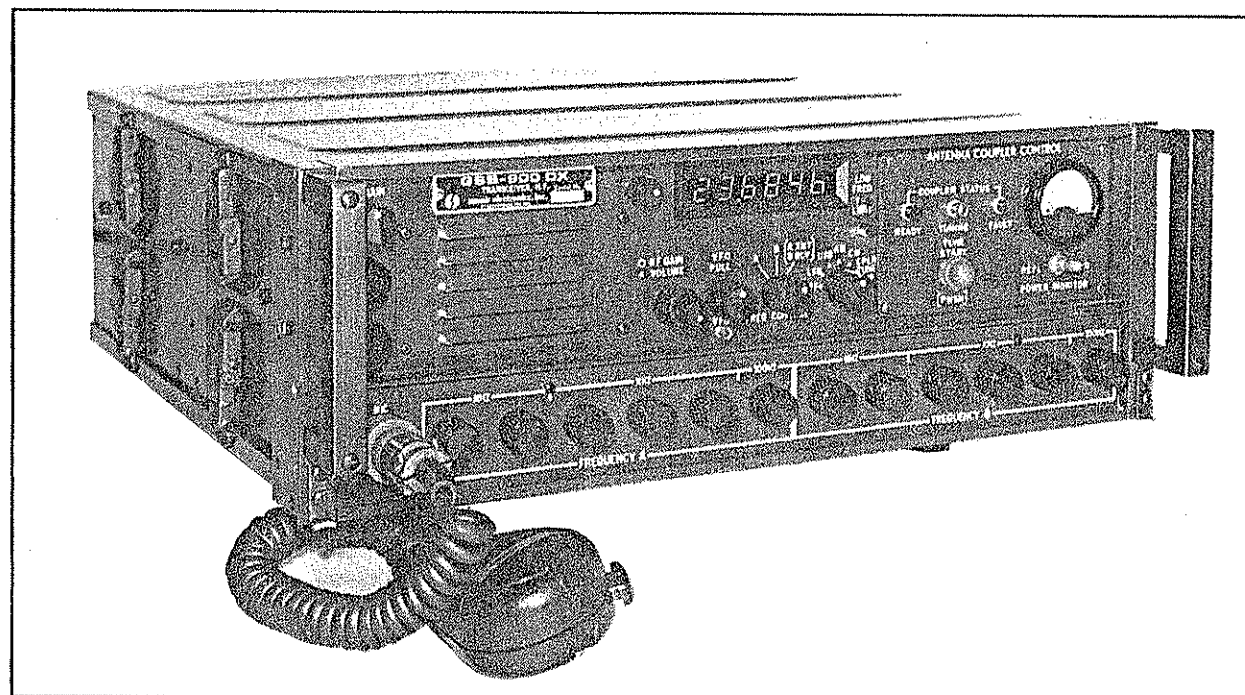


sunair electronics, inc.

3101 S. W. 3rd Avenue, Ft. Lauderdale, Florida 33315 USA



**OPERATION AND
MAINTENANCE MANUAL**

**TRANSCEIVER HF/SSB
SYNTHESIZED
HALF-DUPLEX**

GSB-900 DX

PRODUCT SERVICE:

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

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TRAINING:

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SECTION 1

GENERAL INFORMATION

1.1 SCOPE

This instruction manual contains the necessary information to install, operate and service the GSB-900DX Transceiver.

1.2 TRANSCEIVER DESCRIPTION

1.2.1 GENERAL

The GSB-900DX is a high quality single sideband half duplex transceiver covering the frequency range of 1.6000 to 29.9999 MHz. Modes of operation include Lower Sideband (LSB), Upper Sideband (USB), Amplitude Modulation (AM) and Continuous Wave (CW). Operation in the Frequency Shift Keying (FSK) and Facsimile (FAX) Mode is also possible with the addition of suitable modems. The transceiver is mechanically and electrically designed to meet stringent military specifications for shock, vibration and protection from outside environments. The unit is completely sealed (dust free) utilizing neither blowers nor ventilating louvers, making it ideal for mobile as well as base station use. It can operate over wide temperature extremes (-30° to +65°C) and up to 100% relative humidity.

The GSB-900DX is composed of seven major sub-assemblies, (1) front panel 1A1, (2) control panel 1A2 (optional), (3) receiver/ exciter 1A3, (4) synthesizer 1A4, (5) filter module 1A5, (6) power supply 1A6, (7) power amplifier 1A7. See Figure 1.1 for major assembly location.

1.2.2 FRONT PANEL - 1A1

The half-duplex front panel contains all standard controls for operation of the transceiver in Lower Sideband (LSB), Upper Sideband (USB), Amplitude Modulation (AM), and Continuous Wave (CW) modes. (Operation in the Frequency Shift Keying (FSK) and Facsimile (FAX) modes are also possible with the addition of external modems.) The panel contains two complete sets of frequency select

dials, one marked "Frequency A" and the other marked "Frequency B" allowing the operator to set in two different frequency channels. These frequencies may then be called up by switching the Frequency Control switch to "A", or "B", or "A XMT/B RCV", the latter providing a half-duplex capability. The frequency of operation is shown on a six digit LED display.

1.2.3 CONTROL PANEL - 1A2 (optional)

This unit plugs into the front panel and contains all controls necessary to remotely operate an antenna coupler or a linear power amplifier. Tuning status of the coupler or LPA is monitored by the meter installed in the tuning unit panel. When the GSB-900DX is operated into a 50 ohm antenna and a coupler or LPA is not installed, the transceiver is supplied with a meter panel which indicates receive signal strength and relative power output of the transmitter.

1.2.4 RECEIVER/EXCITER - 1A3

The Receiver/Exciter module contains the low level signal generation circuitry. The 1st I.F. frequency is well above the 30 MHz upper limit of the transceiver-providing the unusually high spurious signal rejection found only in this frequency scheme. The extensive use of integrated circuits provides an unusually high level of reliability. High quality crystal filters are employed both in the "front end" of the radio and in the I.F. section for sideband selection. The Receiver/Exciter is fully contained on four plug-in printed circuit boards plus a mother board and employs fully modularized construction.

1.2.5 SYNTHESIZER - 1A4

Frequency control is by means of a digital frequency synthesizer providing 100 Hz frequency steps. In addition, the operator can select a high stability VFO mode of operation, which provides

continuous tuning between the 100 Hz synthesized increments. All frequencies in the transceiver are derived from a Temperature Compensated Crystal Oscillator (TCXO) which provides instant on-frequency operation with no warmup. The frequency stability is better than $\pm 1 \times 10^{-6}$ over the full specified ambient temperature range of the radio. The long term stability is $\pm 5 \times 10^{-7}$ per year; permitting long intervals between calibration.

The Synthesizer is fully modularized for ease of maintenance. High reliability is assured through the extensive use of both digital and linear integrated circuits. The Synthesizer is fully contained on five plug-in printed circuit boards plus a mother board.

1.2.6 FILTER MODULE -1A5

The filter module is contained on four P-C boards and housed in a removable unit. Filter selection is automatically accomplished by the front panel frequency selectors which control a D.C. motor. High power low pass filters are used in the transmit mode to remove all unwanted harmonics from the power amplifier output. In the receive mode high pass networks are switched in the filter which in conjunction with the low pass filters yield a band-pass filter. This module also contains circuitry for control and protection of the power amplifier.

1.2.7 POWER SUPPLY -1A6

The GSB-900DX will operate from power sources of 115 or 230 volt 50-60 Hz A.C. and in addition from 13 or 26 volt D.C. sources (either positive or negative ground) with the optional, self contained, D.C. Inverter Module. The same transceiver can

operate from both A.C. and D.C. power sources, with the D.C. Inverter Module installed, by changing the external power input cable. The selection of 13 or 26 volt D.C. operation is easily accomplished by changing connections on a jumper strip in the power supply. The power supply employs fully modularized construction for ease of maintenance.

1.2.8 RF POWER AMPLIFIER -1A7

The GSB-900DX contains an all solid state broadband power amplifier which will match 50 ohm loads with voltage standing wave ratios (V.S.W.R.) under 2:1 over the entire frequency range of the radio with no additional operator tuning. Adequate 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 (P.E.P.) and 100 watts average power output over the entire frequency range. The power amplifier incorporates Automatic Level Control (ALC) which limits the peak power output to 100 watts while increasing the average power with highly varying speech inputs. The ALC also prevents the increase in intermodulation distortion caused by "flat topping" in the P.A. and alleviates the usual critical setting of the transmit gain control. The P.A. employs circuits to protect the amplifier under excess V.S.W.R. or other abnormal conditions. In the A.M. mode, an Automatic Carrier Control (ACC) circuit is engaged which controls the amount of A.M. power output. The power amplifier is easily removeable (as a module) from the rear of the radio.

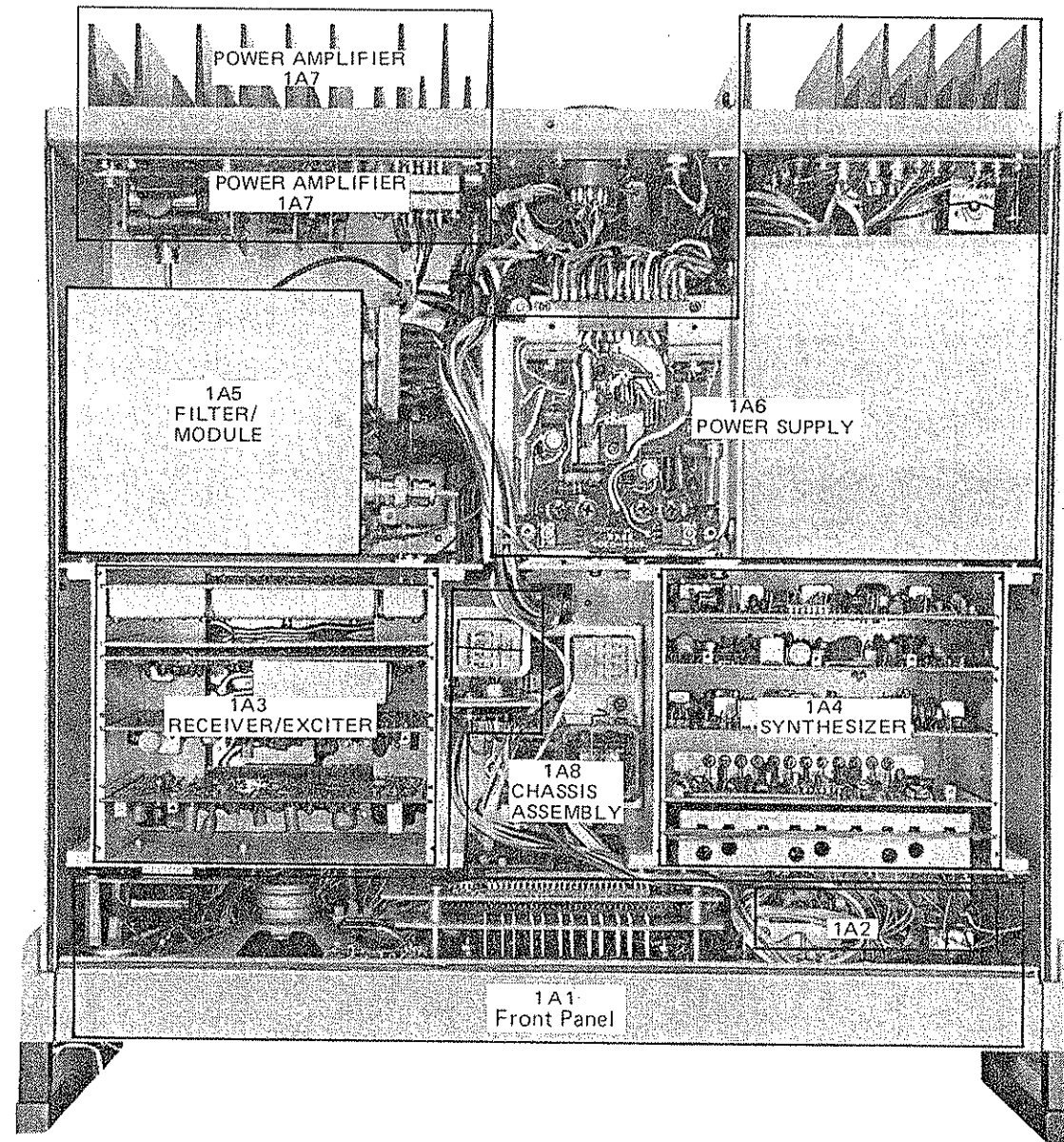


Figure 1.1 GSB-900DX Major Assembly Locations

SUNAIR GSB-900DX

1.3 TECHNICAL SPECIFICATIONS

Electrical and physical specifications of the Sunair GSB-900DX Transceiver are listed below.

1.3.1 GENERAL

FREQUENCY RANGE: 1.6 to 30 MHz (100 Hz increments, plus VFO).

NUMBER of CHANNELS: 284,000, Synthesized.

RESOLUTION: Digital, direct readout (100 Hz steps, plus VFO).

FREQUENCY STABILITY: $\pm 1 \times 10^{-6}$ TCXO, over rated temperature range.

OPERATING MODES: USB, LSB, AME, CW, (FSK and FAX with external optional modems).

RF INPUT/OUTPUT IMPEDANCE: 50 ohms nominal, unbalanced.

DUTY CYCLE: Continuous.

ENVIRONMENTAL TEMPERATURE: -30°C to $+65^{\circ}\text{C}$, for 100 watts PEP output. -30° to $+50^{\circ}\text{C}$, for 100 watts Average (Continuous FSK). External blower kit required for continuous FSK service.

HUMIDITY: 100% at 50°C .

SHOCK: Per MIL-STD-810B, Method 516.1, Procedure I, Fig. 516.1.2, Amplitude a Duration c.

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

ENCLOSURE: Per MIL-STD-108, table II. (Splash-proof).

METER MONITORS: Relative power output, received signal strength.

FRONT PANEL CONTROLS: Digital Frequency Select, Simplex/Half duplex operation, VFO, Volume, Mode/on-off, RF Gain, Transmitter Gain, Speaker on/off, Light Dimmer, and optional plug-in antenna coupler control panel.

POWER INPUT: AC: 115/230 volts $\pm 15\%$, 50-60 Hz; at 400 watts max.

DC: (optional) 13/26 volts $\pm 10\%$; at 480 watts max.

DIMENSIONS: (CM) 15.2H x 46.6W x 45.7D
(INCHES) 6H x 18.25W x 18D

WEIGHT: 22.7 kgs. (55 pounds)

1.3.2 RECEIVER

SENSITIVITY: SSB: 0.5 uv into 50 ohms for 10 db S+N/N.
(2-30 MHz) — AM: Not more than 3.0 uv into 50 ohms for 10 db S+N/N.
(1.6 to 2.0 MHz) 6db degradation.

AUDIO OUTPUT: 5 watts into 8 ohms (speaker) @ less than 10% distortion; 10 dbm nominal into 600 ohms (internally adjustable).

SELECTIVITY: 300 to 3000 Hz nominal (6db points), standard.

IF REJECTION: Not less than 70 db.

IMAGE REJECTION: Not less than 80 db.

AGC: Fast attack, slow release. Threshold 5 uv nominal, 15 db max audio change for 100 db R.F. input change.

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

EXTERNAL SPURIOUS RESPONSE: -65 db, non-harmonically related.

1.3.3 TRANSMITTER

POWER OUTPUT: SSB: 100 watts PEP and average nom.
CW: 100 watts Avg. nom.
AME: 30-40 watt carrier.

HARMONIC SUPPRESSION:
-40 db, second harmonic.
-50 db, all other harmonics.
-60 db, all harmonics, (with antenna coupler)

INTERMODULATION DISTORTION: At least 33 db below PEP., typical.

SUNAIR GSB-900DX

CARRIER SUPPRESSION: 50 db.

UNDESIREDBAND SUPPRESSION: 50 db
at 1.5 kHz.

HUM AND NOISE LEVEL: -50 db.

1.4 EQUIPMENT SUPPLIED

The following table is a list of equipment, with appropriate Sunair part numbers, supplied with the GSB-900DX Transceiver.

	Sunair Part No.
1.4.1 Transceiver, GSB-900DX with 115/230 volt power supply.	5024601050 Gray 5024601092 Green
1.4.2 Hand Held Microphone Assembly	5024000609
1.4.3 Operation and Maintenance Manual	5024600509
1.4.4 Power Cord Assembly, 115 V A.C. OR Power Cord Assembly, 230V A.C.	5024002091 5024002156
1.4.5 Ancillary Kit	5024000455 115V 5024000498 230V
1.4.6 Temperature Compensated Crystal Oscillator (TCXO) Frequency Standard-mounts inside GSB-900DX.	5024012704

1.5 OPTIONAL EQUIPMENT-NOT SUPPLIED

The following table of accessories and spares are NOT supplied but are made available by Sunair Electronics, Inc. as compatible equipment for the GSB-900DX. Part numbers and descriptions are given to facilitate ordering.

1.5.1 Antenna Coupler, Remote Controlled, GCU-910A	5024300050 Gray 5024300092 Green
1.5.2 Automatic Antenna Coupler, GCU-935	6035003095 Green 6035003052 Gray
1.5.3 Kilowatt Linear Power Amplifier GSL- 1900A.	6032001059 Gray 6032001091 Green

SUNAIR GSB-900DX

1.5.4	Control Cable for GCU-910A or GCU-935 (specify length)	0588680001	
1.5.5	Control Cable for GSL-1900A (specify length)	0579240002	
1.5.6	Antenna Coupler Tuning Control (Kilowatt Control) mounts in Front Panel of GSB-900DX.	Refer to Applicable Manual	
1.5.7	Coaxial Cable, type RG58/U (recommended for connecting antennas to the GSB-900DX, or for connecting the GSB-900DX to the GCU910A or GCU-935 where the length will be under 100 feet). SPECIFY LENGTH	0588130001	
1.5.8	Coaxial Cable, type RG8/U (same as 1.5.7 above, but recommended where length will exceed 100 feet). SPECIFY LENGTH	0586640000	
1.5.9	D.C. Inverter Module (Powers the GSB-900DX from either 13 or 26 volt D.C. sources while still permitting operation from 115/230V A.C. mains). Module mounts inside GSB-900DX.	5024021398	
1.5.10	Power Cord Assembly-D.C. (includes 10 feet of connecting cable). For use with item 1.5.9 above. (Supplied with DC inverter above).	5024002296	
1.5.11	C.W. Key (includes 3 foot cable and connector).	5024000994	
1.5.12	Handset Assembly (with coiled cord and connector).	5024000790	
1.5.13	Headset (includes cable and connector).	0840200005	
1.5.14	Desk Type Microphone (includes cable and connector).	5024000897	
1.5.15	Shock Mount Assembly (recommended for mobile applications).	5024002598	
1.5.16	Rack Mount Kit (adapts GSB-900DX to mount in a standard 19 inch rack). Two-piece rack slides.	5024004051 Gray 5024004094 Green	
	Three-piece rack slides.	5024004850 Gray 5024004892 Green	

SUNAIR GSB-900DX

1.5.17 Doublet Antenna Kit	0996240000	
1.5.18 75 foot Long Wire Antenna Kit	0999200003	
1.5.19 150 foot Long Wire Kit	0999210009	
1.5.20 16 foot Mobile Fiberglass Whip Antenna (use with 1.5.21 below).	0712950001	
1.5.21 Heavy Duty Strap-Type Bumper Mount for 1.5.20 above.	0715730002	
1.5.22 Heavy Duty Feed Thru Mount (for 1.5.20 above).	5024402090	
1.5.23 Right Angle Vehicular mount for 1.5.20 above.	5024402596	
1.5.24 35 foot Fiberglass Base Station Whip Antenna.	0715850008	
1.5.25 23 foot Fiberglass Marine Whip Antenna with Flange Base.	0715760009	
1.5.26 23 foot Fiberglass Marine Whip Antenna.	0712980008	
1.5.27 Laydown Mount for above.	0712990003	
1.5.28 GRC-951 Remote Audio/Keyline Con- trol for GSB-900DX.	5024850092	
1.5.29 Remote Control Cable for GRC-951 (specify length).	0588690007	
1.5.30 Depot Spare Parts Kit for D.C. Inverter Module.	5024902092	
1.5.31 Blower Kit 115 VAC (mounts on rear panel).	5024006089	
1.5.32 Blower Kit 220 VAC (mounts on rear panel).	5024006097	
1.5.33 Manual Phone Patch Assembly (See Page 6-1 for description).	5024400054	Gray
	5024400097	Green
1.5.34 Depot Spare Parts Kit for GSB-900DX	5024900201	
1.5.35 Field Module Kit for GSB-900DX	5024905300	
1.5.36 Service Kit, 900 Series	5024000391	
1.5.37 Running Spares Kit	5024900197	
1.5.38 Syllabic Squelch Assy.	5024048458	Gray
	5024048491	Green

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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.

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SECTION 2

INSTALLATION

2.1 GENERAL

Section two 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 hook-ups and final checkouts after installation is also provided.

2.2 UNPACKING AND INSPECTION

Unpack and inspect all parts and equipment as soon as received.

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 is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

If concealed damage is discovered after a 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 the damage should also be forwarded to Sunair. Include the following:

- (a) Order number
- (b) Model and serial number
- (c) Name of transportation agency

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

2.3 RESHIPPING

The shipping carton for the GSB-900DX has been carefully designed to protect the transceiver and its accessories during shipment. This carton and its associated packing materials should be used to re-ship the radio.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around controls, connectors, and other protrusions from the radio. Rigid cardboard should be placed at the corners of the equipment to protect against denting.

When returning one or more subassemblies for repair, please ship AIR PARCEL POST consigned to:

SUNAIR ELECTRONICS, INC.
3101 SW 3rd Avenue
Ft. Lauderdale, Florida 33315
U.S.A.

Plainly mark with indelible ink all mailing documents as follows:

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

and be sure to mark on 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

General installation procedures and mounting requirements are given for the GSB-900DX transceiver. Satisfactory operation of this equipment will depend upon the care and thoroughness taken during installation.

2.4.1 GENERAL INSTALLATION

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

b. 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.

c. Provide maximum separation between coupler output and the radio with its associated wiring. Coupler may be mounted 100 ft. from radio if RG58 rf cable is used, or further if RG8 is used.

d. Antenna lead from antenna coupler to antenna must be insulated for at least 10kv 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. distant as this will decrease antenna efficiency.

e. If the radio is installed on a wood or fiber glass 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.

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

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

h. Linear amplifiers with low level modulation such as used in the GSB-900DX will oscillate if the RF power output is radiated or conducted into the low level stages. Evidence of this situation is erratic

or excessive 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 longer 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 heat sinks. If extended periods of RTTY transmission are anticipated, forced air cooling of the heat sinks is recommended. Figure 2.1 shows the applicable GSB-900DX outline dimensions for use in this installation. Figures 2.2 and 2.3 show typical Base Station system installations. Refer to section 2.5 for recommendations of suitable antennas. See section 2.4.5 for rack mounted installations.

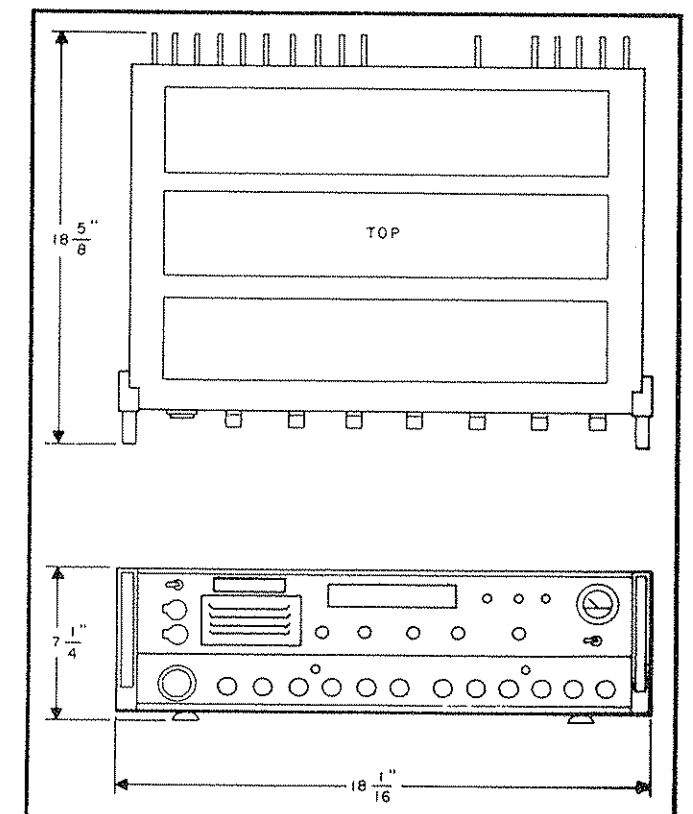


Figure 2.1 Outline Configuration

SUNAIR GSB-900DX

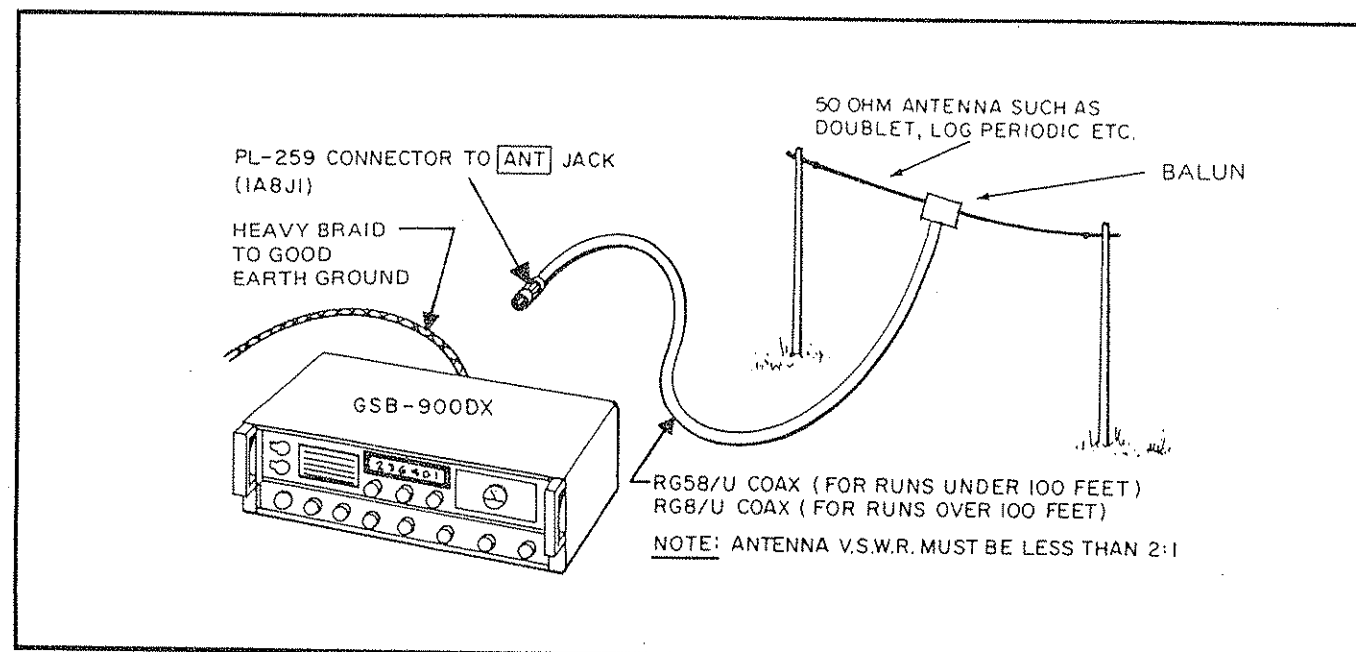


Figure 2.2 Base Station Installation (50 ohm Antenna)

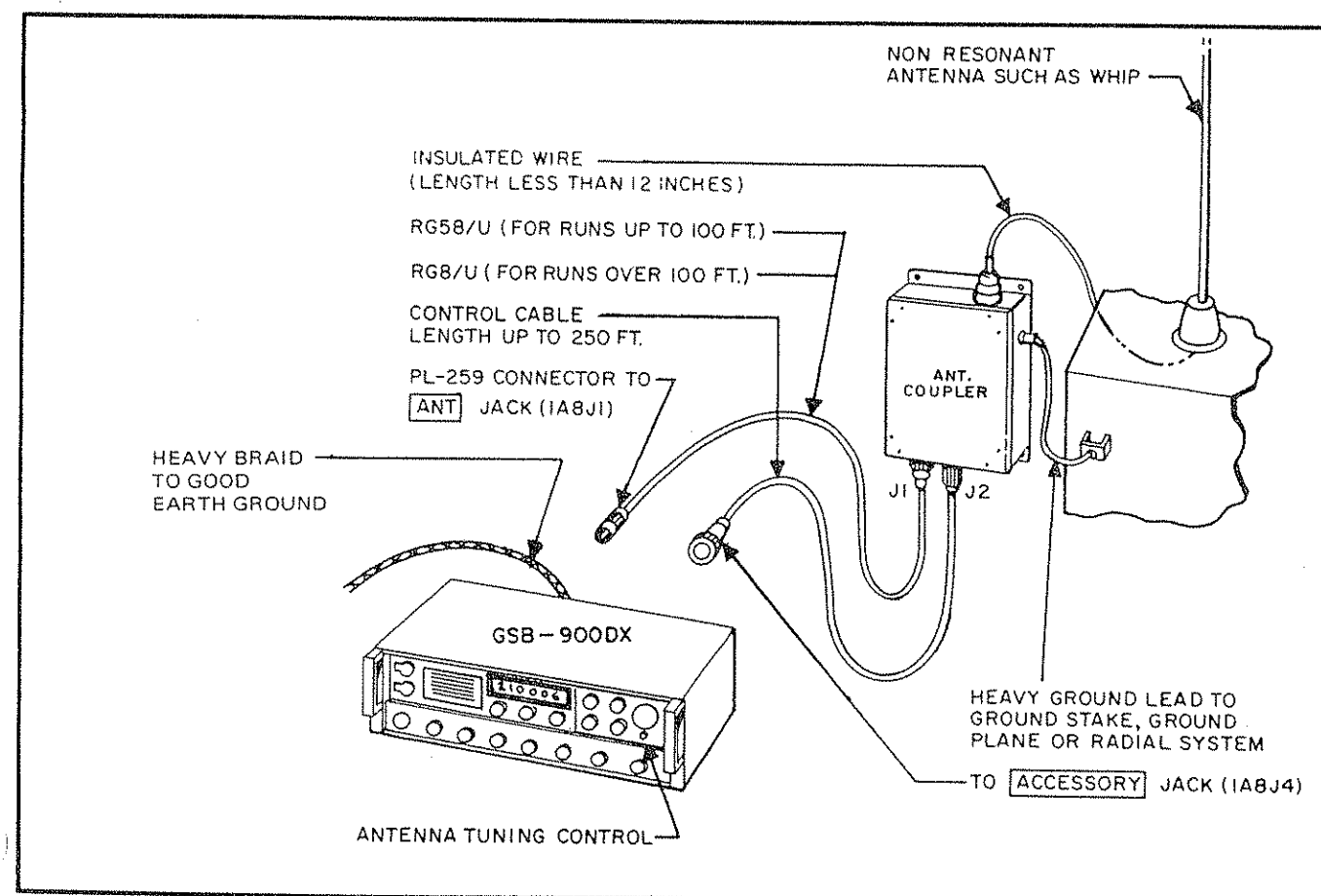


Figure 2.3 Base Station Installation (Non-Resonant Antennas)

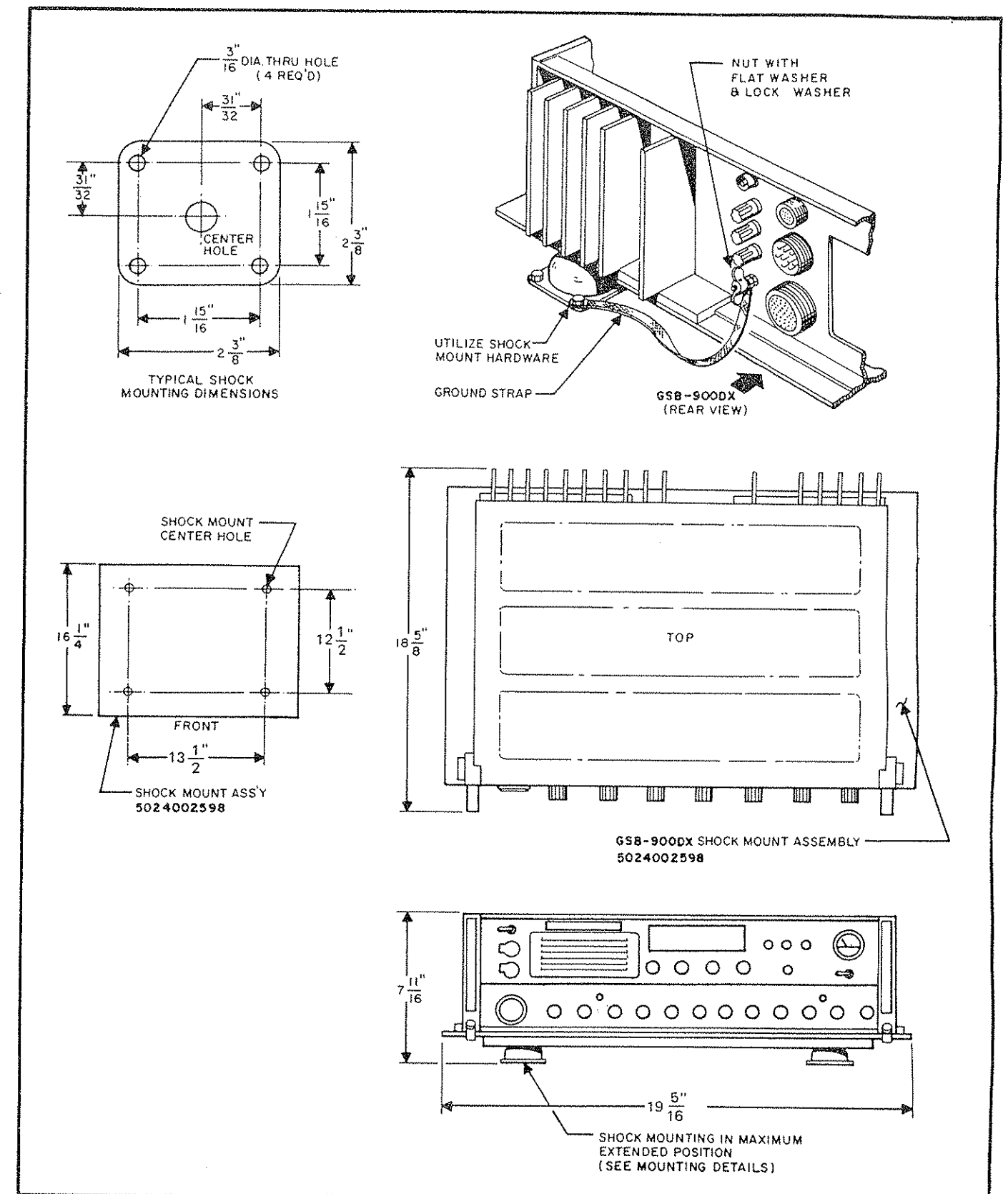


Figure 2.4 Shock Mount Assembly and Details

2.4.3 VEHICULAR INSTALLATIONS

The GSB-900DX Shock Mount Assembly (Sunair Part No. 5024002598) is designed to mount the Transceiver in vehicular installations. Figure 2.4 gives the applicable outline dimensions for the GSB 900DX coupled with the shock mount. Figure 2.5 shows a typical vehicular installation. See section

2.5 for specific antenna recommendations. In order to minimize R.F. pickup, it is important that the ground strap supplied with the shock mount be securely fastened between the ground post on the radio and the bottom of the right rear shock isolator (see detail, figure 2.4). It is also important to ground the antenna coupler to the frame of the vehicle by the shortest possible path.

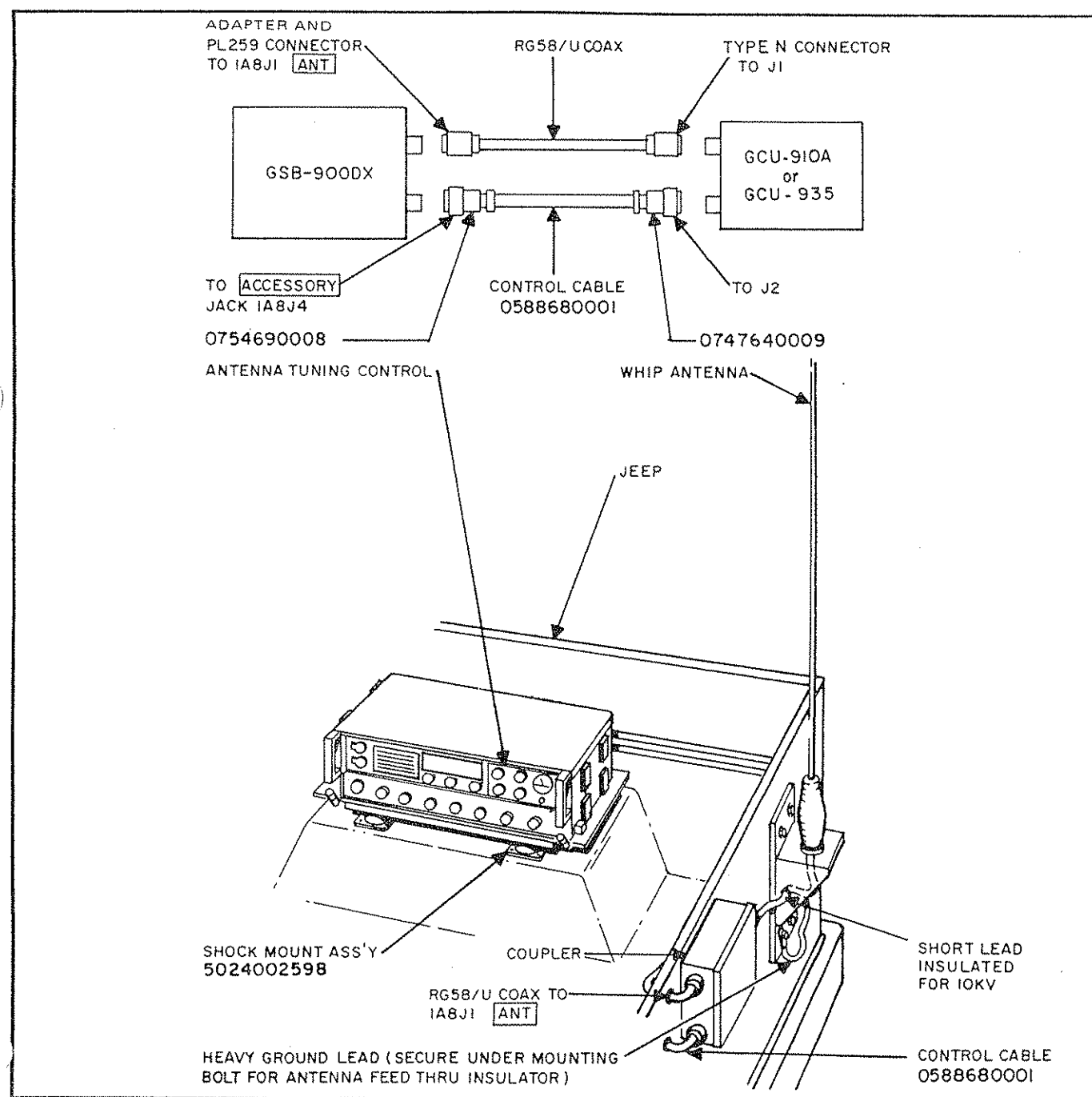


Figure 2.5 Typical Vehicular Installation

2.4.4 MARINE INSTALLATIONS

In marine installations, follow the same recommendations as outlined in paragraph 2.4.3. If the radio is installed in a wood or fiberglass boat, a ground plate of 12 square foot minimum area in contact with the water should be installed. A heavy ground lead such as 1 inch wide strap or braid should be connected between the ground post on the radio and the ground plate. The length of this ground lead should be held to an absolute min-

imum commensurate with a neat installation

2.4.5 RACK MOUNTED INSTALLATIONS

The GSB-900DX may be conveniently mounted in a standard 19 inch rack using the Rack Mount Kit. The kit includes a pair of rack slides, associated hardware and filler panel. The GSB-900DX, in the rack mounted configuration, requires a standard panel space seven inches high. Refer to figure 2.6 for assembly details.

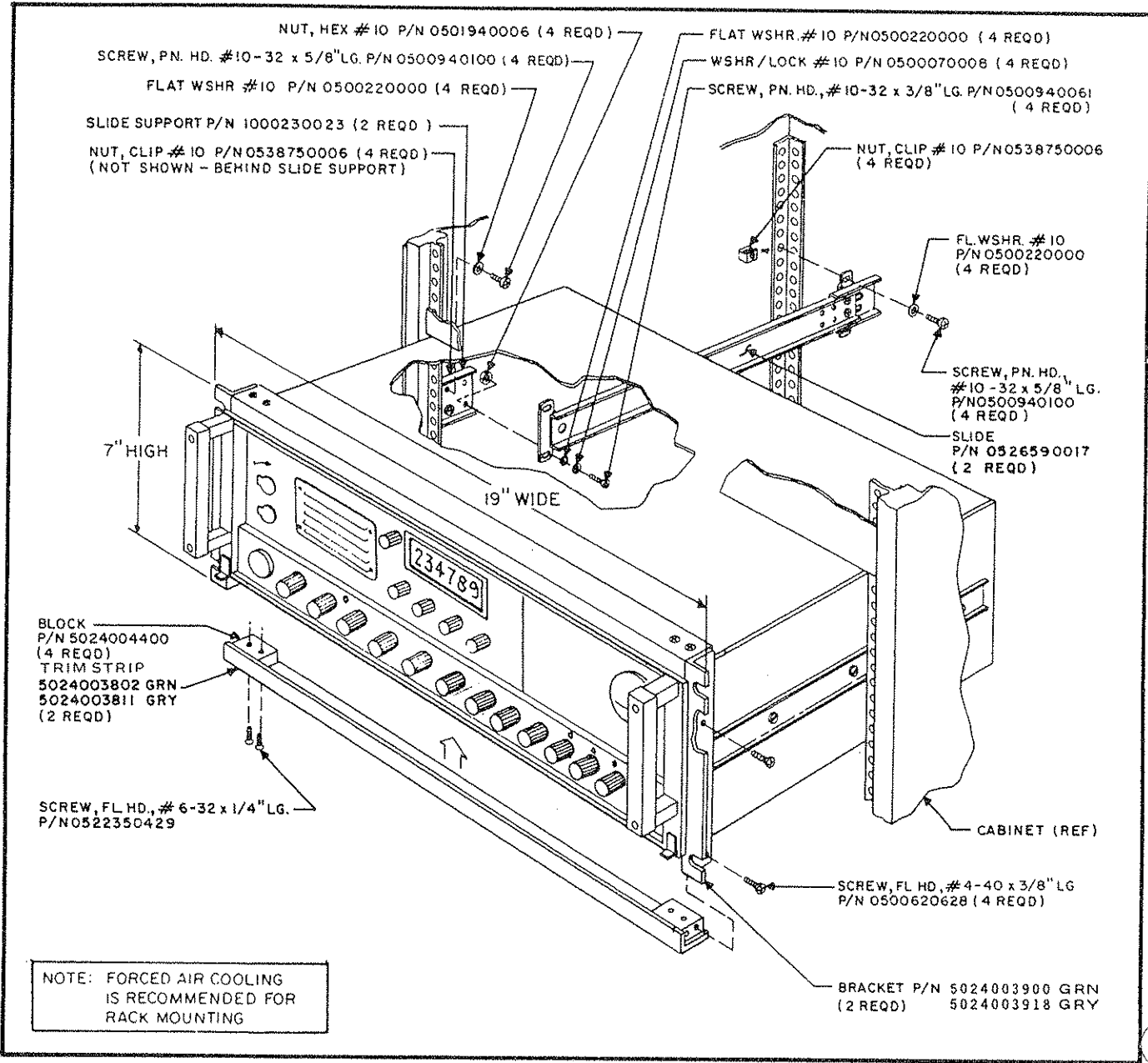


Figure 2.6 Rack Mounted Installation

2.5 ANTENNAS AND GROUND SYSTEMS

2.5.1 GENERAL

The GSB-900DX is designed to operate into a 50 ohm resistive antenna system with a maximum voltage standing wave ratio (V.S.W.R.) of 2:1. When used with the GCU-910A, or GCU-935 Antenna Coupler, the system will match antennas ranging from 15 foot whips to 150 foot long wires. The couplers 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 the manual. Antennas for use in the 1.6 to 30 MHz spectrum generally fall into three categories:

- (a) Narrow band 50 ohm antennas
- (b) Random length non resonant antennas
- (c) Broad Band 50 ohm antennas

Several popular antennas falling into each of the above categories are discussed below. For specific recommendations, consult our experienced Field Service department.

Some general "DO'S" and "DON'T'S" of antenna installation are listed below:

a. The antenna should be clear of all large objects such as trees and buildings.

b. Although the GCU-910A or GCU-935 coupler 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 as the size would be prohibitive.

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 2.7)

NOTE

An inadequate ground system is most often responsible for disappointing performance when using a whip antenna.

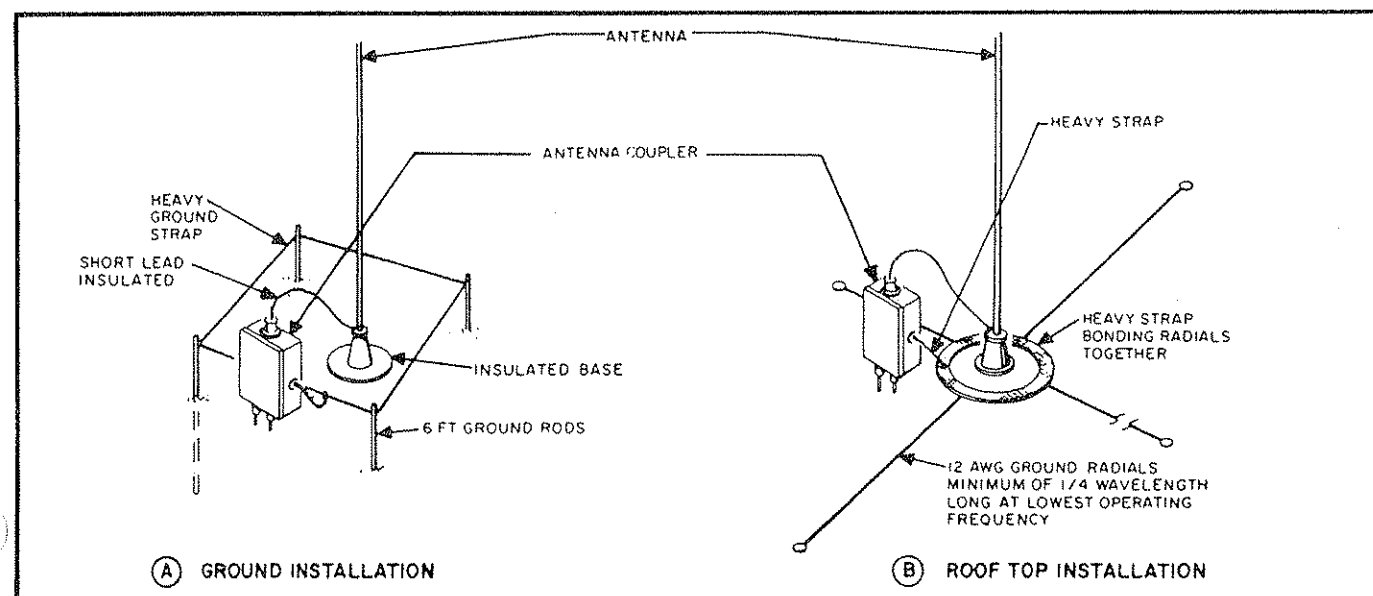


Figure 2.7 Whip Antenna

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 2.8 and 2.9 respectively. Both types of antennas may be assembled from the Sunair Doublet Antenna Kit (part #0996240004). Their operation is efficient for only a narrow band of frequencies within approximately 2 1/2% 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 in a vertical direction.

2.5.3 RANDOM LENGTH NON RESONANT ANTENNAS

Whips and long wires 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 it is rugged and self supporting. The antenna impedance is strongly dependent on the operating frequency and an antenna coupler, therefore, 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 does not result in a practical size antenna for low frequency operation. Thirty-five foot whip antennas offer a good compromise between practical height and good electrical performance at low frequencies. The Antenna Couplers are designed to efficiently match whip antennas of 15 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

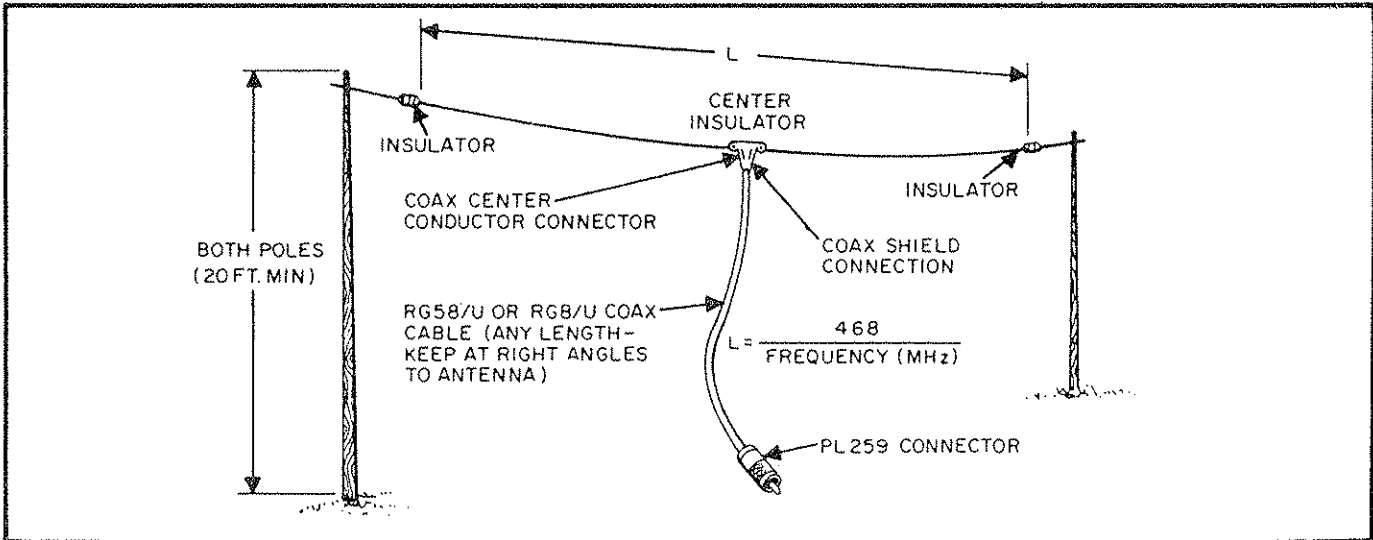


Figure 2.8 Doublet Antenna

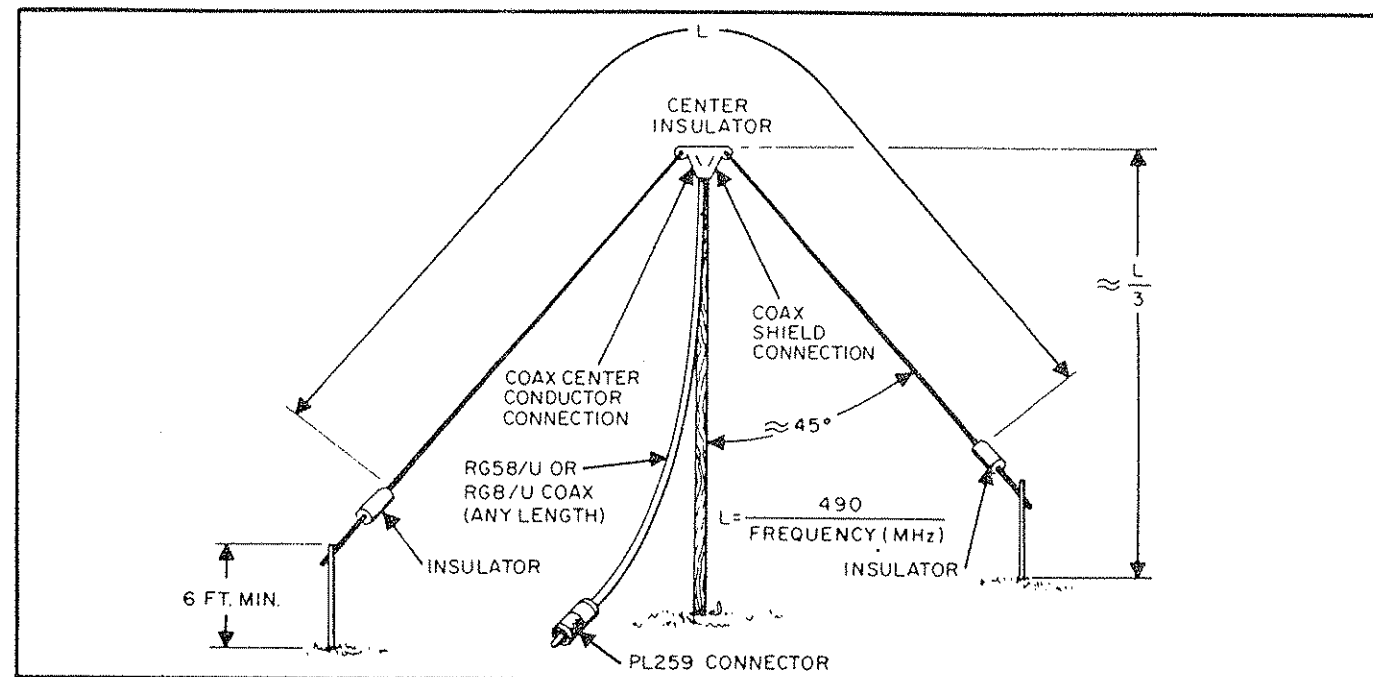


Figure 2.9 Inverted 'V' Antenna

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 1/4 wave long at the lowest operating frequency. The whip's radiation pattern is omni-directional in the azimuthal plane.

The long wire antenna, illustrated in Figure 2.10, 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 antenna couplers will efficiently match long wire antennas up to 150 feet in length. The radiation pattern of the long wire antenna is also a function of operating frequency. The two most popular length long wire antennas, 75 and 150 foot (available from Sunair as part numbers 0999200003 and 0999210009 respectively) exhibit excellent low frequency radiation efficiency.

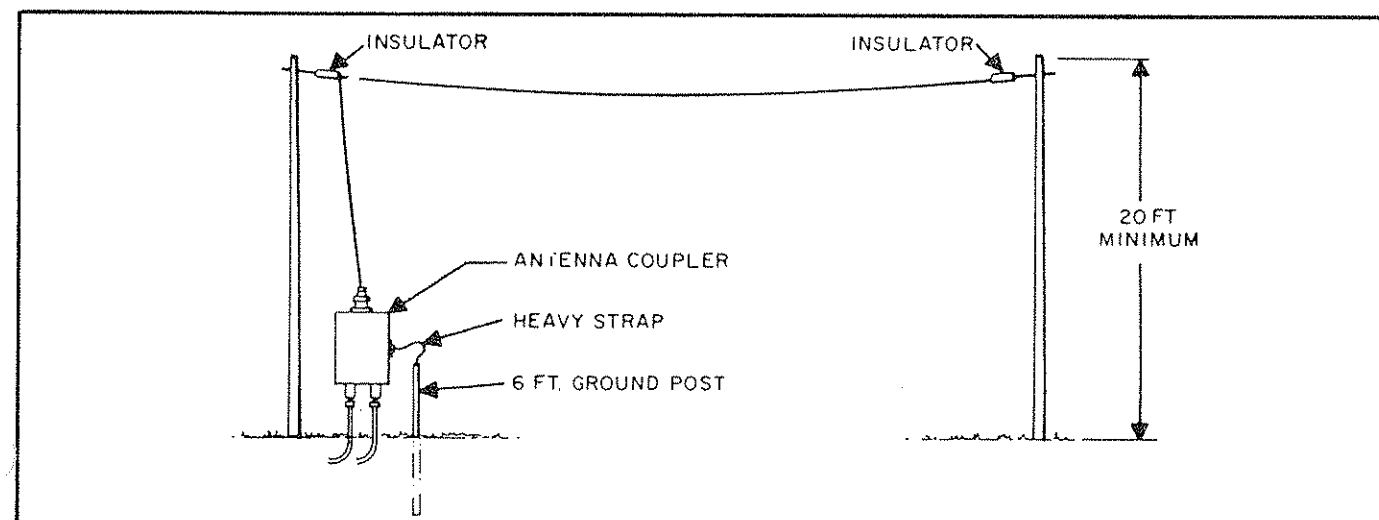


Figure 2.10 Long Wire Antenna

2.5.4 BROAD BAND 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 output impedance over the rated band of frequencies, an antenna coupler is NOT required. Some common examples are:

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

Consult the Sunair Field Service department for specific recommendations.

A.C. power cord is shipped with the radio. Figure 2.11 shows the line cord assembly wiring for 115 volt operation while Figure 2.12 shows the 230 volt wiring.



Check the tag on the line cord before connecting the radio to power mains to insure that the correct voltage has been selected. Permanent damage to the radio may occur if the incorrect power cord is used. Refer to Table 2.2 and check fuses F1 and F2 on the rear apron to make sure the proper value has been inserted in the fuse holders.

2.6 POWER REQUIREMENTS

2.6.1 OPERATION FROM ALL A.C. POWER SOURCES

As supplied from the factory, the GSB-900DX is wired for continuous operation from 115 or 230 volt $\pm 15\%$, 50-60 Hz, single phase A.C. power mains. The selection of 115 or 230 volt nominal line voltage is made by the appropriate wiring in the connector of the A.C. power cord assembly. The line voltage range may therefore be easily altered by changing the power cord. (See Table 2.1). The nominal line voltage is normally specified by the customer at the time of ordering and the proper

2.6.2 A.C. OPERATION UNDER HIGH LINE VOLTAGE CONDITIONS

The GSB-900DX power supply a-c transformer has provision for high line connection. If the a-c power mains are normally high (132 or 264 vac) the high line connection should be used as the radio will dissipate less power and operation will be more reliable.

The radio may be wired for high line voltage operation by changing connections on terminal strip 1A6TB1 on the power supply (refer to Figures 2.13 and 2.14). The GSB-900 DX is normally wired at the factory for the nominal 115/230 volt connections.

NOMINAL LINE VOLTAGE	LINE VOLTAGE RANGE	POWER CORD IN USE	REFER TO FIGURES
115	98 to 132	115V	2.11, 2.13
*132	112 to 152	115V	2.11, 2.14
230	196 to 264	230V	2.12, 2.13
*264	224 to 304	230V	2.12, 2.14

* High Line Connections

Table 2.1 A.C. Line Voltage Range Table

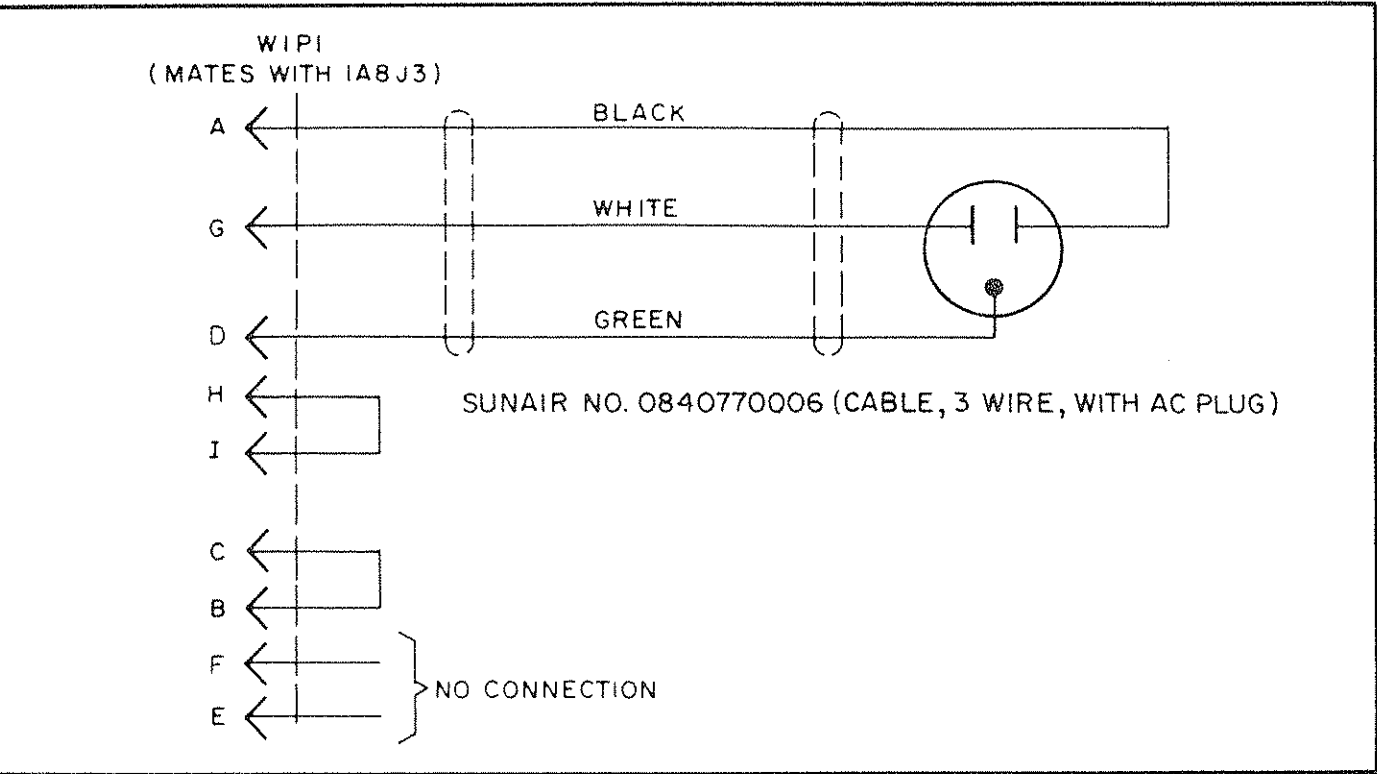


Figure 2.11 115 VAC Power Cord Schematic

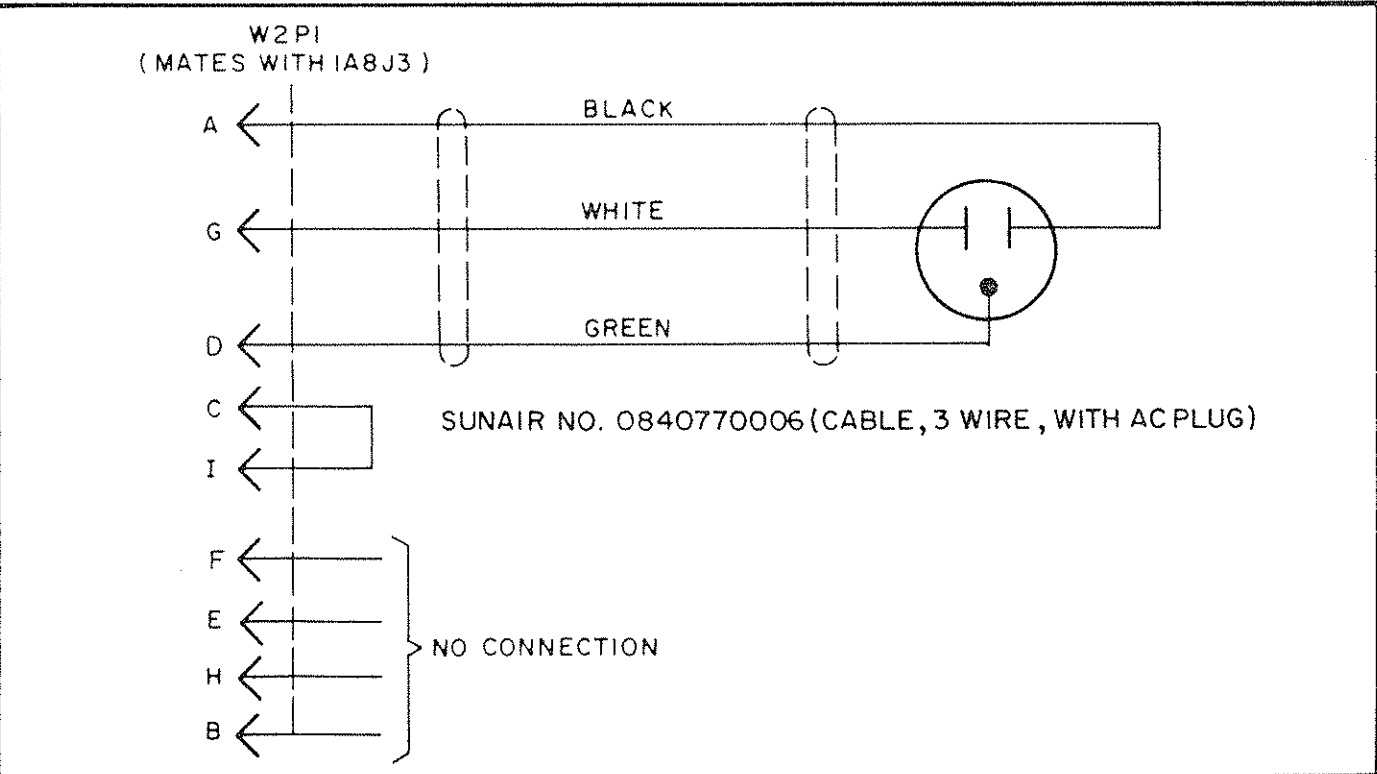


Figure 2.12 230 VAC Power Cord Schematic

NOTE

The high line voltage connections must either be requested at the time of ordering or the radio must be rewired in the field to provide for continuous high line voltage operation (see figure 2.14).

on the D.C. Inverter assembly 1A6A2. The Power Cord wiring for D.C. operation is shown in figure 2.16.

CAUTION

Before connecting the radio to the D.C. power source, check the marker tag on the regulator heat sink at the rear of the radio to make sure that the proper voltage range has been selected. Permanent damage to the radio can occur if the wrong range is selected.

