceiver audio output level to -10 db.
4. Reset the RF Generator to 2.184 MHz.
5. Increase the RF Generator output level until the transceiver audio output level comes up to approximately -10 db.
6. The change in RF output level in db is the adjacent sideband rejection and should exceed 50 db. Record.

b) USB Rejection

1. Set the RF Generator to 2.184 MHz, CW, 0.5µv.
2. Set the transceiver to LSB and channel 9 (02185.5 KHz).
3. Using the transceiver volume control, set the transceiver audio output level to -10 db.
4. Reset the RF Generator to 2.187 MHz.
5. Increase the RF Generator output level until the transceiver audio output level comes up to approximately -10db.
6. The change in RF output level in db is the adjacent sideband rejection and should not exceed 50 db.

5.4.18 IF REJECTION

a) First IF Rejection (33.6) MHz.

1. Set the RF Generator to 17.996 MHz, CW, Vernier, 0.5µv.
2. Set the transceiver to USB and channel 7 (17.995.0).
3. Peak the RF Generator frequency for maximum audio output.
4. Using the transceiver volume control, set the transceiver audio output level to -10db.
5. Reset the RF Generator to 33.6 MHz and CW. Increase the RF Generator output level until the transceiver audio output level comes up to approximately -10db.
6. The change in RF output level should exceed 80 db. Record.

b) Second IF Rejection (5.6 MHz)

1. Set the RF Generator to 5.806 MHz, CW, 0.5µv.
2. Set the transceiver to USB and channel 10 (05805.0 KHz).
3. Peak the RF Generator frequency for maximum audio output.
4. Using the transceiver volume control, set the transceiver audio output level to -10db.
5. Reset the RF Generator to 5.599 MHz, CW. Increase the RF Generator output level until the transceiver audio output level come up to approximately -10db. The change in RF output level should exceed 70 db. Record.

5.4.19 SQUELCH ADJUSTMENT AND OPERATION

a) Squelch Adjustment

1. Set the RF Generator to 5.805 MHz, AM, 1 KHz @ 50%, 40 µv.

2. Set the transceiver to AM, channel 10 (05805.0 KHz), squelch fully CW.
3. Adjust 1A3R110 so that the squelch breaks in at this setting of the RF Generator (40µv).
4. Check squelch operation (AM Mode) by reducing the RF Generator output level to 10 µv and then slowly increasing the RF Generator output level until the squelch breaks.
5. The squelch should break between 30 to 50 µv of RF Generator output. Record.
6. Rotate squelch fully CW.

b) USB Squelch Operation

1. Set the RF Generator to 5.806 MHz, CW, 5µv.
2. Set the transceiver to USB, channel 10 (05805.0 KHz), squelch fully CW.
3. Peak the RF Generator frequency for maximum transceiver audio output.
4. Rotate the transceiver squelch control fully CCW. Transceiver will mute.
5. Slowly increase the RF Generator output until the squelch breaks.
6. The squelch should break between 30 to 50 µv. Record.
7. Rotate squelch control fully CW.

5.4.20 "S" METER CALIBRATION CHECK

a) Set the RF Generator to 5.806 MHz, CW, 100µv.

b) Set the Transceiver to USB, channel 10 (05805.0 KHz) and squelch fully CW.

c) "S" meter will read 9 or more.

5.4.21 TRANSMITTER ALIGNMENT

Connect transceiver and test equipment as shown in Figure 5.8.

5.4.22 VSWR ALC ADJUSTMENT

a) Set the transceiver to USB and channel 7 (17995.0 KHz).

b) Modulate the transceiver by applying 500 Hz and 2400 Hz audio signals of equal amplitude and a combined amplitude level of 0.20 vrms to the transceiver MIC input.

c) Key transmitter. Measure the VSWR ALC voltage at 1A1A1J17-H. Adjust 1A7A1C5 for a null in the VSWR voltage (.5 vdc max). Record the VSWR ALC voltage.

d) Temporarily disconnect the dummy load from the transceiver. The VSWR ALC voltage should rise to 1.5 VDC. Record VSWR ALC voltage (dummy load disconnected).

e) Unkey transmitter. Reconnect dummy load to transceiver.

5.4.23 ALC Adjustment

a) Set the transceiver to USB and channel 8 (2185.0 KHz).

b) Modulate the transceiver as in step 5.4.22.b.

c) Key transmitter. Adjust 1A7A1R19 for 71 vrms transceiver RF output. Unkey transmitter.

d) Set the transceiver to channel 7 (17995.0 KHz).

e) Key transmitter. Adjust 1A7A4 C1 for 71 vrms transceiver RF output.

1. Adjust 1A3R58 for 5.5 VDC measured at 1A7A1TP1.
2. Unkey transmitter.

NOTE

If unable to obtain 71 vrms in steps 5.4.23.c and 5.4.23.e, then increase the setting of 1A5R34 and repeat steps 5.4.23.a through e.2.

5.4.24 CARRIER SUPPRESSION

NOTE

For carrier suppression adjustments, use a shorted MIC connector (pin A shorted to pin c) for keying the transmitter. Introduction of unwanted audio noise will make carrier balance adjustments difficult.

a) Set the transceiver to USB and channel 8 (2185.0 KHz).

b) Key transmitter (with no audio input). Adjust 1A3R34 and 1A3C26 for minimum transmitter RF output, less than 2.0 Vpp. (Adjustments R34 and C26 interact and several adjustments are necessary.

NOTE

If unable to obtain less than 2.0 Vpp RF output after several adjustments of 1A3R34 and C26, then back off 1A5R34 an additional 5° CCW. (Steps 5.4.23.a through 5.4.24.b must be repeated after resetting 1A5R34.)

1. Unkey the transmitter.

c) Set mode switch to LSB. (OPTIONAL)

1. Key transmitter. RF output voltage must be less than 2.0 Vpp RF output. If further adjustment of 1A3R34 and C26 is required, then steps 5.4.24.b through 5.4.24.c.1 must be repeated.

d) Unkey transmitter. Record levels from steps 5.4.24.b and 5.4.24.c.1.

5.4.25 TRANSMIT OUTPUT POWER

a) Set the transceiver to USB and channel 8 (2185.0 KHz).

b) Modulate transceiver as in step 5.4.22.b.

c) Key transmitter. RF output voltage should range between 66 vrms to 76 vrms.

d) Unkey transmitter. Record RF output voltage.

(OPTIONAL)
1. Set mode switch to LSB. Key transmitter. RF output voltage should range between 66 vrms to 76 vrms.
2. Unkey transmitter. Record RF output voltage. Set mode switch to USB.

e) Repeat the procedure outlined in steps 5.4.25.a through 5.4.25.c. for channels 2 through 7 and record.

f) Remove the two-tone modulation.

5.4.26 ACC ADJUSTMENT

a) Set the transceiver to AM and channel 7 (17995.0 KHz).

b) Key transmitter. Adjust 1A7A1R1 for 42 vrms of transmitter RF output.

c) Unkey transmitter.

d) Set channel switch to 8 (2185.0 KHz).

e) Key transmitter. RF output voltage should fall between 39 and 44 vrms.

NOTE

If necessary, readjust 1A7A1R1. Then return to step 5.4.26.a. RF output should be 39 to 44 vrms. Continue adjusting 1A7A1 R1 in channels 7 and 8 until the RF output of both channels are between 39 and 44 vrms.

f) Unkey transmitter. Record RF output of steps 5.4.26.b. and 5.4.27.c.

5.4.27 AM CARRIER INJECTION ADJUSTMENT

a) Place the 1A4 Assembly on an extender card.

b) Set the transceiver to AM and channel 7 (17995.0 KHz).

c) Connect VOM, 10 VDC range, to 1A7A1-TP1. Key transmitter. Adjust 1A4R32 for 5.5 VDC at 1A7A1TP1. Recheck steps 5.4.26.a through 5.4.27.c because of interaction of 1A4R32 and 1A7A1R1. Record TP1 voltage setting.

d) Reinstall 1A4 into transceiver.

5.4.28 TRANSMIT AUDIO/AUDIO COMPRESSION LEVELS ADJUSTMENTS

a) Set the transceiver to AM and channel 7 (17995.0 KHz).

b) Single-tone audio modulate transmitter with a 0.100 vrms 1 KHz tone. Key transmitter.

c) Adjust 1A3R56 for approximately 50% modulations (observed on scope).

1. Slowly vary the audio signal generator over its frequency range to find the frequency of maximum modulation (maximum envelope closure). If necessary, back off on 1A3R56 if over modulating.

2. At frequency of maximum modulation, adjust 1A3R56 for 100% modulation.

NOTE

At 100% modulation, decreasing 1A3R56 will cause a decrease in modulation. If, however, decreasing 1A3R56 (CCW rotation) increases modulation, then, this is an indication of over 100% modulation, and 1A3R56 must be backed-off (CCW) and readjusted.

1. Reduce single-tone audio input to 31.5 vrms. Adjust 1A3R90 for 85% modulation (setting modulated waveform for 8 divisions/1 division on scope will give 85% modulation. See Figure 5.9.
2. Repeak audio generator frequency for maximum frequency of modulation, and if necessary, readjust 1A3R90 for 85% modulation.
3. Bring audio generator level back up to 0.1 vrms. If necessary, readjust 1A3R56 for 100% modulation and repeat steps 5.4.15 through 5.4.17.

g) Unkey transmitter.

5.4.29 CW MODE SIDETONE LEVEL ADJUSTMENT

a) Place the 1A8 assembly on an extender card.

1. Connect the 150 ohm load and the RF voltmeter to phone jack.
2. Set the transceiver to CW and channel 7 (17995.0 KHz).

b) Key transmitter with CW key. Adjust 1A8R4 for 0.3 vrms audio output. Transceiver relative power meter should read approximately 1.0.

c) Unkey transmitter. Reinstall the 1A8 in the transceiver.

5.4.30 LOW/HIGH LINE VOLTAGE OPERATION

a) Low Line Voltage Operation (25VDC)

1. Test set-up is the same test set-up used for the transmitter alignment. See Figure 5.8.
2. Set the DC supply voltage to 25 VDC.
3. Set the transceiver to AM and channel 1 (02000.0/2998.0 KHz).
4. Key transmitter (with no audio modulation). RF output voltage should range between 28 vrms and 31 vrms. Repeat the procedure outlined in steps 5.4.30.a.3 and 5.4.30.a.4 for channels 2 through 7. Insure that the filter module cycles for each channel change.
5. Record the worst case voltage output and it's respective frequency from step 4 above.

b) High Voltage Operation (31 VDC)

1. Use the same test set-up used for low line voltage operation (step 5.4.30.1).
2. Set the DC supply voltage to 31 VDC.
3. Set the transceiver to AM and channel 1 (02000.0/2.998.0 KHz).
4. Key transmitter (with no audio modulation). RF output voltage should range between 28 vrms and 31 vrms. Repeat the procedure outlined above for channels 2 through 7.
5. Record the highest voltage output and it's respective frequency.

5.4.31 FAULT ANALYSIS

5.4.31.1 Display Driver

The Display Drivers operated from a Standard BCD code (see Table 5.1) obtained from the switches directly. For instance, if a display segment is continuously illuminated, the problem may be located in the corresponding driver. Table 5.2 is provided as an aid to troubleshooting display problems.

5.4.32 FAULT ANALYSIS TABLE

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Transceiver inoperative, no front panel lights, no display	a. Primary power (28VDC) missing.	a. Check power cable and vehicle fuse.
	b. Transceiver fuse blown.	b. Check for fault, then replace fuse (15 amp).
	c. 18 VDC Regulator 1A2U1 or pass element 1A2Q8 defective.	c. Replace 1A2U1 or 1A2Q8. Refer to section 4.15.
	d. 12 VDC Regulator 1A2U2 or pass element 1A2Q9 defective.	d. Replace 1A2U2 or 1A2Q9. Refer to section 4.15.
	e. 5 VDC Regulator 1A2U3 defective.	e. Replace 1A2U3. Refer to section 4.15.
	f. Short circuit on 18V, 12V, or 5V line.	f. Check for short circuit on +18V, +12V, +5V, +12AMR, +12USB, +12LSB lines.
Transceiver will not load frequencies	a. Load Mode (disable switch), panel control board in disable position.	a. Set Load disable switch to ON position.
	b. Mode switch S10 defective.	b. Replace S10.
	c. Load RCV (S11). Load XMIT (S10) defective.	c. Replace S10 or S11.
	d. Defective Panel Control Board.	d. Refer to section 4.6. Repair or replace defective components.
	e. Defective Counter Demuxer board.	e. Refer to section 4.8. Repair or replace defective components.
	f. Defective Memory Band board.	f. Refer to section 4.7. Repair or replace defective components.

Audio in speaker or on phone jack, AGC test point shows RF signal present (<8.5 VDC)	a. Short circuit on audio lines.	a. Check and repair.
	b. Audio amplifier defective 1A8U18.	b. Replace 1A8U18.
	c. Audio driver 1A3A4 defective.	c. Replace 1A3U4.
	d. Squelch control fully CCW and signal level below 30 µv.	d. Advance squelch control fully CW.
No audio in speaker or on phone jack in all modes, AGC test point shows no signal (+8.5VDC).	a. Synthesizer inoperative.	a. Check 1A6U1 and 1A6U8. Refer to section 4.2. Check all LO's in USB mode. Repair or replace defective components.
	b. First Mixer board inoperative.	b. Refer to section 4.3. Repair or replace defective components.
	c. Second Mixer board inoperative.	c. Refer to section 4.4. Repair or replace defective components.
	d. Audio Board inoperative.	d. Check U1, U2 and U3. Refer to section 4.5. Repair or replace defective components.
AM mode normal, USB or LSB inoperative.	a. LO#3 missing.	a. Check Synthesizer board. Refer to section 4.2. Replace defective components.
Received signals weak in all modes.	a. Filter module defective or does not channel.	a. Refer to section 4.13. Repair or replace defective components.
	b. First Mixer board defective.	b. Refer to section 4.3. Repair or replace defective components.
	c. Second Mixer board defective.	c. Refer to section 4.4. Repair or replace defective components.
	d. LO injection levels low.	d. Refer to section 4.2. Repair or replace defective components.
Transmitter will not key.	a. Keyline interlock missing.	a. Check to see if coupler is connected. Check coupler cable of open circuit.
	b. Relay 1A7K2 or 1A7A1K1 defective.	b. Repair or replace defective component(s).
	c. Defective microphone.	c. Repair or replace.

Transceiver will not turn on.	a. Defective relay 1A1K1.	a. Check for broken wiring. Repair or replace defective component.
Coupler does not tune when TUNE button is pushed. FAULT light comes on.	a. Defective RF cable between coupler and transceiver.	a. Check cable and connectors. Repair or replace.
	b. Defective coupler.	b. See coupler manual for corrective action.
	c. Defective control cable between coupler and transceiver.	c. Check cable and connectors. Repair or replace.
DIMMER control does not affect display intensity.	a. Display turned off.	a. Turn DIMMER on.
	b. DIMMER circuit inoperative.	b. Check circuit and repair or replace as required.
Transmitter keys but little or no output in all modes.	a. Defective Second Mixer board.	a. Refer to Section 4.4. Repair or replace as required.
	b. Defective First Mixer board.	b. Refer to Section 4.3. Repair or replace as required.
	c. Defective filter module or band motor does not channel.	c. Refer to section 4.13. Repair or replace as required.
	d. Defective RF Power Amplifier.	d. Refer to Section 4.12. Repair or replace as required.
	e. Defective or disconnected coaxial cables.	e. Check coaxial cables and fittings. Check cables for continuty. Repair or replace as required.
Transmitter keys. Carrier OK in AM. No modulation. No output in USB or LSB.	a. Defective microphone.	a. Repair or replace.
	b. Defective Audio Board.	b. Refer to Section 4.5. Repair or replace as requried.
Transmitter keys. Output OK in USB or LSB. No carrier on AM.	a. Defective Second Mixer Board.	a. Check 1A4Q5 and associated circuitry.
Too much carrier in AM. Cannot adjust.	a. Defective ACC.	a. Check 1A7A4CR2, CR3. Check 1A7A1Q1, Q2, Q3 and associated circuitry.

SSB output too high or too low.	a. ALC adjusted incorrectly.	a. Adjust 1A7A1R19 for 70.7 vrms into 50 ohms at 10000.0 KHz.
AM carrier level too high or too low.	a. ACC adjusted incorrectly.	a. Adjust 1A7A1R1 to 42 vrms into 50 ohms at 10000.0 KHz.
Filter channel motor rotates continously.	a. Two or more band lines grounded or shorted together.	a. Check cable between transceiver and remote control for shorted, grounded or interchanbged band lines.
	b. Defective 1A7K1.	b. Replace defective part.
	c. Diode 1A7CR6 shorted.	c. Replace defective part.
Frequency display flashes. Radio is inoperative.	a. Frequency selected is below 2000 KHz or above 17999.9 KHz.	a. Select a frequency between 2000.0 KHz and 17999.9 KHz.
	b. 10 MHz switch set to a "0".	b. Set 10 MHz to a 1 or 2.
Coupler does not tune when tune button is pushed.	a. Coupler is not connected or is defective or cable between coupler and transceiver is defective.	a. Check cable and coupler.

5.4.33 POWER AMPLIFIER REMOVAL AND SERVICING

1. To remove the power amplifier remove the 6 rear black screws holding the power amplifier to the rest of the chassis. Disconnect (pull off) the rf input and output connectors. Disconnect the PA power connector. Disconnect the Regulator Power connector.

2. For servicing the power amplifier, it is desirable to use an external source capable of 28 VDC at 12 amperes, continuously variable from 0 to 28 VDC. If such a power source is not available, the transceiver power supply can be used. A typical test set-up is shown in Figure 5.10.

CAUTION

When using a HP606 or other RF signal generator to test the power amplifier, extreme caution should be exercised to prevent overdriving the unit and needlessly destroying transistors. Remember, the protection circuits are disconnected during tests of this type.

3. Before applying DC power, make sure the signal generator output is zero. Then slowly increase the power supply voltage, observing the ammeter, until +28V is reached. At this point the ammeter should be reading approximately 1 ampere. If, during the increasing of the source voltage, the current rises well beyond the 1 ampere level, a short circuit exists on the line, or one or both output transistors have failed. To determine which output transistors is defective, allow the current to remain at approximately 3 amperes for 30 seconds. Then feel both transistors. The defective one will be much hotter than the good one.

4. If power output is low, the defective stage can be readily determined by observing with an oscilloscope the waveform at the input center tap of T2 (the 10 turn side) for the pre-driver, T3 for the driver, or T5 for the output stage. Under normal operating conditions, these points will show primarily second harmonic energy, so if a large amount of fundamental frequency energy is present, it means only half of push pull stage is operational. Now that the defective stage has been located, an observation of the respective collector waveforms will determine the failed transistor. The collector waveform on the good transistor will be much greater in amplitude than that of the defective one.

5. While it is necessary to remove the printed circuit board from the heat-sink to replace 1A2Q1 or Q2, it is NOT necessary to remove the board to replace Q3, Q4, Q5 or Q6. Transistors Q3 and Q4 may be removed by unscrewing the two nuts from the studs on these components and unsoldering four connections on the top of the board for each transistor. The transistors may be removed from the top of the board. Transistors Q5 and Q6 may be removed by unscrewing the four hold down screws (two per transistor), and unsoldering four connections for each transistor. These transistors also remove from the top of the board.

6. Before replacing any or all of the four high power transistors, Q3, Q4, Q5 and Q6, clean the heatsink area thoroughly around each transistor making sure no foreign particles can come between the transistor and the heatsink. Apply a fresh coat of heat sink compound to the transistor and mount the transistor solidly to the heatsink before soldering. Make sure all collector leads point toward the output connector 1A7J2. Trim the leads to convenient lengths and solder to the printed circuit boards.

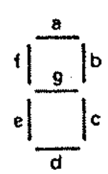
7. When transistor replacement is complete, test the power amplifier per test setup shown in Figure 5.10. Apply DC power and slowly increase signal generator drive until 100 watts is shown on the wattmeter. The ammeter should indicate approximately 8.5 amperes. Allow the amplifier output to remain at 100 watts for one or two minutes. Remove the signal drive. The ammeter should drop to 1 ampere or slightly greater. If the current drops to 2 amperes or higher and slowly decays toward the 1 ampere level, this means that one or both output transistors has not been properly seated to the heatsink. They should be removed, examined for foreign particles and replaced carefully. Repeat the above test to insure proper installation.

8. After installing power amplifier in transceiver, check current ALC to be sure it is operational. This may be done by placing an oscilloscope probe on pin P of connector 1A1A1J9 on the motherboard. See the vertical range at 50 milliseconds per division and set trace at lowest marker division. Set transceiver mode switch to USB. Key transceiver and observe voltage rise. Trace should appear as in Figure 5.11A Now place MODE switch in AM position and key transceiver. Oscilloscope trace should appear as in Figure 5.11B. The additional step in the waveform is evidence that the current ALC is operational and is preventing overdrive to the amplifier. If this additional step is not observed, troubleshoot the current ALC loop and correct the problem before rekeying the transmitter. Without the current ALC protection, the power amplifier can be destroyed. It is designed to limit the amplifier current to 10 amperes. This current can then be monitored across 1A2R24 in the power amplifier. Since this resistor is 0.1 ohm resistance, a voltage of 1 volt across it represents 10 amperes current.

Display Number	2^3 IC Pin 6	2^2 IC Pin 2	2^1 IC Pin 1	2^0 IC Pin 7
0	Low	Low	Low	Low
1	Low	Low	Low	High
2	Low	Low	High	Low
3	Low	Low	High	High
4	Low	High	Low	Low
5	Low	High	Low	High
6	Low	High	High	Low
7	Low	High	High	High
8	High	Low	Low	Low
9	High	Low	Low	High

Low = Less than 0.5V
High = Greater than 2.5V

TABLE 5.1 DISPLAY DRIVERS BCD



Segment Identification
a = pin 1
b = pin 13
c = pin 10
d = pin 8
e = pin 7
f = pin 2
g = pin 11

Display Segments	2^3 Pin 6	2^2 Pin 2	2^1 Pin 1	2^0 Pin 7	Balancing Pin 4	a Pin 13	b Pin 12	c Pin 11	d Pin 10	e Pin 9	f Pin 15	g Pin 14
0	0	0	0	0	1	0	0	0	0	0	0	1
1	0	0	0	1	1	1	0	0	1	1	1	1
2	0	0	1	0	1	0	0	1	0	0	1	0
3	0	0	1	1	1	0	0	0	0	1	1	0
4	0	1	0	0	1	1	0	0	1	1	0	0
5	0	1	0	1	1	0	1	0	0	1	0	0
6	0	1	1	0	1	1	1	0	0	0	0	0
7	0	1	1	1	1	0	0	0	1	1	1	1
8	1	0	0	0	1	0	0	0	0	0	0	0
9	1	0	0	1	1	0	0	0	1	1	0	0
[illegible]	1	0	1	0	1	1	1	1	0	0	1	0
[illegible]	1	0	1	1	1	1	1	0	0	1	1	0
[illegible]	1	1	0	0	1	1	0	1	1	1	0	0
[illegible]	1	1	0	1	1	0	1	1	0	1	0	0
[illegible]	1	1	1	0	1	1	1	1	0	0	0	0
(Blank)	1	T	1	1	1	1	1	1	1	1	1	1

TABLE 5.2 DISPLAY SEGMENT ILLUMINATION vs DRIVER INPUT/OUTPUT

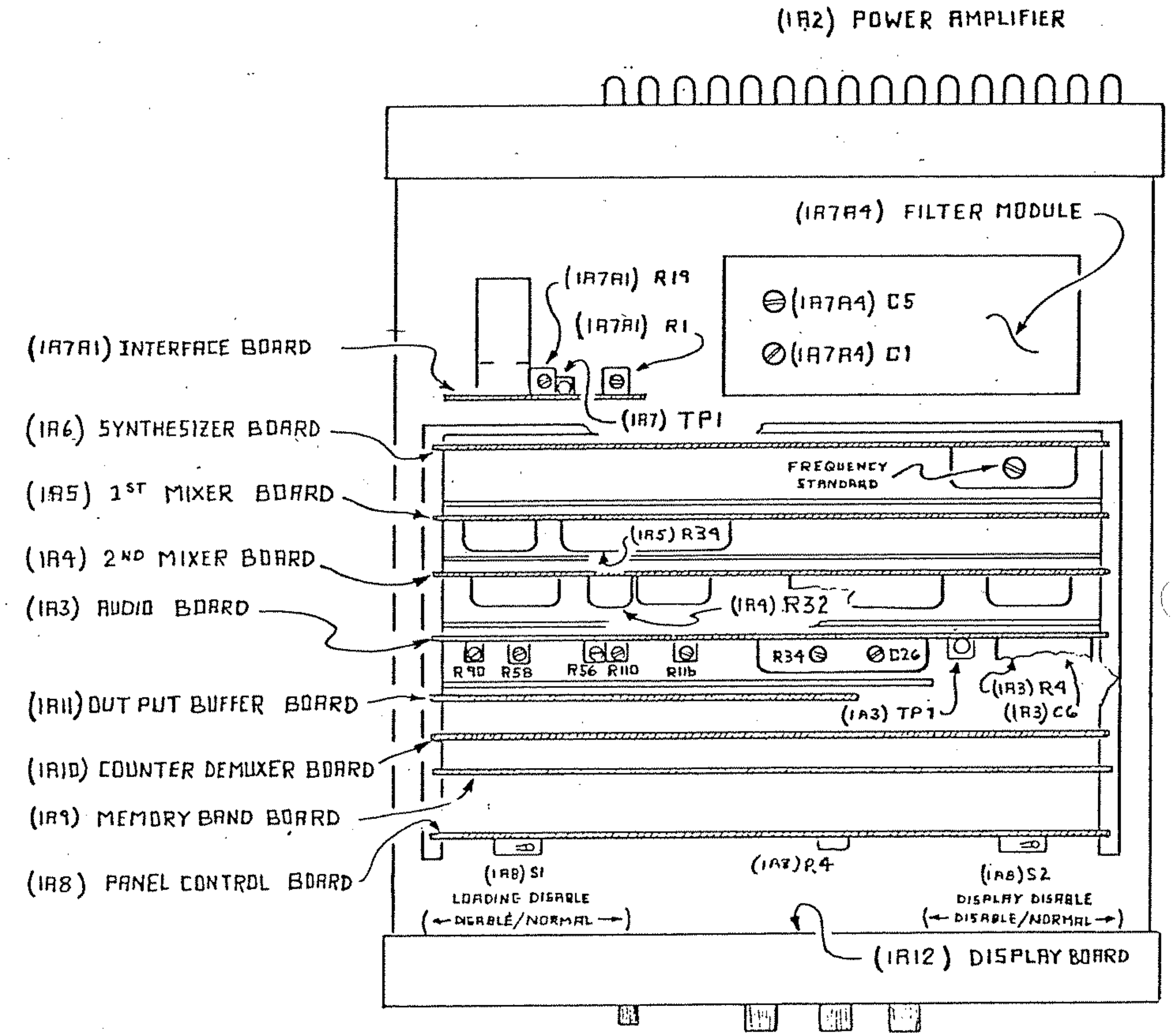


FIGURE 5.1 CIRCUIT BOARD AND ADJUSTMENT LOCATIONS

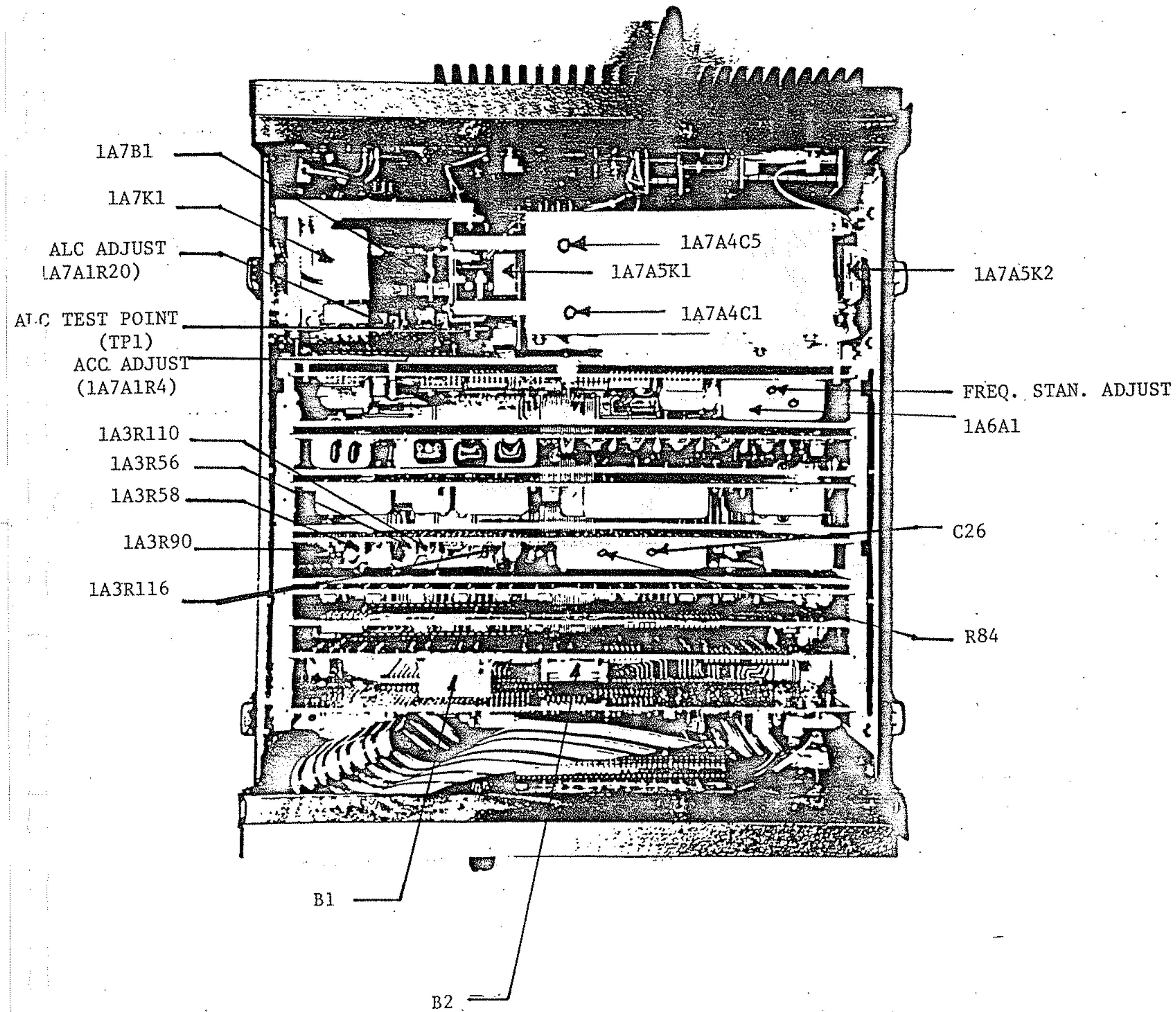


Figure 5.2 ADJUSTMENTS AND TEST POINTS

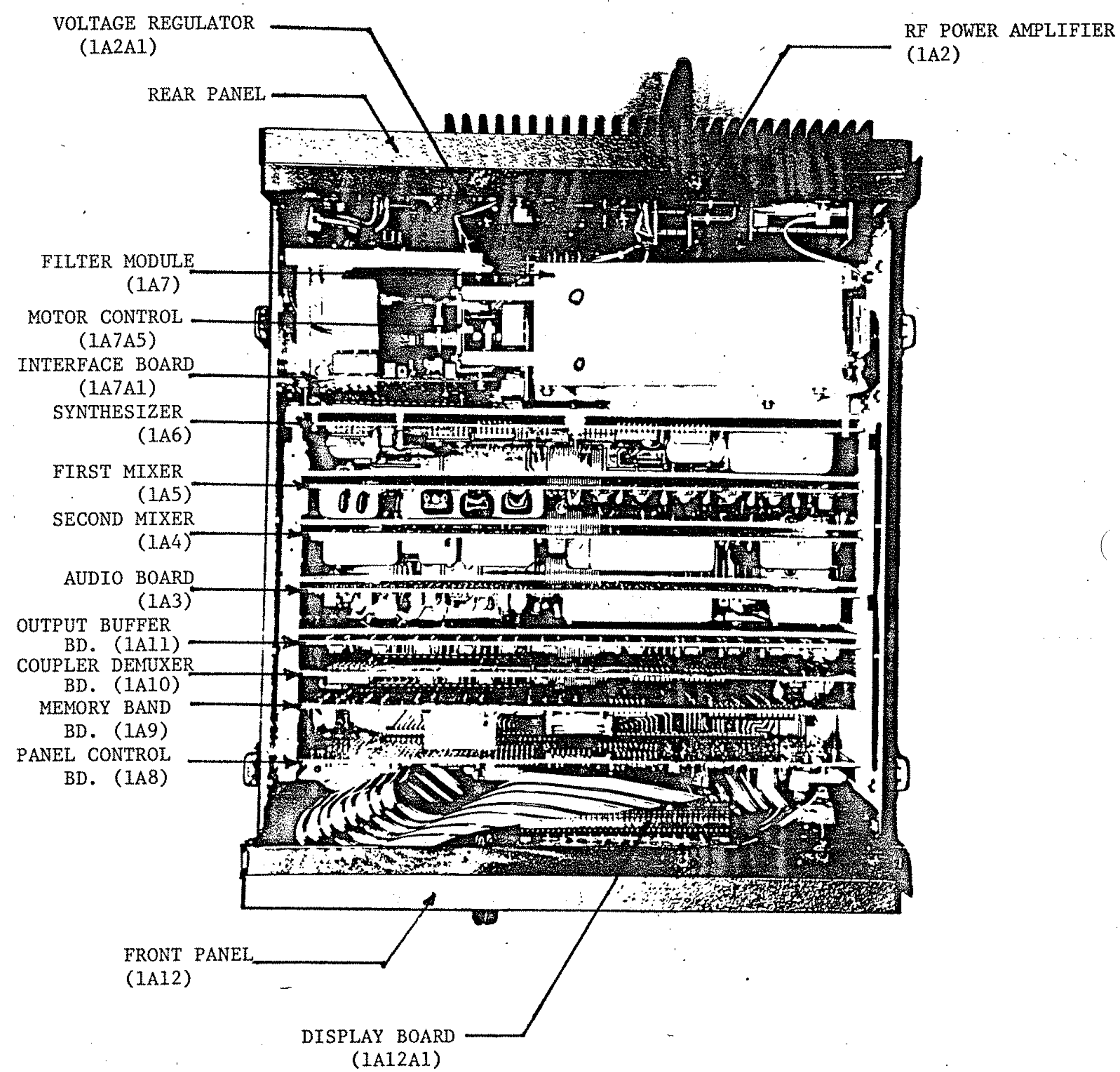


FIGURE 5.3 MAJOR ASSEMBLIES

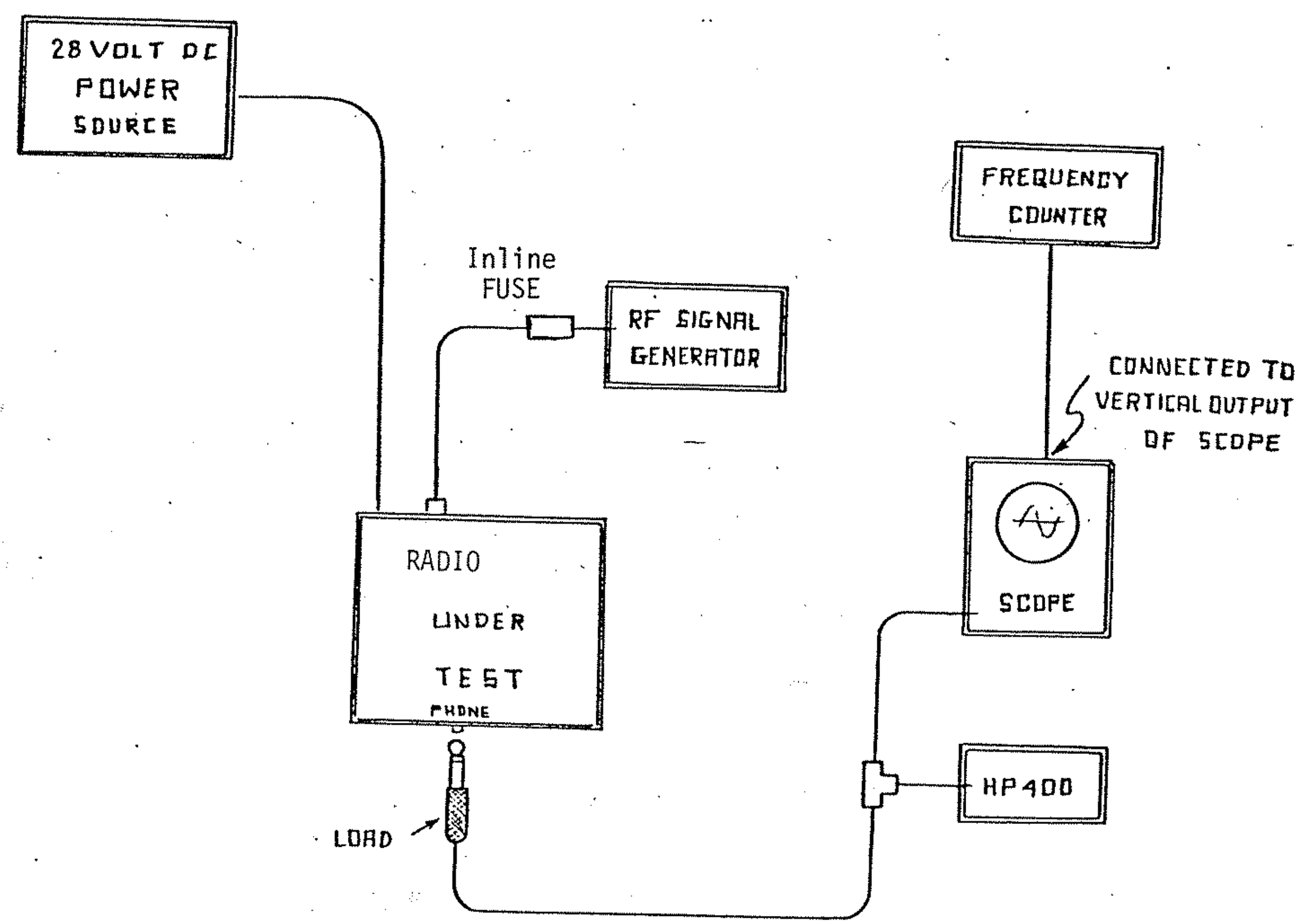


FIGURE 5.4 RECEIVE TEST SETUP

CW KEY (SHORTED PLUG)