2.6.3 OPERATION FROM D.C. POWER SOURCE

If the GSB-900DX is equipped with the optional D.C. Inverter Module (Sunair part # 5024021398) operation from D.C. power sources of 13 or 26 volts $\pm 10\%$, positive or negative ground is possible. The GSB-900DX is unique in that both D.C. and A.C. power supplies can be left in the radio at all times. Selection of D.C. or A.C. operation is accomplished by wiring in the connector of the Power Cord Assembly. The selection of operation from nominal 13 or 26 volt power sources is accomplished by changing connections on terminal strip 1A6TB2 (see figure 2.15) on the power supply and

The GSB-900DX incorporates reverse polarity protection when fed from D.C. power sources. If the radio does not operate, check the polarity of the D.C. power connections. Refer to the accessory section of the manual for detailed installation instructions of the D.C. Inverter Module. The D.C. Power

DESIGNATOR	FUNCTION	LOCATION	TYPE AND RATING
1A8F1, 1A8F2	A.C. Line	Rear Apron	For nominal 115V input, use type MDL (SLO-BLO), 5 amp. PN 0858660008
			For nominal 230V input, use type MDL (SLO-BLO), 3 amp. PN 0896660001
1A8F3	D.C. Line	Rear Apron	For nominal 13V input, use type MDL(SLO BLO), 30 amp. PN 0846300001
			For nominal 26V input, use type MDL(SLO BLO), 15 amp. PN 0848500008
1A6F1	+28V	Power Supply	Type AGC, 15 amp. PN 0848740009
1A6F2	+12V	Power Supply	Type AGC, 3 amp. PN 1002550009
1A6F3	+5V	Power Supply	Type AGC, 3 amp. PN 1002550009

Table 2.2 GSB-900DX Fuse Table

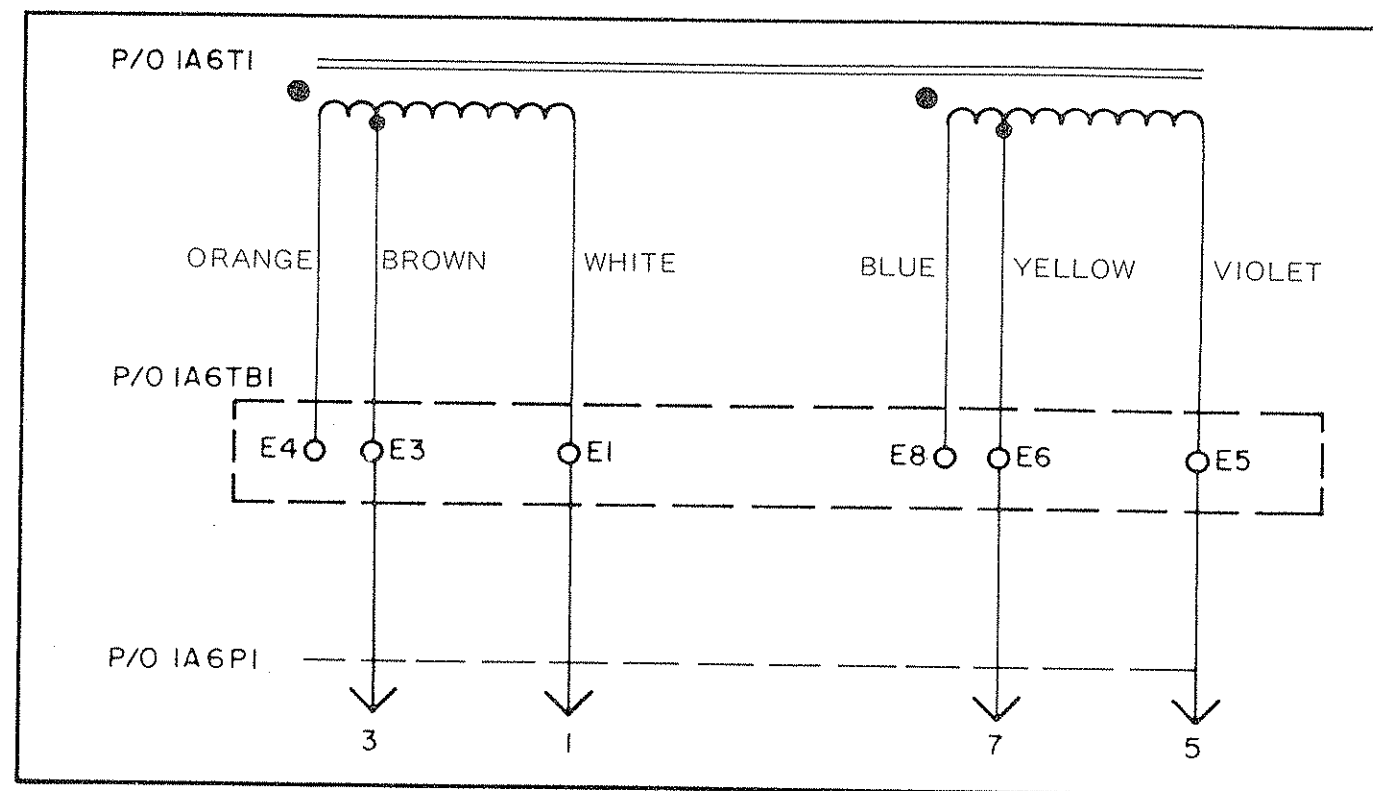


Figure 2.13 Power Supply Wiring - 115V or 230 VAC Inputs

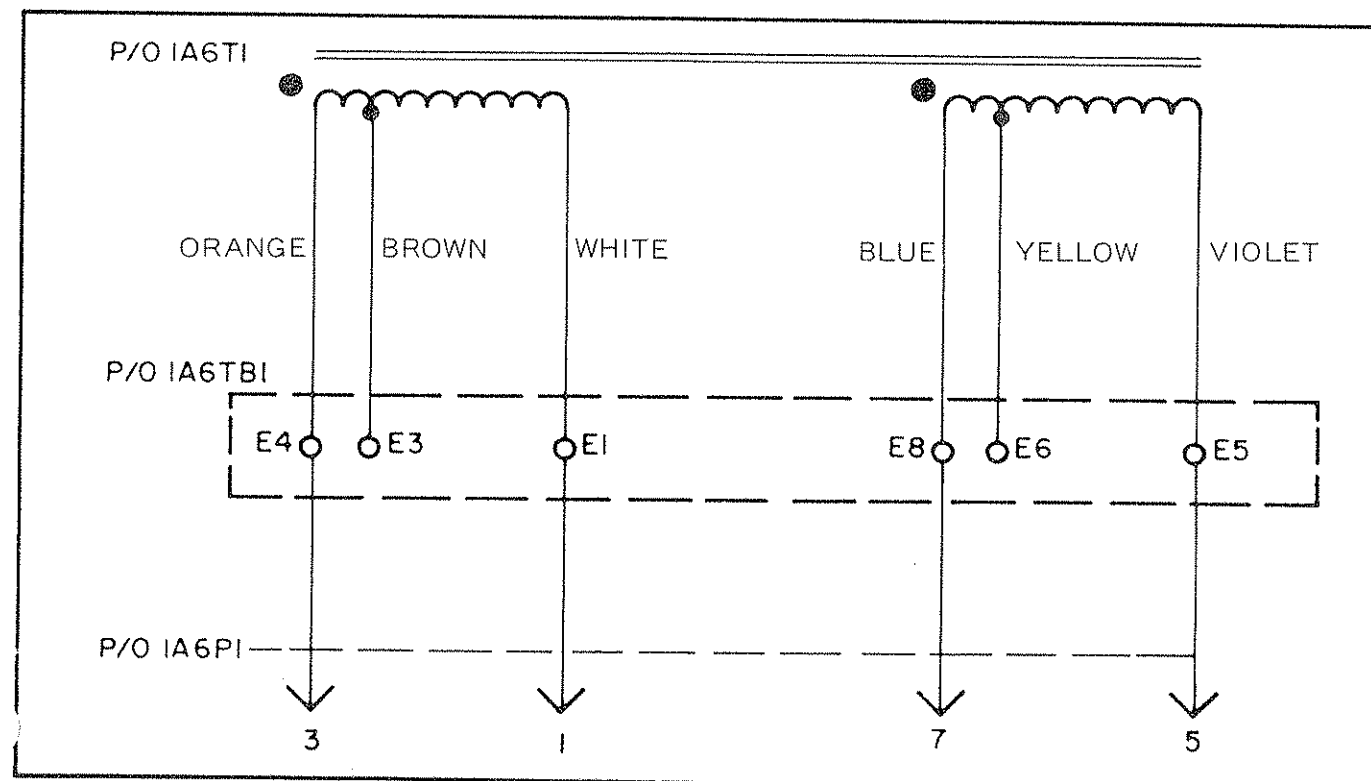
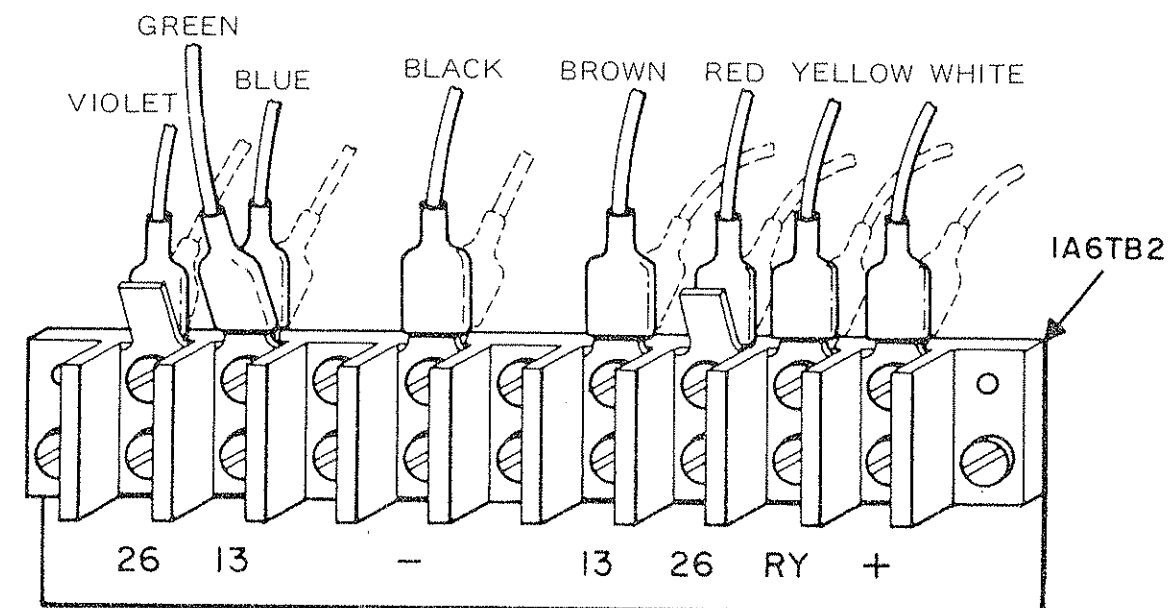
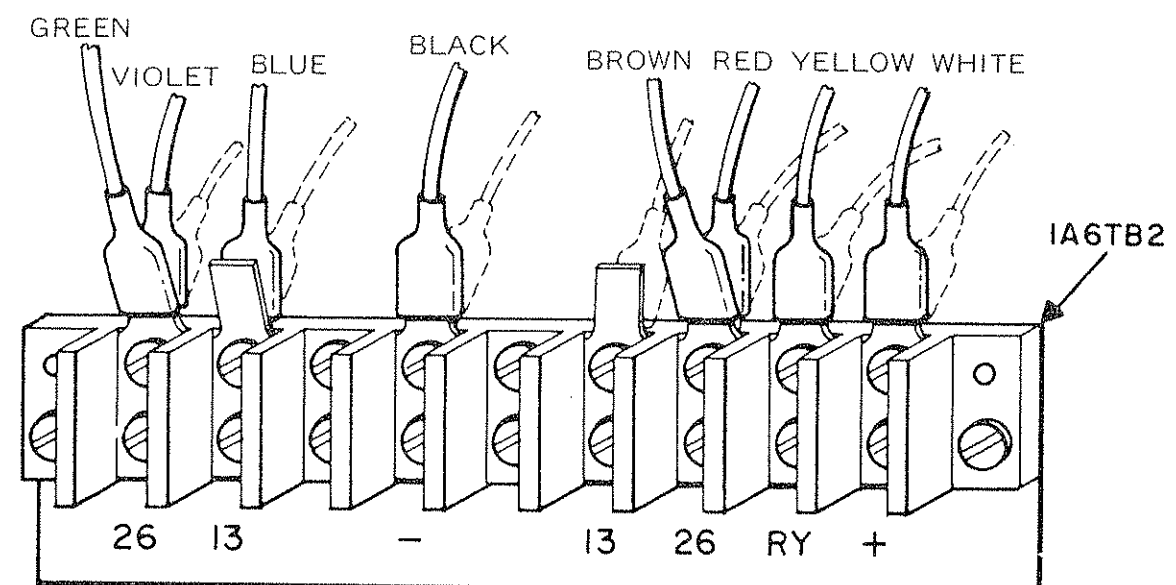


Figure 2.14 Power Supply Wiring - 132V or 264 VAC Inputs



CONNECTIONS SHOWN ABOVE FOR 13 VDC OPERATION

NOTE: SI MUST BE IN 13VDC POSITION ON DC INVERTER BOARD



CONNECTIONS SHOWN ABOVE FOR 26 VDC OPERATION

NOTE: SI MUST BE IN 26VDC POSITION ON DC INVERTER BOARD

Figure 2.15 D.C. Inverter Connections to Power Supply Terminal Strip 1A6TB2

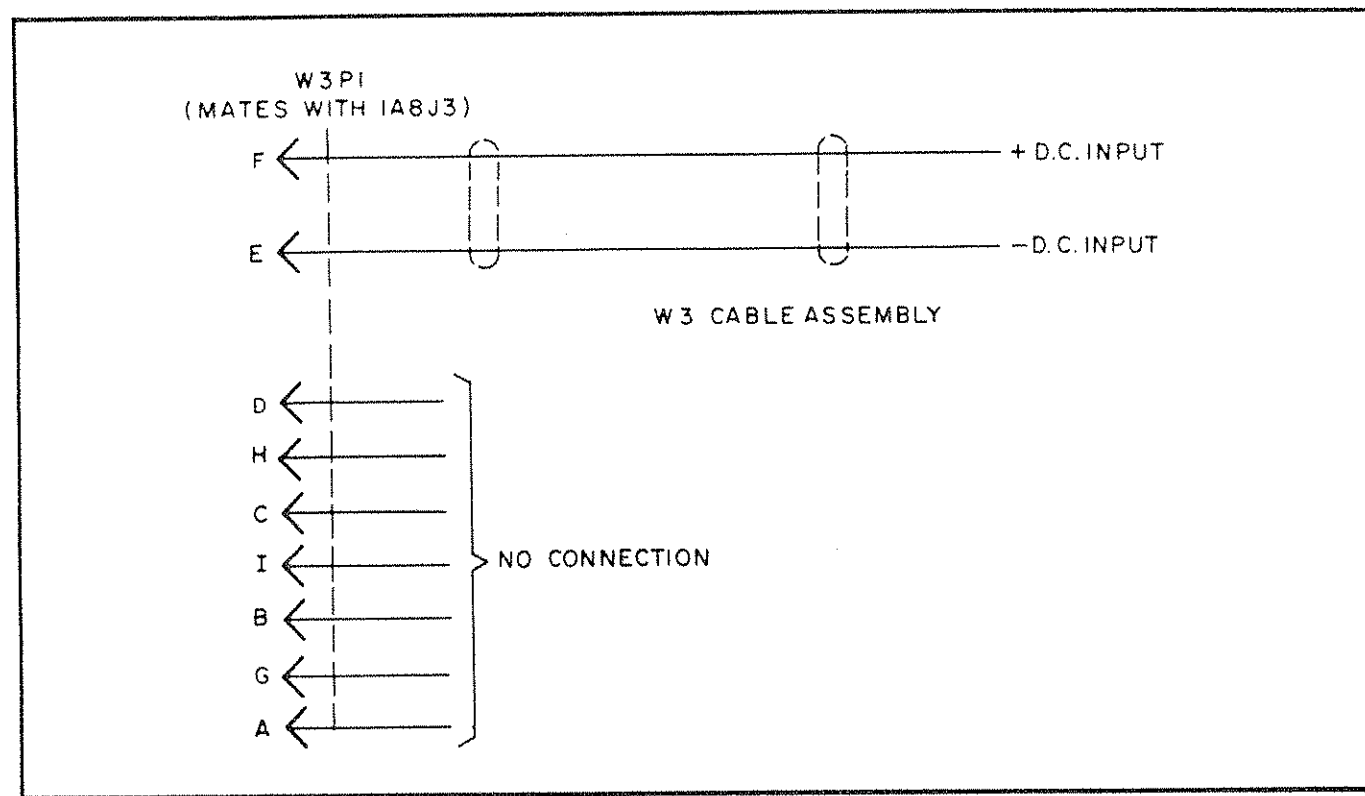


Figure 2.16 D.C. Power Connector Schematic

Cable Assembly is supplied from the factory with approximately 10 feet of connecting cable. However, if the installation permits, the cable should be trimmed to minimum length consistent with a neat installation. This will ensure minimum voltage drop in the cable under the high input currents present when in transmit (particularly with 13 volt input).

NOTE

Before applying power to the radio, refer to table 2.2 and check that the correct value of fuse F3 (on the rear apron of the radio) has been inserted in its fuse holder.

Table 2.3
MATING CONNECTORS TO GSB-900DX AND ACCESSORIES

DESCRIPTION		DESIGNATOR	MATING PARTS		
			Connector	Cable Clamp	Rubber Boot(s)
			Sunair Part Numbers		
GSB-900DX	Microphone	1A1J1	0753570009	0754450007	0700550038
	Phone	1A1J2	0754010007	—	—
	Key	1A1J3	0754010007	—	—
	Antenna	1A8J1	0742190005 (Note 1)	—	—
	Audio	1A8J2	0754000001	0740250001	0700550046
	Power	1A8J3	0753580004	0754570002	0700550038 0700550046 0700550054
	Accessory	1A8J4	0754690008	Included with Connector	0700550054 0700550062 0700550071
GCU-910A or GCU-935	RF Input	J1	0747020001 (Note 2)	—	—
	Control Unit	J2	0747640009	Included with Connector	0700550054 0700550062 0700550071
GRC-951	Audio	J1	0754000001	0740250001	0700550046

NOTE

- 1. When used with RG-58/U Coax, use Adapter No. 0742070000.
- 2. When used with RG-8/U Coax, use connector No. 0754140008.

SECTION 3
OPERATION

3.1 GENERAL

This section provides installation and instructions required for proper operation of the Half Duplex front panel.

3.2 OPERATING CONTROLS

3.2.1 Listed below are descriptions of all controls, indicators and connectors located on the Half Duplex front panel. They are illustrated in Figure 3.1.

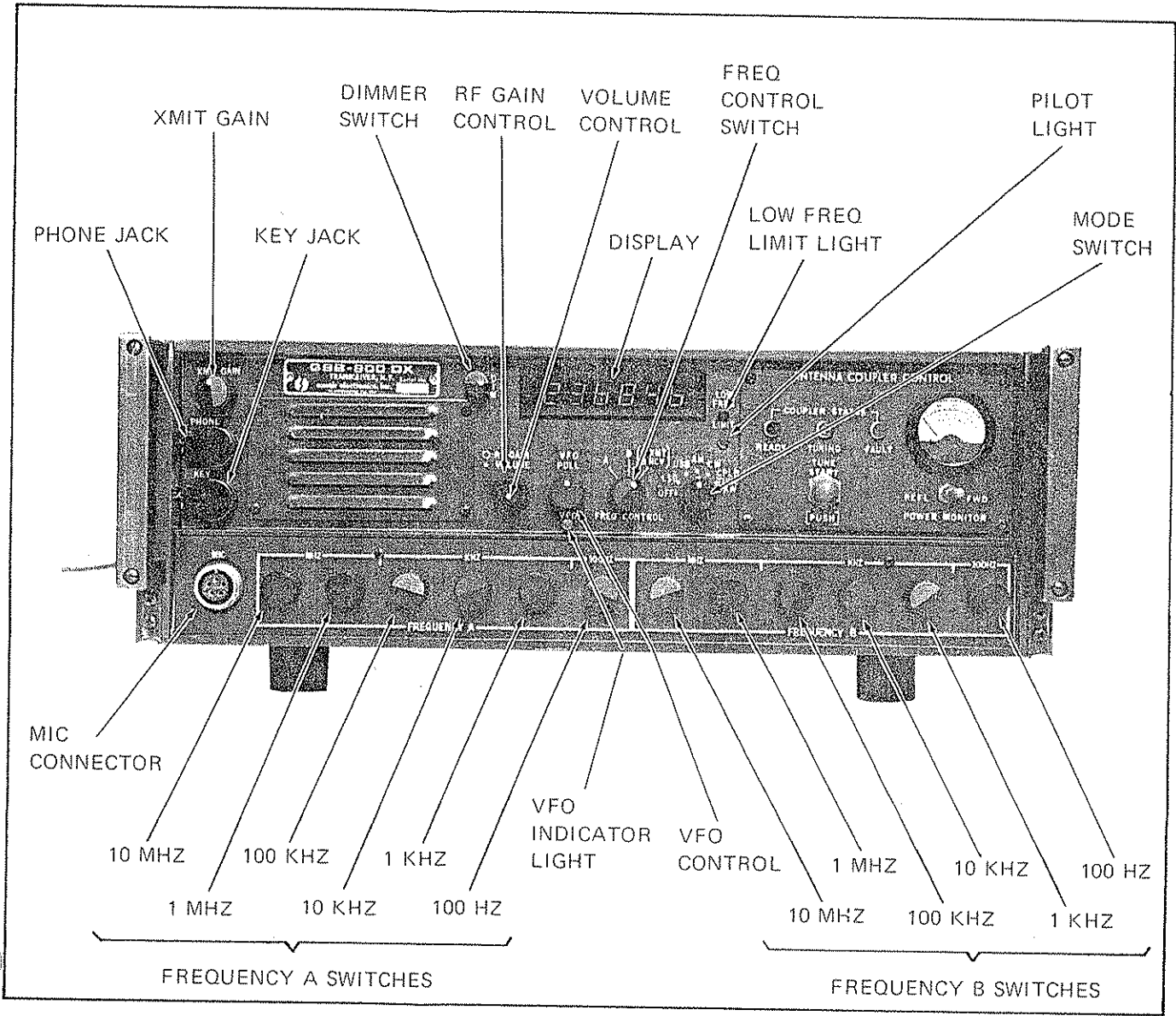


Figure 3.1 GSB-900 DX Transceiver Front Panel

FREQUENCY SWITCHES (12)

FREQUENCY A (6)	Selects the "A" operating frequency: 10 MHz switch, 1 MHz switch, 100 kHz switch, 10 kHz switch, 1 kHz switch, 100 Hz switch.
FREQUENCY B (6)	Selects the "B" operating frequency: 10 MHz switch, 1 MHz switch, 100 kHz switch, 10 kHz switch, 1 kHz switch, 100 Hz switch.

	SWITCH POSITION	EQUIPMENT RESPONSE
MODE SWITCH	OFF	Disconnects Primary Power
	LSB	a) Applies Primary Power b) Select Lower Sideband Mode
	USB	a) Applies Primary Power b) Selects Upper Sideband Mode
	AM	a) Applies Primary Power b) Selects Amplitude Modulation Mode
	CW	a) Applies Primary Power b) Selects Continuous Wave Mode. A CW key must be connected to the key jack on the front panel.
	CPLR TUNE KW	a) Applies Primary Power b) Disconnects microphone and CW key. c) Keys the radio in AM mode. IF AN ACCESSORY GCU-910A, GCU-935, OR GSL-1900A IS CONNECTED IN THE SYSTEM: d) Energizes the accessory.

VOLUME (outer knob)	Controls the level of the receive audio signal to the speaker and PHONE jack.
RF GAIN (inner knob)	Controls gain of the RF and IF amplifiers in the receive mode. Counter clockwise rotation decreases the gain.
FREQUENCY CONTROL	Selects the appropriate set of FREQUENCY SWITCHES to program the radio. "A" transmits and receives on frequency set into "A" dials. "B" transmits and receives on frequency set into "B" dials. "A XMIT/B RCV" transmits on frequency set into "A" dials, and receives on frequency set into "B" dials.
XMIT GAIN	Controls microphone input level to the transceiver in TRANSMIT mode.
KEY JACK	Accepts standard 1/4 inch 2 circuit plug 0754010007 from CW telegraph key.

PHONE JACK	Accepts standard 1/4 inch 2 circuit plug from ear-phones. Automatically disconnects speaker, when in use.
DIM CONTROL	Controls intensity of LED frequency readout, pilot light, and meter illumination.
MIC CONNECTOR	For connection of dynamic microphone with built in push-to-talk (PTT) switch. Mates with connector 0753570009.
VFO (potentiometer control with pull-on, push-off switch)	a) VFO OFF mode (control pushed in): Frequency controlled solely by the FREQUENCY dials. b) VFO ON mode (control pulled out) ± 5 kHz range is provided. "VFO ON" indicator light is lit in this mode.
VFO INDICATOR LIGHT	Lights when in VFO mode.
FREQUENCY DISPLAY	Indicates frequency selected by appropriate FREQUENCY dial. In A XMT/B RCV mode shows RCV frequency in receive, and XMIT frequency in transmit.
LOW FREQUENCY LIMIT LIGHT	Lights when a frequency below 1.6000 MHz has been selected. The radio is also disabled when this condition occurs.

3.3 REAR APRON FUSES AND CONNECTORS

3.3.1 Refer to Figure 3.2 for location

ANT (1A8J1)	ANTENNA connector: R.F. input/output of unit. Mates with connector 0742190005.
AUDIO (1A8J2)	AUDIO connector: for connection of 600 ohm balanced AUDIO OUTPUT and AUDIO INPUT. Mates with connector 0754000001.
POWER (1A8J3)	POWER connector: for connection of A.C. or D.C. power to the Transceiver (see Section 2.6). Mates with connector 0753580004.
ACCESSORY (1A8J4)	ACCESSORY connector: For connecting accessory equipment such as the GCU-910A Antenna Coupler. Mates with connector 0754690008.
FUSES (F1, F2, F3)	A.C. and D.C. input line fuses (see Table 2.2).
GROUND POST	Refer to Section 2, paragraph 2.4.1 (b).

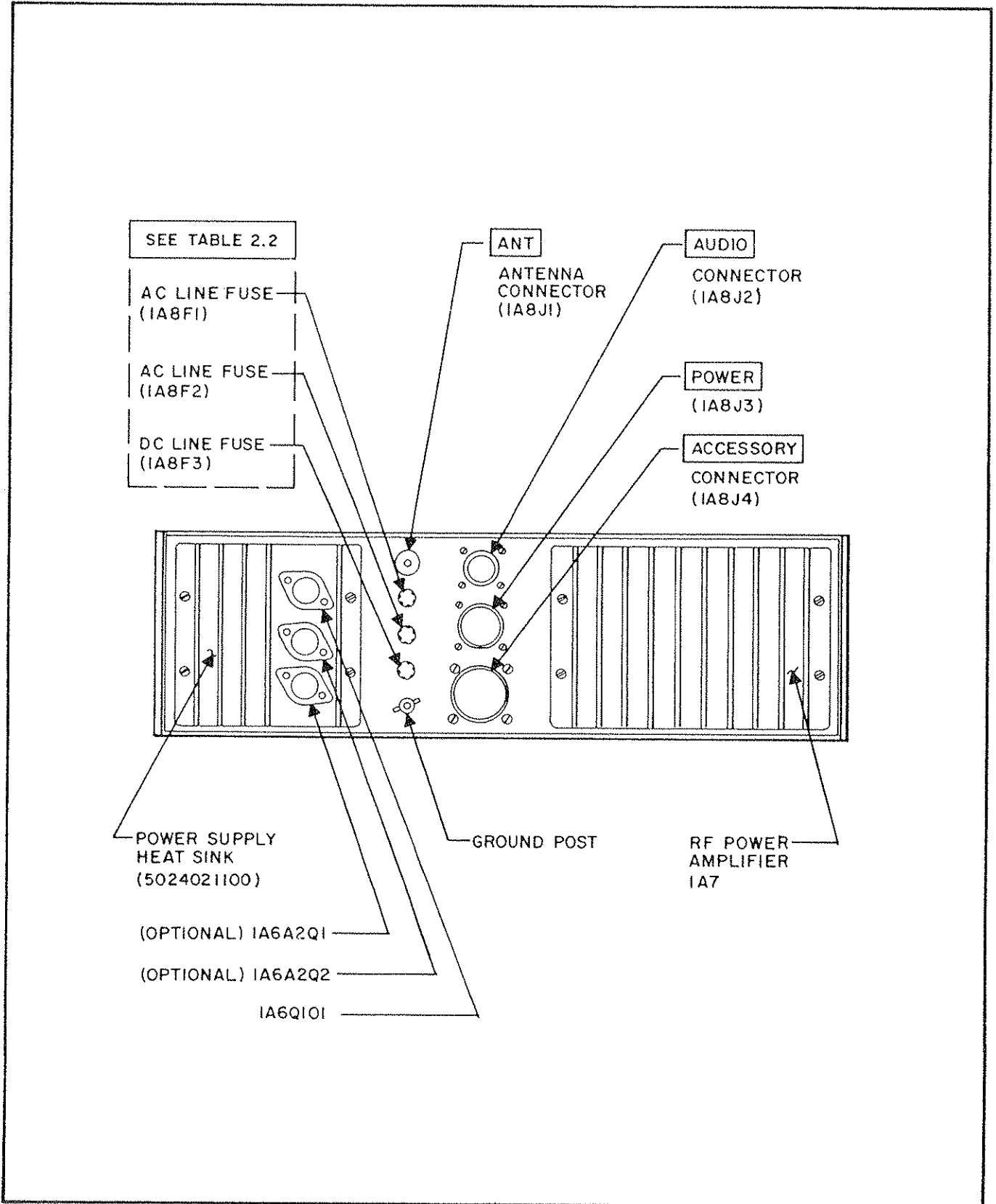


Figure 3.2 GSB-900DX Rear Aprons Components and Connectors

3.4 OPERATING THE GSB-900 DX INTO A 50 OHM ANTENNA

Connect the 50 ohm antenna (or dummy load) to the transceiver. Connect a microphone (to 1A1J1), a CW key (to 1A1J3) or 600 ohm audio source (to 1A8J2).

Follow the steps listed below:

a) Turn the VOLUME and XMIT GAIN controls fully counter-clockwise. Turn the RF GAIN control fully clockwise.

b) Set the MODE switch for the desired operating mode (LSB, USB, AM, or CW).

c) Turn DIM control fully CW. This is the bright or daytime position. (One stop CCW is the dim or night time position. Fully CCW is off.)

d) Turn the FREQUENCY CONTROL switch to "A" position.

e) Set the six FREQUENCY A dials to the desired operating frequency. Set the VFO control in the "in" (off) position.

f) Set the VOLUME control for a comfortable listening level.

g) RF GAIN control: For normal operating conditions, the RF GAIN control may be left set in its maximum clockwise position as this will provide the greatest receiver sensitivity. When receiving a strong signal, background noise may be considerably reduced by setting the RF GAIN control to provide an "S" meter reading (with no-signal) equal to the "signal present" condition.

h) If being used in LSB or USB modes: key microphone. Speak into the microphone and advance the XMIT GAIN control until no further output (as indicated on the front panel meter) can be obtained. Do not advance the control beyond this point as no further power output will occur and increased background noise will be picked up by the microphone.

If being used in the AM mode: key microphone. Note carrier level (approximately 30 to 40 watts when not talking) on meter. When talking, advance the XMIT GAIN control until the meter "bounces" slightly with voice peaks.

If being used in the CW mode: The level of sidetone to the transmit section is preset at the factory. No adjustment of the XMIT GAIN control is necessary. Automatic switching of the transceiver from receive to transmit will occur when the key is depressed. In addition, a side tone (approximately 1 kHz) should be audible from the speaker whenever the key is depressed.

NOTE

When communicating in CW with a station keying its carrier, rather than a 1 kHz sidetone as in the GSB-900DX, it may be necessary to decrease the GSB-900DX frequency by 1 kHz. When communicating between GSB-900DX's or similar synthesized equipment, no correction is necessary.

If being used with a remote audio input: Potentiometer R58 on the AUDIO board (1A3A4) should be used to adjust the transmit audio level (if required) instead of the XMIT GAIN control on the front panel.

j) VFO operation: When receiving a signal from a transmitter with synthesized frequency control, it is seldom necessary (or desirable) to use the VFO receiver tuning control, and it should be left in its "in" position. When receiving signals from non-synthesized transmitting equipment, some error in transmitted frequency may exist. Pull out the VFO control (note light comes on) and adjust for the most natural quality. Approximately ± 5 kHz range is provided around the set frequency.

k) Operating FREQUENCY B dials: Turn the FREQUENCY CONTROL switch to "B" position and operate the radio in the same manner as for the FREQUENCY A position.

l) Half duplex operation: Turn the FREQUENCY CONTROL switch to "A" position. Set FREQUENCY A dials to desired TRANSMIT frequency. Then turn FREQUENCY CONTROL switch to "B" position. Set FREQUENCY B dials to desired receive frequency. Now turn FREQUENCY CONTROL switch to "A XMIT/B RCV" position. Note that receive frequency is displayed while receiving, and transmit frequency is displayed when transmitting.

Half-duplex or two frequency simplex operation requires two different, discrete frequencies: one for transmission and the other for reception. These two frequencies are normally separated from one another by less than 500 kHz. This is required primarily by the selectivity characteristics of the antenna coupler. The coupler is tuned to the transmit frequency, so received signal strength degrades as the separation between the two frequencies is increased. An additional consideration is the propagation characteristics of the two frequencies used: the closer the frequencies, the less variation in path length, fading, etc. will be noted. (Typical Marine public correspondence stations have 300 to 400 kHz separation between transmit and receive frequencies.)

The GSB-900DX input and output filter networks, used to reduce harmonics and cross channel interference, are banded for the following frequency ranges:

Band 1	1.6 – 1.9999 MHz
Band 2	2.0 – 2.9999 MHz
Band 3	3.0 – 3.9999 MHz
Band 4	4.0 – 5.9999 MHz
Band 5	6.0 – 8.9999 MHz
Band 6	9.0 – 12.9999 MHz
Band 7	13.0 – 19.9999 MHz
Band 8	20.0 – 29.9999 MHz

In receive mode, these filters are band-pass networks, attenuating the received signal at frequencies above and below the band limits given above.

When operating in the Half Duplex mode, the transmit dials ["A"] determine the filter used. Therefore, if the receive frequency is widely

separated from the transmit frequency so that both are not in the same filter band, severe degradation of the received signal may result. However, if the receive frequency happens to fall in an adjacent filter band (i.e. xmit frequency: 2.850 MHz, receive frequency: 3.150 MHz), but within a few hundred KHz of the adjacent band edge [see chart], the degradation of the received signal should not be noticeable.

m) For simplex operation of two discrete frequencies, such as a day frequency and a night frequency, the FREQUENCY A dials may be set for one frequency, and the FREQUENCY B dials set for the other. Then, when the FREQUENCY CONTROL switch is turned from one to the other, only the antenna coupler, if used, must be retuned.

3.5 OPERATING THE GSB-900DX WITH THE GCU-910A ANTENNA COUPLER

If the antenna in use does not present a 50 ohm load to the exciter within the allowable 2:1 V.S.W.R. range, the antenna must be "matched" to the exciter. Use of the GCU-910A antenna coupler can accomplish this. Refer to sections 2.4 and 2.5 for typical installations.

To place the system in operation, follow the procedure outlined below:

- a) Check to see that all antenna connections are secure.
- b) Connect a microphone (to 1A1J1), a C.W. key (to 1A1J3) or 600 ohm audio source (to 1A8J2). If the 600 ohm source is used, preset R5 on the AUDIO XFMR board (1A8A1) to minimum by turning them at least 10 turns counter-clockwise.
- c) Refer to Table 2.1 and check that the proper line fuses have been installed.
- d) Set the XMIT GAIN control fully counter-clockwise. Check to see that the POWER switch is in OFF position.

e) Connect the Exciter to its power source.

NOTE

f) Place the COARSE INPUT and COARSE OUTPUT switches on the ANTENNA TUNING CONTROL PANEL in their "1" positions.

g) Set the (6) FREQUENCY control switches to the desired operating frequency. VFO switch push in.

h) Place the MODE switch in the TUNE (antenna coupler tune) position.

Place the PWR MONITOR switch on the ANTENNA TUNING CONTROL PANEL in the FWD (forward power) position. The meter should read approximately .25 relative power.

j) Place the PWR MONITOR switch in REFL (reflected power) position. Turn the FINE INPUT switch on the ANTENNA TUNING CONTROL PANEL fully counter-clockwise and hold the control in this position until the LIMIT LAMP, located directly over the control switch lights.

k) Turn the TUNE switch full counter-clockwise and hold the control in this position until the LIMIT LAMP over this control lights.

NOTE

Operation of the FINE INPUT and TUNE switches are as follows:

The switches are 4 position spring-loaded switches with a center-off position. The TUNE switch controls the TUNE INDUCTOR in the antenna coupler. The FINE INPUT switch controls the FINE INPUT (vernier) CAPACITOR in the coupler. Rotation of these switches to their first counter-clockwise position causes a slow decrease in the respective element value. Further counter-clockwise rotation will produce a rapid decrease in the respective element value. Similarly, clockwise rotation will produce first a slow and then a rapid increase in the respective element value.

An END LIMIT indicating light is located above each control. If the lamp lights when the switch is activated, it signifies that the respective coupler element is at either end of its adjustment range. If this condition occurs, rotate the switch in the proper direction to make the lamp extinguish.

l) Rotate the TUNE switch fully clockwise and hold it in this position until a null in reflected power occurs. Carefully rock this control back and forth until the best null can be obtained. If the element reaches its end limit before a null occurs, rotate the COARSE OUTPUT switch one position clockwise, and again search for a null with the tune control counter-clockwise.

m) Rotate the FINE INPUT switch fully clockwise until a better null is obtained. Rock this control back and forth for the best null. If the end limit is reached before a null is obtained, return the element to its minimum position by rotating the switch fully counter-clockwise until the other end limit occurs, increase the COARSE INPUT switch one position clockwise, and again try to obtain a null with the FINE INPUT control.

n) Repeat steps (m) and (n) above until a complete null in reflected power is obtained.

NOTE

With most antennas, additional complete nulls in reflected power can be obtained at higher numerical settings of the COARSE INPUT and COARSE OUTPUT controls. Although the antenna is properly "matched" to the exciter with these settings, and the system may be operated in this manner, the antenna coupler is operating at reduced efficiency. For optimum system performance, the system should be operated with these controls at the lowest numerical settings that will produce a complete null in reflected power.

o) Set the MODE switch for the desired operating mode (LSB, USB, AM, or CW).

p) If being used in LSB or USB modes: Speak into the microphone and advance the GAIN until no further output power (as indicated on the front panel meter) can be obtained. Turn the control approximately 20 degrees beyond this point. Do not advance the control beyond this point as no further power output will occur and distortion may be introduced.

If being used in the AM mode: Follow the same procedure as with LSB and USB above, except approximately 30 to 40 watts of carrier should be indicated on the meter when not talking.

If being used in the CW mode: The level of audio to the transmit section is preset at the factory. No adjustment of the GAIN control is necessary.

NOTE

In the CW position, the transmitted signal is actually an SSB 1 KHz tone on USB, giving a transmitted CW frequency 1 KHz above the dial (suppressed carrier) frequency. To communicate with a station operating in the simplex CW mode on a true carrier frequency, set the GSB-900DX frequency dials 1 KHz below the desired CW carrier frequency.

If being used with a remote audio input: Potentiometers R5 on the AUDIO XFMR board (1A8A1) should be used to adjust the transmit audio level instead of the GAIN control on the front panel. If operation of the unit is anticipated over a wide range of frequencies, this adjustment should be made at the highest frequency since the system gain (but not the power output) falls off slightly with frequency. When the point of maximum power is found, advance R5 approximately 2 turns beyond this point to set the ALC.

NOTE

If the antenna V.S.W.R. is extremely high, the +28V "over current" protection in the power supply may trip. This is evidenced by a condition of no power output when in transmit mode. If this condition occurs, place the MODE switch in the OFF position, wait 15 seconds, and return MODE switch to on. If the condition persists, repeat the antenna coupler tuning procedure.

CAUTION

Whenever the frequency is changed, the antenna coupler must be returned. Failure to tune the coupler will result in severely degraded communications and may cause the 28VDC "over current" protection to trigger upon keying the transmitter.

3.6 GCU-935 AUTOMATIC ANTENNA TUNER CONTROLS

(Contained on Antenna Tuning Control Panel which mounts in the front panel of the GSB-900DX.)

TUNE START Initiates a tune cycle. This is the only action required to tune after mode switch is placed in KW/CPLR TUNE.

TUNER STATUS Lights

FAULT This light is illuminated for the following conditions:

1. When the transceiver is initially turned on.
2. When the GSB-900DX MODE switch is switched from any position to CPLR TUNE KW.

FAULT	3. When the time delay runs out (approximately 40 seconds after initiation of a tune start pulse).	Switch FWD	Indicates relative forward RF power in coax at the input to the antenna tuner.
	4. When a tune cycle has been initiated and the GSB-900DX MODE switch is moved from the CPLR TUNE KW position.	Switch REFL	Indicates relative reflected RF power on coax at the input to the antenna tuner. A null in this reading indicates that the antenna is correctly matched to the transceiver.
	5. Any time the reflected power exceeds a threshold determined by the setting of the GAIN control. (This normally is less than 5 watts reflected power.)		
TUNING	This light is illuminated only during tune cycle (when the transmitter is keyed on).		
READY	This light is illuminated after a tuning cycle has been completed and the tuner has turned to a VSWR less than 15:1.		
POWER MONITOR	Switches meter input when in TRANSMIT mode:		

- 3.7 KW CONTROL UNIT
- The KW Control Panel, which is designed to mount in the space provided in the front panel of the GSB-900DX duplicates the following control functions:
- a) Filament Power on-off
 - b) Plate Power on-off
 - c) Test meter selector switch, forward and reflected power.
 - d) All indicator lamps on LPA-1900A

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SECTION 4

THEORY OF OPERATION

4.1 GENERAL

The discussion of the theory of operation of the GSB-900 DX will be presented in eight parts: synthesizer, receiver, exciter, RF power amplifier, power supply, filter module, control panel. Each part will contain a block diagram discussion followed by a detailed explanation of the circuit theory.

4.1.1 OVERALL BLOCK DIAGRAM

Figure 4.1 shows an overall block diagram of the GSB-900DX. Discussion of the various functions and circuits is presented in the sections following.

4.2 SYNTHESIZER 1A4

This unit consists of six printed circuit boards: Spectrum Generator (1A4A1), Low Digit Generator (1A4A2), Translator (1A4A3), VHF Divider (1A4A4), VCO (1A4A5) and the Synthesizer Mother board (1A4A6). Figure 4.3 shows an overall block diagram of the synthesizer. An isometric drawing of the mechanical components of the synthesizer unit is shown in Figure 5.6.

4.2.1 GENERAL

The synthesizer (1A4) generates the three local oscillator injection frequencies needed to determine the operating frequency of the radio. The synthesizer input is the 5 MHz reference signal from the Frequency Standard. The three local oscillator injection frequencies are obtained from the 5 MHz reference by a combination of direct synthesis and digital phase lock techniques. The frequency accuracy of the radio is therefore solely determined by the accuracy of the Frequency Standard.

The 3rd L.O. (10.5 MHz reference) is derived by direct synthesis techniques (i.e. by dividing and mixing). This local oscillator signal is used as a product detector injection on receive and as a

carrier generator on transmit. This reference is derived in the Spectrum Generator assembly, 1A4A1.

The 2nd L.O. generator consists of a crystal oscillator at a nominal frequency of 80.7500 MHz located in the Translator assembly (1A4A3). This frequency is used in the VHF Mixer assembly (1A3A1), in the Receiver/Exciter, to convert the 1st I.F. frequency of 91.2500 MHz to the 2nd I.F. of 10.5 MHz. Since the 2nd L.O. oscillator is not referenced to the Frequency Standard, a small frequency error can exist on this L.O. However, because of the mixing scheme used in the Translator, this same error appears on the 1st L.O. frequency and is therefore cancelled at the output of the VHF Mixer.

The VCO (1st L.O.) generator is a phase locked oscillator covering the frequency range of 91.2500 to 121.2499 Hz in 100 Hz steps. The exact frequency of the oscillator is given by:

$$F_1 = 91.2500 + F_0 + e \text{ (MHz)}$$

Where: F_1 = 1st L.O. frequency

F_0 = dialed frequency

e = 2nd L.O. error

On receive, the 1st L.O. is used to convert the incoming signal up to the 1st I.F. frequency (91.25 MHz). On transmit, the 1st L.O. is used to convert the transmit signal at the 1st I.F. frequency down to its final operating frequency.

4.2.2 SPECTRUM GENERATOR -1A4A1

Refer to Figure 5.24

4.2.2.1 GENERAL

The Spectrum Generator (1A4A1) generates the fixed reference frequencies needed in the syn-

thesizer. The input is the 5 MHz reference from the Frequency Standard and the outputs consist of references at the following frequencies: 10.5 MHz (Product Detector), 21 MHz (to Translator), 20 MHz (to Translator), 17 MHz (to Low Digit Generator), 100 kHz (to VHF Divider), and 1 kHz (to Low Digit Generator).

4.2.2.2 20 MHz REFERENCE GENERATOR

The 5 MHz Reference from the Frequency Standard is amplified by U1 and formed into a short pulse by pulse generator U2. The fourth harmonic of this 5 MHz pulse (i.e. 20 MHz) is filtered by the double-tuned circuit (C7, C8, C9, C10, L2 and L3) and is amplified by U3. The output is obtained from U3 through Pi Network (C14, C15, C16, C17, L4) which matches the high output impedance of U3 to 50 ohms. A portion of this signal is also applied to the 17 MHz mixer and to Buffer Amplifier U8.

4.2.2.3 1 MHz, 100 kHz and 1 kHz REFERENCE GENERATOR

The 5 MHz output pulse from U2A is fed to U4, a divide-by-5 counter. The resultant 1 MHz output is fed to three stages of divide-by-10 counters (U5, U6 and U7); thereby producing the desired 100 kHz and 1 kHz outputs.

4.2.2.4 17 MHz REFERENCE GENERATOR

The 1 MHz pulse from U4 is passed through a tuned circuit (L14, C53) which is tuned to 3 MHz (i.e. the 3rd harmonic of the 1 MHz). This 3 MHz signal is amplified by Q5, further filtered by another tuned circuit (L15, C55) and applied as one input to mixer Q6. A portion of the 20 MHz reference is also applied to Q6. The resultant 17 MHz signal is filtered by a double-tuned circuit (L16, C59, C62, L17, C65 and C66) and is applied to a complementary emitter follower (Q7, Q8). The emitter follower matches the high output impedance of mixer Q6 to 50 ohms.

4.2.2.5 21 MHz REFERENCE GENERATOR

The 1 MHz pulse from U4 is passed through a tuned circuit (L7, C30) which filters the pulse into

a 1 MHz sine wave. Complementary emitter follower (Q1, Q2) transforms the impedance to 50 ohms to match the input impedance of the balanced mixer X1. The 1 MHz sine wave is applied to X1 pin 1.

The 20 MHz reference from U3 is amplified by U8 and applied as the second input to the balanced mixer at pin 8. The resultant 21 MHz signal taken from X1 pins 3 and 4, is filtered by triple-tuned circuit (C32, C33, L8, C34, L9, C35, C36, L10, C37, and C38) and then amplified by U9. The output of U9 is matched to 50 ohms by emitter follower, Q9.

4.2.2.6 10.5 MHz REFERENCE GENERATOR

The 21 MHz output from U9 is also fed to flip-flop U10 which generates a 10.5 MHz square wave. The signal is filtered to a sine wave by a double-tuned circuit (L12, C46, C47, L13, C48, and C49) and then matched to 50 ohms by emitter follower, Q4.

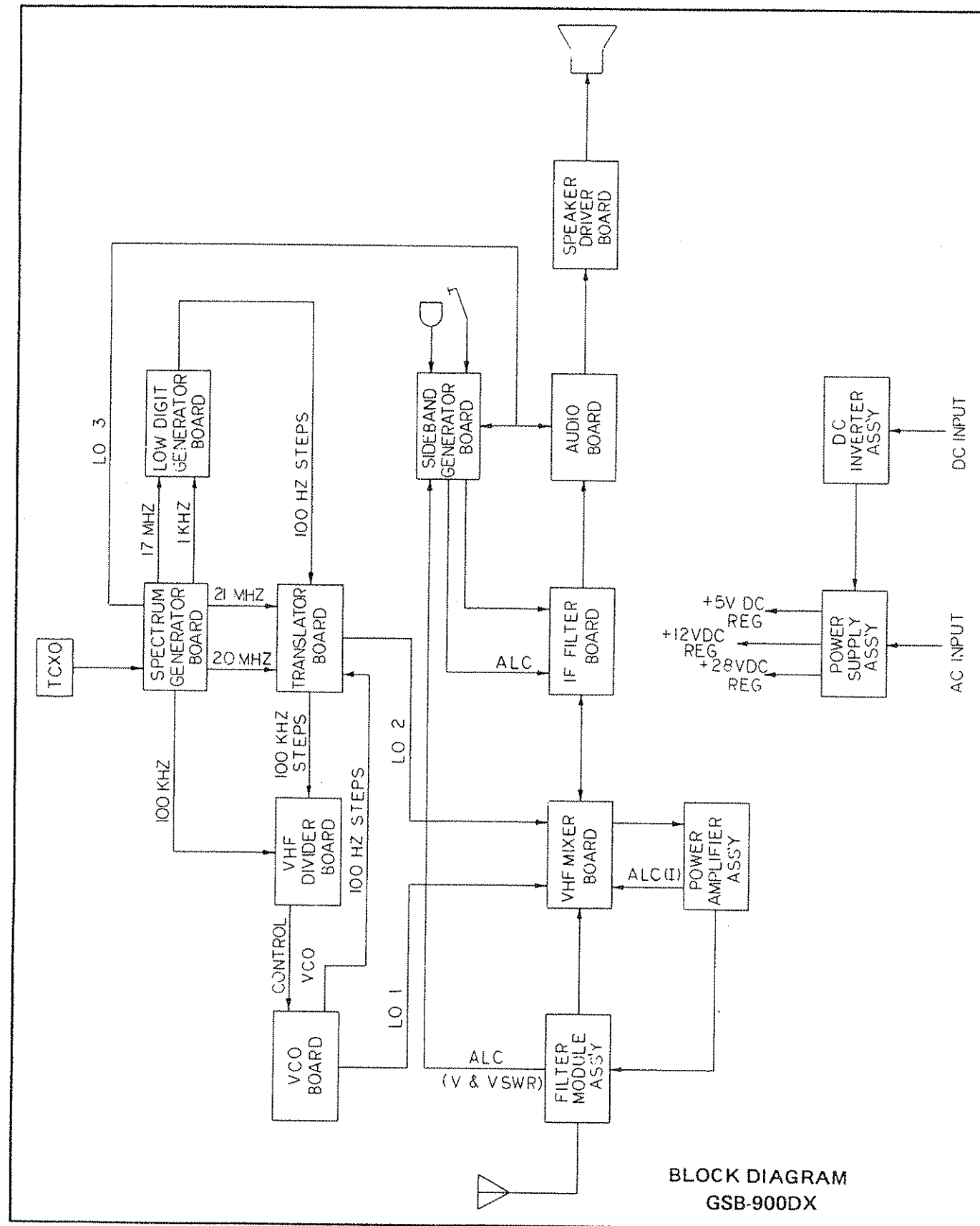
The flip-flop (U10) is disabled by switch (Q3) in the AM receive mode to prevent a "beat" note from appearing at the receiver output. +12 volts, applied to the "Blanking Pulse In" line in these modes, saturates Q3; thereby disabling the flip-flop and effectively removing the 10.5 MHz output. At all other times there is no voltage on the "Blanking Pulse In" line. Q3 is therefore cut off and the flip-flop (U10) operates in its normal divide-by-2 mode. A blanking pulse from the L.O. Blanking on Mother board 1A4A6 also disables the flip-flop for approximately 100 milliseconds whenever the setting of the 1 MHz frequency switch on the front panel is changed.

4.2.3 LOW DIGIT GENERATOR – 1A4A2

Refer to Figure 5.25

4.2.3.1 GENERAL

The Low Digit Generator (1A4A2) generates the 100 Hz, 1 kHz and 10 kHz synthesized frequency steps. The inputs are the 17 MHz reference (from the Spectrum Generator), 1 kHz reference (from the Spectrum Generator), BCD frequency control lines (from the front panel frequency control switches) and the Coarse Steering voltage (from the 10 kHz frequency control switch on the front



BLOCK DIAGRAM
GSB-900DX

Figure 4.1 GSB-900DX Overall Block Diagram

panel). The output is 1.5000 to 1.5999 MHz in 100 Hz steps and is fed to the Translator as a mixing reference.

4.2.3.2 VOLTAGE CONTROLLED OSCILLATOR

The Voltage Controlled Oscillator or VCO (Q1) is a Colpitts oscillator covering the range of 15.000 to 15.999 MHz. Coarse frequency tuning is provided by the action of the Coarse Steering voltage on varactor diodes CR1 and CR2. Fine frequency control is provided by the Phase Detector (U2) acting through the loop filter (R8, C7, R5 and C3) and 1 kHz notch filter (R4, C6, R6, C5, C4, C68 and R3) on varactor diodes CR3 and CR4. The oscillator output is loosely coupled through C15 to isolation amplifier U1.

The VCO is fed from a voltage regulator (R9, CR5, Q2 and R10) which provides a finely regulated 7.3 volts.

4.2.3.3 MIXER AND PULSE GENERATOR

The mixer (Q3) transforms the VCO frequency to 2.000-1.001 MHz to place the signal in the range of the Preset Counters. The inputs to the mixer consist of the VCO signal (fed from the output of U1) and the 17 MHz reference. The output of the mixer is filtered by a 2.5 MHz low pass filter (C23, C24, L7, C25, C26, L8 and C27) and is then amplified by U6. Quad NAND Gate, U7, connected as a monostable multivibrator, forms the signal into a short pulse to drive the preset counter.

4.2.3.4 PRESET COUNTER

The Preset Counter (U8, U9, U10, U11) is a counter whose division ratio is controlled by the 100 Hz, 1 kHz and 10 kHz Frequency control switches on the front panel. During the normal counting interval, the counter functions as a divide-by-2000 counter. During the Preset interval, the clock is disabled and the counter is loaded (or preset) to a count determined by the settings of the frequency control switches. The frequency control information is entered in binary-coded-decimal (BCD) format and the division ratio, D, is therefore determined by the formula:

$$D=2000-(100 N_{10kHz} + 10 N_{1kHz} + N_{100Hz})$$

where:

N_{10kHz} , N_{1kHz} and N_{100Hz} are, respectively, the settings of the 10 kHz, 1 kHz and 100 Hz frequency dials.

Or, for example:

DIAL SETTINGS			PRESET	COUNT (D)
10 kHz	1 kHz	100 Hz		
0	0	0	000	2000
0	0	1	001	1999
0	0	2	002	1998
0	1	1	011	1989
1	9	9	199	1801
9	9	9	999	1001

4.2.3.5 PRESET GENERATOR

The preset generator applies a short pulse to the data strobe inputs of the preset counter when a full count is detected. A "look ahead" scheme is employed to eliminate miscounting due to the propagation delays in the counter. When the counter has reached a count of 1999, the inputs to pins 2, 3, 4, 5, 6, 11, and 12 of NAND gate U3 will be in a "one" state. As soon as the clock input to pin 1 of this gate returns to a "one" state, the output of U3 will change to a "zero" state, thereby triggering monostable multivibrator U4. Then U4 presets the counters by applying a "zero" to their data strobe inputs for approximately 100 nsec. The output of U4 will return to a "one" state before the beginning of the next clock pulse.

4.2.3.6 PHASE DETECTOR, LOOP FILTER and 1 kHz NOTCH FILTER

The phase detector compares the frequency of the output of the Preset Counter with that of the 1 kHz reference from the Spectrum Generator. Action of the phase detector is as follows:

If the VCO frequency is high, the output frequency of mixer Q3 will be low. The output frequency of the Preset Counter will, therefore, also be low. The Phase Detector output voltage will decrease until the frequency error is corrected. Conversely, if the VCO frequency is low, the mixer output frequency will be high and the Phase Detector will increase until the error is corrected. If there is no frequency error, the output voltage of the Phase Detector will remain constant. The Loop Filter (R8, C7, R5, and C3) removes any 1 kHz components in the Phase Detector output and also determines the transient response of the loop. The 1 kHz frequency components are further attenuated by twin tee notch filter R3, R4, R6, C4, C5, C6, and C68. The action of this Phase Lock Loop is to make the VCO frequency follow the relationship: $F_{VCO} = 17.000 - D$ (kHz); where D is the count ratio. The VCO will therefore vary from 15.000 to 15.999 MHz in 1 kHz steps.

4.2.3.7 OUTPUT DIVIDER CIRCUITRY

The output from Buffer U1 is further amplified by Q5 and fed to divide-by-10 counter U5. The output of U5 is filtered to a sine wave by a bandpass filter (L11, C39, C40, C41, and L13) and is fed to emitter follower, Q6 which matches the output to 50 ohms. The output from the Low Digit Generator is 1.5000 to 1.5999 MHz in 100 Hz steps and follows the relationship:

$$F_{OUT} = 1.5000(\text{MHz}) + N(\text{kHz})$$

where N=knob settings of the 10 kHz, 1 kHz and 100 Hz (i.e. 0.1 kHz) dials.

4.2.4 TRANSLATOR—1A4A3

Refer to Figure 5.26.

4.2.4.1 GENERAL

The translator (1A4A3) combines the signals from the Low Digit Generator (1A4A2) and VCO (1A4A5) and generates a signal which, after subsequent frequency division in the VHF Divider (1A4A4), is used to phase lock the VCO to the proper frequency. The second L.O. and V.F.O. signals are also generated in this assembly. The

inputs to this assembly are: 20 and 21 MHz references (from the Spectrum Generator); 1st L.O. (from the VCO); 1.5000-1.5999 MHz (from the Low Digit Generator); and the V.F.O. Control and V.F.O. ON/OFF signals from the front panel. The output is the 10.0-39.9 MHz reference signal which is fed to the VHF Divider. In the V.F.O. mode, the internally generated 21 MHz V.F.O. is substituted for the 21 MHz reference from the Spectrum Generator.

4.2.4.2 ERROR CANCELLING

Since the 2nd L.O. is a free running crystal oscillator and is not referenced to the Frequency Standard, a small frequency error can exist. However, because of the mixing scheme employed in this assembly, both the 1st L.O. and 2nd L.O. will have the same frequency error. This error will therefore be cancelled in the VHF Mixer Assembly (1A3A1).

4.2.4.3 V.F.O. AND 21 MHz REFERENCE AMPLIFIERS

The V.F.O. (Q1) is a Colpitts Crystal Oscillator, covering the frequency range of 20.995 to 21.005 MHz and thereby providing approximately ± 5 kHz tuning adjustment around the dialed frequency of the radio. The V.F.O. control voltage, acting on varactor diodes CR6 and CR7 in series with the crystal, "pulls" the crystal's oscillation frequency to provide this small frequency change. The tuned circuit in the collector of Q1 (L23, C101) adjusts the circuit to resonance at 21 MHz. Inductor L22, in series with crystal Y1, compensates for small variations in the oscillation frequency of the crystal thus adjusting the center frequency of the oscillator to 21.0000 MHz. The oscillator output is buffered and amplified by U2 when in the V.F.O. mode. The 21 MHz reference from the spectrum generator is amplified by U1 when the V.F.O. mode is not selected.

In the V.F.O. mode, +12V appears on the V.F.O. ON/OFF input line. This applies base bias to Oscillator Q1 and turns on amplifier U2 through transistor switch Q3. When the V.F.O. mode is not selected, the voltage on the V.F.O. ON/OFF line is removed, amplifier U1 is activated and the oscil-

lator (Q1) and amplifier (U2) are turned off. The 21 MHz reference from the Spectrum Generator therefore controls the frequency of the radio.

Emitter Follower Q2 and the network consisting of R67, R68, R69, CR8, CR9, CR10, and CR13, CR14, CR15 compensate for the nonlinear frequency vs. voltage characteristic of the varactor diodes. The V.F.O. Control voltage from the front panel is applied to varactor diodes CR6 and CR7 through this network, thereby providing the desired small frequency swing around 21 MHz.

4.2.4.4 2nd L.O. CIRCUITRY

The 2nd L.O. (Q7) is a Colpitts crystal oscillator of similar design to the V.F.O. Tuned circuit L17, C46, and C47 tunes the circuit to resonance at 80.75 MHz. A small sample of oscillator output is taken from the junction of C46, C47 and Y2 and is fed to Amplifier Q9. The 2nd L.O. output to the receiver/exciter module is taken from the drain of Q9 through pi network C67, L25 and C68 which matches the output to 50 ohms.

4.2.4.5 100.75 MHz MIXER

The 100.75 MHz mixer (Q8) heterodynes the 2nd L.O. output from Q7 and the 20 MHz reference from the Spectrum Generator. The triple tuned bandpass filter selects the desired sum frequency of 100.75 while rejecting the two originals and the difference frequencies. Tuned circuit L28, C72 prevents loading of the 20 MHz signal by the oscillator. Tuned circuit L27, C71 prevents the loading of the oscillator by the pi network. Pi network C48, L18, C49 transforms the 50 ohm input impedance to 200 ohms thereby increasing the voltage level by approximately 2:1 to ensure adequate mixer drive. Test point TP3 provides a convenient 50 ohm test point for the connection of a spectrum analyzer or any other suitable measuring instrument to aid in bandpass filter alignment.

4.2.4.6. BALANCED MIXER

Depending on the mode selected, the balanced mixer heterodynes the 1.5000–1.5999 MHz output

of the Low Digit Generator and either the 21 MHz reference or the V.F.O. The 19.45 MHz bandpass filter selects the desired difference frequency. The output is fed to U3 where the signal is amplified and further filtered by tuned circuit L5-C17. Automatic Gain Control (AGC) is provided by diodes CR5, CR12 and their associated circuitry to ensure a constant and proper level to the 81.25 MHz mixer, Q11. Test point TP1 provides a well isolated point for observation of the signal without appreciable loading of the tuned circuit.

4.2.4.7 81.25 MHz MIXER

The 81.25 MHz Mixer (Q11) combines the 19.5000–19.4001 MHz signal from amplifier U3 and the 100.7500 MHz signal from mixer Q8 to produce the difference frequency of 81.2500–81.3499 MHz. The 81.25 MHz bandpass filter (L7, C20, L38, C21, L8, C22, C23 and C24) selects the desired difference frequency. A well-isolated test point, TP2, is also provided here to permit observation of the signal with 50 ohm equipment.

4.2.4.8 OUTPUT MIXER AND BROADBAND AMPLIFIER

The output mixer, Q4, heterodynes the 81.25 MHz mixer output and the VCO sample from the VCO assembly (1A4A5). The VCO sample is fed to the mixer through balun transformer T3 which transforms the signal to a 200 ohm impedance level to ensure adequate voltage drive to the mixer. The mixer output is filtered by a 10-50 MHz bandpass filter (L9, C29, L10, C86 and L11) and then transformed to a low impedance by emitter follower Q10. Potentiometer R54 in the base circuit of Q10 permits output level adjustment. The output of Q10 passes through 50 MHz Low Pass Filter (C74, C75, L30, C76, C82, C77, L31) to the broadband amplifier (Q5, Q6). Negative feedback around the the amplifier (R17, R19, R6) provides flat gain to well beyond 50 MHz as well as a constant input impedance, stable D.C. operating point, and low output impedance.

4.2.5 V.H.F. DIVIDER—1A4A4

Refer to Figure 5.27.

4.2.5.1 GENERAL

The V.H.F. Divider (1A4A4) contains a divide-by-400 high speed preset counter which forms the 10 MHz, 1 MHz and 100 kHz frequency steps. A phase detector compares the frequency and phase of the output of this counter with that of the 100 kHz reference from the Spectrum Generator (1A4A1) and develops a fine steering correction voltage which is fed back to control the frequency of the VCO (1A4A5). This "phase lock loop", by controlling the VCO frequency, forces the input to the V.H.F. Divider to follow the relationship:

$$F_{in} = 10.0 + 10 N_{10 \text{ MHz}} + N_{1 \text{ MHz}} + 0.1 N_{100 \text{ kHz}}$$

where: $N_{10 \text{ MHz}}$ = the 10 MHz digit

$N_{1 \text{ MHz}}$ = the 1 MHz digit

$N_{100 \text{ kHz}}$ = 100 kHz (i.e. .1 MHz) digit

and F_{in} is given in MHz

The input frequency therefore varies from 10.0 to 39.9 MHz in 100 kHz steps. The 10 MHz input corresponds to dial settings of "000" whereas the 39.9 MHz input corresponds to dial settings of "299" on the 10 MHz, 1 MHz and 100 kHz dials respectively.

The inputs to the V.H.F. Divider are: the 100 kHz reference (from the Spectrum Generator); the output signal from the Translator; the frequency control lines from the 1 MHz and 100 kHz switches on the front panel (8 wires); and the 10 MHz preset lines (from the V.C.O.). The output is the fine steering voltage which is fed back to the V.C.O.

4.2.5.2 BROADBAND AMPLIFIER

The broadband amplifier consists of a two stage feedback amplifier (Q1,Q2) followed by a complementary emitter follower (Q3,Q4). The negative feedback network, (R6,R7,R4) around Q1 and Q2, provides flat gain to well beyond 50 MHz, a constant input impedance over the frequency range, and stable D.C. operating point. R1 establishes the input impedance of this amplifier at 50 ohms. The output of the feedback amplifier is fed to the

complementary emitter follower (Q3,Q4). This emitter follower provides a low driving impedance for the subsequent high speed prescaler, and also establishes the proper logical zero and logical one levels to be compatible with the subsequent TTL logic integrated circuits.

4.2.5.3 PRESCALER

The prescaler (U2) is a high speed dual flip-flop connected in a conventional divide-by-four configuration. Its output is buffered by NAND gate U1C so as not to place excessive loading on U3.

4.2.5.4 PRESET COUNTERS

The preset counters (U3, U6, U7) consist of two stages of preset decade counters (U3, U6) followed by a preset divide-by-four dual flip-flop (U7). U7 is preset by quad two input NAND gate U13 and the A and B sections of quad two input NAND gate U8. During the normal counting mode (that is, when the counters are not being preset) the data strobe (D_s) lines on U3 and U6 are held in a "1" state by preset flip-flop U10. This permits these counters to function in their normal divide-by-ten mode. Similarly, the 10 MHz preset bus is held in a "0" state by U10. This forces the outputs of gates U8A and U8B and, therefore, the preset inputs to dual flip-flop U7, to be in a "1" state. Also the outputs of U13C and U13D, and therefore the clear inputs to U7 are forced to a "1" state. U7, therefore, counts in its normal divide-by-four mode. During the preset interval, the D_s lines to U3 are held in a "0" state by U10 and the inputs to U8A, U8B, U13C and U13D are held in a "1" state by U10. The clock pulse to the counters is inhibited and the preset information from the 10 frequency control lines is entered into counters U3, U6 and U7.

4.2.5.6 100 kHz CARRY GENERATOR

When all four 100 kHz preset lines are programmed to a "0" state by the front panel switches (corresponding to a dial setting of 0 on the 100 kHz frequency control), a special "carry" signal must be generated to program the counters to the correct division ratio.

Mathematically, this is necessary because a dial

setting of zero requires the input counter, U3, to divide by zero—an impossible operation. The count is corrected by programming U3 to divide-by-ten in this state and then subtracting one count from the next decade counter. Note that this is the same mathematical operation of “borrowing” when, for example, one subtracts nine from ten.

Quad two input NAND gate U4 is connected as a quad inverter with a common output. One of the four 100 kHz input lines is connected to each section of the gate. This special gate is of the “open collector” type enabling all four outputs to be connected together. The output of U4 is inverted by U5A. If all four inputs to U4 are zero, (dial set to “0” on the 100 kHz switch), the output of U4 will be in a “one” state and the U5A output will be a “zero”. If any of the 100 kHz inputs are in a “1” state, the U5A output will also be a “1”.

4.2.5.7 PRESET GENERATOR

During the normal counting interval, the Q output of flip-flop U10 is in a “1” state, the preset bus is in a “1” state and the 10 MHz preset bus is in a “0” state. In order to count properly, the pre-setting must occur between input clock pulses. A “look ahead” scheme is therefore employed to eliminate the propagation delays through the various counters.

First assume that the 100 kHz dial is not in the “0” position (that is, that the output of U5A is in a “1” state). When the preset counter has reached a count of 399 (that is, one count from being filled); counter U3 will have a count of “9” (or binary 1001), U6 will have a count of “9” (or binary 1001) and U7 will have a count of “3” (or binary 11). The output of 8 input NAND gate U9 will sense this unique state and will go to a “0” state. U8C inverts this output to a “1” state, making the K1 input to master/slave flip-flop U10 a “1”. On the next transition of the U3 input clock to a “0” state, the Q output of U10 will toggle to a “0” state and, therefore, the preset bus will be in a “0” state and the 10 MHz preset bus will be in a “1” state. Presetting will therefore occur. On the next transition of the U3 input clock back to a “1” state, the output of U8D will transition from a “1” to a “0” state, applying a “0” to

the preset input (P) of U10 and forcing the Q output of U10 back to a “1” state. This terminates the preset cycle, and the normal counting sequence is restored.

If the 100 kHz dial is set in the “0” position, the U5A output will be in a “0” state. The output of carry gate U5B will therefore always be in a “1” state and will not follow the Q_A output of U6. Flip-flop U10 will now be “armed” at the 389th counter state instead of at the 399th state. The desired “carry” of ten counts will therefore occur.

4.2.5.8 PHASE DETECTOR

The 100 kHz reference from the Spectrum Generator is divided in frequency by four to 25 kHz by dual flip-flop U11. In the phase detector (U12), the frequency and phase of the output of the preset counter is compared with that of the 25 kHz reference and a fine steering correction voltage is fed back to control the frequency of the V.C.O. (1A4A5). This feedback voltage changes in the correct direction to bring the V.C.O. into phase lock. The phase detector operates in the following manner: If the frequency of the preset counter output is greater than that of the 25 kHz reference, the phase detector output will decrease in voltage. If the frequency of the preset counter output is less than that of the 25 kHz reference, the phase detector output will increase in voltage. If the two frequencies are exactly the same, the phase detector output will remain constant.

4.2.6 V.C.O.—1A4A5

Refer to Figure 5.28.

4.2.6.1 GENERAL

The V.C.O. (1A4A5) generates the variable frequency 1st L.O. signal which controls the operating frequency, F_O , of the radio. This signal is generated in three voltage controlled oscillators each covering a 10 MHz frequency range, and selected by the 10 MHz switch on the front panel of the radio. The frequency ranges of the oscillators are (assuming a 2nd L.O. frequency of nominal 80.7500 MHz):

OSCILLATOR	F _O RANGE (MHz)	VCO FREQUENCY RANGE (MHz)
Band 0	0.0000 to 9.9999	91.2500 to 101.2499
Band 1	10.0000 to 19.9999	101.2500 to 111.2499
Band 2	20.0000 to 29.9999	111.2500 to 121.2499

Table 4.1 VCO Frequency Ranges

The actual oscillator frequencies will deviate from the above by an amount equal to the difference between the actual 2nd L.O. frequency and its nominal 80.7500 MHz.

The exact operating frequency of the oscillators is controlled by two independent D.C. voltages, designated coarse and fine steering. Each steering voltage is applied to a voltage variable capacitance diode (varactor) connected across the oscillator tank circuit. The coarse steering voltage is derived from a precision voltage divider located on the 1 MHz frequency control switch on the front panel. This voltage sets the oscillator frequency within the acquiring range of the phase lock loop. The fine steering voltage is derived from the phase detector on the V.H.F. Divider (1A4A4) after subsequent filtering by the loop filter. This voltage is the D.C. feedback within the phase lock loop which forces the oscillator to the correct frequency.

The oscillator outputs are buffered by two independent amplifiers: one providing the output to the Receiver Exciter module (1A3) and the other providing the oscillator sample to the Translator (1A4A3). Two transistor switches develop the 10 MHz preset signals for the V.H.F. Divider (1A4A4).

4.2.6.2 OSCILLATORS

The three oscillators are of identical design and, therefore, only the "Band 0" Oscillator will be discussed. The "Band 0" Oscillator is a conventional Colpitts oscillator employing a low noise dual gate MOSFET(Q6). The resonant tank circuit consisting of C20, C21, L1, C16, CR3 and CR4 determines the oscillation frequency of the circuit. Feedback is provided by C20 and C21. Two point tracking of the oscillator frequency is provided by L1 at the low frequency end of the band and C16

at the high frequency end. The coarse steering voltage from a resistor string on the 1 MHz switch is applied to voltage variable capacitance diode (varactor) CR4 through the filter network (C10, R26, C11, and R27) and RF bypass network (R30, C14, R31 and C15). Fine steering voltage from the phase detector in the VHF Divider assembly, 1A4A4, is applied to varactor diode CR3 through the loop filter (R23, C7, R24, C8, R25, and C9) and the 25 kHz twin tee notch filter (R20, C5, R22, C3, C4, R21 and C6). The output is taken from the drain of Q6 through C22. Hot carrier diodes CR5 and CR6 prevent the RF signal from biasing the varactor diodes into their conducting region.

4.2.6.3 OUTPUT BUFFER AMPLIFIER

The output of each oscillator is fed to the output buffer amplifier (Q9, Q10). This amplifier is a conventional cascode configuration providing high input impedance, high isolation, and negligible feedback. The output of the amplifier is fed through bandpass filter (C46, L11, L12, C48, L13, and C50) and matching transformer (T1) to the Receiver/Exciter module.

4.2.6.4 TRANSLATOR BUFFER AMPLIFIER

The translator buffer amplifier (Q11, Q12) is similar in operation to the output buffer. The output is taken from the collector of Q11 through C54 and matching transformer T2.

4.2.6.5 LOGIC SWITCHING

Transistors Q3, Q4 and Q5 apply +12 volts to the appropriate oscillator circuit when the respective band command line is connected to ground by the 10 MHz switch on the front panel. Transistors Q1 and Q2 generate the required 10 MHz preset code

for the VHF Divider (1A4A4) in the following sequence:

10 MHz switch Position	2 ⁰ Preset logic level	2 ¹ Preset logic level
0	0	1
1	1	0
2	0	0

NOTE

The TTL compatible logic levels are as follows:

Logical 0 = less than 0.8 volts
Logical 1 = greater than 2.0 volts but less than 5.0 volts

4.2.6.6 MECHANICAL

Refer to figure 5.6.

The V.C.O. board is secured between two metal plates (front and rear) that serve as a support and an electrical shield. This unit is rigidly mounted to the end plate of the synthesizer card guides to ensure superior performance under extreme vibration and shock conditions. Ability to make alignment adjustments is provided by access holes where necessary.

4.2.7 SYNTHESIZER MOTHER BOARD-1A4A6

Refer to figure 5.17.

The synthesizer mother board consists of five receptacles, and their related components and circuitry. It is mounted on four standoffs located on the chassis, under the synthesizer module, as shown in figure 5.6. The five printed circuit cards (1A4A1, 1A4A2, 1A4A3, 1A4A4, and 1A4A5), described previously in this section, insert into this mother board thereby constituting the entire synthesizer module.

4.2.7.1 L.O. BLANKER CIRCUITRY (PART OF SYNTHESIZER MOTHER BOARD 1A4A6)

The L.O. Blanker Circuitry protects the power amplifier from transients due to a frequency change while in the transmit mode. If the radio operator inadvertently changes the 1 MHz frequency dial on the front panel while in one of the transmit modes, the Synthesizer may momentarily change frequency by several MHz while the switch is between its detent positions. This would result in a large transient on the output and could damage the power amplifier.

When the setting of the 1 MHz switch is changed, the "preset 2⁰ 1 MHz" frequency control line will change from either:

- a) logical "0" (approximately 0.2 volts) to logical "1" (approximately 3 volts) state
- or
- b) logical "1" to logical "0" state

In case a) a positive-going differentiated pulse is formed by differentiating network C8, R3, CR2 and R10 and is applied to the base of switch Q2 through R4. Q2 will saturate driving switch Q1 into conduction and generate a 12 volt blanking pulse through isolation diode CR4. The blanking pulse is applied to the Spectrum Generator (1A4A1) to blank the 3rd L.O. (10.5 MHz) output. The blanking duration is approximately 100 to 200 msec and is controlled by the time constant of the differentiating network.

In case b) a negative-going pulse is formed by differentiating network C2, R2, CR1 and R5 and is applied to the base of Q1 through R8. Q1 will saturate, forming the blanking pulse. Blanking duration is 100 to 200 msec and is controlled by the time constant of the differentiating network.

In the AM RECEIVE mode, +12 volts is applied to the output through isolation diode CR3. This blanks the 3rd L.O. while in this mode and prevents a beat note between the 3rd L.O. and the carrier of the received signal.

4.2.8 SYNTHESIZER PROGRAMMING

Figure 5.17 shows a wiring diagram of the front panel.

The six FREQUENCY A dials and six FREQUENCY B dials are connected together through germanium diodes to prevent interaction. Germanium diodes are required because of their low forward voltage drop as compared to silicon. Do not replace these diodes with silicon types as this reduces the noise margin in the synthesizer programmed counters and frequency accuracy and stability will be jeopardized. The switch grounds for A are all tied together above ground and the A common is taken to the FREQUENCY CONTROL switch. Likewise, the switch grounds for B are also tied together above ground and the B common is taken to the FREQUENCY CONTROL switch. If the FREQUENCY CONTROL switch is in the "A" position, the FREQUENCY A switch ground is completed, allowing the A dials to control the synthesizer frequency. When the FREQUENCY CONTROL switch is in the "B" position, the FREQUENCY B switches control the synthesizer frequency. In the A XMIT/B RCV position, the two A and B grounds are taken to relay K3, where they are alternated from B on receive to A on transmit. K3 is energized by the keyline, so is pulled in any time a transmit command is given.

4.2.9 FREQUENCY DISPLAY

A schematic of the frequency display is shown in Figure 5.18. Figure 4.2 shows the location of the frequency display boards and regulator assembly.

4.2.9.1 DECODER

The digital control signals from the frequency dials also supply information to the decoder board, 1A1A2, so that the LED display may be properly programmed. The LED display drivers, U4 through U9, all require a BCD (binary coded decimal) code to properly light the display. The 10 kHz, 1 kHz, and 100 Hz lines are standard BCD, so require no further processing, but the 10 MHz, 1 MHz, and 100 kHz lines are not BCD, so must be converted.

The 10 MHz switch requires only a 0, 1, or 2 to appear, so may be programmed simply through the use of diodes CR1 through CR4.

The 1 MHz switch provides a 9's complement BCD, so it is converted to BCD by U1, an arithmetic logic unit.

The 100 kHz switch provides a 10's complement BCD (or inverted BCD), so requires more complicated processing to convert to BCD. This is done by U2, an arithmetic logic unit; U3, a quad nor gate; and transistors Q1 and Q2.

The outputs of all six drivers are connected to 1A1A2J1.

4.2.9.2 DISPLAY

The six digit LED display board 1A1A3 plugs into the DECODER board via 1A1A3P1. Each segment is connected through an isolation resistor, R1 through R42, and the decimal point on U3 is energized through R43. The display intensity is changed by adjusting the supply voltage to the display anodes. This is done by S16 on the front panel. In the bright position, 5V is supplied to the LED's; and in the dim position, the voltage is dropped to 3V through CR53, 54 and 55.

4.2.9.3. 5VDC REGULATOR ASSEMBLY

Figure 5.17

A 5 VDC regulator is used to supply the necessary voltage to the FREQUENCY DISPLAY. This regulator and the relay K101 are located on a sub-chassis which is screwed to the RCVR/EXCTR compartment card guide. Voltage for the regulator is obtained from the filter capacitor on the GSB-900DX 5 VDC power supply through a lead and a solder lug under the capacitor's (1A6A1C9) positive ("+") screw terminal.

4.3 RECEIVER

The receiver electronics are divided among four printed circuit boards: VHF MIXER (1A3A1), IF/FILTER (1A3A2), AUDIO (1A3A4), and SPEAKER DRIVER (1A1A1). The first three boards are interconnected by plugging into the RECEIVER/EXCITER MOTHER BOARD, (1A3A5). The SPEAKER DRIVER is located on the front panel. The block diagram is shown in figure 4.1.

4.3.1 GENERAL

Received signals are first passed through a band pass filter network in the filter module, then are fed into an 11 pole high pass filter on the VHF

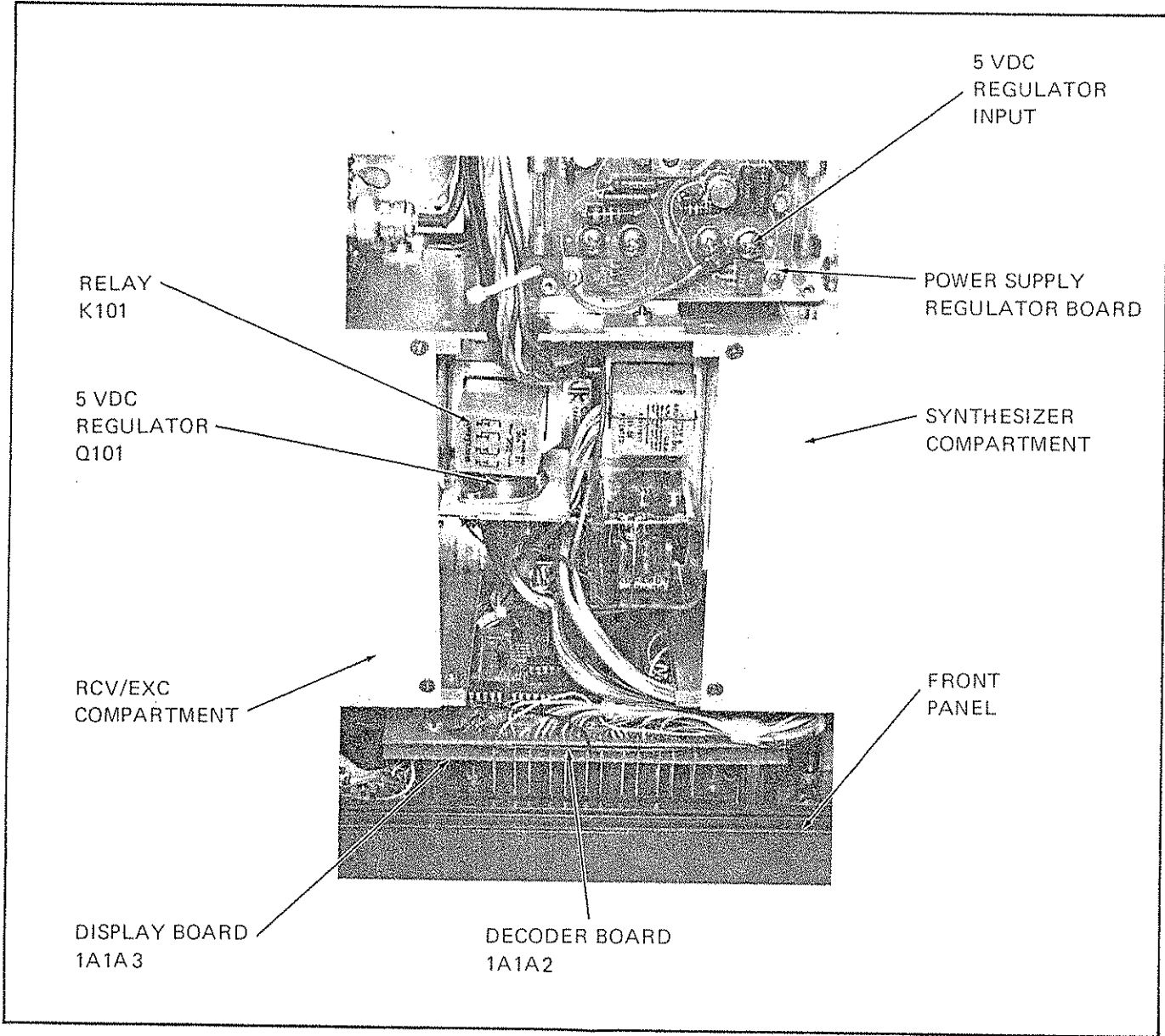


Figure 4.2 Top View Showing Display and 5 VDC Connection

mixer board. This filter is a very sharp cut off broadcast band rejection network. The signal is then amplified and mixed in a balanced mixer with the first local oscillator, providing an output on 91.25 MHz.

In addition to 91.25 MHz, the mixer output contains several other significant mixing products, but because of the high frequencies involved they are separated in frequency from 91.25 MHz by a relatively large amount. The unwanted products are removed by passing the mixer output through a

narrow band 91.25 MHz crystal filter. The resulting 91.25 MHz signal is then amplified and mixed again in another balanced mixer with the second local oscillator (80.75 MHz), which yields an output at 10.5 MHz. High frequency products from this mixing are removed by a low pass filter.

The 10.5 MHz I.F. signal is amplified, then fed to a diode gating network which selects the upper sideband filter (USB), lower sideband filter (LSB), or amplitude modulation filter (AM). These filters determine the receiver's bandwidth and reduce the

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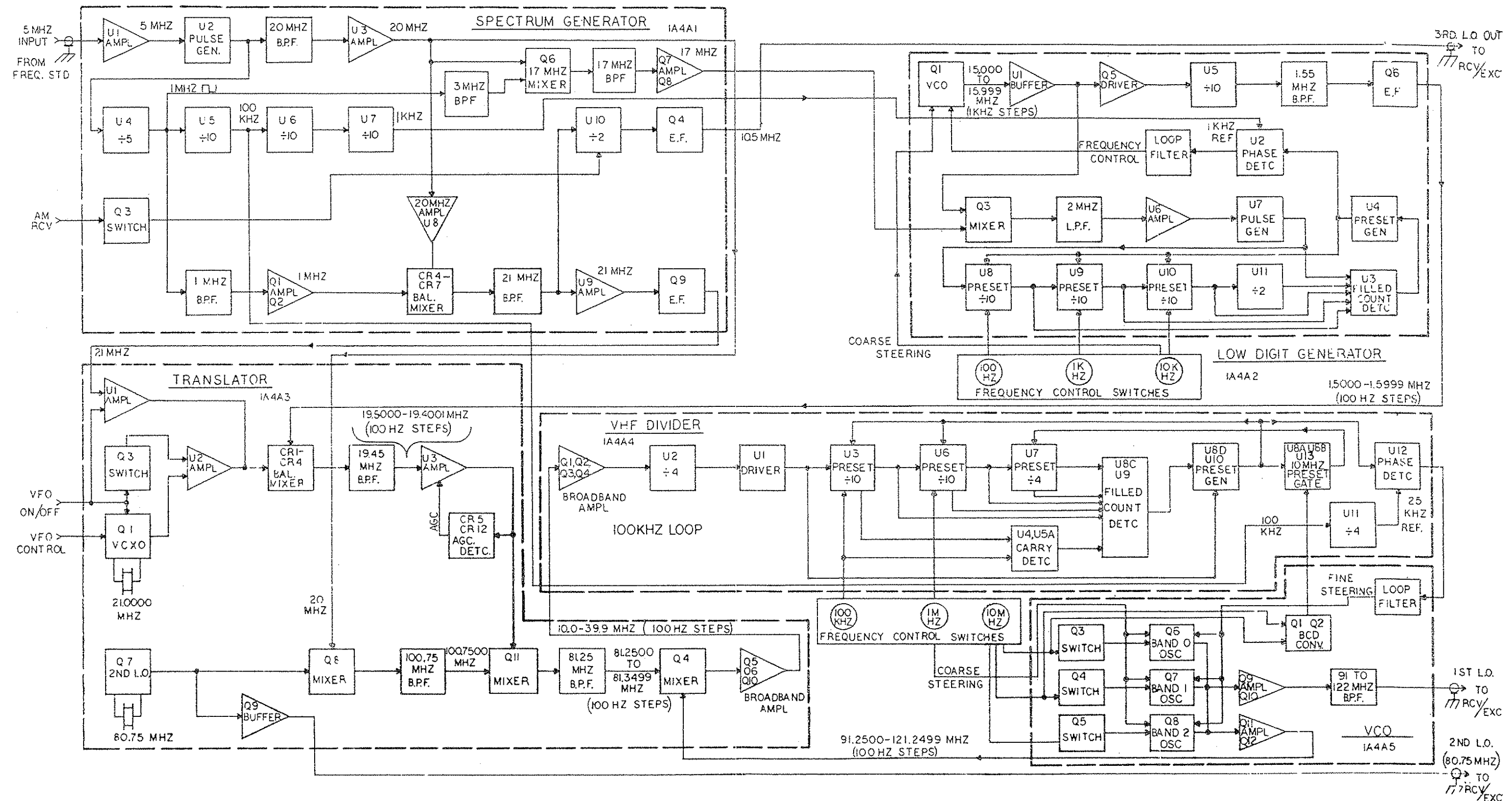


Figure 4.3 Synthesizer Block Diagram and Details

SUNAIR GSB-900DX

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interference from adjacent channels. The filtered I.F. signal is passed through another diode gate, then is highly amplified in two integrated circuit I.F. amplifiers. The output of the second I.F. amplifier is coupled to a product detector when receiving sideband signals and to a fixed amplifier and an envelope detector for receiving amplitude modulated signals. The fixed amplifier also feeds into the AGC detector which develops a D.C. voltage proportional to the received signal amplitude. The AGC voltage is amplified and used to control the voltage gain of the RF amplifier and the two integrated circuit I.F. amplifiers.

The product detector combines the 2nd I.F. signal with the 3rd local oscillator (10.5 MHz), giving an audio signal which reproduces the original transmitted audio. The audio is fed to a 600 ohm line driver and to a fixed audio amplifier. The envelope detector detects the amplitude of the received signal reproducing the audio on a transmitted AM signal. The resultant audio is also fed to the 600 ohm line driver and to the fixed audio amplifier.

The output of the fixed audio amplifier is connected to the VOLUME control, then to the speaker driver (located on the front panel), which supplies up to five watts of audio to the speaker.

The AGC voltage also is used to vary the current through the front panel meter to give a visual indication of relative signal strength received.

The front panel RF GAIN control acts to vary the gain of an amplifier which shuts back the AGC voltage, reducing the gain of the RF amplifier and the two integrated circuit I.F. amplifiers. This greatly reduces background noise when receiving strong signals.

The following subparagraphs describe circuit operation of the individual circuits by printed circuit board.

4.3.2 VHF MIXER BOARD – 1A3A1

Refer to Figure 5.30.

4.3.2.1 GENERAL

The VHF Mixer board provides RF to IF frequency conversion in the transmit mode and IF to RF frequency conversion in the receive mode.

4.3.2.2 BROADCAST FILTER

The R.F. input signal appears on pin 15 of 1A3A1-P1, and is passed through the broadcast band filter network, starting with C9 and ending at C13, to stepup transformer T1, which matches the R.F. amplifier (Q2) input impedance to the 50 ohm characteristic impedance of the broadcast band filter.

4.3.2.3 RF AMPLIFIER

The R.F. amplifier is a dual gate MOSFET with protection diodes built into the input gate to prevent burnout under overload. The input signal is applied to gate 1 and the amplified signal is taken from the drain through transformer T3. The source (gate 1 through R8) is biased positively by 3.6V to increase the dynamic gain range when Gate 2 voltage is varied. The 40673 transistor can now be practically cut off when gate 2 voltage is taken to zero. Gate 2 derives its voltage from the automatic gain control (AGC) line, which varies between +8V at no signal to approximately +2V for an extremely strong signal.

The output of T3 passes through diode CR3 to the input of the balanced mixer. Since the +12R voltage is +12V during receive (and ground during transmit) and the +12T voltage is ground during receive (and +12V during transmit), diode CR3 is switched on (conducts) by the voltage on T3, through the mixer, and R14 to the +12T line (which is at ground potential). Likewise, diode CR1 is turned off during receive and has no effect on the operation.

4.3.2.4 1st LO AMPLIFIER AND BALANCED MIXER

Local oscillator number 1 is injected at pin 18 of 1A3A1-P1 into amplifier Q5. The amplified L.O. is applied to the balanced mixer pin 8. The injected R.F. signal at pin 1 now mixes with the L. O. signal to provide several outputs, one of which is 91.25 MHz. 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 L.O. number 1 plus the R.F. signal and L.O. number 1 minus the RF signal. L.O. number 1 frequency is variable between 92.85 MHz and 121.25 MHz, corresponding to 1.6 to 29.999 MHz selected by the front panel frequency dials. In the GSB-900DX, the difference frequency is selected and a first I.F. of 91.25 MHz was picked to minimize spurious frequencies within the transceiver. Note that at the lowest frequency of operation, 1.6 MHz, the sum and difference frequencies in the mixer output are 3.2 MHz apart making it a simple task to remove the sum frequency with a narrow band crystal filter.

For instance, if the received signal is on 10.000 MHz, the first L.O. frequency is 101.25 MHz, and the two mixer output frequencies are 91.25 and 111.25 MHz.

4.3.2.5 VHF FILTER AND BILATERAL AMPLIFIER

The mixer output is taken from pins 3 and 4 of the balanced mixer and fed through a matching network, L10 and C41, into filter FL1 at 91.25 MHz. The filter impedance is approximately 4000 ohms, hence the need for matching from the low impedance mixer output. Another matching network, C44 and L11, match the filter into the 50 ohm input impedance of the bilateral amplifier, Q6 and Q7. The amplifier is bilateral in that it amplifies in both directions, Q6 is active on receive, and Q7 is active on transmit.

Capacitors C46 and C47 form an impedance transformation network with T7 to match the gate 1

impedance of Q6. When Q6 is turned on by +12R on gate 2; Q7 is turned off by the +12T ground on its gate 2 (for explanation see paragraph 4.3.2.3). As with the R.F. amplifier, the source is biased positively by 3.6V to allow gate 2 to turn the device on or off.

The output of amplifier Q6 is taken through impedance matching network T8, C55, and C56 to the input of the second balanced mixer X2. Note that in the receive mode, T7 is the input transformer and T8 is the output transformer for Q6; while in transmit mode, T8 is the input transformer and T7 is the output transformer for Q7.

4.3.2.6 2ND LO AMPLIFIER AND BALANCED MIXER

The second mixer operates in a manner similar to the first mixer. The main difference is that the first mixer is an "up converter", that is, its output frequency is higher than the input frequency. The second mixer is a "down converter" changing the 91.25 MHz signal to 10.5 MHz. Transistor Q8 amplifies the second local oscillator signal, 80.75 MHz, and feeds it to the mixer, pin 8. The output of the second mixer is taken from pins 3 and 4 and passes through a low pass filter to eliminate the high frequency mixing products. The output of the VHF mixer board is on pin number 5 of 1A3A1-P1.

Other circuits on the VHF mixer board are used during transmit and will be discussed in Section 4.4, Exciter.

4.3.3 IF/FILTER BOARD -1A3A2

Refer to Figure 5.31.

4.3.3.1 GENERAL

The IF/Filter board accepts the output of the VHF mixer, routes the signal through the selected band-pass IF filter and amplifies the resultant signal in the two IF amplifiers, U1 and U2.

4.3.3.2 DIODE GATES AND IF FILTERS

The signal from the VHF mixer board is fed to the IF/Filter board on pin 5 of 1A3A2-P1. This 10.5 MHz signal is amplified by Q3 and fed to the junction of diodes CR1, CR3, and CR5. Diodes CR1 and CR2 form a gate for the input of FL1, CR3 and CR4 form a gate for the input of FL2, CR5 and CR6 form a gate for the input of FL3.

As the GSB-900DX uses "high side" conversion, that is, the first local oscillator is always higher in frequency than the received signal, the sidebands are reversed. This means that a lower sideband signal received at the antenna is converted by the mixer to an upper sideband signal at the 10.5 MHz I.F. To pass the upper sideband IF signal on to the detector, an upper sideband filter must be used. Therefore, FL1 is the filter used for receiving and transmitting the lower sideband, but is in reality an upper sideband filter. Similarly the upper sideband is received and transmitted by lower sideband filter, FL3.

The diode gates, which are also repeated at the filter outputs, operate as follows: Assume the LSB mode is selected. A +12VDC voltage is applied to pin 9 of 1A3A2-P1. This turns on CR8, CR1 and CR12. Using the input gate as an example, current flows through L8, CR8, R27, CR1 and R19. A

voltage of approximately +5VDC exists across R19 as a result, which turns off CR3 and CR5. CR2 is turned off because the cathode is more positive (+6V) than the anode (+4V). So the signal is allowed to pass into the filter. Additionally, the other filter input gates are turned off. Using CR3 and CR4 as an example, CR4 is conducting, (+4 VDC on its anode), with a path to ground for the cathode through R28 and R32. This shorts any signal leakage across CR3 to ground through C19; and CR3 is turned off with +5V on the cathode and +4V on the anode.

The input and output gates for the other filters operate in a similar manner. CR7, CR8, CR9 and CR10 prevent interaction with other control circuits.

4.3.3.3 INTEGRATED CIRCUIT IF AMPLIFIER

The filter output is fed through C37 to another diode gate, CR17 and CR18. This gate switches circuits from receive to transmit, so during receive, CR17 is turned on and CR18 is off. This allows the signal to go to pin 2 of U1, an integrated circuit amplifier. There it is amplified by approximately 30db and fed to pin 2 of U2, another integrated circuit amplifier. Schematics of U1 and U2, CA-3053, are given in Figure 4.4.

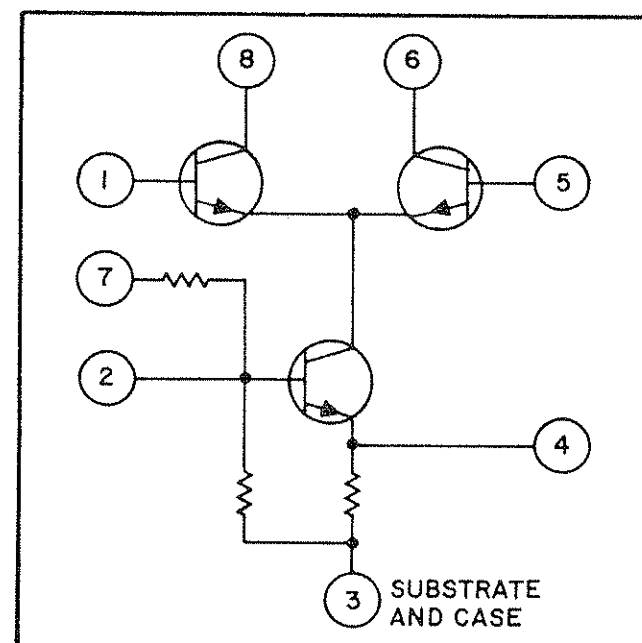


Figure 4.4 CA3053 Schematic of U1 and U2

The networks L3, C51, C52 and L4, C58, C59 are tuned to 10.5 MHz and are used for impedance transformation. The output of the I.F./Filter board is on pin 11 of 1A3A2-P1. AGC voltage for gain control of U1 and U2 is supplied through pin 13 of 1A3A2-P1.

Other circuits on the IF/Filter board are used during transmit and will be discussed in Section 4.4, Exciter.

4.3.4 AUDIO BOARD -1A3A4

See Figure 5.32.

4.3.4.1 GENERAL

The 10.5 MHz I.F. output from the IF/Filter board is supplied to pin 11 of 1A3A4-P1, and then is routed to two circuits: the product detector, Q6, Q8, and Q9, and the fixed gain I.F. amplifier, Q1.

4.3.4.2 FIXED IF AMPLIFIER AND AGC DETECTOR

The output from Q1 is fed to an emitter follower, Q2, to drive the AGC detector amplifier, Q3. A threshold bias is established on Q3 by R14 and R15. Any received signal of sufficient amplitude to overcome this pre bias, that appears at the base of Q3 will cause Q3 to conduct thereby lowering the collector voltage. This allows diode CR4 to conduct, reducing the base voltage on AGC amplifier Q4. In turn this causes the emitter voltage on Q4, which is the AGC voltage, to drop proportional to received signal strength. The "no signal" value of AGC voltage is approximately +8.8 VDC which provides maximum R.F. and I.F. gains. A signal of 100,000 uv will cause the AGC voltage to drop to approximately +2.5 to +3.0 VDC. The "no signal" AGC voltage is established primarily by R16 and R17. The AGC attack time is determined by R13 and C11. CR3 is used to equalize the load on Q2.

4.3.4.3 "S" METER AMPLIFIER

Transistor Q5 is a D.C. amplifier which drives the "S" meter. Its threshold is set so that meter move-

ment begins when a signal of approximately 2 or 3 uv is received, and provides full scale meter deflection for a 100,000 uv signal.

4.3.4.4 RF GAIN CONTROL AMPLIFIER

Amplifier Q12 is driven from the RF GAIN CONTROL to reduce the AGC voltage which in turn reduces the R.F. and I.F. amplifier gains. As the RF GAIN CONTROL is turned counter clockwise, the base voltage of Q12 is made more positive causing Q12 to conduct lightly at first, then more heavily to "pull down" the AGC voltage. With the RF GAIN CONTROL fully counter-clockwise, it should be possible to completely disable the receiver.

4.3.4.5 AM DETECTOR

In addition to the AGC circuitry, amplifier Q1 also drives the AM detector, Q7 and Q10. Transistor Q7 is a high gain amplifier used to drive amplitude detector Q10 with a large signal for best linearity. Q10 is biased almost to cutoff so that it will detect amplitude variations. The output is reduced by R43 to equal the product detector output voltage. The AM detector is turned on in the "AM" mode by the +12R AM voltage on pin 7 of 1A3A4-P1.

4.3.4.6 PRODUCT DETECTOR

The product detector Q6, Q8, and Q9 combines the 10.5 Mhz I.F. signal with that of the 3rd local oscillator, 10.5 MHz. Q9 amplifies the 3rd L.O. and injects it into the detector where the R.F. components are removed by C29 leaving only the audio. The product detector is turned on only in USB, LSB, or CW by voltages on either pin 8 or pin 9 of 1A3A4-P1. CR1 and CR2 are diode gates used to prevent interaction between the +12 USB and +12 LSB lines.

4.3.4.7 600 OHM LINE DRIVER

Both the product detector output and the envelope detector outputs are combined in R42 and feed integrated circuit 600 ohm line driver, U1, and fixed gain audio amplifier Q11. The CA3020 line driver is a conventional push-pull multistage amplifier feeding output transformer T1. The input to U1

is controlled by R48 and the balanced 600 ohm output appears on pins R and T of 1A3A4-P1. Pin S is the output transformer center tap and is not normally used. A side tone is provided from the CW oscillator through pin 4 of 1A3A4-P1 to the audio system of the receiver to allow monitoring of the CW signal. This sidetone is injected into the junction of the product detector or output and the envelope detector output through capacitor C49. Resistor R46 attenuates the side tone to provide a comfortable listening level for the 1 KHz tone when the volume control is in a normal position.

4.3.5 SPEAKER DRIVER - 1A1A1

Refer to Figure 5.33.

The speaker driver is a hybrid integrated assembly capable of delivering five watts of audio to an eight ohm speaker. Since the circuit is designed for 24VDC and the GSB-900DX power supply furnishes regulated 28VDC, the diode string CR1 through CR6 is necessary to maintain constant voltage drop for the unit. Output to the speaker is taken through a 320uf, capacitor (C7 and C8 in parallel), to provide a good fidelity. Q1 and Q2 provide a muting function in Coupler Tune or in PTT. CR7 disables the muting circuit when in the CW mode to provide sidetone.

4.4 EXCITER

The exciter is contained on three printed circuit boards; sideband generator board (1A3A3), IF/Filter board (1A3A2), and VHF mixer board (1A3A1). Since the GSB-900DX is a transceiver, a number of the same circuits and components are used in both the receive and transmit modes. A block diagram is shown in Figure 4.6.

4.4.1 GENERAL

Input to the exciter is available from three sources: microphone, 600 ohm balanced lines, or CW key. The microphone input signal is applied across the XMIT GAIN control on the front panel, then is amplified and fed to the balanced modulator. The 600 ohm balanced input is level controlled by an internal adjustment, then amplified and fed to the

balanced modulator. Keying the exciter, through the CW key, turns on a 1 kHz tone oscillator which is impedance matched through an emitter follower to the balanced modulator. The 1 kHz tone oscillator also supplies a side tone to the audio system to allow monitoring of the transmitted CW signal.

The balanced modulator takes an R.F. signal, 10.5 MHz, from the 3rd local oscillator amplifier, and "audio" from either of the above three sources. It then suppresses the R.F. carrier, 10.5 MHz, and supplies two signals as outputs: 10.5 MHz plus the audio frequencies (upper sideband, USB) and 10.5 MHz minus the audio frequencies (lower sideband, LSB). Hence, the output of the balanced modulator is double sideband, DSB. After amplification in a fixed gain I.F. amplifier, the DSB signal is gated into either the USB filter or LSB filter as selected on the front panel. AM operation in the GSB-900DX is, in reality, carrier plus USB only, so the AM filter is not used in transmit. The appropriate sideband filter eliminates the unwanted sideband and feeds through another diode gate into a bilateral amplifier. The gain of the bilateral amplifier is controlled by a peak voltage ALC and a VSWR ALC (automatic level control). The voltage ALC controls the peak transmitter output, and the VSWR ALC protects the P.A. transistors from high standing wave ratios.

The bilateral amplifier output is then impedance matched by an emitter follower, into which the AM carrier is injected from the automatic carrier control (ACC) amplifier.

The ACC detector operates on an average output level to maintain a constant carrier output. This helps prevent "carrier wipe out" by the ALC system. The emitter follower output is passed through a low pass filter to a balanced mixer. Notice that the transmit signal from the filter gate has been flowing in a direction exactly reversed from the receive signal flow. Therefore, this balanced mixer is the second VHF mixer described in the receiver section, and the second L.O. amplifier is the same as in receive.

The transmit output of the balanced mixer is the second L.O. frequency (80.75 MHz) plus the I.F. frequency (10.5 MHz) or 91.25 MHz. This output

is amplified in the transmit side of the VHF bilateral amplifier, filtered in the 91.25 MHz crystal filter, and mixed again in another balanced mixer (the first mixer described in the receiver section). The 91.25 MHz signal is combined with the first local oscillator frequency to provide the desired frequency output between 1.6 and 30 MHz. The desired frequency signal is amplified in a pre-amplifier and a linear amplifier, then passes through a low pass filter. This is now the exciter output.

A detector, which monitors current in the power amplifier transistors, supplies a signal to provide an ALC to control the gain of the pre-amplifier stage, limiting the P.A. current to a safe level.

The following subparagraphs describe circuit operation of the individual circuits by printed circuit board.

4.4.2 SIDEBAND GENERATOR BOARD-1A3A3

Refer to figure 5.34.

4.4.2.1 GENERAL

The sideband generator board processes the audio input and translates the audio in a balanced modulator to a DSB suppressed carrier signal centered around 10.5 MHz. The board also contains ALC and ACC control circuitry.

4.4.2.2 AUDIO AND BALANCED MODULATOR

Microphone input is supplied on pin 18 of 1A3A3-P1. At this point the level has been set by the front panel XMIT GAIN control. The microphone audio is amplified by Q4 and feeds into the balanced modulator, CR3, CR4, CR5, and CR6. Resistors R32, R34, and R35, in series with the diodes, equalize their forward conduction to permit a good carrier balance (null) to be obtained. Carrier balance is achieved by nulling the 10.5 MHz output with potentiometer R34 and capacitor C26. Transformer T1 is tuned to 10.5 MHz and capacitors C23, C24 provide an impedance transformation to match the input impedance of the next stage. The double sideband suppressed carrier signal output is on pin 16 of 1A3A3-P1.

R.F. carrier energy for switching the balanced modulator is supplied through pin F of 1A3A3-P1 and amplified by Q1.

4.4.2.3 AUTOMATIC CARRIER CONTROL (ACC)

A small amount of 10.5 MHz carrier is supplied to the automatic carrier control amplifier Q5 through a diode gate, CR1, CR2. This gate prevents carrier energy from being transmitted in USB, LSB, or CW modes, but allows the carrier to be passed and amplified in the AM mode.

The +12 AM(T) signal, on pin 5 of 1A3A3-P1, turns CR1 on and CR2 off. It also supplies operating voltage for ACC detector amplifiers Q2 and Q3, and carrier control gate Q5.

Detected R.F. voltage from the ACC detector (in the Amplifier/Coupler Unit) is applied to Q2 through threshold control R1. The amplified D.C. voltage has the audio frequency removed by R9, C39, so it will maintain an average power characteristic and not follow the peak envelope of the output wave-form. C4 provides a "soft" initial carrier turn-on. The dc control voltage is inverted in Q3 and applied to ALC amplifier Q9. This controls the system gain and maintains a constant carrier level. Switch Q11 is required to disable the voltage ALC stage Q10, preventing unwanted ALC interaction.

4.4.2.4 600 OHM TRANSMIT AMPLIFIER

The 600 ohm transmit audio is supplied on Pin C of 1A3A3-P1 and passes through amplifier Q14 to the balanced modulator.

4.4.2.5 CW TONE OSCILLATOR

Transistors Q7 and Q8 form the 1 KHz tone oscillator. The frequency is determined by the "Twin T" notch filter C28, C29, C31, R38, R40, and R43. The oscillator is turned on by grounding pin 2 of 1A3A3-P1, causing transistor Q12 to conduct, which grounds the keyline and keys the transmitter. When the CW key is removed from ground, capacitor C37 and resistor R50 hold Q12 on for

approximately one second. This prevents the keying relay from dropping out between normal CW characters and words, but automatically returns the transceiver to "Receive" after a key up of approximately one second. Transistor Q13 prevents the tone oscillator from being energized during normal keyline operation.

Since the tone oscillator output is high impedance, an emitter follower, Q6, is required to drive the low impedance balanced modulator. A sidetone from the tone oscillator is sent out pin D of 1A3A3-P1 to the audio board, 1A3A4, for monitoring purposes.

4.4.2.6 VSWR AND VOLTAGE ALC AMPLIFIERS

Transistors Q9 and Q10 are ALC amplifiers for voltage ALC (Q10) and VSWR ALC (Q9). The VSWR ALC is set by a fixed resistance ratio, but the voltage ALC, which determines the peak power output of the transmitter, is set by potentiometer, R55. Q15 acts with Q10 as a differential amplifier to provide temperature compensation of the ALC.

4.4.3 IF/FILTER BOARD—1A3A2

Refer to Figure 5.31

4.4.3.1 GENERAL

The IF/Filter board accepts the DSB output from the SB generator board, routes the signal through the selected SB filter and amplifies the resultant IF signal. Carrier injection for AM operation also occurs on this board.

4.4.3.2 TRANSMIT IF AMPLIFIER

The double sideband suppressed carrier output from the sideband generator is injected at pin 16 of 1A3A2-P1. Here it is amplified by a fixed gain IF amplifier, Q4. Application of +12 T to pin 10 of 1A3A2-P1 energizes Q4, turns CR18 on and turns CR17 off (+12R goes to ground during xmit, as +12T does during receive).

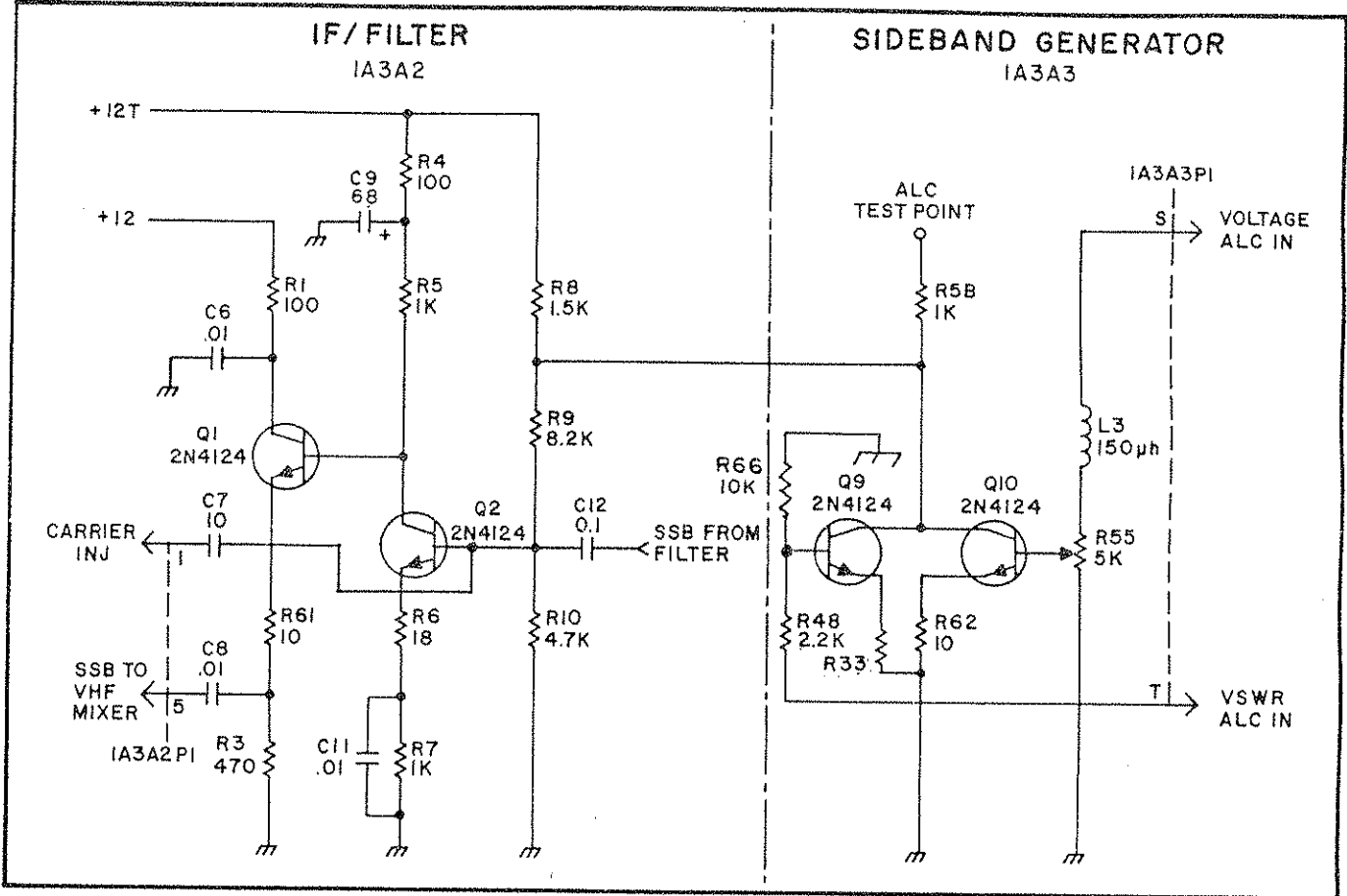


Figure 4.5 Voltage & VSWR ALC Control Schematic

4.4.3.3 TRANSMIT FILTER SELECTION

The front panel MODE switch selects the desired mode of operation, so the DSB signal passes through either the USB filter or LSB filter to eliminate the undesired sideband. Note that in the AM position, the +12AM(T) voltage selects the lower sideband filter in transmit, providing USB at the exciter output (See section 4.3.3.2 for an explanation of sideband inversion).

4.4.3.4 TRANSMIT GAIN CONTROL AMPLIFIER

The SSB signal thus produced is amplified in transistor Q2 and impedance matched to the output by emitter follower Q1. Note that in the bilateral amplifier Q1, Q2, and Q3, transistor Q3 is turned on only in receive, and Q1 and Q2 are turned on only in transmit.

Since the base of Q1 represents a high impedance, it is used as the carrier injection point for AM operation.

ALC controls the gain of transistor Q2 to limit its output when either the transmitter output has reached 100W peak, or the output transistor voltage rating is in danger of being exceeded by a high voltage standing wave ratio (VSWR) at the transmitter output. Figure 4.5 shows the full ALC loop control. When a voltage appears at 1A3A3-P1 pin T or at the base of Q10 of sufficient amplitude to bias either Q9 or Q10 "on", the appropriate transistor conducts through R8, on 1A3A2, causing a large voltage drop to appear across R8. This decreases the bias voltage on the base of Q2, reducing its gain and the output from pin 5 of 1A3A2-P1.

4.4.4 VHF MIXER-1A3A1 (Transmit)

Refer to Figure 5.30.

4.4.4.1 GENERAL

The IF signal from the SB generator board is up converted to 91.25 MHz, filtered and then mixed with the first LO frequency to yield the desired transmit RF output frequency. ALC current control is also performed on this board.

4.4.4.2 LOW PASS FILTER AND BALANCED MIXER

The SSB (or AM) signal from the IF/Filter board enters the VHF mixer board on pin 5 of 1A3A1-P1. From there, it passes through a low pass filter, C62 thru C66, L14 and L15, to attenuate harmonics of the 10.5 MHz signal. Then it is injected into the balanced mixer X2 at pin 4. Operation of the balanced mixers is described in Section 4.3.2.

4.4.4.3 TRANSMIT BILATERAL AMPLIFIER AND FILTER

The 10.5 MHz signal is converted up to 91.25 MHz and fed to the bilateral amplifier. In transmit, Q7 is activated and Q6 is turned off (again see Section 4.3.3 for discussion). Input to Q7 is at T8. Capacitors C55 and C56 match between the low impedance of the mixer and the high impedance across T8. At the output, C46 and C47 provide impedance matching into the filter matching network, L11 and C44. The 91.25 MHz signal is filtered by FL1 to remove unwanted mixing products, C41 and L10 match the filter impedance to the balanced mixer X1.

4.4.4.4 BALANCED MIXER AND RECEIVER SHUT DOWN

The balanced mixer combines the 91.25 MHz signal with the first L.O. providing a difference frequency equal to the desired output frequency. This signal now has the sideband reversed per the earlier discussion, in paragraph 4.3.3.2, and is fed to the pre-amplifier Q3. The +12T voltage at pin 10 of 1A3A1-P1 turns on Q1 and Q3 and turns off

diode CR3. During transmit, +12R goes to ground, but the AGC voltage remains at approximately +9VDC on pin 13 of 1A3A1-P1, which turns diode CR1 on. This drops the voltage on gate 2 of Q2 to approximately +1 VDC, turning off Q2. This prevents transmit loop oscillations by breaking the path between RF input (Receive) on pin 15 of 1A3A1-P1, and input to the transmitter pre-amplifier at C34.

4.4.4.5 EXCITER LINEAR AMPLIFIER

The signal is amplified in Q3 and Q1 and passed through a low pass filter, C10, C11, C12, C19, C20, L6, and L7, to pin 8 of 1A3A1-P1.

4.4.4.6 CURRENT ALC AMPLIFIER

Transistor Q4 is the current ALC control stage which, upon conduction, causes a large voltage drop to appear across R18, reducing the base bias on Q3 thus lowering its gain. During receive, +12R voltage through CR13 and R48 keeps Q4 turned on, and capacitor C36 charges to +12V. When the transmitter is keyed, CR13 is turned off and C36 must discharge through R48 into Q4, keeping Q4 turned on, and Q3 turned off for approximately one millisecond. This allows "Switch On" transients to be dissipated before the P.A. receives the signal.

Whenever the P.A. current exceeds a preset threshold, a DC voltage appears at pin U of 1A3A1-P1. This turns Q4 on, reducing the gain of Q3, which decreases the output and brings the P.A. current back to a safe level.

4.4.5 RECEIVER/EXCITER MOTHER BOARD

The schematic of the Receiver/Exciter mother board is illustrated in Figure 5.35. This unit consists of four receptacles, their circuitry and related components. It is located under the chassis below the Receiver/Exciter module to mount four printed circuit boards (1A3A1, 1A3A2, 1A3A4, and 1A3A5). Refer to Figure 5.16 for proper orientation.

4.5 R.F. POWER AMPLIFIER 1A7A1

Refer to Figure 5.36.

4.5.1. GENERAL

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

4.5.2 PREDRIVER, DRIVER AND POWER AMPLIFIER

Input from the exciter is connected to 1A7J1. Transformer T1 converts the single ended exciter input to push-pull to drive the predriver Q1 and Q2. Bias for the predriver (for AB2 operation) is taken from CR1, which is in a forward conduction state. C2, R4 and C3, R5 are feedback networks for gain stabilization. The driver, Q3 and Q4, is driven push-pull through T2, and obtains its bias from CR2. The output stage, Q5 and Q6, is fed push-pull through T4 and obtains its bias from CR3. Note that all bias lines are tied together and are not energized during receive. This minimizes the receive current drain for the GSB-900DX. The single ended output is taken at 1A7J2 from T6.

4.5.3 CURRENT ALC DETECTOR

Transistor Q7 monitors the voltage across resistor R24. The values of R18 and R19 have been chosen to cause Q7 to conduct heavily when a current of 10 amperes or more flows through R24. Thus when Q7 is turned on, a voltage appears across R33 and 1A7A1-J3 Pin B. This voltage controls the current ALC amplifier on the VHF mixer board.

4.5.4 VSWR ALC DETECTOR

A detector circuit, R30, R31, CR4 and C28 is coupled to the collector of Q6 to monitor the collector AC voltage. If the voltage should exceed 65V peak (normally caused by high VSWR), the voltage appearing on pin D of 1A7A1-J3 causes the VSWR ALC amplifier on the sideband gen-

erator board, 1A3A3, to reduce the transmit I.F. gain to bring the output to within safe limits for the output power transistors.

4.6 POWER SUPPLY 1A6

Refer to Figure 5.37.

4.6.1 GENERAL

AC input is brought in through 1A6P1 Pins 1,3,5, and 7. The input windings are appropriately strapped by the power connector; ie, for 115V operation, the primary windings are in parallel, and for 230V operation, the primary windings are in series. For continuous operation at line voltages 15% higher than 115V or 230V, taps are provided on terminal board TB1. Regulated DC output voltages of +28, +12 and +5 volts are provided for operation of the transceiver.

4.6.2 28VDC REGULATOR

The A-C output for the 28V regulator is rectified by 1A6-CR1 thru 1A6-CR4 and filtered by 1A6C5. Transistor Q2 is connected as a constant current source to feed zener diode CR3, and the base of the series regulator transistor, 1A6-Q101.

Two protection circuits are provided to prevent damage to the regulator transistor and to the sections of the GSB-900DX utilizing the +28VDC power. If the +28VDC is inadvertently short circuited or the current drawn from the supply exceeds approximately 16 amperes, the current through resistor R2 causes Q5 to conduct, sending a voltage pulse to SCR Q6, which grounds the base of 1A6-Q101, turning off the regulator. This circuit must then be recycled by shutting off the transceiver input power and waiting approximately 15 seconds for 1A6C5 to discharge.

If the regulator transistor, 1A6-Q101, should ever fail short circuit, approximately 42VDC would appear on the output causing damage to the audio speaker driver and the R.F. power amplifier. CR4 is a zener diode which will conduct when the output voltage reaches 35 VDC, sending a voltage pulse to SCR Q104. This will cause Q104 to conduct, blowing fuse F1, preventing damage to components using 28 VDC.

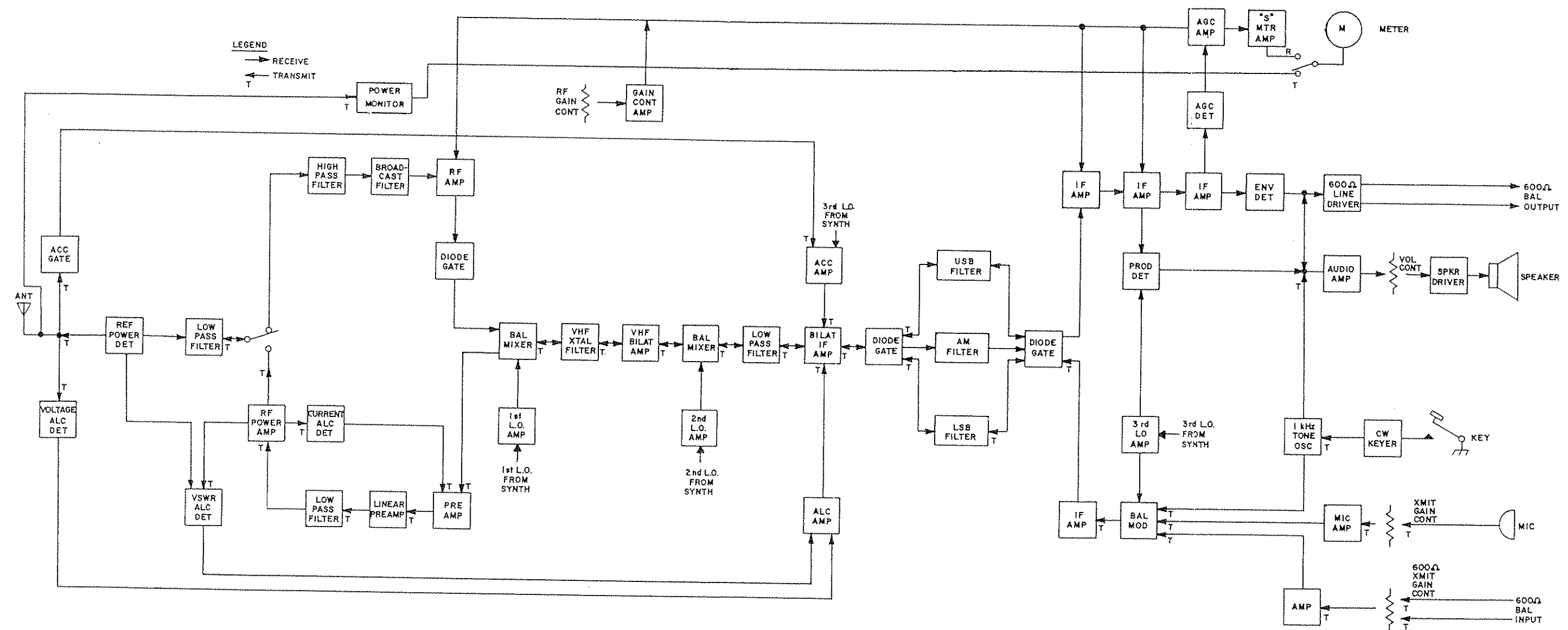


Figure 4.6 GSB-900DX Transceiver Block Diagram

SUNAIR GSB-900DX

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4.6.3 12 VDC AND 5 VDC REGULATORS

The +12 VDC and +5 VDC power supplies are very similar in design. Each uses a bridge rectifier assembly, U1 or U3, to obtain DC, then filters the AC component in capacitors C5 or C9. Both supplies use integrated circuit voltage regulators for maximum ripple reduction and excellent regulation. The main circuit differences are the methods in which the I.C. internal reference sources are utilized to obtain the desired output voltage. The integrated circuits drive series regulator transistors Q102 and Q103.

The heart of the +12 VDC system is the 723IC regulator. Figure 4.7 is a simplified diagram of the IC and its associated circuits.

CIRCUIT OPERATION

The error amplifier is a high gain differential amplifier. It amplifies the voltage difference between pin 3 and pin 2. Voltage for pin 2 of the IC is provided by the voltage divider R7 and R17. If the voltage pin 2 is not the same as that of pin 3, then the error amplifier output will increase or decrease accordingly.

The purpose of CR9 and R23 in the emitter circuit of QA is to insure that the collector to emitter voltage of QA is high enough for proper operation.

C7 is a high frequency compensating capacitor to prevent amplifier oscillation.

Q9, R6, R31, R28, and internal transistor QB comprise the short circuit protection. Load current is monitored by the voltage drop across R6. When the voltage across R6 approaches .5VDC, Q9 starts to conduct. This causes QB to conduct, thereby decreasing the drive to QA. Since the collector current of QA decreases, the voltage at pin 7 increases and Q7 conducts less causing the output voltage to decrease. At loads heavier than maximum, the current through R6 is constant and is approximately equal to 2.3 amps. R31 limits Q9's emitter current and R28 provides a stable thermal circuit for QB.

The 5VDC regulator is similar to the 12VDC.

4.6.4 REGULATOR TRANSISTOR LOCATIONS

The series regulator transistor for the +12 volt supply is physically located on the main power supply chassis. The +28 VDC series regulator, 1A6-Q101, is physically located on the regulator heat sink at the rear of the transceiver.

4.6.5 D.C. INVERTER -1A6A2

Figure 5.38 shows a schematic of the DC inverter.

Basically, the inverter is a transistor oscillator utilizing a saturable core. Upon application of D.C. voltage to the oscillator, Q1 and Q2, slight differences between the two transistors causes one to conduct more heavily than the other and it quickly reaches saturation. Once this occurs, no further change in current is noted and the field in transformer T1 collapses, driving the "on" transistor to an "off" state and the "off" transistor to an "on" state. When the second transistor reaches saturation, the cycle reverses. The result is a square wave oscillator capable of many amperes of current.

Transistors Q1 and Q2 supply the square wave current to the power transformer primary (1A6T1) for 13V or 26V operation. The saturable core transformer design used here allows only 1A6A2-T1 to saturate, and then at a relatively low current level (minimum power dissipation) and prevents the main power transformer from saturating. This eliminates voltage "spikes" in the output. Initial "turn on" bias is established by R1, R2, and R7. Diodes CR1, CR2 and associated components R5, R6 and C1, form an additional "despiking" network to insure that a clean wave form appears at the output.

NOTE

Refer to paragraph 2.6 for instructions when changing DC operating voltage.

Relay K1 is used to keep the oscillator transistors within allowable ratings during AC operation of

the power supply. This allows the DC modules to remain connected to the power supply without damage during AC operation. Note that for 13 VDC operation, the transistor collectors (Q1 and Q2) are connected to the 13 V power transformer input windings 2 and 6 on TB2. For 26VDC operation, the transistor collectors (Q1 and Q2) are connected to the 26V power transformer input windings 1 and 7 on TB2.

Either positive or negative ground DC sources may be used, since the DC input circuit on the GSB-900DX is floating with respect to ground. Figure 4.8. shows a schematic of the DC relay control circuit.

It is basically a voltage regulator which supplies 12VDC to relay 1A8K2 regardless of input voltage, 13V or 26V. Diode CR2 prevents energizing of the circuit if the polarity of the input voltage is incorrect. This prevents damage to the D.C. inverter.

The oscillator transistors, Q1 and Q2, are physically located on the power supply heat sink at the rear of the transceiver, and are mounted in a line directly beneath the 28VDC regulator transistor, 1A6-Q101 (See Figure 3.2). The DC relay and control circuit are located on a bracket attached to the front of the receiver/exciter assembly (See Figure 5.16).

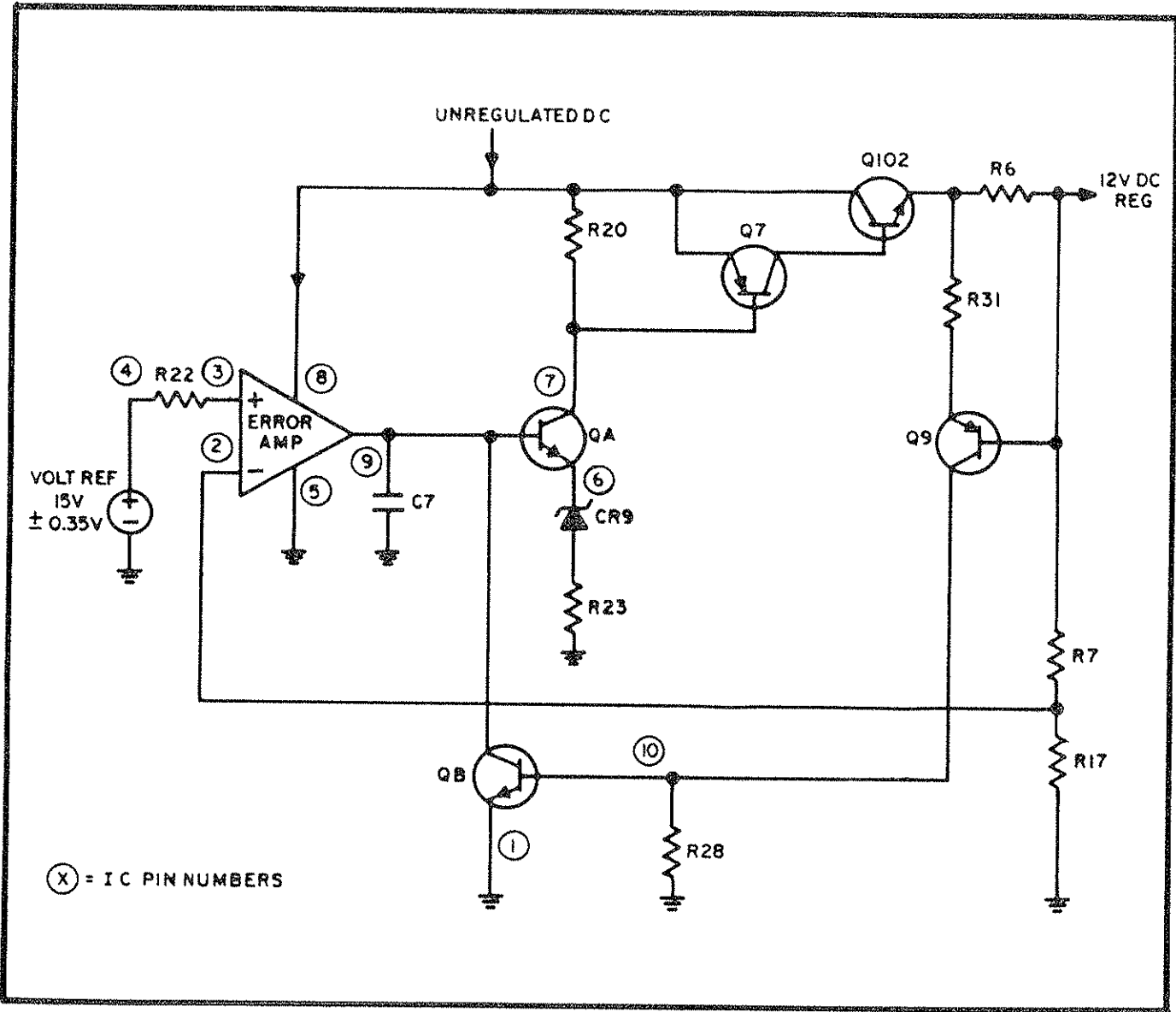


Figure 4.7 723IC Regulator

4.7 FILTER MODULE 1A5

A block diagram of the filter module is given in Figure 4.9. The filter module consists of four printed circuit boards: odd channel filter board, even channel filter board, receive filter board, and RF detector board. Figure 5.39 shows the position of each board within the module.

4.7.1 GENERAL

The filters are arranged to provide low pass filtering in the transmit mode and bandpass filtering in the receive mode by switching in high pass filters during the receive mode only. Therefore, only the transmit low pass elements must handle 100 watts of RF power and the high pass receive elements can utilize smaller low power inductors. The low pass and high pass filters are all dual section elliptical design with an ultimate attenuation of 40db. This attenuation is added to that normally present in the RF power amplifier to give excellent harmonic attenuation. Because of the required size of the transmit filter inductors, these filters have been divided among two boards: odd channel filters, 1,3,5, and 7 and even channel filters 3,4,6, and 8. Table 4.2 shows filter band numbers and their frequency ranges.

The bands are automatically selected by the front panel digital frequency control switches.

The transmit filters are switched by special high voltage reed relays energized by +12VDC on the selected band line. The receive filters are switched by pin diodes to preserve the excellent cross modulation characteristics of the receiver. The appropriate filter is selected by +12VDC on the selected band line. Only the correct input and output diodes are turned on, with the selecting voltage reverse - biasing the other diodes, turning the unwanted filters off. Schematic diagrams of the filter boards are given in Figures 5.41, 5.42 and 5.43.

4.7.2 RF DETECTOR BOARD

Refer to Figure 5.40

The RF Detector board (1A5A4) incorporates the voltage ALC detector, the ACC detector, the output level detector and a circuit to break the keyline whenever a filter band is changed. This latter circuit protects the reed relays whenever the frequency band is changed while the transmitter is keyed.

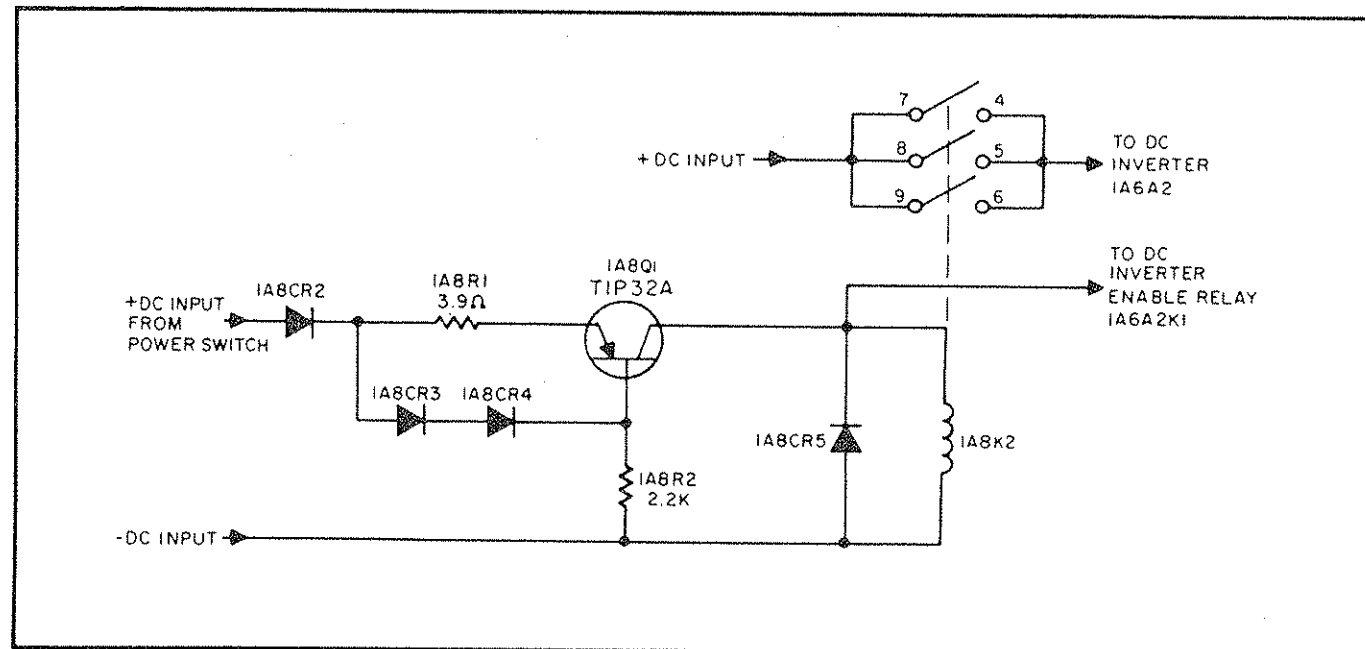


Figure 4.8 D.C. Relay Control Circuit

BAND NUMBER	FREQUENCY RANGE
1	1.6 to 1.9999 MHz
2	2.0 to 2.9999 MHz
3	3.0 to 3.9999 MHz
4	4.0 to 5.9999 MHz
5	6.0 to 8.9999 MHz
6	9.0 to 12.9999 MHz
7	13.0 to 19.9999 MHz
8	20.0 to 29.9999 MHz

Table 4.2 Filter Module (1A5) Filter Band Numbers & Frequency Range Table

Channeling is accomplished by applying +20VDC to any of the band control lines. This applies a positive going DC pulse through the pulse forming networks into the base of Q1. This energizes reed relay K1 which breaks the keyline so the band switching relays do not make or break with the transmitter keyed. The selected band then switches via reed relays on the even channel or odd channel board. After a delay of approximately 50 usec, relay K1 drops out allowing the keyline to function. (A band change requires approximately 50 usec to accomplish.)

4.7.3 VOLTAGE ALC DETECTOR

The voltage ALC detector consists of a resistive voltage divider R7 and R9, RF detector CR15, and emitter followers Q2 and Q3. This combination provides an extremely fast and responsive ALC. The detector output drives the emitter followers to charge capacitor C15, which discharges through R18. The decay is long enough to eliminate the audio modulation from the ALC line. Capacitor C12 is adjusted to provide optimum ALC performance over the complete frequency range of the transceiver.

4.7.4 ACC DETECTOR

The ACC detector derives its output by rectifying

the voltage at the antenna connector with diode CR16 and diode CR18. The voltage is decreased by resistors R8 and R10. This detector has a fast rise and fast decay time at this point, so it is necessary to increase the time constant to maintain constant carrier level. This averaging network is located on the sideband generator board.

4.7.5 OUTPUT DETECTOR

The output detector CR14 samples the transmit output voltage at the antenna terminal and provides a relative power output signal to the front panel meter when the coupler control panel is not used.

4.7.6 KEY LINE

Relay K2 is used in conjunction with relay 1A8K1 to key the transceiver to transmit mode. A schematic of the keying circuit is shown in figure 4.10. Note that if an interlock feature is required with auxiliary equipment, the jumper between 1A8J4-n and 1A8J4-p may be removed and the interlock performed in the auxiliary equipment.

Whenever the keyline is grounded and the band channeling motor is not running, relay K2 is energized. This switches the RF power amplifier the low pass filter input, applies +28 VDC to the power amplifier bias circuit and then keys relay 1A8K1. Relay 1A8K1 switches the low voltage

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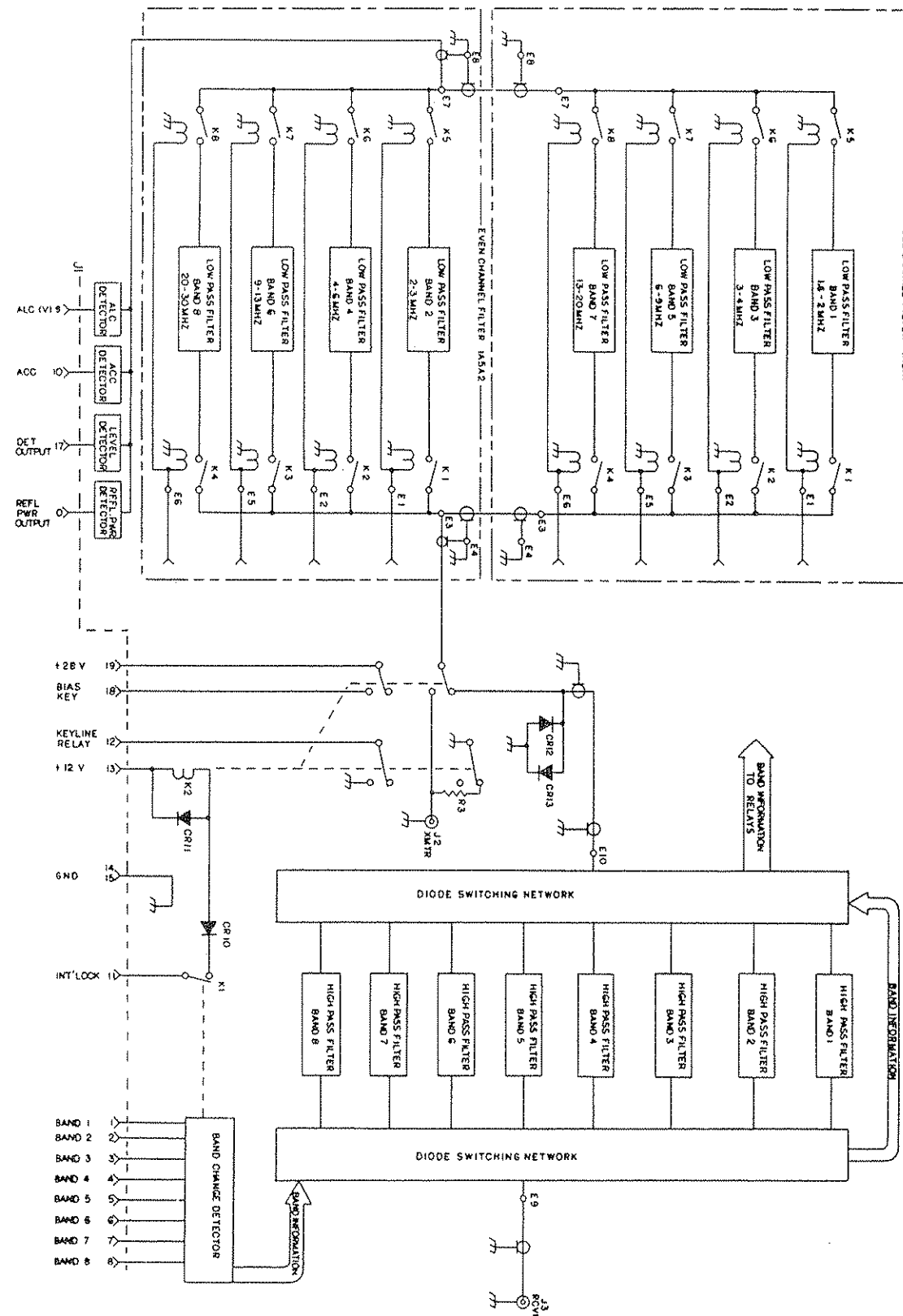


Figure 4.9 Filter Module (1A5) Block Diagram

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from receive to transmit (grounds +12R and energizes +12T), and switches the front panel meter from "S" meter to output monitor.

4.7.7 REFLECTED POWER DETECTOR

The Reflected Power Detector provides an ALC output proportional to reflected power (VSWR) to protect the RF power amplifier. If the VSWR is less than 2 to 1, no ALC action is generated. As the VSWR increases above 2 to 1, the ALC voltage increases and reduces system gain, keeping the PA dissipation within safe limits.

4.8 METER PANEL 1A2

A schematic diagram of the meter panel is shown in Figure 5.23. The meter panel is used on GSB-900DX transceivers which do not require an antenna coupler. The meter reads received signal strength in "S" units in the receive mode, and relative forward power output in the transmit mode.

If a control panel is installed in lieu of the meter panel, refer to the appropriate manual for operation and maintenance.

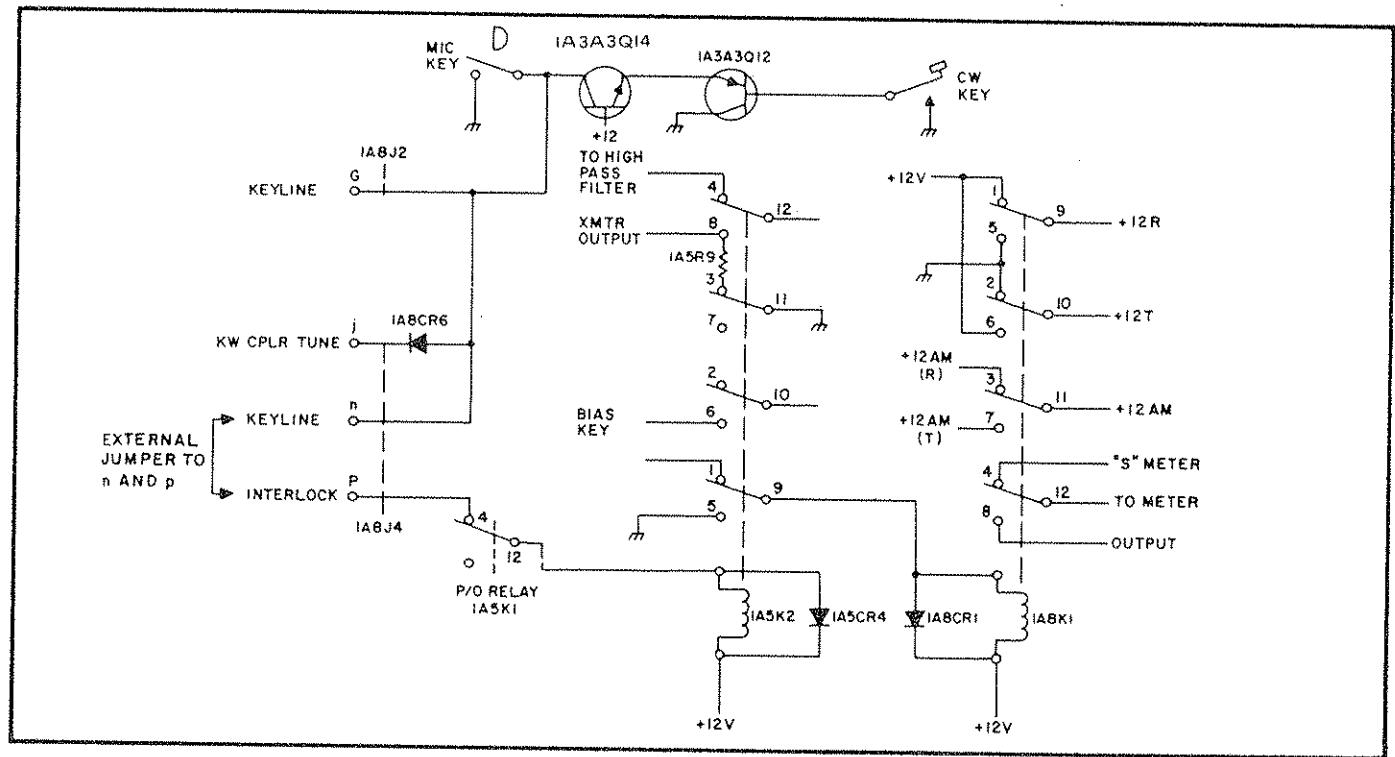


Figure 4.10 Keying Circuit

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SECTION 5

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 module or subassembly. Also included in this section are module removal procedures.

5.2 PREVENTIVE 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 proper mating.

5.3 COVER REMOVAL

To remove the top and bottom covers from the equipment perform the following steps (See Figure 5.1).

- a. Remove the Phillip's screws at the rear of each cover.
- b. Unsnap the two fasteners on each side of the equipment for each cover and pull the cover up and back from the front panel.

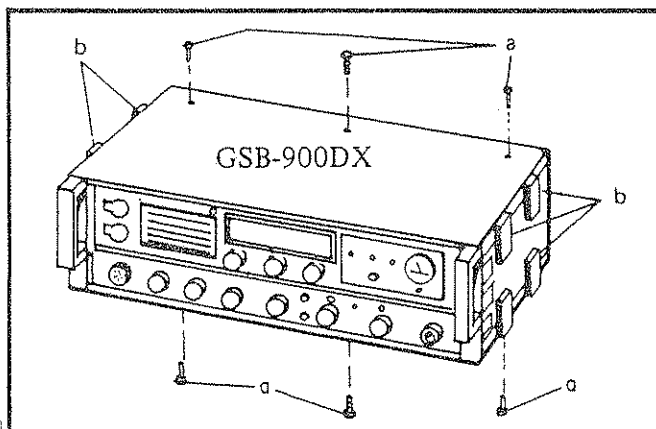


Figure 5.1 GSB-900DX Cover Disassembly

5.4 PERFORMANCE TEST

The following tests will provide overall performance data on this equipment as well as aid in determining specific problems or a deterioration in performance.

5.4.1 TEST EQUIPMENT

The following test equipment or equivalent is required to perform the following procedures:

- a. RF Signal Generator - Wavetek 3001
- b. Audio Voltmeter - HP400E
- c. RF Voltmeter - HP410C
- d. Coax Tee Connector - HP11042A
- e. Oscilloscope - Tektronix 2445
- f. Frequency Counter - Systron Donner 6242A/option 10
- g. Digital Voltmeter - HP3468A
- h. VOM - Simpson 260
- i. Audio Oscillator - HP204D
- j. Dummy Load, 50 Ohms @150W - Bird 8185
- k. Thruline Wattmeter, 100W - Bird 43
- l. RF Voltmeter - Boonton 92E with both open circuit probe tip and 50 ohm BNC adapter 918A
- m. DC Power Supply - 0 to 40VAC, 35A, HP6269B
- n. Spectrum Analyzer (optional) with:
HP141T Display Section
HP8554B RF Section
HP8552A IF Section
- o. Vector Impedance Meter (optional)
HP4193A
- p. Sunair CW Key, Microphone, Service Kit.

5.4.2 PRELIMINARY

a. Connect AC power cable to rear panel connector J3 and to a 115 AC, 50 to 60 Hz, 1 phase power source (or 230 VAC, if a 230 VAC power cable is used).

b. Using the coaxial cable, connect the rf signal generator, paragraph 5.4.1 item A, to the rear panel antenna connector, J1.

c. Set front panel controls to the following positions listed in Table 5.1.

Refer to Figure 5.17 for Front Panel wiring and Figure 5.19 for Main Frame wiring diagrams with their appropriate parts lists.

SWITCH or CONTROL	POSITION
FREQUENCY Switches	01.6000 MHz
MODE Switch	LSB
RF GAIN Control	Fully Clockwise
XMIT GAIN Control	Fully Counter Clockwise
DIMMER Control	Fully Counter Clockwise
VFO Control	PUSH IN
VOLume Control	Fully Counter Clockwise

Table 5.1 Front Panel Control Test Positions

5.4.3 POWER SUPPLY (1A6)

STEP No.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1.	Power Turn On		Perform Steps A thru C of paragraph 5.4.2	
2	+5 VDC	VOM on 10 VDC range, common lead on chassis ground, "+" lead on either lead of 0.22 ohm resistor, R14 on regulator board, 1A6A1.	Read Voltage on VOM	VOM should read between +4.75 and +5.25 volts. If not, check line fuses 1A8F1 and 1A8F2, and fuse 1A6A1 F3 on regulator board, and 1A6A1Q4 and associated circuitry.
3	+12 VDC	VOM on 50 VDC range, common lead on chassis ground, "+" lead on either lead of 0.22 ohm resistor, R6, on regulator board, 1A6A1.	Read voltage on VOM	VOM should read between +11.2 and +12.8 volts. First check fuse 1A6A F2 on regulator board, and 1A6A1Q2 and associated circuitry.
4	+28 VDC	VOM on 50 VDC range, common lead on chassis ground, "+" lead on P in A of power amplifier connector 1A8P1.	Read voltage on VOM	VOM should read between +26.5 and +29.5 volts. If not, check fuse 1A6A1 F1, transistor 1A6Q101, and 1A6A1Q2 and associated circuitry.

5.4.4 FRONT PANEL (1A1) AND MAIN FRAME (1A8)

1	DIMMER		Advance DIMMER switch fully CW.	Meter and frequency dials should be lighted. If not, check cabling in front panel and main chassis for broken or shorted wires.
2a	LOW LIMIT FREQ. light		Turn frequency switches to 1.5000 MHz	LOW LIMIT FREQ. lights should be lit and "S" meter should read full scale. If not, check cabling around front panel switches S1, S2, and S3.
2b	Same as 2a above		Turn frequency switches to 1.6000 MHz	LOW LIMIT FREQ. light should be out and "S" meter should read zero. If not, check transistor 1A3A4 Q4 on audio board.
3a	VFO Control		Pull out VFO control	Lamp below VFO control should be lighted.
3b	Same as 3a above		Push in VFO control	Lamp below VFO control should be out.
4	AUDIO jack		Adjust turn VOLUME control approximately 1/2 CW.	Noise should be heard in the background coming from the speaker.
5	L.O. Blanker (1A8A1)		Sequence 1 MHz Frequency control switch through each of its positions (both clockwise and counterclockwise) with MODE switch in USB.	Brief blanking of receiver noise whenever switch position is changed. If faulty, refer to schematic and check voltages and waveforms.