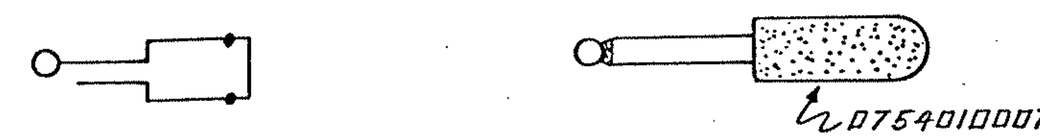


FIGURE 5.5

150 OHM AUDIO LOAD

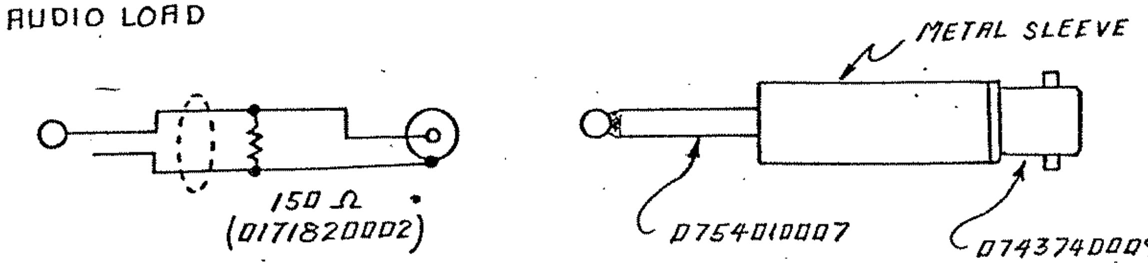


FIGURE 5.6

MIC KEY (SHIELDED)

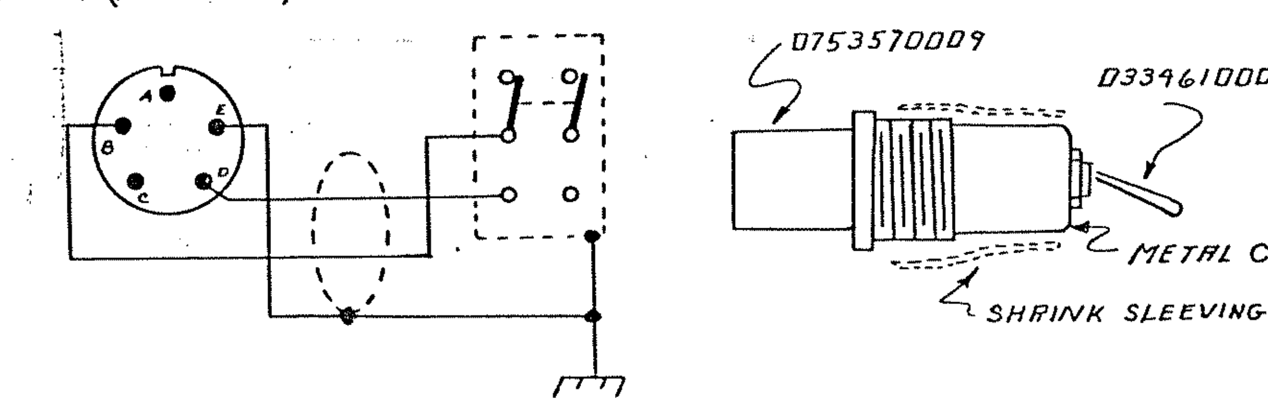


FIGURE 5.7

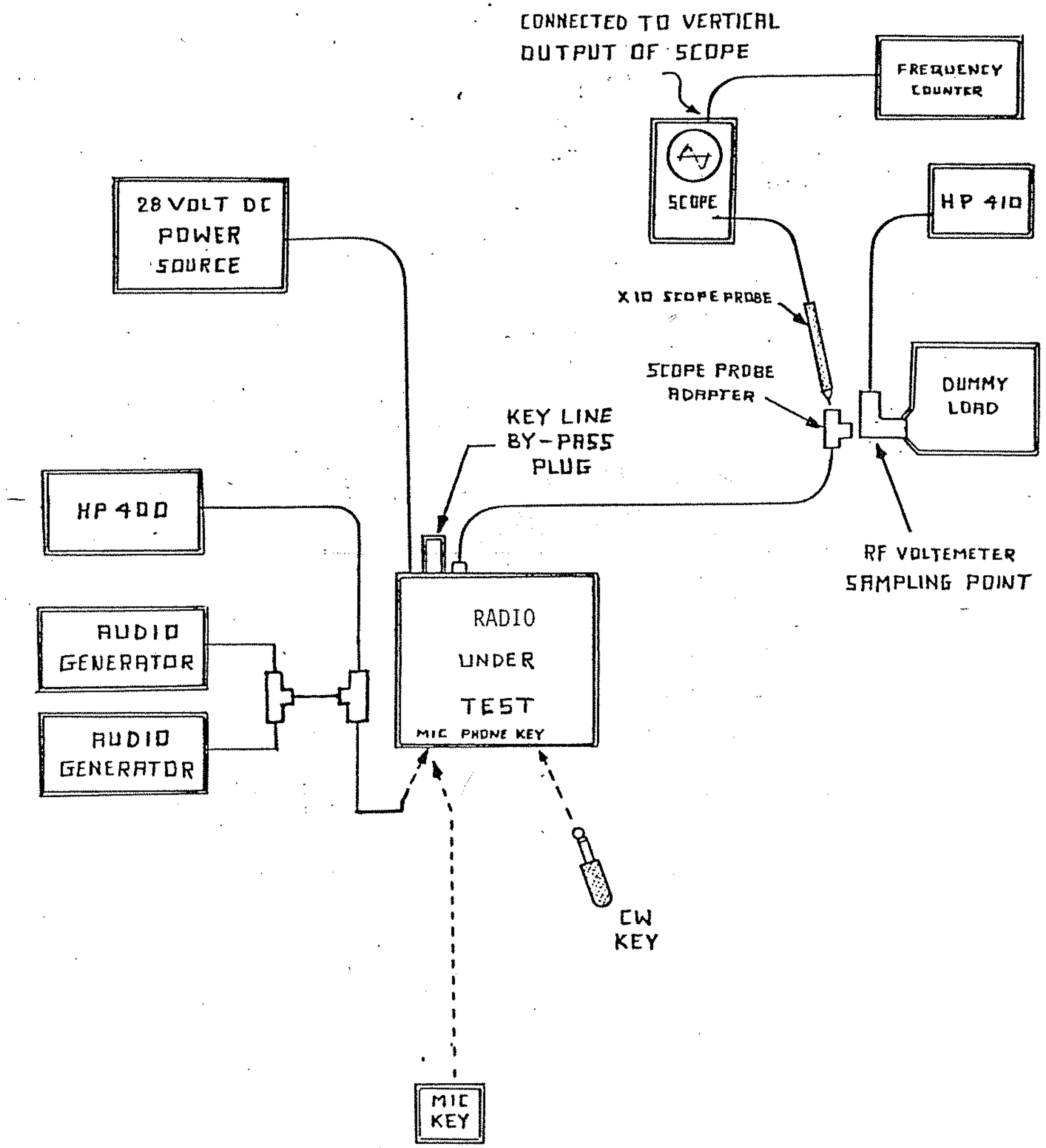


FIGURE 5.8 TRANSMIT TEST SETUP

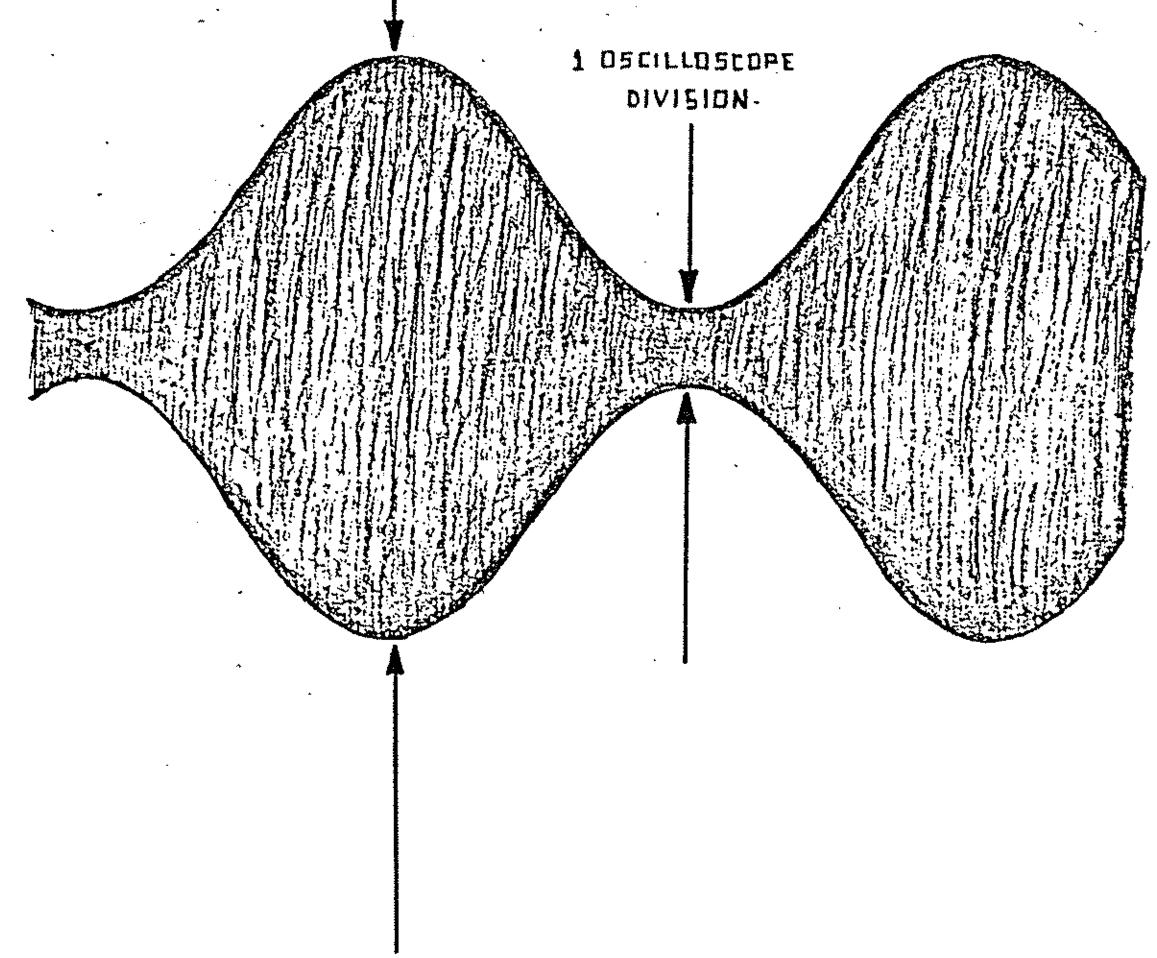


FIGURE 5.9 85% MODULATION (AM) SCOPE PATTERN

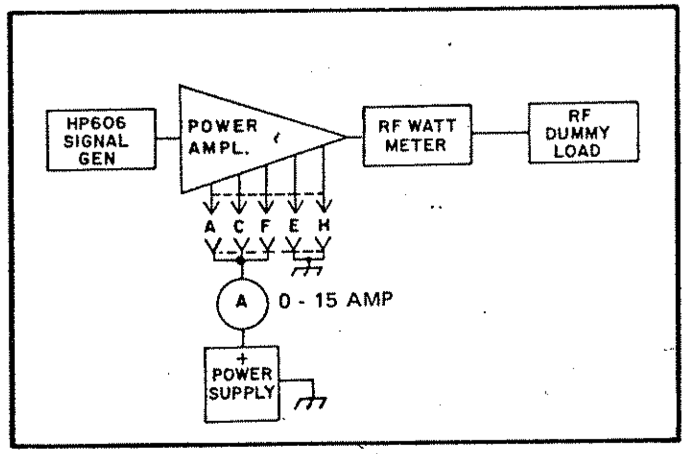


Figure 5.10 Amplifier Test Setup

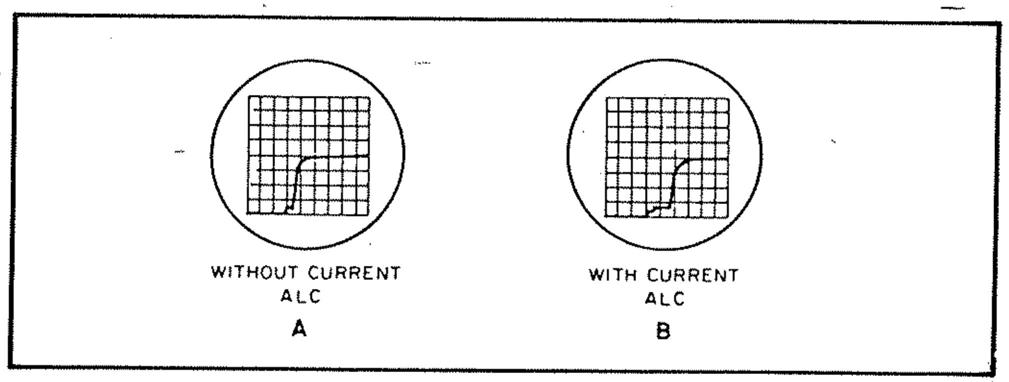


Figure 5.11 Current ALC Wave Form

TABLE OF ASSEMBLIES

DESIGNATOR			DESCRIPTION	SUNAIR PART NUMBER
1A1			Chassis Assembly	8056010092
	1A1A1		Motherboard	8056015094
	1A1A2		Rear Panel Assembly	8056013598
		1A1A2A1	Regulator	8056090291
1A2			Power Amplifier Assembly	8056090096
1A3			Audio Board	8040060095
1A4			Second Mixer Board	8040050090
1A5			First Mixer Board	8040040094
1A6			Synthesizer	8056040099
1A7			Filter Module	8056030093
	1A7A1		Interface Board	8056033092
	1A7A2		Even Channel Board	8056035095
	1A7A3		Odd Channel Board	8056034099
	1A7A4		ALC/ACC Detector Board	8040120098
	1A7A5		Motor Control Board	8056031090
	1A7A6		Relay Board	8056032096
1A8			Panel Control Board	8056050094
1A9			Memory Band Board	8056070095
1A10			Counter Demuter Board	8056060090
1A11			Output Buffer Board	8056080091
1A12			Front Panel Assembly	8056020098
	1A12A1		Display Board	8056035090

80560010093 REV 04 FINAL ASSY, TESTED SNR-601

Bumper, Plastic	0507740009
Bumper 13/16 OD x 13/16 LG	0508140005
Cover, Bottom	8056010301
Cover, Card Cage	8056014101
Cover, Top	8056011005
Final Assy	8056001191
Fuse, AGC, 15 Amp, 32V	0848740009
Strike, Black	0526520001

8056001191 REV 07 FINAL ASSY 1A

1A1	Chassis Assembly	8056010092
1A2	PA/Heatsink Assy	8056090096
1A3	PC Assy Audio	8040060095
1A4	PC Assy Second Mixer	8040050090
1A5	PC Assy First Mixer	8040040094
1A6	PC Assy, Synthesizer	8056040099
1A7	Filter Module Assy	8056030093
1A8	PC Assy, Panel Control	8056050094
1A9	PC Assy, Memory/Band	8056070095
1A10	PC Assy, Counter Demuxer	8056060090
1A11	PC Assy, Output Buffer	8056080091
1A12	Front Panel Assy	8056020098

MISCELLANEOUS

Cable Assy, Display	8056025596
Cable Assy, RF, PA/Filter	8056030590
Gasket, PA Heatsink	8056012109

8056010092 REV 08 CHASSIS ASSEMBLY 1A1

CHASSIS ASSEMBLY	8056010092
Bezel, Front & Back	8056014403
Bracket, Mother Board Mtg. LFT	8056013903
Bracket, Mother Board Mtg. RT	8056013709
Card Guide, Plastic	1005820007
Catch, Hold Down Black	0526370009
Gasket, Bezel	8056014705
Gasket Kit, Case Bottom	8056014608
Gasket Kit, Case Top	8056014501
Insulator, Shield	8040083001
PC Assy, Mother Board	8056015094
Rail, Side	8056014306
Rear Panel Assy	8056013598
LH Card Cage Rail	8056014209
RH Card Cage Rail	8056014004
Shield	8056013407

8056015094 REV 07 PC ASSY MOTHERBOARD 1A1A1

	PC ASSY MOTHERBOARD	8056015094
1A1P1	Conenctor, Power, 7 Pin Rect.	0753530007
C1	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C3	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, 0.1µf, 100V, Z5U	0244080003
C6	Capacitor, 470µf, 50V	0280890001
C7	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C8	Capacitor, .22µf, 35V, T368	0283510005
CR1	Diode, Rectifier 1N5400	0403970008
CR2	Diode, Zener 1N5349A	0405380003
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Didoe, Signal, Sil 1N4454	0405270003
CR6	Diode, Siganl, Sil 1N4454	0405270003
CR7	Diode, Rectifier 1N4004	0405180004
CR8	Diode, Signal, Sil 1N4454	0405270003
J3	Connector, PC, 22 Pin	1005560030
J4	Connector, PC, 22 Pin	1005560030
J5	Connector, PC, 22 Pin	1005560030
J6	Connector, PC, 22 Pin	1005560030
J7	Connector, PC, 22 Pin	1005560030
J8	Connector, PC, 22 Pin	1005560030
J9	Connector, PC, 15 Pin Female	1003400035
J10	Connector, PC, 15 Pin Female	1003400035
J11	Connector, PC, 15 Pin Female	1003400035
J12	Connector, PC, 15 Pin Female	1003400035
J13	Connector, PC, 15 Pin Female	1003400035
J14	Connector, PC, 15 Pin Female	1003400035
J15	Connector, PC, 15 Pin Female	1003400035
J16	Connector, PC, 15 Pin Female	1003400035
J17	Conenctor, PC, 18 Pin Female	0753610001
J18	Connector, Power, 7 Pin Rect.	0753530007
J19	Connector, PC, 40 Pin Male	1003323006
J20	Connector, PC, 40 Pin Male	1003323006
L1	Inductor, Choke, A+, 40µh	0563720000
Q1	Transistor, NPN, SI	0448610001
R1	Resistor, 56, 10%, ¼W	0174290004
R2	Resistor, 7.5, 5%, 3W	0178950009

MISCELLANEOUS

Connector, PC, 30 Pin Female	1006170014
Connector, RF, Subminiature	0753700000
Mica Insulator MOT. Case 199	0508700001
Relay, SPST, 24V, Power 60A	0660040000

8056013598 REV 06 REAR PANEL ASSY 1A1A2

1A1J1	Connector, Power 3 Pin Male	1005550018
1A1J2	Connector, Power 17 Pin Female	1005550034
1A1J3	Connector, RF, UHF	0753300001
1A1P3	Connector, RF, BNC	0753710005
	<u>MISCELLANEOUS</u>	
	Fuseholder, Panel Mount	1004740018
	Gasket, Fuseholder	1004740000
	Gasket Kit, Rear Panel	8056011404
	PC Assy Regulator	8056090291

8056090291 REV 02 PC ASSY REGULATOR 1A1A2A1

	PC Assy Regulator	8056090291
C31	Capacitor, 1µf, 50V, 20%	1005330018
C32	Capacitor, 1µf, 50V, 20%	1005330018
C33	Capacitor, 1µf, 50V, 20%	1005330018
C34	Capacitor, 1µf, 50V, 20%	1005330018
C35	Capacitor, 1µf, 50V, 20%	1005330018
C36	Capacitor, 1µf, 50V, 20%	1005330018
C37	Capacitor, 1µf, 50V, 20%	1005330018
CR5	Diode, Rectifier 1N5400	0403970008
Q8	Transistor, PNP, SI	1003410014
Q9	Transistor, PNP, SI	1003410014
R35	Resistor, 10, 5%, 3W	0163220000
R37	Resistor, 10, 5%, 3W	0163220000
U1	IC Linear	1003400019
U2	IC Linear	1003410022
U3	IC Linear	0448600005

8056090096 REV 08 PA HEATSINK ASSY 1A2

	PA HEATSINK ASSY	8056090096
C30	Capacitor, 22pf, 500V, CD15, 2%	1000050025
J1	Connector, RF, Snap-On	1000170012
J2	Connector, RF, Snap-On	1000170012
Q3	Transistor, NPN, SI	0448150000
Q4	Transistor, NPN, SI	0448150000
Q5	Transistor, NPN, SI	0448170001
Q6	Transistor, NPN, SI	0448170001
R21	Resistor, 50, 10%, 30W	0193240009
R34	Resistor, 1, 5%, 10W	0169680002
R36	Resistor, 0.25, 10%, 10W	1003430015
	MISCELLANEOUS	
	Heatsink, Machined	8056090509
—	PC Assy Power Amplifier	5024030192

5024030192U PC ASSY POWER AMPLIFER P/O 1A2

	PC ASSY POWER AMPLIFIER	5024030192
C2	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C3	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C4	Capacitor, 0.0022μf, 200V, Z5F, 10%	0272780006
C5	Capacitor, 0.0022μf, 200V, Z5F, 10%	0272780006
C6	Capacitor, 1μf, 50V, 198D	0280910002
C7	Capacitor, 1μf, 50V, 198D	0280910002
C8	Capacitor, 1μf, 50V, 198D	0280910002
C9	Capacitor, 1μf, 50V, 198D	0280910002
C10	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C11	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C12	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C15	Capacitor, 47μf, 50V, CL65B	0245750002
C16	Capacitor, 1μf, 50V, 198D	0280910002
C17	Capacitor, 0.01μf, 250V, X5V, 20%	0280950004
C18	Capacitor, 0.1μf, 50V, X7R, 20%	0281610002
C19	Capacitor, 1μf, 50V, 198D	0280910002
C21	Capacitor, 125μf, 3V	0266020003
C25	Capacitor, 47μf, 20V, 196D	0281700001
C26	Capacitor, 0.001μf, 250V, X5R, 10%	0286260000
C27	Capacitor, .22μf, 35V, T368	0283510005
C28	Capacitor, 47μf, 20V, 196D	0281700001
C29	Capacitor, 1μf, 50V, 198D	0280910002
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004

CR4	Diode, Signal, Sil. 1N4454	0405270003
J3	Connector, Power, 7 Pin Rect.	0753590000
L1	Inductor, Molded, 22µh, 5%	0650000005
L2	Inductor, Molded, 6.8µh, 5%	0659210002
L3	Choke, RF	5024030605
L4	Inductor, Molded, 2.7µh, 5%	0652180001
L5	Choke, RF	5024030702
L6	Inductor, Molded, 2.7µh, 5%	0652180001
L7	Inductor, Molded, 2.7µh, 5%	0652180001
Q1	Transistor, NPN, SI. 2N3866	0448140004
Q2	Transistor, NPN, SI. 2N3866	0448140004
Q7	Transistor, PNP, SI. 2N4249	0446780006
R1	Resistor, 10, 5%, ¼W	0177160004
R2	Resistor, 1K, 10%, ½W	0167480006
R3	Resistor, 82, 10%, ¼W	0184610001
R4	Resistor, 330, 5%, ¼W	0170910008
R5	Resistor, 330, 5%, ¼W	0170910008
R6	Resistor, 10, 5%, ¼W	0177160004
R7	Resistor, 10, 5%, ¼W	0177160004
R8	Resistor, 22, 10%, ¼W	0192690001
R9	Resistor, 300, 5%, 5W	0161140009
R10	Resistor, 820, 10%, ½W	0175600007
R11	Resistor, 1K, 10%, ½W	0167480006
R12	Resistor, 820, 10%, ½W	0175600007
R13	Resistor, 1, 10%, ½W	0194770001
R14	Resistor, 1, 10%, ½W	0194770001
R15	Resistor, 1, 10%, ½W	0194770001
R16	Resistor, 1, 10%, ½W	0194770001
R18	Resistor, 1K, 10%, ½W	0167480006
R19	Resistor, 3.3K, 5%, ½W	0184090008
R20	Resistor, 3.3, 10%, ½W	0186050003
R22	Resistor, 29, 10%, ½W	0165920009
R23	Pot. 10, 5%, ½W, PC Mount	0346380006
R24	Resistor, 0.1, 10%, 15W	0193360004
R25	Resistor, 470, 5%, ¼W	0184110009
R26	Resistor, 10, 10%, 2W	0163840008
R27	Resistor, 10, 10%, 2W	0163840008
R28	Resistor, 10, 10%, 2W	0163840008
R29	Resistor, 10, 10%, 2W	0163840008
R30	Resistor, 150, 10%, ¼W	0172730007
R31	Resistor, 5.1K, 5%, ½W	0183700007
R32	Resistor, 470, 5%, ¼W	0184110009
R33	Resistor, 2.7K, 10%, ¼W	0186670001
R34	Resistor, 2.2, 10%, ½W	0178690007
R35	Resistor, 2.2, 10%, ½W	0178690007
T1	Transformer Input	5024030401
T2	Transformer Interstage	5024030508

MISCELLANEOUS

Driver Transformer Assy.	5024030893

	Heat Sink	0840730004
	Mounting Pad, Transistor	0502710004
	Output Transformer Assy.	5024031199

5024030893D DRIVER TRANSFORMER ASSY

	DRIVER TRANSFORMER ASSY	5024030893
C13	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C14	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C31	Capacitor, 7-35pf, 160V, N1500	0287390004

MISCELLANEOUS

	Core, Ferrite 3/8 OD X 3/16 LG	0613650000

5024031199C OUTPUT TRANSFORMER ASSY

	OUTPUT TRANSFORMER ASSY	5024031199
C23	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C24	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002

MISCELLANEOUS

	Clip, Component	0533320003
	Core, Ferrite 3/8 OD x 3/16 LG	0613650000
	Spacer, Plate	5024031504

8040060095S PC ASSY AUDIO 1A3

	PC ASSY AUDIO	8040060095
C1	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C2	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C3	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C4	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C5	Capacitor, 22µf, 15V, T368	0296660001
C6	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C7	Capcaitor, .01µf, 25V, X55/Y5P	0281627771
C8	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C9	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C10	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C11	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C12	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C13	Capcaitor, .01µf, 25V, X55/Y5P	0281627771
C14	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C15	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C16	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C17	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C18	Capacitor, 22µf, 15V, T368	0296660001
C19	Capacitor, .01µf, 25v, X55/Y5P	0281627771
C20	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C21	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C22	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C23	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C24	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, 68µf, 15V	0296547778
C26	Capacitor, .8-8pf, PC MT. Glass	1000060012
C27	Capacitor, 6.8µf, 20V, T368	0296780006
C29	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C30	Capacitor, 68µf, 15V	0296547778
C31	Capacitor, 15µf, 15V, 196D	0281720002
C32	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C33	Capacitor, 6.8µf, 20V, T368	0296780006
C34	Capacitor, 22µf, 15V, T368	0296660001
C35	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C36	Capcaitor, .01µf, 25V, X55/Y5P	0281627771
C37	Capacitor, 6.8µf, 20V, T368	0296780006
C38	Capacitor, 6.8µf, 20V, T368	0296780006
C39	Capacitor, 15µf, 15V, 196D	0281720002
C40	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C41	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C42	Capacitor, 6.8µf, 20V, T368	0296780006
C43	Capacitor, 6.8µf, 20V, T368	0296780006
C44	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C45	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C46	Capacitor, 68µf, 15V	0296547778
C47	Capacitor, 22µf, 15V, T368	0296660001
C48	Capacitor, .01µf, 25V, X55/Y5P	0281627771

C49	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C50	Capacitor, 68µf, 15V	0296547778
C51	Capacitor, 68µf, 15V	0296547778
C52	Capacitor, .47µf, 50V, X7R, 20%	0283377771
C53	Capacitor, 1µf, 35V, 196D	0281660000
C54	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C55	Capacitor, 6.8µf, 20V, T368	0296780006
C56	Capacitor, 6.8µf, 20V, T368	0296780006
C57	Capacitor, 68µf, 15V	0296547778
C58	Capacitor, 68µf, 15V	0296547778
C59	Capacitor, 6.8µf, 20V, T368	0296780006
C61	Capacitor, 6.8µf, 20V, T368	0296780006
C62	Capacitor, .47µf, 50V, X7R, 20%	0283377771
C63	Capacitor, 6.8µf, 20V, T368	0296780006
C64	Capacitor, 15µf, 15V, 196D	0281720002
C65	Capacitor, 6.8µf, 20V, T368	0296780006
C66	Capacitor, 68µf, 15V	0296547778
C67	Capacitor, 1µf, 35V, 196D	0281660000
C68	Capacitor, 6.8µf, 20V, T368	0296780006
C69	Capacitor, 6.8µf, 20V, T368	0296780006
C70	Capacitor, 15µf, 15V, 196D	0281720002
C71	Capacitor, 6.8µf, 20V, T368	0296780006
C72	Capacitor, 100µf, 20V	0282230009
C73	Capacitor, 6.8µf, 20V, T368	0296780006
C74	Capacitor, 1µf, 35V, 196D	0281660000
C75	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C76	Capacitor, 6.8µf, 20V, T368	0296780006
C77	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C78	Capacitor, 22µf, 15V, T368	0296660001
C79	Capacitor, 6.8µf, 20V, T368	0296780006
C81	Capacitor, 100µf, 20V	0282230009
C82	Capacitor, 22µf, 15V, T368	0296660001
C83	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C84	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C85	Capacitor, 15µf, 15V, 196D	0281720002
C86	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C87	Capacitor, 1µf, 35V, 196D	0281660000
C88	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C89	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C90	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C91	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C92	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C93	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C94	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C95	Capacitor, 0.001µf, 100V, X5E, 10%	0282080007
C96	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C97	Capacitor, 5pf, 500V, DM10	0261190008
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Hot Carrier	0405280009
CR4	Diode, Hot Carrier	0405280009