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5.4.5 RECEIVER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1			Perform steps a thru c of par. 5.4.2.	
2	Sensitivity	Audio VTVM on phone jack on front panel for steps 2 through 7.	Turn VOLUME control to 1/4 CW. Set RF signal generator to 50 microvolts at 16.0 MHz and adjust frequency for a peak audio signal on audio VTVM.	Peak indication. If none, consult sections 4.3.2, 4.3.3, and 4.3.4. Check for synthesizer outputs at LO 1, LO 2, and LO 3 on Receiver/Exciter Mother Board 1A3A5. See section 5.5.
3	Same		Remove coax cable from RF signal generator output. Adjust GSB-900DX VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale.
4	Same		Reconnect coax cable to RF generator and set generator to 5.0 microvolts (into 50 ohms).	Minimum 10db increase over level in step 3. If not, realign VHF mixer board (1A3A1) and IF/Filter Board (1A3A2). See par. 5.6.1 and 5.6.2.
5	Same		Set MODE switch to USB and repeat steps 3 and 4 above.	If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter Board (1A3A2).
6	Same		Adjust RF signal generator frequency for "zero beat", and increase output to 3 microvolts (into 50 ohms). Set MODE switch to AM position and adjust VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale. If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter board (1A3A2).
7	AM Sensitivity		Turn on 30% modulation at 1 kHz on RF signal generator.	Minimum 10db increase over level in step 6.
8	AGC Control	Audio VTVM on PHONE jack on front panel and VOM set on 10 VDC range, between test point 1A3A4 TP1, on audio board and chassis ground for steps 8 thru 12.	Remove 1 kHz modulation and set signal generator or output to zero, set MODE switch to USB.	VOM should read between +7.5 and +9.0 VDC, and "S" meter should read zero. If "S" meter reads full scale, check wiring around RF gain control and transistor Q4 on the audio board, (1A3A4).
9	Same		Set signal generator output to 5 microvolts and adjust frequency for peak audio VTVM reading.	VOM should read down scale and "S" meter should begin to read upscale.
10	AGC Control		Adjust GSB-900 VOLUME control for audio VTVM reading of -10db on the 1 volt scale.	-10db on 1 volt scale.
11	Same		Increase RF signal generator output to 500,000 microvolts.	VTVM should increase 15db or less from reading in step 10, and "S" meter should read full scale. If not, check 1A3A4 Q5 and associated circuitry.
12	RF GAIN control		Turn RF GAIN control fully counter clockwise.	Reading on VTVM should decrease at least 30db from reading in step 11. If not, check wiring on RF GAIN control and 1A3A4 Q12.
13	Same		Turn RF signal level to zero.	"S" meter should remain at full scale.
14			Turn RF GAIN control fully clockwise.	"S" meter reading should decay to zero.
15	SPEAKER		Turn RF signal generator level to 5 microvolts and turn SPEAKER switch to ON.	Audio present at speaker.
16	600 ohm AUDIO OUTPUT	Audio VTVM between pins E and F of rear panel AUDIO connector 1A8J2.	Set RF signal generator to 100 microvolts. Adjust potentiometer, R48, on the audio board (1A3A4), to provide a VTVM level of '0' dBm (800 MV RMS).	'0' dBm reading. If not, check integrated circuit, 1A3A4 U1, and associated circuitry.

5.4.6 TRANSMITTER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1		Dummy load connected through coaxial cable to rear panel ANT connector, 1A8J1 through coaxial connector. HP410B VTVM connected to remaining port of coaxial for steps 1 thru 8.	Frequency dials set for 16.0000 MHz, mode switch at LSB, XMIT GAIN fully counterclockwise	
2	AM Carrier check & adjustment		Turn mode switch to COUPLER TUNE. Adjust potentiometer, R1 (ACC Control), on sideband generator board (1A3A3) to give a VTVM reading of 42 VRMS.	VTVM should read 42 VRMS. If not, check relays 1A8K1 and 1A8K2, Diode 1A8CR6 (on rear panel ACCESSORY connector 1A8J4), see sections 4.4 and 4.5. If RF power amplifier is suspected, see section 5.8.4.
3	CW Power output check & adjustment sidetone check		Turn MODE switch to CW position. Insert CW key in KEY jack on front panel. Turn SPEAKER switch ON and adjust VOLUME control to 1/3 CW. Depress CW key and adjust ALC control, R55, on sideband generator board (1A3A3) to give a VTVM reading of 71 VRMS.	VTVM should read 71 VRMS. If not check Q6, Q7, Q8 and Q12, and associated circuitry on sideband generator board (1A3A3). A 1 kHz tone should be heard through the speaker when the key is depressed and the transmitter should remain keyed for approximately one second after the CW key is released. If not, check 1A3A3 Q12 and associated circuitry.
4	CARRIER NULL		Insert microphone into MIC connector on front panel. Turn XMIT GAIN fully CCW. Turn MODE switch to USB and depress microphone push to talk switch. Adjust carrier balance controls R34 and C26 on the sideband generator (1A3A3) for the best null.	VTVM should read less than .5 VRMS. If not, check CR3, CR4, CR5, CR6, and associated circuitry on the sideband generator (1A3A3) for defective components.
5	USB		Turn XMIT GAIN control to approximately 1/3 CW. Key microphone and speak in a normal voice, holding microphone within 1/2 inch of lips. Observe VTVM reading.	VTVM should show a peak reading of 70 VRMS. If not, check wiring around MIC connector and chassis and check 1A3A3 Q4 and associated circuitry, check voltage ALC circuits.
6	LSB		Turn MODE switch to LSB repeat step 5 above.	VTVM should show a peak reading of 70 VRMS.
7	AM		Turn mode switch to AM repeat step 5 above.	VTVM should read approximately 42 VRMS until modulation is applied, then will rise to a peak of approximately 70 VRMS.
8	600 ohm input	Connect audio VTVM and audio oscillator, set to 1 kHz, to pins band C of AUDIO connector 1A8J2 located on the rear panel.	Adjust audio oscillator output for '0' dBm on the audio VTVM. Turn XMIT GAIN control full CCW, and MODE switch to USB. Key transmitter with microphone and adjust R58 on audio board 1A3A4, until RF VTVM reads 70 VRMS.	If no output is obtained, check cabling, 1A3A4 T2, 1A3A4 R58, 1A3A3 Q11, and associated circuitry.
9	I.F. Gain adjustment	Same as in 1 above	Set FREQUENCY dial for 29.99 MHz. Extend VHF Mixer out of card basket using extender card. Turn 1A3A1R16 fully CCW. Place MODE switch in CW and depress CW key. Turn 1A3A1R16 CW until power output levels off. Advance 1A3A1R16 approx. 15° beyond this point. Replace VHF Mixer in card basket.	VTVM reading between 67 and 71 volts RMS.

5.5 SYNTHESIZER

The following paragraphs provide troubleshooting and fault isolation information for those problems peculiar to the synthesizer.

5.5.1 FAULT ANALYSIS

The Synthesizer Fault Analysis Table, contained in the following

subparagraphs, is designed to isolate a faulty assembly first and then a faulty stage. If the defective assembly has been isolated by substitution, then the technician may proceed directly to the appropriate paragraph to isolate the faulty stage. Once a defective stage has been found, refer to the appropriate circuit diagram and make voltage checks to isolate the faulty component.

5.5.1.1 PRELIMINARY CHECKS

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
1	Freq. Std. output	Oscilloscope probe at X1A4A1 pin 5.	Check for proper wave form.	300 to 900 mv p-p sine wave, 200 nsec. rep. rate	a) Freq. Std. (1A8U1) and associated wiring. b) Spectrum Gen. (1A4A1) for shorted input.
2	Freq. Std. Alignment	Same as step 1 above except connect Frequency Counter to Vertical Output of oscilloscope.	Measure frequency. If out of tolerance: remove access screw at top of Freq. Std., adjust Frequency Trim and replace access screw.	Frequency within ± 5 Hz of 5,000,000 MHz.	If proper alignment cannot be obtained, Frequency Standard must be replaced.
3	Low Digit Phase Lock	Oscilloscope probe at test point 1A4A2TP3.	Set all FREQUENCY knobs to "O". Refer to Low Digit Gen. schematic and check waveform.	D.C. level of 1.5V to 2.5V	a) H.F. VCO Coarse Steering Voltage (see table 5.9) If faulty, check R12 through R22 located on the back of the 10 kHz switch (1A1S4). Also check associated front panel wiring. b) 1 kHz and 17 MHz references (consult Spectrum Gen., 1A4A1 schematic). If faulty, check Spectrum Gen.

5.5.1 ELIMINARY CHECKS (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK:
4	VHF Loop Phase Lock	Oscilloscope probe at test point 1A4A4TP1.	Set all FREQUENCY knobs to "0". Consult VHF Divider schematic and check waveform.	D.C. level of 1.5V to 2.5V	c) Frequency Control lines (consult tables 5.2 thru 5.8). If faulty, check Frequency control switches on front panel and associated main frame wiring. d) Low Digit Gen. voltage readings (consult schematic). e) Low Digit Gen. alignment (See section 5.5.2.2). a) VHF VCO Coarse Steering Voltage (see table 5.8). If faulty, check R1 thru R11 located on the back of the 1 MHz switch (1A1S2). Also check associated front panel wiring. b) Translator output (consult Translator schematic and if faulty, repair translator section 5.5.2.3). c) Frequency Control lines (consult tables 5.2 thru 5.8) If faulty check Frequency Control switches on front panel and associated wiring. d) VHF Divider voltage readings (consult schematic). If faulty repair VHF Divider. e) VCO output (consult VCO schematic and section 5.5.2.5). If faulty repair VCO.
5	VFO operation	Oscilloscope probe at 1A4A3U2 pin 6. Connect Vertical Ampl. output of oscilloscope to Frequency Counter (place Translator on extender card)	Pull out front panel VFO control. Rotate control to both extreme positions and measure frequency.	Minimum adjustment range of 20.995 to 21.005 MHz	a) VFO control voltage range at 1A4A3 pin A. Normal range is 4.2V (control CW) to 12V (control CCW). If faulty, check VFO control (1A1R27) on front panel and associated wiring. b) VFO ON/OFF control line. Should be +12V with control pulled out and OV with control pushed in. If faulty, check VFO control (1A1R27) on front panel and associated wiring. c) Faulty component in Translator VFO circuit. Consult Translator schematic and perform voltage check. d) Misalignment of VFO circuit in Translator. Consult alignment procedure (section 5.5.2.3).

5.5.1.2 FREQUENCY CODING

The following tables (5.2 thru 5.8) are provided to assist in making the preliminary checks described in this section.

10 MHz DIAL	X1A4A5 Pin Numbers (Function)		
	18(Band "0" Command)	17(Band "1" Command)	16(Band "2" Command)
0	0	1	1
1	1	0	1
2	1	1	0

NOTE

1. A "0" indicates short circuit to chassis ground

2. A "1" indicates open circuit to chassis ground

3. All readings taken with VCO (1A4A5) disconnected from X1A4A5

Table 5.2 10 MHz Switch

1 MHz DIAL	X1A4A4 Pin Numbers (Function)			
	J (2 ⁰ 1 MHz)	H (2 ¹ 1 MHz)	8 (2 ² 1 MHz)	7 (2 ³ 1 MHz)
0	1	0	0	1
1	0	0	0	1
2	1	1	1	0
3	0	1	1	0
4	1	0	1	0
5	0	0	1	0
6	1	1	0	0
7	0	1	0	0
8	1	0	0	0
9	0	0	0	0

NOTE

1. A "0" indicates short circuit to chassis ground

2. A "1" indicates open circuit to chassis ground

3. All readings taken with VHF Divider (1A4A4) disconnected from X1A4A4.

Table 5.3 1 MHz Switch

100 kHz DIAL	X1A4A4 Pin Numbers (Function)			
	4 (2^3 100 kHz)	5 (2^2 100 kHz)	D (2^1 100 kHz)	E (2^0 100 kHz)
0	0	0	0	0
1	1	0	0	1
2	1	0	0	0
3	0	1	1	1
4	0	1	1	0
5	0	1	0	1
6	0	1	0	0
7	0	0	1	1
8	0	0	1	0
9	0	0	0	1

NOTE

1. A "0" indicates short circuit to chassis ground

2. A "1" indicates open circuit to chassis ground

3. All readings taken with VHF Divider (1A4A4) disconnected from X1A4A4

Table 5.4 100 kHz Switch

10 kHz DIAL	X1A4A2 Pin Numbers (Function)			
	R (2^3 10 kHz)	15 (2^2 10 kHz)	14 (2^1 10 kHz)	S (2^0 1 kHz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. A "0" indicates short circuit to chassis ground

2. A "1" indicates open circuit to chassis ground

3. All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A4

Table 5.5 10 kHz Switch

1 kHz DIAL	X1A4A2 Pin Numbers (Function)			
	N (2^3 1 kHz)	13 (2^2 1 kHz)	12 (2^1 1 kHz)	P (2^0 1 kHz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. A "0" indicates short circuit to chassis ground
2. A "1" indicates open circuit to chassis ground
3. All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A2

Table 5.6 1 kHz Switch

100 Hz DIAL	X1A4A2 Pin Numbers (Function)			
	L (2^3 100 Hz)	11 (2^2 100 Hz)	10 (2^1 100 Hz)	M (2^0 100 Hz)
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1

NOTE

1. A "0" indicates short circuit to chassis ground
2. A "1" indicates open circuit to chassis ground
3. All readings taken with Low Digit Generator (1A4A2) disconnected from X1A4A2

Table 5.7 100 Hz Switch

I H.F. VCO (Low Digit Coarse Steering)

10 kHz DIAL	X1A4A2 pin U VOLTS
0	3.50
1	3.85
2	4.15
3	4.55
4	4.95
5	5.40
6	5.90
7	6.40
8	7.00
9	7.70

II VHF VCO (VCO Coarse Steering)

1 MHz DIAL	X1A4A5 pin 15 VOLTS
0	1.37
1	1.78
2	2.18
3	2.75
4	3.31
5	4.12
6	4.93
7	6.15
8	7.85
9	9.56

NOTE

*All voltages above measured with
20,000 ohm/volt meter. Variations
of $\pm 5\%$ are permissible*

Table 5.8 Coarse Steering Voltage Readings

5.5.2 SYNTHESIZER SUBASSEMBLY TESTING AND ALIGNMENT PROCEDURES

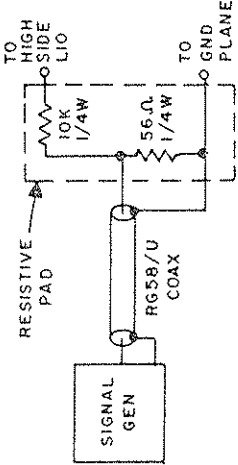
The following paragraphs give the testing and alignment procedures for the synthesizer printed circuit board subassemblies. It is assumed that the defective subassembly has first been isolated either by substitution or by following the preliminary checks of Section 5.5.1.1. During the following tests, the printed circuit board being tested should be extended from the card basket using the extender card (Sunair No. 5024003098) supplied in the ancillary kit.

At any step in the procedure, if the required result cannot be obtained, refer to the schematic of the subassembly and make suitable voltage measurements to isolate the faulty component. When the faulty subassembly has been restored to operation the preliminary checks of Section 5.5.1.1 should be repeated to ensure full synthesizer operation.

5.5.2.1 SPECTRUM GENERATOR TESTING AND ALIGNMENT

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	20 MHz ref. alignment and test	Oscilloscope probe at 1A4A1 pin 1. Connect frequency counter to Vertical Ampl. output of oscilloscope.	Tune L2, L3 & L4 for maximum output. NOTE <i>Adjustments interact and must be repeated until no further increase in output can be obtained.</i>	Minimum output of 300 mv p-p (sine wave) on oscilloscope. Frequency of 20 MHz $\pm$ 20 Hz on Frequency counter. NOTE <i>If proper output cannot be obtained, refer to the schematic and check U1, U2, U3 and their associated circuitry.</i>
2	1 kHz ref. output	Oscilloscope probe on 1A4A1 pin 18	Consult schematic and check waveform	Pulse with following parameters: Rep. rate= 1 millisecond Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V
3	100 kHz Ref. output	Oscilloscope probe on 1A4A1 pin 17	Consult schematic and check waveform	Pulse with following parameters: Rep. rate= 10 microseconds Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V

5.5.2.1 SPECTRUM GENERATOR TESTING AND ALIGNMENT (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	21 MHz Ref. alignment and test	RF voltmeter with unterminated tip on 1A4A1 pin 4. Connect signal generator as shown below. Set generator frequency to 21.00 MHz using Frequency Counter. Temporarily short jumper between U8 pin 2 and ground plane of printed circuit board. Similarly solder short jumper across L7. 	Set generator level to 250 mv RMS. Tune L8, L9 & L10 for maximum output on RF voltmeter. NOTE <i>Adjustments interact and must be repeated until no further increase in output can be obtained.</i> Tune L10 for maximum output on RF voltmeter	
4b	21 MHz Ref. alignment and test	Same as 4a above except remove 10K resistor from L10 and connect to high side of L9	Tune L9 for maximum output. Repeat L10 for maximum output. Repeat tuning of L9 and L10 until no further output can be obtained	
4c	21 MHz Ref. alignment and test	Same as 4a above except remove 10K resistor from L10 and connect to high side of L8.	Tune L8, L9 and L10 for maximum output. Repeat tuning, in sequence, until no further output can be obtained	
4d	21 MHz Ref. alignment and test	Leave RF voltmeter connected as in step 4a above. Disconnect the (2) jumpers and resistive pad network added in step 4a.	Carefully repeat L8, L9 and L10 for maximum output. Repeat tuning, in sequence, until no further output can be obtained	Meter indication of 85 mv RMS minimum, when tuning is complete. NOTE <i>If proper output cannot be obtained, refer to schematic and check Q1, Q2, and U8 and their associated circuitry. Also check CR4 thru CR7 and associated circuitry.</i>
5a	3rd L.O. (10.5 MHz Ref.) output	Connect RF voltmeter to 1A4A1 pin 13. Connect oscilloscope to U10 pin 8.	Place MODE switch on front panel in USB position. Refer to schematic and check waveform at U10 pin 8. Disconnect oscilloscope.	a) Proper oscilloscope waveform. b) RF voltmeter indication of 100 mv RMS minimum.
5b	3rd L.O. (10.5 MHz Ref.) output	Same as 5a above	Place MODE switch in AM position	RF voltmeter reading decreases at least 20 dB from that obtained in 5a above

5.14

5.14

5.5.2.2 LOW DIGIT GENERATOR (1A4A2)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	17 MHz Ref.	Connect RF voltmeter to 1A4A2 pin C	Check RF voltmeter reading	Reading greater than 100 mv RMS. If out of specification, check C28, L9 and R21
2	1 kHz Ref.	Connect oscilloscope to 1A4A2 pin 18	Display waveform on scope	Pulse present with the following parameters: rep. rate=1 msec. Duty ratio=0.2 Logical "0" level: less than 0.6V Logical "1" level: greater than 2.2V If out of specification, check U2 and associated circuitry
3	Phase Lock	Connect oscilloscope to 1A4A2 pin 1. Connect vertical Ampl. output of oscilloscope to frequency counter. Connect V.O.M. to TP3.	Set 10 kHz, 1 kHz and 100 Hz frequency dials on front panel to "0"	V.O.M. should indicate approximately 1.5V.

NOTE

If V.O.M. reads approximately 0.8V or 5V, this is an "out of phase lock" indication. Check:

- Voltage at TP1 (see schematic) if incorrect, check CR5, Q2 and associated circuitry
- Refer to schematic and check waveform at TP2. If no signal is present, check Q1, U1 and associated circuitry
- Refer to schematic and check waveforms at U7, U8, U9, U10, U11, and U2.
- If the waveform at pin 1 of U7A deviates from the correct waveform on the schematic, check U6, Q3 and associated circuitry.

If "out of Phase Lock" condition does not exist proceed to Step 4.

5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	Output frequency	Same as Step 3 above	Measure output frequency	Output frequency of 1.5000 MHz ± 2 Hz. If out of tolerance: a) Refer to tables 5.5, 5.6, 5.7 and check 10 kHz, 1 kHz and 100 Hz preset lines. b) Refer to schematic and check waveforms at U3, U4, U7, U8, U9, U10 and U11
4b	Output frequency	Same as Step 3 above	Set 1 kHz and 100 Hz dials at "5"	Output frequency of 1.5055 MHz ± 2 Hz. V.O.M. indication of $1.95 \pm 0.25V$. NOTE a) If V.O.M. indication is out of tolerance but frequency is correct, proceed to step 5 and align VCO (Q1). b) If both frequency and V.O.M. readings are out of tolerance, refer to schematic and check U3, U4, U8, U9 and associated circuitry.
4c	Output frequency	Same as Step 3 above	Leave 1 kHz and 100 Hz dials set at "0". Set 10 kHz dial at 9.	Output frequency of 1.5955 MHz ± 2 Hz. V.O.M. indication of $1.95 \pm 0.25V$. NOTE a) If V.O.M. indication is out of tolerance but frequency is correct, proceed to Step 6 and align VCO (Q1). b) If both frequency and V.O.M. readings are out of tolerance, refer to schematic and check U10 and associated circuitry.

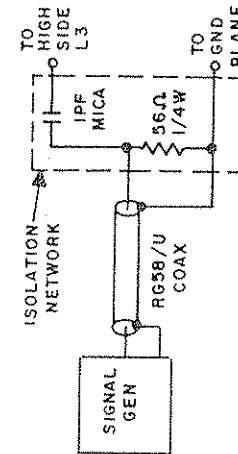
5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE																														
4d	Output frequency	Same as Step 3 above	Follow the table below and check for required frequencies <table><tr><th>10 kHz DIAL</th><th>1 kHz DIAL</th><th>100 Hz DIAL</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>2</td></tr><tr><td>0</td><td>0</td><td>3</td></tr><tr><td>0</td><td>0</td><td>4</td></tr><tr><td>0</td><td>0</td><td>5</td></tr><tr><td>0</td><td>0</td><td>6</td></tr><tr><td>0</td><td>0</td><td>7</td></tr><tr><td>0</td><td>0</td><td>8</td></tr><tr><td>0</td><td>0</td><td>9</td></tr></table>	10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	0	0	1	0	0	2	0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0	0	9	FREQUENCY (+2 Hz) 1.5001 MHz 1.5002 MHz 1.5003 MHz 1.5004 MHz 1.5005 MHz 1.5006 MHz 1.5007 MHz 1.5008 MHz 1.5009 MHz <i>If the required frequencies cannot be obtained, refer to schematic and check U8.</i>
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL																																
0	0	1																																
0	0	2																																
0	0	3																																
0	0	4																																
0	0	5																																
0	0	6																																
0	0	7																																
0	0	8																																
0	0	9																																
4e	Output frequency	Same as Step 3 above	Follow the table below: <table><tr><th>10 kHz DIAL</th><th>1 kHz DIAL</th><th>100 Hz DIAL</th></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>2</td><td>0</td></tr><tr><td>0</td><td>3</td><td>0</td></tr><tr><td>0</td><td>4</td><td>0</td></tr><tr><td>0</td><td>5</td><td>0</td></tr><tr><td>0</td><td>6</td><td>0</td></tr><tr><td>0</td><td>7</td><td>0</td></tr><tr><td>0</td><td>8</td><td>0</td></tr><tr><td>0</td><td>9</td><td>0</td></tr></table>	10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	0	1	0	0	2	0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0	0	9	0	FREQUENCY (+2 Hz) 1.5010 MHz 1.5020 MHz 1.5030 MHz 1.5040 MHz 1.5050 MHz 1.5060 MHz 1.5070 MHz 1.5080 MHz 1.5090 MHz <i>If the required frequencies cannot be obtained, refer to schematic and check U9.</i>
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL																																
0	1	0																																
0	2	0																																
0	3	0																																
0	4	0																																
0	5	0																																
0	6	0																																
0	7	0																																
0	8	0																																
0	9	0																																
4f	Output frequency	Same as Step 3 above	Follow the table below: <table><tr><th>10 kHz DIAL</th><th>1 kHz DIAL</th><th>100 Hz DIAL</th></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>2</td><td>0</td><td>0</td></tr><tr><td>3</td><td>0</td><td>0</td></tr><tr><td>4</td><td>0</td><td>0</td></tr><tr><td>5</td><td>0</td><td>0</td></tr><tr><td>6</td><td>0</td><td>0</td></tr><tr><td>7</td><td>0</td><td>0</td></tr><tr><td>8</td><td>0</td><td>0</td></tr><tr><td>9</td><td>0</td><td>0</td></tr></table>	10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	1	0	0	2	0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0	0	9	0	0	FREQUENCY (+2 Hz) 1.5100 MHz 1.5200 MHz 1.5300 MHz 1.5400 MHz 1.5500 MHz 1.5600 MHz 1.5700 MHz 1.5800 MHz 1.5900 MHz <i>See Note on following page.</i>
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL																																
1	0	0																																
2	0	0																																
3	0	0																																
4	0	0																																
5	0	0																																
6	0	0																																
7	0	0																																
8	0	0																																
9	0	0																																

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5a	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "0"	NOTE If the required frequencies cannot be obtained, refer to schematic and check U10. Output level of 200 mv p-p minimum.
5b	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "9"	
			NOTE If the required results cannot be obtained in Steps 5a and 5b above, refer to schematic and check Q5, Q6, U5 and associated circuitry.	
6a	VCO alignment	Same as Step 3 above	NOTE The alignment of the VCO, detailed in Step 6 below, should only be necessary if a component has been replaced in the voltage controlled oscillator (VCO) circuit (Q1). All other causes of improper operation should first be checked before proceeding with the alignment. Set 1 kHz and 10 kHz dials to "5". Set 10 kHz dial to "0". Tune L3 for a V.O.M. indication of 1.95 ± 0.25 volts.	
6b	VCO alignment	Same as Step 3 above	Leave 1 kHz and 100 Hz dials set at "5". Tune C8 for a V.O.M. indication of 1.95 ± 0.25 volts.	
6c	VCO alignment	Same as Step 3 above	Repeat 6a and 6b until required performance is obtained.	When tracking is complete, the V.O.M. should read 1.95 ± 0.25 volts at both settings of the 10 kHz dial.

5.5.2.3 TRANSLATOR (1A4A3)

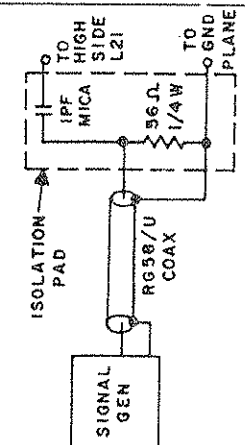
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	21 MHz Ampl. alignment and test	Oscilloscope probe on TP4.	Place front panel VFO control in "IN" position. Tune L23 for maximum output.	Sine wave, 800 mv p-p min. rep. rate = 47.6 nsec. NOTE <i>If required output cannot be obtained, refer to schematic and check U1 and associated circuitry.</i>
2a	VFO alignment and test	Same as step 1 above. Except also connect V.O.M. to 1A4A3 pin A. Connect Frequency Counter to Vertical Ampl. output of oscilloscope.	Pull OUT front panel VFO control. Rotate VFO until a reading of 7.6V is obtained on the V.O.M. Tune L23 until the VFO circuit begins to oscillate. Carefully rock the adjustment of L23 back and forth to center the tuning in the middle of the oscillation range.	
2b	VFO alignment (cont'd)	same as 2a above.	Adjust L22 for a frequency counter reading of 21.0000 MHz ± 100 Hz. If this frequency cannot be obtained within the adjustment range of L22, slight adjustment of L23 is permissible to obtain the correct frequency.	Frequency counter reading of 21.0000 MHz ± 100 Hz. Oscilloscope should indicate a sine wave, 700 mv p-p minimum amplitude.
2c	VFO alignment (cont'd)	same as 2a above.	Rotate VFO control over its complete range. When the test is complete, place the VFO control in the "IN" position.	Oscilloscope amplitude should remain greater than 700 mv p-p. The Frequency should vary as a minimum between 20.995 and 21.005 MHz. NOTE <i>If the required results cannot be obtained, refer to the schematic and check Q1, Q3, U2 and their associated circuitry. If the VFO cannot be aligned on frequency, VFO crystal, Y1, should be replaced.</i>
3a	19.45 MHz Ampl.	Connect RF voltmeter to U3 pin 6. Temporarily unplug the Low Digit Generator, 1A4A2, from the mother board. Temporarily solder a short jumper from U1 pin 2 to the printed circuit board ground plane. Set the signal generator frequency to 19.45 MHz using the Frequency Counter. Set the generator level to 250 mv RMS and connect as shown above.	Tune L3 and L5 for max. RF voltmeter reading. As tuning progresses, reduce signal generator level to keep RF voltmeter reading below 100 mv RMS.	



5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

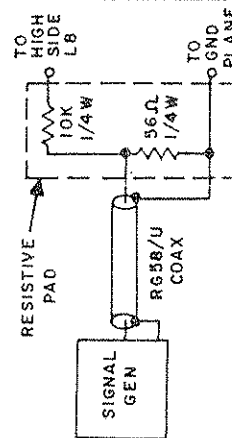
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
3b	19.45 MHz alignment (cont'd)	Disconnect 1 pf capacitor from high side of L3 and connect to the high side of L2. Set the generator level to 250 mv RMS.	Tune L2 and L3 for max. RF voltmeter reading (adjustments interact). As the tuning progresses, reduce the generator level to keep the RF voltmeter reading below 100 mv RMS.	
3c	19.45 MHz alignment (cont'd)	Disconnect 1 pf capacitor from high side of L2 and connect to the high side of L1. Set the generator level to 250 mv RMS.	Tune L1, L2 and L3 for max. RF voltmeter reading (adjustments interact). As the tuning progresses, reduce the generator level to keep the RF voltmeter reading below 100 mv RMS.	
3d	19.45 MHz alignment (cont'd)	Disconnect the isolation network signal generator and jumper wire added in 3a above. Plug the Low Digit Generator back into the mother board. Place the V.O.M. on the 10V D.C. range and connect to U3 pin 1. Connect the RF voltmeter to TP1. Terminate TP1 in a 50 ohm lead.	Carefully repeat the slugs on L1, L2, L3 and L4. A point will be found where the voltage on the V.O.M. begins to increase. Tune the four inductors for max. V.O.M. indication.	When tuning is complete, the RF voltmeter should read approximately 7 mv RMS.
NOTE <i>If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d</i>				
NOTE <i>The V.O.M. is monitoring the Automatic Gain control (AGC) voltage on this amplifier.</i>				
NOTE <i>If the required performance cannot be obtained, consult the schematic and check U3, CR1 through CR4 and associated circuitry. Also check the output of the Low Digit Generator (consult schematic).</i>				
NOTE <i>The adjustments of L1, L2 and L3 interact and must be repeated, in sequence for best spurious rejection and maximum output.</i>				
NOTE <i>Approximate output level of -30 dBm at 19.45 MHz. All spurious outputs down at least 40 db from the 19.45 MHz output (typically will be 50 db down).</i>				

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4	2nd L.O. alignment and test	Oscilloscope probe at 1A4A3 pin 11. Connect ground lead of probe to printed circuit board ground plane. Connect Vertical Ampl. output of oscilloscope to frequency counter.	Tune L17 until the circuit breaks into oscillation (as evidenced by a sudden increase in meter reading). Tune L25 for maximum meter indication. Carefully rock L17 back and forth to adjust the circuit to the center of its oscillation range.	Minimum output level of 300 mv p-p. Output frequency of 80.7500 MHz $\pm$ 4 kHz.
NOTE <i>If required output cannot be obtained, refer to schematic and check Q7, Q9 and their associated circuitry. If the frequency is out of tolerance, replace crystal Y2.</i>				
5a	100.75 MHz Band-pass Filter alignment and test	Temporarily solder a short jumper between Q8 gate #1 and the printed circuit board ground plane. Connect RF Voltmeter, terminated in a 50 ohm tip probe, to TP3. Set signal generator to 100.75 MHz using the frequency counter. Connect signal generator as shown below. Set generator level to 250 mv RMS.	Tune L21 for maximum output on RF Voltmeter.	
				
5b	100.75 MHz Band-pass Filter alignment and test	Disconnect 1 pf capacitor from L21 and connect to the high side of L36	Tune L36 and L21 for maximum output on RF Voltmeter (adjustments interact and must be repeated until no further increase in output can be obtained).	
5c	100.75 MHz Band-pass Filter alignment and test	Disconnect 1 pf capacitor from L36 and connect to the high side of L20.	Tune L20, L36 and L21 for maximum output on RF Voltmeter (adjustments interact)	

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5d	100.75 MHz Bandpass Filter alignment and test	Disconnect 1 pF capacitor, 56 ohm resistor and signal generator. Disconnect jumper added in Step 5a above.	Carefully repeak L20, L36 and L21 for maximum RF Voltmeter indication (adjustments interact). NOTE <i>If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d</i>	After tuning is complete, RF Voltmeter should read approximately 70 mv RMS.
	100.75 MHz Bandpass Filter alignment and test (alternate procedure for use with spectrum analyzer)	Connect spectrum analyzer to TP3. Set C.F. to 100.75 MHz, scan width to 5 MHz/div & bandwidth to 300 kHz. Set display mode to LOG.	Peak L20, L36 and L21 for maximum amplitude at 100.75 MHz (adjustments interact and must be repeated until no further output can be obtained).	After tuning is complete, output level on analyzer at 100.7500 MHz should be approximately -10 dBm. All spurious outputs should be at least 40 dB below the 100.75 MHz output.
6a	81.25 MHz Bandpass Filter alignment and test	Temporarily solder a short jumper between Q11 gate 1 and the ground plane on the printed circuit board. Connect the RF voltmeter to TP2. Set the signal generator frequency to 81.25 MHz, using the frequency counter. Set the generator level at 250 mv RMS. Connect the signal generator as shown below.	Tune L8 for maximum reading on RF voltmeter.	



5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
6b	81.25 MHz B.P.F. alignment and test	Disconnect the 10K resistor from L8 and connect to the high side of L7.	Tune L7 and L8 for maximum RF voltmeter indication. NOTE <i>These adjustments interact and must be repeated until no further increase in output can be obtained.</i>	
6c	81.25 MHz B.P.F. alignment and test	Disconnect jumper, 10K resistor, 56 ohm resistor and signal generator added in step 6a.	Carefully repeak L7 and L8 for maximum indication on RF voltmeter (adjustments interact). NOTE <i>If required output cannot be obtained, check Q11 and associated circuitry.</i>	Indication of approximately 40 mv on RF voltmeter when tuning is complete.
7a	Output level adjustment	Connect oscilloscope probe to 1A4A3 pin 15 and connect ground lead of probe to the printed circuit board ground plane near pin 15.	Set front panel frequency dials (6) to 29.9999 MHz. Adjust R54 for a reading of 600 mv p-p on oscilloscope.	Oscilloscope display of 600 mv p-p, rep rate of 25 nsec (slightly distorted sine wave)
7b	Output level adjustment	Same as 7a above.	Set front panel frequency dials to 00.0000 MHz	Oscilloscope display of 600 mv p-p minimum amplitude (distorted sine wave), rep rate of 100 nsec.
				NOTE <i>If required results cannot be obtained, refer to schematic and check: Q4, Q5, Q6, Q10 and associated circuitry. Also check the VCO (1A4A5) for proper output (refer to VCO schematic)</i>

5.5.2.4 VHF DIVIDER (1A4A4)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE																														
1a	100 kHz Dial test	Connect Signal Generator to X1A4A4 pin B using 50 ohm coaxial cable. Set generator level to 100 mv RMS.	Connect VOM to TP1. Set signal generator frequency to 9.9 MHz using the frequency counter. Temporarily unplug the Translator (1A4A3) from the card basket. Set 10 MHz, 1 MHz, and 100 kHz dials on front panel to "0"	VOM indication of greater than 4.5 volts																														
1b	100 kHz Dial test	Same as 1a above	Slowly increase generator frequency	At 10.0 MHz ± 1 kHz, VOM indication should abruptly change to an indication of less than 0.9 volts.																														
NOTE <i>If the proper indication in Steps 1a and 1b above cannot be obtained, refer to schematic and check all D.C. voltages and waveforms.</i>																																		
1c	100 kHz Dial test	Same as 1a above	Follow the table below. In each case, the V.O.M. should indicate greater than 4.5 volts with the generator below the transition frequency and less than 0.9 volts above the transition frequency <table><tr><th>10 MHz DIAL</th><th>1 MHz DIAL</th><th>100 kHz DIAL</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>2</td></tr><tr><td>0</td><td>0</td><td>3</td></tr><tr><td>0</td><td>0</td><td>4</td></tr><tr><td>0</td><td>0</td><td>5</td></tr><tr><td>0</td><td>0</td><td>6</td></tr><tr><td>0</td><td>0</td><td>7</td></tr><tr><td>0</td><td>0</td><td>8</td></tr><tr><td>0</td><td>0</td><td>9</td></tr></table> Transition Frequency (± 1 kHz) 10.1 MHz 10.2 MHz 10.3 MHz 10.4 MHz 10.5 MHz 10.6 MHz 10.7 MHz 10.8 MHz 10.9 MHz	10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	0	0	1	0	0	2	0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0	0	9	NOTE <i>If the required results cannot be obtained, refer to schematic and check U3, U4, U5, U8, U9, U10, U13 and associated circuitry.</i>
10 MHz DIAL	1 MHz DIAL	100 kHz DIAL																																
0	0	1																																
0	0	2																																
0	0	3																																
0	0	4																																
0	0	5																																
0	0	6																																
0	0	7																																
0	0	8																																
0	0	9																																

5.5.2.4 VHF DIVIDER (1A4A4) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINTS	PROCEDURE	REQUIRED PERFORMANCE																														
2	1MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9 volts above the transition frequency. <table><tr><th>10 MHz DIAL</th><th>1 MHz DIAL</th><th>100 kHz DIAL</th></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>2</td><td>0</td></tr><tr><td>0</td><td>3</td><td>0</td></tr><tr><td>0</td><td>4</td><td>0</td></tr><tr><td>0</td><td>5</td><td>0</td></tr><tr><td>0</td><td>6</td><td>0</td></tr><tr><td>0</td><td>7</td><td>0</td></tr><tr><td>0</td><td>8</td><td>0</td></tr><tr><td>0</td><td>9</td><td>0</td></tr></table>	10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	0	1	0	0	2	0	0	3	0	0	4	0	0	5	0	0	6	0	0	7	0	0	8	0	0	9	0	Transition Frequency (± 1 kHz) 11.0 MHz 12.0 MHz 13.0 MHz 14.0 MHz 15.0 MHz 16.0 MHz 17.0 MHz 18.0 MHz 19.0 MHz
10 MHz DIAL	1 MHz DIAL	100 kHz DIAL																																
0	1	0																																
0	2	0																																
0	3	0																																
0	4	0																																
0	5	0																																
0	6	0																																
0	7	0																																
0	8	0																																
0	9	0																																
NOTE <i>If required results cannot be obtained, refer to schematic and check U6, U5 and associated circuitry.</i>																																		
3	10 MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9V above the transition frequency <table><tr><th>10 MHz DIAL</th><th>1 MHz DIAL</th><th>100 kHz DIAL</th></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>2</td><td>0</td><td>0</td></tr><tr><td>2</td><td>9</td><td>9</td></tr></table>	10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	1	0	0	2	0	0	2	9	9	Transition Frequency (± 1 kHz) 20.0 MHz 30.0 MHz 39.9 MHz																		
10 MHz DIAL	1 MHz DIAL	100 kHz DIAL																																
1	0	0																																
2	0	0																																
2	9	9																																
NOTE <i>If required results cannot be obtained, refer to schematic and check U7, U8A, U8B, U13 and associated circuitry.</i>																																		

SUNAIR GSB-900DX

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	Max. toggle frequency	Same as Step 1a above	Set 10 MHz dial at "2". Set 1 MHz and 100 kHz dials at "g". Set the signal generator frequency at 45 MHz. Set the generator level at 100 mv RMS.	V.O.M. should indicate less than 0.9V
4b	Max. toggle frequency	Same as Step 1a above	Slowly increase the generator frequency until the V.O.M. indicates greater than 4.5 volts.	Generator frequency greater than 50.0 MHz.
NOTE <i>If the required results cannot be obtained, refer to schematic and check:</i> a) Q1 through Q4 b) Waveform at U2 pin 3 <i>If a) and b) above check o.k. U2 should be replaced.</i>				
5.5.2.5 V.C.O. (1A4A5)				
1a	BAND "0" alignment and test	Connect frequency counter to 1st L.O. output (J1). Connect external +1.95 volts D.C. from power supply to X1A4A5 pin 4.	Set front panel 10 MHz frequency selector switch (1A1S1) to "0". Set 1 MHz frequency selector switch (1A1S2) to "0". Adjust L1 for required performance.	Frequency indication of 91.75 ± 0.2 MHz. If no output present, proceed to steps 2 and 3. If steps 2 and 3 performance is acceptable, check Q3, Q6, and associated circuitry. If no output is obtained in all three steps, -1, 2, and 3- check buffer stage Q9, Q10.
1b	BAND "0" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "0". Set front panel 1 MHz frequency selector switch (1A1S2) to "g". Adjust C16 for required performance.	Frequency indication of 100.75 ± 0.75 MHz
1c	BAND "0" alignment and test	Same as 1a above.	Repeat steps 1a and 1b until both conditions are satisfied.	91.75 ± 0.2 MHz 100.75 ± 0.75 MHz.
2a	BAND "1" alignment and test	Same as 1a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "0". Adjust L4 for required performance.	Frequency indication of 101.75 ± 0.2 MHz. If no output present, but steps 1 and 3 are correct, check Q4, Q7, and associated circuitry.
2b	BAND "1" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "g".	Frequency indication of 110.75 ± 0.75 MHz.
2c	BAND "1" alignment and test	Same as 1a above.	Repeat steps 2a and 2b until both conditions are satisfied.	101.75 ± 0.2 MHz. 110.75 ± 0.75 MHz.

5.5. VCO (1A4A5) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
3a	BAND "2" alignment and test	Same as 1a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "0". Adjust L7 for required performance.	Frequency indication of 111.75 ± 0.2 MHz. If no output present, but steps 1 and 2 are correct, check Q5, Q8 and associated circuitry.
3b	BAND "2" alignment and test	Same as 1a above.	Leave front panel 10 MHz frequency selector switch (1A1S1) set at "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "g". Adjust C38 for required performance.	Frequency indication of 120.75 ± 0.75 MHz.
3c	BAND "2" alignment and test	Same as 1a above.	Repeat steps 3a and 3b until both conditions are satisfied.	111.75 ± 0.2 MHz, 120.75 ± 0.75 MHz.
4a	1st L.O. output level	Connect R.F. Voltmeter with 50 ohm BNC adapter to 1st L.O. output connector (J1). Connect external +1.95 volts D.C. from power supply to X1A4A5 pin 4. Tack solder 47 ohm 1/4 or 1/2 watt carbon resistor from X1A4A5 pin 2 to ground.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Set front panel 1 MHz frequency selector switch (1A1S2) to "6". Adjust L12 (access hole near 1st L.O. output connector J1) for maximum level.	Reading greater than 100 mV rms (225 mV typical).
4b	1st L.O. output level	Same as 4a above.	Set front panel 10 MHz frequency selector switch (1A1S1) and 1 MHz frequency selector switch (1A1S2) to "0". Record this output level.	Reading greater than 100 mV RMS (225 mV typical).
4c	1st L.O. output level	Same as 4a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Set front panel 1 MHz frequency selector switch (1A1S2) to "g". Record this output level.	Reading greater than 100 mV RMS (225 mV typical).
4d	1st L.O. output level	Same as 4a above.	If necessary, adjust L12 slightly so that the readings of steps 4a, b, and c are within 3 db of each other.	If any reading in steps 4a, b, or c is low, check buffer stage Q9, Q10 and associated circuitry.

5.5.2.5 VCO (1A4A5) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5a	1st L.O. output level to translator	Tack solder 47 ohm 1/4 or 1/2 watt carbon resistor from X1A4A5 pin 2 to ground. Connect open circuit probe tip from R.F. Voltmeter to X1A4A5 pin 2. Place a 50 ohm load on 1st L.O. output connector J1. Connect +1.95 volts D.C. from external power supply to X1A4A5 pin 4.	Set front panel 10 MHz frequency selector switch (1A1S1) to "0". Sequence the front panel 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2. If proper output cannot be obtained, refer to schematic and check buffer stage Q11 and Q12 and associated circuitry.
5b	1st L.O. output level to translator	Same as 5a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "1". Sequence the 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2.
5c	1st L.O. output level to translator	Same as 5a above.	Set front panel 10 MHz frequency selector switch (1A1S1) to "2". Sequence the 1 MHz frequency selector switch (1A1S2) from "0" through "9".	Reading should remain greater than 100 mV RMS (225 mV typical) in each position of 1A1S2.
6a	Logic Outputs	V.O.M. on X1A4A5 pin 17.	Front panel 10 MHz frequency selector switch (1A1S1) position: "0" "1" "2"	less than 0.5 V.D.C. greater than 2.2 V.D.C. less than 0.5 V.D.C.
6b	Logic Outputs	V.O.M. on X1A4A5 pin 18.	Front panel 10 MHz frequency selector switch (1A1S1) position: "0" "1" "2"	greater than 2.2 V.D.C. less than 0.5 V.D.C. less than 0.5 V.D.C. If these readings cannot be obtained, consult the schematic and check logic switches Q1, Q2, and associated circuitry.

5.6 RECEIVER/EXCITER BOARD ALIGNMENT

The following paragraphs provide alignment instructions for the Receiver/Exciter printed boards.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5.6.1 V.H.F. MIXER BOARD (1A3A1)				
1	1st IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1 and set frequency for 16.0 MHz.	Remove VHF Mixer Board from RCVR/Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J1 and plug VHF mixer into extender card. Set Frequency switches at 16,0000. Mode switch at USB, and adjust RF gain Control so that "S" meter reads "S 9". Set RF generator level to 10 MV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust capacitors C41 and C44 for peak on the "S" meter. Next adjust Transformer T7 and T8 for peak on the "S" meter. Recheck C44 and T7 for meter peak. Remove extender card and replace VHF mixer board into its connector in the card basket.	If no peaking is observed check E24 and E18 on the RCVR/Exciter Mother board, using a high frequency oscilloscope to determine if 1st L.O. and 2nd L.O. are present (approximately 0dBm). If not, check synthesizer sections 4.2 and 5.5. If 1st L.O. and 2nd L.O. are present, check outputs of Q5 and Q8 on VHF mixer board, then check Q2 and associated circuitry.
5.6.2 IF/FILTER BOARD (1A3A2)				
1	2nd IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1, and set frequency for 16.0 MHz.	Remove IF/Filter board from RCVR/Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J2, and plug IF/Filter board into extender card. Set frequency switches at 16,0000 mode switch at USB and adjust RF GAIN control so that "S" meter reads "S 9". Set RF Generator level to 10 MV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust inductors L3 and L4 for peak on the "S" meter. Remove Extender card and replace IF/Filter board in its connector in the card basket.	If no peak is observed, check U1 and U2 plus associated circuitry on IF/Filter board. Also check Q3 and associated circuitry.
5.6.3 SIDEBAND GENERATOR BOARD (1A3A3)				
1	BALANCED MODULATOR TUNING	Connect RF VTVM and dummy load to antenna connector, 1A8J1.	Remove sideband generator board from RCVR/Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J3, and plug sideband generator board into extender card. Turn potentiometer 1A3A3, R34, approximately 8 turns CW. Turn XMIT GAIN full CCW with microphone and, observing RF VTVM, tune Transformer T1 for maximum output. Remove extender card and replace sideband generator board in its connector in the card basket. Repeat carrier null alignment per par. 5.4.6, step 4.	If no carrier output is observed, check E16 on RCVR/Exciter mother board to determine if 3rd L.O. is present (approximately 0dBm). If not, refer to synthesizer sections 4.2 and 5.5. If 3rd L.O. is present, check output of 1A3A3 Q1 and associated circuitry.

5.7 FAULT ANALYSIS TABLE

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Receiver inoperative, meter not illuminated.	a. Primary power fuse F1, F2 or (for DC operation) F3 not installed or open. b. +12VDC fuse (1A6A1 F2) open in power supply. c. Power cord defective or not connected. d. Power supply defective.	a. Replace fuse. b. Replace fuse. c. Make continuity check of cable, replace or repair cable. d. Refer to sections 4.6 and 5.4.3. Repair or replace regulator board or entire power supply module if required.
No audio or background noise at speaker or phones jack. Meter indicates RF signal present.	a. 28VDC protective crowbar has operated. b. Speaker switch at OFF or defective. c. Speaker driver board defective. d. Amplifier 1A3A4 Q11 defective.	a. Turn off main power. Wait 15 seconds and re-energize radio. If still no audio, check 28VDC power supply for short circuited output. b. Check position of switch and make necessary continuity checks. c. Refer to section 4.3.5. Repair or replace defective assembly. d. Replace defective transistor.
No audio or background noise at speaker in all modes. Meter does not indicate, but is illuminated.	a. +5 VDC fuse open in power supply. b. VHF mixer board defective. c. IF/Filter board defective. d. Audio board defective. e. Synthesizer defective.	a. Replace fuse. If fuse blows again, check +5V line for short circuit. b. Refer to section 4.3.2. Repair or replace defective assembly. c. Refer to section 4.3.3. Repair or replace defective assembly. d. Refer to section 4.3.4. Repair or replace defective assembly. e. Refer to section 4.2. Repair or replace defective assembly.
AM mode normal, other modes inoperative.	a. 3rd L.O. injection absent at 1A3A4 audio board. b. Synthesizer defective.	a. Make continuity test of cable. Repair or replace. b. Refer to section 4.2. Repair or replace defective assembly.
AM, or USB, or LSB, inoperative, other modes operative.	a. Mode switch defective. b. IF/Filter board defective.	a. Make continuity check. Repair or replace switch. b. Check diode switches on IF/Filter board. Check filters. Repair or replace defective parts.
No audio at speaker. Meter at full scale.	a. RF GAIN control fully CCW or defective. b. Transistor 1A3A4 Q12 defective. a. Transistor 1A3A4 Q4 defective.	a. Adjust RF GAIN control CW. Replace defective component. b. Replace defective component. a. Replace transistor.
Distorted audio at speaker. Meter remains at full scale.		
Received signals weak in all modes "S" meter also low.	a. Filter module defective or does not channel. b. VHF mixer board defective.	a. Refer to section 4.7. Repair or replace defective component. b. Refer to section 4.3.2. Repair or replace defective assembly.

5.7 FAULT ANALYSIS TABLE (CONT'D)

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Received signals weak in all modes- Cont.	c. IF/Filter board defective. d. Local oscillator injection levels low. e. Coaxial cables defective.	c. Refer to section 4.3.3. Repair or replace defective assembly. d. Refer to section 4.2. Repair or replace defective assembly. e. Make continuity tests, repair or replace defective cable.
Transmitter will not key.	a. Defective microphone. b. 1A5K2 or 1A8K1 defective. c. Jumper between pins n and p missing on accessory socket-1A8J4.	a. Repair or replace. b. Replace defective part. c. Replace jumper.
Transmitter keys but no output or output low in all modes.	a. Defective sideband generator board. b. Defective IF/Filter board. c. Defective VHF mixer board. d. Defective or disconnected coaxial cables. e. Defective RF power amplifier module. f. Defective filter module.	a. Refer to section 4.4.2. Repair or replace defective assembly. b. Refer to section 4.4.3. Repair or replace defective assembly. c. Refer to section 4.4.4. Repair or replace defective assembly. d. Check all coaxial fittings. Perform continuity test on coaxial cables and repair or replace. e. Refer to sections 4.5 and 5.8.4. Repair or replace defective assembly. f. Refer to section 4.7. Repair or replace defective assembly.
Transmitter keys, output ok in CW, carrier ok in AM, but no modulation or output in USB or LSB.	a. Defective microphone. b. Broken or shorted wire between microphone and RCVR/Exciter mother board.	a. Repair or replace. b. Perform continuity check. Repair broken wire.
Transmitter keys, output ok in CW, USB, LSB. No carrier in AM.	a. Defective ACC.	a. Check 1A3A3 Q2, Q3, Q5 and associated circuitry.
Too much carrier in AM, can not adjust.	a. Defective ACC. b. Defective ACC potentiometer. c. Defective ACC detector.	a. Check 1A3A3 Q2, Q3, and Q5 and associated circuitry. b. Replace 1A3A3 R1. c. Check ACC detector on 1A5A4. Repair and replace defective component.
SSB or CW output too high or too low.	a. ALC control adjusted incorrectly.	a. Adjust 1A3A3 R55 in CW mode for 71 VRMS into 50 ohms at 16.0000 MHz.
AM Carrier level too high or too low.	a. ACC control adjusted incorrectly.	a. Adjust 1A3A3 R1 in AM mode for 42 VRMS.

5.7 FAULT ANALYSIS TABLE (CONT'D)

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
AM operation or coupler tune causes 28VDC crowbar to act, disabling 28V.	a. Inoperative or defective current ALC loop.	a. Check transistor 1A7Q7 and associated circuitry. Check 1A3A1 Q4 and associated circuitry. Continuity test cable between 1A3A1 P1 U and 1A7J3 B.
No CW or side tone.	a. Defective or inoperative tone oscillator.	a. Check 1A3A3 Q6, Q7, Q8, and associated circuitry.
Sidetone ok, but XMTR does not key in CW mode	a. Defective CW keying transistor. b. Defective T/R relay.	a. Check 1A3A3 Q12, CR7, CR8, and associated circuitry. b. Check relays 1A8K1 and 1A5K2.
Unit inoperative with DC main power applied.	a. Main source polarity reversed. b. DC module not installed or installed improperly. c. DC module defective.	a. Switch + and - leads to DC source. b. Refer to section 2.6.3. c. Refer to section 4.6.2 and repair or replace defective module.
Power output ok, but no meter indication, meter ok on receive.	a. Inoperative or defective output detector circuit. b. Broken wire in cable line.	a. Check detector 1A5CR5 and associated circuitry. b. Make continuity checks and repair.
ANTENNA COUPLER PROBLEMS		
Power output ok, but no meter indication, meter ok on receive.	a. Defective or disconnected coaxial cable between transmitter and coupler. b. Defective or inoperative detector in coupler. c. Broken wire in cabling.	a. Continuity test and repair or replace. b. Repair or replace defective device. Consult coupler handbook. c. Continuity test and repair.
Coupler does not tune - any control.	a. +28VDC missing in coupler. b. Coupler tune line not grounded in coupler tune mode. c. Mode switch is not in coupler tune position.	a. Continuity test and repair. b. Check mode switch wiring and continuity of cable and repair. c. Check position of mode switch.

5.8 MODULE REMOVAL

This section provides special test information and module removal instructions.

5.8.1 REMOVAL OF FILTER MODULE-1A5

5.8.1.1 Disconnect all cables from the motor control board (1 power connector, 3 coax connectors).

5.8.1.2 Turn transceiver upside down and remove four screws holding filter module.

5.8.1.3 To remove filter assembly from its case, remove four flathead screws around case periphery and pull assembly out from the case.

5.8.2 FRONT PANEL REMOVAL

To remove the front panel from the transceiver:

a) Remove the power supply (1A6) cover. Unscrew the "+" screw from the 5V filter capacitor C9. Remove the solder lug and wire from beneath the screw and replace the screw in the capacitor.

b) Remove the top cover of the RCVR/EXCTR P.C. compartment. Remove all four cards. Remove the two screws attaching the regulator subassembly to the card guide. Replace the cards in the compartment (note the correct order is imprinted on the top cover). Replace top cover.

c) Disconnect the two connectors that plug into the top of the transceiver chassis (1A1P1 and 1A2P1).

d) Turn the unit over and carefully disconnect the mother board connectors (1A1P2 on the RCV/EXC side and 1A1P3 on the SYNTH side).

e) Remove the three rear screws on each front panel end cap and carefully pull the panel away from the rest of the unit.

f) To replace the front panel, reverse the above procedure, being careful not to kink, break, or pinch wires, particularly around the digital switches and the 5 volt regulator. Dress the solder lug on the 5V regulator lead so that it does not short against anything when reinstalled on the filter capacitor "+" terminal screw.

5.8.2.1 FREQUENCY CODING

NOTE

To test "A" switches, *FREQUENCY CONTROL* switch must be in "A" position. To test "B" switches *FREQUENCY CONTROL* switch must be in "B" position. "O" indicates ground, "1" indicates open circuit.

10 MHz Dial (A or B)	1A1P3			1A1A2 U4	
	Pin 2	Pin 3	Pin B	Pin 1	Pin 7
0	0	1	1	0	0
1	1	0	1	0	1
2	1	1	0	1	0

Table 5.9 Frequency Coding

1 MHz Dial (A or B)	1A1P3				*1A1A2 U5			
	Pin 4	Pin D	Pin H	Pin 7	Pin 6	Pin 2	Pin 1	Pin 7
0	1	0	0	1	0	0	0	0
1	1	0	0	0	0	0	0	1
2	0	1	1	1	0	0	1	0
3	0	1	1	0	0	0	1	1
4	0	1	0	1	0	1	0	0
5	0	1	0	0	0	1	0	1
6	0	0	1	1	0	1	1	0
7	0	0	1	0	0	1	1	1
8	0	0	0	1	1	0	0	0
9	0	0	0	0	1	0	0	1

100 kHz Dial (A or B)	1A1P3				1A1A2 U6			
	Pin 5	Pin E	Pin F	Pin 6	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	1	0	0	1	0	0	0	1
2	1	0	0	0	0	0	1	0
3	0	1	1	1	0	0	1	1
4	0	1	1	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	0	0	0	1	1	0
7	0	0	1	1	0	1	1	1
8	0	0	1	0	1	0	0	0
9	0	0	0	1	1	0	0	1

10 kHz Dial (A or B)	1A1P3				1A1A2 U7			
	Pin R	Pin K	Pin 9	Pin 14	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

Table 5.9 Frequency Coding (Cont'd)

1 kHz Dial (A or B)	1A1P3				1A1A2 U8			
	Pin P	Pin L	Pin 10	Pin 13	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

100 Hz Dial (A or B)	1A1P3				1A1A2 U9			
	Pin N	Pin M	Pin 11	Pin 12	Pin 6	Pin 2	Pin 1	Pin 7
0	0	0	0	0	0	0	0	0
1	0	0	0	1	0	0	0	1
2	0	0	1	0	0	0	1	0
3	0	0	1	1	0	0	1	1
4	0	1	0	0	0	1	0	0
5	0	1	0	1	0	1	0	1
6	0	1	1	0	0	1	1	0
7	0	1	1	1	0	1	1	1
8	1	0	0	0	1	0	0	0
9	1	0	0	1	1	0	0	1

Table 5.9 Frequency Coding (Cont'd)

5.8.3 POWER SUPPLY REMOVAL

5.8.3.1 Remove four screws securing top cover of power supply.

5.8.3.2 To remove Regulator board (1A6A1), take out four large screws holding two capacitors (1A6A1-C5 and C9) as shown in Figure 5.2. Next, unfasten two hold down screws and pull the board forward and slightly upward to remove.

5.8.3.3 To take out the entire power supply from the chassis, remove only the screws, shown in Figure 5.2, from the RIGHT SIDE PANEL. DO NOT remove the cover clamps and their associated hardware. Unplug the connector, 1A6P1, from the chassis as illustrated in Figure 5.3. Re-

move the four screws holding the regulator heat sink and then unscrew the transistor 1A6Q101 from the heat sink. If a D.C. Inverter is installed, disconnect its leads from terminal board 1A6TB2. Next remove the screws holding the Power Supply module to chassis. To reach the forward screws it will be necessary to pull out the two rear boards (1A4A1 and 1A4A2) from the synthesizer module. The remaining four screws at the rear of the chassis are easily accessible.

5.8.3.4 When reinstalling capacitors 1A6A1C5 and C9, on the regulator board, make sure polarity is correct (polarity is marked on regulator board 1A6A1). The four capacitor mounting screws should be tight against their lock washers but not so tight as to strip the internal threads in the capacitor.

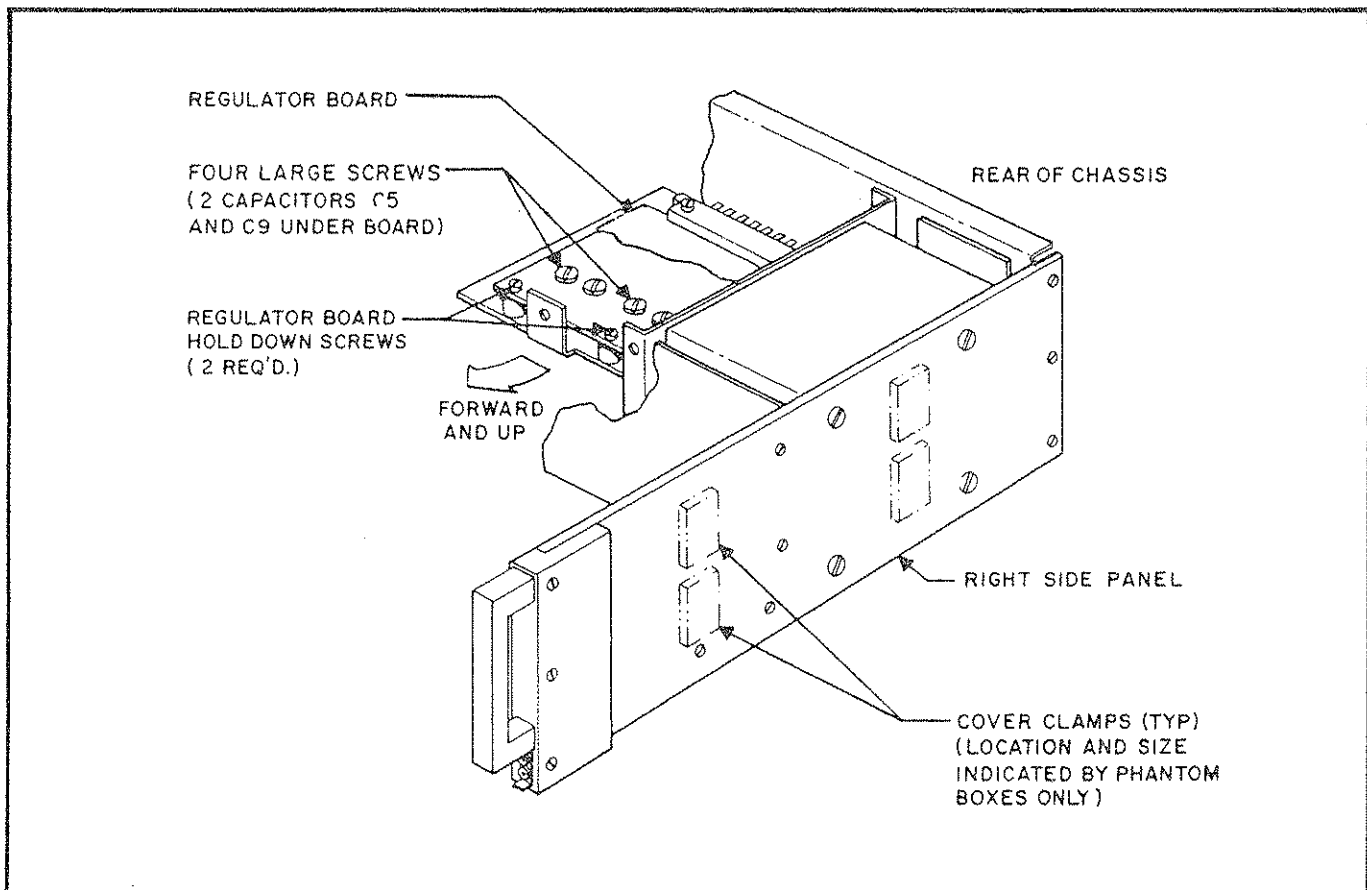


Figure 5.2 Power Supply Regulator Board (1A6A1)

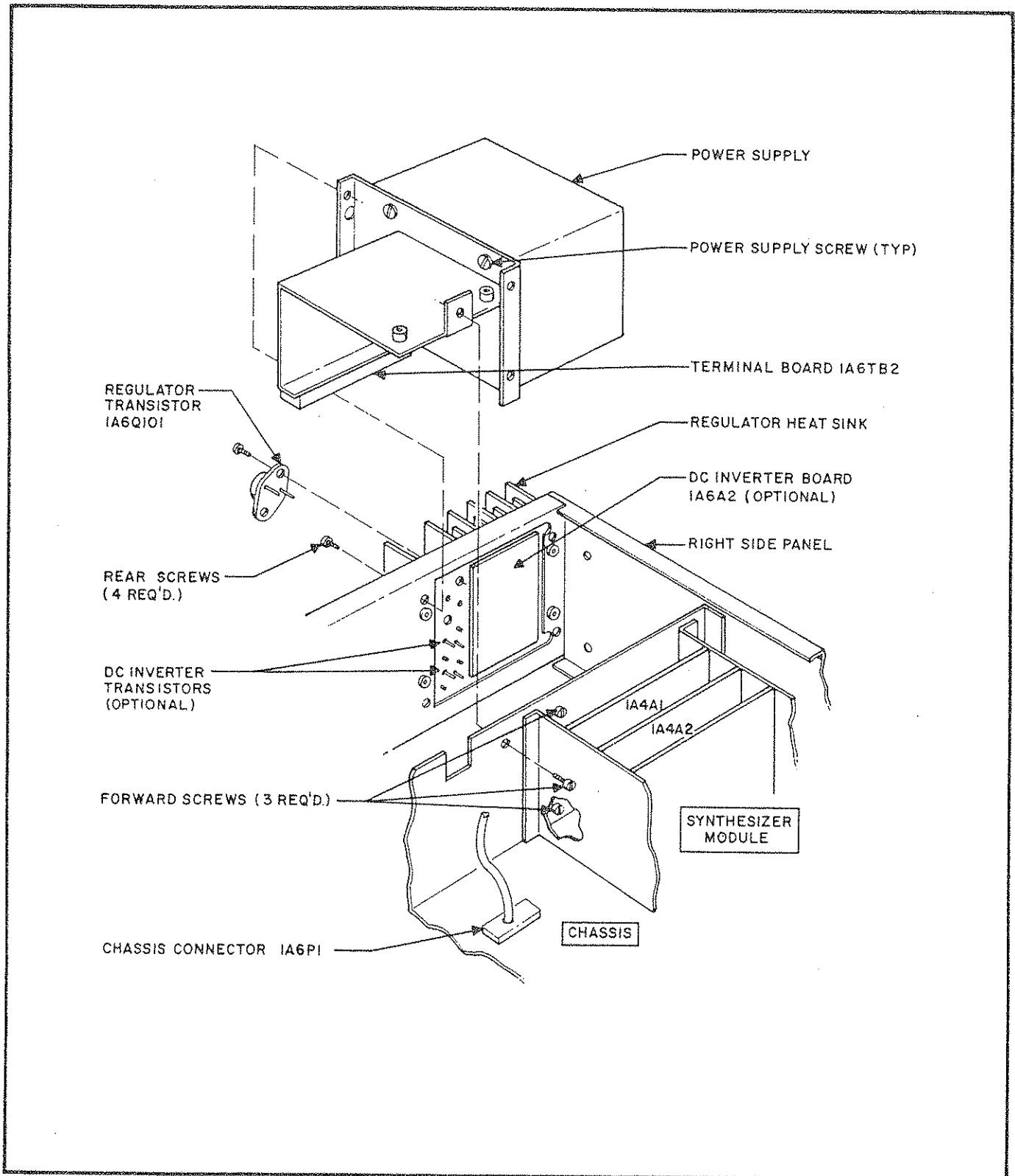


Figure 5.3 Power Supply Removal (1A6)

5.8.4 RF POWER AMPLIFIER REMOVAL AND SERVICING

When a power amplifier failure is suspected, first test the exciter output into 50 ohms at connector 1A3P3 to insure that it is capable of providing approximately 4 volts peak to peak undistorted output on SSB (using hand microphone).

5.8.4.1 To remove power amplifier, disconnect connectors 1A7J1, J2, and J3. Remove the four screws holding heat sink assembly to transceiver rear panel. Power amplifier assembly removes from the rear of the transceiver.

5.8.4.2 For servicing the power amplifier, it is desirable to use an external power source capable of 28VDC 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 5.4.

CAUTION

When using a HP 606 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.

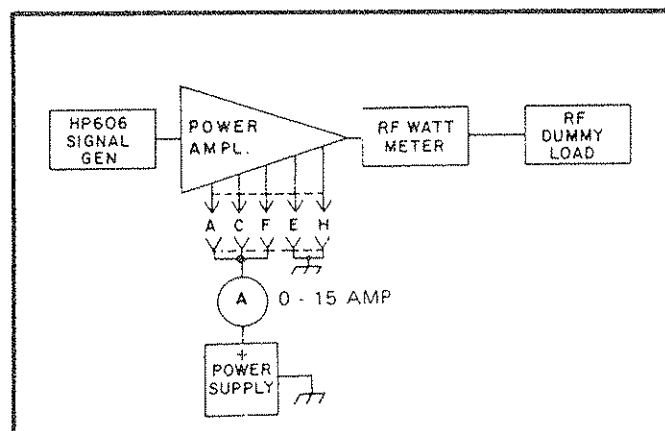


Figure 5.4 Power Amplifier Test Setup

5.8.4.3 Before applying D.C. power, make sure the signal generator output is at 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 transistor 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.

5.8.4.4 If power output is low, the defective stage can be readily determined by observing with an oscilloscope the wave form at the input center tap of T2 (the 10 turns side) for the predriver, 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 the push pull stage is operational. Now that the defective stage has been located, an observation of the respective collector wave forms will determine the failed transistor. The collector wave form on the good transistor will be much greater in amplitude than that of the defective one.

5.8.4.5 While it is necessary to remove the printed circuit board from the heat sink to replace 1A7Q1 or Q2, it is NOT necessary to remove the board to replace 1A7Q3, 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.

NOTE

If the radio is used for voice only operation, it is permissible to replace only the defective output transistor (Q5 or Q6), leaving the other in place. However, if the radio is used for RTTY or data transmission, both Q5 and Q6 should be replaced as a matched pair, if one is found to be destroyed. Failure to do so will likely cause increased intermodulation products and reduces reliability.

5.8.4.6 Before replacing any or all of the four high power transistors, Q3, Q4, Q5 and Q6, clean the heat sink area thoroughly around each transistor making sure no foreign particles can come between the transistor and the heat sink. Apply a fresh coat of heat sink compound to the transistor and mount the transistor solidly to the heat sink 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 board. If Q5 and Q6 have been replaced it is recommended that the bias current be checked. This can be done by unsoldering the top wire of inductor L5 from the top of T5/T6. Connect a d-c ammeter from L5 to T5/T6. Apply 28VDC to the P.A and adjust R23 until the meter reads 80 ma. Remove the ammeter and carefully resolder the inductor lead.

5.8.4.7 When transistor replacement is complete, test the power amplifier per test setup shown in figure 5.4. Apply D.C. 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 heat sink. They should be removed, examined for foreign particles and replaced carefully. Repeat the above test to insure proper installation.

5.8.4.8 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 the collector of 1A3A1Q4 on the VHF mixer board. Set the vertical range to 2VDC per division, sweep speed at 50 milliseconds per division and set trace at lowest marker division. Set transceiver mode switch to USB and XMIT GAIN fully CCW. Key transceiver and observe voltage rise. Trace should appear as in Figure 5.5A. Now place MODE switch in AM position and key transceiver. Oscilloscope trace should appear as in Figure 5.5B. The additional step in the wave form is evidence that the current ALC is operational and is preventing overdrive to the power amplifier. If this additional step is not observed, trouble shoot 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.

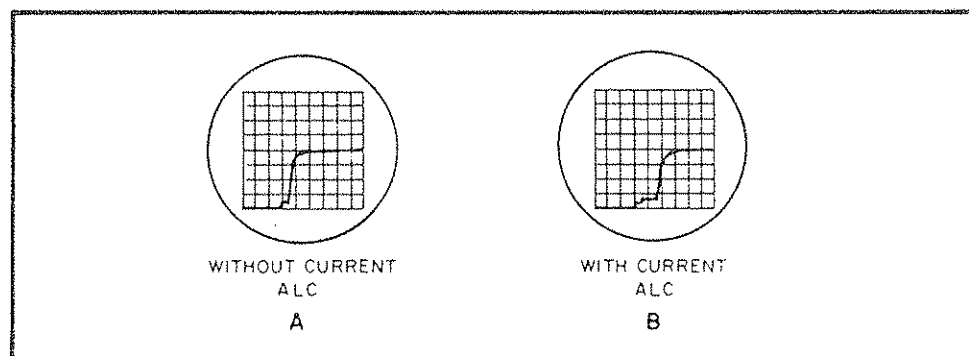


Figure 5.5 Current ALC Wave Form

SUNAIR GSB-900DX

This current can then be monitored across 1A7R24 in the power amplifier or 1A6R2 on the power supply regulator

board. Since these resistors are 0.1 ohm resistance, a voltage of 1 volt across them represents 10 amperes current.

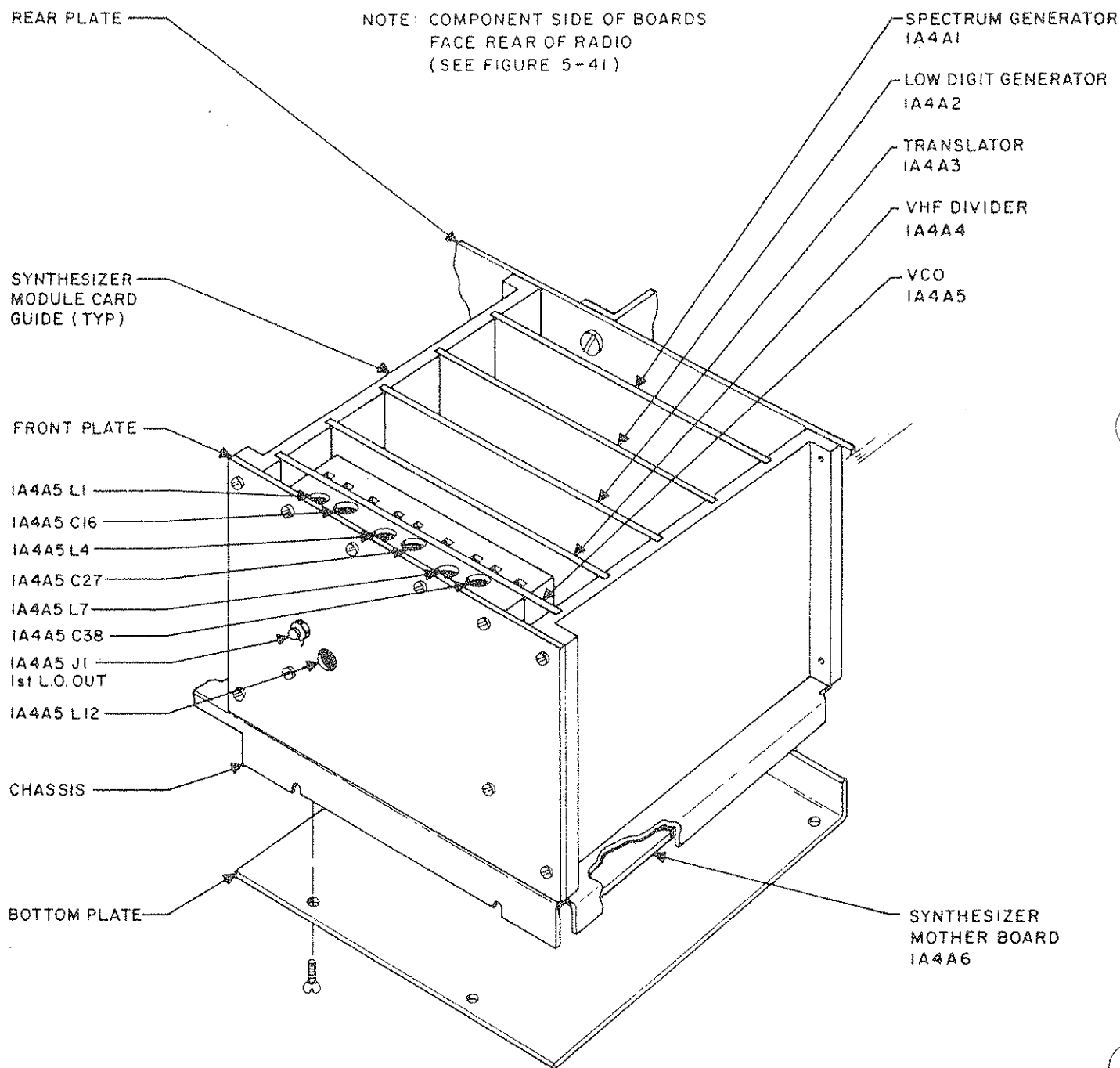


Figure 5.6 Synthesizer Mechanical Assembly

5.9 PRINTED CIRCUIT BOARDS

5.9.1 PRINTED CIRCUIT BOARD REPAIR AND MAINTENANCE

To avoid damage to the printed circuit boards during the replacement of components or integrated circuits, extreme care should be used in soldering and desoldering operations. A low wattage (30 to 50 watts) soldering iron with a narrow tip (1/8" or smaller) should be used. Due to the circuit density on the boards, solder "bridges" or short circuits between adjacent copper foil runs are possible if care is not used during soldering operations. After soldering is completed, the area around the connection should be closely inspected for excess solder or "bridges" between connections and runs with any removed before re-installing the board. A low wattage iron is necessary to prevent the application of excessive heat to the copper foil. Excessive heat will cause the foil to separate from the board rendering the board unrepairable. Only a good electronic-grade rosin core solder should be used in making repairs. **DO NOT USE ACID CORE SOLDER!**

NOTE

Caution should be used when removing the printed circuit boards from their enclosures. A card extractor can be easily made from a length of heavy gauge wire (#10-#12). Form a hook at each end and insert each hook into the holes provided at the top outer edge of each board. Apply gentle upward pressure near each hook to free the board(s) from their edge connectors.

When replacing boards in their edge connectors, insure that the proper

board is in its correct position in the card guides provided at each board edge and gently apply downward pressure to the top edge of the board until it is fully seated in its edge connector.

DO NOT USE SCREWDRIVERS OR PLIERS TO REMOVE BOARDS!

5.10 LOGIC NOTES

Various types of digital and linear logic devices are used in the GSB-900DX. A brief description of these devices is presented to explain their basic operation and symbolic notation.

HIGH - a high also known as a logic high or a logic one is a signal in two state 5 volt logic that generally measures between 2.5 volts and 5.0 volts.

LOW - a low also known as a logic low or a logic zero is a signal in two state 5 volt logic that generally measures between 0 and 0.5 volts.

5.10.1 AND GATE

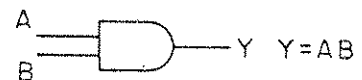


Figure 5.7

An And gate can have two or more inputs. The level of the output is dependent on the state of all the input levels. For a high level to appear at the output, all of the input levels must be high. If any or all inputs are low, the output will be low. The logic equation is read: Y equals A and B.

5.10.2 AND-OR-INVERT GATE

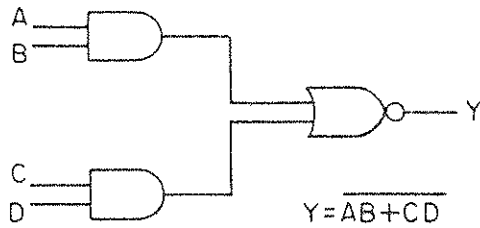


Figure 5.8

The And-Or-Invert gate may have two or more input pairs. For the output, Y, to be low, both inputs of any pair of inputs must be high. To produce a high output, Y, at least one input of each pair of inputs must be low. The logic equation is read: Y equals A and B or C and D NOT (low).

5.10.3 NAND GATE

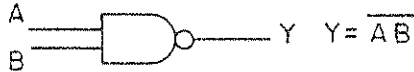


Figure 5.9

A Nand gate may have two or more inputs. If both inputs are high, the output is low. If either or both inputs are low, the output will be high. The logic equation reads: Y equals A and B NOT.

5.10.4 OR GATE

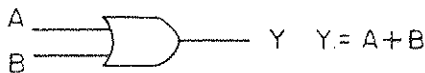


Figure 5.10

The Or gate has two inputs. The output is high if either or both of the inputs is high. If both inputs are low, the output will be low. The logic equation reads: Y equals A or B.

5.10.5 J-K FLIP FLOP

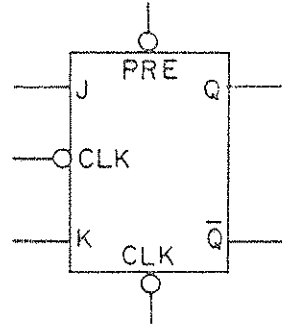


Figure 5.11

The J-K Flip Flop is a memory device that records both the status of a single bit of information on an output called Q and the inverse of that bit of information on an output called $\bar{Q}$. The status of the outputs of the device are determined by the levels produced on inputs called J, K, Clock, Clear and Preset. If the Clear input is forced low while the Preset input is high, the output Q will always be low and the output $\bar{Q}$ will be high. The condition of the outputs Q and $\bar{Q}$ will not change after the Clear input becomes high. If the Preset input is forced low while the Clear input is high, the Q output will always be high and the output $\bar{Q}$ will be low. This condition, too, will persist after the Preset input is driven high. If a Clock pulse occurs which first goes high and then back low while the J, Clear and Preset inputs are high and the K input is low, the Q output will become high if it wasn't already and the $\bar{Q}$ input will switch low if it wasn't already. If the same Clock pulse occurs while the J input is low and the K, Clear and Preset inputs are high the Q output will switch low if it wasn't already low and the $\bar{Q}$ output will switch high if it wasn't already high. If the Clock pulse occurs while inputs J and K are low and Clear and Preset are high no output change on Q or $\bar{Q}$ will occur. If J, K, Clear and Preset are high each successive Clock pulse will cause the outputs Q and $\bar{Q}$ to change state or toggle from their former logic state to the inverse of that former logic state.

5.10.6 INVERTER

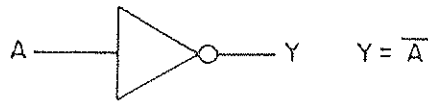


Figure 5.12

The Inverter has a single input. The output level is the opposite of the input level or inverted. The logic equation reads: Y equals A NOT.

5.10.7 SCHMITT TRIGGER

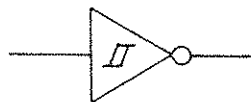


Figure 5.13

The Schmitt Trigger is basically an inverter that exhibits different output switching characteristics for positive and negative going input pulses. The trigger uses hysteresis, or backlash in the switching mode. Hysteresis is the voltage difference between the positive and negative thresholds. A positive going threshold of approximately 1.7 volts will cause the output to switch low, and a negative going threshold of approximately 0.9 volts will cause the output to switch high. The output can be triggered from slow input ramps. This device can handle DC input levels from 0.5 volts to 2.5 volts and still produce a logic output voltage. Standard 5 volt logic devices produce indeterminate output voltages if they see input voltages between 0.8 and 2.0 volts.

5.10.8 PROM

Programmable Read Only Memories (PROMS) are logic elements that are manufactured in many different input and output configurations. Proms are programmed by blowing selected fuse links, and once programmed cannot be altered. Selection of addresses produces an output or number of outputs previously programmed in that memory location. Depend-

ing on the device type, outputs may be factory manufactured with logical 1 or logical 0 outputs. In the case where a device is supplied with logical 1 outputs all desired logical 0 outputs must be programmed. If outputs are supplied as logical 0's, all desired logical 1 outputs must be programmed.

5.10.9 RAM

Random Access Memories (RAMS) are logic elements that are manufactured in many different input and output configurations. Unlike the Prom, a Ram can be re-programmed over again many times and the information stored can be retrieved by utilizing Read/Write, Chip enable and address inputs. The GSB-900DX utilizes six CMOS Rams in the memory system for reliability and low power consumption.

5.10.10 VOLTAGE COMPARATOR

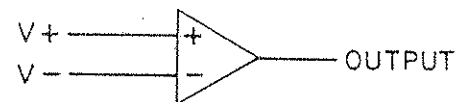


Figure 5.14

A Voltage Comparator has two inputs, V+ and V-. The V+ input is normally set to a fixed voltage level or reference voltage. The V- input is usually variable. The output is high as long as the V+ input is more positive than the V- input. As the V- input rises, or becomes more positive, and exceeds the V+ input level, the output switches low. If the variable V- input voltage becomes less positive than the V+ reference input, the output switches to a high level once again.

5.10.11 OPERATIONAL AMPLIFIER

The Operational Amplifier generally provides a method of converting a small input signal into a signal of greater magnitude. The output voltage follows the changes that occur at the input terminals. In the case where the

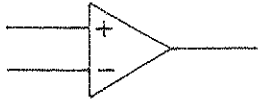


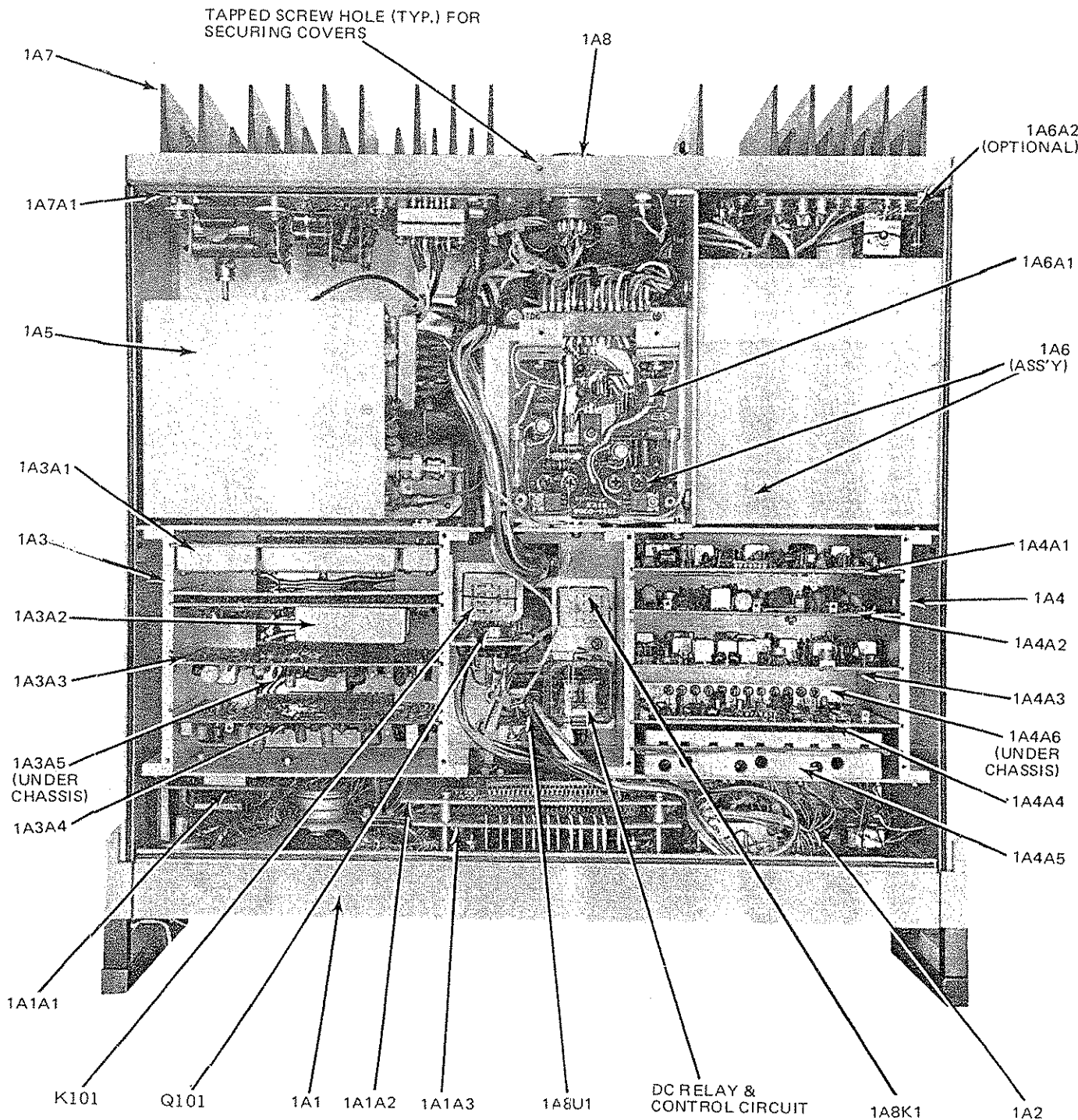
Figure 5.15

V- input is tied to the operational amplifier output, the output voltage follows the input voltage supplied at the V+ input. This circuit is in fact called a voltage follower circuit. It is a circuit used to convert a high impedance variable voltage output to an equivalent Low impedance variable voltage output which will not be as readily affected by variations in loading as a high impedance output would be.

5.10.12 INVERTED SIGNALS

An inverted signal with respect to logic is denoted by the signal title with a bar over the top of the signal title. An inverted signal or one with a bar over its title is a signal that is low when the signal is present and high when it is not present. As an example, if a signal is called Read Freq, then the inverted equivalent of Read Freq would be written as Read Freq and described either as Read Freq Inverted or Read Freq Not.

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER	
ASSEMBLY	SUBASSEMBLY			
1A1		<u>FRONT PANEL ASSEMBLY</u>	5024640055	GRY GRN
	1A1A1	SPEAKER DRIVER BOARD	5024640096	
	1A1A2	DECODER BOARD	5024041798	
	1A1A3	DISPLAY BOARD	5024646096	
1A2		METER PANEL ASSEMBLY OR ANTENNA TUNING CONTROL ASSY (OPTION)	5024645596	GRN GRY
			5024041992 5024041950 or Refer to Ap- plicable Matl.	
1A3		<u>RECEIVER/EXCITER ASSEMBLY</u>	-----	
	1A3A1	V.H.F. MIXER	5024110099	
	1A3A2	I.F./FILTER	5024120094	
	1A3A3	SIDEBAND GENERATOR	8033160209	
	1A3A4	AUDIO BOARD	5024140095	
1A4	1A3A5	RECEIVER/EXCITER MOTHER BOARD	5024011899	
		<u>SYNTHESIZER ASSEMBLY</u>	-----	
	1A4A1	SPECTRUM GENERATOR	5024060091	
	1A4A2	LOW DIGIT GENERATOR	5024070097	
	1A4A3	TRANSLATOR	5024080092	
	1A4A4	V.H.F. DIVIDER	5024090098	
	1A4A5	V.C.O.	5024100093	
1A5	1A4A6	SYNTHESIZER MOTHER BOARD	5024011597	
		<u>FILTER MODULE</u>	5024050096	
	1A5A1	ODD CHANNEL FILTER BOARD	5024057490	
	1A5A2	EVEN CHANNEL FILTER BOARD	5024057791	
	1A5A3	RECEIVE FILTER BOARD	5024057295	
1A6	1A5A4	RF DETECTOR BOARD	5024057597	
		<u>POWER SUPPLY</u>	5024020090	
	1A6A1	REGULATOR BOARD ASSEMBLY	5024024095	
1A7	1A6A2	D.C. INVERTER (OPTION)	5024021398	
		<u>R.F. POWER AMPLIFIER ASSEMBLY</u>	5024030095	
1A8	1A7A1	R.F. POWER AMPLIFIER CIRCUIT BOARD	5024030290	GRN GRY
		<u>CHASSIS ASSEMBLY</u>	5024010094 5024010051	



5.11 SCHEMATIC DIAGRAMS

The following pages contain schematic diagrams, voltage charts and parts lists requirements for all assemblies of the GSB-900DX.

Figure 5.16 GSB-900DX Top View and Table of Assemblies

SUNAIR GSB-900DX

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A1A1	FRONT PNL ASSY. GR. GSB-900DX	5024640055
C1	PC Assy. Speaker Gry. GSB-900	5024041798
C2	Capacitor, 1UF, 35V, T368	0283630001
C3	Capacitor, 0.01UF, 25V, X55	0281620008
C4	Capacitor, 0.01UF, 25V, X55	0281620008
C5	Capacitor, 0.01UF, 25V, X55	0281620008
C6	Capacitor, 0.01UF, 25V, X55	0281620008
C7	Capacitor, 0.1UF, 50V	1001010027
CR50	Diode, Signal, Sil. 1N4454	0405270003
CR51	Diode, Rectifier 1N4004	0505180004
CR52	Diode, Rectifier 1N4004	0405180004
CR53	Diode, Rectifier 1N4004	0405180004
CR54	Diode, Rectifier 1N4004	0405180004
CR55	Diode, Rectifier 1N4004	0405180004
CR56	Diode, Rectifier 1N4004	0405180004
DS1	Lamp Assy. Red	0840740000
DS2	Lamp Assy. Amber	0840870001
DS3	Lamp Assy. Painted	5024641523
J1	Connector, Power, 5 Pin Round	0753560003
J2	Not used	
J3	Connector, Headphone	0840850000
J4	Connector, Phone Jack, 2 Cond.	0754430006
LS1	Speaker, 3XS Oval, 8 ohm, 5W	0877970009
R1	Not used	
R2	Resistor, 422, 1%, 1/8W	0194030008
R3	Resistor, 422, 1%, 1/8W	0194030008
R4	Resistor, 301, 1%, 1/8W	0194150003
R5	Resistor, 340, 1%, 1/8W	0194910008
R6	Not used	
R7	Resistor, 200, 1%, 1/8W	0194270009
R8	Resistor, 100, 1%, 1/8W	0194890007
R9	Resistor, 200, 1%, 1/8W	0194270009
R10	Resistor, 140, 1%, 1/8W	0194390004
R11	Resistor, 140, 1%, 1/8W	0194390004
R12	Not used	
R13	Resistor, 140, 1%, 1/2W	0194390004
R14	Resistor, 121, 1%, 1/8W	0195320000
R15	Resistor, 100, 1%, 1/8W	0194890007
R16	Resistor, 715, 1%, 1/8W	0195060008
R17	Resistor, 60.4, 1%, 1/8W	0195180003
R18	Resistor, 100, 1%, 1/8W	0194890007
R19	Resistor, 60.4, 1%, 1/8W	0195180003
R20	Resistor, 80.6, 1%, 1/8W	0195200004
R21	Resistor, 80.6, 1%, 1/8W	0195200004
R22	Resistor, 80.6, 1%, 1/8W	0195200004
R23	Not used	
R24	Resistor, 422, 1%, 1/8W	0194030008
R25	Resistor, 422, 1%, 1/8W	0194030008
R26	Resistor, 301, 1%, 1/8W	0194150003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R27	Resistor, 340, 1%, 1/8W	0194910008
R28	Resistor, 100, 1%, 1/8W	0194890007
R29	Resistor, 200, 1%, 1/8W	0194270009
R30	Resistor, 100, 1%, 1/8W	0194890007
R31	Resistor, 200, 1%, 1/8W	0194270009
R32	Resistor, 140, 1%, 1/8W	0194390004
R33	Resistor, 140, 1%, 1/8W	0194390004
R34	Not used	
R35	Resistor, 140, 1%, 1/2W	0194390004
R36	Resistor, 121, 1%, 1/2W	0195320000
R37	Resistor, 100, 1%, 1/8W	0194890007
R38	Resistor, 715, 1%, 1/8W	0195060008
R39	Resistor, 60.4, 1%, 1/8W	0195180003
R40	Resistor, 100, 1%, 1/8W	0194890007
R41	Resistor, 60.4, 1%, 1/8W	0195180003
R42	Resistor, 80.6, 1%, 1/8W	0195200004
R43	Resistor, 80.6, 1%, 1/8W	0195200004
R44	Resistor, 80.6, 1%, 1/8W	0195200004
R45	Not used	
R46	Not used	
R47	Not used	
R48	Pot. 5K, 20%, 2W, 1/4 Shaft	0346020000
R49	Resistor, 47, 10%, 2W	0163720002
R50	Resistor, 33, 10%, 1W	0165660007
R51	Pot. Tandem, 5K/5K, 20%, 1/2W	5024641400
R52	Pot. 5K, Linear, SPST	5024641701
R53	Resistor, 2.7K, 10%, 1/4W	0186670001
R54	Resistor, 8.2K, 5%, 1/2W	0189540001
R55	Pot. Tandem, 5K/5K, 20%, 1/2W	5024641400
S1	Switch, Rotary, 10MHz	5024041101
S2	Switch, Rotary, 1MHz	5024041208
S3	Switch, Rotary, 100KHz	5024041305
S4	Switch, Rotary, 10KHz	5024041402
S5	Switch, Rotary, 1KHz, 100Hz	5025041500
S6	Switch, Rotary, 1KHz, 100Hz	5024041500
S7	Switch, Rotary, 10MHz	5024041101
S8	Switch, Rotary, 1MHz	5024041208
S9	Switch, Rotary, 100KHz	5024041305
S10	Switch, Rotary, 10KHz	5024041402
S11	Switch, Rotary, 1KHz, 100Hz	5024041500
S12	Switch, Rotary, 1KHz, 100Hz	5024041500
S13	Switch, Rotary, Mode	5024041607
S14	Not used	
S15	Switch, Rotary, Freq. Control	5024640501
S16	Switch, Rotary, 2P5T 3/8 Shaft	0346600006
	Knob, .50D, Blk, W/D Br. Screw	0346420008
	Knob, .70D, Blk, Sk. Br. Screw	0346700001
	Knob, .70D, Blk, Wht Dot, Skrt	5024641604
	Terminal Strip, 4 Term, 1 Gnd	0996700072
	Terminal Strip, 3 Term, 1 Gnd	0996700081
	Terminal Strip, 5 Term, 1 Gnd	0996700102

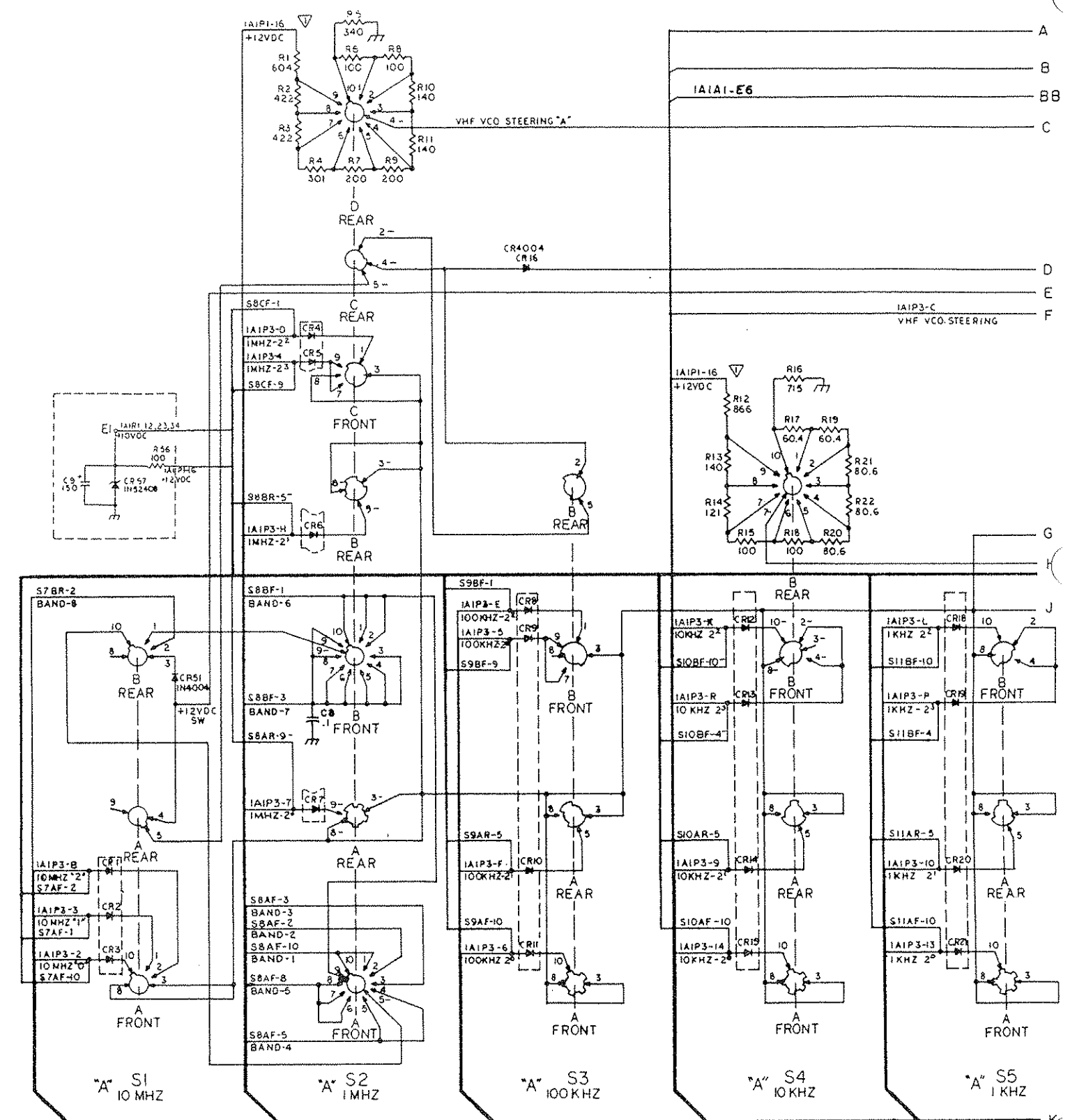
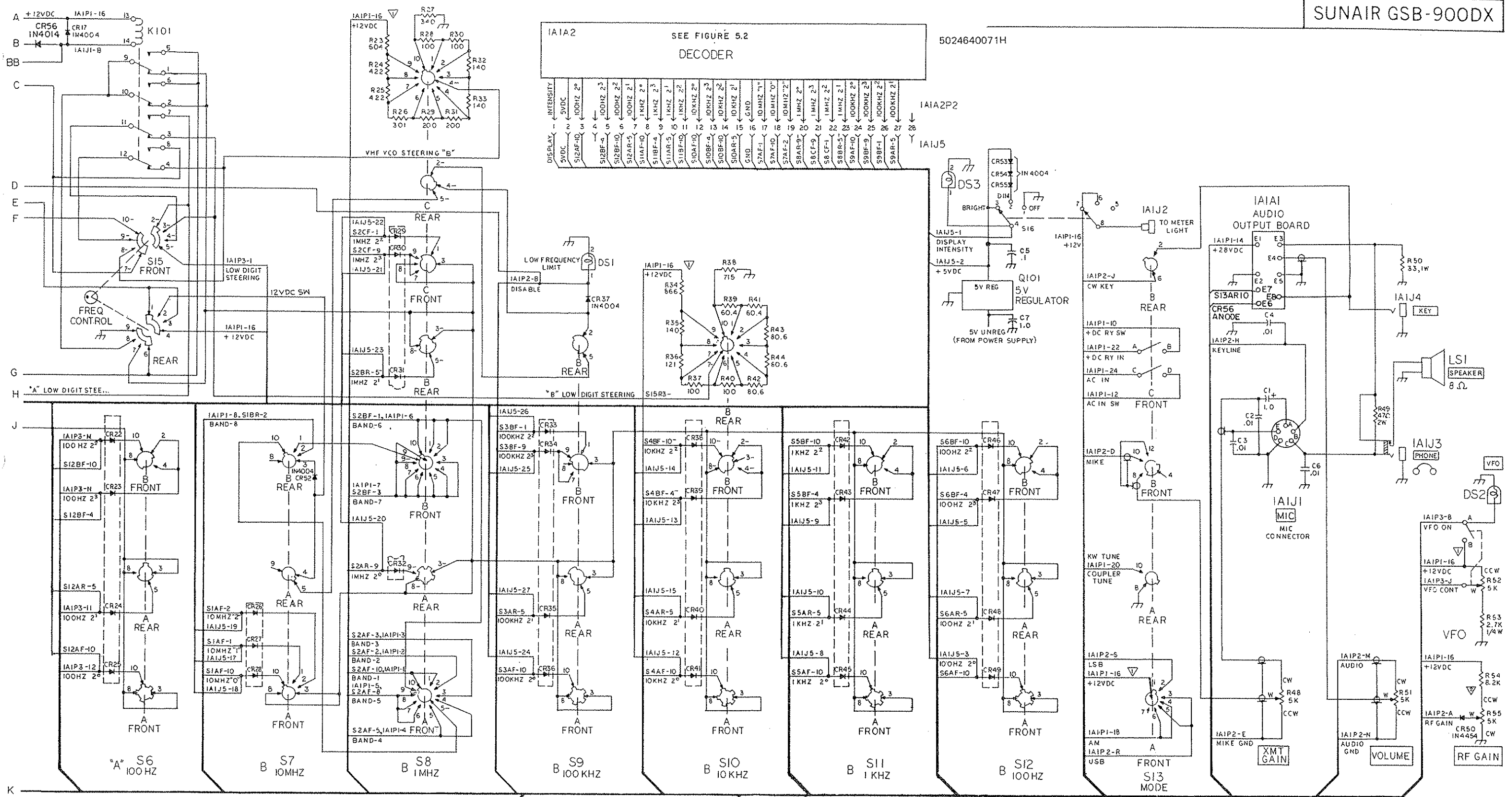


Figure 5.17 Half Duplex Front Panel Wiring Diagram (Sheet 1 of 2)



- NOTES:
- COMMON CONNECTION FOR +12VDC
 - PREFIX ALL DESIGNATORS WITH "IAI"
 - ALL RESISTORS IN OHMS
 - ALL CAPACITORS IN UF

Figure 5.17 Half Duplex Front Panel Wiring Diagram
(Sheet 2 of 2)
5-47

SUNAIR GSB-900DX

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	HARNESS, FR. Panel GSB-900DX	5024641094
C1	Not used	
C2	Not used	
C3	Not used	
C4	Not used	
C5	Capacitor, 0.1 UF, 50 V	0754420001
C6	Not used	
C7	Capacitor, 1 UF, 35 V, T368	0283630001
C8	Not used	
C9	Capacitor, 15 UF, 20 V, 198D	0280920008
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, Germ. 1N270	0405510004
CR13	Diode, Signal, Germ. 1N270	0405510004
CR14	Diode, Signal, Germ. 1N270	0405510004
CR15	Diode, Signal, Germ. 1N270	0405510004
CR16	Diode, Rectifier 1N4004	0405180004
CR17	Diode, Rectifier 1N4004	0405180004
CR18	Diode, Signal, Germ. 1N270	0405510004
CR19	Diode, Signal, Germ. 1N270	0405510004
CR20	Diode, Signal, Germ. 1N270	0405510004
CR21	Diode, Signal, Germ. 1N270	0405510004
CR22	Diode, Signal, Germ. 1N270	0405510004
CR23	Diode, Signal, Germ. 1N270	0405510004
CR24	Diode, Signal, Germ. 1N270	0405510004
CR25	Diode, Signal, Germ. 1N270	0405510004
CR26	Diode, Signal, Germ. 1N270	0405510004
CR27	Diode, Signal, Germ. 1N270	0405510004
CR28	Diode, Signal, Germ. 1N270	0405510004
CR29	Diode, Signal, Germ. 1N270	0405510004
CR30	Diode, Signal, Germ. 1N270	0405510004
CR31	Diode, Signal, Germ. 1N270	0405510004
CR32	Diode, Signal, Germ. 1N270	0405510004
CR33	Diode, Signal, Germ. 1N270	0405510004
CR34	Diode, Signal, Germ. 1N270	0405510004
CR35	Diode, Signal, Germ. 1N270	0405510004
CR36	Diode, Signal, Germ. 1N270	0405510004
CR37	Diode, Rectifier 1N4004	0405180004
CR38	Diode, Signal, Germ. 1N270	0405510004
CR39	Diode, Signal, Germ. 1N270	0405510004
CR40	Diode, Signal, Germ. 1N270	0405510004
CR41	Diode, Signal, Germ. 1N270	0405510004
CR42	Diode, Signal, Germ. 1N270	0405510004
CR43	Diode, Signal, Germ. 1N270	0405510004
CR44	Diode, Signal, Germ. 1N270	0405510004
CR45	Diode, Signal, Germ. 1N270	0405510004
CR46	Diode, Signal, Germ. 1N270	0405510004
CR47	Diode, Signal, Germ. 1N270	0405510004
CR48	Diode, Signal, Germ. 1N270	0405510004
CR49	Diode, Signal, Germ. 1N270	0405510004
CR50	Not used	
CR51	Not used	
CR52	Not used	
CR53	Not used	
CR54	Not used	
CR55	Not used	
CR56	Not used	
CR57	Diode, Zener 1N5240B	0403850002

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
J2	Jack, Phone Tip, Red	0753350009
J5	Housing, Connector	0754400000
J5	Pin, Connector	0754410005
J5	Key, Polarizing, Connector	0754420001
K101	Relay, 4 PDT, 12 V, Sensitive	0666640009
P1	Connector, Power, 24 Pin Rect.	0753330008
P2	Connector, PC, 15 Pin Female	0753340003
P3	Connector, PC, 15 Pin Female	0753340003
Q101	IC. Linear, Vol. Reg. MC7805ACK	0447190008
R1	Resistor, 100, 1%, 1/8W	0194890007
R2	Not used	
R3	Not used	
R4	Not used	
R5	Not used	
R6	Not used	
R7	Not used	
R8	Not used	
R9	Not used	
R10	Not used	
R11	Not used	
R12	Resistor, 475, 1%, 1/8W	0196610001
R13	Not used	
R14	Not used	
R15	Not used	
R16	Not used	
R17	Not used	
R18	Not used	
R19	Not used	
R20	Not used	
R21	Not used	
R22	Not used	
R23	Resistor, 100, 1%, 1/8W	0194890007
R24	Not used	
R25	Not used	
R26	Not used	
R27	Not used	
R28	Not used	
R29	Not used	
R30	Not used	
R31	Not used	
R32	Not used	
R33	Not used	
R34	Resistor, 475, 1%, 1/8W	
R35	Not used	
R36	Not used	
R37	Not used	
R38	Not used	
R39	Not used	
R40	Not used	
R41	Not used	
R42	Not used	
R43	Not used	
R44	Not used	
R45	Not used	
R46	Not used	
R47	Not used	
R48	Not used	
R49	Not used	
R50	Not used	
R51	Not used	
R52	Not used	
R53	Not used	
R54	Not used	
R55	Not used	
R56	Resistor, 100, 5%, 1/4W	0171180003
	PCB. A Channel Diodes	5024641205
	PCB. B Channel Diodes	5024641302

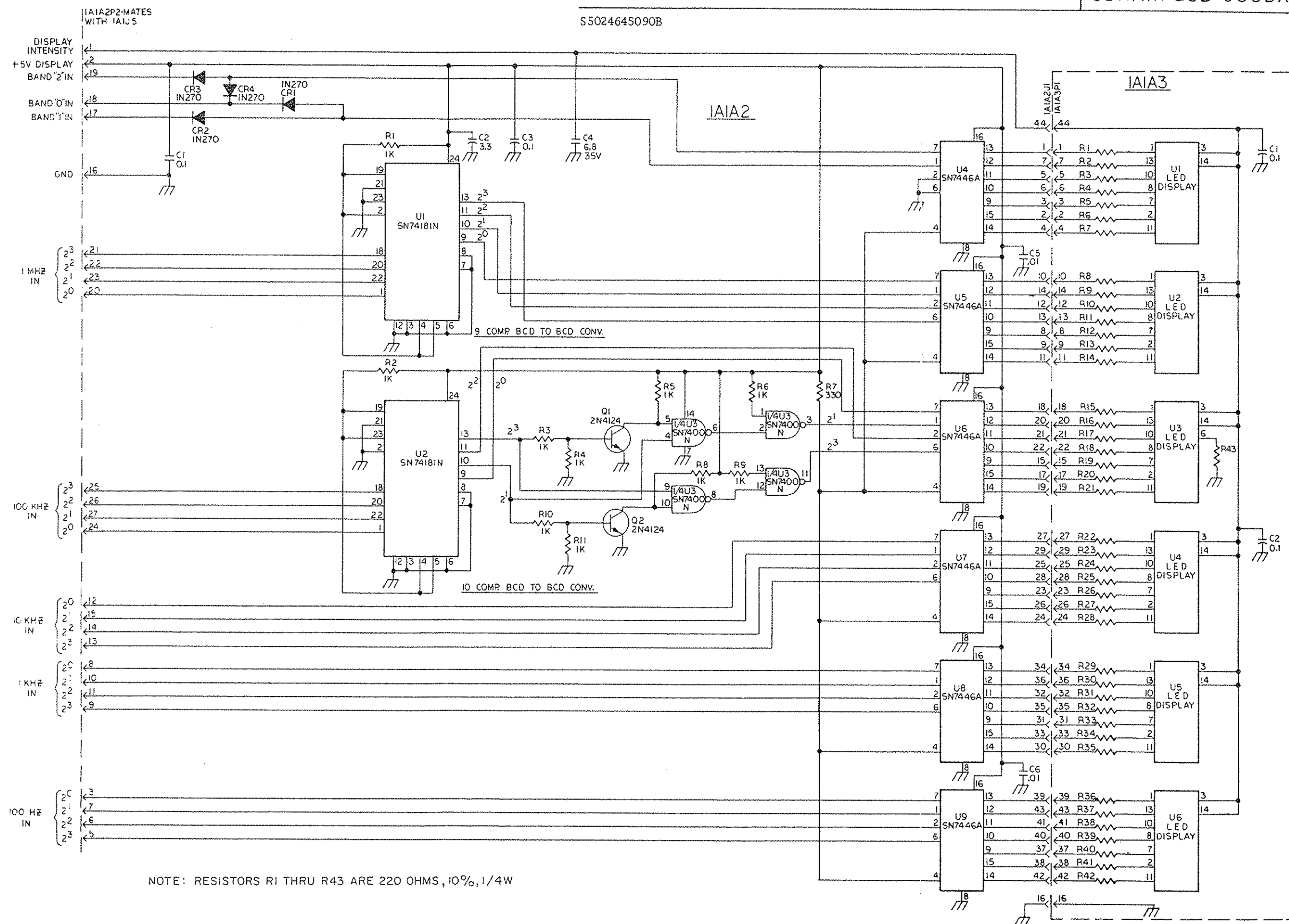
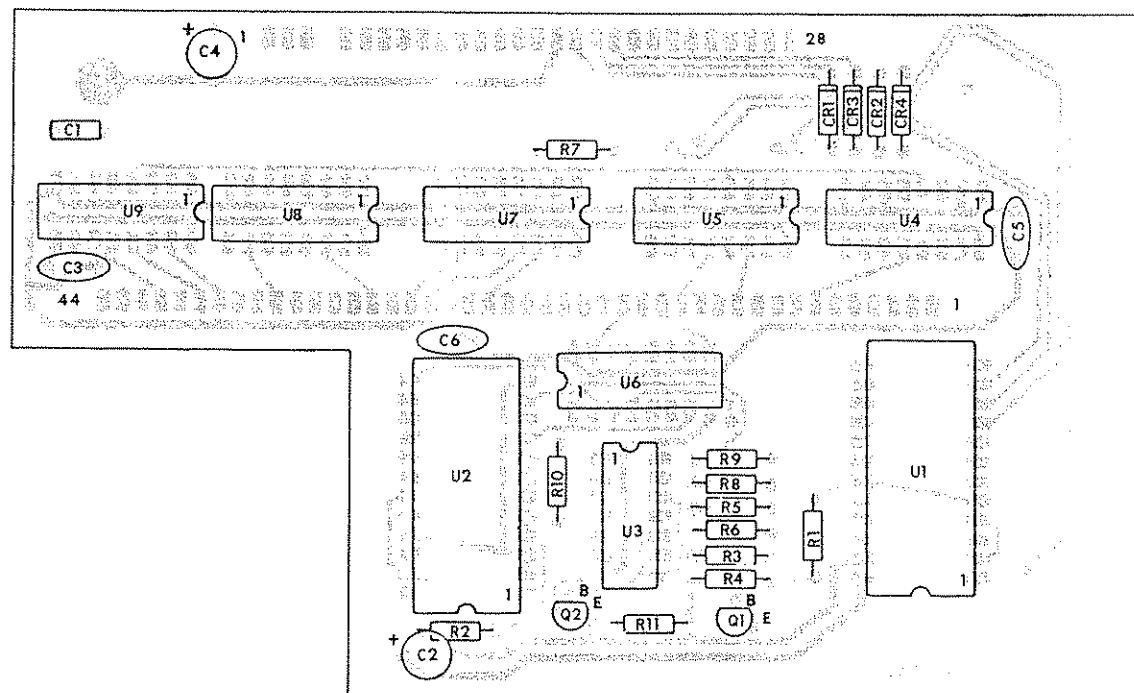
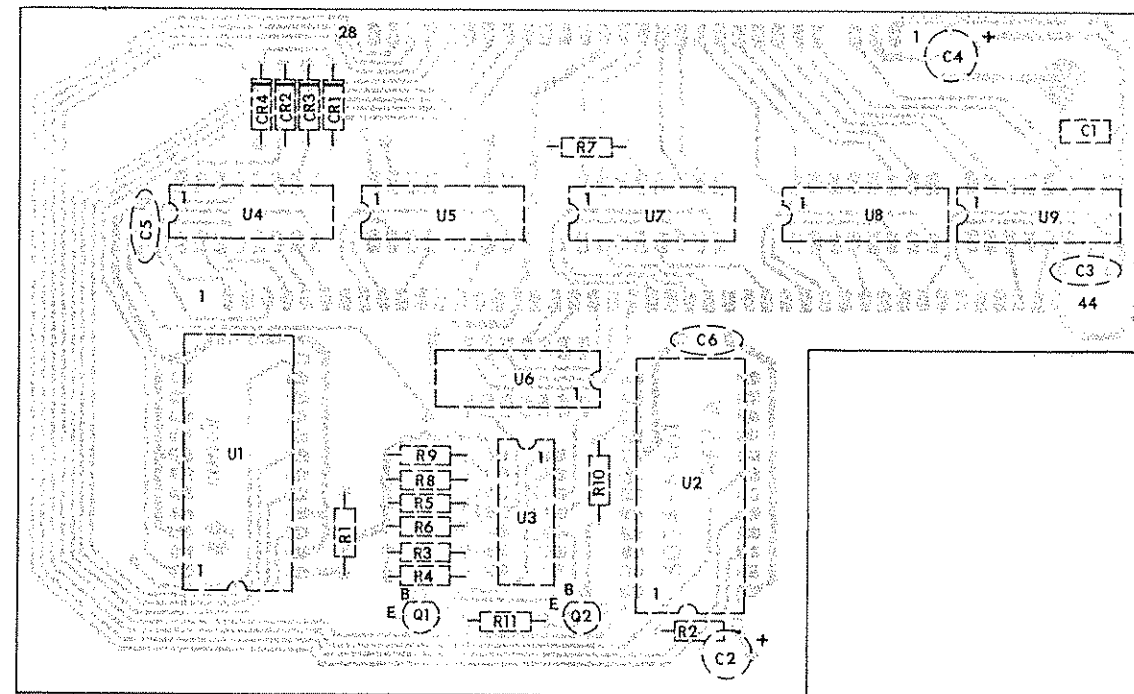


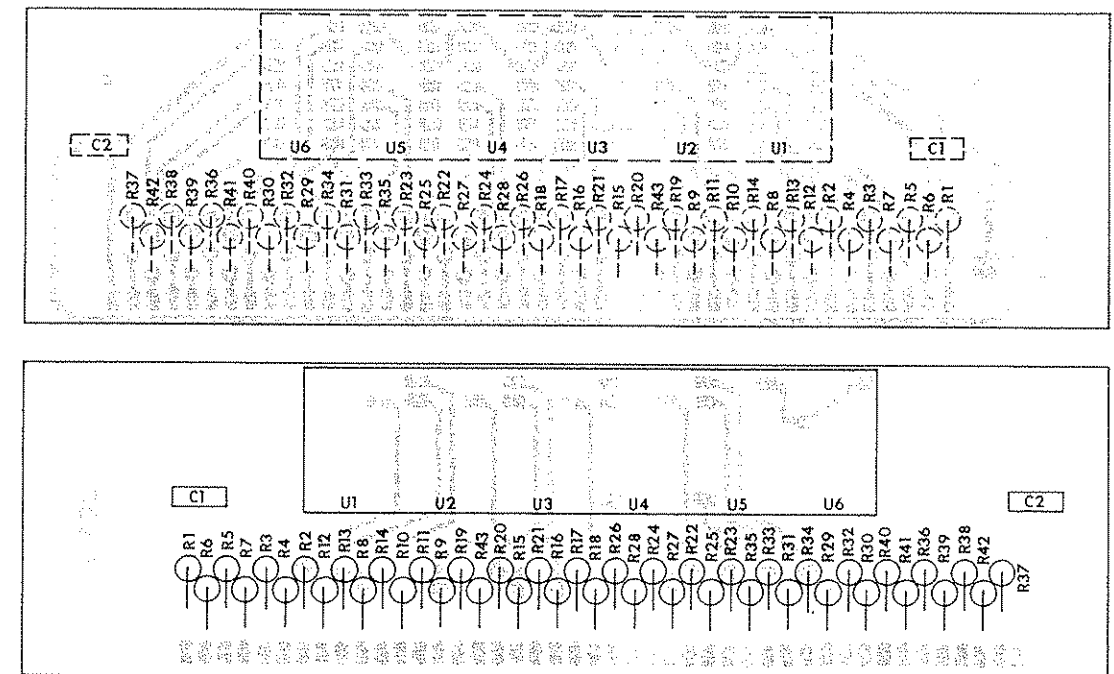
Figure 5.18 Decoder and Display Schematic

SUNAIR GSB-900DX

1A1A2 Decoder PC Board



1A1A3 DISPLAY BOARD



1A1A2 Decoder Board

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	PC ASSY DECODER GSB-900DX	5024646096
C2	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C3	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C4	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C5	Capacitor, 6.8 UF, 20 V, T368	0296780006
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Signal, Germ. 1N270	0405510004
CR2	Diode, Signal, Germ. 1N270	0405510004
CR3	Diode, Signal, Germ. 1N270	0405510004
CR4	Diode, Signal, Germ. 1N270	0405510004
J1	Connector, Power, 10 Pin Rect.	0754360008
P1	Not used	
P2	Pin Strap, Right Angle	0754390004
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 1K, 10%, 1/4W	0171560001
R2	Resistor, 1K, 10%, 1/4W	0171560001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R3	Resistor, 1K, 10%, 1/4W	0171560001
R4	Resistor, 1K, 10%, 1/4W	0171560001
R5	Resistor, 1K, 10%, 1/4W	0171560001
R6	Resistor, 1K, 10%, 1/4W	0171560001
R7	Resistor, 330, 5%, 1/4W	0170910008
R8	Resistor, 1K, 10%, 1/4W	0171560001
R9	Resistor, 1K, 10%, 1/4W	0171560001
R10	Resistor, 1K, 10%, 1/4W	0171560001
R11	Resistor, 1K, 10%, 1/4W	0171560001
U1	IC Digital SN7418N	0448550008
U2	IC Digital SN7418N	0448550008
U3	IC Digital SN7400N	0448070006
U4	IC Digital SN7446A	0448560003
U5	IC Digital SN7446A	0448560003
U6	IC Digital SN7446A	0448560003
U7	IC Digital SN7446A	0448560003
U8	IC Digital SN7446A	0448560003
U9	IC Digital SN7446A	0448560003

1A1A3 DISPLAY BOARD

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY DISPLAY GSB-900DX/SC	5024645596
C1	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C2	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
R1	Resistor, 220, 10%, 1/4W	0171320000
R2	Resistor, 220, 10%, 1/4W	0171320000
R3	Resistor, 220, 10%, 1/4W	0171320000
R4	Resistor, 220, 10%, 1/4W	0171320000
R5	Resistor, 220, 10%, 1/4W	0171320000
R6	Resistor, 220, 10%, 1/4W	0171320000
R7	Resistor, 220, 10%, 1/4W	0171320000
R8	Resistor, 220, 10%, 1/4W	0171320000
R9	Resistor, 220, 10%, 1/4W	0171320000
R10	Resistor, 220, 10%, 1/4W	0171320000
R11	Resistor, 220, 10%, 1/4W	0171320000
R12	Resistor, 220, 10%, 1/4W	0171320000
R13	Resistor, 220, 10%, 1/4W	0171320000
R14	Resistor, 220, 10%, 1/4W	0171320000
R15	Resistor, 220, 10%, 1/4W	0171320000
R16	Resistor, 220, 10%, 1/4W	0171320000
R17	Resistor, 220, 10%, 1/4W	0171320000
R18	Resistor, 220, 10%, 1/4W	0171320000
R19	Resistor, 220, 10%, 1/4W	0171320000
R20	Resistor, 220, 10%, 1/4W	0171320000
R21	Resistor, 220, 10%, 1/4W	0171320000
R22	Resistor, 220, 10%, 1/4W	0171320000
R23	Resistor, 220, 10%, 1/4W	0171320000
R24	Resistor, 220, 10%, 1/4W	0171320000
R25	Resistor, 220, 10%, 1/4W	0171320000
R26	Resistor, 220, 10%, 1/4W	0171320000
R27	Resistor, 220, 10%, 1/4W	0171320000
R28	Resistor, 220, 10%, 1/4W	0171320000
R29	Resistor, 220, 10%, 1/4W	0171320000
R30	Resistor, 220, 10%, 1/4W	0171320000
R31	Resistor, 220, 10%, 1/4W	0171320000
R32	Resistor, 220, 10%, 1/4W	0171320000
R33	Resistor, 220, 10%, 1/4W	0171320000
R34	Resistor, 220, 10%, 1/4W	0171320000
R35	Resistor, 220, 10%, 1/4W	0171320000
R36	Resistor, 220, 10%, 1/4W	0171320000
R37	Resistor, 220, 10%, 1/4W	0171320000
R38	Resistor, 220, 10%, 1/4W	0171320000
R39	Resistor, 220, 10%, 1/4W	0171320000
R40	Resistor, 220, 10%, 1/4W	0171320000
R41	Resistor, 220, 10%, 1/4W	0171320000
R42	Resistor, 220, 10%, 1/4W	0171320000
R43	Resistor, 220, 10%, 1/4W	0171320000
	Connector, PC, 22 Pin Male	0754370003
	Socket Assy. Display	0842120009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FREQ. DISPLAY ASSY. GSB-900DX	5024645090
V1	Diode, Led, 7 Segment, Hi Int.	1001260015
V2	Diode, Led, 7 Segment, Hi Int.	1001260015
V3	Diode, Led, 7 Segment, Hi Int.	1001260015
V4	Diode, Led, 7 Segment, Hi Int.	1001250015
V5	Diode, Led, 7 Segment, Hi Int.	1001250015
V6	Diode, Led, 7 Segment, Hi Int.	1001250015

SUNAIR GSB-900DX

5024012119M

NOTES:

1. PREFIX ALL PARTIAL DESIGNATORS WITH "1A8-"
2. UNLESS OTHERWISE DESIGNATED
-ALL CAPACITORS ARE IN MICROFARADS (μF)
-ALL INDUCTORS ARE IN MICROHENRIES (μH)
3. FUSE RATINGS:
- F1 { 5A FOR 115VAC INPUT, OR
F2 { 3A FOR 230VAC INPUT.
F3 { 30A^{SLO}_{BLO} FOR 13VDC INPUT, OR
15A^{SLO}_{BLO} FOR 26VDC INPUT.
- AUDIO
1A8J2
J ——— NC
H ——— NC
K ——— NC
GND A ———

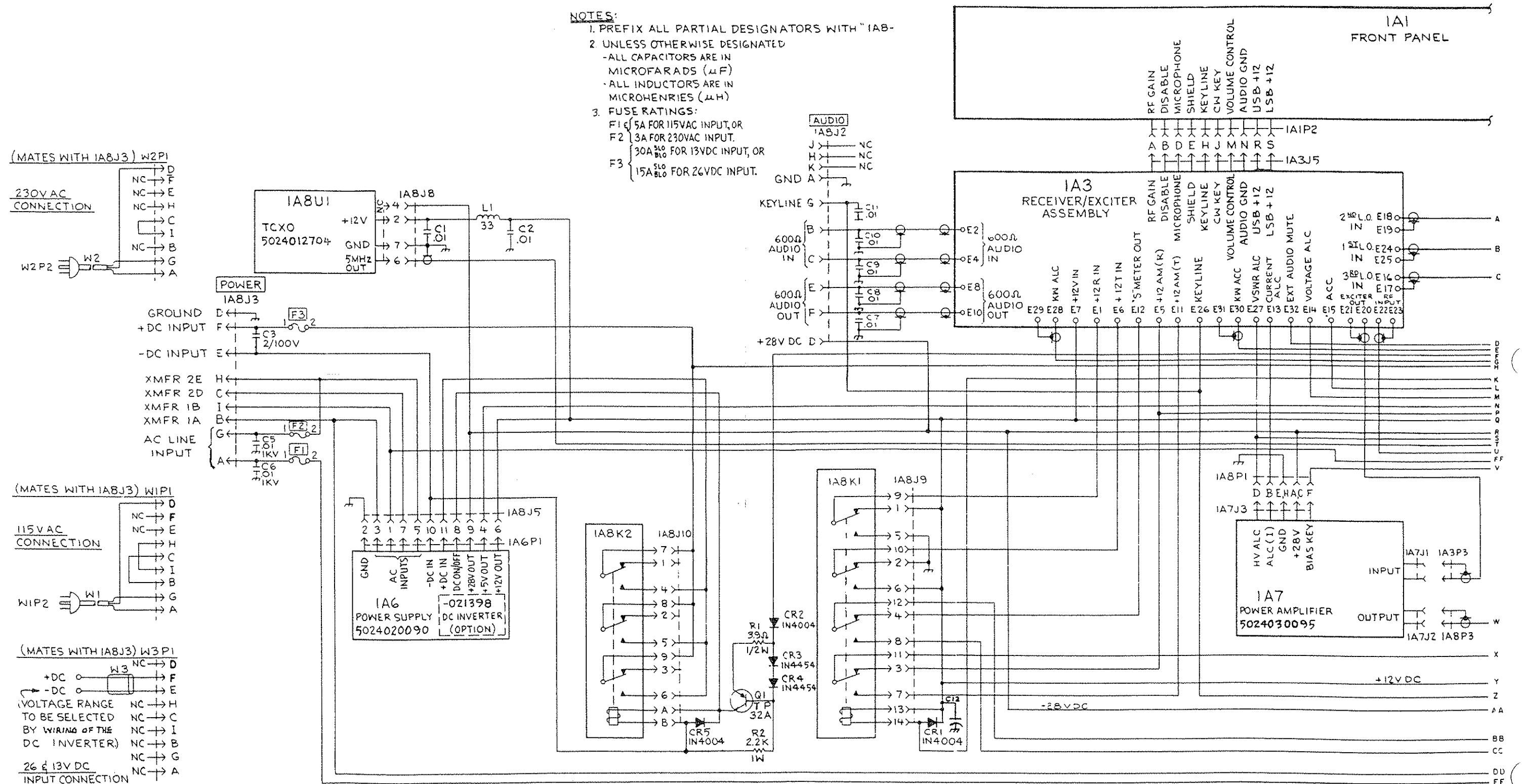


Figure 5.19 Main Frame Wiring

5024012119M

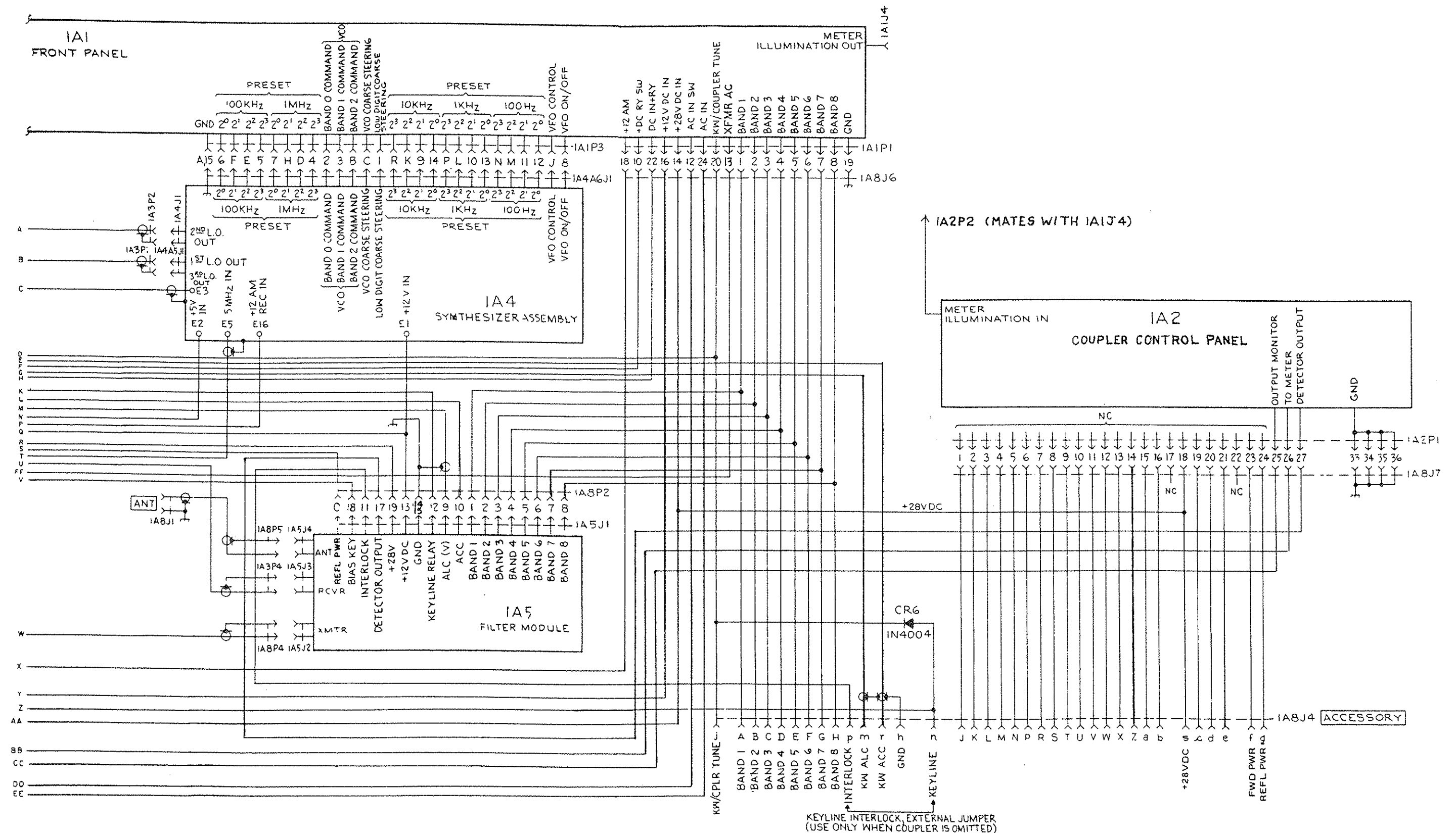


Figure 5.19 Main Frame Wiring

PARTS LIST, MAIN FRAME
50240XXXXX CHASSIS ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CHASSIS ASSY.	50240XXXXX
1A3P1	Connector, RF, Subminiature	0753700000
1A3P2	Connector, RF, Subminiature	0753700000
1A3P3	Connector, RF, Miniature	0753720001
1A3P4	Connector, RF, Miniature	0753720001
1A8P5	Connector, RF, BNC	0753710005
1A8U1	TCXO, 5MHZ Ground Eqpt.	5024012704
C1	Capacitor, 0.01UF, 25V, X5S	0281620008
C2	Capacitor, 0.01UF, 25V, X5S	0281620008
C3	Capacitor, 2UF, 100V, Mylar	0272420000
C4	Not used	
C5	Capacitor, 0.01UF, 1000V, Z5U, 20%	0243550006
C6	Capacitor, 0.01UF, 1000V, Z5U, 10%	0243550006
C7	Capacitor, 0.01UF, 25V, X5S	0281620008
C8	Capacitor, 0.01UF, 25V, X5S	0281620008
C9	Capacitor, 0.01UF, 25V, X5S	0281620008
C10	Capacitor, 0.01UF, 25V, X5S	0281620008
C11	Capacitor, 0.01UF, 25V, X5S	0281620008
C12	Capacitor, 15UF, 35V	0282240004
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Rectifier 1N4004	0405180004
J1	Connector, RF, UHF	0753300001
J2	Connector, Power, 10 Pin Round	0753990008
J3	Connector, Power, 9 Pin Round	0753440008
J4	Connector, Power, 37 Pin Round	0753430002
J5	Connector, Power, 11 Pin Rect.	0753460009
J6	Connector, Power, 24 Pin Rect.	0753510006
J7	Connector, Power, 36 Pin Rect.	0753520001
K1	Relay, 4PDT, 12V, Sensitive	0666640009
K2	Relay, 3PDT, 12V, Plug-In 10A	0666760004
L1	Inductor, Molded, 47UH, 5%	0652680003
P1	Connector, Power, 7 Pin Rect.	0753530007
P2	Connector, Power, 20 Pin Rect.	0753550008
Q1	Transistor, PNP, Sil. T1P-32A	0448200007
Q101	Transistor, NPN, Si.	0448210002
R1	Resistor, 3.9, 5%, 1/2W	0168270005
R2	Resistor, 2.2K, 10%, 1W	0164510001
	Socket, Tube 7 Pin	0764370006
	Connector, RF, COAX Feedthru	0753690004
	COAX Cable Assy.	5024003799

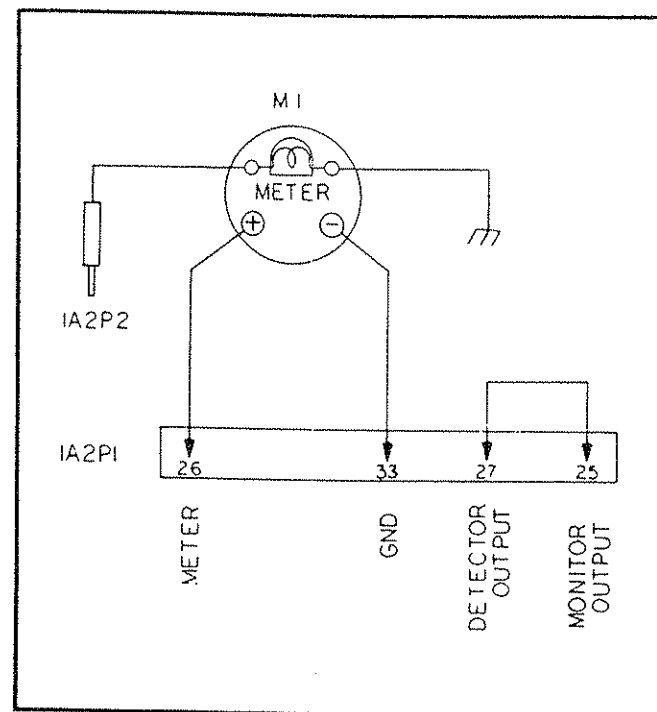


Figure 5.23 Meter Panel Schematic (1A2)

50240419XXE METER PANEL ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
M1	Meter, Illuminated	5024042204
P1	Connector, 36 Pin	0754070000
P2	Plug, Phone Tip, Red	0753680000

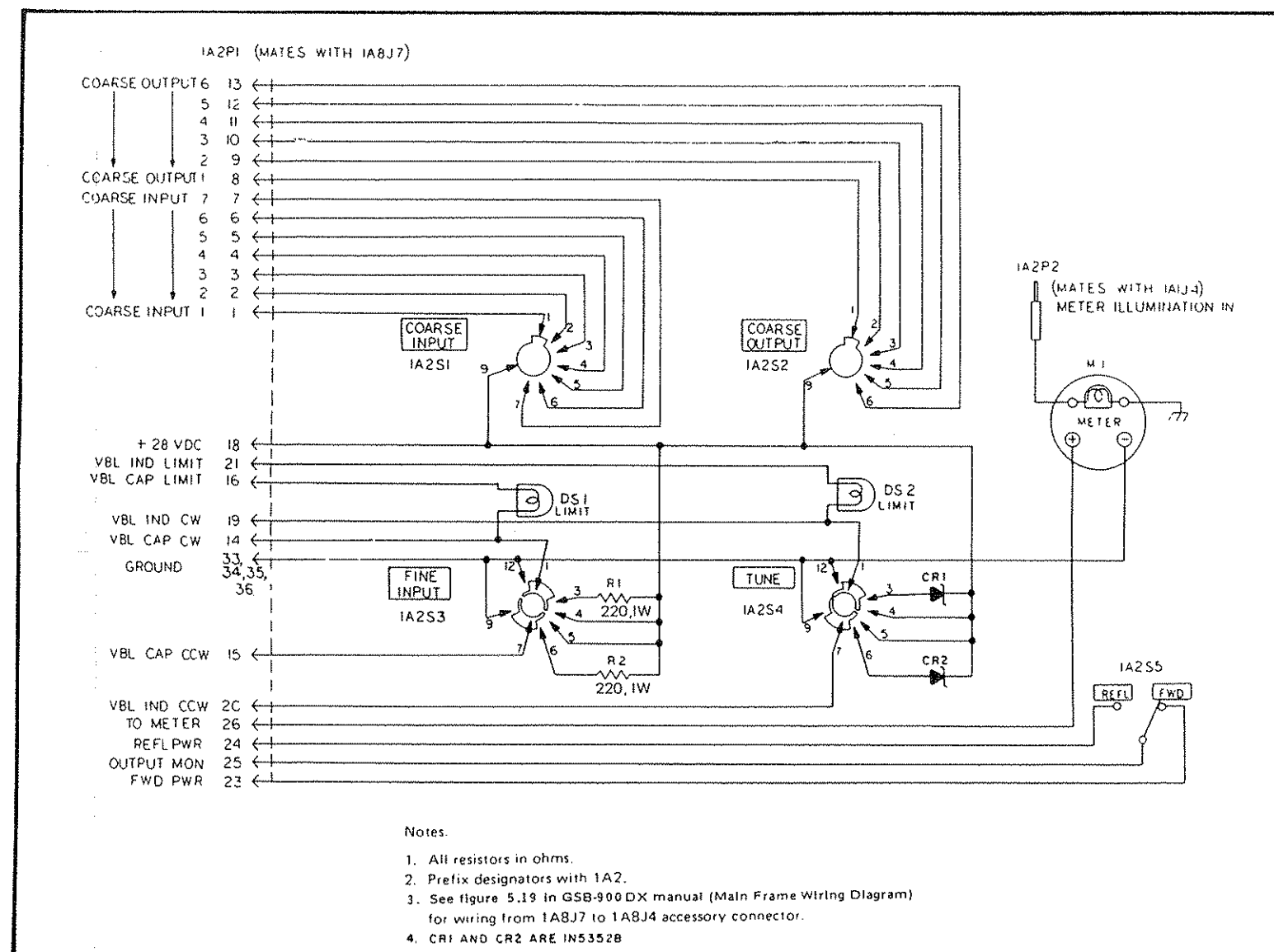


Figure 5.22 Schematic Diagram GCU-910A Antenna Tuning Control Unit

6032400051N KW CONTROL GSL-1900A

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	KW CONTROL	6032400051
1A2R2	Resistor, 220, 10%, 1/2W	0172850002
C1	Capacitor, 0.01UF, 1000V, Z5U, 20%	0243550006
CR1	Diode, Rectifier, 1N4004	0405180004
DS1	Lamp Assy. White Incandescent	6032072401
DS2	Lamp Assy. Green Incandescent	6032072100
DS3	Lamp Assy. Amber Incandescent	6032072207
DS4	Lamp Assy. Amber Incandescent	6032072207
DS5	Lamp Assy. Amber Incandescent	6032072207
DS6	Lamp Assy. Green Incandescent	6032072100
DS7	Lamp Assy. Red Incandescent	6032072304
DS8	Lamp Assy. White Incandescent	6032072401
M1	Meter	5024042204
P1	Connector, Power, 36 Pin Rect.	0754070000
P2	Plug, Phone Tip, Red	0753680009
R1	Resistor, 15, 10%, 1/2W	0178570001
R2	Not used	
R3	Resistor, 47, 10%, 1/2W	0167980009
R4	Resistor, 100, 10%, 1/2W	0174790007
S1	Switch, Pushbutton, SPDT	1000870014
S2	Switch, Pushbutton, DPDT	1000870006
S3	Switch, Pushbutton, SPDT	1000870014
S4	Switch, Pushbutton, SPDT	1000870014
S5	Switch, Toggle, DPDT	0334610001

6035150055K CPLR TUNE CONTROL GCU-935

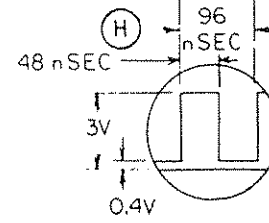
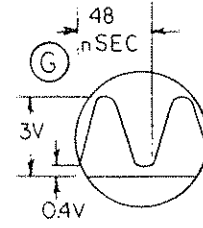
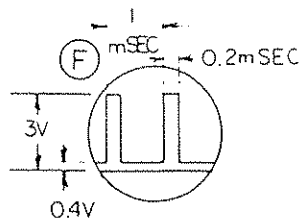
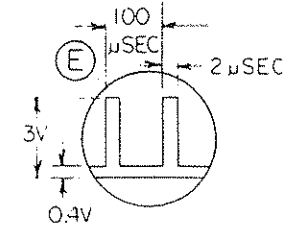
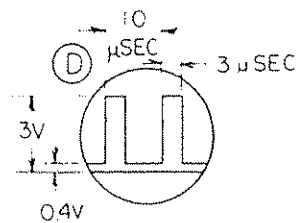
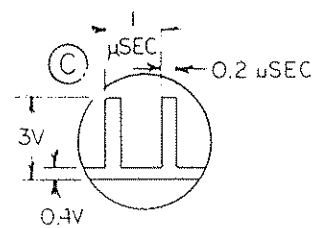
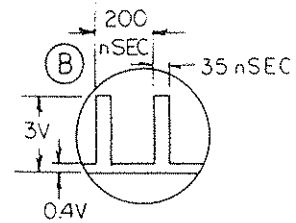
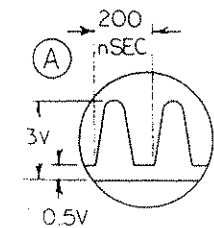
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CPLR TUNE CONTROL	6035150055
1A2P1	Connector, Power, 36 Pin Rect.	0754070000
1A2P2	Plug, Phone Tip, Red	0753680009
1A2S1	Switch, Toggle, DPDT	0334610001
1A2S2	Switch, Pushbutton, SPST, N.O.	0346520002
DS1	Lamp Assy. Green	0841480001
DS2	Lamp Assy. Red	0841490007
DS3	Lamp Assy. Amber	0841500002
M1	Meter	5024042204
R1	Resistor, 10K, 10%, 1/4W	0170410005
R2	POT, 10K, 10%, 3/4W, 1/8 Shaft	0335900003
R3	Resistor, 15K, 10%, 1/4W	0172350000
	Boot, Pushbutton Switch 1/2-40	0346530008
	Boot, Toggle Switch 1/4-40	0531120007
	Tie, Cable, 4 Lg. 3/4Dia.	0600240002
	Clip, Lamp Assy. Mtg.	0841510008
	Terminal, Lamp Assy.	0841520003
	Terminal Strip, 8 Term. 2 Gnd.	0859070000
	Wire Kit, Tune Control GCU-935	6035150004

5024042352L CPLR, TUNE CONTROL GCU-910A

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CPLR, TUNE CONTROL	5024042352
CR1	Diode, Zener 1N5352B	0405110006
CR2	Diode, Zener 1N5352B	0405110006
DS1	Lamp Assy. Amber	0840870001
DS2	Lamp Assy. Amber	0840870001
R1	Resistor, 220, 10%, 1W	0197190006
R2	Resistor, 220, 10%, 1W	0197190006
S1	Switch, Rotary, Coarse Input	5024042701
S2	Switch, Rotary, Coarse Output	5024042808
S3	Switch, Rotary, Motor Control	5024042603
S4	Switch, Rotary, Motor Control	5024042603
S5	Switch, Toggle, DPDT	0334610001
	Boot, Toggle Switch 1/4-40	0531120007
	Terminal Strip, 3Term., 1Grd.	0996700056
	Meter	5024042204
	Wire Kit, Tun. Cont. GCU-910A	5024042301
	Panel, Coupler Control, Grey	5024042514