CR5	Diode, Hot Carrier	0405280009
CR6	Diode, Hot Carrier	0405280009
CR7	Diode, Signal, Sil. 1N4454	0405270003
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Rectifier 1N4004	0405180004
CR11	Diode, Rectifier 1N4004	0405180004
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Diode, Signal, Sil. 1N4454	0405270003
CR14	Diode, Signal, Sil. 1N4454	0405270003
CR15	Diode, Rectifier 1N4004	0405180004
CR16	Diode, Rectifier 1N4004	0405180004
L1	Inductor, Molded, 22μh, 5%	0650000005
L2	Inductor, Molded, 33μh, 5%	0659690004
L3	Inductor, Molded, 22μh, 5%	0650000005
L4	Inductor, Molded, 22μh, 5%	0650000005
L5	Inductor, Molded, 22μh, 5%	0650000005
L6	Inductor, Molded, 47μh, 5%	0652680003
L7	Inductor, Molded, 220μh, 5%	0650500008
Q1	Transistor, NPN, SI. 2N4124	0448010003
Q2	Transistor, NPN, SI. 2N4124	0448010003
Q3	Transistor, PNP, SI. 2N4126	0448020009
Q4	Transistor, N-CH FET	0447450000
Q5	Transistor, NPN, SI. 2N4124	0448010003
Q6	Transistor, NPN, SI. 2N4124	0448010003
Q7	Transistor, N-CH. FET	0443930007
R1	Resistor, 56, 10%, ¼W	0174290004
R2	Resistor, 4.7K, 5%, ¼W	0170770001
R3	Resistor, 4.7K, 5%, ¼W	0170770001
R4	Pot, 500, 10%, ½W, 4 Turns	0197510019
R5	Resistor, 470, 5%, ¼W	0184110009
R6	Resistor, 1.2K, 10%, ¼W	0181860007
R7	Resistor, 2.2K, 5%, ¼W	0178070009
R8	Resistor, 12K, 10%, ¼W	0183180003
R9	Resistor, 6.8K, 5%, ¼W	0174810008
R10	Resistor, 100, 5%, ¼W	0171180003
R11	Resistor, 4.7K, 5%, ¼W	0170770001
R12	Resistor, 47, 10%, ¼W	0179360001
R13	Resistor, 560, 5%, ¼W	0183200004
R14	Resistor, 10, 5%, ¼W	0177160004
R15	Resistor, 820, 10%, ¼W	0178210005
R16	Resistor, 3.9K, 10%, ¼W	0178830003
R17	Resistor, 1K, 10%, ¼W	0171560001
R18	Resistor, 12K, 10%, ¼W	0183180003
R19	Resistor, 12K, 10%, ¼W	0183180003
R20	Resistor, 3.3K, 10%, ¼W	0170890007
R21	Resistor, 470, 5%, ¼W	0184110009
R22	Resistor, 820, 10%, ¼W	0178210005
R23	Resistor, 120, 10%, ¼W	0186550006
R24	Resistor, 47, 10%, ¼W	0179360001
R25	Resistor, 120, 10%, ¼W	0186550006

R26	Resistor, 12K, 10%, ¼W	0183180003
R27	Resistor, 3.3K, 10%, ¼W	0170890007
R28	Resistor, 100, 5%, ¼W	0171180003
R29	Resistor, 100, 5%, ¼W	0171180003
R30	Resistor, 560, 5%, ¼W	0183200004
R31	Resistor, 220, 10%, ¼W	0171320000
R32	Resistor, 180, 10%, ¼W	0175220000
R33	Resistor, 100, 5%, ¼W	0171180003
R34	Pot. 20, 10%, ¾W, 15 Turns	0346770009
R35	Resistor, 100, 5%, ¼W	0171180003
R36	Resistor, 12K, 10%, ¼W	0183180003
R37	Resistor, 1K, 10%, ¼W	0171560001
R38	Resistor, 1.5K, 10%, ¼W	0172470005
R39	Resistor, 100, 5%, ¼W	0171180003
R40	Resistor, 22, 10%, ¼W	0192690001
R41	Resistor, 5.6K, 10%, ¼W	0183060008
R42	Resistor, 560, 5%, ¼w	0183200004
R43	Resistor, 10K, 10%, ¼W	0170410005
R44	Resistor, 1.5K, 10%, ¼W	0172470005
R45	Resistor, 15K, 5%, ¼W	0195700007
R46	Resistor, 120K, 10%, ¼W	0175100004
R47	Resistor, 10, 5%, ¼W	0177160004
R48	Resistor, 270, 10%, ¼W	0178450006
R49	Resistor, 270, 10%, ¼W	0178450006
R50	Resistor, 100, 5%, ¼W	0171180003
R51	Resistor, 18K, 10%, ¼W	0175720002
R52	Resistor, 8.2K, 5%, ¼W	0192070002
R53	Resistor, 47, 10%, ¼W	0179360001
R54	Resistor, 2.7K, 10%, ¼W	0186670001
R55	Resistor, 10K, 10%, ¼W	0170410005
R56	Pot. 1K, 10%, ¾W, 15 Turns	0338490019
R57	Resistor, 8.2K, 5%, ¼W	0192070002
R58	Pot. 10K, 10%, ¾W, 15 Turns	0338490043
R59	Resistor, 3.9K, 10%, ¼W	0178830003
R60	Resistor, 560, 5%, ¼W	0183200004
R61	Resistor, 560, 5%, ¼W	0193200004
R62	Resistor, 1.2K, 10%, ¼w	0181860007
R63	Resistor, 5.6K, 10%, ½W	0183060008
R64	Resistor, 1.2K, 10%, ¼W	0181860007
R65	Resistor, 560, 5%, ¼W	0183200004
R66	Resistor, 680, 10%, ¼W	0176630007
R68	Resistor, 18K, 10%, ¼W	0175720002
R69	Resistor, 100K, 10%, ¼W	0170390004
R70	Resistor, 1K, 10%, ¼W	0171560001
R71	Resistor, 3.3K, 10%, ¼W	0170890007
R72	Resistor, 6.8K, 5%, ¼W	0174810008
R73	Resistor, 120, 10%, ¼W	0186550006
R74	Resistor, 560, 5%, ¼W	0183200004
R75	Resistor, 47K, 10%, ¼W	0171060008
R76	Resistor, 150K, 10%, ¼W	0176750002
R77	Resistor, 18K, 10%, ¼W	0175720002

R78	Resistor, 6.8K, 5%, ¼W	0174810008
R79	Resistor, 220, 10%, ¼W	0171320000
R80	Resistor, 680, 10%, ¼W	0176630007
R81	Resistor, 10, 5%, ¼W	0177160004
R82	Resistor, 150, 10%, ¼W	0172730007
R83	Resistor, 1K, 10%, ¼W	0171560001
R84	Resistor, 1K, 10%, ¼W	0171560001
R85	Resistor, 100K, 10%, ¼W	0170390004
R86	Resistor, 33K, 10%, ¼W	0177920009
R87	Resistor, 5.6K, 10%, ¼W	0183060008
R88	Resistor, 220, 10%, ¼W	0171320000
R89	Resistor, 680, 10%, ¼W	0176630007
R90	Pot. 10K, 10%, ¾W, 15 Turns	0338490043
R91	Resistor, 1.2K, 10%, ¼W	0181860007
R92	Resistor, 22, 10%, ¼W	0192690001
R93	Resistor, 15K, 5%, ¼W	0195700007
R94	Resistor, 10K, 10%, ½W	0170410005
R95	Resistor, 1K, 10%, ¼W	0171560001
R96	Resistor, 150, 10%, ¼W	0172730007
R97	Resistor, 1K, 10%, ¼W	0171560001
R98	Resistor, 10K, 10%, ¼W	0170410005
R99	Resistor, 820, 10%, ¼W	0178210005
R100	Resistor, 5.6K, 10%, ¼W	0183060008
R101	Resistor, 100, 5%, ¼W	0171180003
R102	Resistor, 27K, 10%, ¼W	0171200004
R103	Resistor, 22K, 5%, ¼W	0172230004
R104	Resistor, 33K, 10%, ¼W	0177920009
R105	Resistor, 5.6K, 10%, ¼W	0183060008
R106	Resistor, 2.2K, 5%, ¼W	0178070009
R107	Resistor, 82, 10%, ¼W	0184610001
R108	Resistor, 2.2K, 5%, ¼W	0178070009
R109	Resistor, 10K, 10%, ¼W	0170410005
R110	Pot. 5K, 10%, ¾W, 15 Turns	0338490086
R111	Resistor, 100, 5%, ¼W	0171180003
R112	Resistor, 470, 5%, ¼W	0184110009
R113	Resistor, 22K, 5%, ¼W	0172230004
R114	Resistor, 1K, 10%, ¼W	0171560001
R115	Resistor, 47K, 10%, ¼W	0171060008
R116	Pot. 5K, 10%, ¾W, Turns	0338490086
R117	Resistor, 1.5K, 10%, ¼W	0172470005
R118	Resistor, 470, 5%, ¼W	0184110009
R119	Resistor, 4.7K, 5%, ¼W	0170770001
R120	Resistor, 27K, 10%, ¼W	0171200004
R121	Resistor, 22K, 5%, ¼W	0172230004
R122	Resistor, 470K, 10%, ¼W	0180570005
R123	Resistor, 4.7K, 5%, ¼W	0170770001
R124	Resistor, 22, 10%, ¼W	0192690001
R126	Resistor, 22K, 5%, ¼W	0172230004
R127	Resistor, 3.3K, 10%, ¼W	0170890007
R128	Resistor, 10K, 10%, ¼W	0170410005
R129	Resistor, 330, 5%, ¼W	0170910008

R130	Resistor, 1.2K, 10%, ¼W	0181860007
R131	Resistor, 47K, 10%, ¼W	0171060008
R132	Resistor, 1K, 10%, ¼W	0171560001
R133	Resistor, 4.7K, 5%, ¼W	0170770001
R134	Resistor, 680, 10%, ¼W	0176630007
R135	Resistor, 47, 10%, ¼W	0179360001
R136	Resistor, 10K, 10%, ¼W	0170410005
R138	Resistor, 1K, 10%, ¼W	0171560001
R139	Resistor, 1, 10%, ½W	0194770001
T1	Transformer, Interstage 1-1	8040040701
T2	Transformer, Balanced Mod.	8040060605
T3	Transformer, Audio PC Mount	0491660006
U1	IC Linear	0447950002
U2	IC Linear	0447950002
U3	IC Linear	0447950002
U4	IC Linear	0444600001
U5	IC Linear	0447950002
U6	IC Linear	1003420028
U7	IC Linear	0447950002

MISCELLANEOUS

Heat Sink	0840730004
Shield, Balanced Modulator	8040061008
Shield, IF	8040061105
Test Point, White	0753640007

8040050090J PC ASSY SECOND MIXER 1A4

	PC ASSY SECOND MIXER	8040050090
C1	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C3	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C4	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C5	Capacitor, 1µf, 35V, 196D	0281660000
C6	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C7	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C8	Capacitor, 1µf, 35V, 196D	0281660000
C9	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C10	Capacitor, 68µf, 15V	0296547778
C11	Capacitor, 68µf, 15V	0296547778
C12	Capacitor, .01µf, 25V, X55/Y5P	0281660000
C13	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C14	Capacitor, 0.001µf, 100V, X5E, 10%	0282080007
C15	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C16	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C17	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C18	Capacitor, 68µf, 15V	0296547778
C19	Capacitor, 56pf, 500V, DM15, 2%	0282360000
C20	Capacitor, 68µf, 15V	0296547778
C21	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C22	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C23	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C24	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C25	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C26	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C27	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C28	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C29	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C30	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C31	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C32	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C33	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C34	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C35	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C36	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C37	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C38	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C39	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C40	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C41	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C42	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C43	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C44	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C45	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C46	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C47	Capacitor, .01µf, 25V, X55/Y5P	0281627771

C48	Capacitor, 6.8µf, 20V, T368	0296780006
C49	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C50	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C51	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C52	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
CR1	Diode, Zener 1N5227B	0405250002
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Signal, Sil. 1N4454	0405270003
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
CR11	Diode, Signal, Sil. 1N4454	0405270003
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Diode, Signal, Sil. 1N4454	0405270003
CR14	Diode, Signal, Sil. 1N4454	0405270003
CR15	Diode, Signal, Sil. 1N4454	0405270003
CR16	Diode, Signal, Sil. 1N4454	0405270003
CR17	Diode, Signal, Sil. 1N4454	0405270003
CR18	Diode, Signal, Sil. 1N4454	0405270003
CR19	Diode, Signal, Sil. 1N4454	0405270003
CR20	Diode, Signal, Sil. 1N4454	0405270003
CR21	Diode, Signal, Sil. 1N4454	0405270003
CR22	Diode, Signal, Sil. 1N4454	0405270003
CR23	Diode, Signal, Sil. 1N4454	0405270003
CR24	Diode, Signal, Sil. 1N4454	0405270003
CR25	Diode, Signal, Sil. 1N4454	0405270003
CR26	Diode, Signal, Sil. 1N4454	0405270003
FL1	Filter, Crystal, USB, 5.6 MHz	8040050502
FL2	Filter, Crystal, AM, 5.6 MHz	8040050600
L1	Inductor, Molded, 0.82µh, 5%	0652320007
L2	Inductor, Molded, 0.82µh, 5%	0652320007
L3	Inductor, Molded, 150µh, 5%	0659190001
L4	Inductor, Molded, 150µh, 5%	0659190001
L5	Inductor, Molded, 33µh, 5%	0659690004
L6	Inductor, Molded, 33µh, 5%	0659690004
L7	Inductor, Molded, 33µh, 5%	0659690004
L8	Inductor, Molded, 33µh, 5%	0659690004
L9	Inductor, Molded, 33µh, 5%	0659690004
L10	Inductor, Molded, 33µh, 5%	0659690004
L11	Inductor, Molded, 33µh, 5%	0659690004
Q1	Transistor, N-CH, FET 40673	0447450000
Q2	Transistor, N-CH, FET 40673	0447450000
Q3	Transistor, NPN, SI. 2N4124	0448010003
Q4	Transistor, NPN, SI. 2N4124	0448010003
Q5	Transistor, PNP, SI. 2N4126	0448020009
Q6	Transistor, NPN, SI. 2N4124	0448010003
Q7	Transistor, NPN, SI. 2N4124	0448010003

R1	Resistor, 10K, 10%, ¼W	0170410005
R2	Resistor, 4.7K, 5%, ¼W	0170770001
R3	Resistor, 100K, 10%, ¼W	0170390004
R4	Resistor, 1K, 10%, ¼W	0171560001
R5	Resistor, 47, 10%, ¼W	0179360001
R6	Resistor, 27, 10%, ¼W	0172590001
R7	Resistor, 560, 5%, ¼W	0183200004
R8	Resistor, 27, 10%, ¼W	0172590001
R9	Resistor, 1K, 10%, ¼W	0171560001
R10	Resistor, 10K, 10%, ¼W	0170410005
R11	Resistor, 10K, 10%, ¼W	0170410005
R12	Resistor, 3.3K, 10%, ¼W	0170890007
R13	Resistor, 1K, 10%, ¼W	0171560001
R14	Resistor, 1K, 10%, ¼W	0171560001
R15	Resistor, 1.8K, 10%, ¼W	0178190004
R16	Resistor, 47, 10%, ¼W	0179360001
R17	Resistor, 100, 5%, ¼W	0171180003
R18	Resistor, 330, 5%, ¼W	0170910008
R19	Resistor, 1.8K, 10%, ¼W	0178190004
R20	Resistor, 1.5K, 10%, ¼W	0172470005
R21	Resistor, 47, 10%, ¼W	0179360001
R22	Resistor, 33, 10%, ¼W	0182530001
R23	Resistor, 680, 10%, ¼W	0176630007
R24	Resistor, 1.5K, 10%, ¼W	0172470005
R25	Resistor, 2.2K, 5%, ¼W	0178070009
R26	Resistor, 2.2K, 5%, ¼W	0178070009
R27	Resistor, 2.2K, 5%, ¼W	0178070009
R28	Resistor, 2.2K, 5%, ¼W	0178070009
R29	Resistor, 2.2K, 5%, ¼W	0178070009
R30	Resistor, 2.2K, 5%, ¼W	0178070009
R31	Resistor, 2.2K, 5%, ¼W	0178070009
R32	Pot. 10K, 10%, ½W, PC Mount	0346630002
R33	Resistor, 2.7K, 10%, ¼W	0186670001
R34	Resistor, 2.2K, 5%, ¼W	0178070009
R35	Resistor, 4.7K, 5%, ¼W	0170770001
R36	Resistor, 1K, 10%, ¼W	0171560001
R37	Resistor, 4.7K, 5%, ¼W	0170770001
R38	Resistor, 4.7K, 5%, ¼W	0170770001
R39	Resistor, 4.7K, 5%, ¼W	0170770001
R40	Resistor, 1.5K, 10%, ¼W	0172470005
R41	Resistor, 1.5K, 10%, ¼W	0172470005
R42	Resistor, 22K, 5%, ¼W	0172230004
R43	Resistor, 100, 5%, ¼W	0171180003
R44	Resistor, 100, 5%, ¼W	0171180003
R45	Resistor, 470, 5%, ¼W	0184110009
R46	Resistor, 1.2K, 10%, ¼W	0181860007
R47	Resistor, 2.2K, 5%, ¼W	0178070009
R48	Resistor, 12K, 10%, ¼W	0183180003
R49	Resistor, 12K, 10%, ¼W	0183180003
R51	Resistor, 10, 5%, ¼W	0177160004
R52	Resistor, 470, 5%, ¼W	0184110009

R53	Resistor, 4.7K, 5%, ¼W	0170770001
R54	Resistor, 4.7K, 5%, ¼W	0170770001
R55	Resistor, 4.7K, 5%, ¼W	0170770001
R56	Resistor, 4.7K, 5%, ¼W	0170770001
R57	Resistor, 4.7K, 5%, ¼W	0170770001
R58	Resistor, 100, 5%, ¼W	0171180003
R59	Resistor, 47, 10%, ¼W	0179360001
R60	Resistor, 22K, 5%, ¼W	0172230004
T1	Transformer, Interstage 2-11	8040051100
T2	Transformer, Interstage 2-11	8040051100
T3	Transformer	5024101103
T4	Transformer, Interstage 1-1	8040040701
U1	IC. Linear CA3086	0447950002
X1	Mixer, Broadband, Balanced	1003300006
	<u>MISCELLANEOUS</u>	
	Mounting Pad, Transistor	0502710004
	Shield, Can	8040051509
	Shield, Can	8040051606
	Shield, Can	8040051908

8040040094M PC ASSY FIRST MIXER 1A5

1A5	PC ASSY FIRST MIXER	8040040094
C1	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C2	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C3	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C4	Capacitor, 1µf, 35V, 196D	0281660000
C5	Capacitor, 1µf, 35V, 196D	0281660000
C6	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C7	Capacitor, 1µf, 35V, 196D	0281660000
C8	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C9	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C10	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C11	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C12	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C13	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C14	Capacitor, 1µf, 35V, T368	0283630001
C15	Capacitor, 1µf, 35V, T368	0283630001
C16	Capacitor, 1µf, 35V, T368	0283630001
C17	Capacitor, 1µf, 35V, T368	0283630001
C18	Capacitor, 1µf, 35V, T368	0283630001
C19	Capacitor, 1µf, 35V, T368	0283630001
C20	Capacitor, 3600pf, 500V, DM19, 2%	1002370001
C21	Capacitor, 3000pf, 500V, DM19, 2%	0281320004
C22	Capacitor, 1500pf, 500V, DM19, 2%	0281270007
C23	Capacitor, 1000pf, 500V, DM19, 2%	0281210004
C24	Capacitor, 680pf, 300V, DM15, 5%	0286240009
C25	Capacitor, 500pf, 500V, DM15, 5%	0286120003
C26	Capacitor, 270pf, 500V, DM15, 2%	0280970005
C27	Capacitor, 300pf, 500V, DM15, 2%	0282330003
C28	Capacitor, 200pf, 500V, DM15, 5%	0258040009
C29	Capacitor, 150pf, 500V, DM15, 2%	0281200009
C30	Capacitor, 68pf, 500V, DM15, 2%	1000050041
C31	Capacitor, 82pf, 500V, DM15, 2%	0281120005
C32	Capacitor, 1600pf, 500V, DM19, 2%	0281220000
C33	Capacitor, 1000pf, 500V, DM19, 2%	0281210004
C34	Capacitor, 680pf, 300V, DM15, 5%	0286240009
C35	Capacitor, 470pf, 500V, DM15, 2%	0281440000
C36	Capacitor, 300pf, 500V, DM15, 2%	0282330003
C37	Capacitor, 220pf, 500V, DM15, 2%	0281420009
C38	Capacitor, 3600pf, 500V, DM19, 2%	1002370001
C39	Capacitor, 3000pf, 500V, DM19, 2%	0281320004
C40	Capacitor, 1500pf, 500V, DM19, 2%	0281270007
C41	Capacitor, 1000pf, 500V, DM19, 2%	0281210004
C42	Capacitor, 680pf, 300V, DM15, 5%	0286240009
C43	Capacitor, 500pf, 500V, DM15, 5%	0286120003
C44	Capacitor, 1µf, 35V, T368	0283630001
C45	Capacitor, 1µf, 35V, T368	0283630001
C46	Capacitor, 1µf, 35V, T368	0283630001
C47	Capacitor, 1µf, 35V, T368	0283630001

C48	Capacitor, 1μf, 35V, T368	0283630001
C49	Capacitor, 1μf, 35V, T368	0283630001
C50	Capacitor, 0.1μf, 50V, X7R, 20%	0281610002
C51	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C52	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C53	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C54	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C55	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C56	Capacitor, 1μf, 35V, 196D	0281660000
C57	Capacitor, 0.1μf, 50V, X7R, 20%	0281610002
C58	Capacitor, 200pf, 500V, DM15, 5%	0258040009
C59	Capacitor, 200pf, 500V, DM15, 5%	0258040009
C60	Capacitor, 1800pf, 500V, DM19, 2%	0281300003
C61	Capacitor, 330pf, 500V, DM15, 2%	0281070008
C62	Capacitor, 8200pf, 100V, DM19, 5%	0298620006
C63	Capacitor, 75pf, 500V, DM15, 2%	0281110000
C64	Capacitor, 1300pf, 500V, DM19, 2%	0281380007
C65	Capacitor, 1600pf, 500V, DM19, 2%	0281220000
C66	Capacitor, 390pf, 500V, DM15, 2%	0281040001
C67	Capacitor, 1600pf, 500V, DM19, 2%	0281220000
C68	Capacitor, 0.1μf, 50V, X7R, 20%	0281610002
C69	Capacitor, 2400pf, 500V, DM19, 2%	0280980001
C70	Capacitor, 2400pf, 500V, DM19, 2%	0280980001
C71	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C72	Capacitor, 68μf, 15V	0296547778
C73	Capacitor, 1μf, 35V, 196D	0281660000
C74	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C75	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C76	Capacitor, 68μf, 15V	0296547778
C77	Capacitor, 22μf, 15V; T368	0296660001
C78	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C79	Capacitor, 0.1μf, 50V, X7R, 20%	0281610002
C80	Capacitor, 1μf, 35V, 196D	0281660000
C81	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C82	Capacitor, .01μf. 25V, X55/Y5P	0281627771
C83	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C84	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C85	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C86	Capacitor, .01μf, 25V, X55/Y5P	0281627771
C87	Capacitor, .01μf, 25V, X55/Y5P	0281627771
CR1	Diode, Pin	1005260001
CR2	Diode, Pin	1005260001
CR3	Diode, Pin	1005260001
CR4	Diode, Pin	1005260001
CR5	Diode, Pin	1005260001
CR6	Diode, Pin	1005260001
CR7	Diode, Pin	1005260001
CR8	Diode, Pin	1005260001
CR9	Diode, Pin	1005260001
CR10	Diode, Pin	1005260001
CR11	Diode, Pin	1005260001

CR12	Diode, Pin	1005260001
CR13	Diode, Pin	1005260001
CR14	Diode, Pin	1005260001
CR15	Diode, Pin	0405570007
CR16	Diode, Pin	1005260001
CR17	Diode, Rectifier 1N4004	0405180004
CR18	Diode, Zener 1N5227B	0405250002
CR19	Diode, Signal, SIL 1N4454	0405270003
CR20	Diode, Signal, SIL 1N4454	0405270003
FL1	Filter, Monolithic, 33.6 MHz	8040050707
L1	Inductor, Molded, 220μh, 5%	0650500008
L2	Inductor, Molded, 47μh, 5%	0652680003
L3	Inductor, Molded, 47μh, 5%	0652680003
L4	Inductor, Molded, 47μh, 5%	0652680003
L5	Inductor, Molded, 22μh, 5%	0650000005
L6	Inductor, Molded, 22μh, 5%	0650000005
L7	Inductor, Molded, 22μh, 5%	0650000005
L8	Inductor, Molded, 22μh, 5%	0650000005
L9	Inductor, Molded, 1.5μh, 5%	0649270002
L10	Inductor, Molded, 0.82μh, 5%	0652320007
L11	Inductor, Molded, 0.68μh, 5%	0649030001
L12	Inductor, Molded, 0.47μh, 5%	0649410009
L13	Inductor, Molded, .33μh, 10%	0664200001
L14	Inductor, Molded, 0.22μh, 5%	0650620003
L15	Inductor, Molded, 3.3μh, 5%	0658920006
L16	Inductor, Molded, 2.2μh, 5%	0649890001
L17	Inductor, Molded, 1.5μh, 5%	0649270002
L18	Inductor, Molded, 1.0μh, 5%	0649150007
L19	Inductor, Molded, 0.68μh, 5%	0649030001
L20	Inductor, Molded, 0.47μh, 5%	0649410009
L21	Inductor, Molded, 15μh, 5%	0659070006
L22	Inductor, Molded, 8.2μh, 5%	0652060005
L23	Inductor, Molded, 8.2μh, 5%	0652060005
L24	Inductor, Molded, 5.6μh, 5%	0650360001
L25	Inductor, Molded, 3.3μh, 5%	0658920006
L26	Inductor, Molded, 2.2μh, 5%	0649890001
L27	Inductor, Molded, 1.5μh, 5%	0649270002
L28	Inductor, Molded, 0.82μh, 5%	0652320007
L29	Inductor, Molded, 0.68μh, 5%	0649030001
L30	Inductor, Molded, 0.47μh, 5%	0649410009
L31	Inductor, Molded, .33μh, 10%	0664200001
L32	Inductor, Molded, 0.22μh, 5%	0650620003
L33	Inductor, Molded, 47μh, 5%	0652680003
L34	Inductor, Molded, 47μh, 5%	0652680003
L35	Inductor, Molded, 22μh, 5%	0650000005
L36	Inductor, Molded, 22μh, 5%	0650000005
L37	Inductor, Molded, 22μh, 5%	0650000005
L38	Inductor, Molded, 22μh, 5%	0650000005
L39	Inductor, Molded, 47μh, 5%	0652680003
L40	Inductor, Molded, 220μh, 5%	0650500008
L41	Inductor, Molded, 0.22μh, 5%	0650620003

L42	Inductor, Molded, 220µh, 5%	0650500008
L43	Inductor, Molded, 4.7µh, 5%	0651910005
L44	Inductor, Molded, .33µh, 10%	0664200001
L45	Inductor, Molded, 8.2µh, 5%	0652060005
L46	Inductor, Molded, 6.8µh, 5%	0659210002
L47	Inductor, Molded, 4.7µh, 5%	0651910005
L48	Inductor, Molded, 1.8µh, 5%	0652440002
L49	Inductor, Molded, 220µh, 5%	0650500008
L50	Inductor, Molded, 220µh, 5%	0650500008
L51	Inductor, Molded, 1.0µh, 5%	0649150007
L52	Inductor, Molded, 1.0µh, 5%	0649150007
L53	Inductor, Molded, 22µh, 5%	0650000005
L54	Inductor, Molded, 220µh, 5%	0650500008
L55	Inductor, Molded, 220µh, 5%	0650500008
Q1	Transistor, NPN, SI. 2N4124	0448010003
Q2	Transistor, NPN, SI. 2N3866	0448140004
Q3	Transistor, N-CH, FET 40673	0447450000
Q4	Transistor, NPN, SI 2N5179	0445130008
R1	Resistor, 68, 10%, 1W	1000860027
R2	Resistor, 68, 10%, 1W	1000860027
R3	Resistor, 330, 10%, 1W	0165300001
R4	Resistor, 68, 10%, 1W	1000860027
R5	Resistor, 68, 10%, 1W	1000860027
R6	Resistor, 68, 10%, 1W	1000860027
R7	Resistor, 68, 10%, 1W	1000860027
R8	Resistor, 10K, 10%, ¼W	0170410005
R9	Resistor, 10K, 10%, ¼W	0170410005
R10	Resistor, 10K, 10%, ¼W	0170410005
R11	Resistor, 10K, 10%, ¼W	0170410005
R12	Resistor, 10K, 10%, ¼W	0170410005
R13	Resistor, 10K, 10%, ¼W	0170410005
R14	Resistor, 150, 10%, 1W	0187840008
R15	Resistor, 150, 10%, 1W	0187840008
R16	Resistor, 330, 10%, 1W	0165300001
R17	Resistor, 820, 10%, ¼W	0178210005
R19	Resistor, 10, 5%, ¼W	0177160004
R20	Resistor, 22, 10%, ¼W	0192690001
R21	Resistor, 10K, 10%, ¼W	0170410005
R22	Resistor, 1.5K, 10%, ¼W	0172470005
R23	Resistor, 1.5K, 10%, ¼W	0172470005
R24	Resistor, 27, 10%, ¼W	0172590001
R25	Resistor, 820, 10%, ¼W	0178210005
R26	Resistor, 560, 5%, ¼W	0183200004
R27	Resistor, 470, 5%, ¼W	0184110009
R28	Resistor, 100K, 10%, ¼W	0170390004
R29	Resistor, 1.5K, 10%, ¼W	0172470005
R30	Resistor, 1.5K, 10%, ¼W	0172470005
R31	Resistor, 27, 10%, ¼W	0172590001
R32	Resistor, 27, 10%, ¼W	0172590001
R33	Resistor, 220, 10%, ¼W	0171320000
R34	Pot. 100, 10%, ½W, PC Mount	0346350000

R35	Resistor, 560, 5%, ¼W	0183200004
R36	Resistor, 820, 10%, ¼W	0178210005
R37	Resistor, 2.2K, 5%, ¼W	0178070009
R38	Resistor, 2.2K, 5%, ¼W	0178070009
R39	Resistor, 1.2K, 10%, ¼W	0181860007
T1	Transformer, Interstage 1-1	8040040701
T2	Transformer, Interstage 1-1	8040040701
T3	Transformer	5024111401
T4	Transformer, Input	5024110706
T5	Transformer, RF Amp	5024110803
T6	Transformer, Interstage 1-1	8040040701
X1	Mixer, Broadband, Balanced	1003300006

MISCELLANEOUS

Mounting Pad, Transistor	0502710004
Shield, Exciter	8040041201
Shield, RF Amp	8040041104

	PC ASSY SYNTHESIZER	8056040099
A1	Ovenized Freq. STD. 28 MHz	8040010501
C1	Capacitor, 2.2µf, 50V, 20%	1005330026
C2	Capacitor, 22µf, 16V, 20%	1005340030
C3	Capacitor, 12pf, 500V, DM10, 5%	0260280003
C4	Capacitor, 0.01µf, 25V, X5S	0281620008
C5	Capacitor, 2.2µf, 50V, 20%	1005330026
C6	Capacitor, 22µf, 16V, 20%	1005340030
C7	Capacitor, 22µf, 15V, 196D	0281690006
C8	Capacitor, 0.01µf, 25V, X5S	0281620008
C9	Capacitor, 22µf, 15V, 196D	0281690006
C10	Capacitor, 36pf, 500V, DM10, 5%	0293550000
C11	Capacitor, 1µf, 50V, 20%	1005330018
C12	Capacitor, 68µf, 16V, 20%	1005250019
C13	Capacitor, 43pf, 500V, DM10, 5%	0260800007
C14	Capacitor, 0.01µf, 25V, X5S	0281620008
C15	Capacitor, 47µf, 35V, 20%	1005350001
C16	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C17	Capacitor, 5pf, 500V, DM10	0261190008
C18	Capacitor, 47pf, 500V, DM10, 5%	0294960007
C19	Capacitor, 1µf, 50V, 20%	1005330018
C20	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C21	Capacitor, 0.01µf, 25V, X5S	0281620008
C22	Capacitor, 5-20pf, 100V, Ceramic	0282930001
C23	Capacitor, 18pf, 500V, DM10, 5%	0280300004
C24	Capacitor, 0.01µf, 25V, X5S	0281620008
C25	Capacitor, 39pf, 500V, CM10, 5%	0293290008
C26	Capacitor, 50pf, 500V, DM10, 2%	1000060004
C27	Capacitor, 27pf, 500V, DM10, 5%	0260660001
C28	Capacitor, 0.01µf, 25V, X5S	0281620008
C29	Capacitor, 10pf, 500V, DM10	0259830003
C30	Capacitor, 10pf, 500V, DM10	0259830003
C31	Capacitor, 0.01µf, 25V, X5S	0281620008
C32	Capacitor, 27pf, 500V, DM10, 5%	0260660001
C34	Capacitor, 2.2µf, 35V, T368	0273950002
C35	Capacitor, 0.01µf, 25V, X5S	0281620008
C36	Capacitor, 2.2µf, 35V, T368	0273950002
C37	Capacitor, 0.01µf, 25V, X5S	0281620008
C38	Capacitor, 0.1µf, 100V, 5%	1004610009
C39	Capacitor, 0.1µf, 100V, 5%	1004610009
C40	Capacitor, 1µf, 100V, 5%	1004610017
C42	Capacitor, 0.01µf, 25V, X5S	0281620008
C43	Capacitor, 0.1µf, 100V, 5%	1004610009
C44	Capacitor, 100pf, 500V, DM10, 5%	0274740001
C46	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C47	Capacitor, 0.01µf, 25V, X5S	0281620008
C48	Capacitor, 22µf, 15V, 196D	0281690006
C49	Capacitor, .01µf, 50V, X7R, 20%	0281730008

C50	Capacitor, 10pf, 500V, DM10	0259830003
C51	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C52	Capacitor, 47pf, 500V, DM10, 5%	0294960007
C53	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C54	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C55	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C56	Capacitor, 0.01μf, 25V, X5S	0281620008
C57	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C58	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C59	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C60	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C61	Capacitor, 27pf, 500V, DM10, 5%	0260660001
C62	Capacitor, 47pf, 500V, DM10, 5%	0294960007
C63	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C65	Capacitor, 27pf, 500V, DM10, 5%	0260660001
C67	Capacitor, .01μf, 50V, X7R, 20%	0281730008
C66	Capacitor, 39pf, 500V, DM10, 5%	0293290008
C68	Capacitor, 68pf, 500V, DM10, 5%	0261070002
C69	Capacitor, 0.01μf, 25V, X5S	0281620008
C70	Capacitor, 0.01μf, 25V, X5S	0281620008
C71	Capacitor, 0.01μf, 25V, X5S	0281620008
C72	Capacitor, 0.01μf, 25V, X5S	0281620008
C73	Capacitor, 0.01μf, 25V, X5S	0281620008
C74	Capacitor, 0.01μf, 25V, X5S	0281620008
C75	Capacitor, 0.01μf, 25V, X5S	0281620008
C76	Capacitor, 0.01μf, 25V, X5S	0281620008
C77	Capacitor, 0.01μf, 25V, X5S	0281620008
C78	Capacitor, 0.01μf, 25V, X5S	0281620008
C79	Capacitor, 0.01μf, 25V, X5S	0281620008
C80	Capacitor, 0.01μf, 25V, X5S	0281620008
C81	Capacitor, 0.01μf, 25V, X5S	0281620008
C82	Capacitor, 0.01μf, 25V, X5S	0281620008
C83	Capacitor, 0.01μf, 25V, X5S	0281620008
C84	Capacitor, 0.01μf, 25V, X5S	0281620008
C85	Capacitor, 0.01μf, 25V, X5S	0281620008
C86	Capacitor, 0.01μf, 25V, X5S	0281620008
C87	Capacitor, 150pf, 500V, DM10, 5%	0293430004
C88	Capacitor, 0.01μf, 25V, X5S	0281620008
C89	Capacitor, 0.01μf, 25V, X5S	0281620008
C90	Capacitor, 0.01μf, 25V, X5S	0281620008
C91	Capacitor, 0.01μf, 25V, X5S	0281620008
C92	Capacitor, 0.01μf, 25V, X5S	0281620008
CR1	Diode, Zener	0405240007
CR2	Diode, Tuning	1004560001
CR3	Diode, Signal, Sil 1N4454	0405270003
CR4	Diode, Signal, Sil 1N4454	0405270003
CR5	Diode, Signal, Sil 1N4454	0405270003
L1	Inductor, Molded, 1.0μh, 5%	0648360008
L2	Inductor, Molded, 1.0μh, 5%	0648360008
L3	Inductor, Molded, 47μh, 5%	0646420003