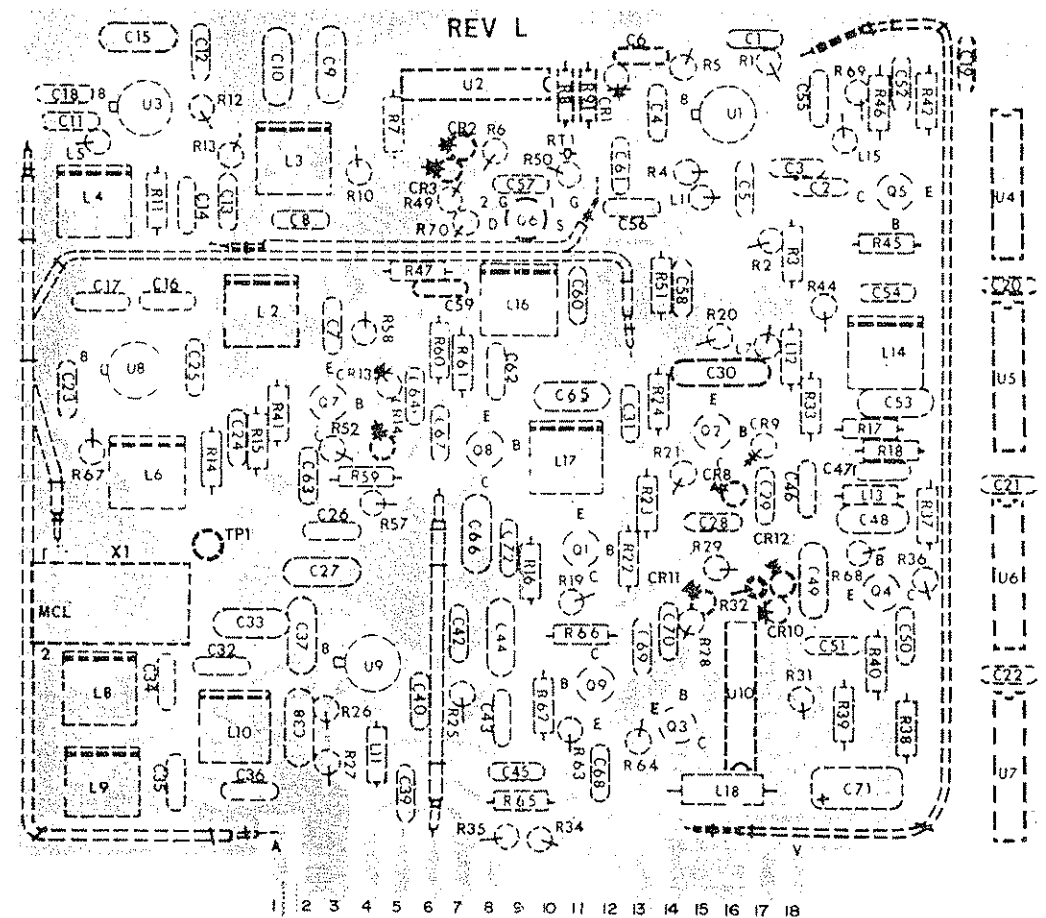
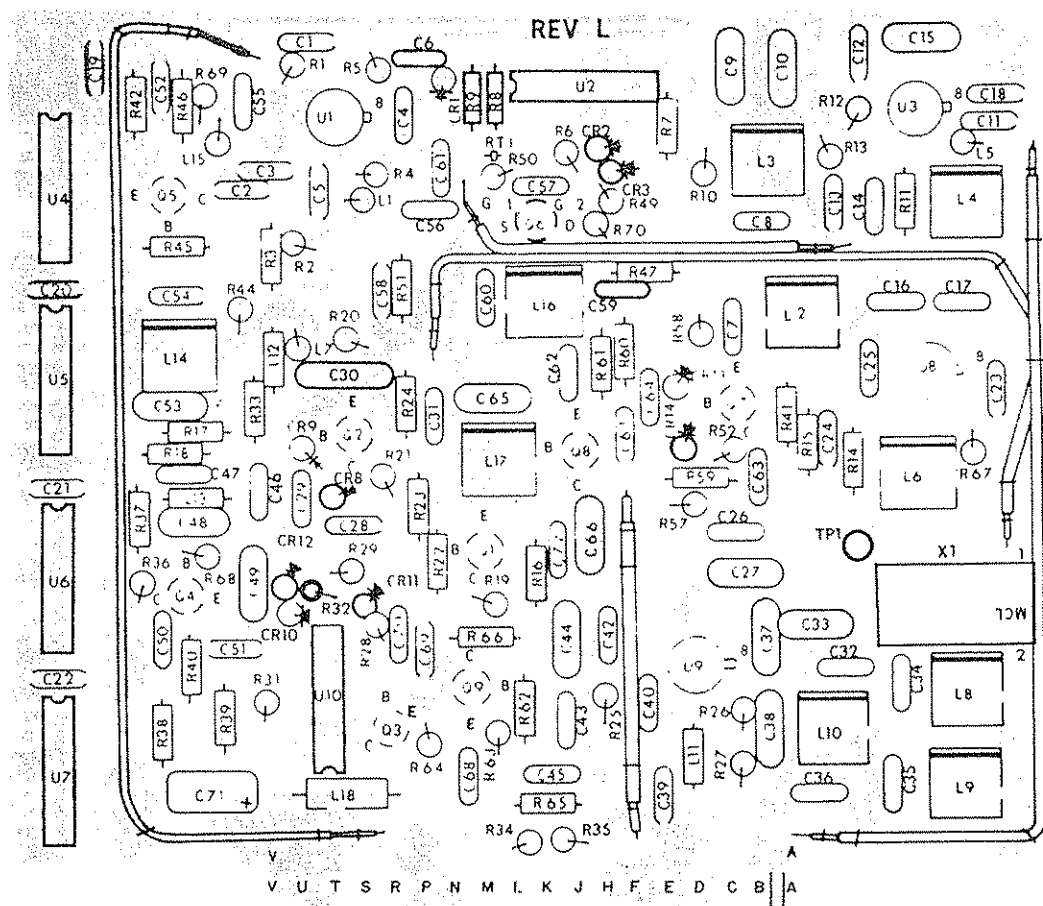
SUNAIR GSB-900DX

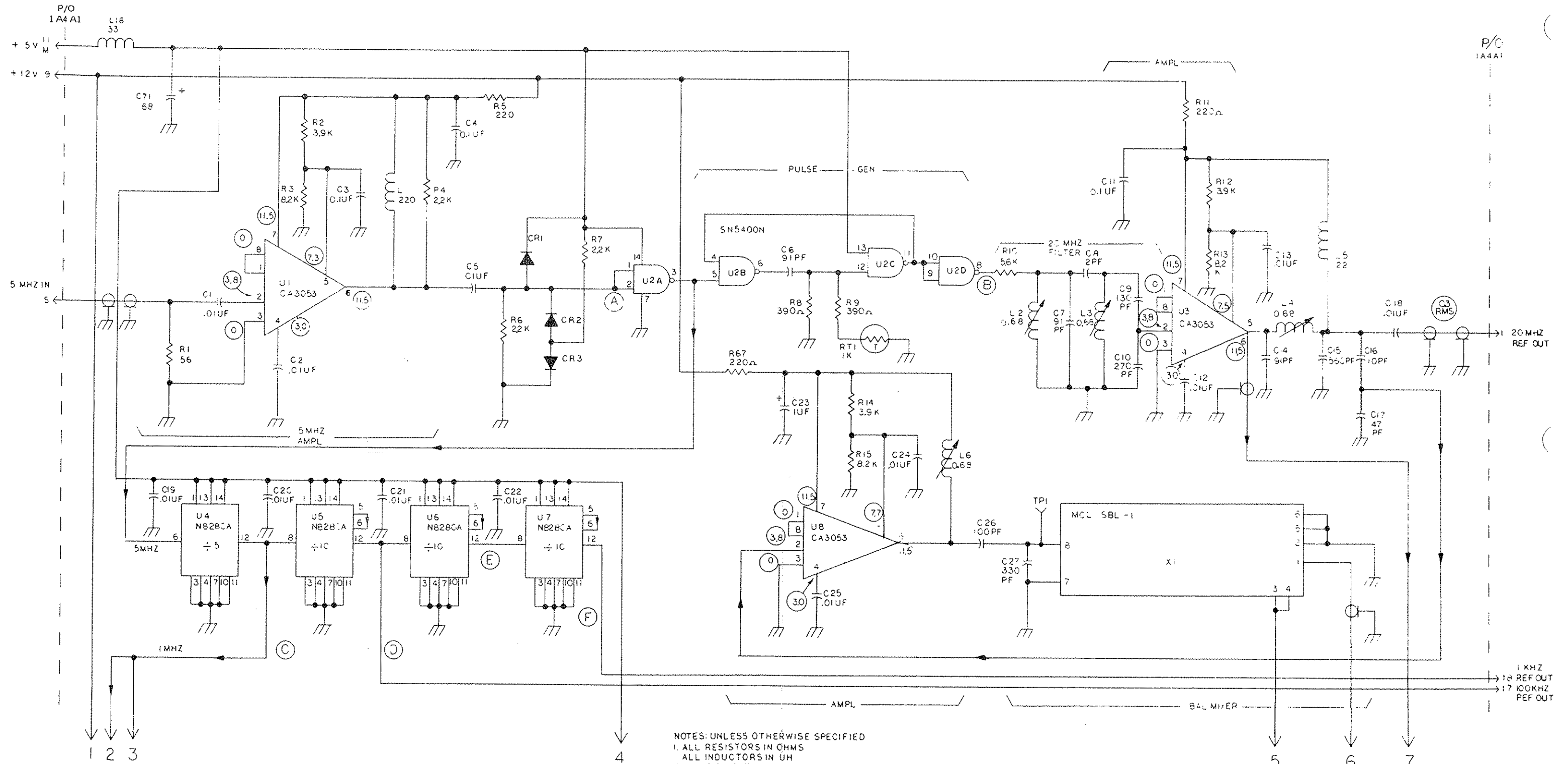
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NOTE: H DOES NOT
CLOCK IN AM. REV.
MODE

Spectrum Generator (1A4A1) Waveforms
(Frequency Dials at 00000.0 KHZ





NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS IN OHMS

ALL INDUCTORS IN UH

2. ALL D.C. VOLTAGE MEASUREMENTS MADE WITH 20,000 OHM/VOLT V.O.M. MAY VARY $\pm 15\%$

3. (12) - DENOTES READINGS MADE WITH 11 MEGOHM V.T.V.M. MAY VARY $\pm 15\%$

4. (12) - READINGS PRESENT IN ALL MODES

5. (12) - READINGS PRESENT IN AM RCV. MODE

6. (12) - READINGS PRESENT WHEN NOT IN AM RCV. MODE

NOTES: CONTINUED

7. (A) REFERENCE WAVEFORMS WITH ALL FREQUENCY DIALS SET AT "0"

Figure 5.24 Spectrum Generator Schematic (1A4A1) (Sheet 1 of 2)

5024060270E

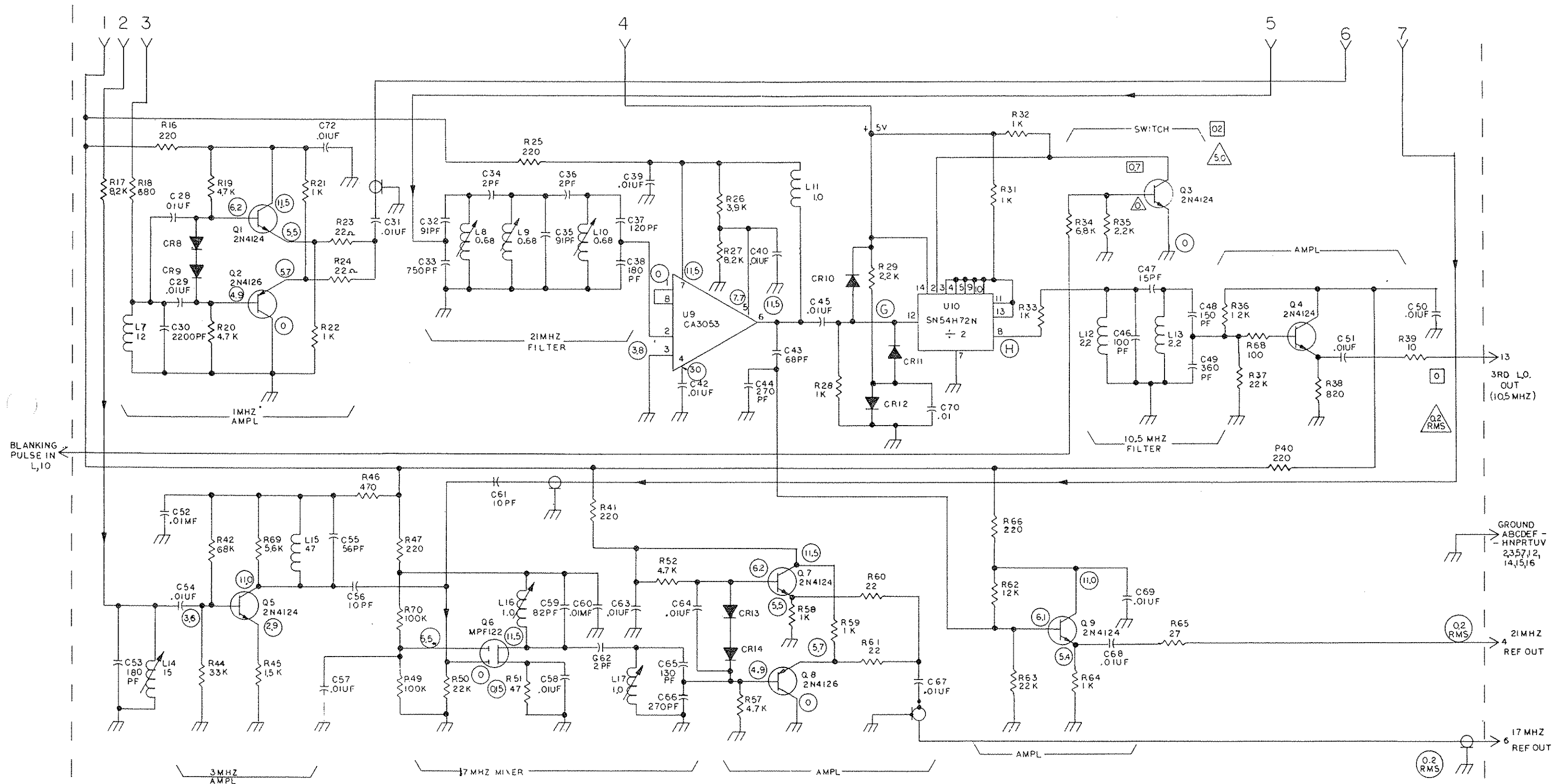


Figure 5.24 Spectrum Generator Schematic (1A4A1) (Sheet 2 of 2)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SPECTRUM GENERATOR	5024060091
C1	Capacitor, 0.01UF, 25V, X5S	0281620008
C2	Capacitor, 0.01UF, 25V, X5S	0281620008
C3	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C5	Capacitor, 0.01UF, 25V, X5S	0281620008
C6	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C7	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C8	Capacitor, 2PF, 500V, DM10	0259710008
C9	Capacitor, 130PF, 500V, DM15, 5%	0274860007
C10	Capacitor, 270PF, 500V, DM15, 5%	0275030008
C11	Capacitor, 0.01UF, 50V, X7R, 20%	0281610002
C12	Capacitor, 0.01UF, 25V, X5S	0281620008
C13	Capacitor, 0.01UF, 25V, X5S	0281620008
C14	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C15	Capacitor, 560PF, 300V, DM15, 5%	0283750006
C16	Capacitor, 10PF, 500V, DM10	0259830003
C17	Capacitor, 47PF, 500V, DM10, 5%	0294960007
C18	Capacitor, 0.01UF, 25V, X5S	0281620008
C19	Capacitor, 0.01UF, 25V, X5S	0281620008
C20	Capacitor, 0.01UF, 25V, X5S	0281620008
C21	Capacitor, 0.01UF, 25V, X5S	0281620008
C22	Capacitor, 0.01UF, 25V, X5S	0281620008
C23	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C24	Capacitor, 0.01UF, 25V, X5S	0281620008
C25	Capacitor, 0.01UF, 25V, X5S	0281620008
C26	Capacitor, 100PF, 500V, DM10, 5%	0274740001
C27	Capacitor, 330PF, 500V, DM15, 5%	0299030008
C28	Capacitor, 0.01UF, 25V, X5S	0281620008
C29	Capacitor, 0.01UF, 25V, X5S	0281620008
C30	Capacitor, 2200PF, 500V, DM19, 2%	0281360006
C31	Capacitor, 0.01UF, 25V, X5S	0281620008
C32	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C33	Capacitor, 750PF, 300V, DM15, 5%	0275410005
C34	Capacitor, 2PF, 500V, DM10	0259710008
C35	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C36	Capacitor, 2PF, 500V, DM10	0259710008
C37	Capacitor, 120PF, 500V, DM15, 5%	0289850002
C38	Capacitor, 180PF, 500V, DM15, 5%	0258280000
C39	Capacitor, 0.01UF, 25V, X5S	0281620008
C40	Capacitor, 0.01UF, 25V, X5S	0281620008
C41	Not used	
C42	Capacitor, 0.01UF, 25V, X5S	0281620008
C43	Capacitor, 68PF, 500V, DM10, 5%	0261070002
C44	Capacitor, 270PF, 500V, DM15, 5%	0275030008
C45	Capacitor, 0.01UF, 25V, X5S	0281620008
C46	Capacitor, 100PF, 500V, DM10, 5%	0274740001
C47	Capacitor, 15PF, 500V, DM10, 5%	0259950009
C48	Capacitor, 150PF, 500V, DM15, 5%	0274980002
C49	Capacitor, 360PF, 500V, DM15, 5%	0275150003
C50	Capacitor, 0.01UF, 25V, X5S	0281620008
C51	Capacitor, 0.01UF, 25V, X5S	0281620008
C52	Capacitor, 0.01UF, 25V, X5S	0281620008
C53	Capacitor, 180PF, 500V, DM15, 5%	0258280000
C54	Capacitor, 0.01UF, 25V, X5S	0281620008
C55	Capacitor, 56PF, 500V, DM10, 5%	0293170002
C56	Capacitor, 10PF, 500V, DM10	0259830003
C57	Capacitor, 0.01UF, 25V, X5S	0281620008
C58	Capacitor, 0.01UF, 25V, X5S	0281620008
C59	Capacitor, 82PF, 500V, DM10, 5%	0262120003
C60	Capacitor, 0.01UF, 25V, X5S	0281620008
C61	Capacitor, 10PF, 500V, DM10	0259830003
C62	Capacitor, 2PF, 500V, DM10	0259710008
C63	Capacitor, 0.01UF, 25V, X5S	0281620008
C64	Capacitor, 0.01UF, 25V, X5S	0281620008
C65	Capacitor, 130PF, 500V, DM15, 5%	0274860007
C66	Capacitor, 270PF, 500V, DM15, 5%	0275030008
C67	Capacitor, 0.01UF, 25V, X5S	0281620008
C68	Capacitor, 0.01UF, 25V, X5S	0281620008
C69	Capacitor, 0.01UF, 25V, X5S	0281620008
C70	Capacitor, 0.01UF, 25V, X5S	0281620008
C71	Capacitor, 68UF, 15V, T368	0296540005
C72	Capacitor, 0.01UF, 25V, X5S	0281620008
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Not used	
CR5	Not used	
CR6	Not used	
CR7	Not used	
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
L1	Inductor, Molded, 220UH, 5%	0650500008
L2	Inductor, Var. 0.68UH	0647900009
L3	Inductor, Var. 0.68UH	0647900009
L4	Inductor, Var. 0.68UH	0647900009
L5	Inductor, Molded, 22UH, 5%	0650000005
L6	Inductor, Var. 0.68UH	0647900009
L7	Inductor, Molded, 12UH, 5%	0652700004
L8	Inductor, Var. 0.68UH	0647900009
L9	Inductor, Var. 0.68UH	0647900009
L10	Inductor, Var. 0.68UH	0647900009
L11	Inductor, Molded, 1.0UH, 5%	0649150007
L12	Inductor, Molded, 2.2UH, 5%	0649890001
L13	Inductor, Molded, 2.2UH, 5%	0649890001
L14	Inductor, Var. 15.0UH	0629790001
L15	Inductor, Molded, 47UH, 5%	0652680003
L16	Inductor, Var. 1.00UH	0647910004
L17	Inductor, Var. 1.00UH	0647910004
L18	Inductor, Molded, 33UH, 5%	0646300008
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, PNP, Si. 2N4126	0448020009
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, NPN, Si. 2N4124	0448010003
Q6	Transistor, N-CH, Fet MFE122	0448030004
Q7	Transistor, NPN, Si. 2N4124	0448010003
Q8	Transistor, PNP, Si. 2N4126	0448020009
Q9	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 56, 10%, 1/4W	0174290004
R2	Resistor, 3.9K, 10%, 1/4W	0178830003
R3	Resistor, 8.2K, 10%, 1/4W	0181620006
R4	Resistor, 2.2K, 5%, 1/4W	0178070009
R5	Resistor, 220, 10%, 1/4W	0171320000
R6	Resistor, 2.2K, 5%, 1/4W	0178070009
R7	Resistor, 2.2K, 5%, 1/4W	0178070009
R8	Resistor, 390, 10%, 1/4W	0178330001
R9	Resistor, 390, 10%, 1/4W	0178330001
R10	Resistor, 5.6K, 10%, 1/4W	0183060008
R11	Resistor, 220, 10%, 1/4W	0171320000
R12	Resistor, 3.9K, 10%, 1/4W	0178830003
R13	Resistor, 8.2K, 10%, 1/4W	0181620006
R14	Resistor, 3.9K, 10%, 1/4W	0178830003
R15	Resistor, 8.2K, 10%, 1/4W	0181620006
R16	Resistor, 220, 10%, 1/4W	0171320000
R17	Resistor, 8.2K, 10%, 1/4W	0181620006
R18	Resistor, 680, 10%, 1/4W	0176630007
R19	Resistor, 4.7K, 5%, 1/4W	0170770001
R20	Resistor, 4.7K, 5%, 1/4W	0170770001
R21	Resistor, 1K, 10%, 1/4W	0171560001
R22	Resistor, 1K, 10%, 1/4W	0171560001
R23	Resistor, 22, 10%, 1/4W	0192690001
R24	Resistor, 22, 10%, 1/4W	0192690001
R25	Resistor, 220, 10%, 1/4W	0171320000
R26	Resistor, 3.9K, 10%, 1/4W	0178830003
R27	Resistor, 8.2K, 10%, 1/4W	0181620006
R28	Resistor, 1K, 10%, 1/4W	0171560001
R29	Resistor, 2.2K, 5%, 1/4W	0178070009
R30	Not used	
R31	Resistor, 1K, 10%, 1/4W	0171560001
R32	Resistor, 1K, 10%, 1/4W	0171560001
R33	Resistor, 1K, 10%, 1/4W	0171560001
R34	Resistor, 6.8K, 5%, 1/4W	0174810008
R35	Resistor, 2.2K, 5%, 1/4W	0178070009
R36	Resistor, 12K, 10%, 1/4W	0183180003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R37	Resistor, 22K, 5%, 1/4W	0172230004
R38	Resistor, 820, 10%, 1/4W	0178210005
R39	Resistor, 10, 5%, 1/4W	0177160004
R40	Resistor, 220, 10%, 1/4W	0171320000
R41	Resistor, 220, 10%, 1/4W	0171320000
R42	Resistor, 68K, 10%, 1/4W	0173520006
R43	Not used	
R44	Resistor, 33K, 10%, 1/4W	0177920009
R45	Resistor, 1.5K, 10%, 1/4W	0172470005
R46	Resistor, 470, 10%, 1/4W	0172610001
R47	Resistor, 220, 10%, 1/4W	0171320000
R48	Not used	
R49	Resistor, 100K, 10%, 1/4W	0170390004
R50	Resistor, 22K, 5%, 1/4W	0172230004
R51	Resistor, 47K, 10%, 1/4W	0179360001
R52	Resistor, 4.7K, 5%, 1/4W	0170770001
R53	Not used	
R54	Not used	
R55	Not used	
R56	Not used	
R57	Resistor, 4.7K, 5%, 1/4W	0170770001
R58	Resistor, 1K, 10%, 1/4W	0171560001
R59	Resistor, 1K, 10%, 1/4W	0171560001
R60	Resistor, 22, 10%, 1/4W	0192690001
R61	Resistor, 22, 10%, 1/4W	0192690001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R62	Resistor, 12K, 10%, 1/4W	0183180003
R63	Resistor, 22K, 5%, 1/4W	0172230004
R64	Resistor, 1K, 10%, 1/4W	0171560001
R65	Resistor, 27, 10%, 1/4W	0172590001
R66	Resistor, 220, 10%, 1/4W	0171320000
R67	Resistor, 220, 10%, 1/4W	0171320000
R68	Resistor, 100, 5%, 1/4W	0171180003
R69	Resistor, 5.6K, 10%, 1/4W	0183060008
R70	Resistor, 100K, 10%, 1/4W	0170390004
RT1	Resistor, 1K at 25C	0196110009
TP1		0525580000
U1	IC Linear CA3053	0448060001
U2	IC Digital SN5400N	0448400006
U3	IC Linear CA3053	0448060001
U4	IC Digital SN74176/N8280A	0448080001
U5	IC Digital SN74176/N8280A	0448080001
U6	IC Digital SN74176/N8280A	0448080001
U7	IC Digital SN74176/N8280A	0448080001
U8	IC Linear CA3053	0448060001
U9	IC Linear CA3053	0448060001
U10	IC Digital SN541472N	0448110001
	Tubing, No. 22 Natural DNP	0579480003
	Wire Kit, Spectrum Gen. Assy.	5024060008
	PCB Spectrum Generator	5024060202
X1	Balanced Mixer	1003300006

5024070097C

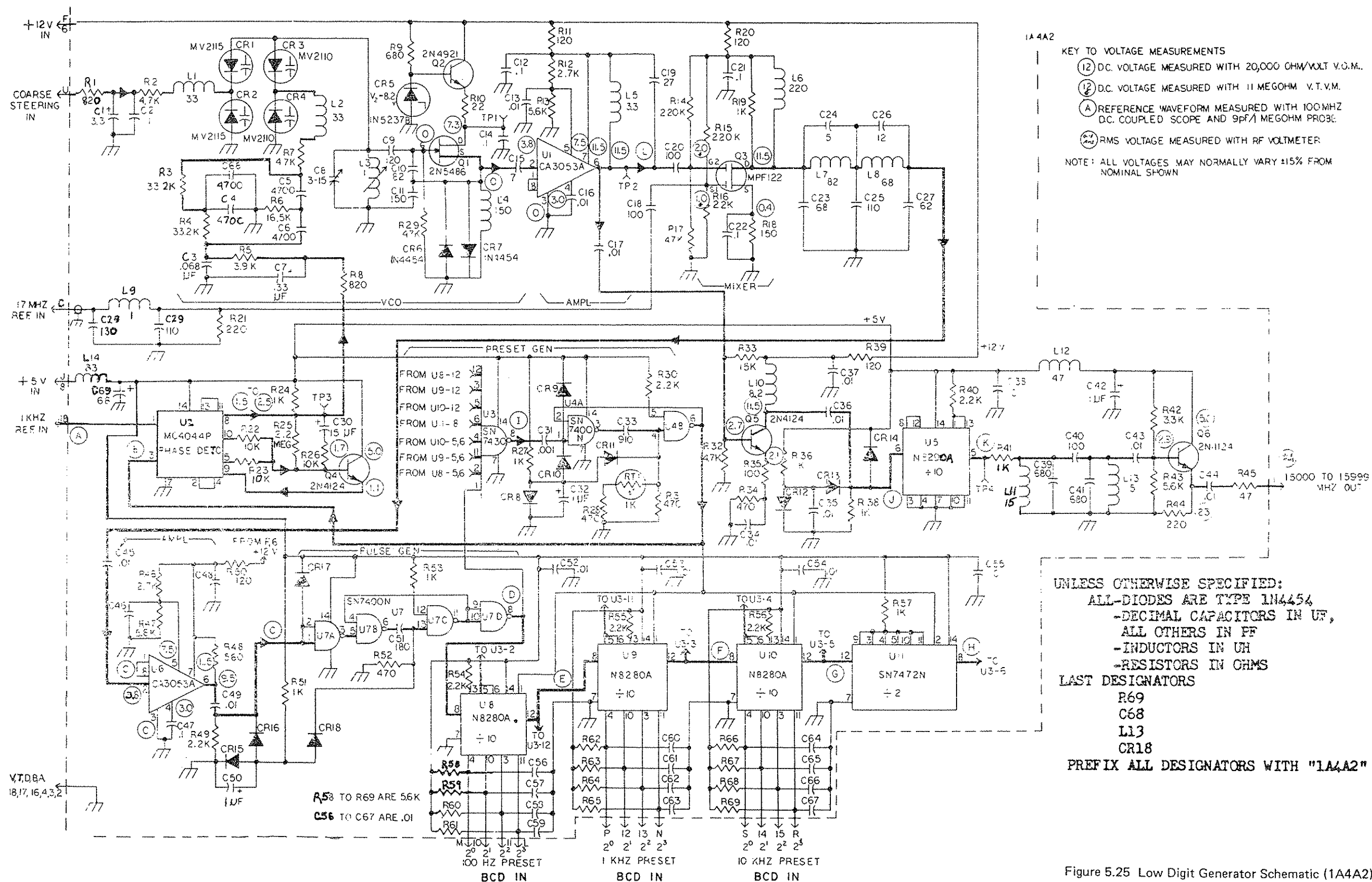
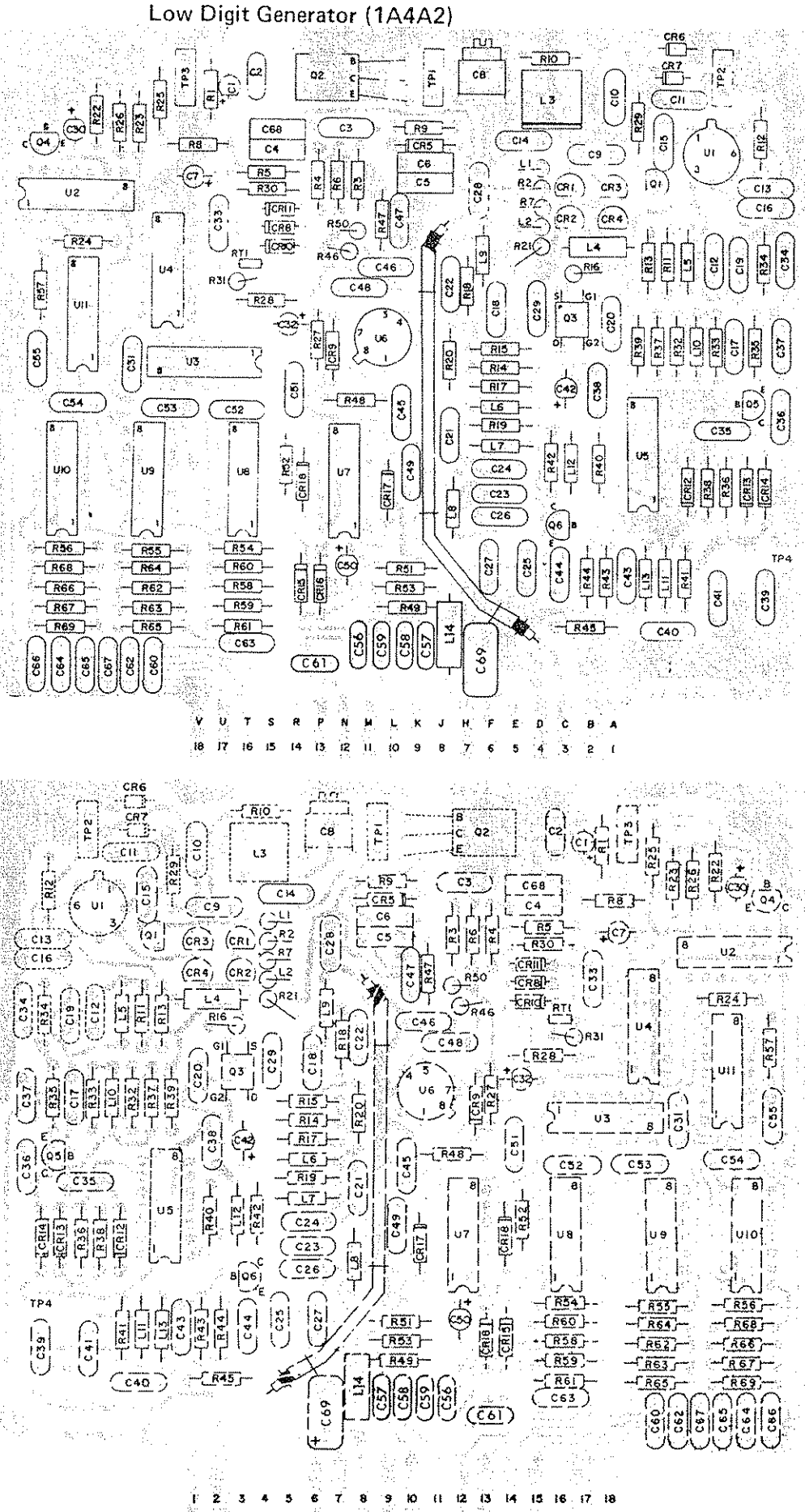


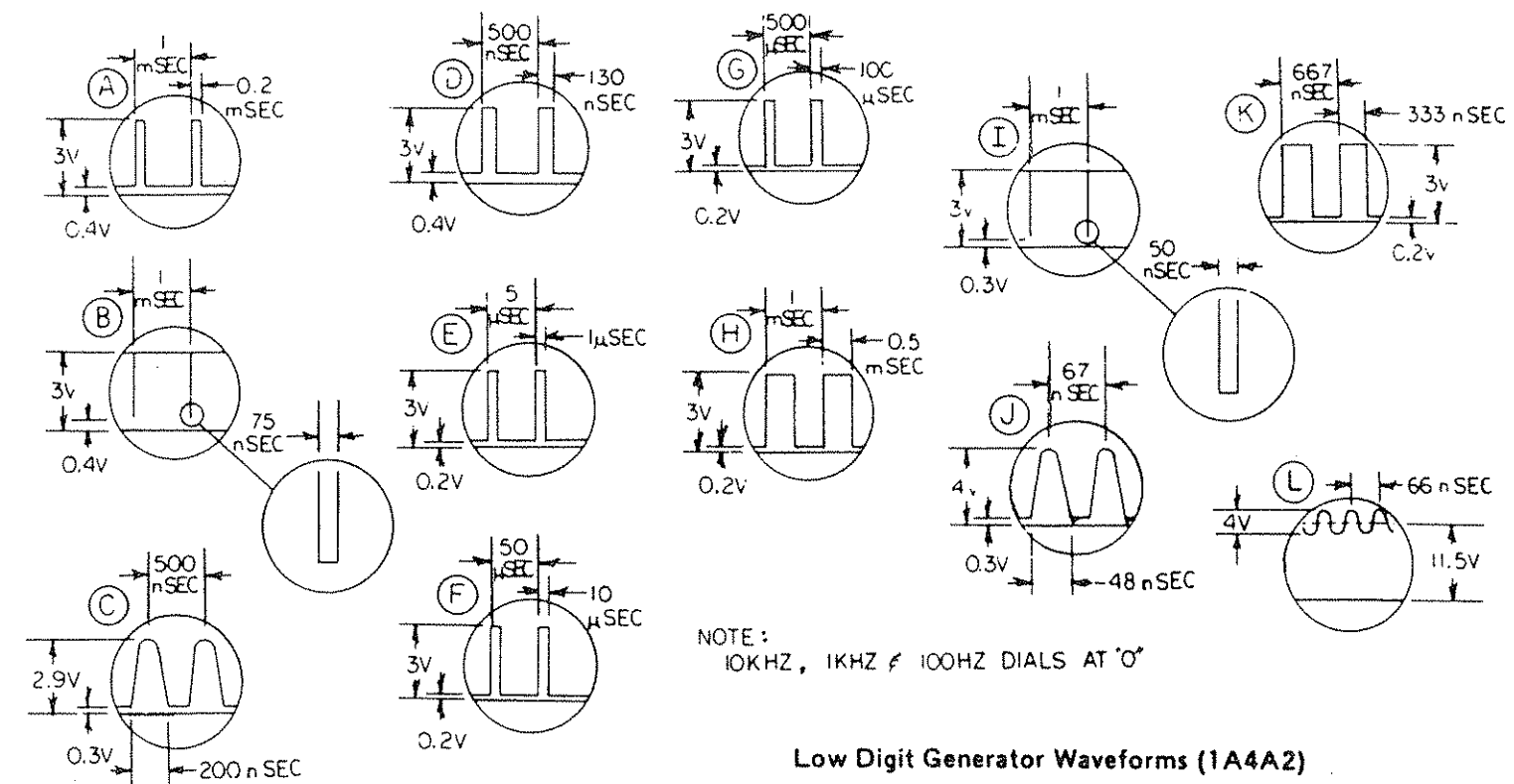
Figure 5.25 Low Digit Generator Schematic (1A4A2)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY LOW DIGIT GENERATOR	5024070097
C1	Capacitor, 3.3UF, 35V, 196D	0281680001
C2	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C3	Capacitor, .068UF, 50V, Mylar	0281640009
C4	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C5	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C6	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C7	Capacitor, 0.33UF, 35V, 196D	0281650004
C8	Capacitor, 3-15PF, 200V, N650	0285710001
C9	Capacitor, 120PF, 500V, DM15, 5%	0289850002
C10	Capacitor, 82PF, 500V, DM10, 5%	0262120003
C11	Capacitor, 150PF, 500V, DM10, 5%	0293430004
C12	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C13	Capacitor, 0.01UF, 25V, X5S	0281620008
C14	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C15	Capacitor, 7PF, 500V, DM10	0292400004
C16	Capacitor, 0.01UF, 25V, X5S	0281620008
C17	Capacitor, 0.01UF, 25V, X5S	0281620008
C18	Capacitor, 100PF, 500V, DM10, 5%	0274740001
C19	Capacitor, 27PF, 500V, DM10, 5%	0260660001
C20	Capacitor, 100PF, 500V, DM10, 5%	0274740001
C21	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C22	Capacitor, .0.1UF, 50V, X7R, 20%	0281610002
C23	Capacitor, 68PF, 500V, DM10, 5%	0261070002
C24	Capacitor, 5PF, 500V, DM10	0261190008
C25	Capacitor, 110PF, 500V, DM10, 5%	0257750002
C26	Capacitor, 12PF, 500V, DM10, 5%	0260280003
C27	Capacitor, 62PF, 500V, DM10, 5%	0283010002
C28	Capacitor, 130PF, 500V, DM15, 5%	0274860007
C29	Capacitor, 110PF, 500V, DM10, 5%	0257750002
C30	Capacitor, 15UF, 15V, 196D	0281720002
C31	Capacitor, 0.001UF, 100V, X7R, 20%	0281630003
C32	Capacitor, 1UF, 35V, 196D	0281660000
C33	Capacitor, 910PF, 100V, CD7, 5%	0288660005
C34	Capacitor, 0.01UF, 25V, X5S	0281620008
C35	Capacitor, 0.01UF, 25V, X5S	0281620008
C36	Capacitor, 0.01UF, 25V, X5S	0281620008
C37	Capacitor, 0.01UF, 25V, X5S	0281620008
C38	Capacitor, 0.01UF, 25V, X5S	0281620008
C39	Capacitor, 680PF, 300V, DM15, 5%	0286240009
C40	Capacitor, 100PF, 500V, DM10, 5%	0274740001
C41	Capacitor, 680PF, 300V, DM15, 5%	0286240009
C42	Capacitor, 1UF, 35V, 196D	0281660000
C43	Capacitor, 0.01UF, 25V, X5S	0281620008
C44	Capacitor, 0.01UF, 25V, X5S	0281620008
C45	Capacitor, 0.01UF, 25V, X5S	0281620008
C46	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C47	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C48	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C49	Capacitor, 0.01UF, 25V, X5S	0281620008
C50	Capacitor, 1UF, 35V, 196D	0281660000
C51	Capacitor, 180PF, 500V, DM15, 5%	0258280000
C52	Capacitor, 0.01UF, 25V, X5S	0281620008
C53	Capacitor, 0.01UF, 25V, X5S	0281620008
C54	Capacitor, 0.01UF, 25V, X5S	0281620008
C55	Capacitor, 0.01UF, 25V, X5S	0281620008
C56	Capacitor, 0.01UF, 25V, X5S	0281620008
C57	Capacitor, 0.01UF, 25V, X5S	0281620008
C58	Capacitor, 0.01UF, 25V, X5S	0281620008
C59	Capacitor, 0.01UF, 25V, X5S	0281620008
C60	Capacitor, 0.01UF, 25V, X5S	0281620008
C61	Capacitor, 0.01UF, 25V, X5S	0281620008
C62	Capacitor, 0.01UF, 25V, X5S	0281620008
C63	Capacitor, 0.01UF, 25V, X5S	0281620008
C64	Capacitor, 0.01UF, 25V, X5S	0281620008
C65	Capacitor, 0.01UF, 25V, X5S	0281620008
C66	Capacitor, 0.01UF, 25V, X5S	0281620008
C67	Capacitor, 0.01UF, 25V, X5S	0281620008
C68	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C69	Capacitor, 68UF, 15V, T368	0296540005
CR1	Diode, Varicap MV2115	0405300000
CR2	Diode, Varicap MV2115	0405300000
CR3	Diode, Varicap MV2110	0405290004
CR4	Diode, VaricapMV2110	0405290004
CR5	Diode, Zener 1N5237B	0405240007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
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
L1	Inductor, Molded, 33UH, 5%	0659690004
L2	Inductor, Molded, 33UH, 5%	0659690004
L3	Inductor, Var, 1.00UH	0647910004
L4	Inductor, Molded, 150UH, 5%	0646780000
L5	Inductor, Molded, 3.3UH, 5%	0658920006
L6	Inductor, Molded, 220UH, 5%	0650500008
L7	Inductor, Molded, 82UH, 5%	0659450003
L8	Inductor, Molded, 68UH, 5%	0651650003
L9	Inductor, Molded, 1.0UH, 5%	0649150007
L10	Inductor, Molded, 8.2UH, 5%	0652060005
L11	Inductor, Molded, 15UH, 5%	0659070006
L12	Inductor, Molded, 47UH, 5%	0652680003
L13	Inductor, Molded, 15UH, 5%	0659070006
L14	Inductor, Molded, 33UH, 5%	0646300008
Q1	Transistor, N-CH, Fet 2N5486	0448050005
Q2	Transistor, NPN, Si. 2N4921	0448040000
Q3	Transistor, N-CH, Fet MFE122	0448030004
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, NPN, Si. 2N4124	0448010003
Q6	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 820, 10%, 1/4W	0178210005
R2	Resistor, 4.7K, 5%, 1/4W	0170770001
R3	Resistor, 33.2K, 1%, 1/8W	0196470005
R4	Resistor, 33.2K, 1%, 1/8W	0196470005
R5	Resistor, 3.9K, 10%, 1/4W	0178830003
R6	Resistor, 16.5K, 1%, 1/8W	0196590001
R7	Resistor, 4.7K, 5%, 1/4W	0170770001
R8	Resistor, 820, 10%, 1/4W	0178210005
R9	Resistor, 680, 10%, 1/4W	0176630007
R10	Resistor, 22, 10%, 1/4W	0192690001
R11	Resistor, 120, 10%, 1/4W	0186550006
R12	Resistor, 2.7K, 10%, 1/4W	0186670001
R13	Resistor, 5.6K, 10%, 1/4W	0183060008
R14	Resistor, 220K, 10%, 1/4W	0177780002
R15	Resistor, 220K, 10%, 1/4W	0177780002
R16	Resistor, 22K, 5%, 1/4W	0172230004
R17	Resistor, 47K, 10%, 1/4W	0171060008
R18	Resistor, 150, 10%, 1/4W	0172730007
R19	Resistor, 1K, 10%, 1/4W	0171560001
R20	Resistor, 120, 10%, 1/4W	0186550006
R21	Resistor, 220, 10%, 1/4W	0171320000
R22	Resistor, 10K, 10%, 1/4W	0170410005
R23	Resistor, 10K, 10%, 1/4W	0170410005
R24	Resistor, 1K, 10%, 1/4W	0171560001
R25	Resistor, 2.2M, 10%, 1/4W	0176870008
R26	Resistor, 10K, 10%, 1/4W	0170410005
R27	Resistor, 1K, 10%, 1/4W	0171560001
R28	Resistor, 470, 10%, 1/4W	0172610001
R29	Resistor, 4.7K, 10%, 1/4W	0171060008
R30	Resistor, 2.2K, 5%, 1/4W	0178070009
R31	Resistor, 470, 10%, 1/4W	0172610001
R32	Resistor, 4.7K, 5%, 1/4W	0170770001
R33	Resistor, 15K, 10%, 1/4W	0172350000
R34	Resistor, 470, 10%, 1/4W	0172610001
R35	Resistor, 100, 5%, 1/4W	0171180003
R36	Resistor, 1K, 10%, 1/4W	0171560001
R37	Not used	
R38	Resistor, 1K, 10%, 1/4W	0171560001
R39	Resistor, 120, 10%, 1/4W	0186550006
R40	Resistor, 2.2K, 5%, 1/4W	0178070009
R41	Resistor, 1K, 10%, 1/4W	0171560001
R42	Resistor, 3.3K, 10%, 1/4W	0170890007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R43	Resistor, 5.6K, 10%, 1/4W	0183060008
R44	Resistor, 220, 10%, 1/4W	0171320000
R45	Resistor, 47, 10%, 1/4W	0179360001
R46	Resistor, 2.7K, 10%, 1/4W	0186670001
R47	Resistor, 5.6K, 10%, 1/4W	0183060008
R48	Resistor, 560, 5%, 1/4W	0183200004
R49	Resistor, 2.2K, 5%, 1/4W	0178070009
R50	Resistor, 120, 10%, 1/4W	0186550006
R51	Resistor, 1K, 10%, 1/4W	0171560001
R52	Resistor, 470, 10%, 1/4W	0172610001
R53	Resistor, 1K, 10%, 1/4W	0171560001
R54	Resistor, 2.2K, 5%, 1/4W	0178070009
R55	Resistor, 2.2K, 5%, 1/4W	0178070009
R56	Resistor, 1K, 10%, 1/4W	0171560001
R57	Resistor, 5.6K, 10%, 1/4W	0183060008
R58	Resistor, 5.6K, 10%, 1/4W	0183060008
R59	Resistor, 5.6K, 10%, 1/4W	0183060008
R60	Resistor, 5.6K, 10%, 1/4W	0183060008
R61	Resistor, 5.6K, 10%, 1/4W	0183060008
R62	Resistor, 5.6K, 10%, 1/4W	0183060008
R63	Resistor, 5.6K, 10%, 1/4W	0183060008
R64	Resistor, 5.6K, 10%, 1/4W	0183060008
R65	Resistor, 5.6K, 10%, 1/4W	0183060008
R66	Resistor, 5.6K, 10%, 1/4W	0183060008
R67	Resistor, 5.6K, 10%, 1/4W	0183060008
R68	Resistor, 5.6K, 10%, 1/4W	0183060008
R69	Resistor, 5.6K, 10%, 1/4W	0183060008
RT1	Resistor, 1K at 25C	0196110009
TP1	Test Point, White	0753640007
TP2	Test Point, White	0753640007
TP3	Test Point, White	0753640007
U1	IC Linear CA3053	0448060001
U2	IC Digital MC4044 P	0448100002
U3	IC Digital SN7430N	0448110008
U4	IC Digital SN7400N	0448070006
U5	IC Digital 74LS196N Selected	0448250004
U6	IC Linear CA3053	0448060001
U7	IC Digital SN7400N	0448070006
U8	IC Digital SN74176/N8280A	0448080001
U9	IC Digital SN74176/N8280A	0448080001
U10	IC Digital SN74176/N8280A	0448080001
U11	IC Digital SN7472N	0448120003
	Terminal, Turret SWGD .071 Mtg	0525580000

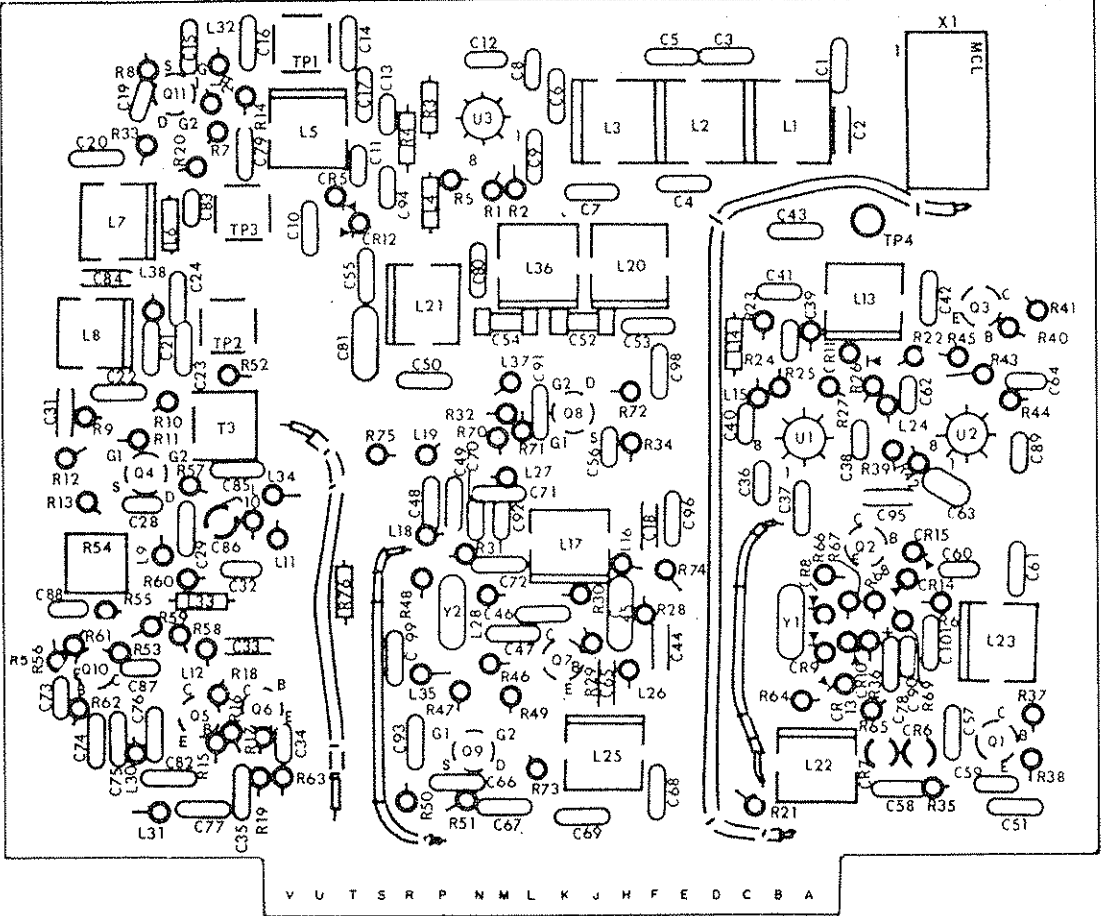
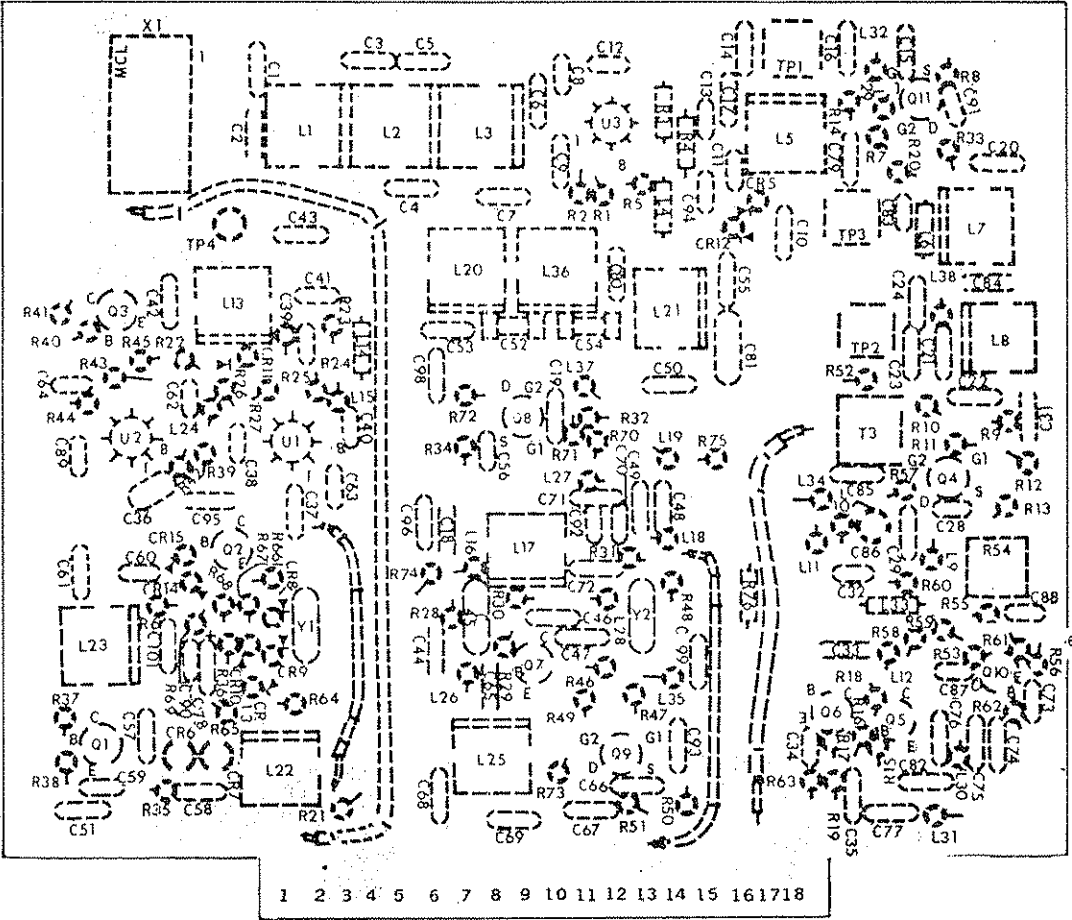




NOTE:
10KHZ, 1KHZ, 100HZ DIALS AT '0'

Low Digit Generator Waveforms (1A4A2)
Frequency Dials At 00000.0 kHz

Translator (1A4A3)



5024080076 L

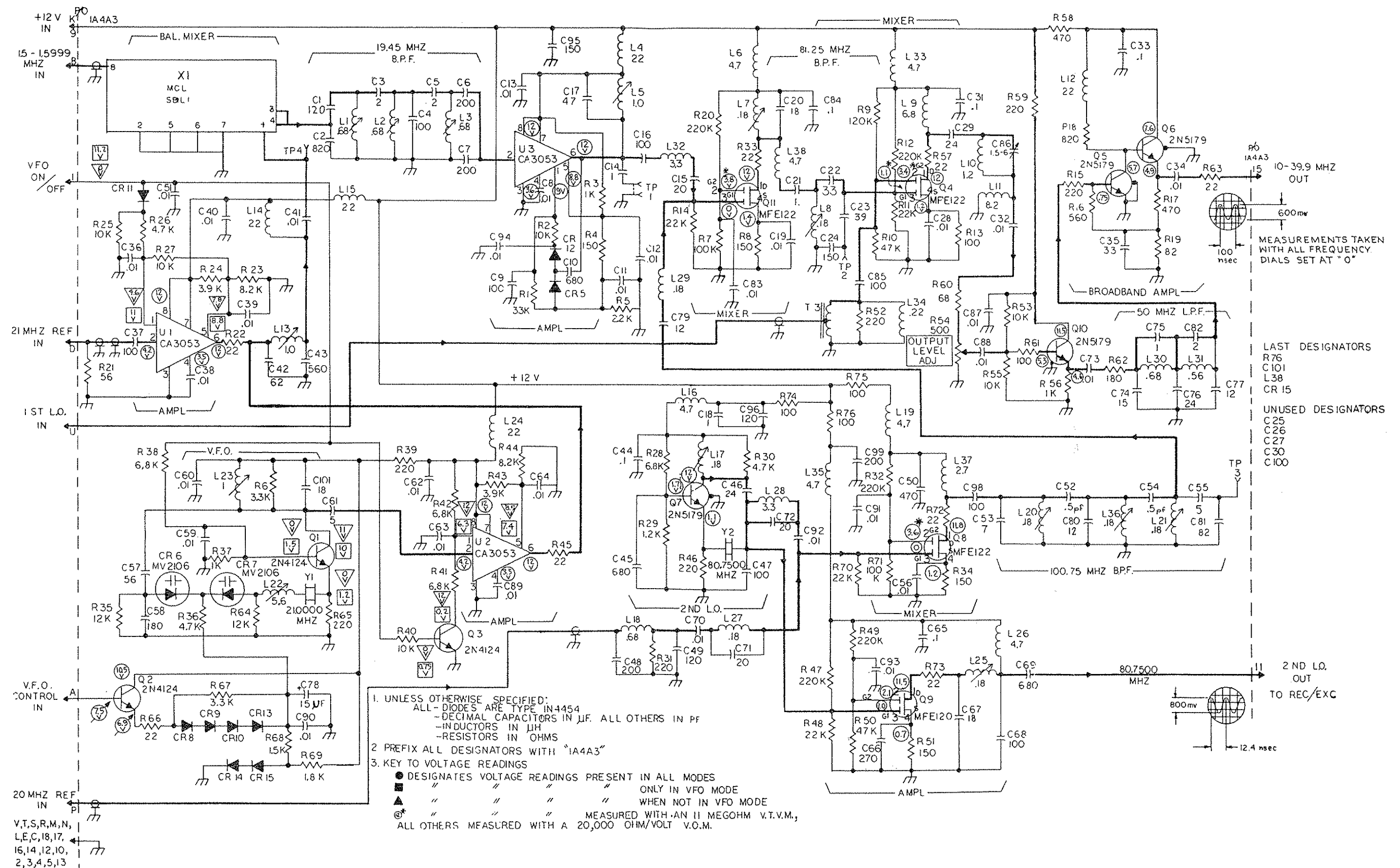


Figure 5.26 Translator Schematic (1A4A3)

5Q24080092N PC ASSY TRANSLATOR

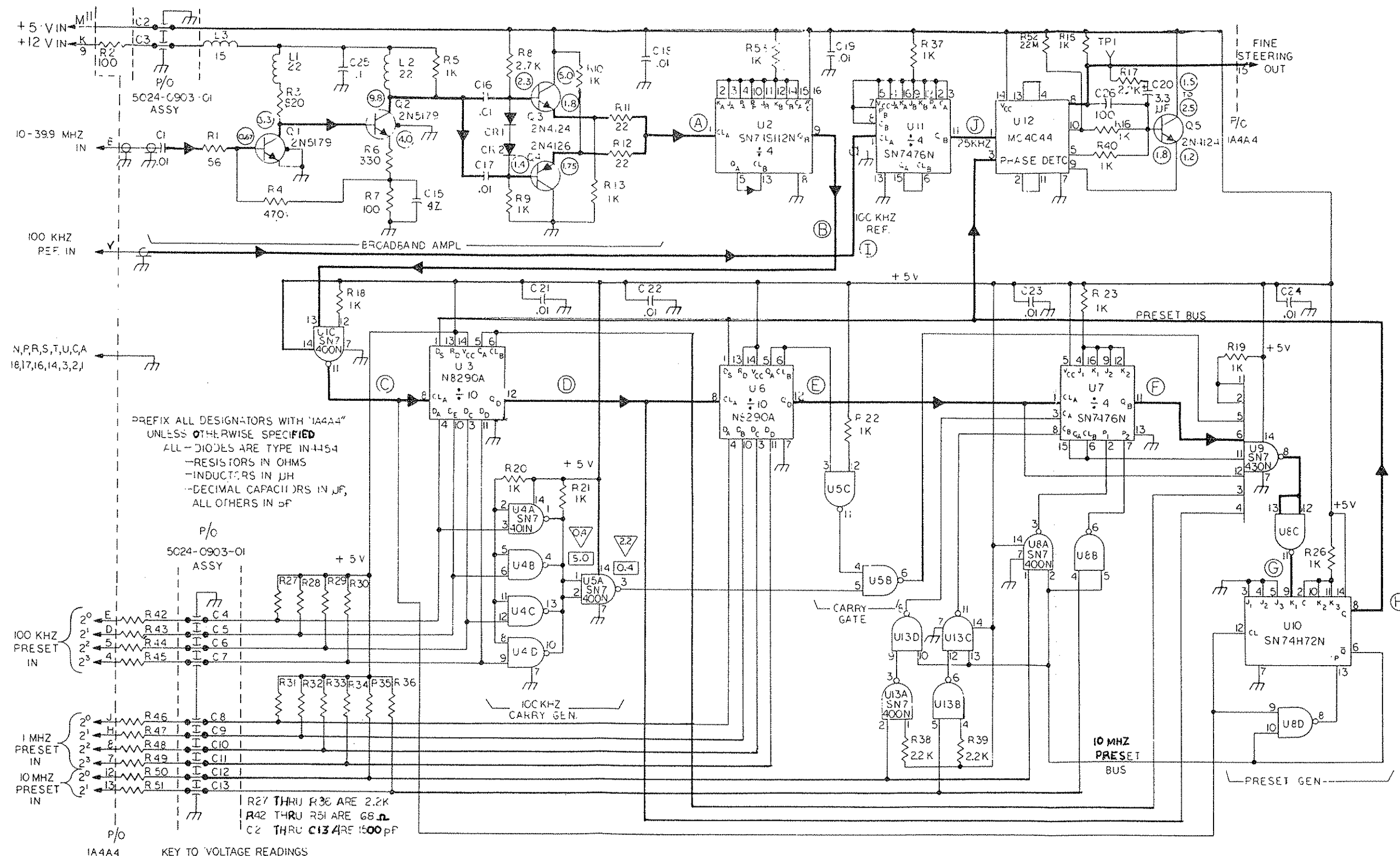
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY TRANSLATOR	5024080092
C1	Capacitor, 120PF, 300V, CD6, 5%	0280880006
C2	Capacitor, 820PF, 100 V, CD7, 5%	0283990007
C3	Capacitor, 2PF, 500 V, DM10	0259710008
C4	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C5	Capacitor, 2PF, 500 V, DM10	0259710008
C6	Capacitor, 200PF, 500 V, DM10, 5%	0293050007
C7	Capacitor, 200PF, 300 V, CD7, 5%	0287150003
C8	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C9	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C10	Capacitor, 680PF, 100 V, CD7, 5%	0284280003
C11	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C12	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C13	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C14	Capacitor, 1PF, 500 V, DM10	0260160008
C15	Capacitor, 20PF, 500 V, DM10, 5%	0260420000
C16	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C20	Capacitor, 18PF, 500 V, DM10, 5%	0260300004
C21	Capacitor, 1PF, 500 V, DM10	0260160008
C22	Capacitor, 33PF, 300 V, CD6, 5%	0286860007
C23	Capacitor, 39PF, 500 V, DM10, 5%	0293290008
C24	Capacitor, 150PF, 500 V, DM10, 5%	0293430004
C25	Not used	
C26	Not used	
C27	Not used	
C28	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C29	Capacitor, 24PF, 500 V, DM10, 5%	0290060001
C30	Not used	
C31	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C32	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C33	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C34	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C35	Capacitor, 33PF, 500 V, DM10, 5%	0260780006
C36	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C37	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C38	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C39	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C40	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C41	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C42	Capacitor, 62PF, 500 V, DM10, 5%	0283010002
C43	Capacitor, 560PF, 100 V, CD7, 5%	0285690001
C44	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C45	Capacitor, 680PF, 100 V, CD7, 5%	0284280003
C46	Capacitor, 24PF, 500 V, DM10, 5%	0290060001
C47	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C48	Capacitor, 200PF, 500 V, DM10, 5%	0293050007
C49	Capacitor, 120PF, 500 V, DM10, 2%	0292880006
C50	Capacitor, 470PF, 100 V, CD7, 5%	0285570005
C51	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C52	Capacitor, 0.5PF, 500 V, NPO	0281740003
C53	Capacitor, 7PF, 500V, DM10	0292400004
C54	Capacitor, 0.5PF, 500 V, NPO	0281740003
C55	Capacitor, 5PF, 500V, DM10	0261190000
C56	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C57	Capacitor, 56PF, 500 V, DM10, 5%	0293170002
C58	Capacitor, 180PF, 500 V, DM10, 5%	0294100008
C59	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C60	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C61	Capacitor, 5PF, 500 V, DM10, 5%	0261190008
C62	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C63	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C64	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C65	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C66	Capacitor, 270PF, 300 V, DM10, 5%	0294600001
C67	Capacitor, 18PF, 500 V, DM10, 5%	0260300004
C68	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C69	Capacitor, 680PF, 100 V, CD7, 5%	0284280003
C70	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C71	Capacitor, 20PF, 500 V, DM10, 5%	0260420000
C72	Capacitor, 20PF, 500 V, DM10, 5%	0260420000
C73	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C74	Capacitor, 15PF, 500 V, DM10, 5%	0259950009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C75	Capacitor, 1PF, 500 V, DM10	0260160008
C76	Capacitor, 24PF, 500 V, DM10, 5%	0290060001
C77	Capacitor, 12PF, 500 V, DM10, 5%	0260280003
C78	Capacitor, 15UF, 15 V, 196D	0281720002
C79	Capacitor, 12PF, 500 V, DM10, 5%	0260280003
C80	Capacitor, 12PF, 500V, DM10, 5%	0260280003
C81	Capacitor, 82PF, 300 V, CD6, 5%	0266520006
C82	Capacitor, 2PF, 500 V, DM10	0259710008
C83	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C84	Capacitor, 0.1UF, 50 V, X7 R, 20%	0281610002
C85	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C86	Capacitor, 1.5-6PF	1001070038
C87	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C88	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C89	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C90	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C91	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C92	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C93	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C94	Capacitor, 0.01UF, 50 V, W5 R, 20%	0281730008
C95	Capacitor, 150PF, 500 V, DM10, 5%	0293430004
C96	Capacitor, 120PF, 500 V, DM10, 2%	0292880006
C97	Not used	
C98	Capacitor, 100PF, 500 V, DM10, 5%	0274740001
C99	Capacitor, 200PF, 500 V, DM10, 5%	0293050007
C100	Not used	
C101	Capacitor, 18PF, 500 V, DM10, 5%	0260300004
CR1	Not used	
CR2	Not used	
CR3	Not used	
CR4	Not used	
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Varicap MV2106	0405310005
CR7	Diode, Varicap MV2106	0405310005
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
L1	Inductor, Var, 0.68UH	0647900009
L2	Inductor, Var, 0.68UH	0647900009
L3	Inductor, Var, 0.68UH	0647900009
L4	Inductor, Molded, 22UH, 5%	0650000005
L5	Inductor, Var, 1.00UH	0647910004
L6	Inductor, Molded, 4.7UH, 5%	0651910005
L7	Inductor, Var, 0.18UH	0647890003
L8	Inductor, Var, 0.18UH	0647890003
L9	Inductor, Molded, 6.8UH, 5%	0659210002
L10	Inductor, Molded, 1.2UH, 10%	0663910005
L11	Inductor, Molded, 8.2UH, 5%	0652060005
L12	Inductor, Molded, 22UH, 5%	0650000005
L13	Inductor, Var, 1.00UH	0647910004
L14	Inductor, Molded, 22UH, 5%	0650000005
L15	Inductor, Molded, 22UH, 5%	0650000005
L16	Inductor, Molded, 4.7UH, 5%	0651910005
L17	Inductor, Var, 0.18UH	0647890003
L18	Inductor, Molded, 0.68UH, 5%	0649030001
L19	Inductor, Molded, 4.7UH, 5%	0651910005
L20	Inductor, Var, 0.18UH	0647890003
L21	Inductor, Var, 0.18UH	0647890003
L22	Inductor, Var, 5.60UH	0647880008
L23	Inductor, Var, 1.00UH	0647910004
L24	Inductor, Molded, 22UH, 5%	0650000005
L25	Inductor, Var, 0.18UH	0647890003
L26	Inductor, Molded, 4.7UH, 5%	0651910005
L27	Inductor, Molded, 0.18UH, 10%	0651890004
L28	Inductor, Molded, 3.3UH, 5%	0658920006
L29	Inductor, Molded, 0.18UH, 10%	0651890004
L30	Inductor, Molded, 0.68UH, 5%	0659030001
L31	Inductor, Molded, 0.56UH, 5%	0649530004
L32	Inductor, Molded, 3.3UH, 5%	0659820006
L33	Inductor, Molded, 4.7UH, 5%	0651910005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L34	Inductor, Molded, 0.22UH, 5%	0650620003
L35	Inductor, Molded, 4.7UH, 5%	0651910005
L36	Inductor, Var, 0.18UH	0647890003
L37	Inductor, Molded, 2.7UH, 5%	0652180001
L38	Inductor, Molded, 4.7UH, 5%	0651910005
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
Q3	Transistor, NPN, Si. 2N4124	0448010003
Q4	Transistor, N-CH, Fet MFE122	0448030004
Q5	Transistor, NPN, Si. 2N5179	0445130008
Q6	Transistor, NPN, Si. 2N5179	0445130008
Q7	Transistor, NPN, Si. 2N5179	0445130008
Q8	Transistor, N-CH, Fet MFE122	0448030004
Q9	Transistor, N-CH, Fet MFE120	0448000008
Q10	Transistor, NPN, Si. 2N5179	0445130008
Q11	Transistor, N-CH, Fet MFE122	0448030004
R1	Resistor, 33K, 10%, 1/4W	0177920009
R2	Resistor, 10K, 10%, 1/4W	0170410005
R3	Resistor, 1K, 10%, 1/4W	0171560001
R4	Resistor, 150, 10%, 1/4W	0172730007
R5	Resistor, 2.2K, 5%, 1/4W	0178070009
R6	Resistor, 3.3K, 10%, 1/4W	0170890007
R7	Resistor, 100K, 10%, 1/4W	0170390004
R8	Resistor, 150, 10%, 1/4W	0172730007
R9	Resistor, 120K, 10%, 1/4W	0175100004
R10	Resistor, 47K, 10%, 1/4W	0171060008
R11	Resistor, 22K, 5%, 1/4W	0172230004
R12	Resistor, 220K, 10%, 1/4W	0177780002
R13	Resistor, 100, 5%, 1/4W	0171180003
R14	Resistor, 22K, 5%, 1/4W	0172230004
R15	Resistor, 220, 10%, 1/4W	0171320000
R16	Resistor, 560, 5%, 1/4W	0183200004
R17	Resistor, 470, 5%, 1/4W	0184110009
R18	Resistor, 820, 10%, 1/4W	0178210005
R19	Resistor, 82, 10%, 1/4W	0184610001
R20	Resistor, 220K, 10%, 1/4W	0177780002
R21	Resistor, 56, 10%, 1/4W	0174290004
R22	Resistor, 22, 10%, 1/4W	0192690001
R23	Resistor, 8.2K, 10%, 1/4W	0181620006
R24	Resistor, 3.9K, 10%, 1/4W	0178830003
R25	Resistor, 10K, 10%, 1/4W	0170410005
R26	Resistor, 4.7K, 5%, 1/4W	0170770001
R27	Resistor, 10K, 10%, 1/4W	0170410005
R28	Resistor, 6.8K, 5%, 1/4W	0174810008
R29	Resistor, 1.2K, 10%, 1/4W	0181860007
R30	Resistor, 4.7K, 5%, 1/4W	0170770001
R31	Resistor, 220, 10%, 1/4W	0171320000
R32	Resistor, 220K, 10%, 1/4W	0177780002
R33	Resistor, 22, 10%, 1/4W	0192690001
R34	Resistor, 150, 10%, 1/4W	0172730007
R35	Resistor, 12K, 10%, 1/4W	0183180003
R36	Resistor, 4.7K, 5%, 1/4W	0170770001
R37	Resistor, 1K, 10%, 1/4W	0171560001
R38	Resistor, 6.8K, 5%, 1/4W	0174810008
R39	Resistor, 220, 10%, 1/4W	0171320000
R40	Resistor, 10K, 10%, 1/4W	0170410005
R41	Resistor, 6.8K, 5%, 1/4W	0174810008
R42	Resistor, 6.8K, 5%, 1/4W	0174810008
R43	Resistor, 3.9K, 10%, 1/4W	0178830003
R44	Resistor, 8.2K, 10%, 1/4W	0181620006
R45	Resistor, 22, 10%, 1/4W	0192690001
R46	Resistor, 220, 10%, 1/4W	0171320000
R47	Resistor, 220K, 10%, 1/4W	0177780002
R48	Resistor, 22K, 5%, 1/4W	0172230004
R49	Resistor, 220K, 10%, 1/4W	0177780002
R50	Resistor, 47K, 10%, 1/4W	0171060008
R51	Resistor, 150, 10%, 1/4W	0172730007
R52	Resistor, 220, 10%, 1/4W	0171320000
R53	Resistor, 10K, 10%, 1/4W	0170410005
R54	Pot., 500, 20%, 1/2W, PC Mount	0345980000
R55	Resistor, 10K, 10%, 1/4W	0170410005
R56	Resistor, 1K, 10%, 1/4W	0171560001
R57	Resistor, 22, 10%, 1/4W	0192690001
R58	Resistor, 470, 5%, 1/4W	0184110009
R59	Resistor, 220, 10%, 1/4W	0171320000

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R60	Resistor, 68, 10%, 1/4W	0187960003
R61	Resistor, 100, 5%, 1/4W	0171180003
R62	Resistor, 180, 10%, 1/4W	0175220000
R63	Resistor, 22, 10%, 1/4W	0192690001
R64	Resistor, 12K, 10%, 1/4W	0183180003
R65	Resistor, 220, 10%, 1/4W	0171320000
R66	Resistor, 22, 10%, 1/4W	0192690001
R67	Resistor, 3.3K, 10%, 1/4W	0170890007
R68	Resistor, 1.5K, 10%, 1/4W	0172470005
R69	Resistor, 1.8K, 10%, 1/4W	0178190004
R70	Resistor, 22K, 5%, 1/4W	0172230004
R71	Resistor, 100K, 10%, 1/4W	0170390004
R72	Resistor, 22, 10%, 1/4W	0192690001
R73	Resistor, 22, 10%, 1/4W	0192690001
R74	Resistor, 100, 5%, 1/4W	0171180003
R75	Resistor, 100, 5%, 1/4W	0171180003
R76	Resistor, 100, 5%, 1/4W	0171180003
T1	Not used	
T2	Not used	
T3	Transformer	5024111401
TP1	Connector, RF, JCM	0753600005
TP2	Connector, RF, JCM	0753600005
TP3	Connector, RF, JCM	0753600005
U1	IC Linear CA3053	0448060001
U2	IC Linear CA3053	0448060001
U3	IC Linear CA3053	0448060001
Y1	Crystal, 21.0000 MHz, HC-18U	5024080301
Y2	Crystal, 80.7500 MHz, HC-18U	5024080408
	Terminal, Turret	0525580000
	Wire Kit, Translator Assy.	5024080009
X1	Mixer, Broadband, Balanced	1003300006