L5	Inductor, Molded, 0.68µh, 5%	0649030001
L6	Inductor, Molded, 0.68µh, 5%	0649030001
L7	Inductor, Molded, 15µh, 5%	0659070006
L8	Inductor, Molded, 0.15µh, 5%	0648620000
L9	Inductor, Molded, 0.15µh, 5%	0648620000
L10	Inductor, Molded, 1.0µh, 5%	0648360008
L11	Inductor, Molded, 15µh, 5%	0659070006
L12	Inductor, Molded, 15µh, 5%	0659070006
L13	Inductor, Molded, 15µh, 5%	0659070006
L14	Inductor, Molded, 0.18µh, 5%	0648740005
L15	Inductor, Molded, .33µh, 10%	0664200001
L16	Inductor, Molded, 1.2µh, 5%	0649910001
L17	Inductor, Molded, 0.18µh, 5%	0648740005
L18	Inductor, Molded, 0.47µh, 5%	0649410009
L19	Inductor, Molded, 2.7µh, 5%	0652180001
L20	Inductor, Molded, 22µh, 5%	0650000005
Q1	Transistor, NPN, SI	0448010003
Q2	Transistor, NPN, SI	0448010003
Q3	Transistor, PNP, SI	0448020009
Q4	Transistor, NPN, SI	0448010003
Q5	Transistor, N-CH, FET	0448050005
Q6	Transistor, N-CH, FET	0448050005
Q7	Transistor, NPN, SI	0448010003
Q8	Transistor, PNP, SI	1004560010
Q9	Transistor, NPN, SI	1006300007
Q10	Transistor, N-Ch FET	1001230035
Q11	Transistor, NPN, SI	0445250000
R2	Resistor, 100, 5%, ¼W	0171180003
R3	Resistor, 100, 5%, ¼W	0171180003
R4	Resistor, 120, 10%, ¼W	0186550006
R5	Resistor, 100, 5%, ¼W	0171180003
R6	Resistor, 2.2K, 5%, ¼W	0178070009
R7	Resistor, 4.7K, 5%, ¼W	0170770001
R8	Resistor, 1K, 10%, ¼W	0171560001
R9	Resistor, 1K, 10%, ¼W	0171560001
R10	Resistor, 1K, 10%, ¼W	0171560001
R11	Resistor, 4.7K, 5%, ¼W	0170770001
R12	Resistor, 1K, 10%, ¼W	0171560001
R13	Resistor, 220, 10%, ¼W	0171320000
R14	Resistor, 1K, 10%, ¼W	0171560001
R15	Resistor, 22K, 5%, ¼W	0172230004
R16	Resistor, 22K, 5%, ¼W	0172230004
R17	Resistor, 470, 5%, ¼W	0184110009
R18	Resistor, 10K, 10%, ¼W	0170410005
R19	Resistor, 47, 10%, ¼W	0179360001
R20	Resistor, 1K, 10%, ¼W	0171560001
R21	Resistor, 10K, 10%, ¼W	0170410005
R22	Resistor, 10K, 10%, ¼W	0170410005
R23	Resistor, 10K, 10%, ¼W	0170410005
R24	Resistor, 2.2K, 5%, ¼W	0178070009
R25	Resistor, 10K, 10%, ¼W	0170410005

R26	Resistor, 10K, 10%, ¼W	0170410005
R27	Resistor, 10K, 10%, ¼W	0170410005
R28	Resistor, 10K, 10%, ¼W	0170410005
R29	Resistor, 1.2K, 10%, ¼W	0181860007
R30	Resistor, 1K, 10%, ¼W	0171560001
R31	Resistor, 4.7K, 5%, ¼W	0170770001
R32	Resistor, 2.7K, 10%, ¼W	0186670001
R33	Resistor, 10K, 10%, ¼W	0170410005
R34	Resistor, 10K, 10%, ¼W	0170410005
R35	Resistor, 10K, 10%, ¼W	0170410005
R36	Resistor, 10K, 10%, ¼W	0170410005
R37	Resistor, 18K, 10%, ¼W	0175720002
R38	Resistor, 47K, 10%, ¼W	0171060008
R39	Resistor, 10K, 10%, ¼W	0170410005
R40	Resistor, 27K, 10%, ¼W	0171200004
R41	Resistor, 10K, 10%, ¼W	0170410005
R42	Resistor, 10K, 10%, ¼W	0170410005
R43	Resistor, 1.5K, 10%, ¼W	0172470005
R44	Resistor, 10K, 10%, ¼W	0170410005
R45	Resistor, 10K, 10%, ¼W	0170410005
R46	Resistor, 10K, 10%, ¼W	0170410005
R47	Resistor, 10K, 10%, ¼W	0170410005
R48	Resistor, 18, 10%, ¼W	0184590001
R49	Resistor, 470, 5%, ¼W	0184110009
R50	Resistor, 470, 5%, ¼W	0184110009
R51	Resistor, 5.6K, 10%, ¼W	0183060008
R52	Resistor, 10K, 10%, ¼W	0170410005
R53	Resistor, 10K, 10%, ¼W	0170410005
R54	Resistor, 470, 5%, ¼W	0184110009
R55	Resistor, 10K, 10%, ¼W	0170410005
R56	Resistor, 10K, 10%, ¼W	0170410005
R57	Resistor, 100, 5%, ¼W	0171180003
R58	Resistor, 1K, 10%, ¼W	0171560001
R59	Resistor, 470, 5%, ¼W	0184110009
R60	Resistor, 100, 5%, ¼W	0171180003
R61	Resistor, 10K, 10%, ¼W	0170410005
R62	Resistor, 10K, 10%, ¼W	0170410005
R63	Resistor, 10K, 10%, ¼W	0170410005
R64	Resistor, 10K, 10%, ¼W	0170410005
R67	Resistor, 470, 5%, ¼W	0184110009
U1	IC Linear	0448600005
U2	IC Digital	1004560028
U3	IC Digital	1004560036
U4	IC Digital	1004560036
U5	IC Digital	1004560028
U6	IC Digital	1004560036
U7	IC Digital	1003890008
U8	IC Digital	1004570023
U9	IC Digital	0448100002
U10	IC Digital	1004560036
U11	IC Digital	1003890008

U12	IC Digital	1004570031
U13	IC Digital	1004570007
U14	IC Digital	1004560036
U15	IC Digital	1003890008
U16	IC Digital	1004580011
U17	IC Digital	1004580029
U18	IC Digital	1004560036
U19	IC Linear	1004580037
U20	IC Digital	1004560036
U21	IC Linear	1004580037
U22	IC Digital	1004560036
U23	IC Digital	1004630018

MISCELLANEOUS

Mounting Pad, Transistor	0502710004
Shield, Synthesizer	8056040706

8056030093 REV 09 FILTER MODULE ASSY 1A7

	FILTER MODULE ASSY	8056030093
C4	Capacitor, 1000pf, 500V	0286270005
C5	Capacitor, 1000pf, 500V	0286270005
C6	Capacitor, 1000pf, 500V	0286270005
C7	Capacitor, 0.1µf, 50V	1001010027
J1	Connector, RF, Subminiature	0753670003
J2	Connector, RF, Subminiature	0753670003
J3	Connector, RF, BNC UG-1094/U	0743740009
R2	Resistor, 10, 10%, 1W	0187720002
R3	Resistor, 10, 10%, 1W	0187720002

MISCELLANEOUS

Coupling, Flex. 3/16-¼ ID	0346360005
Diode, Pin UM4001C	0405430001
Diode, Pin UM4001CR	0405440006
Motor, 12VDC, 96.7/1 Gear/Red	5024053508
PC Assy ALC/ACC Detect	8040120098
PC Assy Even Channel Filter	8056035095
PC Assy Interface	8056033092
PC Assy Motor Control	8056031090
PC Assy Odd Channel Filter	8056034099
PC Assy TR Relay	8056032096
Shaft, .250 OD 6.500L	0332530078
Switch, Wafer, Band Select	8040030501

8040120098D PC ASSY ALC/ACC DETECT 1A7A4

	PC ASSY ALC/ACC DETECT	8040120098
C1	Capacitor, 4-40pf, 25V	0295490004
C2	Capacitor, 150pf, 500V, DM15, 5%	0274980002
C3	Capacitor, 10pf, 500V, DM10	0259830003
C4	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C5	Capacitor, 2-8pf, 200V, NPO	0284300004
C6	Capacitor, 120pf, 500V, DM15, 5%	0289850002
C7	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C8	Capacitor, 2pf, 500V, DM10	0259710008
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 22µh, 5%	0650000005
L2	Inductor, Molded, 2000µh, 5%	0653590008
R1	Resistor, 2.7K, 5%, 2W	0195940008
R2	Resistor, 270, 10%, ¼W	0178450006
R3	Resistor, 1K, 10%, ¼W	0171560001
R4	Resistor, 2.7K, 5%, 2W	0195940008
R5	Resistor, 680, 10%, ½W	0167500007
R6	Resistor, 82, 10%, ¼W	0184610001
T1	Transformer, Current	5024055608

8056031090 REV 02 PC ASSY MOTOR CONTROL 1A7A5

	PC ASSY MOTOR CONTROL	8056031090
C1	Capacitor, 1µf, 50V, 20%	1005330018
C2	Capacitor, 1µf, 50V, 20%	1005330018
C3	Capacitor, 0.01µf, 25V, X5S	0281620008
CR1	Diode, Rectifier 1N4004	0405180004
J1	Connector, PC, 15 Pin Female	1003400035
K1	Relay, DPDT, 12VDC	1005090009
L1	Inductor, Molded, 47µh, 5%	0646420003
S1A	Switch Wafer, Motor Control	8040033608

8056032096 REV 01 PC ASSY TR RELAY 1A7A6

	PC ASSY TR RELAY	8056032096
CR2	Diode, Rectifier 1N4004	0405180004
K1	Relay, DPDT, 12VDC	1004380020
R1	Resistor, 56, 10%, 2W	0197210007
	MISCELLANEOUS	
	Socket, Relay	1004380038

8056033092 REV 04 PC ASSY INTERFACE 1A7A1

	PC ASSY INTERFACE	8056033092
C1	Capacitor, 68µf, 15V, T368	0296540005
C2	Capacitor, 47µf, 35V, 20%	1005350001
C3	Capacitor, 68µf, 15V, T368	0296540005
C4	Capacitor, 68µf, 25V, T368	0282150005
C5	Capacitor, 1µf, 50V, 20%	1005330018
C6	Capacitor, 1µf, 50V, 20%	1005330018
C7	Capacitor, 0.01µf, 25V, X5S	0281620008
C8	Capacitor, 0.01µf, 25V, X5S	0281620008
C9	Capacitor, 0.01µf, 25V, X5S	0281620008
C10	Capacitor, 0.01µf, 25V, X5S	0281620008
C11	Capacitor, 0.01µf, 25V, X5S	0281620008
C12	Capacitor, 0.01µf, 25V, X5S	0281620008
C13	Capacitor, 100µf, 25V, 20%	1005350035
CR1	Diode, Signal, Germ. 1N270	0405510004
CR2	Diode, Rectifier 1N5400	0403970008
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Signal, Sil. 1N4454	0405270003
F1	Fuse, MDL, 3 Amp, 32V	0896660001
K1	Relay, 4PDT, 12V, Sensitive	0666640009
K2	Relay, SPDT, 24V, Reed	1003400001
L1	Inductor, Molded, 150µh, 5%	0659190001
Q1	Transistor, N-CH, FET	0443930007
Q2	Transistor, PNP, SI. 2N4126	0448020009
Q3	Transistor, NPN, SI. MPSU45	0448570009
Q4	Transistor, NPN, SI. MJE2801	0448530007
Q5	Transistor, NPN, SI. 2N4124	0448010003
Q6	Transistor, NPN, SI. 2N4124	0448010003
Q7	Transistor, NPN, SI. 2N4124	0448010003
Q8	Transistor, NPN, SI. 2N4124	0448010003
Q9	Transistor, NPN, SI. 2N4124	0448010003
R1	Pot. 2K, 10%, ¼W, 15 Turns	0338490060
R2	Resistor, 8.2K, 5%, ¼W	0192070002
R3	Resistor, 4.7K, 5%, ¼W	0170770001
R4	Resistor, 1.5K, 10%, ¼W	0172470005
R5	Resistor, 820, 10%, ¼W	0178210005
R6	Resistor, 1K, 10%, ¼W	0171560001
R7	Resistor, 27, 10%, ¼W	0172590001
R8	Resistor, 1K, 10%, ¼W	0171560001
R9	Resistor, 100, 5%, ¼W	0171180003
R10	Resistor, 22K, 5%, ¼W	0172230004
R11	Resistor, 1K, 10%, ¼W	0171560001
R12	Resistor, 2.2K, 5%, ¼W	0178070009
R13	Resistor, 1M, 10%, ¼W	0170650006
R14	Resistor, 220, 10%, ¼W	0171320000
R15	Resistor, 47, 10%, ¼W	0179360001

R16	Resistor, 22K, 5%, ¼W	0172230004
R17	Resistor, 2.2K, 5%, ¼W	0178070009
R18	Resistor, 18K, 10%, ¼W	0175720002
R19	Pot. 10K, 10%, ¾W, 15 Turns	0338490043
R20	Resistor, 10K, 10%, ¼W	0170410005
R21	Resistor, 2.2K, 5%, ¼W	0178070009
R22	Resistor, 3.3K, 10%, ¼W	0170890007
R23	Resistor, 22, 10%, ¼W	0192690001
R24	Resistor, 22, 10%, ¼W	0192690001
R25	Resistor, 1.2K, 10%, ¼W	0181860007
R26	Resistor, 68, 10%, ¼W	0187960003
R27	Resistor, 10K, 10%, ¼W	0170410005
R28	Resistor, 1K, 10%, ¼W	0171560001
R29	Resistor, 1K, 10%, ¼W	0171560001
RT1	Resistor, 5K at 25°C	1001340001

MISCELLANEOUS

	Fuseclip, PC Mount	0534610005
	Socket, Relay, 4PDT, PC Mount	1003420036
	Spring, Relay Hold-Down	0878260005
	Test Point, White	0753640007

8056034099 REV 04 PC ASSY ODD CHANNEL FILTER 1A7A3

	PC ASSY ODD CHANNEL FILTER	8056034099
C1	Capacitor, 510pf, 500V, DM19, 2%	0282630007
C2	Capacitor, 820pf, 500V, DM19, 2%	0281280002
C3	Capacitor, 1500pf, 500V, DM19, 2%	0281270007
C4	Capacitor, 390pf, 500V, DM19, 2%	0282640002
C5	Capacitor, 1800pf, 500V, DM19, 2%	0281300003
C6	Capacitor, 1100pf, 500V, DM19, 2%	0281000000
C7	Capacitor, 250pf, 500V, DM19, 2%	0282680004
C8	Capacitor, 390pf, 500V, DM19, 2%	0282640002
C9	Capacitor, 750pf, 500V, DM19, 2%	0280990006
C10	Capacitor, 200pf, 500V, DM19, 5%	0254260004
C11	Capacitor, 910pf, 500V, DM19, 2%	0281450005
C12	Capacitor, 560pf, 500V, DM19, 2%	0281060002
C13	Capacitor, 120pf, 500V, DM19, 2%	0282750002
C14	Capacitor, 180pf, 500V, DM19, 2%	0282700005
C15	Capacitor, 360pf, 500V, DM19, 2%	0282650008
C16	Capacitor, 91pf, 500V, DM15, 5%	0298740001
C17	Capacitor, 430pf, 500V, DM19, 5%	0254900003
C18	Capacitor, 250pf, 500V, DM19, 2%	0282680004
L1	Inductor, 1.79µh	8056036202
L2	Inductor, 2.93µh	8056037101
L3	Inductor, 3.65µh	8056035907
L4	Inductor, .92µh	8056036504
L5	Inductor, 1.43µh	8056037306
L6	Inductor, 1.83µh	8056036105
L7	Inductor, .37µh	8056036806
L8	Inductor, 0.60µh	8056037501
L9	Inductor, .81µh	8056036601

	PC ASSY EVEN CHANNEL FILTER	8056035095
C1	Capacitor, 820pf, 500V, DM19, 2%	0281280002
C2	Capacitor, 1300pf, 500V, DM19, 2%	0281380007
C3	Capacitor, 300pf, 500V, DM15, 2%	0282330003
C4	Capacitor, 1100pf, 500V, DM19, 2%	0281000000
C5	Capacitor, 620pf, 500V, DM19, 5%	0299150003
C6	Capacitor, 390pf, 500V, DM19, 2%	0282640002
C7	Capacitor, 360pf, 500V, DM19, 2%	0282650008
C8	Capacitor, 620pf, 500V, DM19, 5%	0299150003
C9	Capacitor, 130pf, 500V, DM19, 2%	0282740007
C10	Capacitor, 510pf, 500V, DM19, 2%	0282630007
C11	Capacitor, 270pf, 500V, DM19, 2%	0282670009
C12	Capacitor, 180pf, 500V, DM19, 2%	0282700005
C13	Capacitor, 180pf, 500V, DM19, 2%	0282700005
C14	Capacitor, 300pf, 500V, DM15, 2%	0282330003
C15	Capacitor, 68pf, 500V, DM15, 2%	1000050041
C16	Capacitor, 250pf, 500V, DM19, 2%	0282680004
C17	Capacitor, 130pf, 500V, DM19, 2%	0282740007
C18	Capacitor, 82pf, 500V, DM15, 2%	0281120005
L1	Inductor, 2.78µh	8056036008
L2	Inductor, 2.21µh	8056037209
L3	Inductor, 1.36µh	8056036300
L4	Inductor, 1.21µh	8056036407
L5	Inductor, 0.89µh	8056037403
L6	Inductor, .60µh	8056036709
L7	Inductor, .60µh	8056036709
L8	Inductor, 0.45µh	8056037608
L9	Inductor, .30µh	8056036903

	PC ASSY PANEL CONTROL	8056050094
C1	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C2	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C3	Capacitor, 22µf, 16V, 20%	1005340030
C4	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C6	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C7	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C8	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C9	Capacitor, 6.8µf, 20V, T368	0296780006
C10	Capacitor, 1µf, 35V, 196D	0281660000
C11	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C12	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C13	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C14	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C15	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C16	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C17	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C18	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C19	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C20	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C21	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C22	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C24	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C25	Capacitor, 15µf, 20V, 198D	0280920008
C26	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C27	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C28	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C29	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C30	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C31	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C32	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C33	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C34	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C35	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C37	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C38	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C39	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C40	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C41	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C42	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C43	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C44	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C45	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C46	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C47	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C48	Capacitor, .01µf, 50V, X7R, 20%	0281730008

C49	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C50	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C51	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C52	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C53	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C54	Capacitor, 6.8µf, 20V, T368	0296780006
C55	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C58	Capacitor, 100pf, 500V, DM15, 2%	0281190003
C59	Capacitor, 22pf, 500V, CD15, 2%	1000050025
C60	Capacitor, 47pf, 500V, DM15, 2%	0282420002
C61	Capacitor, 100µf, 25V, 20%	1005350035
C62	Capacitor, 47µf, 35V, 20%	1005350001
C63	Capacitor, 0.02µf, 100V, Z5V	0273450000
C64	Capacitor, 0.47µf, 50V, X5V, 20%	0283370009
C65	Capacitor, 220µf, 50V	0282200002
C66	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C67	Capacitor, 47pf, 500V, DM15, 2%	0282420002
C69	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C70	Capacitor, 470pf, 500V, DM15, 2%	0281440000
C71	Capacitor, 68µf, 25V, 20%	1005350027
C72	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C73	Capacitor, 0.0047µf, 50V, 5/10%	0281540004
C74	Capacitor, 0.01µf, 50V, 5/10%	0281560005
C75	Capacitor, 47µf, 35V, 20%	1005350001
C76	Capacitor, 0.0047µf, 50V, 5/10%	0281540004
C77	Capacitor, 0.05µf, 25V, Y5U	0273570005
C78	Capacitor, .1µf, 50V, X7R, 20%	0281610002
C79	Capacitor, 1µf, 35V, 196D	0281660000
C80	Capacitor, 0.01µf, 25V, X5S	0281620008
C81	Capacitor, 0.01µf, 100V, X7R, 20%	0281630003
C82	Capacitor, 0.01µf, 100V, X7R, 20%	0281630003
C83	Capacitor, .01µf, 50V, X7R, 20%	0281730008
CR1	Diode, Signal, Germ. 1N270	0405510004
CR2	Diode, Signal, Germ. 1N270	0405510004
CR3	Diode, Signal, Germ. 1N270	0405510004
CR4	Diode, Signal, Germ. 1N270	0405510004
CR5	Diode, Signal, Germ. 1N270	0405510004
CR6	Diode, Signal, Germ. 1N270	0405510004
CR7	Diode, Signal, Germ. 1N270	0405510004
CR8	Diode, Signal, Germ. 1N270	0405510004
CR9	Diode, Signal, Germ. 1N270	0405510004
CR10	Diode, Signal, Germ. 1N270	0405510004
CR11	Diode, Signal, Germ. 1N270	0405510004
CR12	Diode, Signal, Sil 1N4454	0405270003
CR13	Diode, Varicap, MV2209	1004620021
CR14	Diode, Zener	0405240007
CR15	Diode, Signal, Sil 1N4454	0405270003
CR16	Diode, Signal, Sil 1N4454	0405270003
CR17	Diode, Signal, Sil 1N4454	0405270003
CR18	Diode, Signal, Sil 1N4454	0405270003
CR19	Diode, Signal, Sil 1N4454	0405270003

CR20	Diode, Signal, Sil 1N4454	0405270003
CR21	Diode, Signal, Sil 1N4454	0405270003
CR22	Diode, Signal, Sil 1N4454	0405270003
K1	Relay, Reed, 12 VDC 1 Form C	1004630026
K2	Relay, Reed, 12 VDC 1 Form C	1004630026
K3	Relay, Reed, 12 VDC 1 Form C	1004630026
L1	Inductor, Molded, 150µh, 5%	0659190001
L2	Inductor, Molded, 150µh, 5%	0659190001
Q1	Transistor, N-CH, FET 2N5486	0448050005
Q2	Transistor, N-CH, FET 2N5486	0448050005
Q3	Transistor, PNP, SI. 2N4126	0448020009
Q4	Transistor, NPN, SI. 2N4124	0448010003
Q5	Transistor, PNP, SI. MPS-A63	0448650002
Q6	Transistor, PNP, SI. 2N4126	0448020009
Q7	Transistor, NPN, SI. 2N4124	0448010003
Q8	Transistor, NPN, SI. 2N4124	0448010003
R1	Resistor, 1K, 10%, ¼W	0171560001
R2	Resistor, 1.2K, 10%, ¼W	0181860007
R3	Resistor, 1.2K, 10%, ¼W	0181860007
R4	Resistor, 1.2K, 10%, ¼W	0181860007
R5	Resistor, 1.2K, 10%, ¼W	0181860007
R6	Resistor, 1.2K, 10%, ¼W	0181860007
R7	Resistor, 1.2K, 10%, ¼W	0181860007
R8	Resistor, 18K, 10%, ¼W	0175720002
R9	Resistor, 8.2K, 5%, ¼W	0192070002
R10	Resistor, 470K, 10%, ¼W	0180570005
R11	Resistor, 470K, 10%, ¼W	0180570005
R12	Resistor, 10K, 10%, ¼W	0170410005
R13	Resistor, 10K, 10%, ¼W	0170410005
R14	Resistor, 10K, 10%, ¼W	0170410005
R15	Resistor, 4.7K, 5%, ¼W	0170770001
R16	Resistor, 4.7K, 5%, ¼W	0170770001
R17	Resistor, 4.7K, 5%, ¼W	0170770001
R18	Resistor, 4.7K, 5%, ¼W	0170770001
R19	Resistor, 4.7K, 5%, ¼W	0170770001
R20	Resistor, 4.7K, 5%, ¼W	0170770001
R21	Resistor, 4.7K, 5%, ¼W	0170770001
R22	Resistor, 560, 5%, ¼W	0183200004
R23	Resistor, 4.7k, 5%, ¼W	0170770001
R24	Resistor, 1.8K, 10%, ¼W	0178190004
R25	Resistor, 5.6K, 10%, ¼W	0183060008
R26	Resistor, 33K, 5%, ¼W	0195820002
R27	Resistor, 10K, 10%, ¼W	0170410005
R28	Resistor, 4.7K, 5%, ¼W	0170770001
R29	Resistor, 1K, 10%, ¼W	0171560001
R30	Resistor, 1.8K, 10%, ¼W	0178190004
R31	Resistor, 1K, 10%, ¼W	0171560001
R32	Resistor, 120, 10%, ¼W	0186550006
R33	Resistor, 120, 10%, ¼W	0186550006
R34	Resistor, 120, 10%, ¼W	0186550006
R35	Resistor, 120, 10%, ¼W	0186550006

R36	Resistor, 120, 10%, ¼W	0186550006
R37	Resistor, 120, 10%, ¼W	0186550006
R38	Resistor, 120, 10%, ¼W	0186550006
R39	Resistor, 120, 10%, ¼W	0186550006
R40	Resistor, 120, 10%, ¼W	0186550006
R41	Resistor, 120, 10%, ¼W	0186550006
R42	Resistor, 120, 10%, ¼W	0186550006
R43	Resistor, 120, 10%, ¼W	0186550006
R44	Resistor, 120, 10%, ¼W	0186550006
R45	Resistor, 120, 10%, ¼W	0186550006
R46	Resistor, 120, 10%, ¼W	0186550006
R47	Resistor, 120, 10%, ¼W	0186550006
R48	Resistor, 120, 10%, ¼W	0186550006
R49	Resistor, 120, 10%, ¼W	0186550006
R50	Resistor, 120, 10%, ¼W	0186550006
R51	Resistor, 120, 10%, ¼W	0186550006
R52	Resistor, 120, 10%, ¼W	0186550006
R53	Resistor, 120, 10%, ¼W	0186550006
R54	Resistor, 120, 10%, ¼W	0186550006
R55	Resistor, 120, 10%, ¼W	0186550006
R56	Resistor, 120, 10%, ¼W	0186550006
R57	Resistor, 120, 10%, ¼W	0186550006
R58	Resistor, 120, 10%, ¼W	0186550006
R59	Resistor, 120, 10%, ¼W	0186550006
R60	Resistor, 120, 10%, ¼W	0186550006
R61	Resistor, 120, 10%, ¼W	0186550006
R62	Resistor, 120, 10%, ¼W	0186550006
R63	Resistor, 120, 10%, ¼W	0186550006
R64	Resistor, 120, 10%, ¼W	0186550006
R65	Resistor, 120, 10%, ¼W	0186550006
R66	Resistor, 120, 10%, ¼W	0186550006
R67	Resistor, 120, 10%, ¼W	0186550006
R68	Resistor, 120, 10%, ¼W	0186550006
R69	Resistor, 120, 10%, ¼W	0186550006
R70	Resistor, 1K, 10%, ¼W	0171560001
R71	Resistor, 47K, 10%, ¼W	0171060008
R72	Resistor, 220, 10%, ½W	0172850002
R73	Resistor, 47K, 10%, ¼W	0171060008
R74	Resistor, 2.2, 10%, ½W	0178690007
R76	Resistor, 8.2K, 5%, ¼W	0192070002
R77	Resistor, 33, 10%, ¼W	0182530001
R78	Resistor, 33, 10%, ¼W	0182530001
R79	Resistor, 3.3K, 10%, ¼W	0170890007
R80	Resistor, 7.5, 5%, 3W	0178950009
R81	Resistor, 15, 10%, ¼W	0181740001
R82	Resistor, 270, 10%, ¼W	0178450006
R83	Resistor, 15, 10%, ¼W	0181740001
R84	Resistor, 4.7K, 5%, ¼W	0170770001
R85	Resistor, 180K, 10%, ¼W	0177280000
R86	Resistor, 6.8K, 5%, ¼W	0174810008
R87	Resistor, 3.3K, 10%, ¼W	0170890007

R88	Resistor, 100, 5%, ¼W	0171180003
R89	Resistor, 100, 5%, ¼W	0171180003
R90	Resistor, 1K, 10%, ¼W	0171560001
R91	Resistor, 33K, 5%, ¼W	0195820002
R92	Resistor, 15K, 5%, ¼W	0195700007
R93	Resistor, 33K, 5%, ¼W	0195820002
R94	Resistor, 22K, 5%, ¼W	0172230004
R95	Resistor, 330, 10%, ½W	0173380000
R96	Resistor, 27K, 10%, ¼W	0171200004
R97	Resistor, 180, 10%, ¼W	0175220000
R98	Resistor, 47K, 10%, ¼W	0171060008
R99	Pot. 500, 10%, ½W, 4 Turns	0197510019
R101	Resistor, 390, 10%, ¼W	0178330001
R102	Resistor, 100, 5%, ¼W	0171180003
R103	Resistor, 22K, 5%, ¼W	0172230004
R104	Resistor, 680, 10%, ¼W	0176630007
R105	Resistor, 5.6K, 10%, ¼W	0183060008
R106	Resistor, 2.2K, 5%, ¼W	0178070009
R107	Resistor, 10K, 10%, ¼W	0170410005
R108	Resistor, 120K, 10%, ¼W	0175100004
R109	Resistor, 680, 10%, ¼W	0176630007
R110	Resistor, 47K, 10%, ¼W	0171060008
SW1	Switch, SPDT, Wht Button Toggle	1004630034
SW2	Switch, SPDT, Wht Button Toggle	1004630034
U1	IC Digital	1005190011
U2	IC Digital	1005160007
U3	IC Digital	1005190011
U4	IC Digital	1005160007
U5	IC Digital	1005170037
U6	IC Digital	1005170029
U7	IC Digital	1005190011
U8	IC Digital	1005150028
U9	IC Linear	8043095329
U10	IC Digital	1005160007
U11	IC Digital	1005180008
U12	IC Digital	1003960014
U13	IC Digital	1005690022
U14	IC Digital	1005690022
U15	IC Digital	1005690022
U16	IC Digital	1005690022
U17	IC Digital	1005690022
U18	IC Linear TDA 2002	1004670028
U19	IC Linear	0447950002
Y1	Crystal, 5.6 MHz	8056050507

	PC ASSY MEMORY/BAND	8056070095
BT1	Battery, Lithium, 3.0V, 1.2 AH	1003320201
BT2	Battery, Lithium, 3.0V, 1.2 AH	1003320201
C1	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C2	Capacitor, 1µf, 50V, 20%	1005330018
C3	Capacitor, 1µf, 50V, 20%	1005330018
C4	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C5	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C6	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C7	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C8	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C9	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C10	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C11	Capacitor, 15µf, 35V	0282240004
C12	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C13	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C14	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C15	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C16	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C17	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C18	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C19	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C20	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C21	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C22	Capacitor, 15µf, 35V, 20%	1005340005
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C24	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C26	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C27	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C28	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C29	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C30	Capacitor, 100µf, 20V	0282230009
C31	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C32	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C33	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C34	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C35	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C36	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C37	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C38	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C39	Capacitor, 0.1µf, 50V, X7R, 20%	0281510002
C40	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C41	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C42	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C43	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C44	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C45	Capacitor, .01µf, 50V, X7R, 20%	0281730008

C46	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C47	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C48	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C49	Capacitor, 22µf, 16V, 20%	1005340030
C50	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C51	Capacitor, 15µf, 35V	0282240004
C52	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
CR1	Diode, Signal, Germ. 1N270	0405510004
CR2	Diode, Signal, Germ. 1N270	0405510004
CR3	Diode, Signal, Germ. 1N270	0405510004
CR4	Diode, Signal, Germ. 1N270	0405510004
CR5	Diode, Signal, Germ. 1N270	0405510004
CR6	Diode, Zener	0405520000
CR7	Diode, Rectifier 1N4004	0405180004
CR8	Diode, Rectifier 1N4004	0405180004
CR9	Diode, Rectifier 1N4004	0405180004
Q1	Transistor, PNP, SI	0448390001
Q2	Transistor, NPN, SI	0448010003
Q3	Transistor, PNP, SI	0448020009
Q4	Transistor, P-CH, FET	1003980007
Q5	Transistor, NPN, SI	0448010003
R1	Resistor, 470K, 10%, ¼W	0180570005
R2	Resistor, 1.2K, 10%, ¼W	0181860007
R3	Resistor, 18K, 10%, ¼W	0175720002
R4	Resistor, 1K, 10%, ¼W	0171560001
R5	Resistor, 18K, 10%, ¼W	0175720002
R6	Resistor, 1K, 10%, ¼W	0171560001
R7	Resistor, 470K, 10%, ¼W	0180570005
R8	Resistor, 1.2K, 10%, ¼W	0181860007
R9	Resistor, 470K, 10%, ¼W	0180570005
R10	Resistor, 1.2K, 10%, ¼W	0181860007
R11	Resistor, 3.9K, 10%, ¼W	0178830003
R12	Resistor, 47K, 10%, ¼W	0171060008
R13	Resistor, 1.8K, 10%, ¼W	0178190004
R14	Resistor, 1.2K, 10%, ¼W	0181860007
R15	Resistor, 1.2K, 10%, ¼W	0181860007
R16	Resistor, 1.2K, 10%, ¼W	0181860007
R17	Resistor, 1.2K, 10%, ¼W	0181860007
R18	Resistor, 1.2K, 10%, ¼W	0181860007
R19	Resistor, 1.2K, 10%, ¼W	0181860007
R20	Resistor, 470K, 10%, ¼W	0180570005
R21	Resistor, 470K, 10%, ¼W	0180570005
R22	Resistor, 470K, 10%, ¼W	0180570005
R23	Resistor, 470K, 10%, ¼W	0180570005
R24	Resistor, 470K, 10%, ¼W	0180570005
R25	Resistor, 470K, 10%, ¼W	0180570005
R26	Resistor, 1K, 10%, ¼W	0171560001
R27	Resistor, 10K, 10%, ¼W	0170410005
R28	Resistor, 4.7K, 5%, ¼W	0170770001
R29	Resistor, 820, 10%, ¼W	0175600007
R30	Resistor, 4.7K, 5%, ¼W	0170770001

R31	Resistor, 4.7K, 5%, ¼W	0170770001
R32	Resistor, 470, 5%, ¼W	0184110008
R33	Resistor, 47K, 10%, ¼W	0171060008
R34	Resistor, 10K, 10%, ¼W	0170410005
R35	Resistor, 470, 5%, ¼W	0184110009
R36	Resistor, 2.2K, 5%, ¼W	0178070009
R37	Resistor, 47K, 10%, ¼W	0171060008
R38	Resistor, 47K, 10%, ¼W	0171060008
R39	Resistor, 47K, 10%, ¼W	0171060008
R40	Resistor, 47K, 10%, ¼W	0171060008
R41	Resistor, 47K, 10%, ¼W	0171060008
R42	Resistor, 47K, 10%, ¼W	0171060008
R43	Resistor, 47K, 10%, ¼W	0171060008
R44	Resistor, 6.8K, 5%, ¼W	0174810008
R45	Resistor, 6.8K, 5%, ¼W	0174810008
R46	Resistor, 1.2K, 10%, ¼W	0181860007
R47	Resistor, 1.2K, 10%, ¼W	0181860007
R48	Resistor, 1.2K, 10%, ¼W	0181860007
R49	Resistor, 1.2K, 10%, ¼W	0181860007
R50	Resistor, 10, 5%, ¼W	0177160004
R51	Resistor, 1.2K, 10%, ¼W	0181860007
R52	Resistor, 1.2K, 10%, ¼W	0181860007
R53	Resistor, 1.2K, 10%, ¼W	0181860007
R54	Resistor, 47K, 10%, ¼W	0171060008
U1	IC Digital, 256 x 4 Ram	1003860001
U2	IC Digital	1005170029
U3	IC Digital	1003960014
U4	IC Digital	1005160007
U5	IC Digital	1005150028
U6	IC Digital	1003960014
U7	IC Digital	1005160007
U8	IC Digital	1005150028
U9	IC Digital	1003960014
U10	IC Digital	1005190011
U11	IC Digital	1005160023
U12	IC Digital	1003960014
U13	IC Digital	1005190011
U14	IC Digital	1005170002
U15	IC Digital	1005170037
U16	IC Digital	1005190011
U17	IC Digital	1005170002
U18	IC Digital	1005170037
U19	IC Digital	1005190011
U20	IC Digital	1005160015
U21	IC Band Prom	1005190038
U22	IC Linear	8043095329
U23	IC Digital	1004660022

	PC ASSY COUNTER DEMUX	8056060090
C1	Capacitor, 1µf, 35V, 196D	0281660000
C2	Capacitor, 1µf, 35V, 196D	0281660000
C3	Capacitor, 1µf, 35V, 196D	0281660000
C4	Capacitor, 1µf, 35V, 196D	0281660000
C5	Capacitor, 1µf, 35V, 196D	0281660000
C6	Capacitor, 1µf, 35V, 196D	0281660000
C7	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C8	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C9	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C10	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C11	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C12	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C13	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C14	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C15	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C16	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C17	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C18	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C19	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C20	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C21	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C22	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C24	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C26	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C27	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C28	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C29	Capacitor, 15µf, 20V, 198D	0280920008
C30	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C31	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C32	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C33	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C34	Capacitor, 22µf, 15V, 196D	0281690006
C35	Capacitor, 15µf, 20V, 198D	0280920008
R1	Resistor, 1.8K, 10%, ¼W	0178190004
R2	Resistor, 18K, 10%, ¼W	0175720002
R3	Resistor, 1K, 10%, ¼W	0171560001
R4	Resistor, 18K, 10%, ¼W	0175720002
R5	Resistor, 1K, 10%, ¼W	0171560001
R6	Resistor, 18K, 10%, ¼W	0175720002
R7	Resistor, 1K, 10%, ¼W	0171560001
R8	Resistor, 18K, 10%, ¼W	0175720002
R9	Resistor, 1K, 10%, ¼W	0171560001
R10	Resistor, 18K, 10%, ¼W	0175720002
R11	Resistor, 1K, 10%, ¼W	0171560001

R12	Resistor, 18K, 10%, ¼W	0175720002
R13	Resistor, 1K, 10%, ¼W	0171560001
R14	Resistor, 470K, 10%, ¼W	0180570005
R15	Resistor, 1.2K, 10%, ¼W	0181860007
R16	Resistor, 47K, 10%, ¼W	0171060008
R17	Resistor, 10, 5%, ¼W	0177160004
R18	Resistor, 470K, 10%, ¼W	0180570005
R19	Resistor, 470K, 10%, ¼W	0180570005
R20	Resistor, 470K, 10%, ¼W	0180570005
R21	Resistor, 470K, 10%, ¼W	0180570005
R22	Resistor, 1.2K, 10%, ¼W	0181860007
R23	Resistor, 1.2K, 10%, ¼W	0181860007
R24	Resistor, 1.2K, 10%, ¼W	0181860007
R25	Resistor, 1.2K, 10%, ¼W	0181860007
R26	Resistor, 470K, 10%, ¼W	0180570005
R27	Resistor, 1.2K, 10%, ¼W	0181860007
R28	Resistor, 470K, 10%, ¼W	0180570005
R29	Resistor, 1.2K, 10%, ¼W	0181860007
R30	Resistor, 470K, 10%, ¼W	0180570005
R31	Resistor, 470K, 10%, ¼W	0180570005
R32	Resistor, 470K, 10%, ¼W	0180570005
R33	Resistor, 470K, 10%, ¼W	0180570005
R34	Resistor, 1.2K, 10%, ¼W	0181860007
R35	Resistor, 1.2K, 10%, ¼W	0181860007
R36	Resistor, 1.2K, 10%, ¼W	0181860007
R37	Resistor, 1.2K, 10%, ¼W	0181860007
U1	IC Linear	8043095329
U2	IC Digital	1005180024
U3	IC Digital	1005180024
U4	IC Digital	1005180024
U5	IC Digital	1005180032
U6	IC Digital	1005180032
U7	IC Digital	1005180032
U8	IC Digital	1005180032
U9	IC Digital	1005190003
U10	IC Digital	1005190003
U11	IC Digital	1005150036
U12	IC Digital	1005150036
U13	IC Digital	1005150036
U14	IC Digital	1005150036
U15	IC Digital	1005150036
U16	IC Digital	1005150036
U17	IC Digital	1005190011
U18	IC Digital	1005190011
U19	IC Digital	1005160015
U20	IC Digital	1005160015
U21	IC Digital	1005160015
U22	IC Digital	1005160015

	PC ASSY OUTPUT BUFFER	8056080091
C1	Capacitor, 22µf, 15V, 196D	0281690006
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C3	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C4	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C5	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C6	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C7	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C8	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C9	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C10	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C11	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C12	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C13	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C14	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C15	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C16	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C17	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C18	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C19	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C20	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C21	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C22	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C24	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C26	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C27	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C28	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C29	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C30	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C31	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C32	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C33	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C34	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C35	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C36	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C37	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C38	Capacitor, .01µf, 50V, X7R, 20%	0281730008
9	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C40	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C41	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C42	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C43	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C44	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C45	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C46	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C47	Capacitor, .01µf, 50V, X7R, 20%	0281730008

R1	Resistor, 470K, 10%, ¼W	0180570005
R2	Resistor, 470K, 10%, ¼W	0180570005
R3	Resistor, 470K, 10%, ¼W	0180570005
R4	Resistor, 470K, 10%, ¼W	0180570005
R5	Resistor, 1.2K, 10%, ¼W	0181860007
R6	Resistor, 1.2K, 10%, ¼W	0181860007
R7	Resistor, 1.2K, 10%, ¼W	0181860007
R8	Resistor, 1.2K, 10%, ¼W	0181860007
R9	Resistor, 470K, 10%, ¼W	0180570005
R10	Resistor, 470K, 10%, ¼W	0180570005
R11	Resistor, 470K, 10%, ¼W	0180570005
R12	Resistor, 470K, 10%, ¼W	0180570005
R13	Resistor, 1.2K, 10%, ¼W	0181860007
R14	Resistor, 1.2K, 10%, ¼W	0181860007
R15	Resistor, 1.2K, 10%, ¼W	0181860007
R16	Resistor, 1.2K, 10%, ¼W	0181860007
R17	Resistor, 1.2K, 10%, ¼W	0181860007
R18	Resistor, 470K, 10%, ¼W	0180570005
R19	Resistor, 1.2K, 10%, ¼W	0181860007
R20	Resistor, 1.2K, 10%, ¼W	0181860007
R21	Resistor, 470K, 10%, ¼W	0180570005
R22	Resistor, 470K, 10%, ¼W	0180570005
RP1	Res Ntwk 8 Pin Sip 10K	1005200009
RP2	Res Ntwk 8 Pin Sip 10K	1005200009
RP3	Res Ntwk 8 Pin Sip 10K	1005200009
RP4	Res Ntwk 8 Pin Sip 10K	1005200009
RP5	Res Ntwk 8 Pin Sip 10K	1005200009
RP6	Res Ntwk 8 Pin Sip 10K	1005200009
RP7	Res Ntwk 8 Pin Sip 10K	1005200009
U1	IC Digital	1003880002
U2	IC Digital	1003880002
U3	IC Digital	1003880002
U4	IC Digital	1003880002
U5	IC Digital	1005180032
U6	IC Digital	1005180032
U7	IC Digital	1005180032
U8	IC Digital	1005180032
U9	IC Digital	1005180032
U10	IC Digital	1005180032
U11	IC Digital	1005180032
U12	IC Digital	1005180032
U13	IC Digital	1005180032
U14	IC Digital	1005180032
U15	IC Digital	1005180032
U16	IC Digital	1005190011
U17	IC Digital	1005190011
U18	IC Digital	1005190003
U19	IC Digital	1005150036
U20	IC Digital	1005150036
U21	IC Digital	1005150036
U22	IC Digital	1005150036

U23	IC Digital	1005150036
U24	IC Digital	1005150036

8056020098 REV 07 FRONT PANEL ASSY 1A12

	FRONT PANEL ASSY	8056020098
C1	Capacitor, 0.01µf, 25V, X5S	0281620008
C2	Capacitor, 0.01µf, 25V, X5S	0281620008
C3	Capacitor, 0.01µf, 25V, X5S	0281620008
C4	Capacitor, 0.01µf, 25V, X5S	0281620008
CR1	Diode, LED, Green	1004350015
CR2	Diode, LED, Red	1004350023
CR3	Diode, LED, Yellow	1004350031
CR4	Diode, Signal, Sil. 1N4454	0405270003
J2	Connector, Phone Jack, 2 Cond.	0754430006
J3	Connector, ¼ in. Jack, 2 Cond	0840850000
M1	Meter	5024042204
R1	Resistor, 22, 10%, 2W	0169940004
R2	Resistor, 1.8K, 10%, ¼W	0178190004
R3	Pot. 1K, 10%, ¾W, 1/8 Shaft	0346410002
R4 (p/o S8)	Pot. 5K +/- 10% W/SPST Switch	1005600015
R5 (p/o S9)	Pot. 5K +/- 10% W/SPST Switch	1005140006
R6	Resistor, 470, 5%, ¼W	0184110009
R7	Resistor, 470, 5%, ¼W	0184110009
R8	Resistor, 8.2K, 10%, ¼W	0181620006
R9	Pot. 5K +/- 10%	1005600023
R10	Resistor, 470, 5%, ¼W	0184110009
R11	Resistor, 470, 5%, ¼W	0184110009
R13	Resistor, 6.8K, 5%, ¼W	0174810008
S1	Switch, Channel, BCD	8056021205
S2	Switch, Pushbutton, Miniature	1005590010
S3	Switch, Pushbutton, Miniature	1005590010
S4	Switch, Pushbutton, Miniature	1005590010
S5	Switch, Pushbutton, Miniature	1005590010
S6	Switch, Pushbutton, Miniature	1005590010
S7	Switch, Pushbutton, Miniature	1005590010
S8 (p/o R4)	Pot. 5K +/- 10% W/SPST Switch	1005600015
S9 (p/o R5)	Pot. 5K +/- 10% W/SPST Switch	1005140006
S10	Switch, Mode	8056021400
S11	Switch, Pushbutton, Miniature	1005590010
S12	Switch, Pushbutton, Miniature	1005590010
S13	Switch, Pushbutton, Miniature	1005590010
SP1	Speaker, 4 Ohm, 2¼ RD	1005600007

MISCELLANEOUS

Boot, Pushbutton, Black	1005590028
Connector, Power, 5 Pin Round	0753560003
Filter, Red, Display	8056022104
Gasket, Display	8056022201
Gasket Kit, Speaker	8056021701
Jack Cover, Connector	0840860005

	Knob, .50D, Blk, W/D Br. Screw	0346420008
	Knob, .70D, Blk, Wht Dot, Skrt	0346060001
	Panel, Front	8056022007
	PC Assy, Display	8056025090
	Plate, Masking, Speaker	8056021906
	Standoff, F-F, 4-40	8056022406

8056025090 REV 01 PC ASSY DISPLAY 1A12A1

	PC ASSY DISPLAY	8056025090
J1	Connector, PC, 20 Pin Inline	1005570019
	Diode, LED, 7 Segment	1004990006
	Socket, IC, 14 Pin STD Profile	1002650003

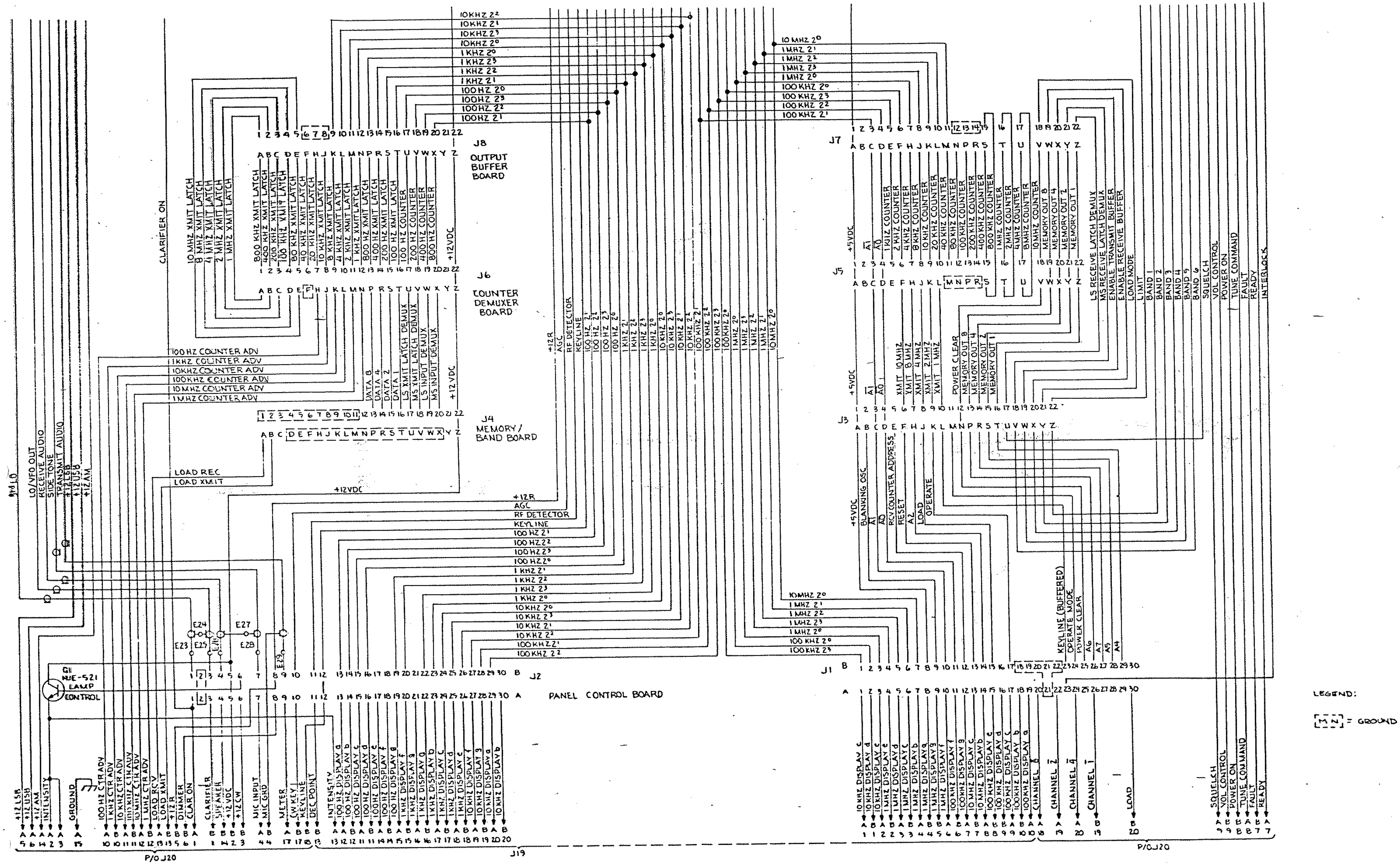


FIGURE 5.12 MOTHERBOARD 1A1A1

Sheet 1 of 2

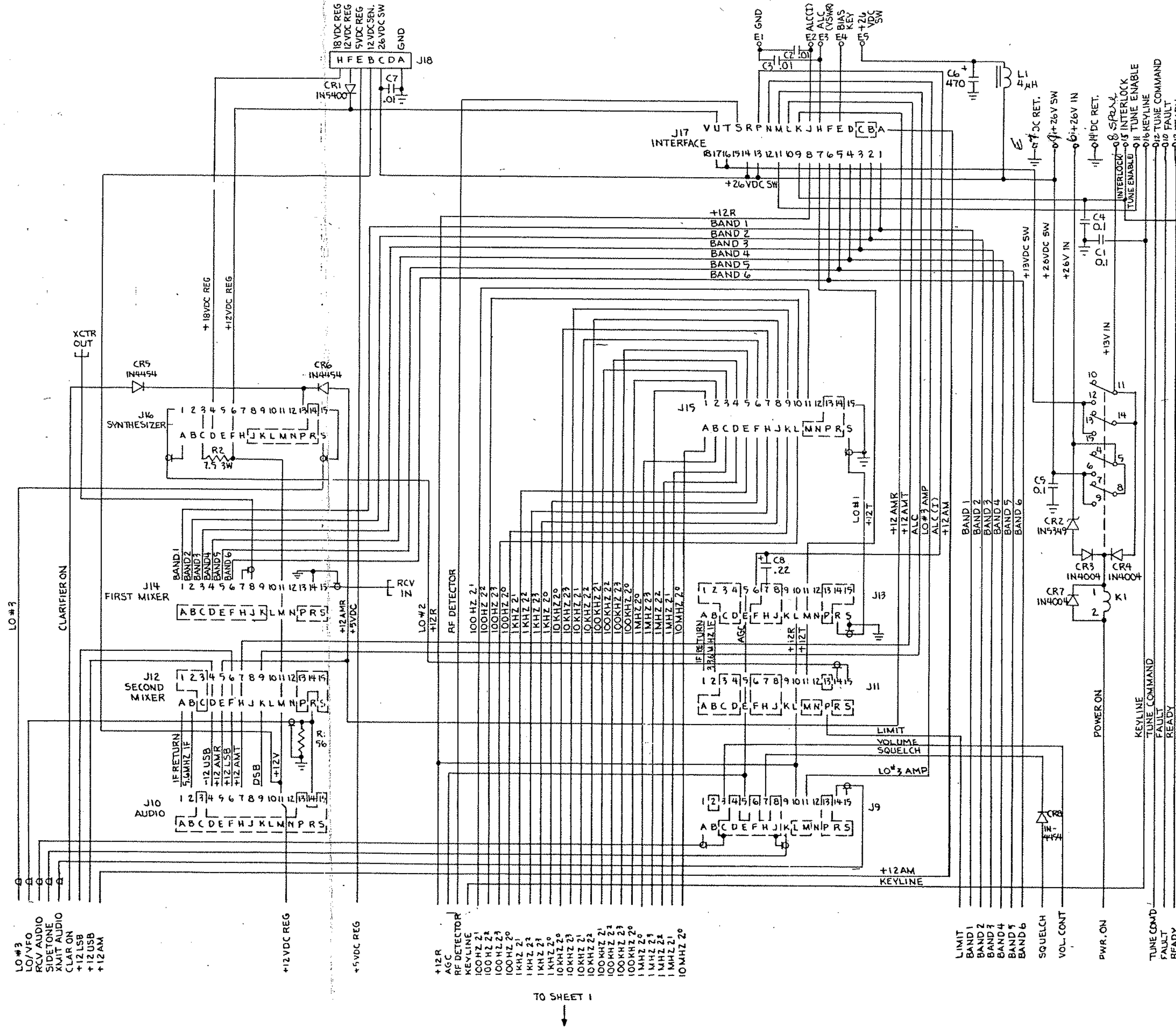
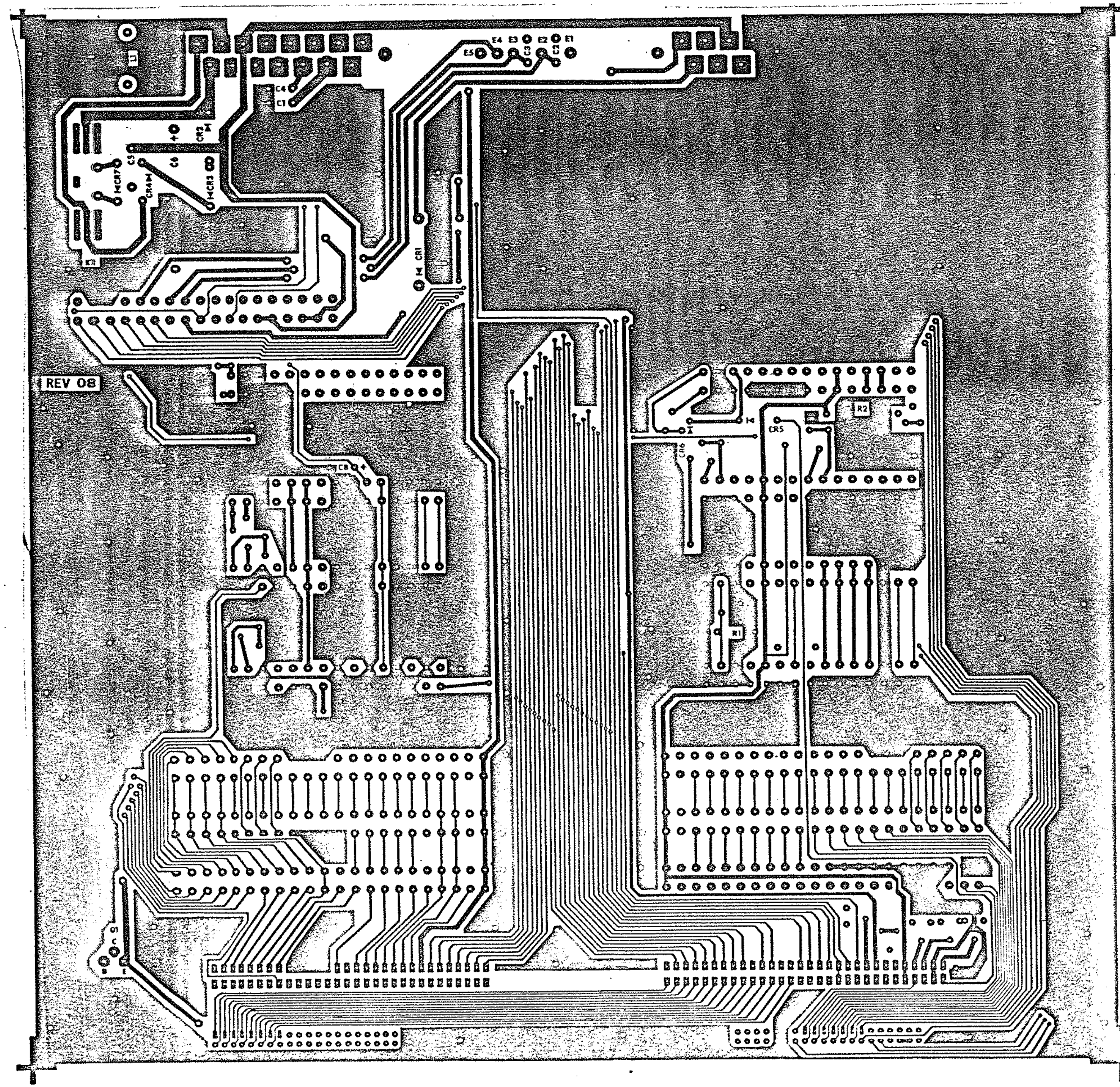


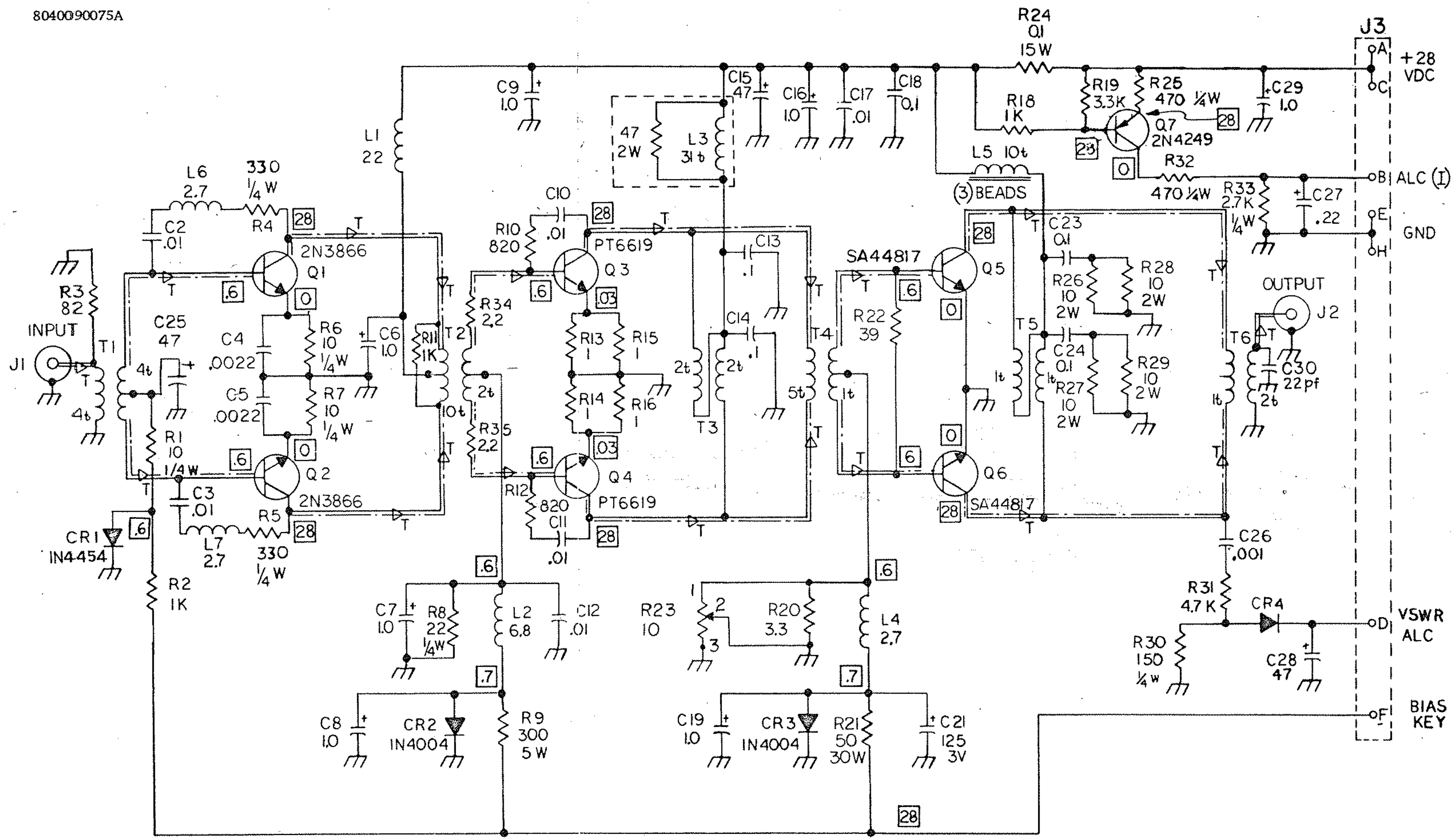
FIGURE 5.12 MOTHERBOARD 1A1A1

(Sheet 2 of 2)



MOTHER BOARD (1A1A1)
COMPONENT SIDE

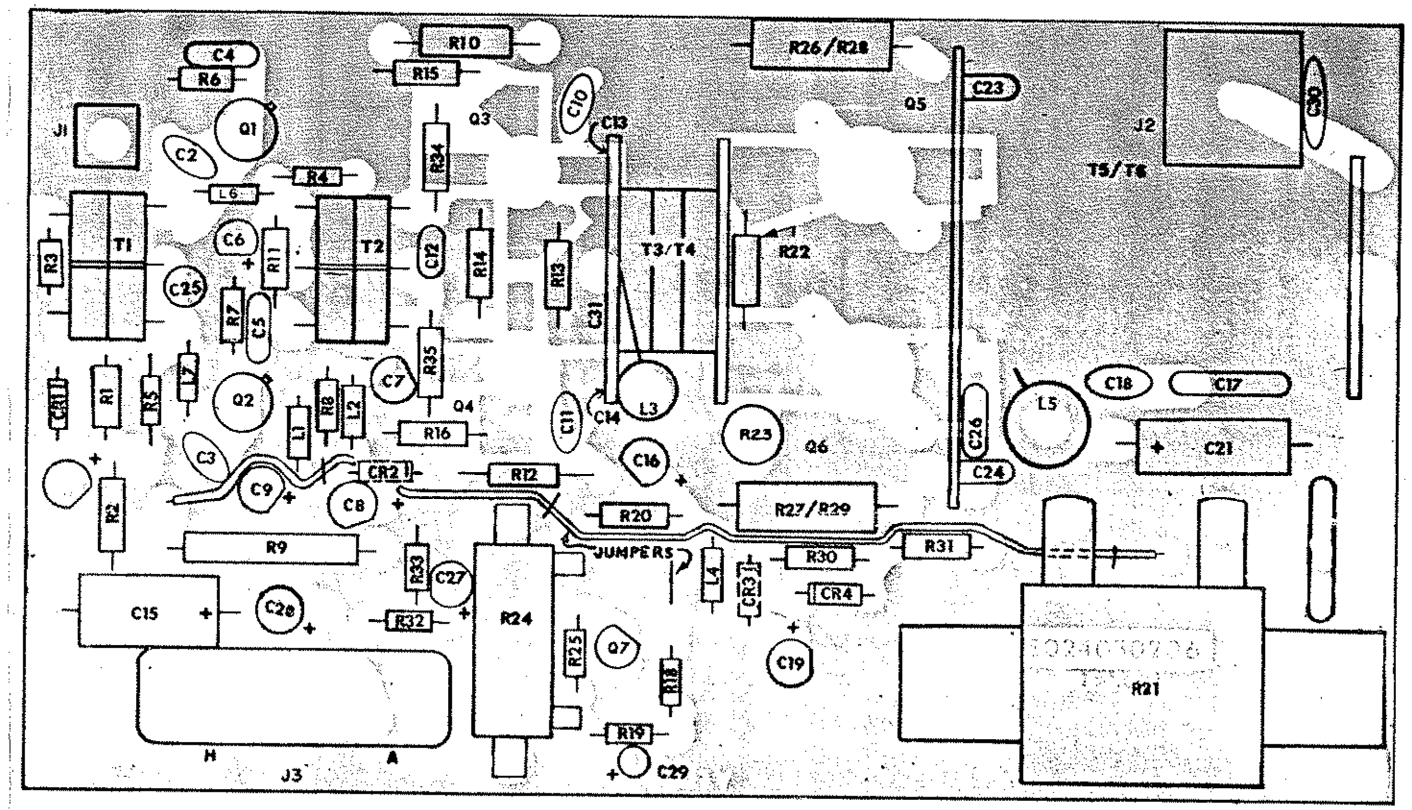
8040090075A



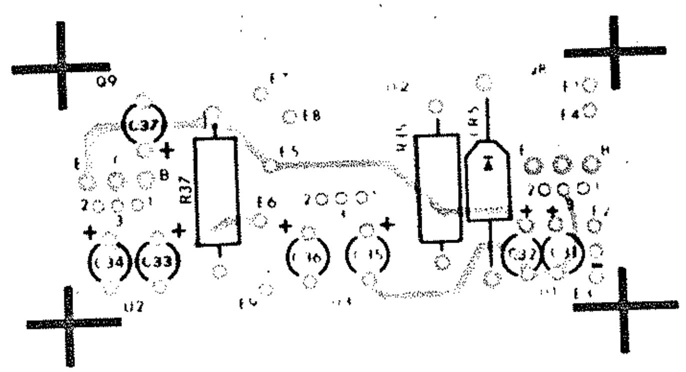
UNLESS OTHERWISE SPECIFIED:

1. ALL–RESISTORS IN OHMS, 1/2 W
   –CAPACITORS IN μF
   –INDUCTORS IN μH
   –DIODES ARE IN4454
2. PREFIX ALL DESIGNATORS WITH 'IA7AI'
3. UNUSED DESIGNATORS:
   R17, C1, C20, C22
4. VOLTAGES ARE GIVEN WITH XMTR KEYED IN SSB AND NO MODULATION

FIGURE 5.13 RF POWER AMPLIFIER (1A2)



R10
R26/R28
C4
R6
R15
C10
C13
C23
Q5
C30
J2
J1
Q1
Q3
C2
R4
R34
T5/T6
L6
T1
C6
R11
T2
C12
R14
R13
T3/T4
R22
R3
C25
R7
C5
C31
R1
R5
L7
Q2
R8
L2
C7
R35
C18
C17
CR1
L1
Q4
C11
C14
L3
L5
R16
R23
Q6
C26
C21
C3
C16
C24
C9
CR2
R12
C8
R20
R27/R29
R2
R9
R33
JUMPERS
L4
CR3
R30
R31
C27
CR4
C15
C28
R32
R24
C19
R25
Q7
R18
R21
R19
H
J3
A
C29