5024090071 D



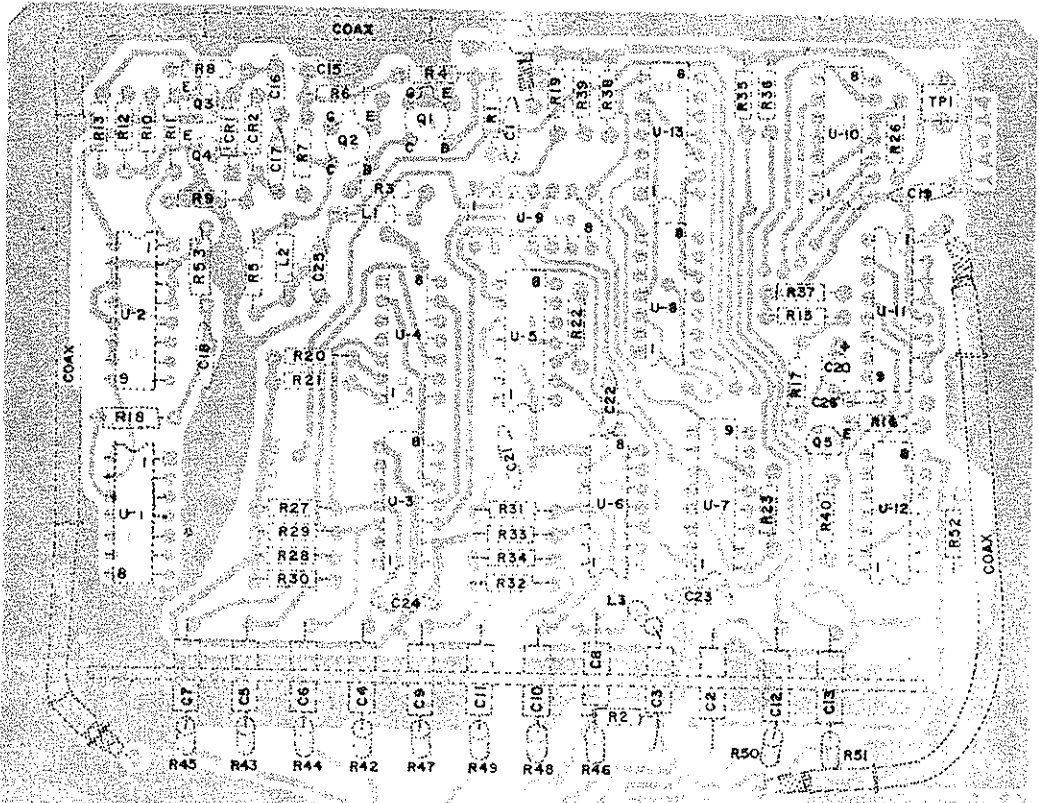
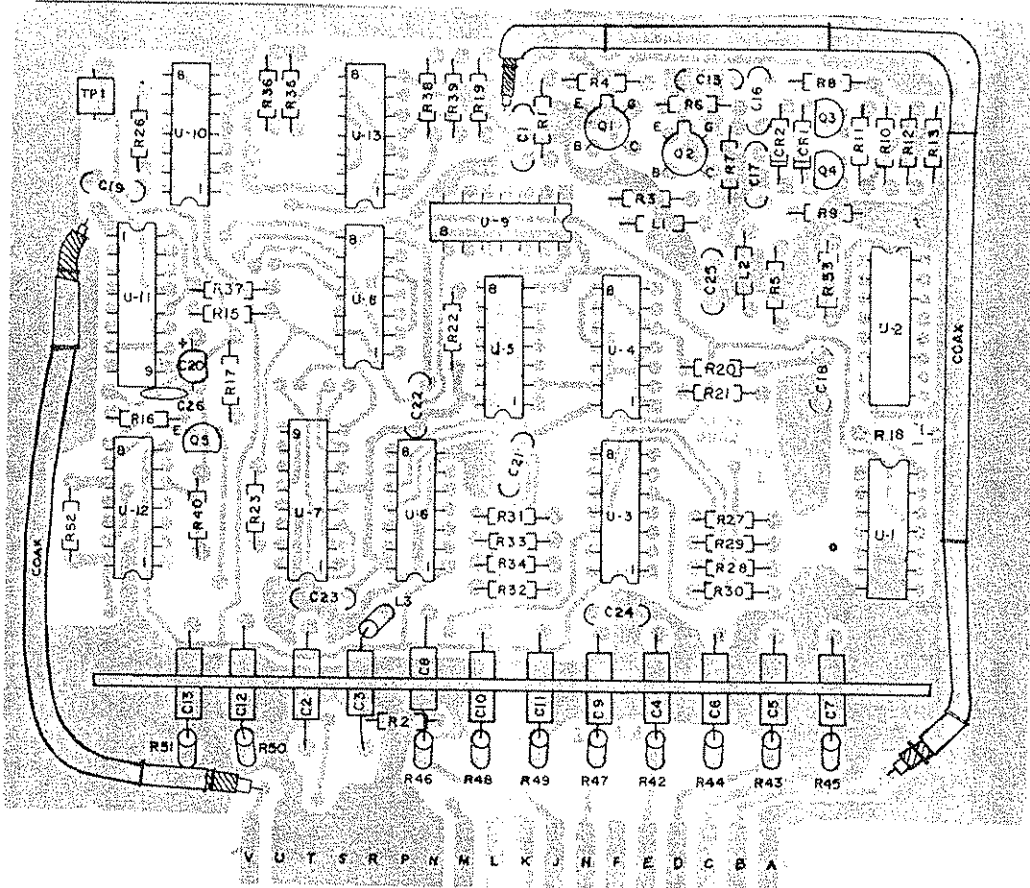
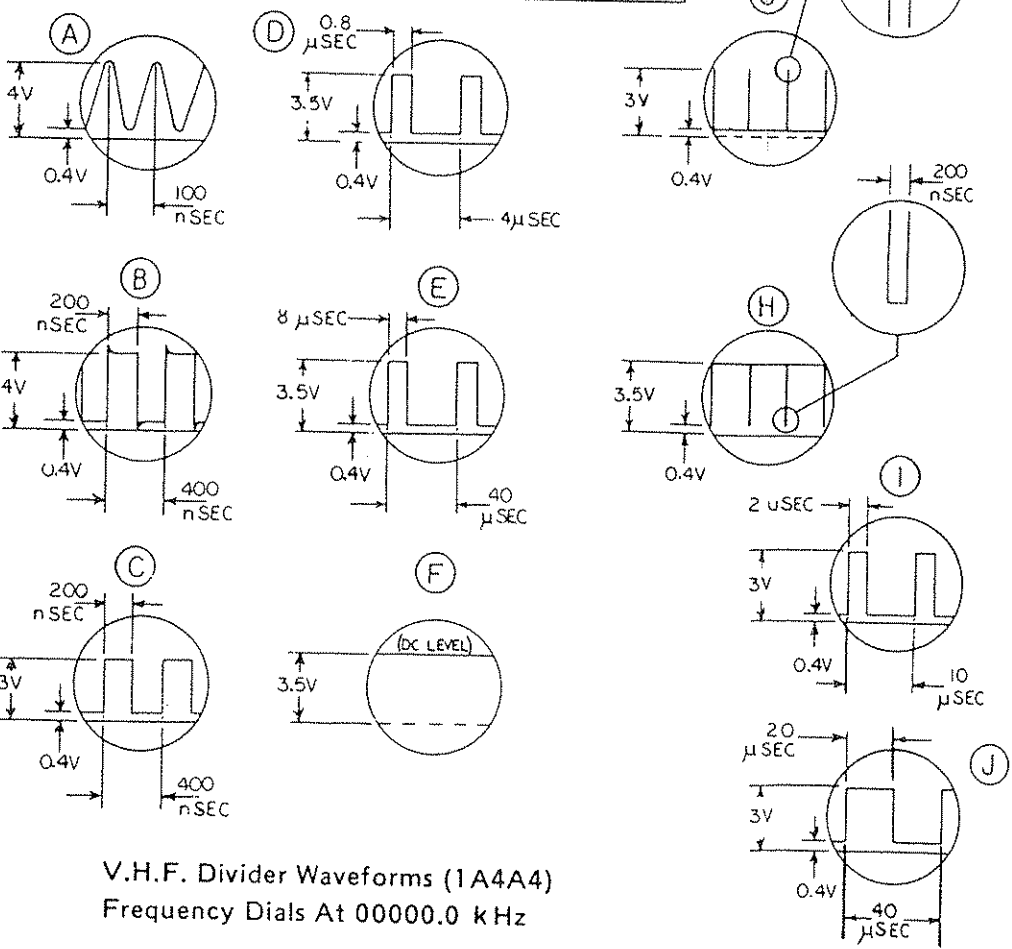
ALL D.C. VOLTAGES MEASURED WITH 20,000 OHM/VOLT V.O.M. AND MAY VARY $\pm 15\%$

ALL WAVEFORMS MEASURED WITH 100MHZ OSCILLOSCOPE AND 9pF/1 MEGOHM PROBE

Figure 5.27 V.H.F. Divider Schematic (1A4A4)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF DIVIDER	5024090098
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C3	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C4	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C5	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C6	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C7	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C8	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C9	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C10	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C11	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C12	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C13	Capacitor, Feed Thru, 1500PF, 500 V	0281760004
C14	Not used	
C15	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C16	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C26	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 22 UH, 5%	0650000005
L2	Inductor, Molded, 22 UH, 5%	0650000005
L3	Inductor, Molded, 15 UH, 5%	0659070006
Q1	Transistor, NPN, Si 2N5179	0445130008
Q2	Transistor, NPN, Si 2N5179	0445130008
Q3	Transistor, NPN, Si 2N4124	0448010003
Q4	Transistor, PNP, Si 2N4126	0448020009
Q5	Transistor, NPN, Si 2N4124	0448010003
R1	Resistor, 56, 10%, 1/4 W	0174290004
R2	Resistor, 100, 5%, 1/4 W	0171180003
R3	Resistor, 820, 10%, 1/4 W	0178210005
R4	Resistor, 470, 10%, 1/4 W	0172610001
R5	Resistor, 1K, 10%, 1/4 W	0171560001
R6	Resistor, 330, 5%, 1/4 W	0170910008
R7	Resistor, 100, 5%, 1/4 W	0171180003
R8	Resistor, 2.7K, 10%, 1/4 W	0186670001
R9	Resistor, 1K, 10%, 1/4 W	0171560001
R10	Resistor, 1K, 10%, 1/4 W	0171560001
R11	Resistor, 22, 10%, 1/4 W	0192690001
R12	Resistor, 22, 10%, 1/4 W	0192690001
R13	Resistor, 1K, 10%, 1/4 W	0171560001
R14	Not used	
R15	Resistor, 1K, 10%, 1/4 W	0171560001
R16	Resistor, 1K, 10%, 1/4 W	0171560001
R17	Resistor, 2.2K, 5%, 1/4 W	0178070009
R18	Resistor, 1K, 10%, 1/4 W	0171560001
R19	Resistor, 1K, 10%, 1/4 W	0171560001
R20	Resistor, 1K, 10%, 1/4 W	0171560001
R21	Resistor, 1K, 10%, 1/4 W	0171560001
R22	Resistor, 1K, 10%, 1/4 W	0171560001
R23	Resistor, 1K, 10%, 1/4 W	0171560001
R24	Not used	
R25	Not used	
R26	Resistor, 1K, 10%, 1/4 W	0171560001
R27	Resistor, 2.2K, 5%, 1/4 W	0178070009
R28	Resistor, 2.2K, 5%, 1/4 W	0178070009
R29	Resistor, 2.2K, 5%, 1/4 W	0178070009
R30	Resistor, 2.2K, 5%, 1/4 W	0178070009
R31	Resistor, 2.2K, 5%, 1/4 W	0178070009
R32	Resistor, 2.2K, 5%, 1/4 W	0178070009
R33	Resistor, 2.2K, 5%, 1/4 W	0178070009
R34	Resistor, 2.2K, 5%, 1/4 W	0178070009
R35	Resistor, 2.2K, 5%, 1/4 W	0178070009
R36	Resistor, 2.2K, 5%, 1/4 W	0178070009
R37	Resistor, 1K, 10%, 1/4 W	0171560001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R38	Resistor, 2.2K, 5%, 1/4 W	0178070009
R39	Resistor, 2.2K, 5%, 1/4 W	0178070009
R40	Resistor, 1K, 10%, 1/4 W	0171560001
R41	Not used	
R42	Resistor, 68, 10%, 1/4 W	0187960003
R43	Resistor, 68, 10%, 1/4 W	0187960003
R44	Resistor, 68, 10%, 1/4 W	0187960003
R45	Resistor, 68, 10%, 1/4 W	0187960003
R46	Resistor, 68, 10%, 1/4 W	0187960003
R47	Resistor, 68, 10%, 1/4 W	0187960003
R48	Resistor, 68, 10%, 1/4 W	0187960003
R49	Resistor, 68, 10%, 1/4 W	0187960003
R50	Resistor, 68, 10%, 1/4 W	0187960003
R51	Resistor, 68, 10%, 1/4 W	0187960003
R52	Resistor, 22M, 10%, 1/4 W	0180950002
R53	Resistor, 1K, 10%, 1/4 W	0171560001
TP1	Test Point, White	0753640007
U1	IC Digital SN7400N	0448070006
U2	IC Digital SN74S112N	0448450003
U3	IC Digital 74LS196N Selected	0448250004
U4	IC Digital SN7401N	0448230003
U5	IC Digital SN7400N	0448070006
U6	IC Digital 74LS196N Selected	0448250004
U7	IC Digital SN7476N	0448240009
U8	IC Digital SN7400N	0448070006
U9	IC Digital SN7430N	0448110008
U10	IC Digital SN74H72N	0448090007
U11	IC Digital SN7476N	0448240009
U12	IC Digital MC4044P	0448100002
U13	IC Digital SN7400N	0448070006
	Wire Kit, VHF Divider Assy.	5024090004
	PCB Wire Divider	5024090009
	Bracket, Feedthru	5024090403



5024100077E

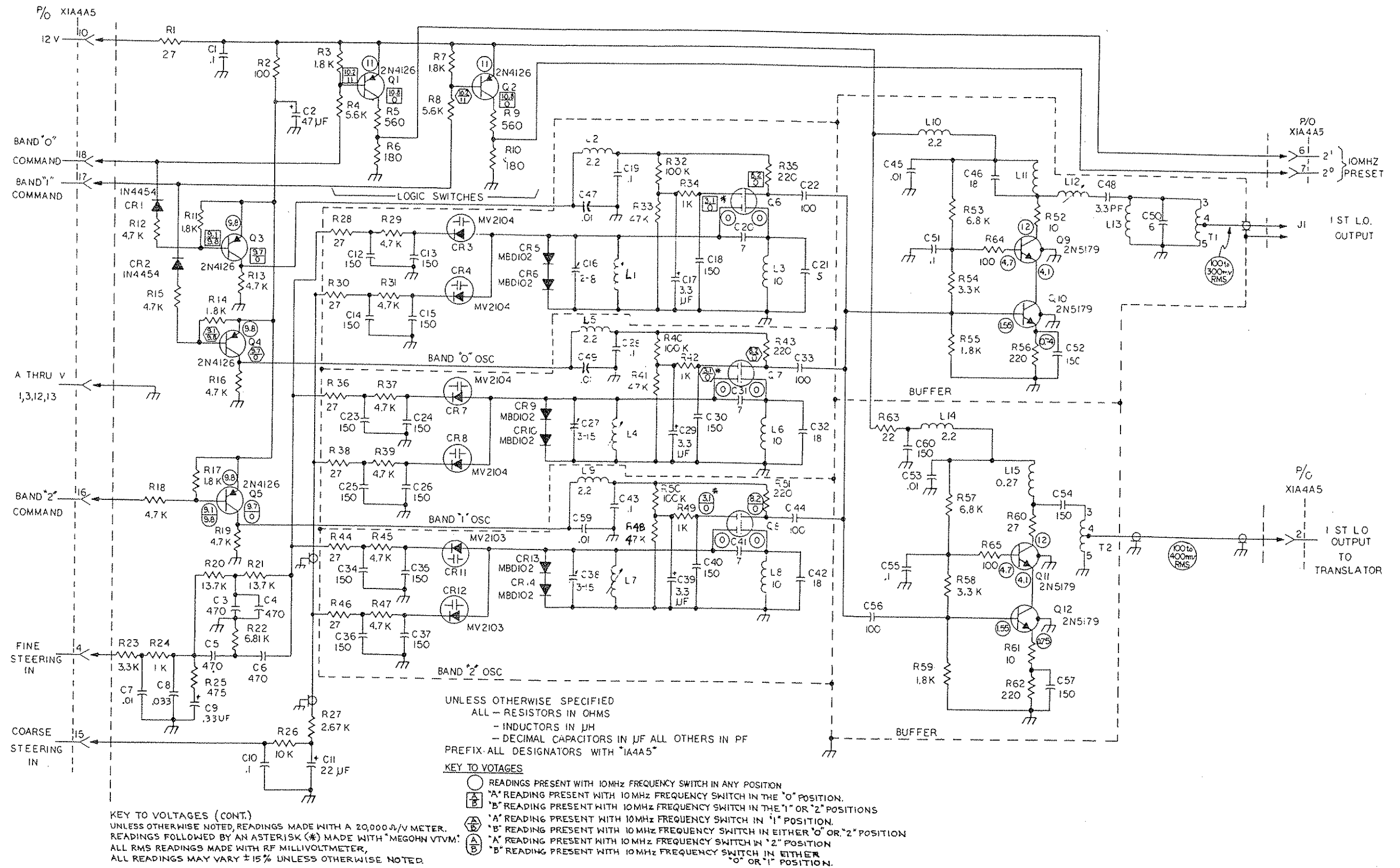
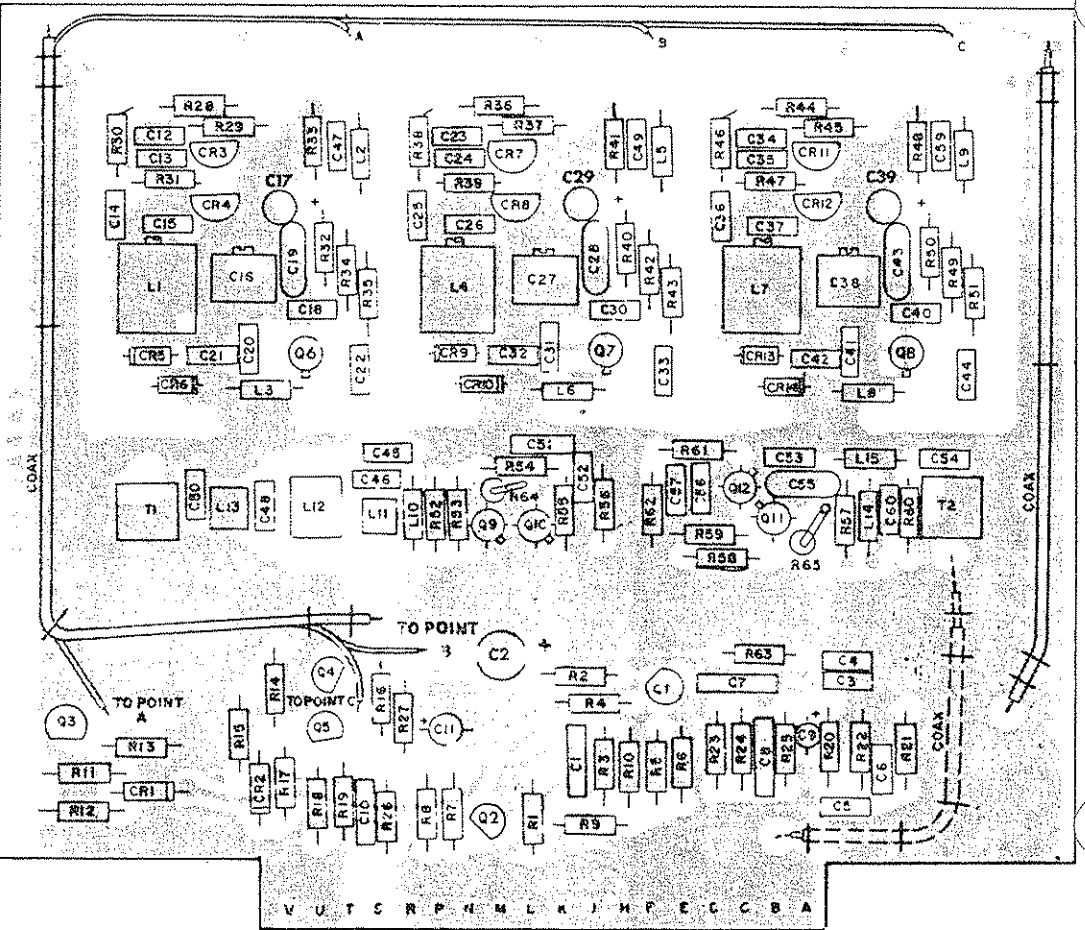
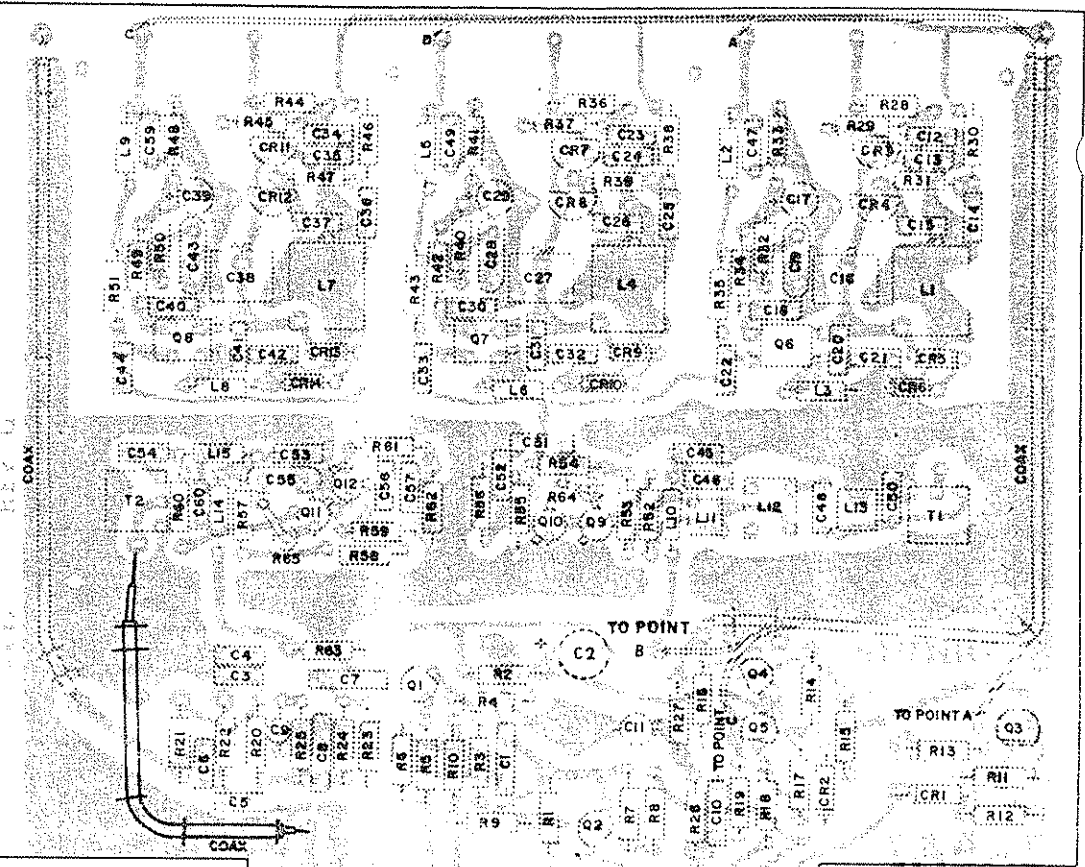


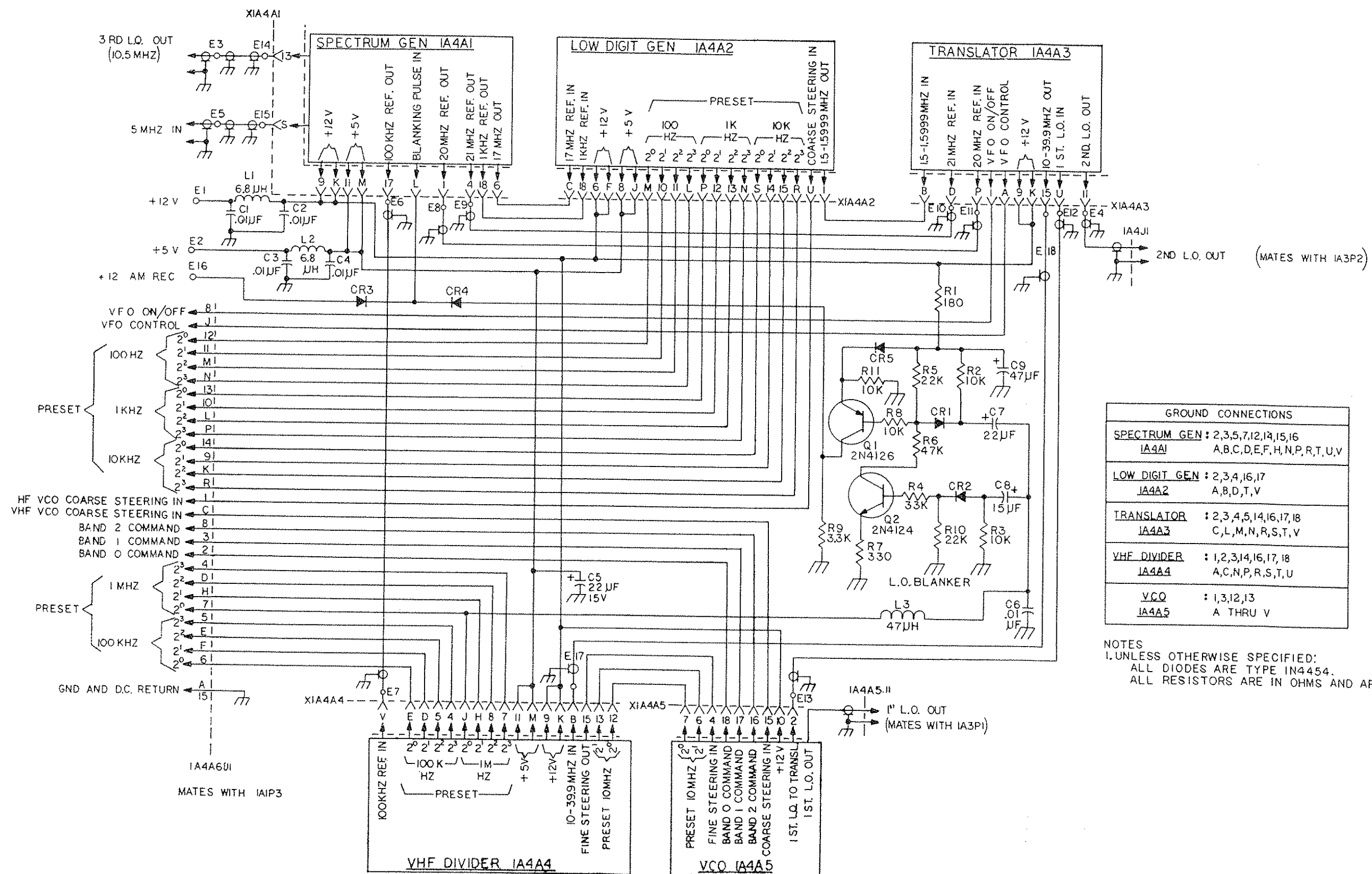
Figure 5.28 VCO Schematic (1A4A5)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF VCO	5024100093			
C1	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	CR13	Diode, Hot Carrier	0405280009
C2	Capacitor, 47UF, 20V, 196D	0281700001	CR14	Diode, Hot Carrier	0405280009
C3	Capacitor, 470PF, 100V, CD7, 5%	0285570005	J1	Connector, RF, Subminiature	0753670003
C4	Capacitor, 470PF, 100V, CD7, 5%	0285570005	L1	Inductor, Var, VDC	5024100701
C5	Capacitor, 470PF, 100V, CD7, 5%	0285570005	L2	Inductor, Molded, 2.2 UH, 10%	0659710005
C6	Capacitor, 470PF, 100V, CD7, 5%	0285570005	L3	Inductor, Molded, 10 UH, 5%	0659570009
C7	Capacitor, 0.01UF, 50V, Mylar	0281560005	L4	Inductor, Var, VCO	5024108008
C8	Capacitor, .033UF, 50V, Mylar	0281770000	L5	Inductor, Molded, 2.2 UH, 10%	0659710005
C9	Capacitor, .33UF, 35V, 196D	0281650004	L6	Inductor, Molded, 10 UH, 5%	0659570009
C10	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	L7	Inductor, Var, VCO	5024100905
C11	Capacitor, 22UF, 15V, 196D	0281690006	L8	Inductor, Molded, 10 UH, 5%	0659570009
C12	Capacitor, 150PF, 500V, DM10, 5%	0293430004	L9	Inductor, Molded, 2.2 UH, 10%	0659710005
C13	Capacitor, 150PF, 500V, DM10, 5%	0293430004	L10	Inductor, Molded, 2.2 UH, 10%	0659710005
C14	Capacitor, 150PF, 500V, DM10, 5%	0293430004	L11	Inductor, Air Wound, VCO .125 D	5024101201
C15	Capacitor, 150PF, 300V, CD7, 5%	0280900007	L12	Inductor, Var, VCO	5024100603
C16	Capacitor, 2-8PF, 200V, NPO	0284300004	L13	Inductor, Air Wound, VCO .250 D	5024101308
C17	Capacitor, 3.3UF, 35V, 196D	0281680001	L14	Inductor, Molded, 2.2 UH, 10%	0659710005
C18	Capacitor, 150PF, 500V, DM10, 5%	0293430004	L15	Inductor, Molded, 0.27 UH, 5%	0649390008
C19	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	Q1	Transistor, PNP, Si. 2N4126	0448020009
C20	Capacitor, 7PF, 500V, DM10	0292400004	Q2	Transistor, PNP, Si. 2N4126	0448020009
C21	Capacitor, 5PF, 500V, DM10	0261190008	Q3	Transistor, PNP, Si. 2N4126	0448020009
C22	Capacitor, 100PF, 500V, DM10, 5%	0274740001	Q4	Transistor, PNP, Si. 2N4126	0448020009
C23	Capacitor, 150PF, 500V, DM10, 5%	0293430004	Q5	Transistor, PNP, Si. 2N4126	0448000008
C24	Capacitor, 150PF, 500V, DM10, 5%	0293430004	Q6	Transistor, N-CH, FET MFE120	0448000008
C25	Capacitor, 150PF, 500V, DM10, 5%	0293430004	Q7	Transistor, N-CH, FET MFE120	0448000008
C26	Capacitor, 150PF, 300V, CD7, 5%	0280900007	Q8	Transistor, N-CH, FET MFE120	0448000008
C27	Capacitor, 3-15PF, 200V, N650	0285710001	Q9	Transistor, NPN, Si. 2N5179	0445130008
C28	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	Q10	Transistor, NPN, Si. 2N5179	0445130008
C29	Capacitor, 3.3UF, 35V, 196D	0281680001	Q11	Transistor, NPN, Si. 2N5179	0445130008
C30	Capacitor, 150PF, 500V, DM10, 5%	0293430004	Q12	Transistor, NPN, Si. 2N5179	0445130008
C31	Capacitor, 7PF, 500V, DM10	0292400004	R1	Resistor, 27, 10%, 1/4W	0172590001
C32	Capacitor, 18PF, 500V, DM10, 5%	0260300004	R2	Resistor, 100, 5%, 1/4W	0171180003
C33	Capacitor, 100PF, 500V, DM10, 5%	0274740001	R3	Resistor, 1.8K, 10%, 1/4W	0178190004
C34	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R4	Resistor, 5.6K, 10%, 1/4W	0180360008
C35	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R5	Resistor, 560, 5%, 1/4W	0183200004
C36	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R6	Resistor, 180, 10%, 1/4W	0175220000
C37	Capacitor, 150PF, 300V, CD7, 5%	0280900007	R7	Resistor, 1.8K, 10%, 1/4W	0178190004
C38	Capacitor, 3-15PF, 200V, N650	0285710001	R8	Resistor, 5.6K, 10%, 1/4W	0183060008
C39	Capacitor, 3.3UF, 35V, 196D	0281680001	R9	Resistor, 560, 5%, 1/4W	0183200004
C40	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R10	Resistor, 180, 10%, 1/4W	0175220000
C41	Capacitor, 7PF, 500V, DM10	0292400004	R11	Resistor, 1.8K, 10%, 1/4W	0178190004
C42	Capacitor, 18PF, 500V, DM10, 5%	0260300004	R12	Resistor, 4.7K, 5%, 1/4W	0170770001
C43	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	R13	Resistor, 4.7K, 5%, 1/4W	0170770001
C44	Capacitor, 100PF, 500V, DM10, 5%	0274740001	R14	Resistor, 1.8K, 10%, 1/4W	0178190004
C45	Capacitor, 0.01UF, 25V, X5S	0281620008	R15	Resistor, 4.7K, 5%, 1/4W	0170770001
C46	Capacitor, 18PF, 500V, DM10, 5%	0260300004	R16	Resistor, 4.7K, 5%, 1/4W	0170770001
C47	Capacitor, 0.01UF, 25V, X5S	0281620008	R17	Resistor, 1.8K, 10%, 1/4W	0178190004
C48	Capacitor, 3.3PF, 1000V, NPO	0262240009	R18	Resistor, 4.7K, 5%, 1/4W	0170770001
C49	Capacitor, 0.01UF, 25V, X5S	0281620008	R19	Resistor, 4.7K, 5%, 1/4W	0170770001
C50	Capacitor, 6PF, 1000V, NDO	0250360004	R20	Resistor, 13.7K, 1%, 1/8W	0196230004
C51	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	R21	Resistor, 13.7K, 1%, 1/8W	0196230004
C52	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R22	Resistor, 6.81K, 1%, 1/8W	0196350000
C53	Capacitor, 0.01UF, 25V, X5S	0281620008	R23	Resistor, 3.3K, 10%, 1/4W	0170890007
C54	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R24	Resistor, 1K, 10%, 1/4W	0171560001
C55	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002	R25	Resistor, 475, 1%, 1/8W	0196610001
C56	Capacitor, 100PF, 500V, DM10, 5%	0274740001	R26	Resistor, 10K, 10%, 1/4W	0170410005
C57	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R27	Resistor, 2670, 1%, 1/8W	0196730007
C58	Not used		R28	Resistor, 27, 10%, 1/4W	0172590001
C59	Capacitor, 0.01UF, 25V, X5S	0281620008	R29	Resistor, 4.7K, 5%, 1/4W	0170770001
C60	Capacitor, 150PF, 500V, DM10, 5%	0293430004	R30	Resistor, 27, 10%, 1/4W	0172590001
CR1	Diode, Signal, Sil. 1N4454	0405270003	R31	Resistor, 4.7K, 5%, 1/4W	0170770001
CR2	Diode, Signal, Sil. 1N4454	0405270003	R32	Resistor, 100K, 10%, 1/4W	0170390004
CR3	Diode, Varicap MV2104	0405330006	R33	Resistor, 47K, 10%, 1/4W	0171060008
CR4	Diode, Varicap MV2104	0405330006	R34	Resistor, 1K, 10%, 1/4W	0171560001
CR5	Diode, Hot Carrier	0405280009	R35	Resistor, 220, 10%, 1/4W	0171320000
CR6	Diode, Hot Carrier	0405280009	R36	Resistor, 27, 10%, 1/4W	0172590001
CR7	Diode, Varicap MV 2104	0405330006	R37	Resistor, 4.7K, 5%, 1/4W	0170770001
CR8	Diode, Varicap MV 2104	0405330006	R38	Resistor, 27, 10%, 1/4W	0172590001
CR9	Diode, Hot Carrier	0405280009	R39	Resistor, 4.7K, 5%, 1/4W	0170770001
CR10	Diode, Hot Carrier	0405280009	R40	Resistor, 100K, 10%, 1/4W	0170390004
CR11	Diode, Varicap MV2103	0405320001	R41	Resistor, 47K, 10%, 1/4W	0171060008
CR12	Diode, Varicap MV2103	0405320001	R42	Resistor, 1K, 10%, 1/4W	0171560001
			R43	Resistor, 220, 10%, 1/4W	0171320000
			R44	Resistor, 27, 10%, 1/4W	0172590001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R45	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R46	Resistor, 27, 10%, 1/4 W	0172590001
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Resistor, 47 K, 10%, 1/4 W	0171060008
R49	Resistor, 1 K, 10%, 1/4 W	0171560001
R50	Resistor, 100 K, 10%, 1/4 W	0170390004
R51	Resistor, 220, 10%, 1/4 W	0171320000
R52	Resistor, 10, 5%, 1/4 W	0177160004
R53	Resistor, 5.8 K, 5%, 1/4 W	0174810008
R54	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R55	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R56	Resistor, 220, 10%, 1/4 W	0171320000
R57	Resistor, 5.8 K, 5%, 1/4 W	0174810008
R58	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R59	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R60	Resistor, 27, 10%, 1/4 W	0172590001
R61	Resistor, 10, 5%, 1/4 W	0177160004
R62	Resistor, 220, 10%, 1/4 W	0171320000
R63	Resistor, 22, 10%, 1/4 W	0192690001
R64	Resistor, 100, 5%, 1/4 W	0171180003
R65	Resistor, 100, 5%, 1/4 W	0171180003
T1	Transformer	5024111401
T2	Transformer	5024101103



5024011554C



GROUND CONNECTIONS	
SPECTRUM GEN : 2,3,5,7,12,14,15,16 IA4A1	A,B,C,D,E,F,H,N,P,R,T,U,V
LOW DIGIT GEN : 2,3,4,16,17 IA4A2	A,B,D,T,V
TRANSLATOR : 2,3,4,5,14,16,17,18 IA4A3	C,L,M,N,R,S,T,V
VHF DIVIDER : 1,2,3,14,16,17,18 IA4A4	A,C,N,P,R,S,T,U
VCO : 1,3,12,13 IA4A5	A THRU V

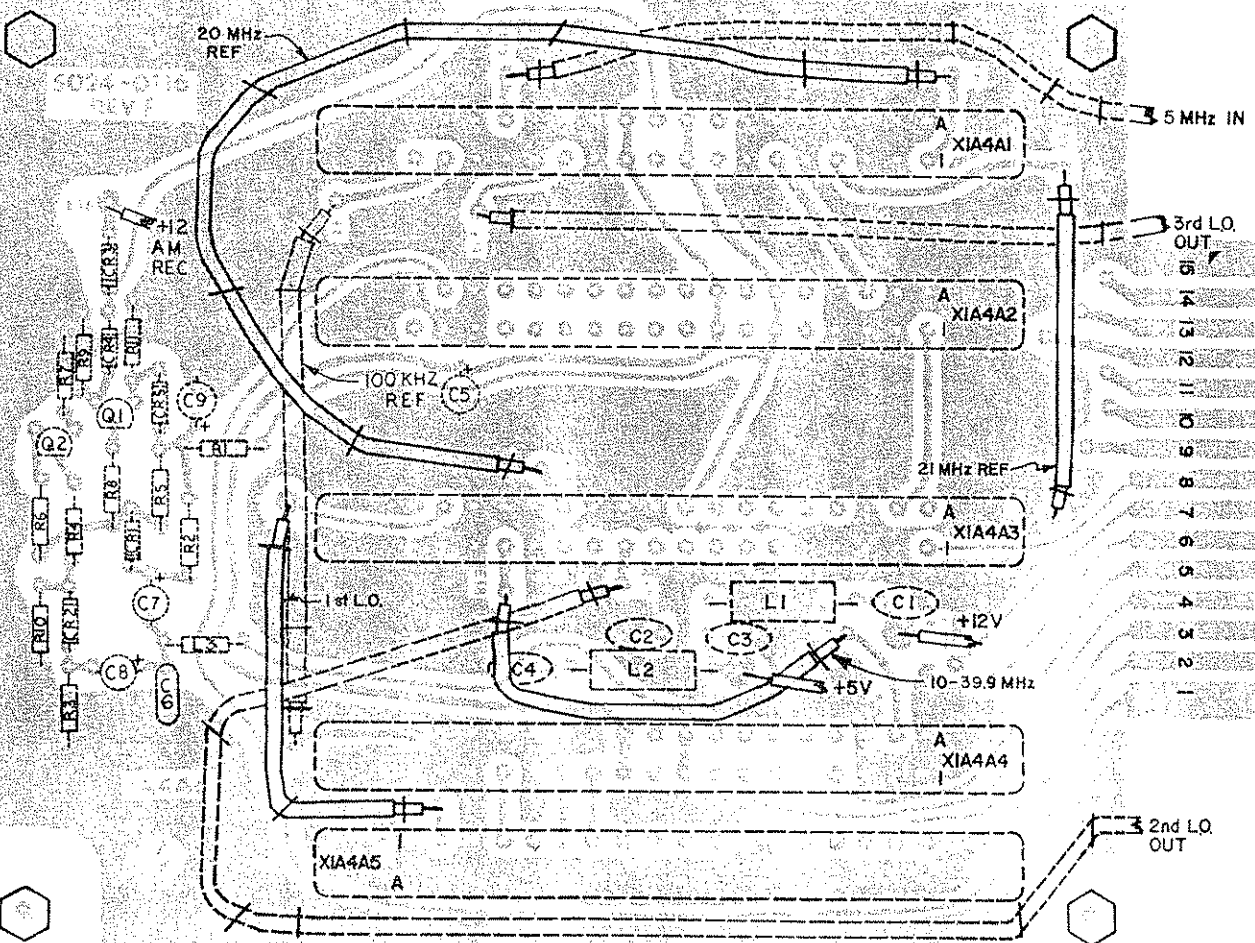
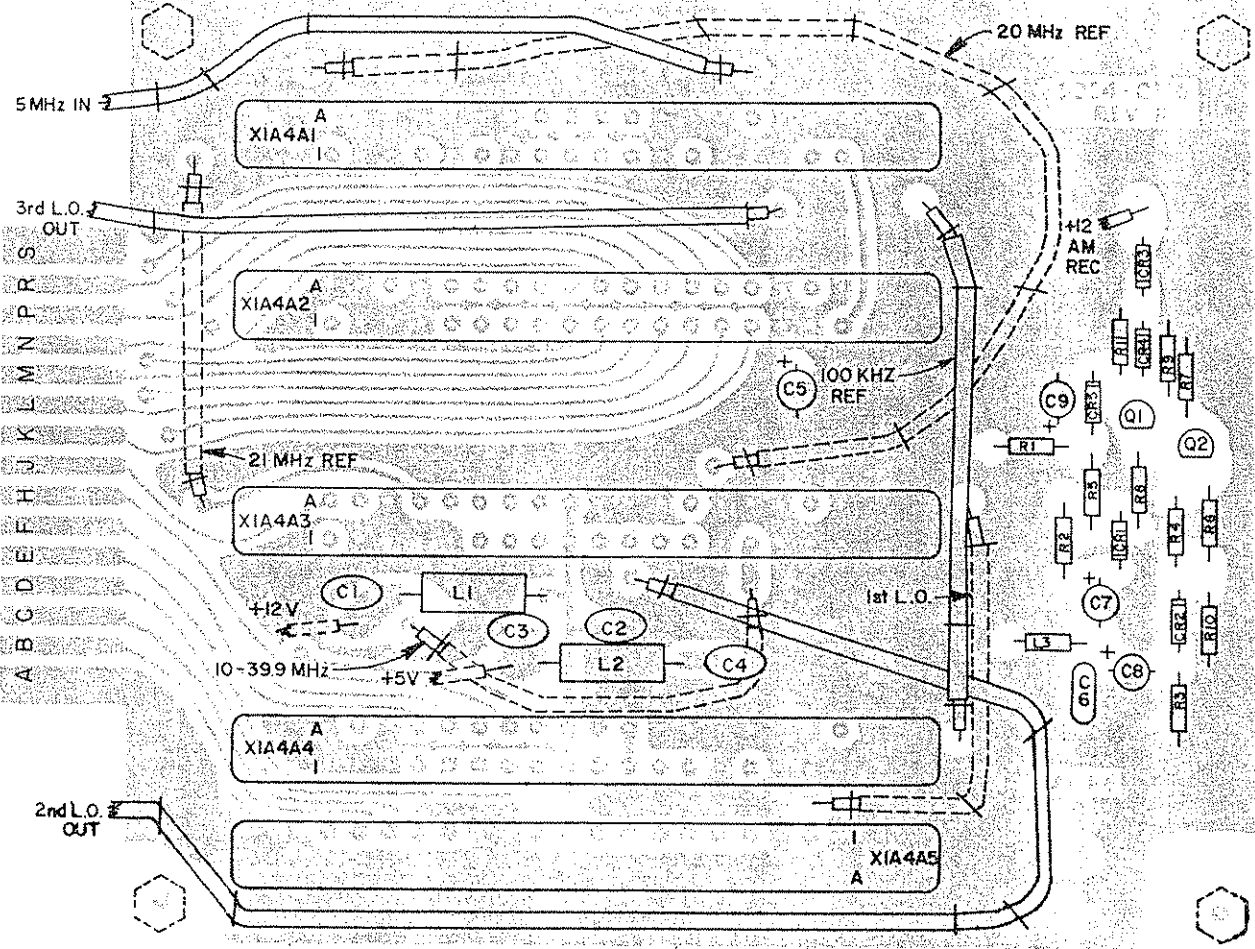
NOTES
 1. UNLESS OTHERWISE SPECIFIED:
 ALL DIODES ARE TYPE IN4454.
 ALL RESISTORS ARE IN OHMS AND ARE 1/4 W.

Figure 5.29 Synthesizer Mother Board (1A4A6) Schematic

5024011597B PC ASSY MOTHER BD. SYNTH.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTHER BD. SYNTH.	5024011597
C1	Capacitor, 0.01UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01UF, 25 V, X5S	0281620008
C4	Capacitor, 0.01UF, 25 V, X5S	0281620008
C5	Capacitor, 22 UF, 15 V, 196 D	0281690006
C6	Capacitor, 0.01UF, 25 V, X5S	0281620008
C7	Capacitor, 22 UF, 15 V, 196 D	0281690006
C8	Capacitor, 15 UF, 15 V, 196 D	0281720002
C9	Capacitor, 47 UF, 20 V, 196 D	0281700001
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Signal, Sil. 1N4454	0405270003
CR5	Diode, Signal, Sil. 1N4454	0405270003
J1	Connector, RF, Subminiature	0753630001
L1	Inductor, Molded, 6.8 UH, 10%	0652200001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
L2	Inductor, Molded, 6.8 UH, 10%	0652200001
L3	Inductor, Molded, 47 UH, 5%	0652680003
Q1	Transistor, PNP, Si. 2N4126	0448020009
Q2	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 180, 10%, 1/4 W	0175220000
R2	Resistor, 10K, 10%, 1/4 W	0170410005
R3	Resistor, 10K, 10%, 1/4 W	0170410005
R4	Resistor, 33K, 10%, 1/4 W	0177920009
R5	Resistor, 22K, 5%, 1/4 W	0172230004
R6	Resistor, 47K, 10%, 1/4 W	0171060008
R7	Resistor, 330, 5%, 1/4 W	0170910008
R8	Resistor, 10K, 10%, 1/4 W	0170410005
R9	Resistor, 3.3K, 10%, 1/4 W	0170890007
R10	Resistor, 22K, 5%, 1/4 W	0172230004
R11	Resistor, 10K, 10%, 1/4 W	0170410005
	Connector, PC, 18 Pin Female	0753610001
	Connector, RF, Subminiature	0753630001
	Key, Polarized, Connector	0753620006



5024110072L

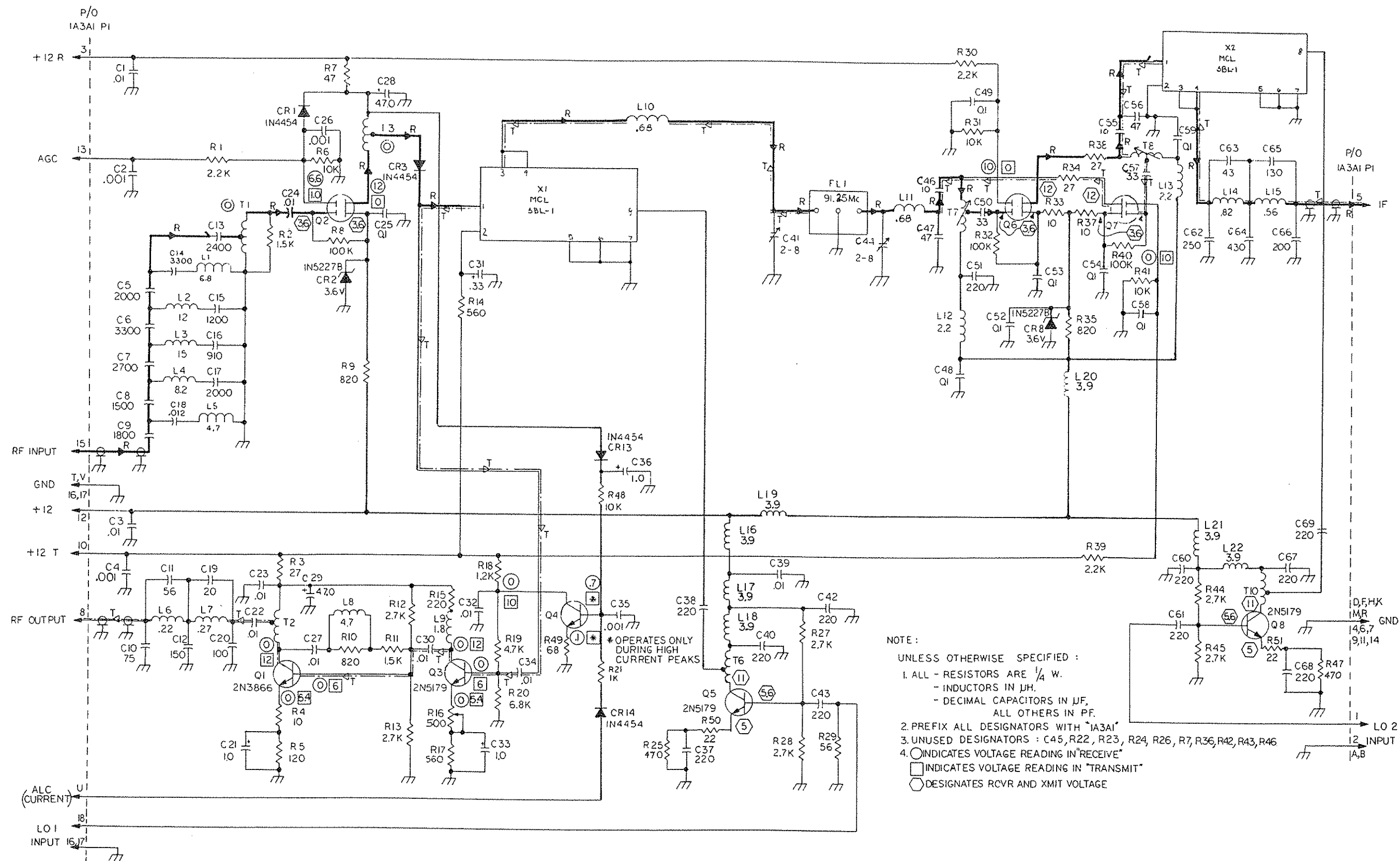
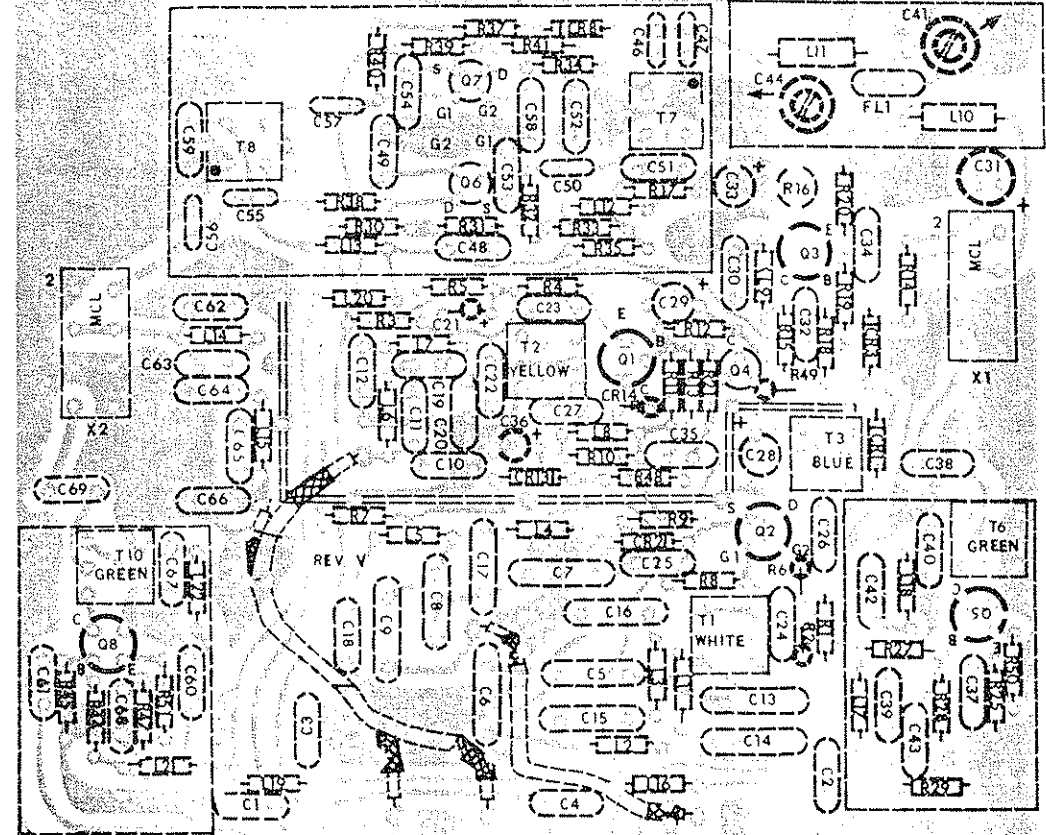
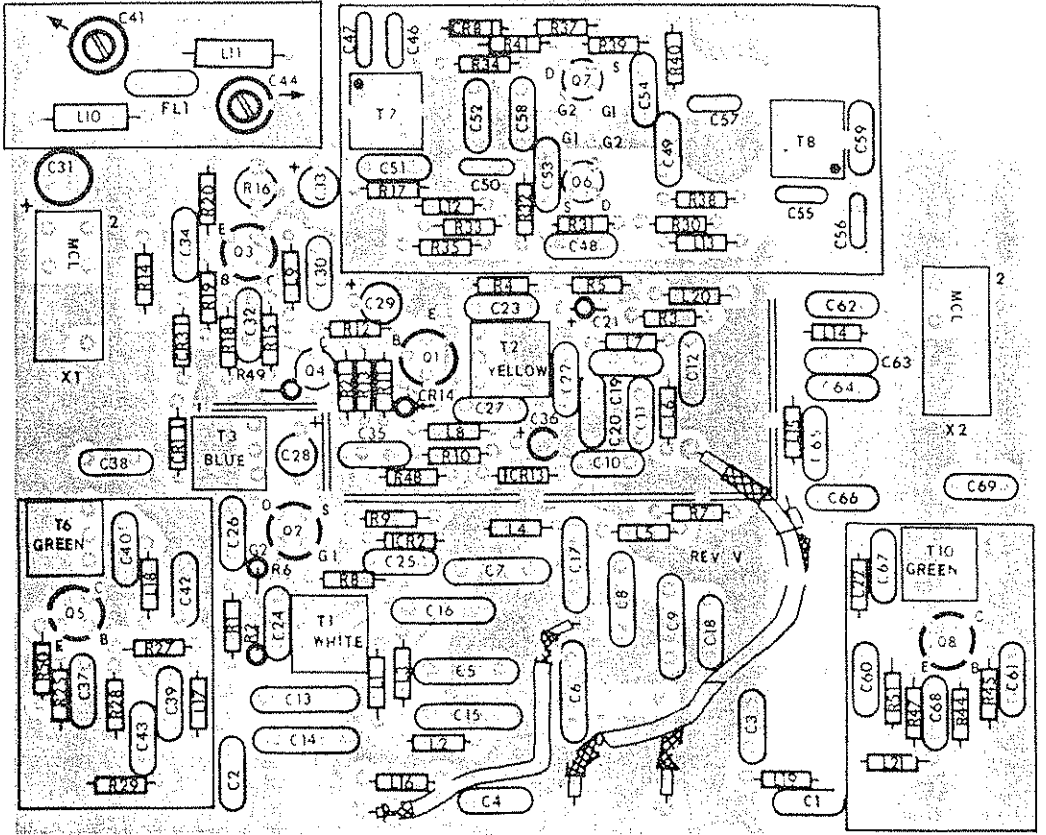


Figure 5-30 VHF Mixer Schematic (1A3A1)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF MIXER	5024110099	CR6	Not used	
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR7	Not used	
C2	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007	CR8	Diode, Zener 1N5227 B	0405250002
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR9	Not used	
C4	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007	CR10	Not used	
C5	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003	CR11	Not used	
C6	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006	CR12	Not used	
C7	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001	CR13	Diode, Signal, Sil. 1N4454	0405270003
C8	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007	CR14	Diode, Signal, Sil. 1N4454	0405270003
C9	Capacitor, 1800 PF, 500 V, DM19, 2%	0281300003	FL1	Filter, Crystal, 91, 25 MHz	5024110501
C10	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000	L1	Inductor, Molded, 6.8 UH, 5%	0659210002
C11	Capacitor, 56 PF, 500 V, DM15, 5%	0274620006	L2	Inductor, Molded, 12 UH, 5%	0652700004
C12	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002	L3	Inductor, Molded, 15 UH, 5%	0659070006
C13	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001	L4	Inductor, Molded, 8.2 UH, 5%	0652060005
C14	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006	L5	Inductor, Molded, 4.7 UH, 5%	0651910005
C15	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006	L6	Inductor, Molded, 0.22 UH, 5%	0650620003
C16	Capacitor, 910 PF, 500 V, DM19, 2%	0281450005	L7	Inductor, Molded, 0.27 UH, 5%	0649390008
C17	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003	L8	Inductor, Molded, 4.7 UH, 5%	0651910005
C18	Capacitor, .012 UF, 50 V, Mylar	0281780005	L9	Inductor, Molded, 1.8 UH, 5%	0652440002
C19	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000	L10	Inductor, Molded, 0.68 UH, 5%	0651770009
C20	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001	L11	Inductor, Molded, 0.68 UH, 5%	0651770009
C21	Capacitor, 1 UF, 50 V, 198 D	0280910002	L12	Inductor, Molded, 2.2 UH, 5%	0649890001
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L13	Inductor, Molded, 2.2 UH, 5%	0649890001
C23	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L14	Inductor, Molded, 0.82 UH, 5%	0652320007
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L15	Inductor, Molded, 0.56 UH, 5%	0649530004
C25	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L16	Inductor, Molded, 3.9 UH, 5%	0650480007
C26	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007	L17	Inductor, Molded, 3.9 UH, 5%	0650480007
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L18	Inductor, Molded, 3.9 UH, 5%	0650480007
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001	L19	Inductor, Molded, 3.9 UH, 5%	0650480007
C29	Capacitor, 47 UF, 20 V, 196 D	0281700001	L20	Inductor, Molded, 3.9 UH, 5%	0605480007
C30	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L21	Inductor, Molded, 3.9 UH, 5%	0605480007
C31	Capacitor, 0.33 UF, 35 V, 196 D	0281650004	L22	Inductor, Molded, 3.9 UH, 5%	0605480007
C32	Capacitor, 0.01 UF, 25 V, X5S	0281620008	Q1	Transistor, NPN, Si, 2N3866	0448140004
C33	Capacitor, 1 UF, 35 V, 196 D	0281660000	Q2	Transistor, N-CH, FET 40673	0447450000
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008	Q3	Transistor, NPN, Si, 2N5179	0445130008
C35	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003	Q4	Transistor, NPN, Si, 2N4124	0448010003
C36	Capacitor, 1 UF, 50 V, 198 D	0280910002	Q5	Transistor, NPN, Si, 2N5179	0445130008
C37	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	Q6	Transistor, N-CH, FET 40673	0447450000
C38	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	Q7	Transistor, N-CH, FET 40673	0447450000
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008	Q8	Transistor, NPN, Si, 2N5179	0445130008
C40	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R1	Resistor, 2.2 K, 5%, 1/4 W	0178070009
C41	Capacitor, 2-8 PF, 350 V, NPO	0268220000	R2	Resistor, 1.5 K, 10%, 1/4 W	0172470005
C42	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R3	Resistor, 27, 10%, 1/4 W	0172590001
C43	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R4	Resistor, 10, 5%, 1/4 W	0177160004
C44	Capacitor, 2-8 PF, 350 V, NPO	0268220000	R5	Resistor, 120, 10%, 1/4 W	0186550006
C45	Not used		R6	Resistor, 10 K, 10%, 1/4 W	0170410005
C46	Capacitor, 10 PF, 500 V, DM10	0259830003	R7	Resistor, 47, 10%, 1/4 W	0179360001
C47	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007	R8	Resistor, 100 K, 10%, 1/4 W	0170390004
C48	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R9	Resistor, 820, 10%, 1/4 W	0178210005
C49	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R10	Resistor, 820, 10%, 1/4 W	0178210005
C50	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006	R11	Resistor, 1.5 K, 10%, 1/4 W	0172470005
C51	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R12	Resistor, 2.7 K, 10%, 1/4 W	0186670001
C52	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002	R13	Resistor, 2.7 K, 10%, 1/4 W	0186670001
C53	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002	R14	Resistor, 560, 5%, 1/4 W	0183200004
C54	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002	R15	Resistor, 220, 10%, 1/4 W	0171320000
C55	Capacitor, 10 PF, 500 V, DM10	0259830003	R16	Pot., 500, 20%, 1/2 W, PC Mount	0345980000
C56	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007	R17	Resistor, 560, 5%, 1/4 W	0183200004
C57	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006	R18	Resistor, 1.2 K, 10%, 1/4 W	0181860007
C58	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
C59	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R20	Resistor, 6.8 K, 5%, 1/4 W	0174810008
C60	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R21	Resistor, 1 K, 10%, 1/4 W	0171560001
C61	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R22	Not used	
C62	Capacitor, 250 PF, 500 V, DM15, 2%	0281100004	R23	Not Used	
C63	Capacitor, 43 PF, 500 V, DM10, 5%	0260800007	R24	Not used	
C64	Capacitor, 430 PF, 500 V, DM15, 5%	0285950001	R25	Resistor, 470, 10%, 1/4 W	0172610001
C65	Capacitor, 130 PF, 500 V, DM15, 2%	0281010005	R26	Not used	
C66	Capacitor, 200 PF, 500 V, DM15, 5%	0258040009	R27	Resistor, 2.7 K, 10%, 1/4 W	0186670001
C67	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R28	Resistor, 2.7 K, 10%, 1/4 W	0186670001
C68	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R29	Resistor, 56, 10%, 1/4 W	0174290004
C69	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
CR1	Diode, Signal, Sil. 1N4454	0405270003	R31	Resistor, 10 K, 10%, 1/4 W	0170410005
CR2	Diode, Zener 1N5227 B	0405250002	R32	Resistor, 100 K, 10%, 1/4 W	0170390004
CR3	Diode, Signal, Sil. 1N4454	0405270003	R33	Resistor, 10, 5%, 1/4 W	0177160004
CR4	Not used		R34	Resistor, 27, 10%, 1/4 W	0172590001
CR5	Not used		R35	Resistor, 820, 10%, 1/4 W	0178210005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R36	Not used	
R37	Resistor, 10, 5%, 1/4W	0177160004
R38	Resistor, 27, 10%, 1/4W	0172590001
R39	Resistor, 2.2K, 5%, 1/4W	0178070009
R40	Resistor, 100K, 10%, 1/4W	0170390004
R41	Resistor, 10K, 10%, 1/4W	0170410005
R42	Not used	
R43	Not used	
R44	Resistor, 2.7K, 10%, 1/4W	0186670001
R45	Resistor, 2.7K, 10%, 1/4W	0186670001
R47	Resistor, 470, 10%, 1/4W	0172610001
R48	Resistor, 10K, 10%, 1/4W	0170410005
R49	Resistor, 68, 10%, 1/4W	0187960003
R50	Resistor, 22, 10%, 1/4W	0192690001
R51	Resistor, 22, 10%, 1/4W	0192690001
T1	Transformer, Input	5024110706
T2	Transformer	5024111401
T3	Transformer, RF Amp	5024110803
T4	Not used	
T5	Not used	
T6	Transformer	5024110901
T7	Inductor	5024110404
T8	Inductor	5024110404
T9	Not used	
T10	Transformer	5024110901
T11	Not used	
X1	Mixer, Broadband, Balanced	1003300006
X2	Mixer, Broadband, Balanced	1003300006
	Wirekit, VHF Mixer Assy.	5024110005
	Shield Can	5024111001
	Shield Can	5024111109
	Shield Can	5024111206
	Shield Can	5024111303



5024120078M

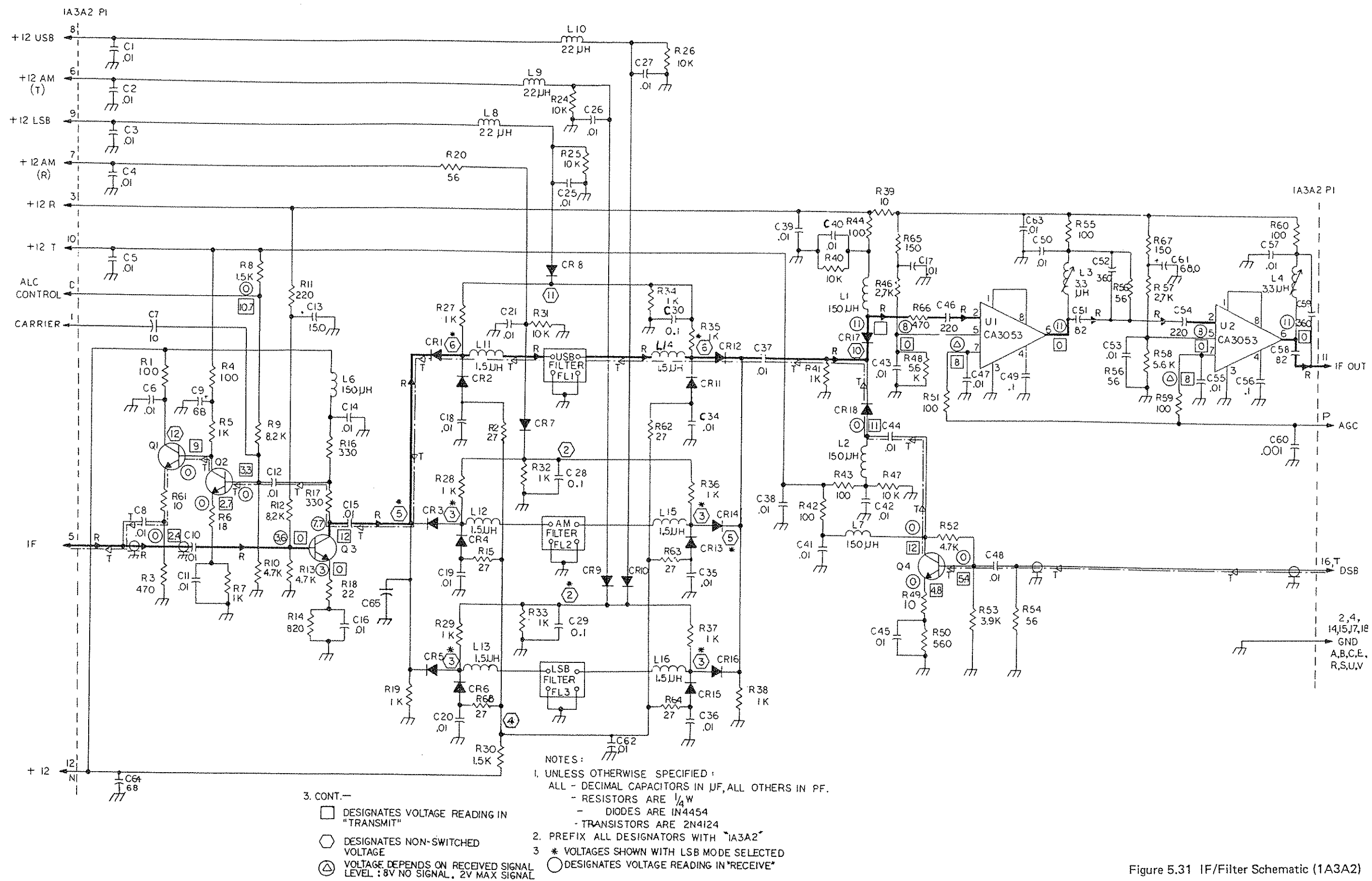
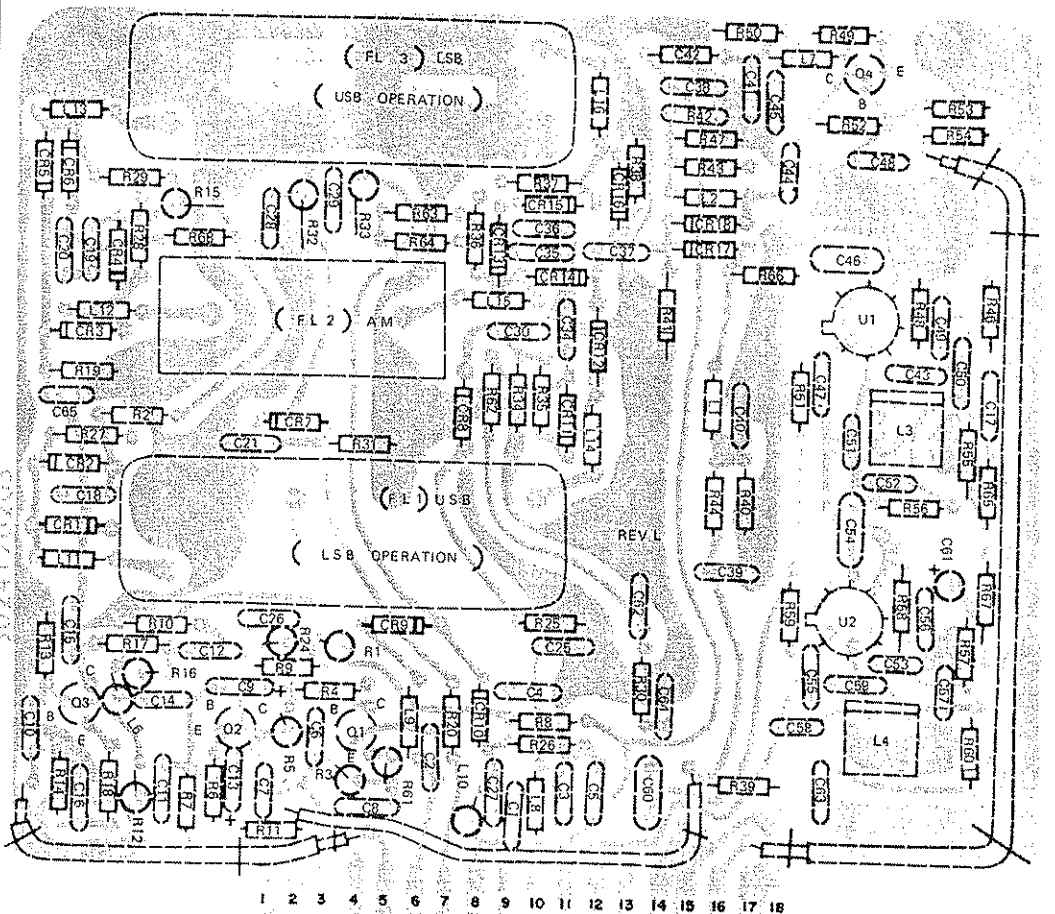
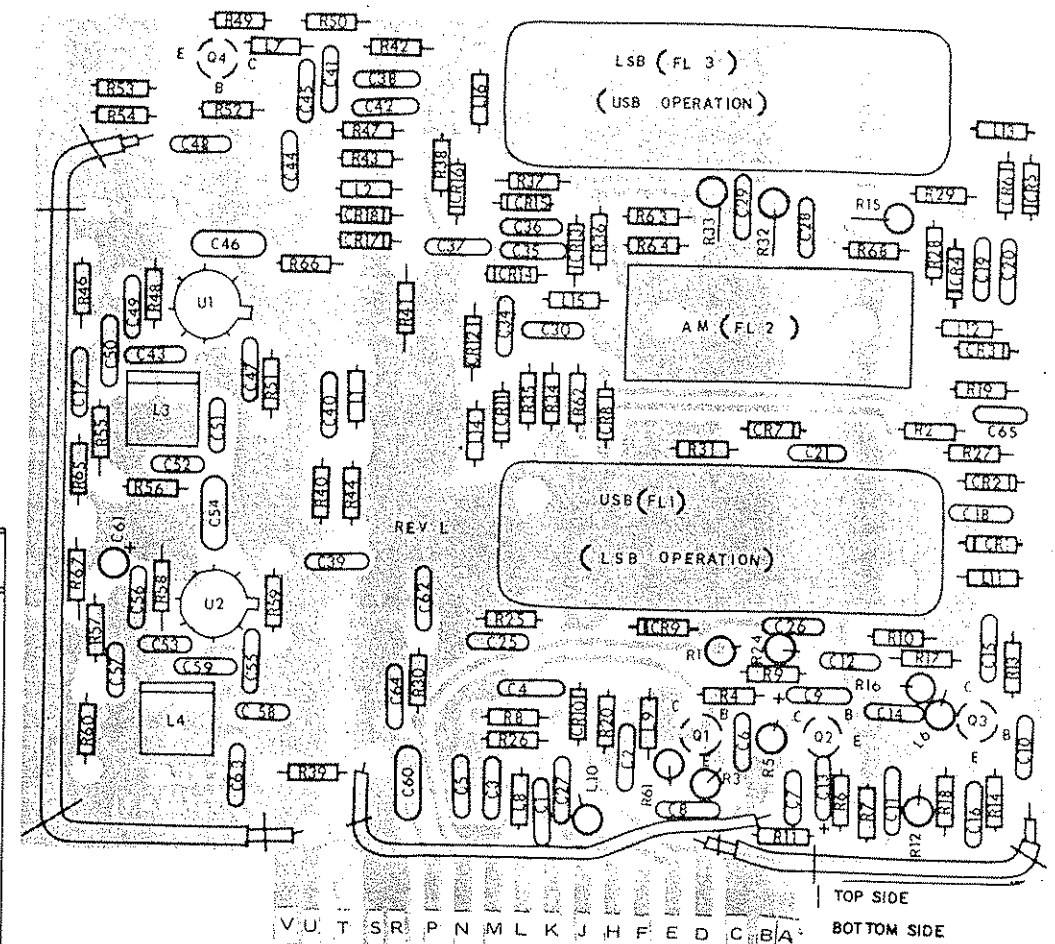