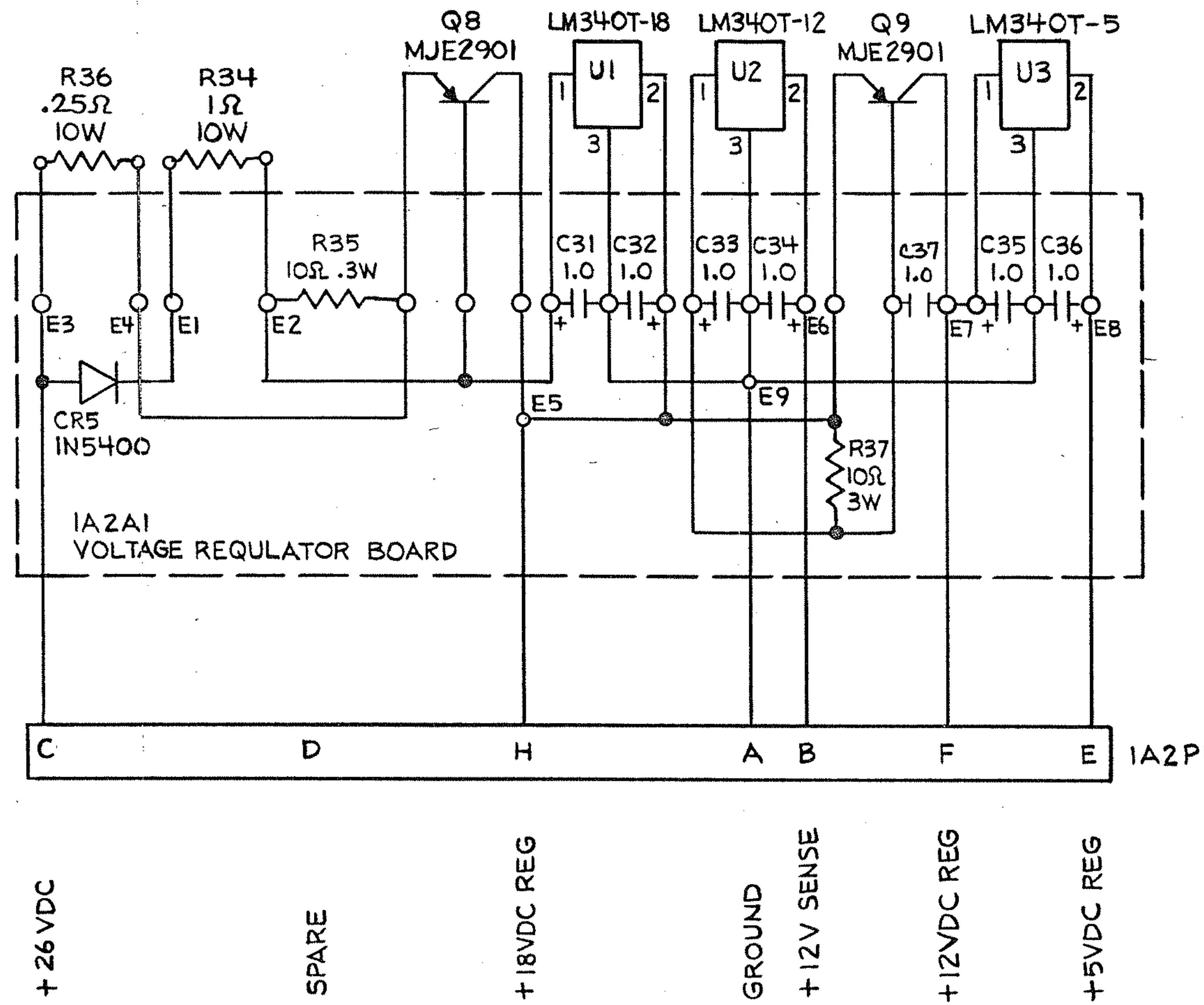


FIGURE 5.14 VOLTAGE REGULATOR 1A2A1

804006007H

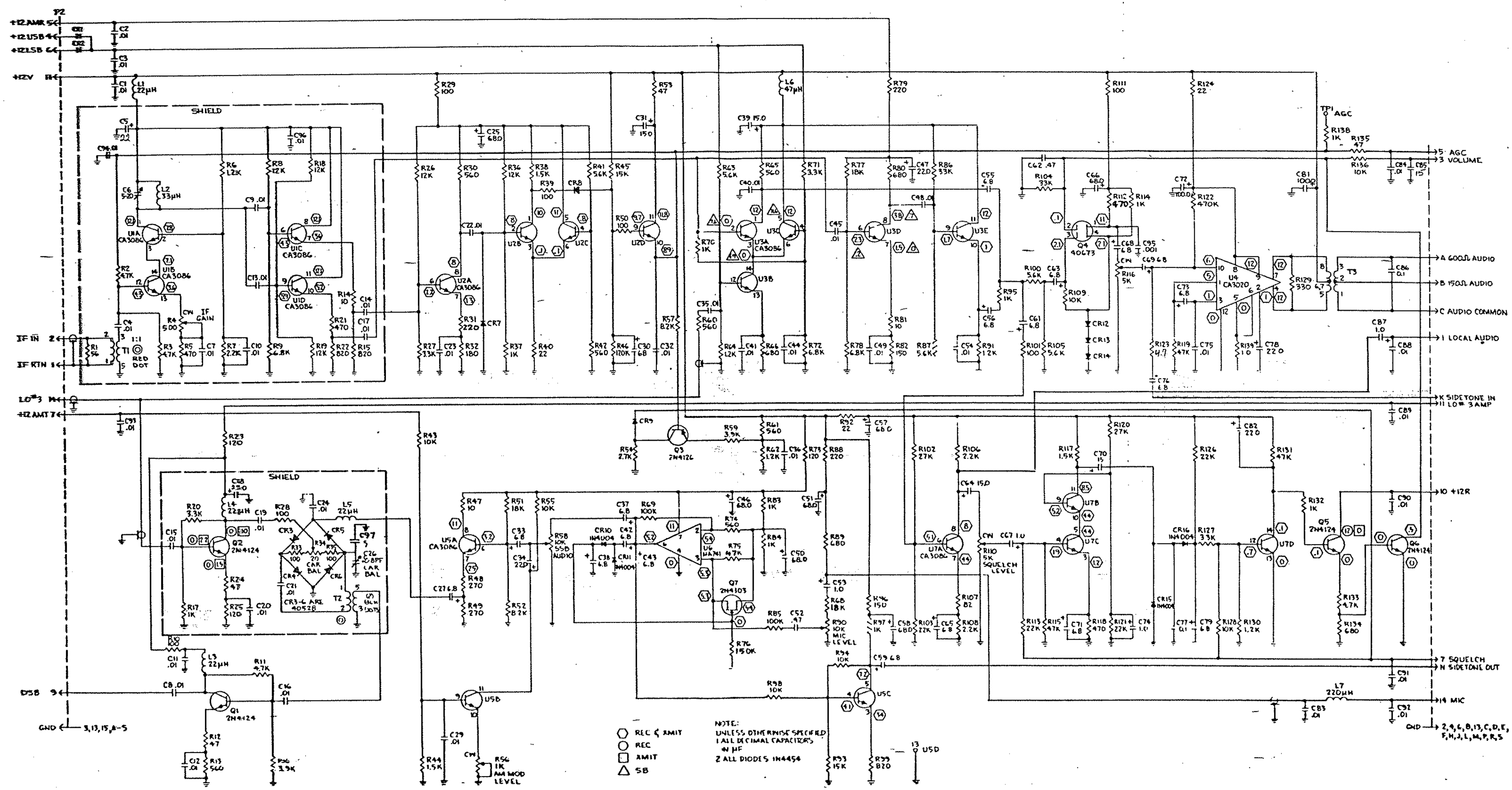
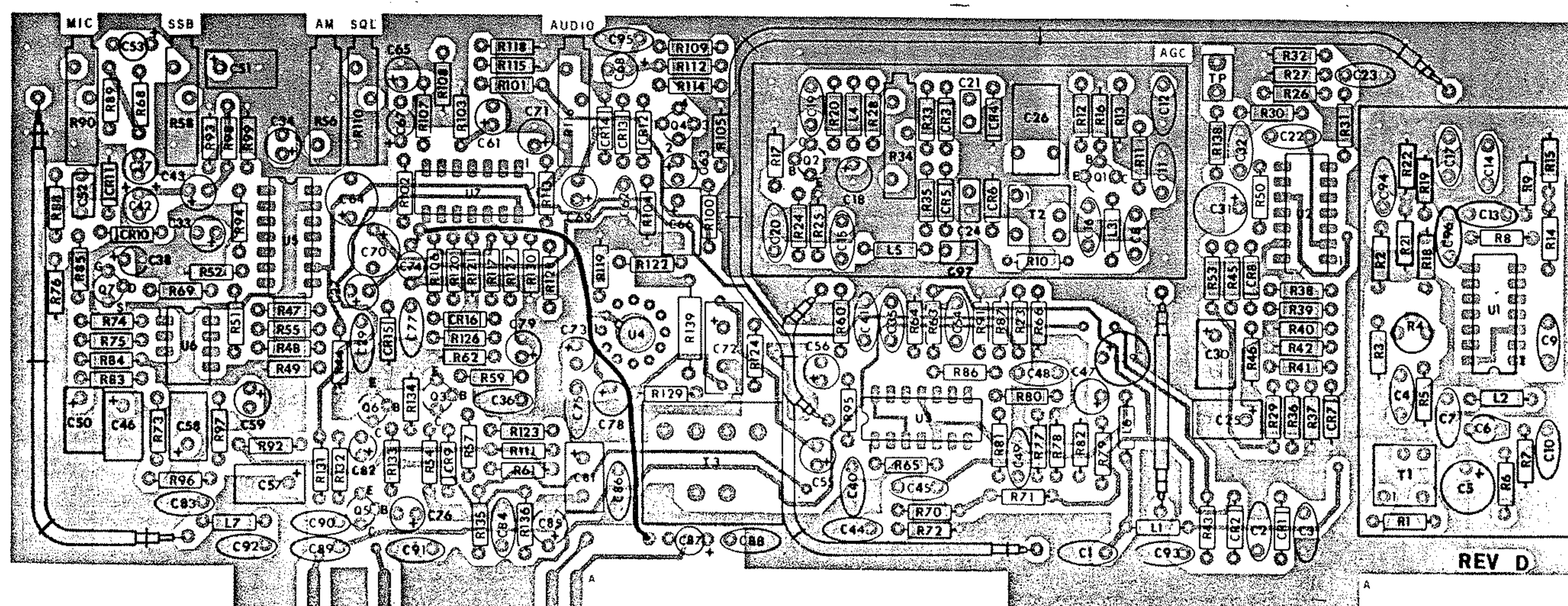


FIGURE 5.15 AUDIO BOARD 1A3


MIC
SSB
AM
SQL
AUDIO
AGC
TP
REV D

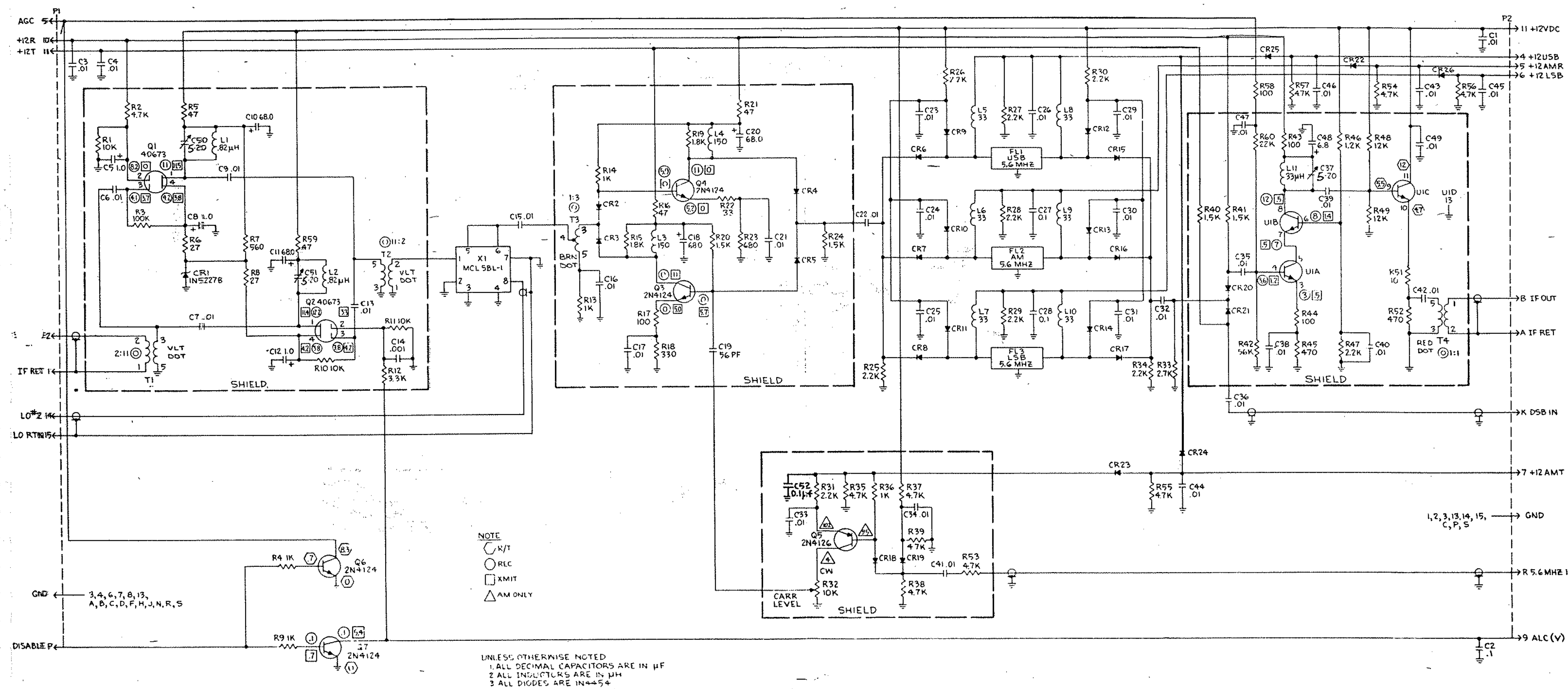
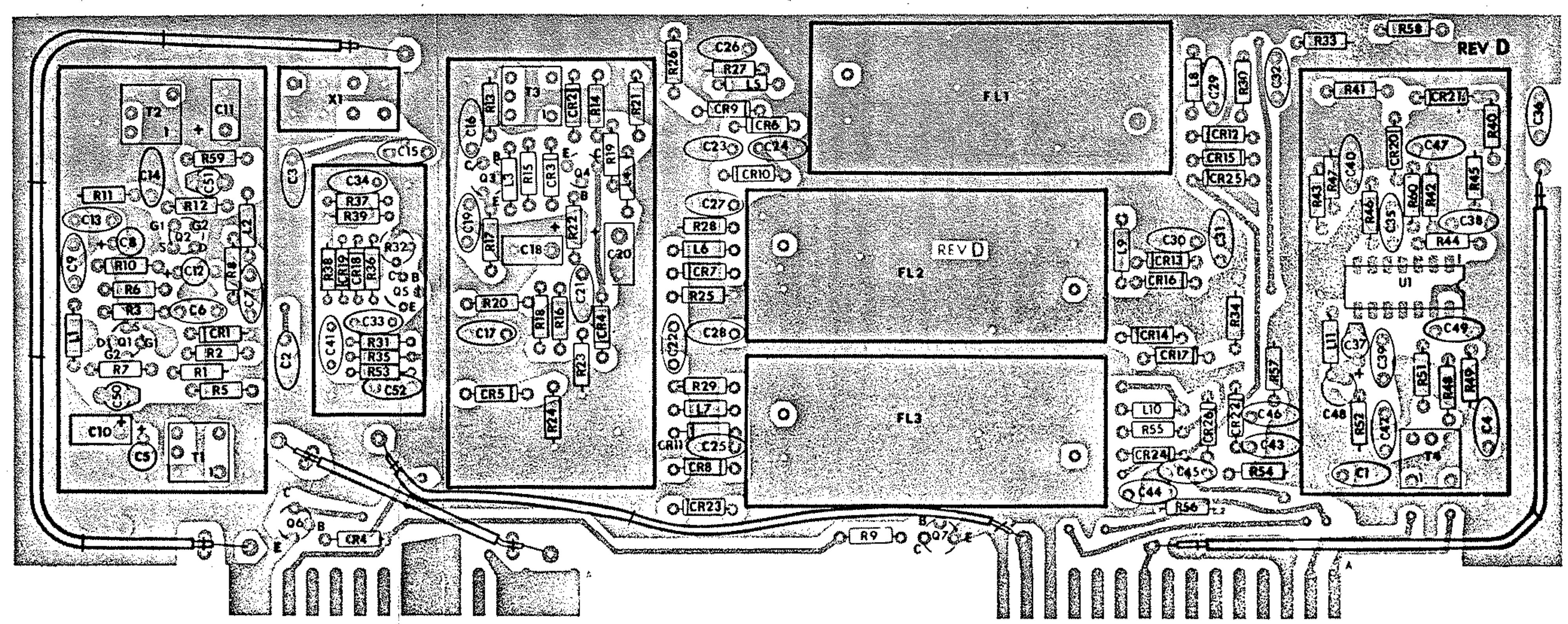
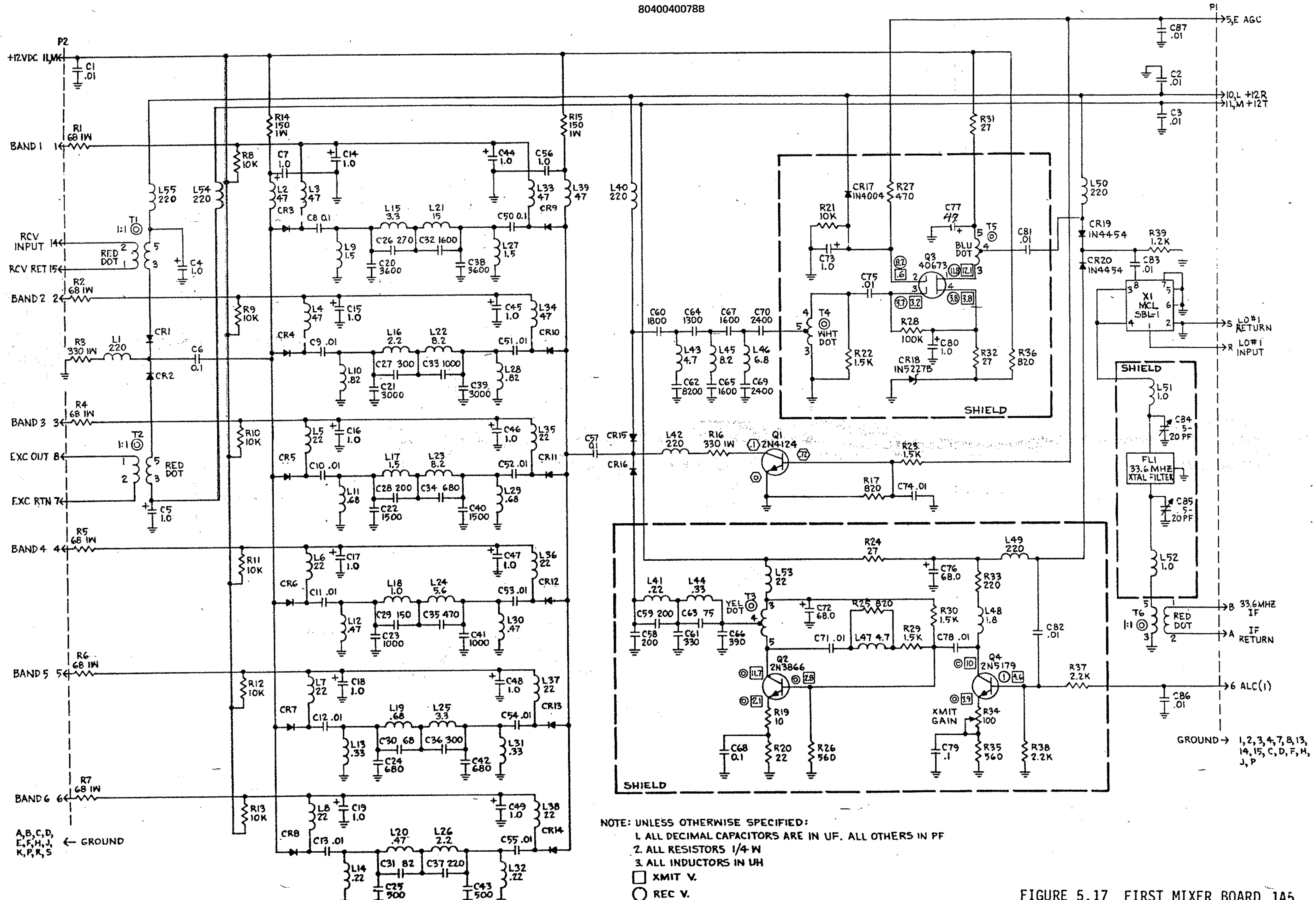


FIGURE 5.16 SECOND MIXER BOARD 1A4

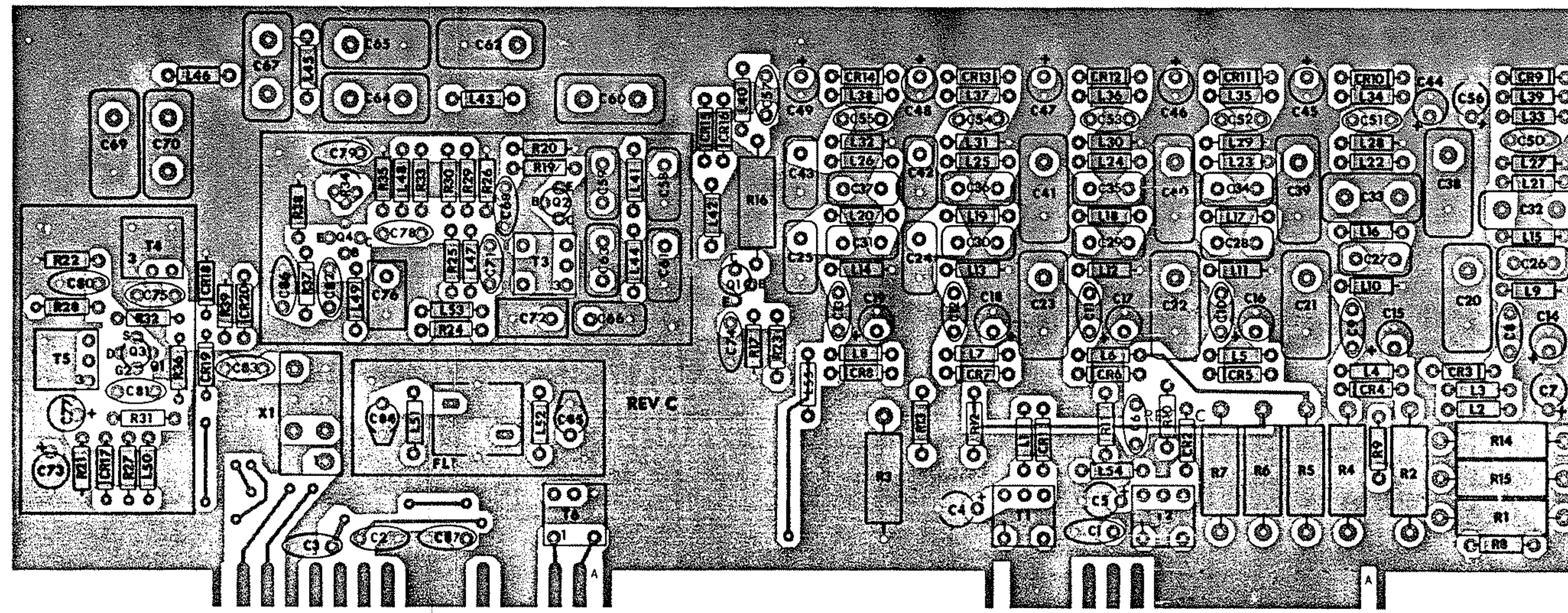


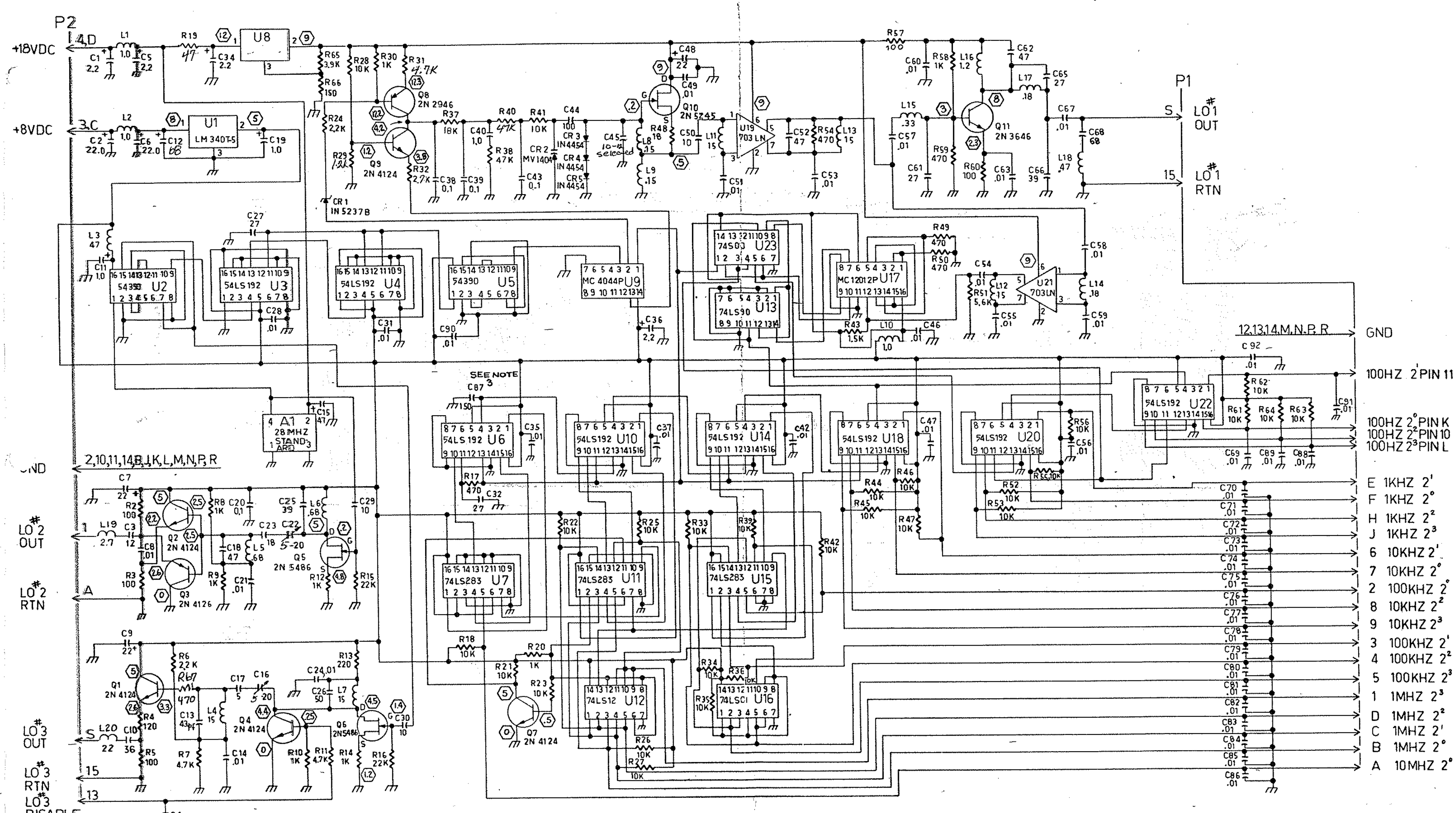
8040040078B



NOTE: UNLESS OTHERWISE SPECIFIED:
1. ALL DECIMAL CAPACITORS ARE IN UF. ALL OTHERS IN PF
2. ALL RESISTORS 1/4 W
3. ALL INDUCTORS IN UH
□ XMIT V.
○ REC V.
⬡ REC & XMIT

FIGURE 5.17 FIRST MIXER BOARD 1A5

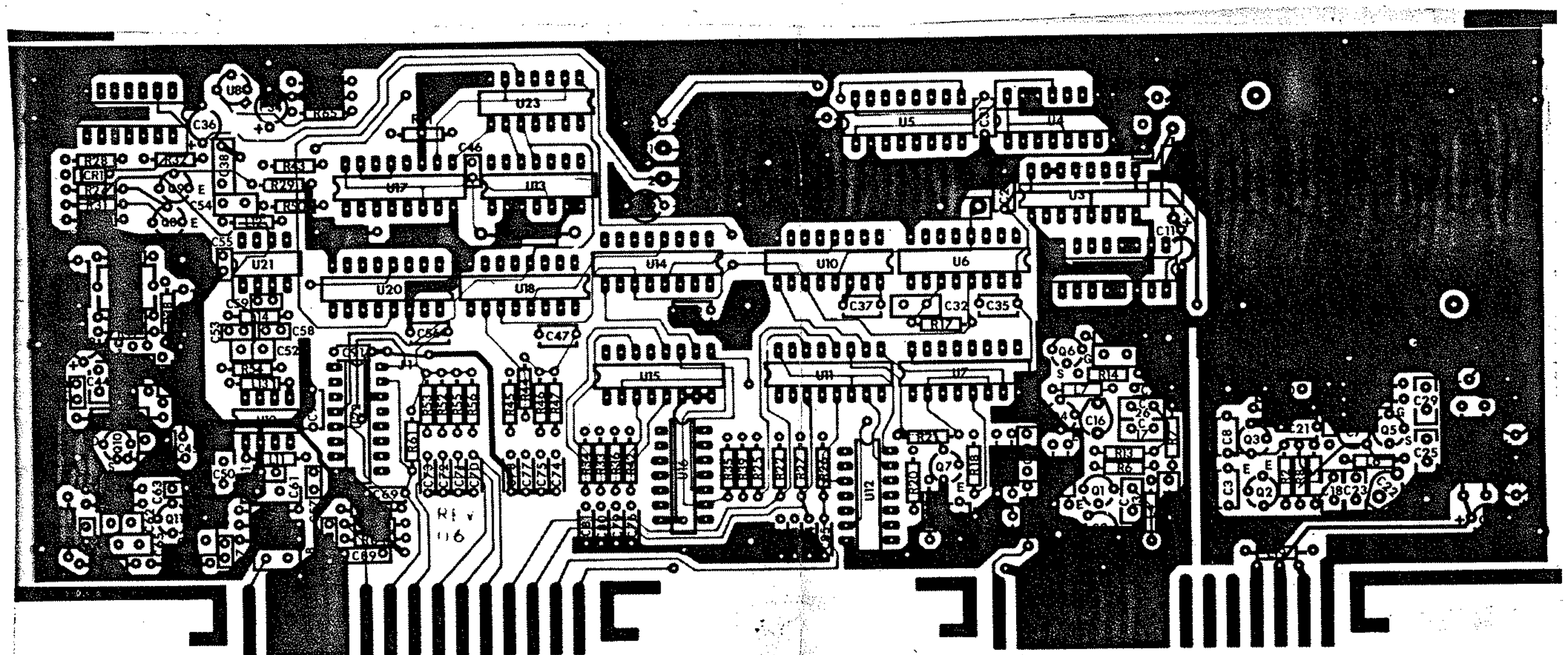




NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTOR VALUES ARE IN OHMS, 1/4W, ±10%
2. ALL DECIMAL CAPACITORS ARE IN MICROFARADS, ALL OTHERS IN PF.
3. SELECTED PART, NOMINAL VALUE SHOWN.
4. ALL INDUCTANCES IN MICRO HENRYS.

FIGURE 5.18 SYNTHESIZER BOARD 1A6



SYNTHESIZER BD (1A6)
COMPONENT SIDE

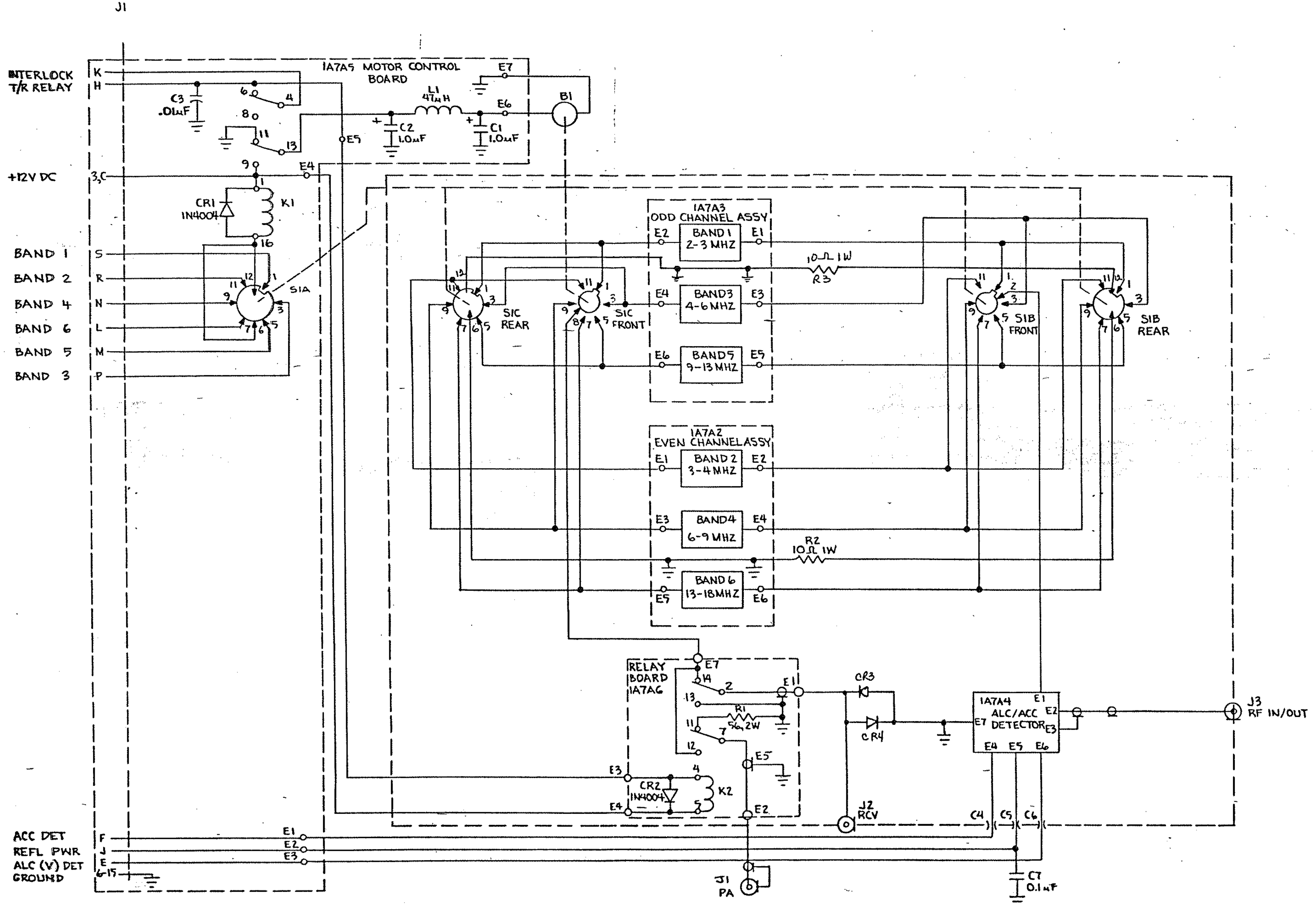
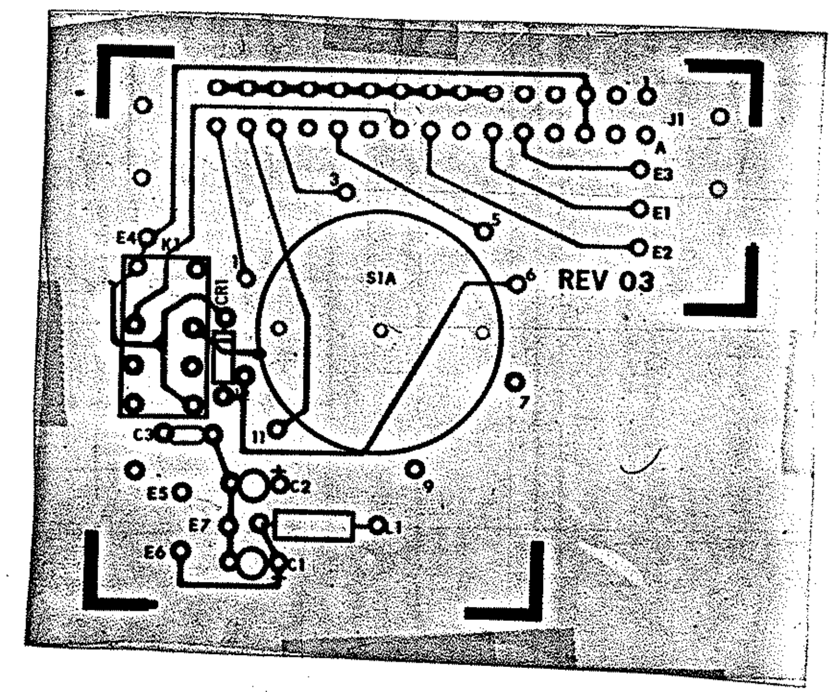
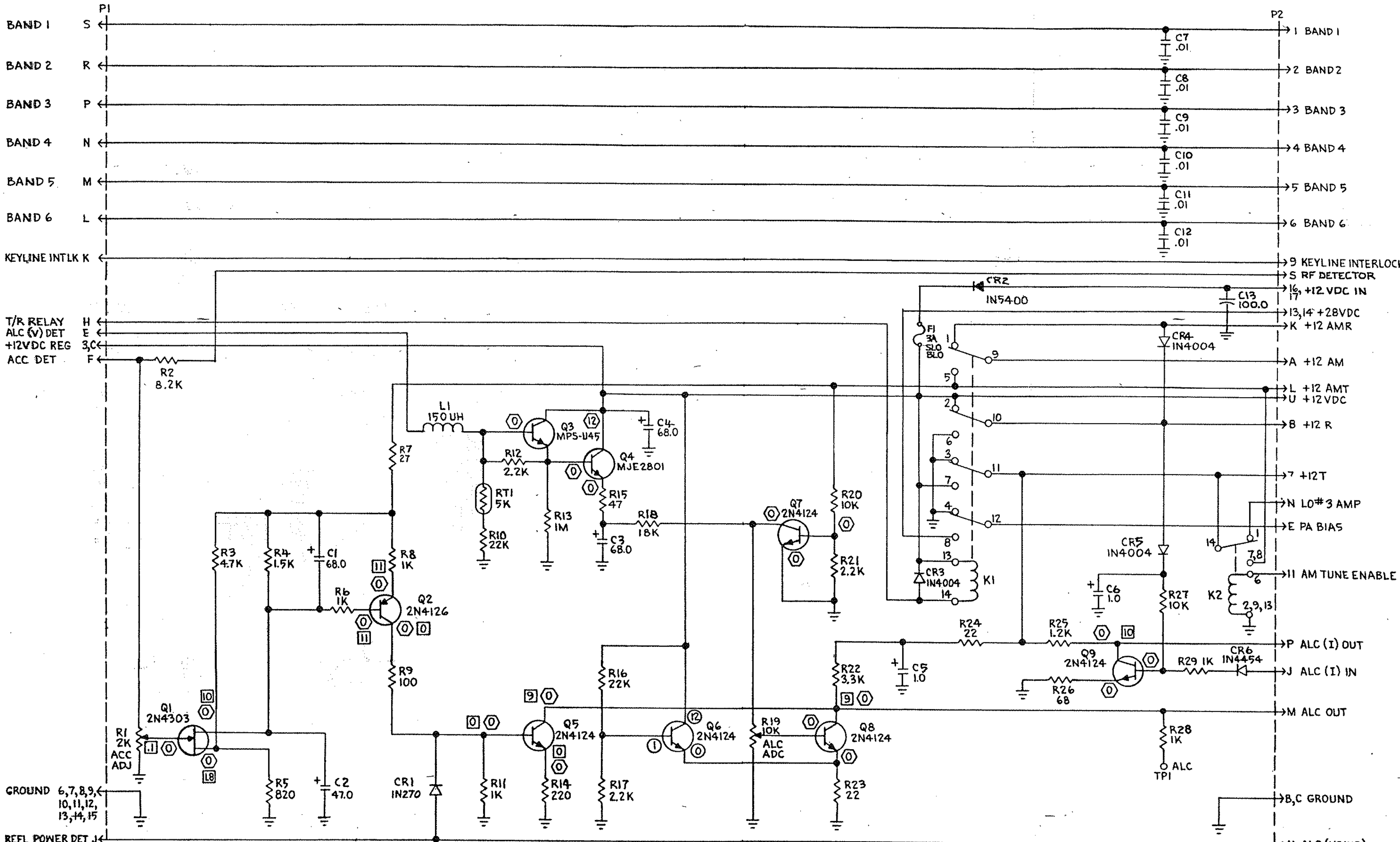


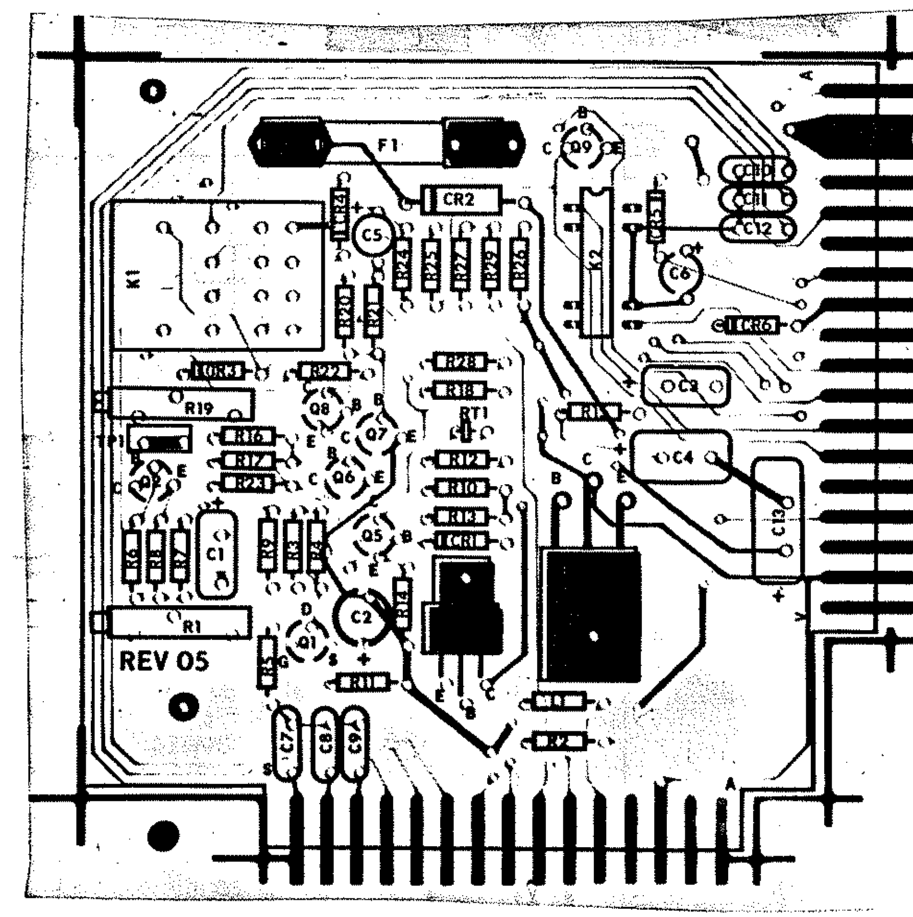
FIGURE 5.19 FILTER MODULE/ MOTOR CONTROL 1A7/1A7A5

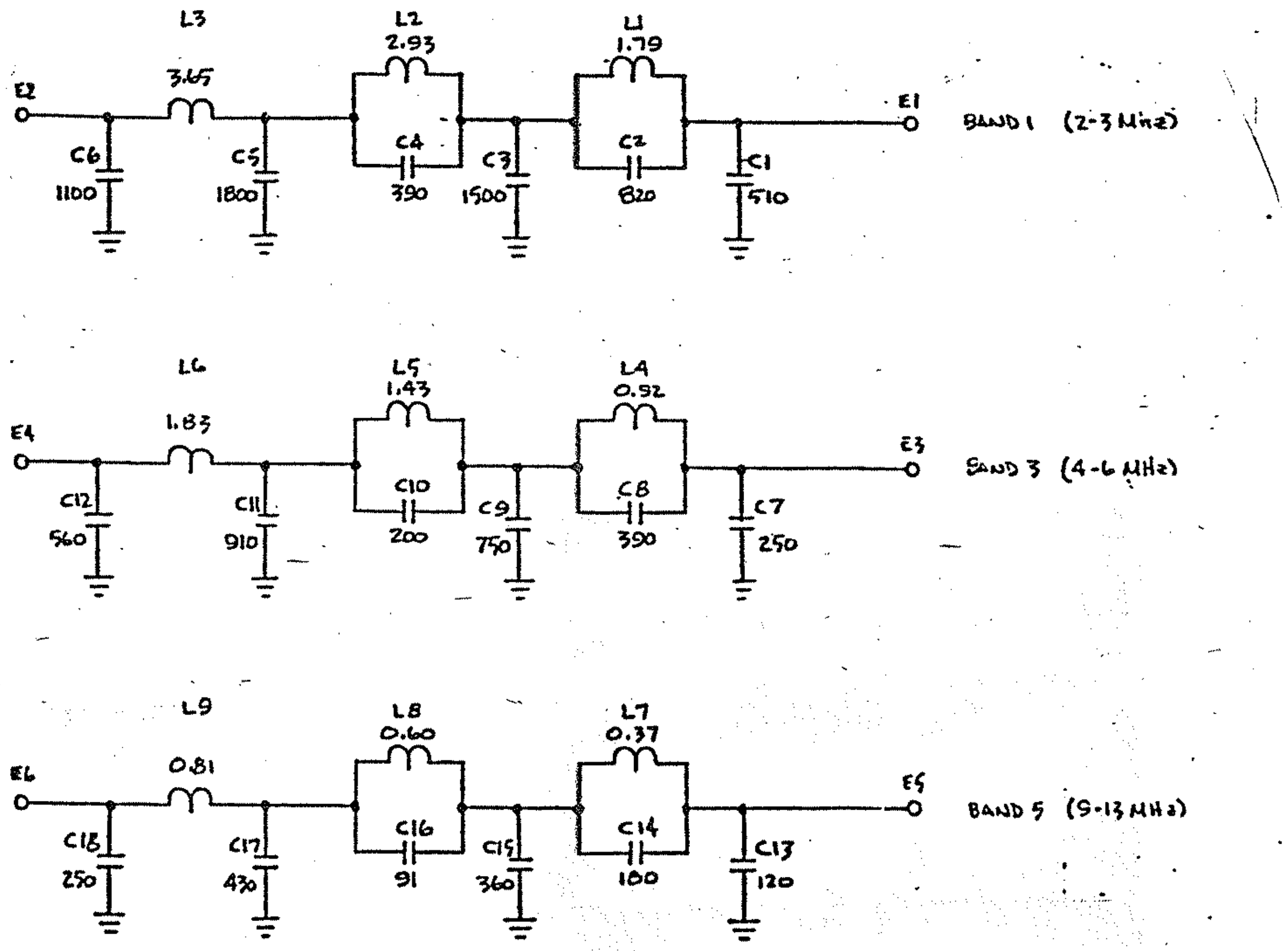

J1
A
E3
E1
E2
E4
K1
CR1
S1A
REV 03
C3
C2
C1
E5
E7
E6
L1



NOTE: □ TRANSMIT (NO ALC OR ACC VOLTAGE)
VOLTAGES WILL BE DEPENDENT ON ALC OR ACC LEVEL
⬡ RECEIVE

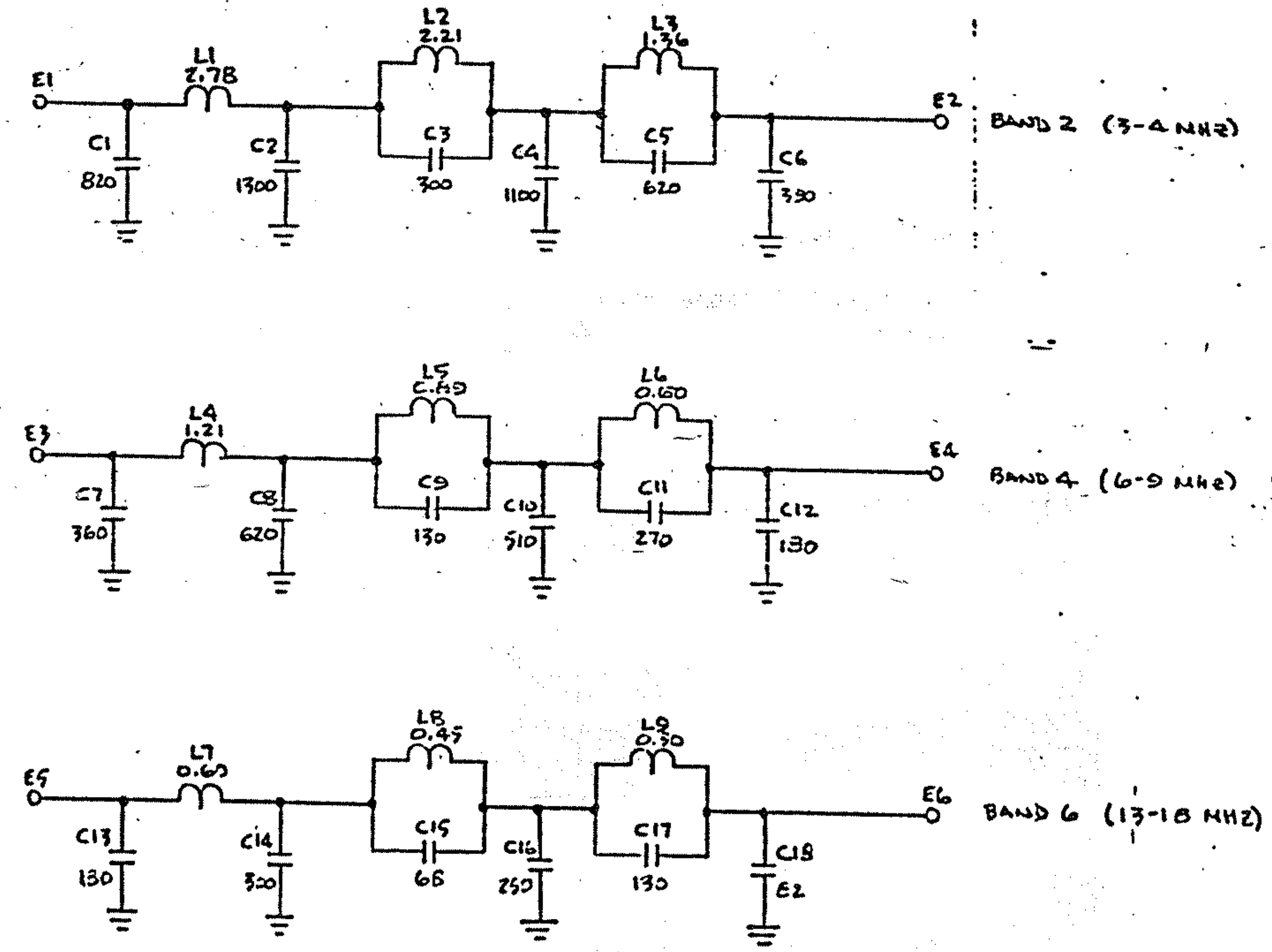
FIGURE 5.20 INTERFACE BOARD 1A7A1


F1
CR2
K1
K2
C5
C6
C4
C13
C1
C2
R19
R1
RT1
Q9
Q8
Q7
Q6
Q5
Q1
REV 05



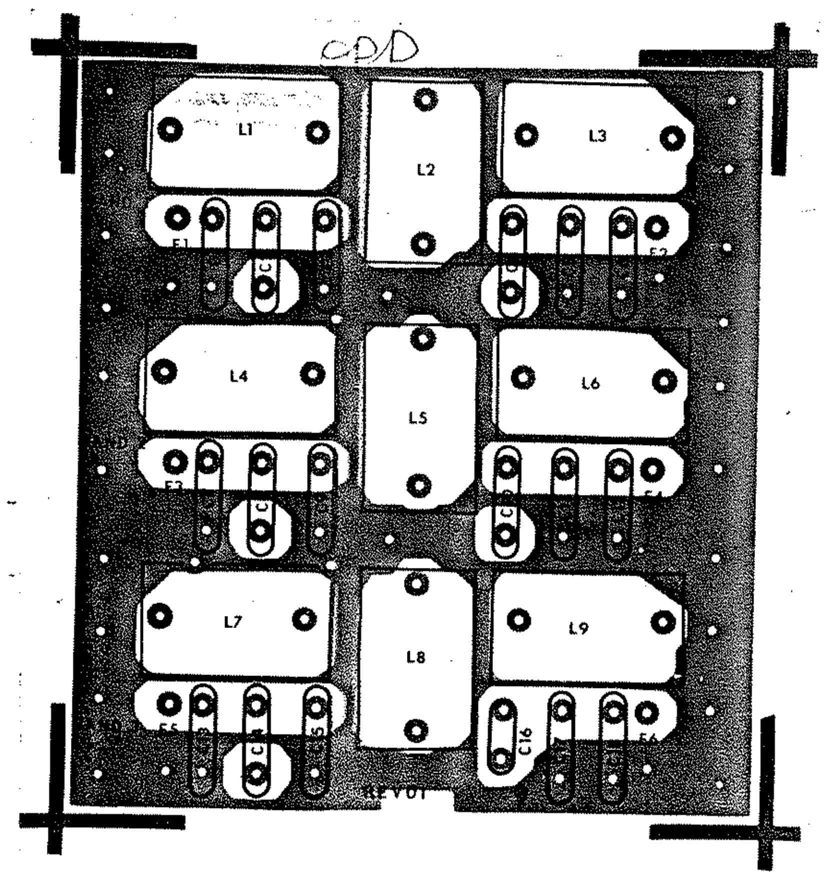
NOTES:
1 ALL CAPACITORS IN pF
2 ALL INDUCTORS IN μH

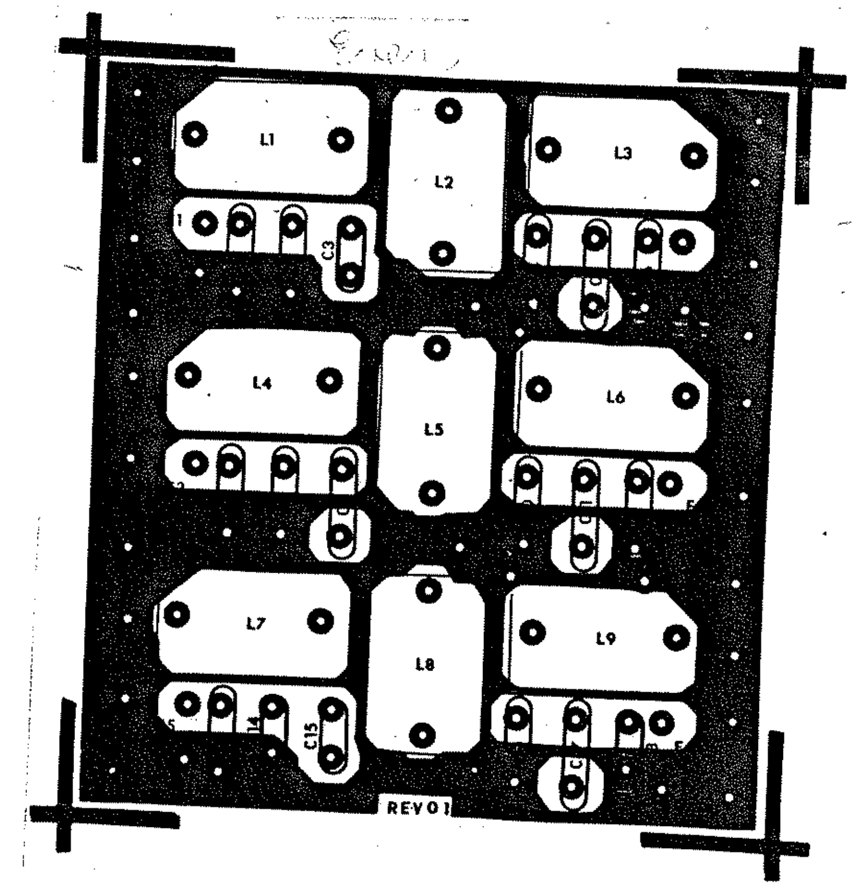
FIGURE 5.22 ODD CHANNEL FILTER BOARD 1A7A3

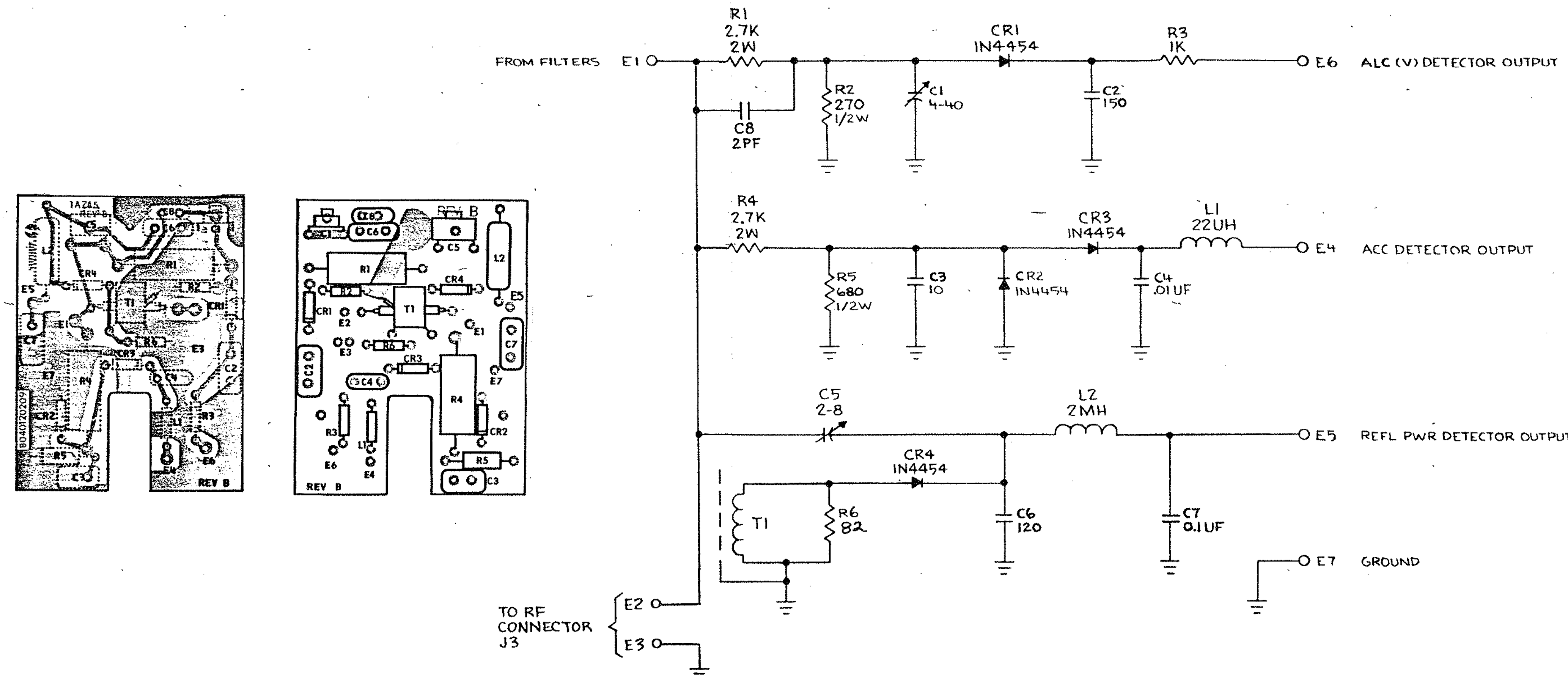


NOTES:
1 ALL CAPACITORS IN pF
2 ALL INDUCTORS IN μH

FIGURE 5.21 EVEN CHANNEL FILTER BOARD 1A7A2


L1
L2
L3
L4
L5
L6
L7
L8
L9
C16
REV 01

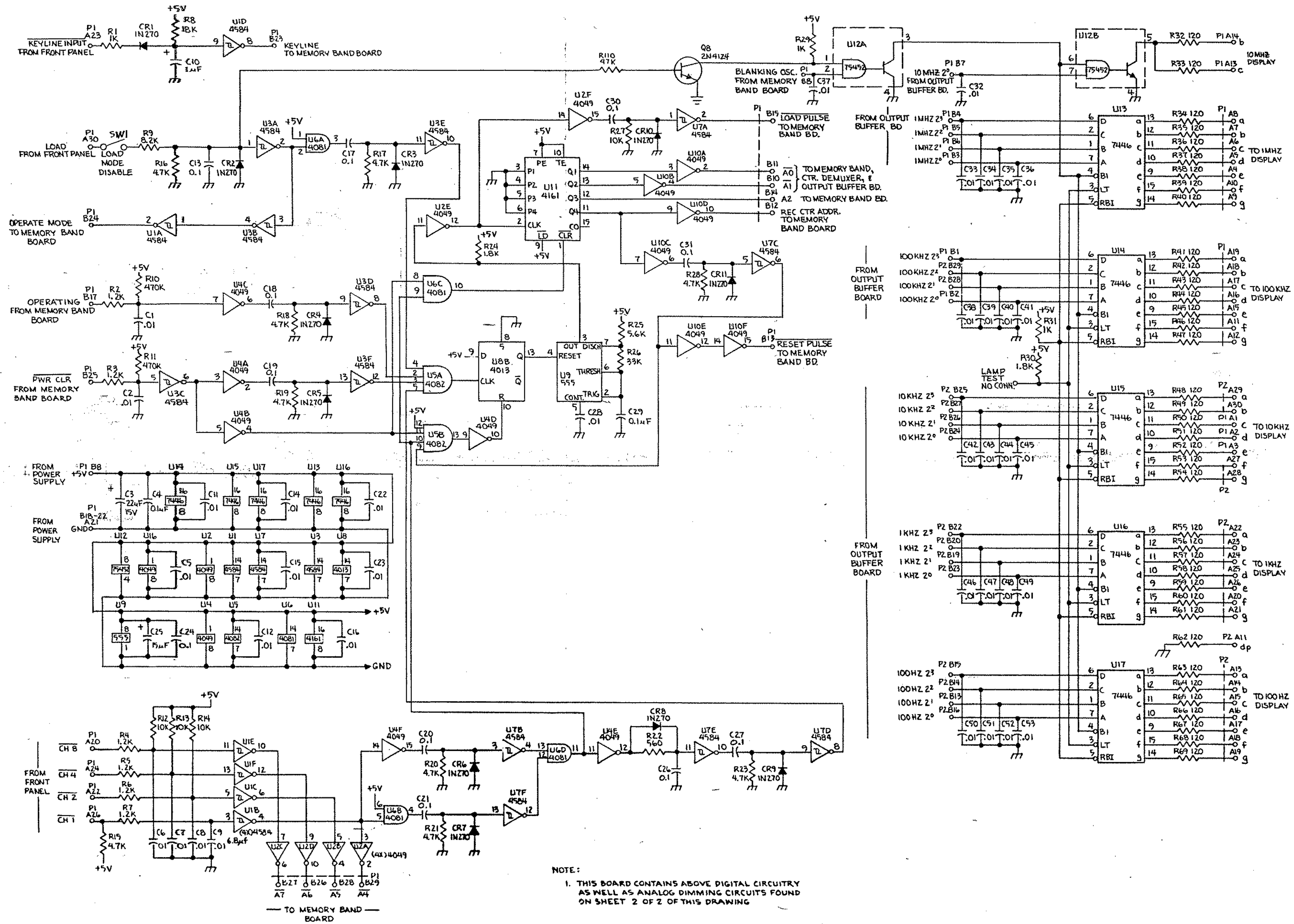

L1
L2
L3
C3
L4
L5
L6
L7
L8
L9
C15
REV 01



NOTES: Unless otherwise specified -

1. All resistors are 1/4W±5%; Resistance values are in ohms.
2. Capacitance values are in picofarads.
3. All diodes to be type 1N4454.
4. Inductance values are in microhenries.

FIGURE 5.23 ACC/ALC BOARD 1A7A4



NOTE:

1. THIS BOARD CONTAINS ABOVE DIGITAL CIRCUITRY AS WELL AS ANALOG DIMMING CIRCUITS FOUND ON SHEET 2 OF 2 OF THIS DRAWING

(Sheet 1 of 2)

FIGURE 5.24 PANEL CONTROL BOARD 1A8

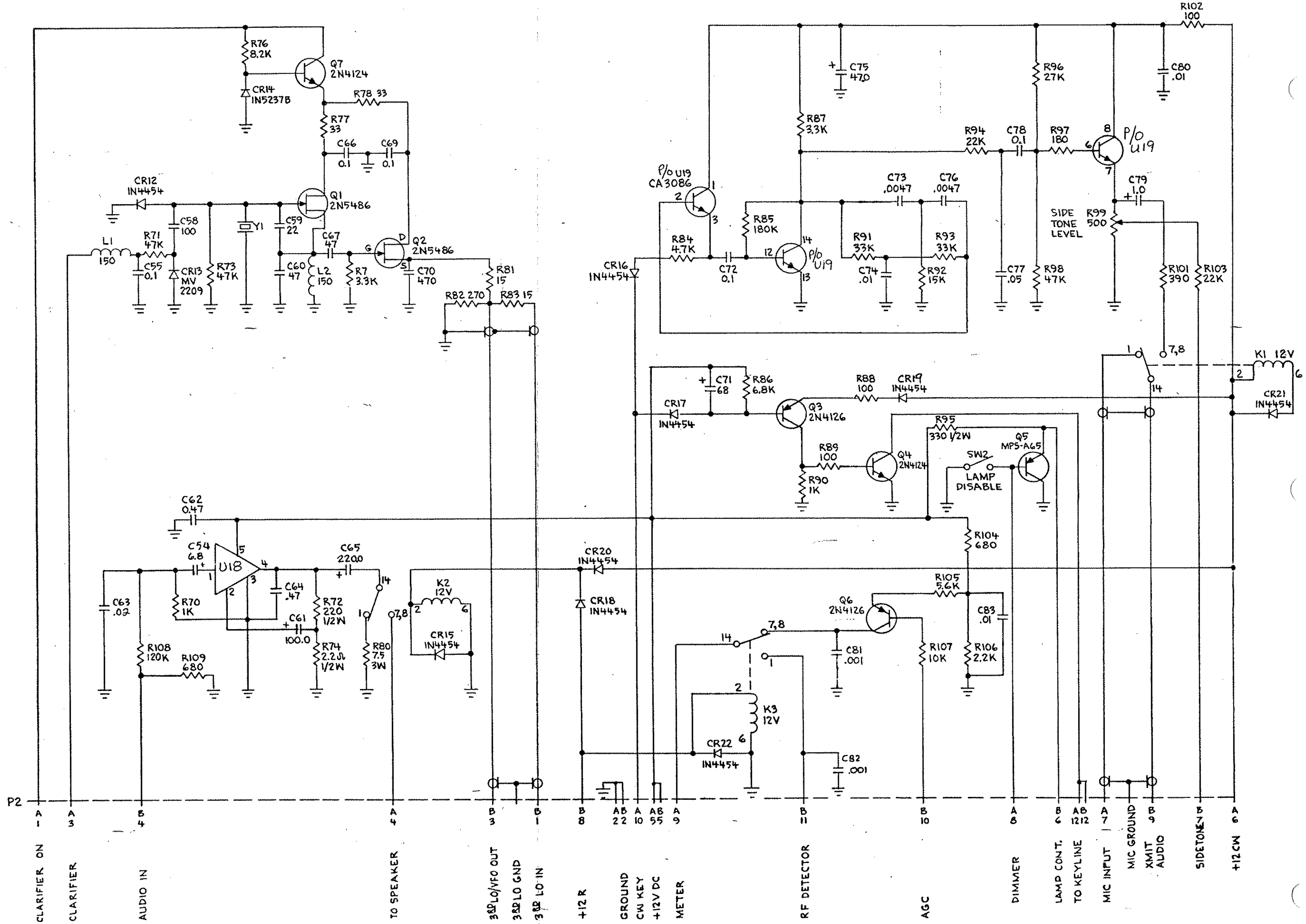
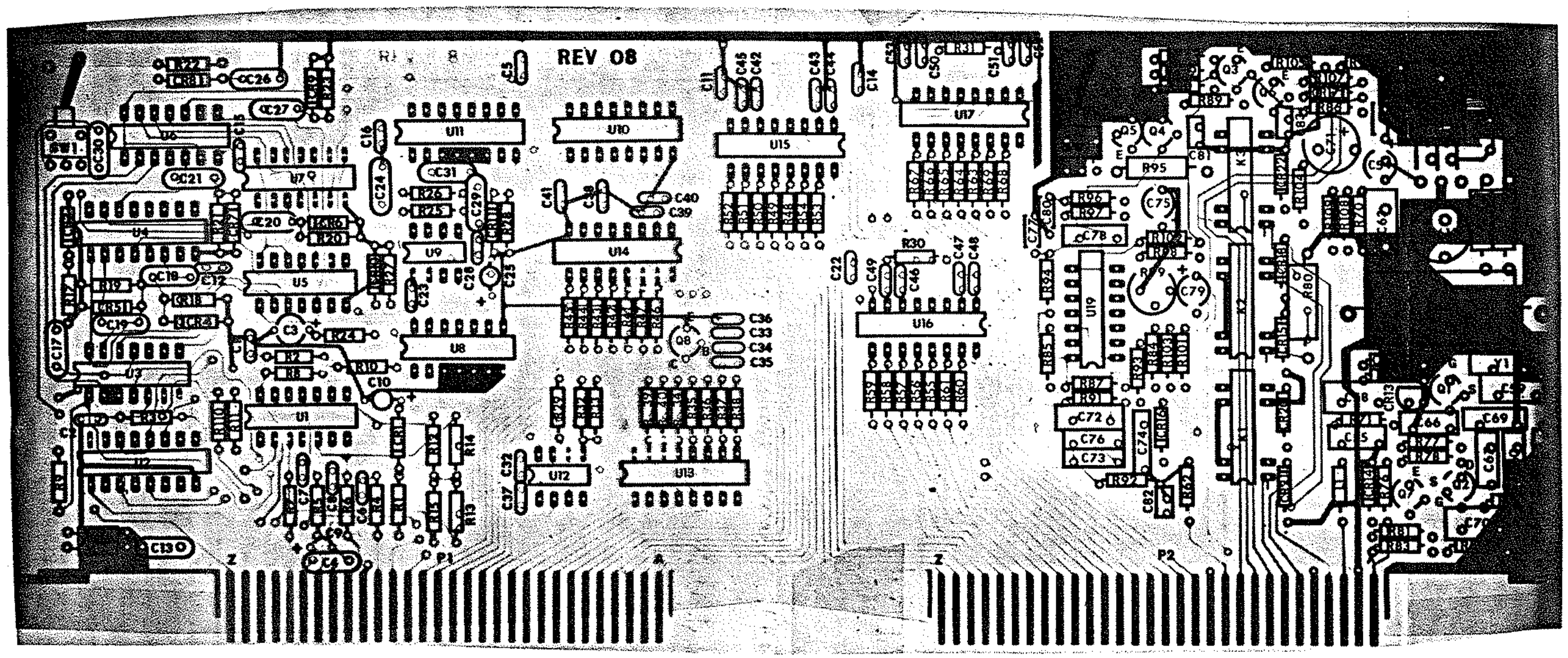


FIGURE 5.24 PANEL CONTROL BOARD **(1A8) (Sheet 2 of 2)**



PANEL CONTROL BD (1A8)
COMPONENT SIDE

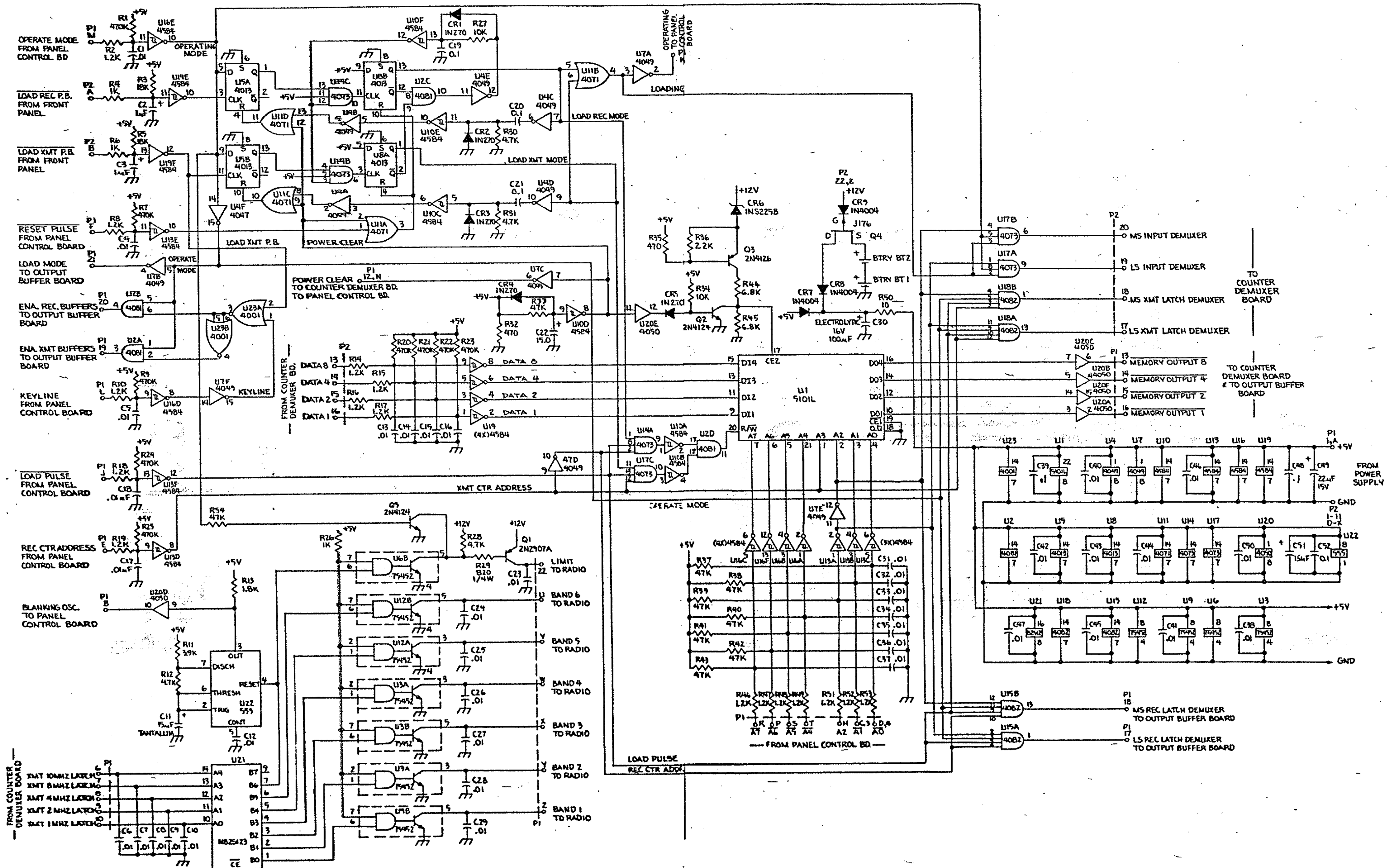
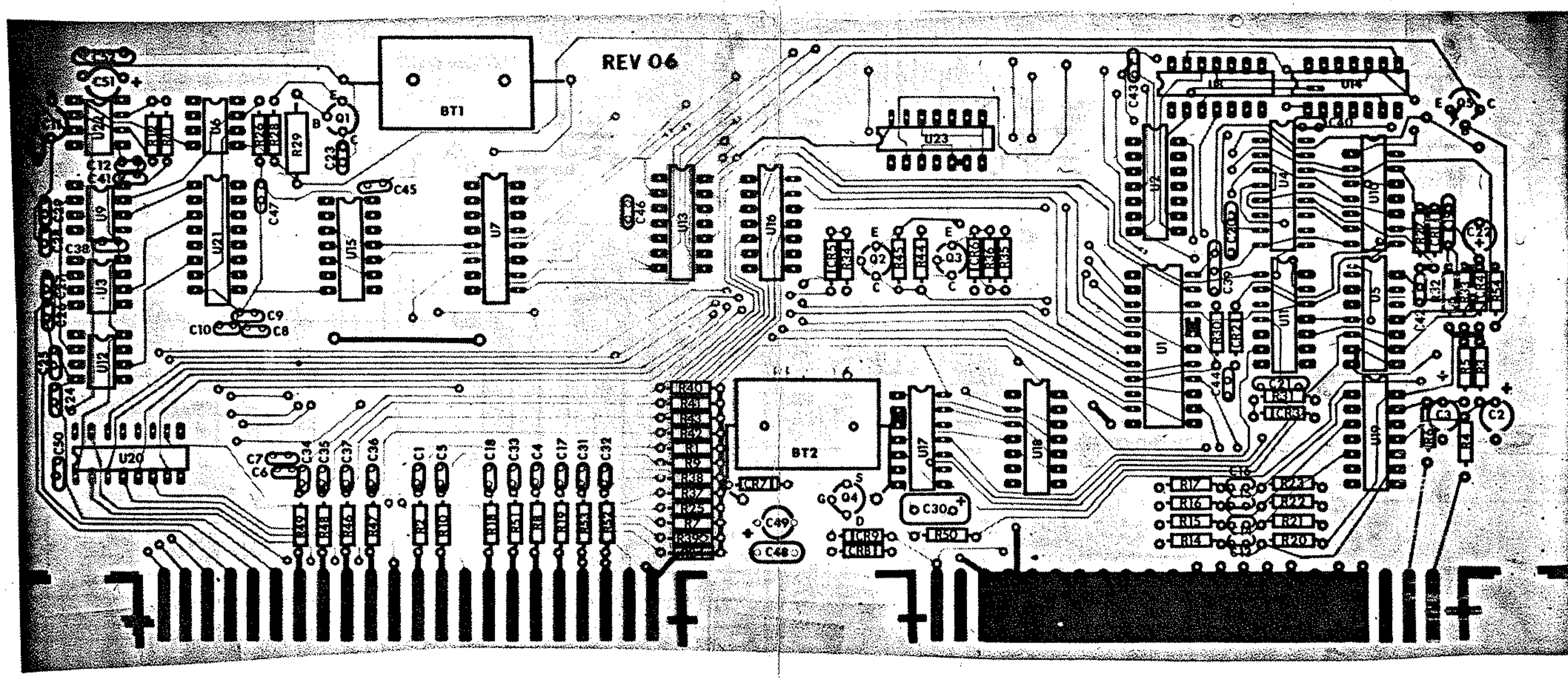


FIGURE 5.25 MEMORY BAND BOARD 1A9



MEMORY BAND BD (1A9)
COMPONENT SIDE

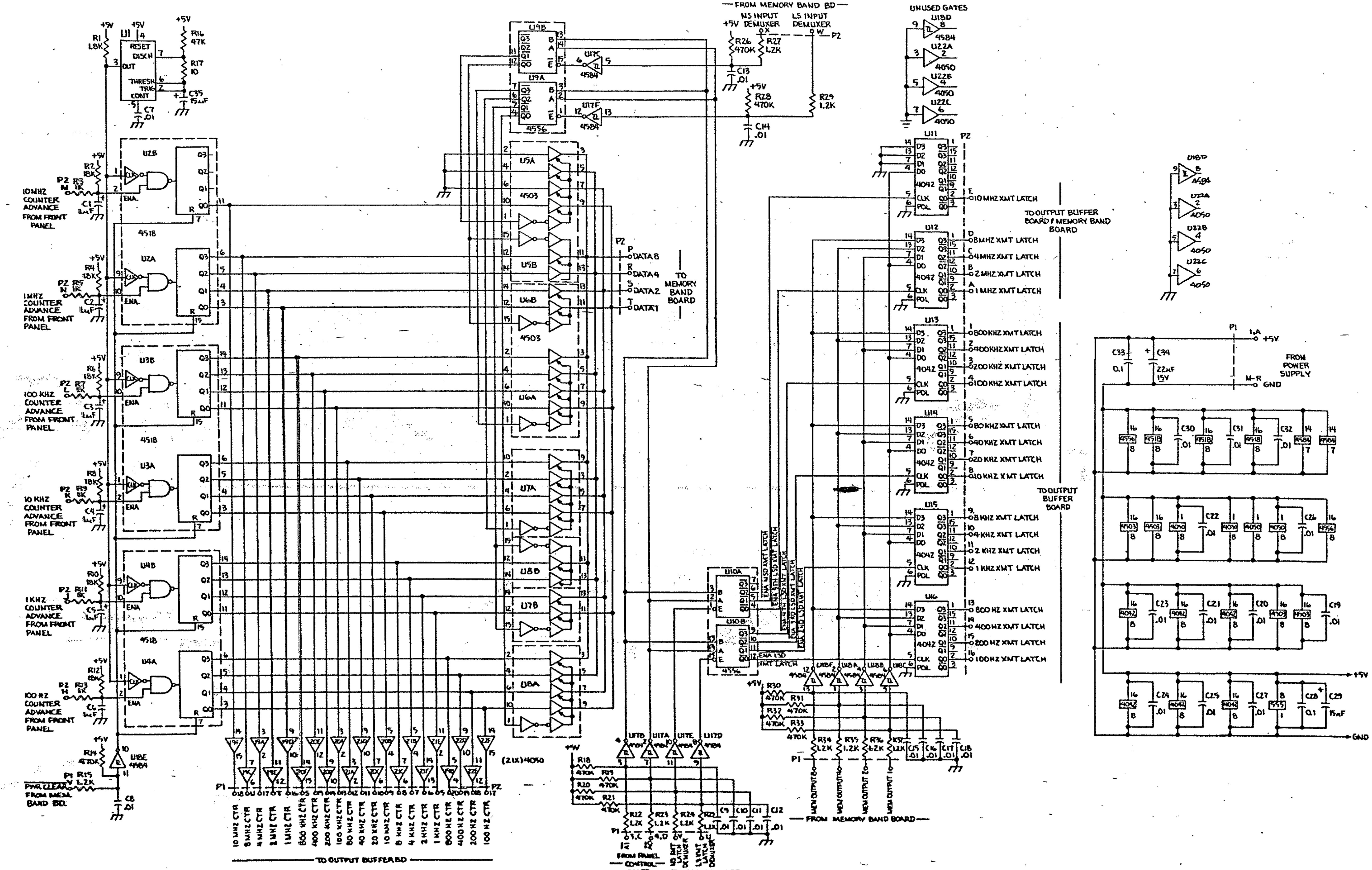
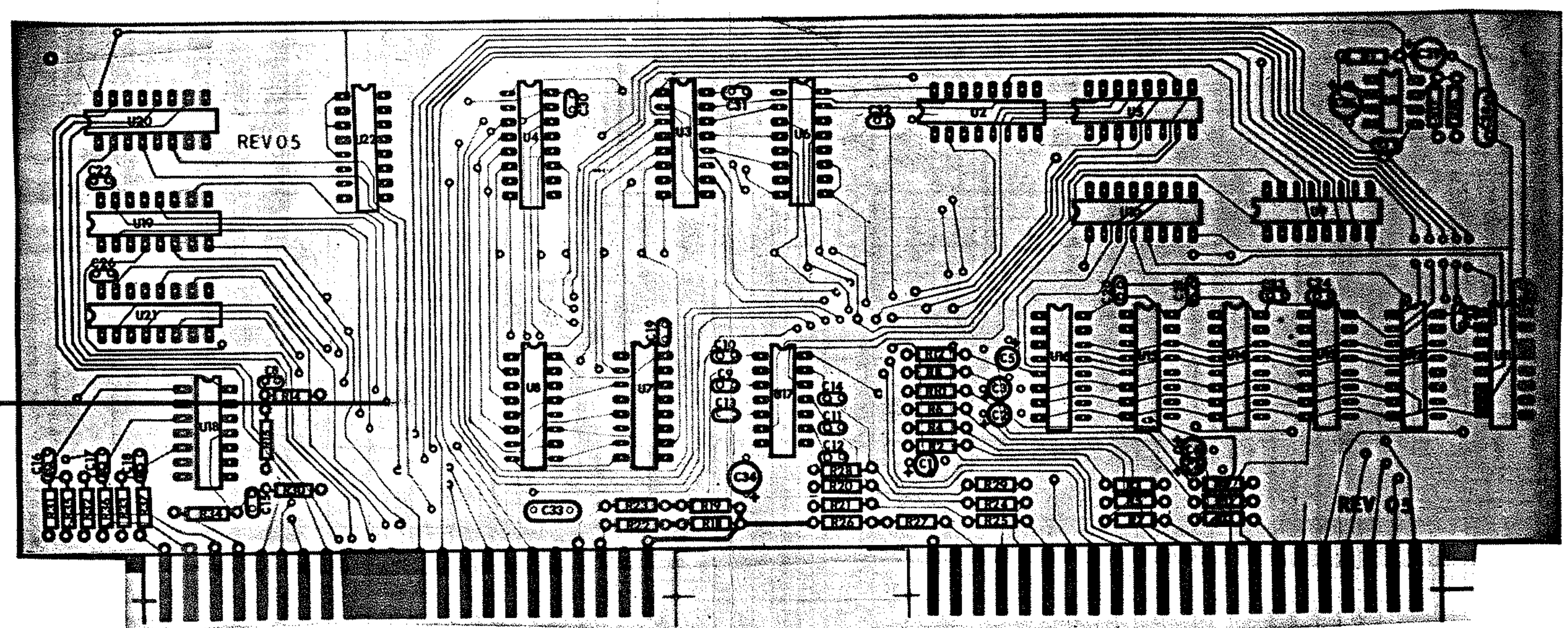
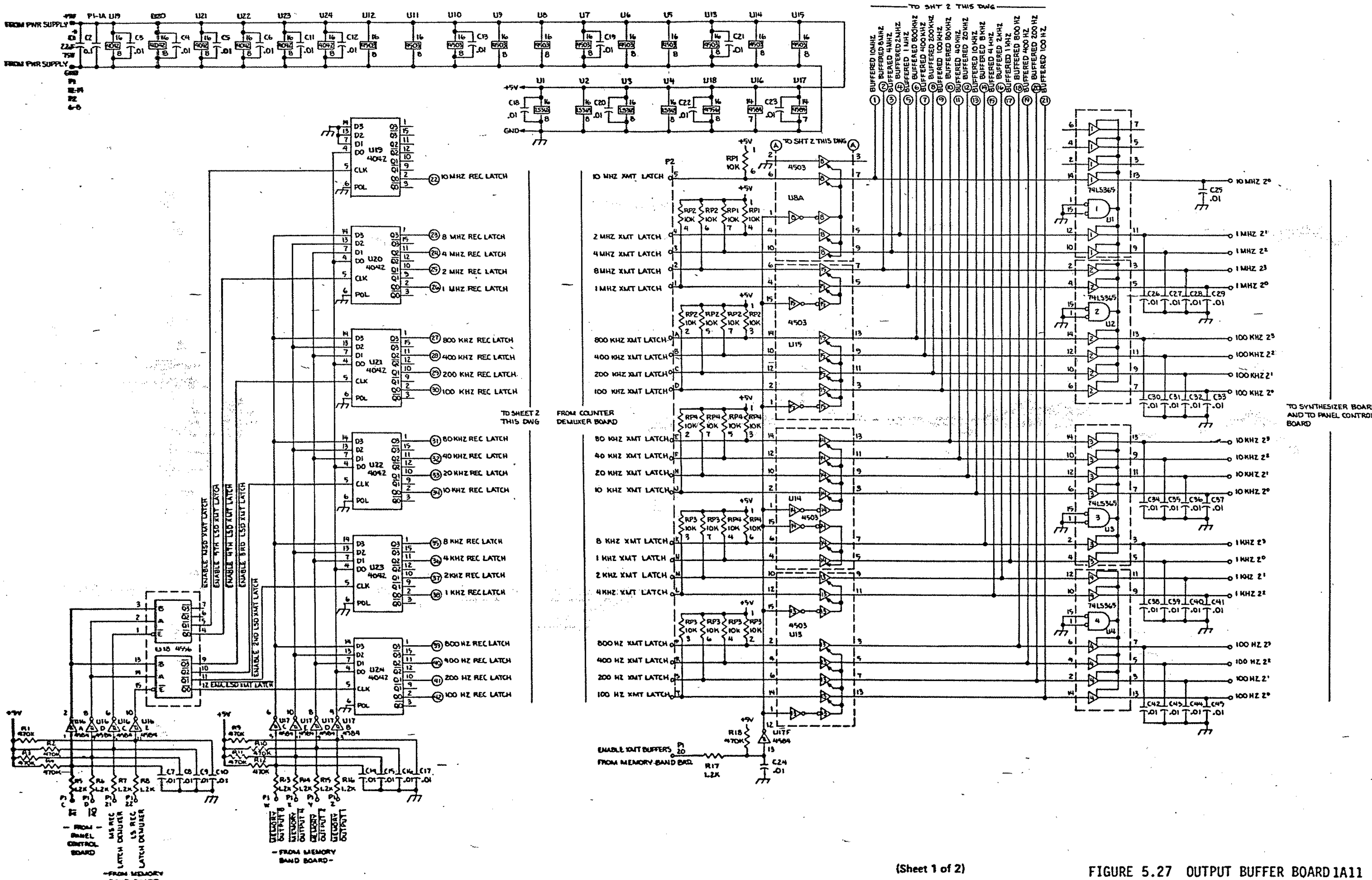


FIGURE 5.26 COUNTER DEMUXER Board (1A10)



COUNTER DEMUXER BD (1A10)
COMPONENT SIDE



(Sheet 1 of 2)

FIGURE 5.27 OUTPUT BUFFER BOARD 1A11

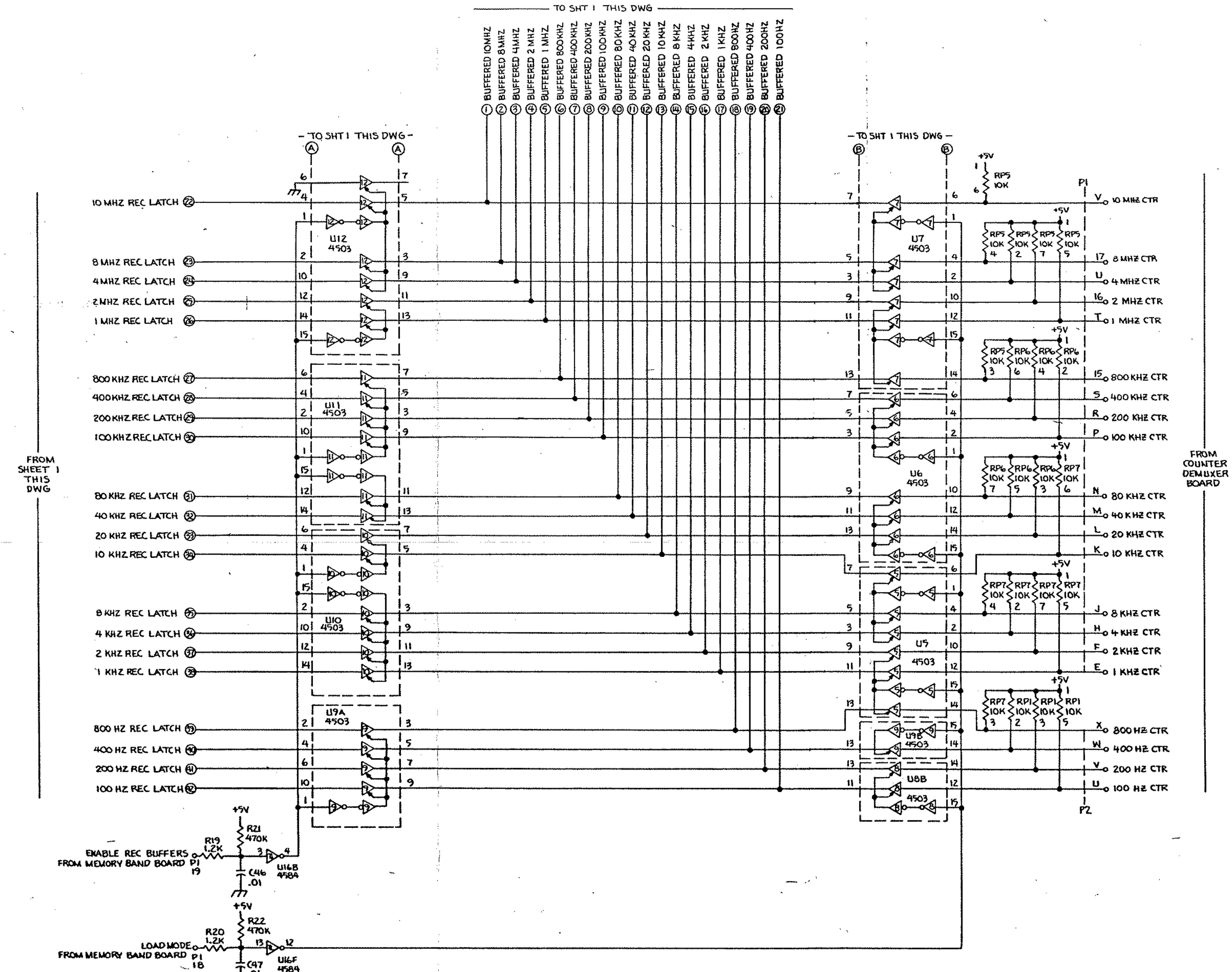
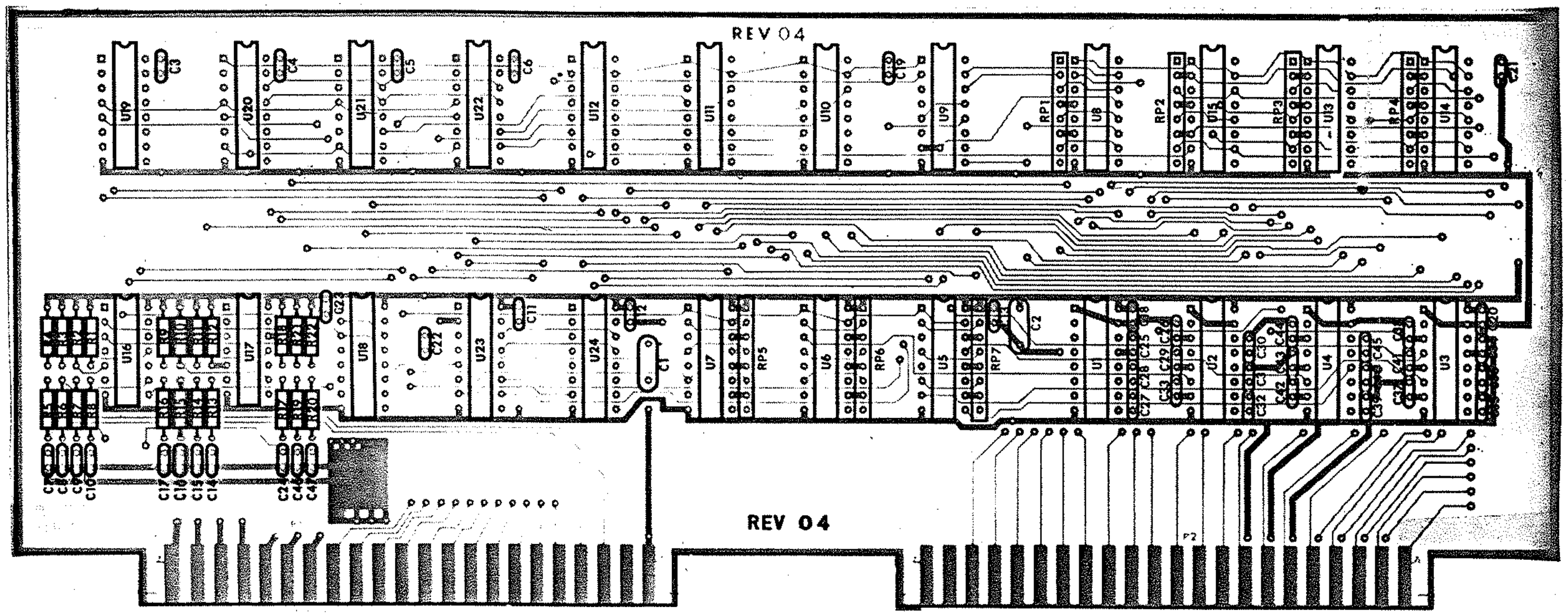


FIGURE 5.27 OUTPUT BUFFER BOARD 1A11 **(Sheet 2 of 2)**



OUTPUT BUFFER BD (1A11)
COMPONENT SIDE

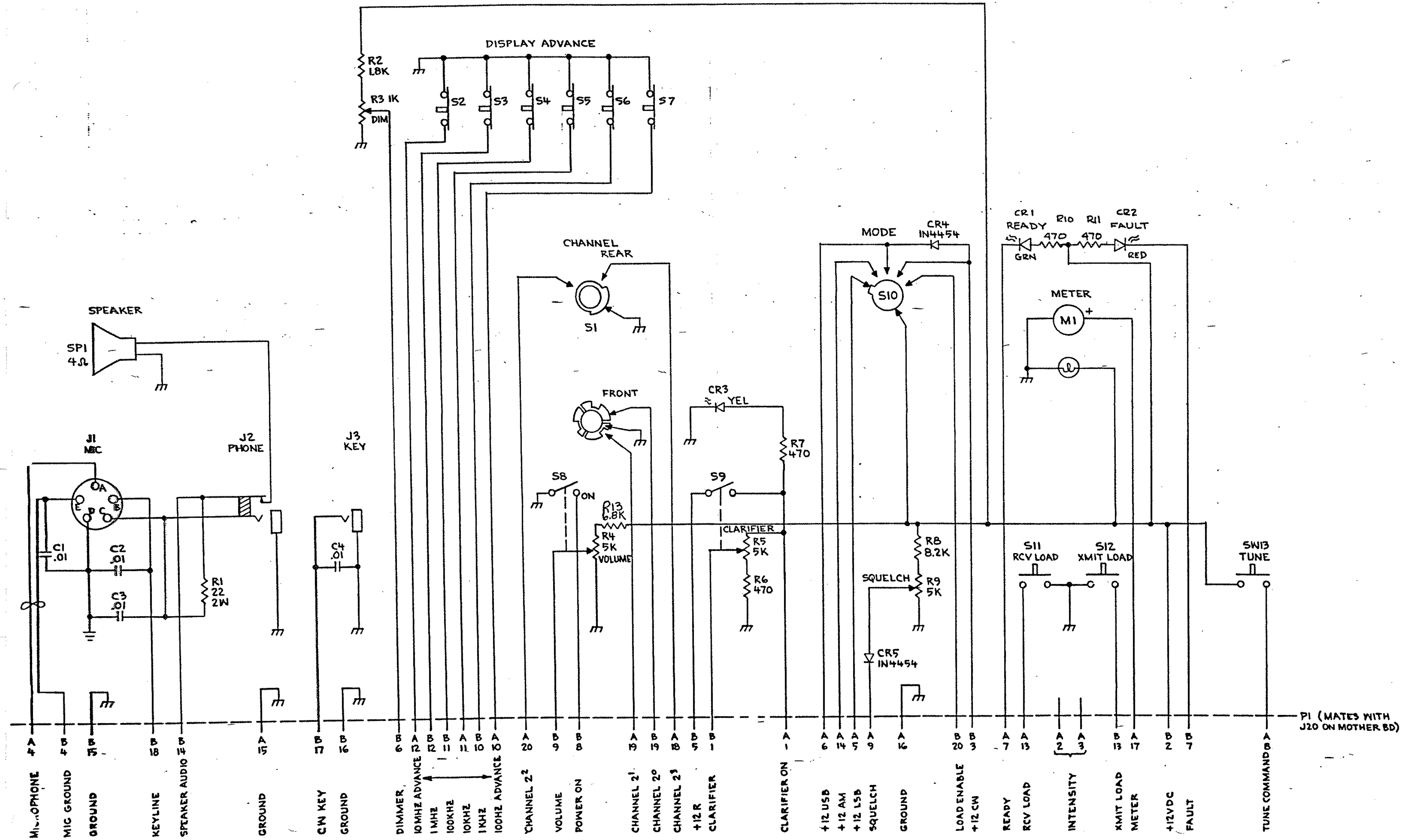
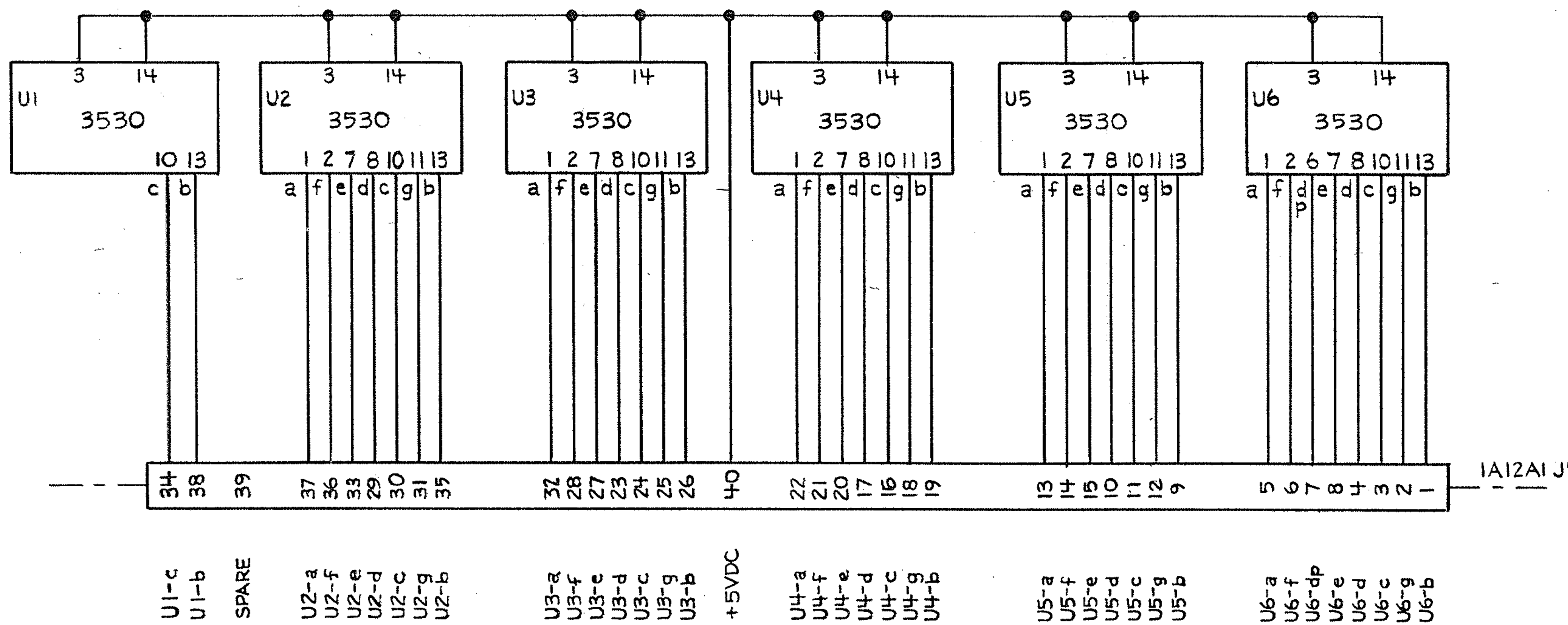


FIGURE 5.28 FRONT PANEL WIRING 1A12



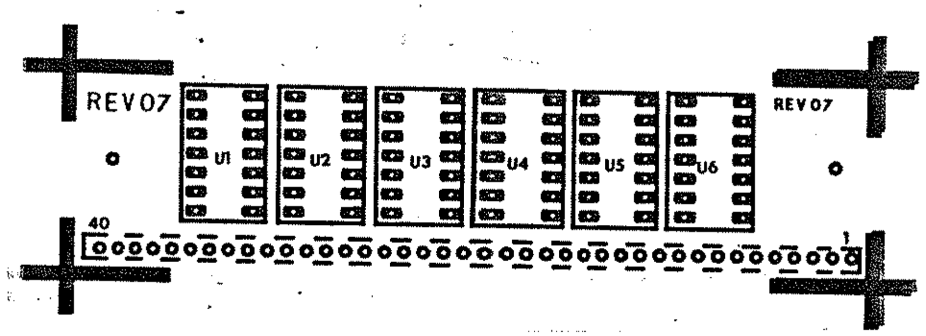


FIGURE 5.29 DISPLAY BOARD 1A12A1