Figure 5.31 IF/Filter Schematic (1A3A2)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY IF FILTER W/O FILTERS	5024120191			
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR10	Diode, Signal, Sil. 1 N4454	0405270003
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR11	Diode, Signal, Sil. 1 N4454	0405270003
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR12	Diode, Signal, Sil. 1 N4454	0405270003
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR13	Diode, Signal, Sil. 1 N4454	0405270003
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR14	Diode, Signal, Sil. 1 N4454	0405270003
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR15	Diode, Signal, Sil. 1 N4454	0405270003
C7	Capacitor, 10 PF, 500 V, DM10	0259830003	CR16	Diode, Signal, Sil. 1 N4454	0405270003
C8	Capacitor, 0.01 UF, 25 V, X5S	0281620008	CR17	Diode, Signal, Sil. 1 N4454	0405270003
C9	Capacitor, 68 UF, 15 V, T368	0296540005	CR18	Diode, Signal, Sil. 1 N4454	0405270003
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008	FL1	Filter, Crystal, LSB, 10.5 MHz	0818250003
C11	Capacitor, 0.01 UF, 25 V, X5S	0281620008	FL2	Filter, Crystal, AM, 10.5 MHz	0818270004
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008	FL3	Filter, Crystal, USB, 10.5 MHz	0818260009
C13	Capacitor, 15 UF, 15 V, 196 D	0281720002	L1	Inductor, Molded, 150 UH, 5%	0659190001
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L2	Inductor, Molded, 150 UH, 5%	0659190001
C15	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L3	Inductor, Var, 3.30 UH	0647930005
C16	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L4	Inductor, Var, 3.30 UH	0647930005
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L5	Not used	
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L6	Inductor, Molded, 150 UH, 5%	0659190001
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L7	Inductor, Molded, 150 UH, 5%	0659190001
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L8	Inductor, Molded, 22 UH, 5%	0650000005
C22	Not used	0281620008	L9	Inductor, Molded, 22 UH, 5%	0650000005
C23	Not used		L10	Inductor, Molded, 22 UH, 5%	0650000005
C24	Not used		L11	Inductor, Molded, 1.5 UH, 5%	0649270002
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L12	Inductor, Molded, 1.5 UH, 5%	0649270002
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L13	Inductor, Molded, 1.5 UH, 5%	0649270002
C26	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L14	Inductor, Molded, 1.5 UH, 5%	0649270002
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008	L15	Inductor, Molded, 1.5 UH, 5%	0649270002
C28	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002	L16	Inductor, Molded, 1.5 UH, 5%	0649270002
C29	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002	Q1	Transistor, NPN, Si. 2 N4124	0448010003
C30	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002	Q2	Transistor, NPN, Si. 2 N4124	0448010003
C31	Not used		Q3	Transistor, NPN, Si. 2 N4124	0448010003
C32	Not used		Q4	Transistor, NPN, Si. 2 N4124	0448010003
C33	Not used		R1	Resistor, 100, 5%, 1/4 W	0171180003
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R2	Resistor, 27, 10%, 1/4 W	0172590001
C35	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R3	Resistor, 470, 5%, 1/4 W	0184110009
C36	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R4	Resistor, 100, 5%, 1/4 W	0171180003
C37	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R5	Resistor, 1K, 10%, 1/4 W	0171560001
C38	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R6	Resistor, 18, 10%, 1/4 W	0184590001
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R7	Resistor, 1K, 10%, 1/4 W	0171560001
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R8	Resistor, 1.5K, 10%, 1/4 W	0172470005
C41	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R9	Resistor, 8.2K, 10%, 1/4 W	0181620006
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R10	Resistor, 4.7K, 5%, 1/4 W	0170770001
C43	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R11	Resistor, 220, 10%, 1/4 W	0171320000
C44	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R12	Resistor, 8.2K, 10%, 1/4 W	0181620006
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R13	Resistor, 4.7K, 5%, 1/4 W	0170770001
C46	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R14	Resistor, 820, 10%, 1/4 W	0178210005
C47	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R15	Resistor, 27, 10%, 1/4 W	0172590001
C48	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R16	Resistor, 330, 5%, 1/4 W	0170910008
C49	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002	R17	Resistor, 330, 5%, 1/4 W	0170910008
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R18	Resistor, 22, 10%, 1/4 W	0192690001
C51	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003	R19	Resistor, 1K, 10%, 1/4 W	0171560001
C52	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003	R20	Resistor, 56, 10%, 1/4 W	0174290004
C53	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R21	Not used	
C54	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002	R22	Not used	
C55	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R23	Not used	
C56	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002	R24	Resistor, 10K, 10%, 1/4 W	0170410005
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R25	Resistor, 10K, 10%, 1/4 W	0170410005
C58	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003	R26	Resistor, 10K, 10%, 1/4 W	0170410005
C59	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003	R27	Resistor, 1K, 10%, 1/4 W	0171560001
C60	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007	R28	Resistor, 1K, 10%, 1/4 W	0171560001
C61	Capacitor, 68 UF, 15 V, T368	0296540005	R29	Resistor, 1K, 10%, 1/4 W	0171560001
C62	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R30	Resistor, 1.5K, 10%, 1/4 W	0172470005
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R31	Resistor, 10K, 10%, 1/4 W	0170410005
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008	R32	Resistor, 1K, 10%, 1/4 W	0171560001
C65	Capacitor, 75 PF, 500 V	0294340009	R33	Resistor, 1K, 10%, 1/4 W	0171560001
CR1	Diode, Signal, Sil. 1 N4454	0405270003	R34	Resistor, 1K, 10%, 1/4 W	0171560001
CR2	Diode, Signal, Sil. 1 N4454	0405270003	R35	Resistor, 1K, 10%, 1/4 W	0171560001
CR3	Diode, Signal, Sil. 1 N4454	0405270003	R36	Resistor, 1K, 10%, 1/4 W	0171560001
CR4	Diode, Signal, Sil. 1 N4454	0405270003	R37	Resistor, 1K, 10%, 1/4 W	0171560001
CR5	Diode, Signal, Sil. 1 N4454	0405270003	R38	Resistor, 1K, 10%, 1/4 W	0171560001
CR6	Diode, Signal, Sil. 1 N4454	0405270003	R39	Resistor, 10, 5%, 1/4 W	0177160004
CR7	Diode, Signal, Sil. 1 N4454	0405270003	R40	Resistor, 10K, 10%, 1/4 W	0170410005
CR8	Diode, Signal, Sil. 1 N4454	0405270003	R41	Resistor, 1K, 10%, 1/4 W	0171560001
CR9	Diode, Signal, Sil. 1 N4454	0405270003	R42	Resistor, 100, 5%, 1/4 W	0171180003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R43	Resistor, 100, 5%, 1/4 W	0171180003
R44	Resistor, 100, 5%, 1/4 W	0171180003
R45	Not used	
R46	Resistor, 2.7K, 10%, 1/4 W	0186670001
R47	Resistor, 10K, 10%, 1/4 W	0170410005
R48	Resistor, 5.6K, 10%, 1/4 W	0183060008
R49	Resistor, 10, 5%, 1/4 W	0177160004
R50	Resistor, 560, 5%, 1/4 W	0183200004
R51	Resistor, 100, 5%, 1/4 W	0171180003
R52	Resistor, 4.7K, 5%, 1/4 W	0170770001
R53	Resistor, 3.9K, 10%, 1/4 W	0178830003
R54	Resistor, 56, 10%, 1/4 W	0174290004
R55	Resistor, 100, 5%, 1/4 W	0171180003
R56	Resistor, 56, 10%, 1/4 W	0172490004
R57	Resistor, 2.7K, 10%, 1/4 W	0186670001
R58	Resistor, 5.6K, 10%, 1/4 W	0183060008
R59	Resistor, 100, 5%, 1/4 W	0171180003
R60	Resistor, 100, 5%, 1/4 W	0171180003
R61	Resistor, 10, 5%, 1/4 W	0177160004
R62	Resistor, 27, 10%, 1/4 W	0172590001
R63	Resistor, 27, 10%, 1/4 W	0175290001
R64	Resistor, 27, 10%, 1/4 W	0175290001
R65	Resistor, 150, 10%, 1/4 W	0172730007
R66	Resistor, 470, 5%, 1/4 W	0184110009
R67	Resistor, 150, 10%, 1/4 W	0172730007
R68	Resistor, 27, 10%, 1/4 W	0172590001
U1	IC Linear CA3053	0448060001
U2	IC Linear CA3053	0448060001



5024140079 M

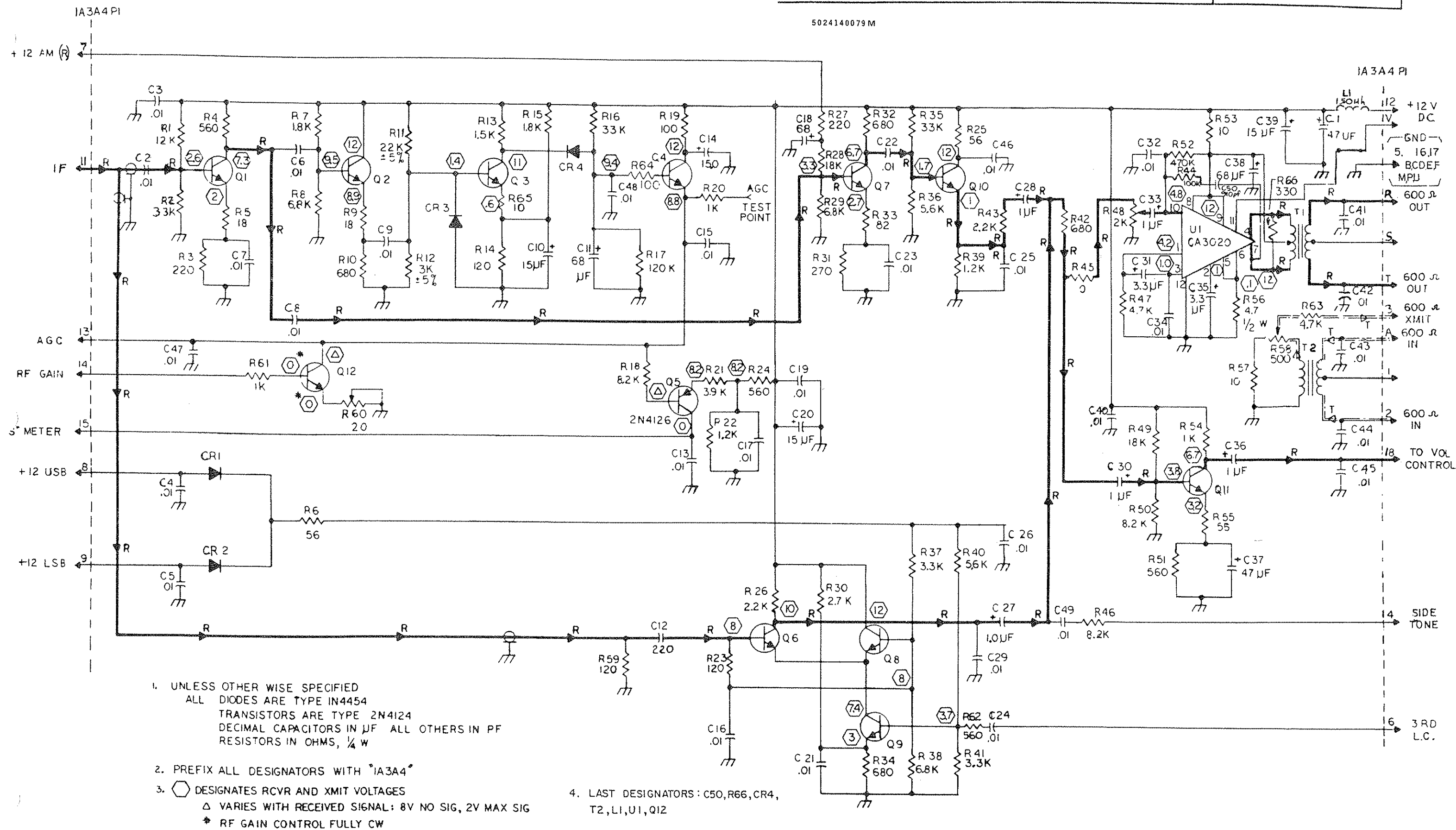
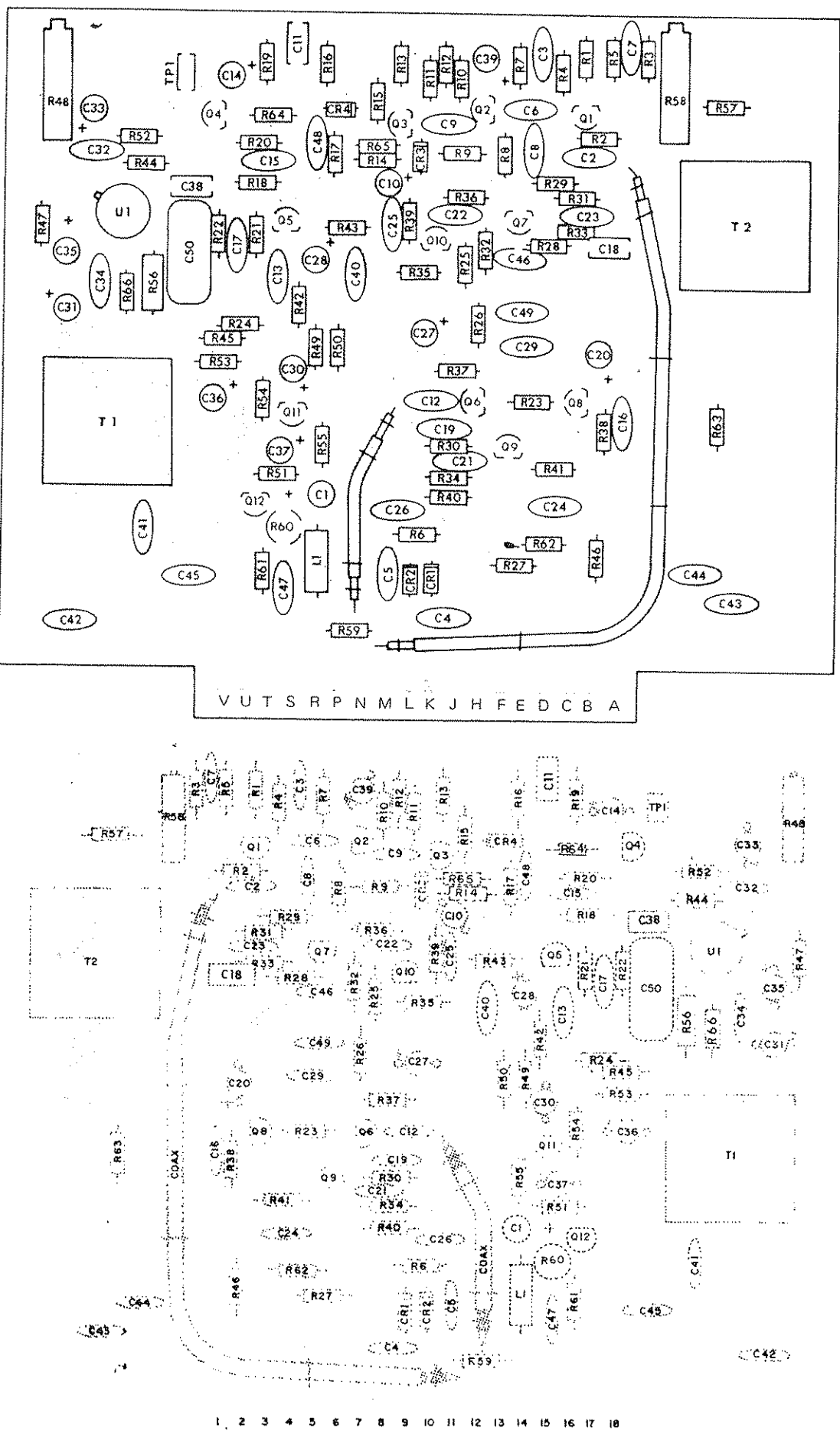


Figure 5.32 Audio Board Schematic (1A3A4)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY AUDIO	5024140095
C1	Capacitor, 47 UF, 20 V, 196 D	0281700001
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C8	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C9	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C10	Capacitor, 15 UF, 20 V, 198 D	0280920008
C11	Capacitor, 68 UF, 25 V, T368	0282150005
C12	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C13	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C14	Capacitor, 15 UF, 20 V, 198 D	0280920008
C15	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C16	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C18	Capacitor, 68 UF, 25 V, T368	0282150005
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 15 UF, 20 V, 198 D	0280920008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C27	Capacitor, 1 UF, 50 V, 198 D	0280910002
C28	Capacitor, 1 UF, 50 V, 198 D	0280910002
C29	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C30	Capacitor, 1 UF, 50 V, 198 D	0280910002
C31	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C32	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C33	Capacitor, 1 UF, 50 V, 198 D	0280910002
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C35	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C36	Capacitor, 1 UF, 50 V, 198 D	0280910002
C37	Capacitor, 47 UF, 20 V, 196 D	0281700001
C38	Capacitor, 68 UF, 25 V, T368	0282150005
C39	Capacitor, 15 UF, 20 V, 198 D	0280920008
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C41	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C44	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C46	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C47	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C48	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C49	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C50	Capacitor, 910 PF, 500 V, DM19, 5%	0297570005
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, 150 UH, 5%	0646780000
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
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
Q8	Transistor, NPN, Si. 2N4124	0448010003
Q9	Transistor, NPN, Si. 2N4124	0448010003
Q10	Transistor, NPN, Si. 2N4124	0448010003
Q11	Transistor, NPN, Si. 2N4124	0448010003
Q12	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 12 K, 10%, 1/4 W	0183180003
R2	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R3	Resistor, 220, 10%, 1/4 W	0171320000
R4	Resistor, 560, 5%, 1/4 W	0183200004
R5	Resistor, 18, 10%, 1/4 W	0184590001
R6	Resistor, 56, 10%, 1/4 W	0174290004
R7	Resistor, 1.8 K, 10%, 1/4 W	0178190004

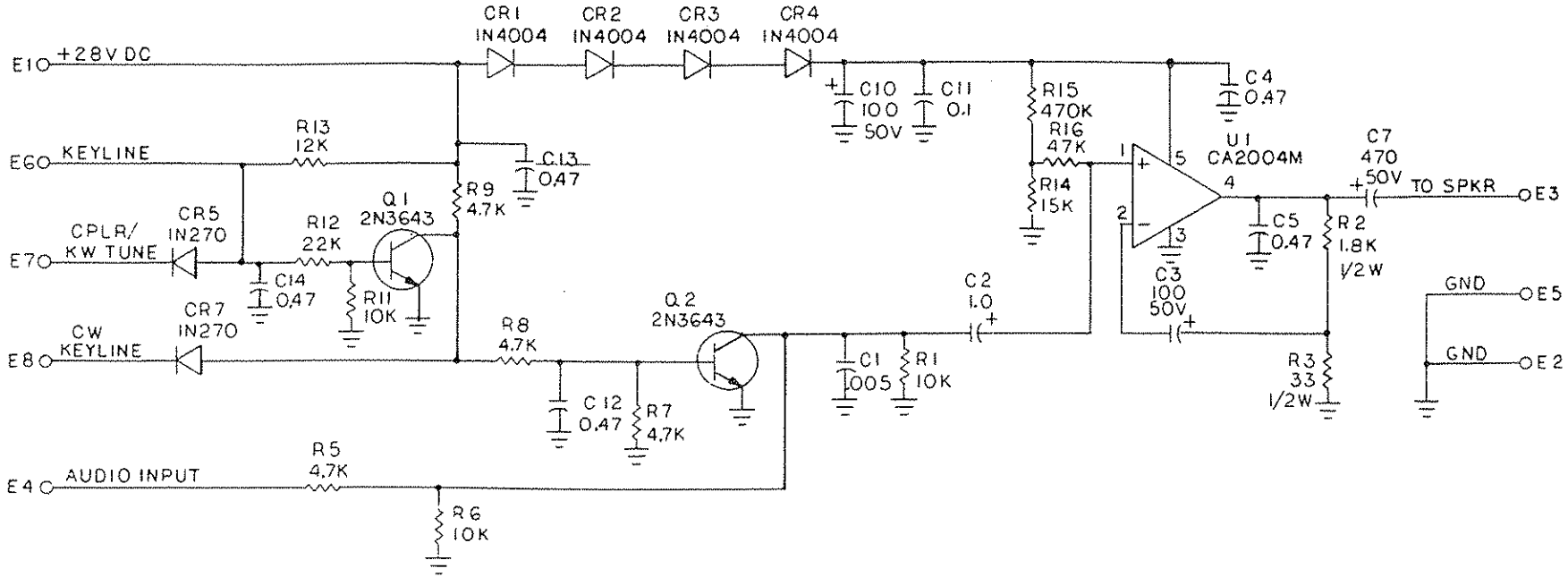
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R8	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R9	Resistor, 18, 10%, 1/4 W	0184590001
R10	Resistor, 680, 10%, 1/4 W	0176630007
R11	Resistor, 22 K, 5%, 1/4 W	0172230004
R12	Resistor, 3 K, 5%, 1/4 W	0197180001
R13	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R14	Resistor, 120, 10%, 1/4 W	0186550006
R15	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R16	Resistor, 33 K, 10%, 1/4 W	0177920009
R17	Resistor, 120 K, 10%, 1/4 W	0175100004
R18	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R19	Resistor, 100, 5%, 1/4 W	0171180003
R20	Resistor, 1 K, 10%, 1/4 W	0171560001
R21	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R22	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R23	Resistor, 120, 10%, 1/4 W	0186550006
R24	Resistor, 560, 5%, 1/4 W	0183200004
R25	Resistor, 56, 10%, 1/4 W	0174290004
R26	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R27	Resistor, 220, 10%, 1/4 W	0171320000
R28	Resistor, 18 K, 10%, 1/4 W	0171520002
R29	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R30	Resistor, 2.7 K, 10%, 1/4 W	0188670001
R31	Resistor, 270, 10%, 1/4 W	0178450006
R32	Resistor, 680, 10%, 1/4 W	0176630007
R33	Resistor, 82, 10%, 1/4 W	0184610001
R34	Resistor, 680, 10%, 1/4 W	0176630007
R35	Resistor, 33 K, 10%, 1/4 W	0177920009
R36	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R37	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R38	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R39	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R40	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R41	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R42	Resistor, 680, 10%, 1/4 W	0176630007
R43	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R44	Resistor, 100 K, 10%, 1/4 W	0170390004
R45	Resistor, 10, 5%, 1/4 W	0177160004
R46	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R47	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R48	Pot., 2 K, 10%, 3/4 W, 15 Turns	0338490060
R49	Resistor, 18 K, 10%, 1/4 W	0175720002
R50	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R51	Resistor, 560, 5%, 1/4 W	0183200004
R52	Resistor, 470 K, 10%, 1/4 W	0180570005
R53	Resistor, 10, 5%, 1/4 W	0177160004
R54	Resistor, 1 K, 10%, 1/4 W	0171560001
R55	Resistor, 56, 10%, 1/4 W	0174290004
R56	Resistor, 4.7 K, 10%, 1/2 W	0195680006
R57	Resistor, 10, 5%, 1/4 W	0177160004
R58	Pot., 500, 10%, 3/4 W, 15 Turns	0338490078
R59	Resistor, 120, 10%, 1/4 W	0186550006
R60	Pot., 20, 10%, 1/2 W, 1 Turn	1000080030
R61	Resistor, 1 K, 10%, 1/4 W	0171560001
R62	Resistor, 560, 5%, 1/4 W	0183200004
R63	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R64	Resistor, 100, 5%, 1/4 W	0171180003
R65	Resistor, 10, 5%, 1/4 W	0177160004
R66	Resistor, 330, 5%, 1/4 W	0170910008
T1	Transformer, Audio, PC Mount	0491660006
T2	Transformer, Audio, PC Mount	0491650001
U1	IC Linear CA3020	0444600001
	Test Point, White	0753640007
	Heatsink, Transistor	0871870002
	Wire Kit, Audio Board Assy.	5024140001
	PCB, Audio	5024140206



5024047095B PC ASSY. SPEAKER DRIVER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY. SPEAKER DRIVER	5024047095
C1	Capacitor, 0.005 UF, 100 V, Z5 V	0273330004
C2	Capacitor, 1 UF, 35 V, T368	0283630001
C3	Capacitor, 100 UF, 50 V	1004260016
C4	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
C5	Capacitor, 0.47 UF, 50 V, X5 V, 20%	
C6	Not used	
C7	Capacitor, 470 UF, 50 V, TAL	0280890001
C8	Not used	
C9	Not used	
C10	Capacitor, 100 UF, 50 V	1004260016
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
C13	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
C14	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Signal, Germ. 1N270	0405510004
CR6	Not used	
CR7	Diode, Signal, Germ. 1N270	0405510004
Q1	Transistor, NPN, SI. 2N3643	0443310009
Q2	Transistor, NPN, SI. 2N3643	0443310009
R1	Resistor, 10 K, 10%, 1/4 W	0170410005
R2	Resistor, 1.8 K, 5%, 1/2 W	0184970008
R3	Resistor, 33, 10%, 1/2 W	0171700007
R4	Not used	
R5	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R6	Resistor, 10 K, 10%, 1/4 W	0170410005
R7	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R8	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R9	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R10	Not used	
R11	Resistor, 10 K, 10%, 1/4 W	0170410005
R12	Resistor, 22 K, 5%, 1/4 W	0172230004
R13	Resistor, 12 K, 10%, 1/4 W	0183180003
R14	Resistor, 15 K, 10%, 1/4 W	0172350000
R15	Resistor, 470 K, 10%, 1/4 W	0180570005
R16	Resistor, 47 K, 10%, 1/4 W	0171060008
U1	IC. Linear	1003140025

5024047079A



NOTES: UNLESS OTHERWISE SPECIFIED:
1. ALL CAPACITORS ARE IN MICROFARADS.
2. ALL RESISTORS ARE IN OHMS AND ARE 1/4 WATT.

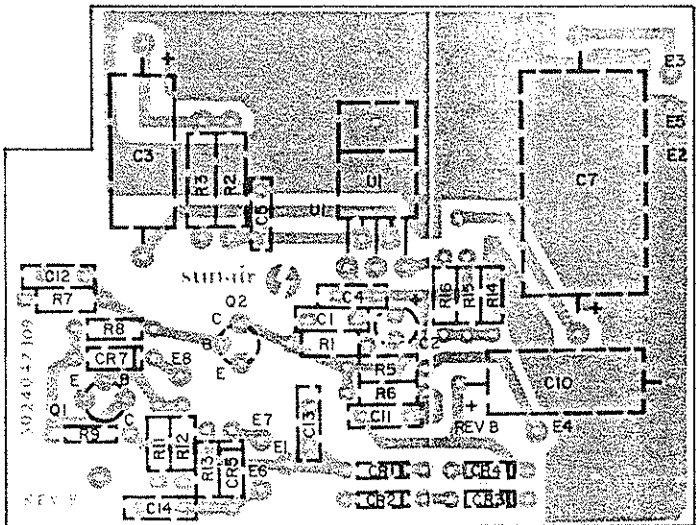
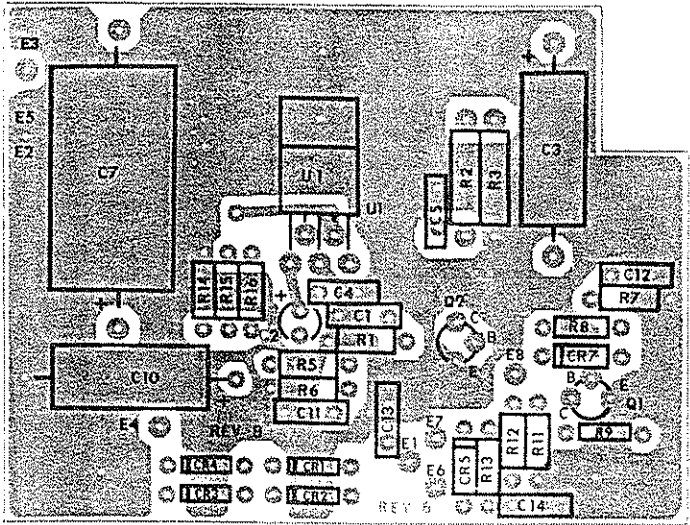
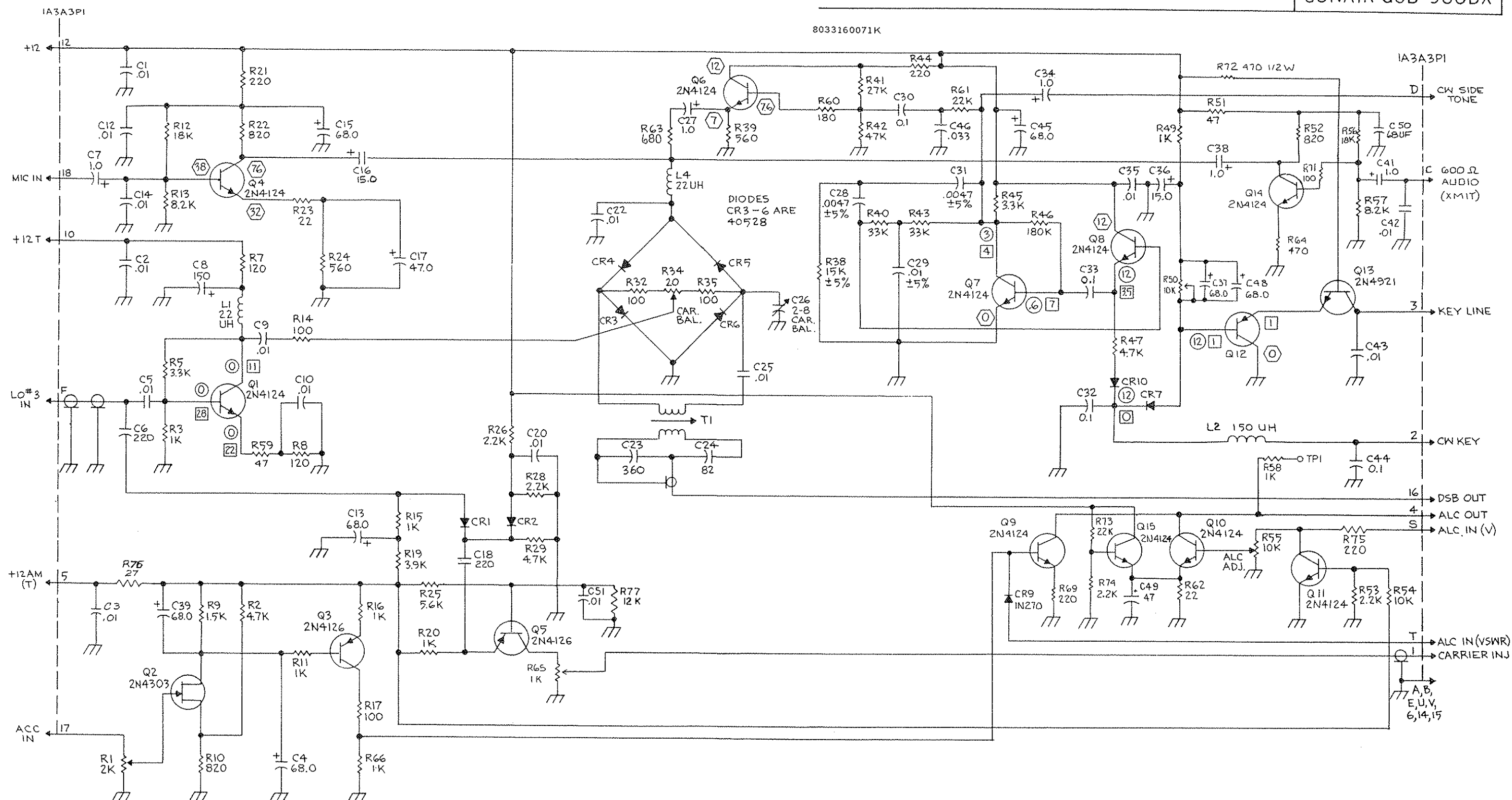


Figure 5.33 Speaker Driver Schematic (1A1A1)

CHANGE DATE AUGUST 1, 1982

SUNAIR GSB-900DX

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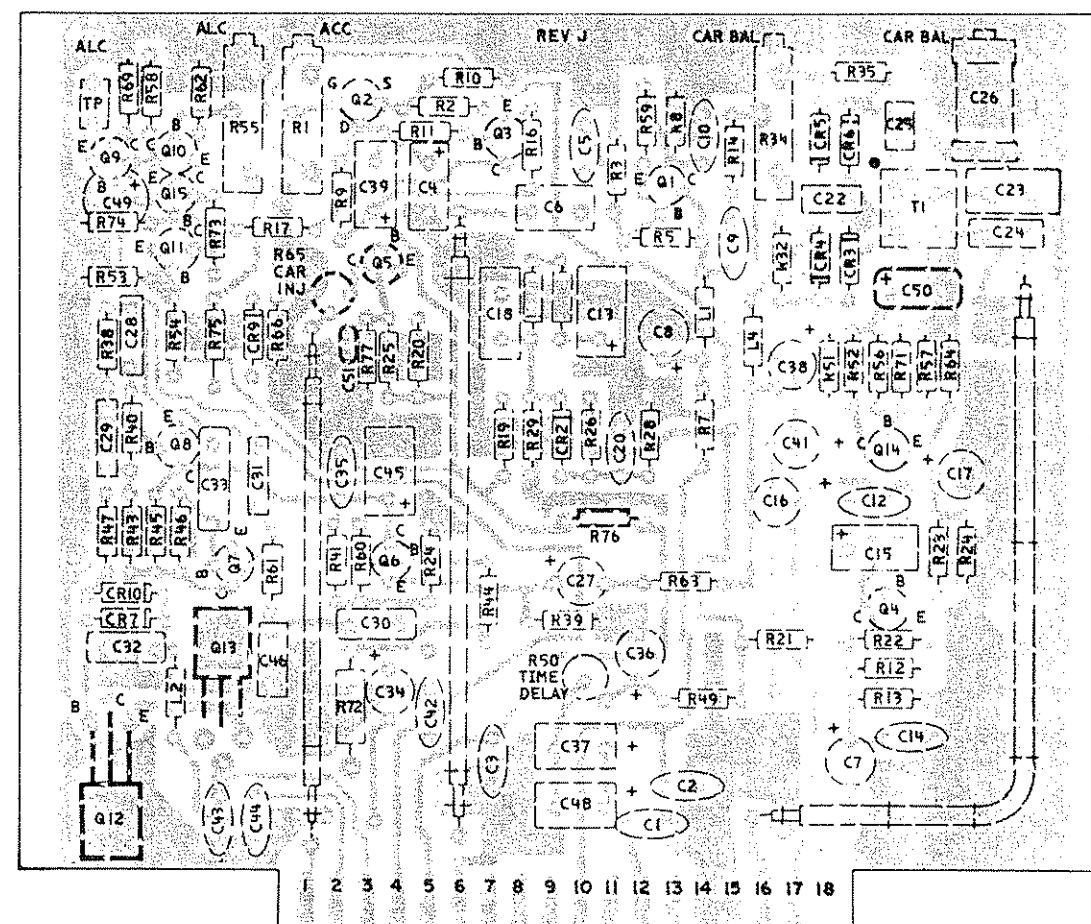
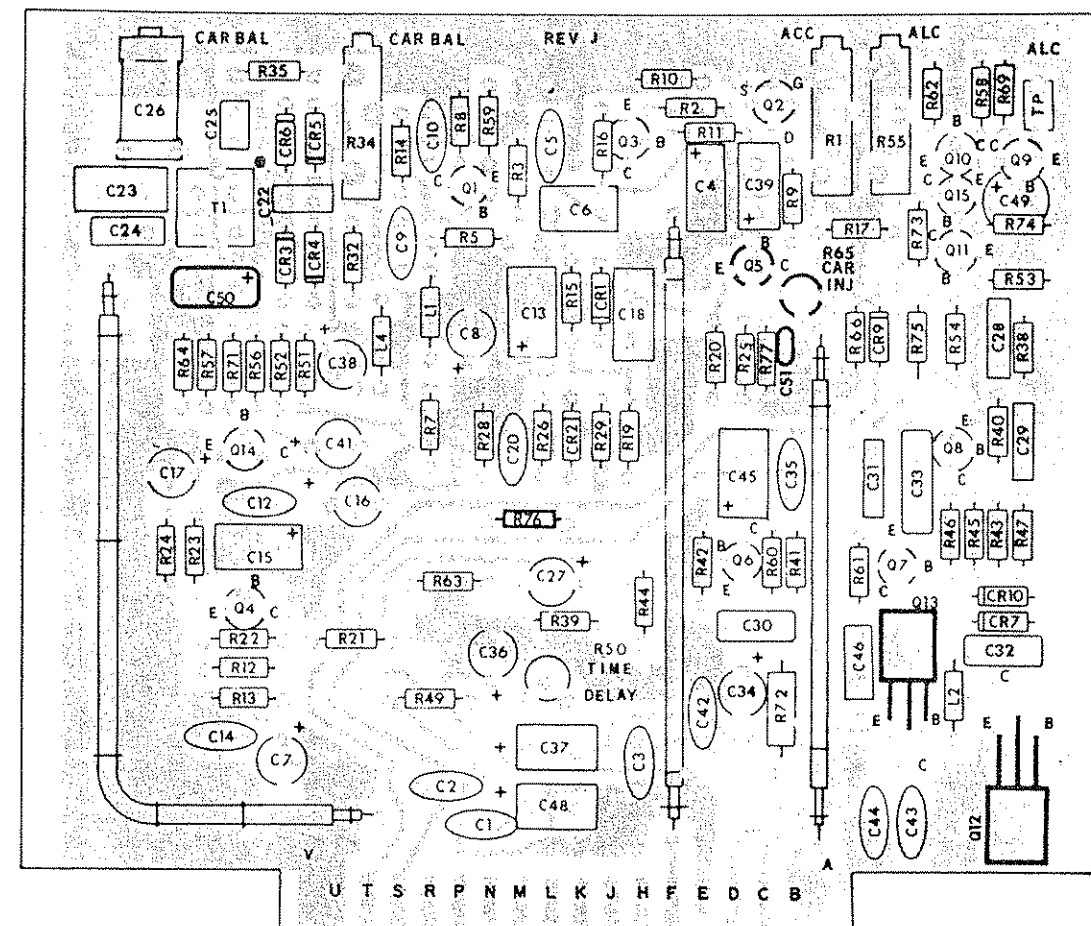


- NOTES, UNLESS OTHERWISE SPECIFIED
1. ALL DECIMAL CAPACITORS IN UF, ALL OTHERS IN PF
ALL RESISTORS IN OHMS
ALL DIODES ARE IN4454
 2. PREFIX ALL DESIGNATORS WITH '1A3A3'
 3. ○ DESIGNATES RECEIVE VOLTAGE
□ DESIGNATES TRANSMIT VOLTAGE
○ DESIGNATES RCV & XMIT VOLTAGE
 4. VOLTAGES ON Q2, Q3 & Q5 CORRECT ONLY FOR A M TRANSIT MODE.

Figure 5.34 Sideband Generator (1A3A3)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	PC ASSY SIDEBAND GEN.	8033160098
C2	Capacitor, 0.01UF, 25V, X55	0281620008
C3	Capacitor, 0.01UF, 25V, X55	0281620008
C4	Capacitor, 0.01UF, 25K, 25V, X55	0281620008
C5	Capacitor, 68UF, 15V, T368	0296540005
C6	Capacitor, 0.01UF, 25V, X55	0281620008
C7	Capacitor, 220PF, 500V, DM15, 2%	0281420009
C8	Capacitor, 1UF, 50V, 198D	0280910002
C9	Capacitor, 15UF, 20V, 198D	0280920008
C10	Capacitor, 0.01UF, 25V, X55	0281620008
C11	Not used	
C12	Capacitor, 0.01UF, 25V, X55	0281620008
C13	Capacitor, 68UF, 15V, T368	0296540005
C14	Capacitor, 0.01UF, 25V, X55	0281620008
C15	Capacitor, 68 UF, 15V, T368	0296540005
C16	Capacitor, 15UF, 20V, 198D	0280920008
C17	Capacitor, 47UF, 20V, 196D	0281700001
C18	Capacitor, 220PF, 500V, DM15, 2%	0281420009
C19	Not used	
C20	Capacitor, 0.01UF, 25V, X55	0281620008
C21	Not used	
C22	Capacitor, 0.01UF, 50V, W5R, 20%	0281730008
C23	Capacitor, 360PF, 500V, DM15, 5%	0275150003
C24	Capacitor, 82PF, 300V, DM15, 5%	0289970008
C25	Capacitor, 0.01UF, 50V, W5R, 20%	0281730008
C26	Capacitor, .8-8PF, PC Mt. Glass	100060012
C27	Capacitor, 1UF, 50V, 198D	0280910002
C28	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C29	Capacitor, 0.01UF, 50V, Mylar	0281560005
C30	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C31	Capacitor, 0.0047UF, 50V, Mylar	0281540004
C32	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C33	Capacitor, 0.1UF, 50V, Mylar	0281580006
C34	Capacitor, 1UF, 50V, 198D	0280910002
C35	Capacitor, 0.01UF, 25V, X55	0281620008
C36	Capacitor, 15UF, 20V, 198D	0280920008
C37	Capacitor, 68UF, 15V, T368	0296540005
C38	Capacitor, 1UF, 50V, 198D	0280910002
C39	Capacitor, 68UF, 15V, T368	0296540005
C40	Not used	
C41	Capacitor, 1UF, 50V, 198D	0280910002
C42	Capacitor, 0.01UF, 25V, X55	0281620008
C43	Capacitor, 0.01UF, 25V, X55	0281620008
C44	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C45	Capacitor, 68UF, 15V, T368	0296540005
C46	Capacitor, .033UF, 50V, Mylar	0281770000
C47	Not used	
C48	Capacitor, 68UF, 15V, T368	0296540005
C49	Capacitor, 47UF, 20V, 196D	0281700001
C50	Capacitor, 68UF, 15V, T368	0296540005
C51	Capacitor, 0.01UF, 50V, W5R, 20%	0281730008
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	Not used	
CR9	Diode, Signal, Germ. 1N270	0405510004
CR10	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 22UH, 5%	0650000005
L2	Inductor, Molded, 150UH, 5%	0659190001
L3	Not used	
L4	Inductor, Molded, 22UH, 5%	0650000005
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, N-CH, FET 2N4303	0443930007
Q3	Transistor, PNP, Si. 2N4126	0448020009
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, PNP, Si. 2N4126	0448020009
Q6	Transistor, PNP, Si. 2N4126	0448020009
Q7	Transistor, NPN, Si. 2N4124	0448010003
Q8	Transistor, NPN, Si. 2N4124	0448010003
Q9	Transistor, NPN, Si. 2N4124	0448010003
Q10	Transistor, NPN, Si. 2N4124	0448010003
Q11	Transistor, NPN, Si. 2N4124	0448010003
Q12	Transistor, PNP, Sil. TIP-32A	0448200007
Q13	Transistor, NPN, Si. 2N4921	0448040000
Q14	Transistor, NPN, Si. 2N4124	0448010003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
Q15	Transistor, NPN, Si. 2N4124	0448010003
R1	Pot., 2K, 10%, 3/4W, 15 Turns	0338490060
R2	Resistor, 4.7K, 5%, 1/4W	0170770001
R3	Resistor, 1K, 10%, 1/4W	0171560001
R4	Not used	
R5	Resistor, 3.3K, 10%, 1/4W	0170890007
R6	Not used	
R7	Resistor, 120, 10%, 1/4W	0186550006
R8	Resistor, 120, 10%, 1/4W	0186550006
R9	Resistor, 1.5K, 10%, 1/4W	0172470005
R10	Resistor, 820, 10%, 1/4W	0178210005
R11	Resistor, 1K, 10%, 1/4W	0171560001
R12	Resistor, 18K, 10%, 1/4W	0175720002
R13	Resistor, 8.2K, 10%, 1/4W	0181620006
R14	Resistor, 100, 5%, 1/4W	0171180003
R15	Resistor, 1K, 10%, 1/4W	0171560001
R16	Resistor, 1K, 10%, 1/4W	0171560001
R17	Resistor, 100, 5%, 1/4W	0171180003
R18	Not used	
R19	Resistor, 3.9K, 10%, 1/4W	0178830003
R20	Resistor, 1K, 10%, 1/4W	0171560001
R21	Resistor, 220, 10%, 1/4W	0171320000
R22	Resistor, 820, 10%, 1/4W	0178210005
R23	Resistor, 22, 10%, 1/4W	0192690001
R24	Resistor, 560, 5%, 1/4W	0183200004
R25	Resistor, 5.6K, 10%, 1/4W	0183060008
R26	Resistor, 2.2K, 5%, 1/4W	0178070009
R27	Not used	
R28	Resistor, 2.2K, 5%, 1/4W	0178070009
R29	Resistor, 4.7K, 5%, 1/4W	0170770001
R30	Not used	
R31	Not used	
R32	Resistor, 100, 5%, 1/4W	0171180003
R33	Not used	
R34	Pot. 20, 10%, 3/4W, 15 Turns	0347700009
R35	Resistor, 100, 5%, 1/4W	0171180003
R36	Not used	
R37	Not used	
R38	Resistor, 15K, 5%, 1/4W	0195700007
R39	Resistor, 560, 5%, 1/4W	0183200007
R40	Resistor, 33K, 5%, 1/4W	0195820002
R41	Resistor, 27K, 10%, 1/4W	0171200004
R42	Resistor, 47K, 10%, 1/4W	0171060008
R43	Resistor, 33K, 5%, 1/4W	0195820002
R44	Resistor, 220, 10%, 1/4W	0171320000
R45	Resistor, 3.3K, 10%, 1/4W	0170890007
R46	Resistor, 180K, 10%, 1/4W	0177280000
R47	Resistor, 4.7K, 5%, 1/4W	0170770001
R48	Not used	
R49	Resistor, 1K, 10%, 1/4W	0171560001
R50	Pot., 10K, 10%, 1/2W PC Mount	0346630002
R51	Resistor, 47, 10%, 1/4W	0179360001
R52	Resistor, 820, 10%, 1/4W	0178210005
R53	Resistor, 2.2K, 5%, 1/4W	0178070009
R54	Resistor, 10K, 10%, 1/4W	0170410005
R55	Pot., 10K, 10%, 3/4W, 15 Turns	0338490043
R56	Resistor, 18K, 10%, 1/4W	0175720002
R57	Resistor, 8.2K, 10%, 1/4W	0181620006
R58	Resistor, 1K, 10%, 1/4W	0171560001
R59	Resistor, 47, 10%, 1/4W	0179360001
R60	Resistor, 180, 10%, 1/4W	0175220000
R61	Resistor, 22K, 5%, 1/4W	0172230004
R62	Resistor, 22, 10%, 1/4W	0192690001
R63	Resistor, 680, 10%, 1/4W	0176630007
R64	Resistor, 470, 5%, 1/4W	0184110009
R65	Pot., 1K, 10%, 1/2, 4 Turns	1000850021
R66	Resistor, 1K, 10%, 1/4W	0171560001
R67	Not used	
R68	Not used	
R69	Resistor, 220, 10%, 1/4W	0171320000
R70	Not used	
R71	Resistor, 100 5%, 1/4W	0173900003
R72	Resistor, 470, 10%, 1/2W	0172230004
R73	Resistor, 22K, 5%, 1/4W	0178070009
R74	Resistor, 2.2K, 5%, 1/4W	0171320000
R75	Resistor, 220, 10%, 1/4W	0172590001
R76	Resistor, 27, 10%, 1/4W	0183180003
R77	Resistor, 12K, 10%, 1/4W	5024130308
T1	Transformer, Balanced Mod	0508700001
	Mica Insulator Mot Case 199	0753640007
	Test Point, White	



5024011872N

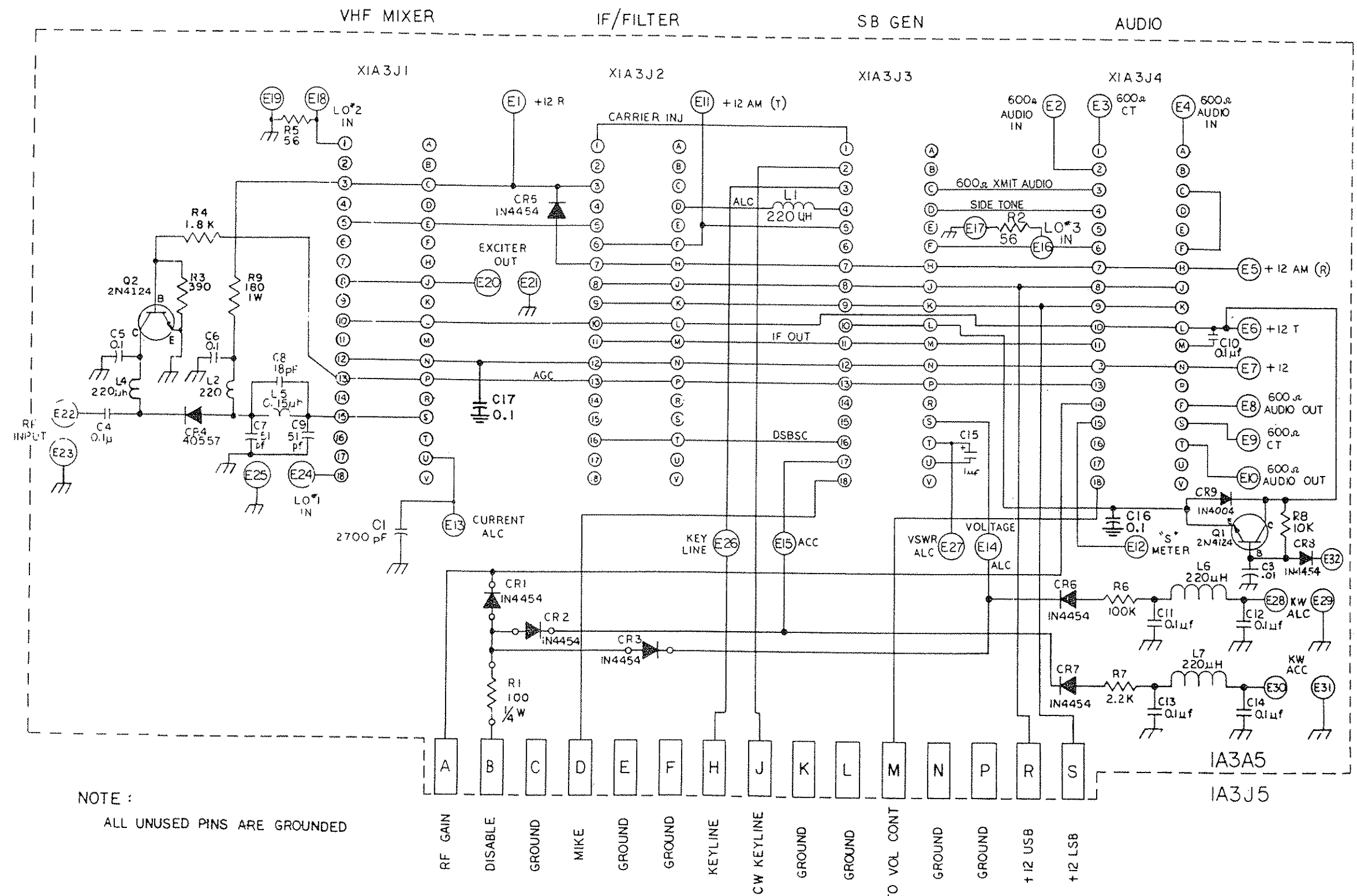
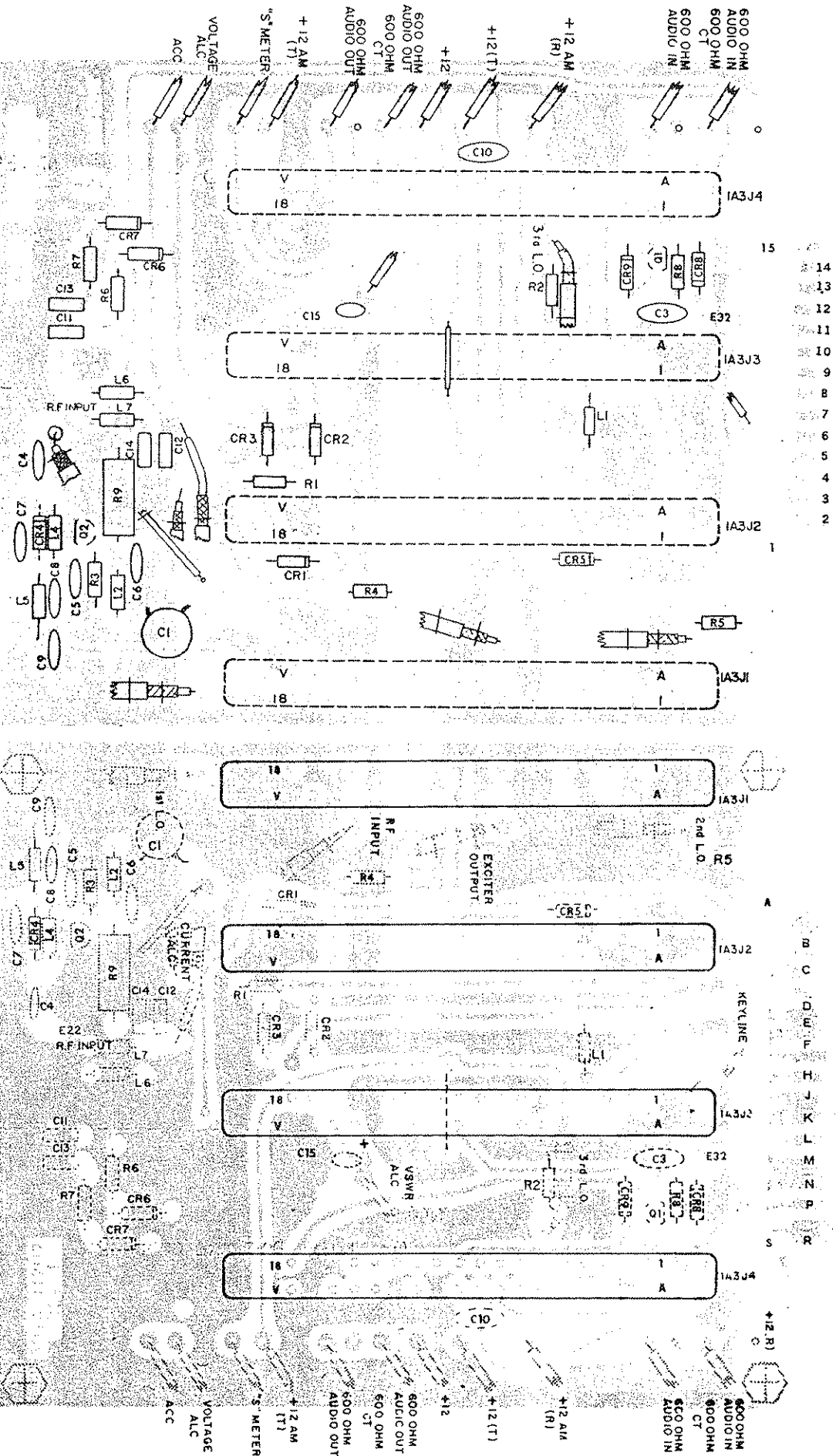


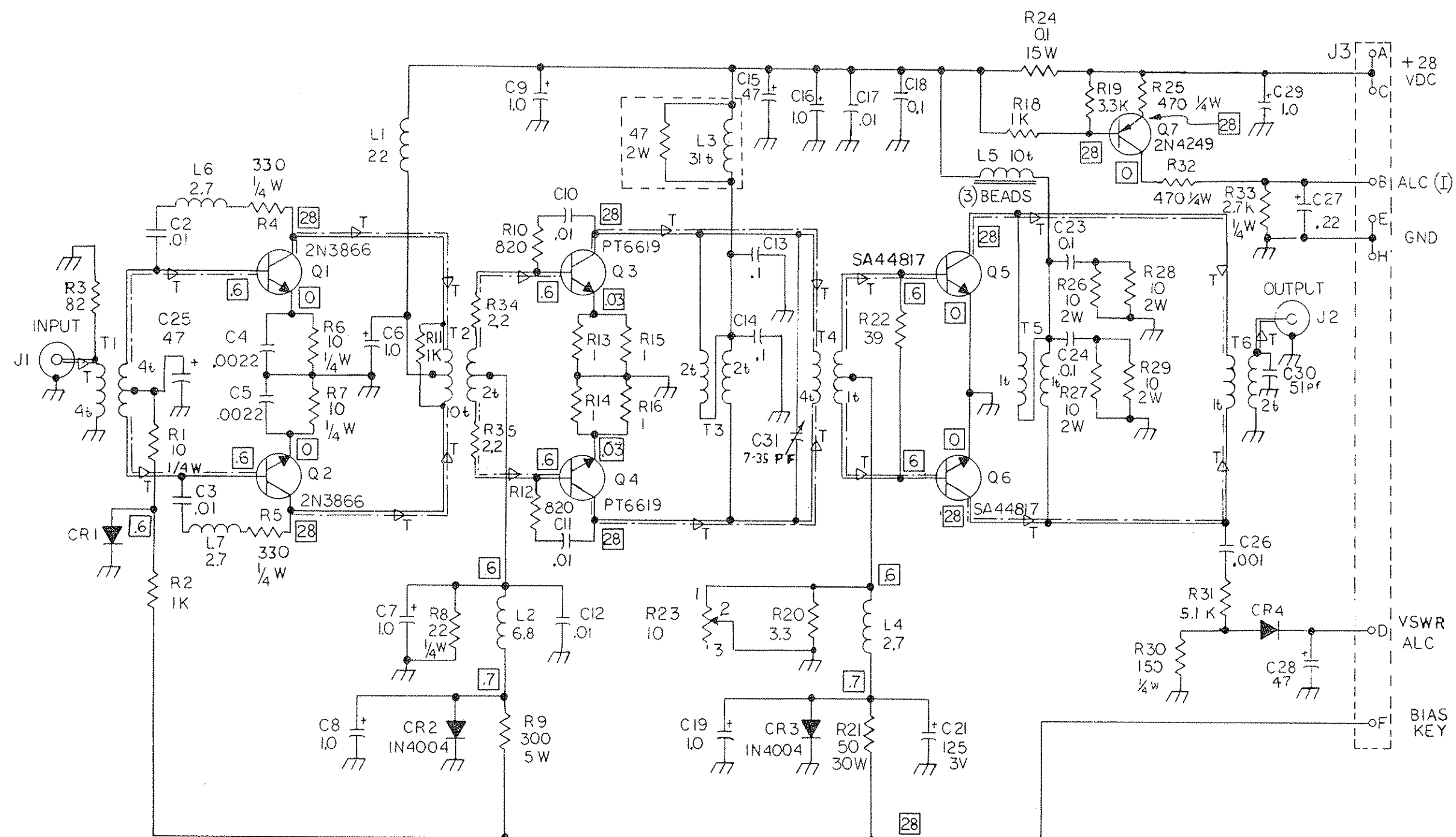
Figure 5.35 Receiver/Exciter Mother Board Schematic (1A3A5)

5024011899L PC ASSY MOTHER BD. REC/EXC

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	PC ASSY MOTHER BD. REC/EXC	5024011899
C2	Capacitor, 2700PF, 500 V, DM19, 2%	0281240001
C3	Not used	
C4	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
C5	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C6	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C8	Capacitor, 18 PF, 500 V, DM15	0281330000
C9	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C10	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C13	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 1 UF, 35 V, 196 D	0281660000
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Signal, Sil. 1N4454	0405270003
CR4	Diode, Pin 50823080	0405570007
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Signal, Sil. 1N4454	0405270003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Resistor, 1N4004	0405180004
J1	Connector, PC, 18 Pin, Female	0753610001
J2	Connector, PC, 18 Pin, Female	0753610001
J3	Connector, PC, 18 Pin, Female	0753610001
J4	Connector, PC, 18 Pin, Female	0753610001
L1	Inductor, Molded, 220 UH, 5%	0650500008
L2	Inductor, Molded, 220 UH, 5%	0650500008
L3	Not used	
L4	Inductor, Molded, 220 UH, 5%	0650500008
L5	Inductor, Molded, 0.15 UH, 5%	0648620000
L6	Inductor, Molded, 220 UH, 5%	0650500008
L7	Inductor, Molded, 220 UH, 5%	0650500008
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 100, 5%, 1/4 W	0171180003
R2	Resistor, 56, 10%, 1/4 W	0174290004
R3	Resistor, 390, 10%, 1/4 W	0178390001
R4	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R5	Resistor, 56, 10%, 1/4 W	0174290004
R6	Resistor, 100 K, 10%, 1/4 W	0170390004
R7	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R8	Resistor, 10 K, 10%, 1/4 W	0170410005
R9	Resistor, 180, 10%, 1 W	1000850030
	Key, Polarizing Connector	0753620006





UNLESS OTHERWISE SPECIFIED:

1. ALL-RESISTORS IN OHMS, $\frac{1}{2}$ W
-CAPACITORS IN μ F
-INDUCTORS IN μ H
-DIODES ARE IN4454

2. PREFIX ALL DESIGNATORS WITH "1A7A1"

3. UNUSED DESIGNATORS:

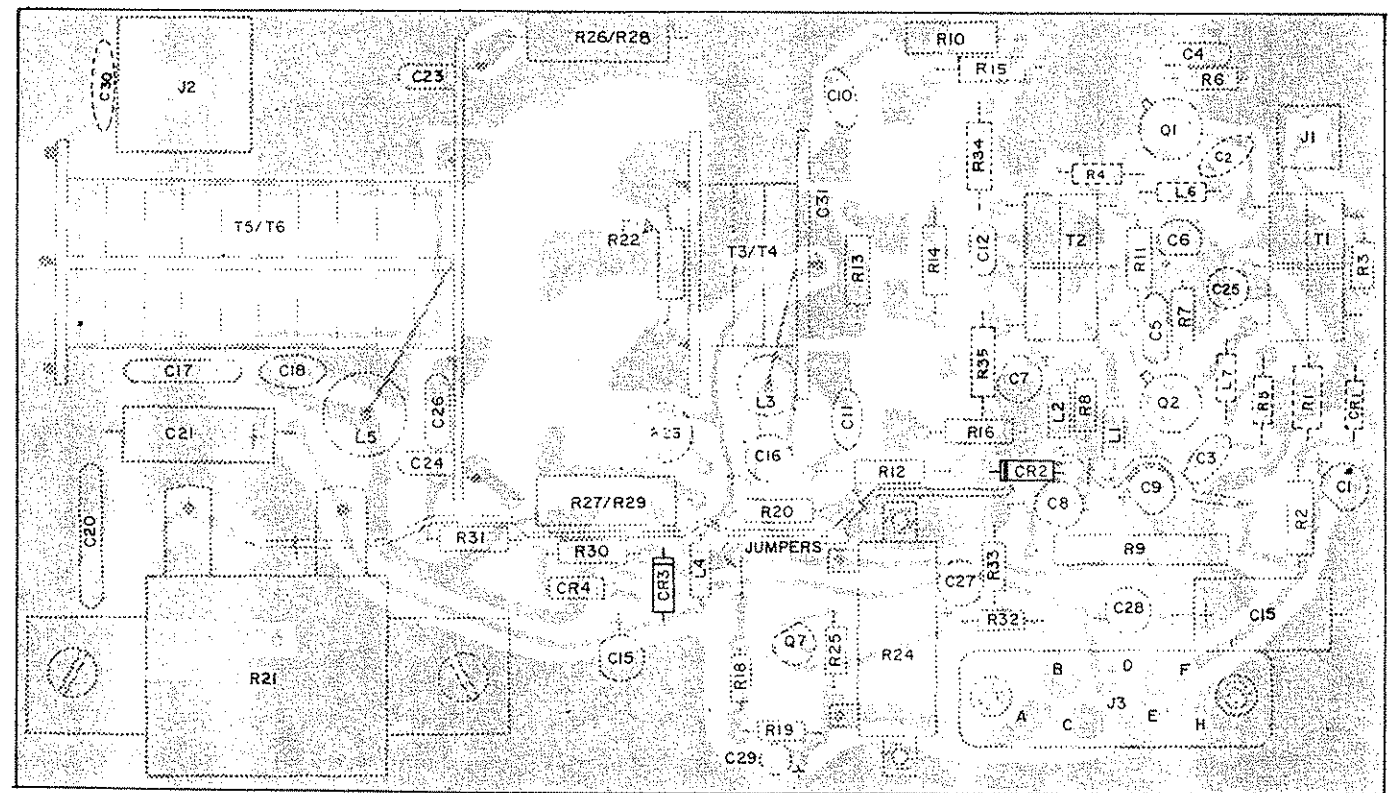
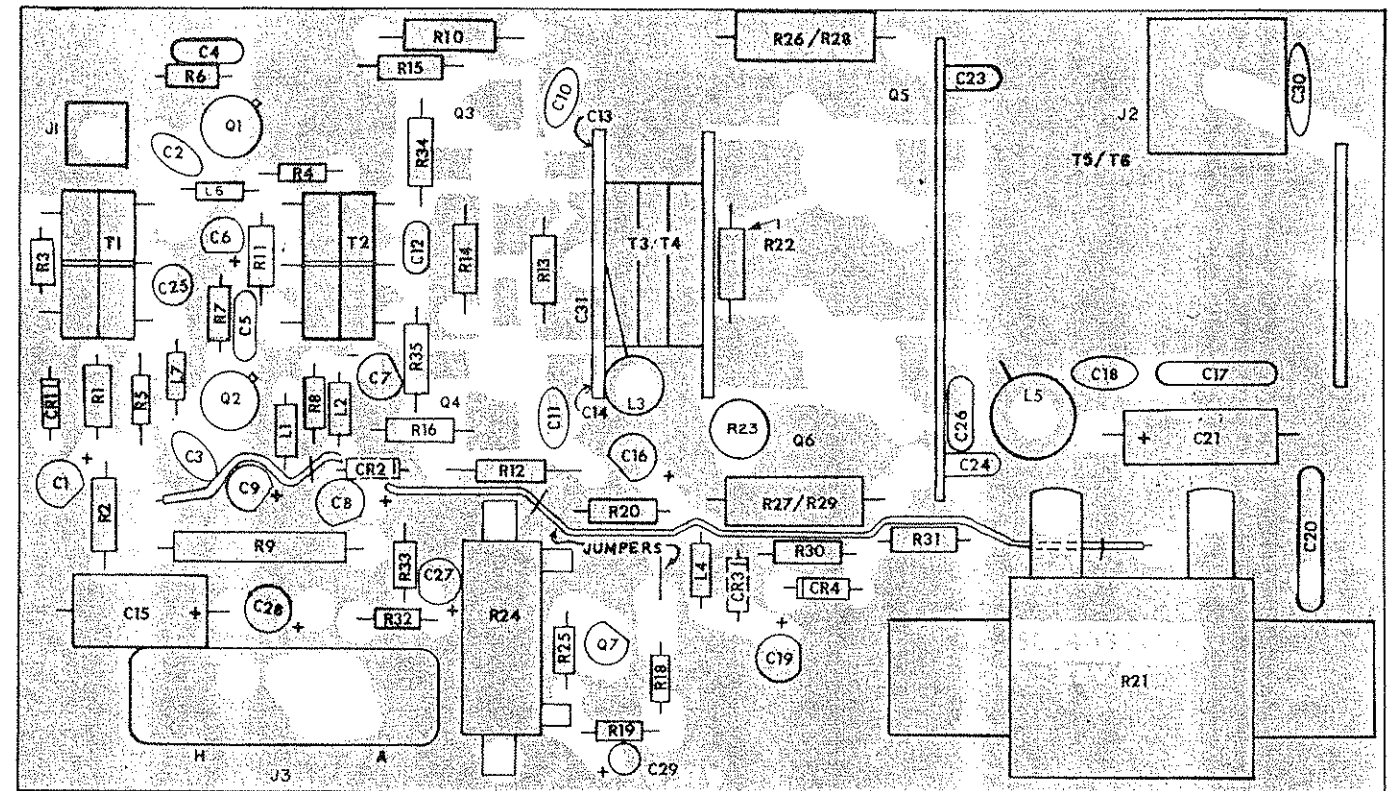
R17 C1, C20

4. VOLTAGES ARE GIVEN WITH XMTR KEYED IN
SSB AND NO
MODULATION

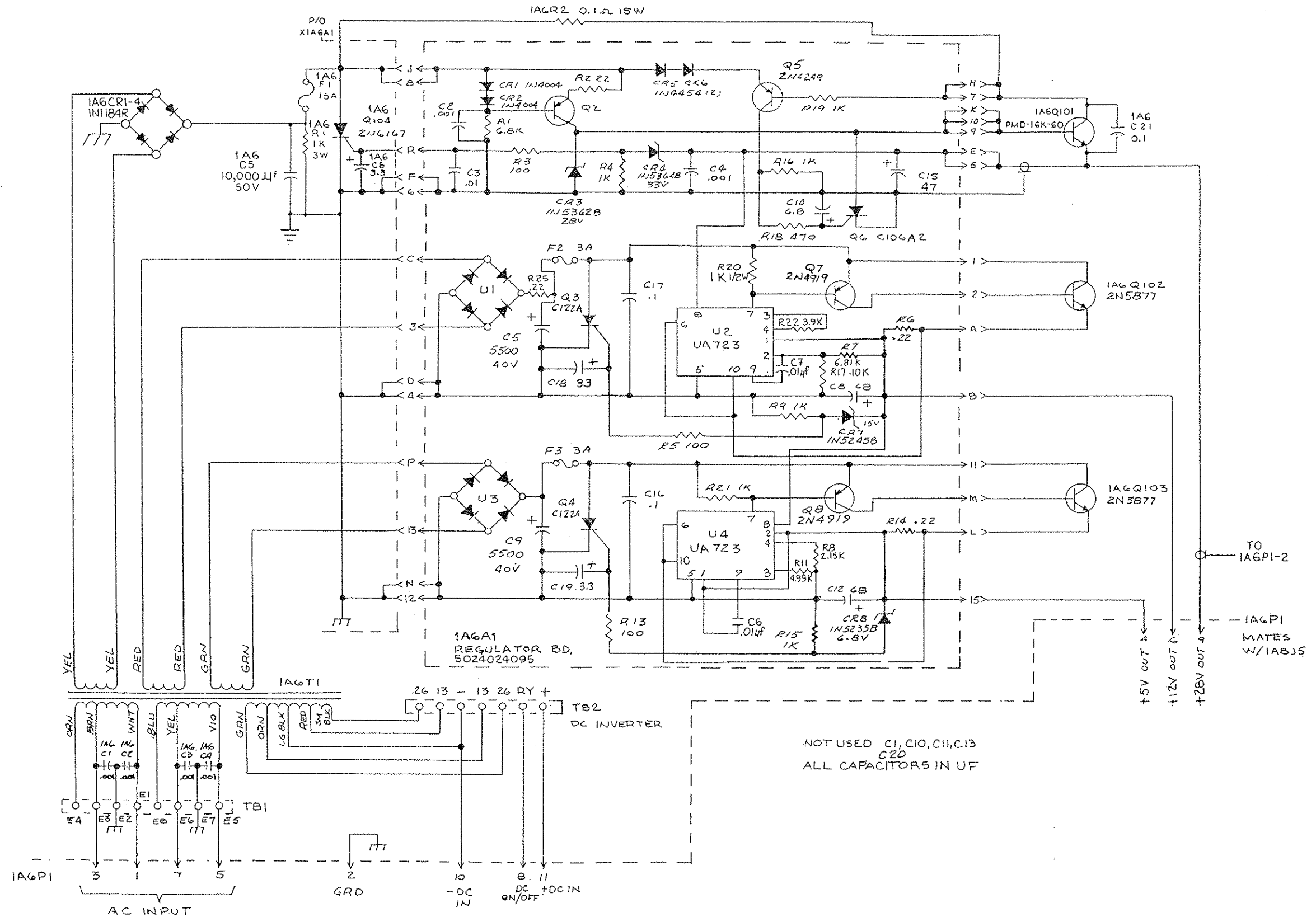
Figure 5.36 RF Power Amplifier Schematic (1A7A1)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	POWER AMPLIFIER ASSY	5024030095
C1	Not used	
C2	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C3	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C4	Capacitor, 0.0022 UF, 200 V, Z5 F, 10%	0272780006
C5	Capacitor, 0.0022 UF, 200 V, Z5 F, 10%	0272780006
C6	Capacitor, 1 UF, 50 V, 198 D	0280910002
C7	Capacitor, 1 UF, 50 V, 198 D	0280910002
C8	Capacitor, 1 UF, 50 V, 198 D	0280910002
C9	Capacitor, 1 UF, 50 V, 198 D	0280910002
C10	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C11	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C12	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C13	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 47 UF, 50 V, CL65 B	0245750002
C16	Capacitor, 1 UF, 50 V, 198 D	0280910002
C17	Capacitor, 0.01 UF, 250 V, Z5 R, 10%	0280950004
C18	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 1 UF, 50 V, 198 D	0280910002
C20	Not used	
C21	Capacitor, 125 UF, 3 V	0266020003
C22	Not used	
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C25	Capacitor, 47 UF, 20 V, 196 D	0281700001
C26	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C27	Capacitor, .22 UF, 35 V, T368	0283510005
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001
C29	Capacitor, 1 UF, 50 V, 198 D	0280910002
C30	Capacitor, 51 PF, 500 V, DM15, 2%	0281350001
C31	Capacitor, 7-35 PF, 160 V, N1500	0287390004
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Rectifier, 1N4004	0405180004
CR3	Diode, Rectifier, 1N4004	0405180004
CR4	Diode, Signal, Sil. 1N4454	0405270003
J1	Connector, RF, JCM	0753600005
J2	Connector, RF, BNC	0753490005
J3	Connector, Power, 7 Pin Rect.	0753590000
L1	Inductor, Molded, 22 UH, 5%	0650000005
L2	Inductor, Molded, 6.8 UH, 5%	0659210002
L3	Choke, RF	5024030605
L4	Inductor, Molded, 2.7 UH, 5%	0652180001
L5	Choke, RF	5024030702
L6	Inductor, Molded, 2.7 UH, 5%	0652180001
L7	Inductor, Molded, 2.7 UH, 5%	0652180001
Q1	Transistor, NPN, Si. 2N3866	0448140004
Q2	Transistor, NPN, Si. 2N3866	0448140004
Q3	Transistor, NPN, Si PT6619	0448150000
Q4	Transistor, NPN Si PT6619	0448150000
Q5	Transistor, NPN Si	0448170001
Q6	Transistor, NPN Si	0448170001
Q7	Transistor, PNP, Si. 2N4249	0446780006
R1	Resistor, 10, 5%, 1/4 W	0177160004
R2	Resistor, 1 K, 10%, 1/2 W	0167480006
R3	Resistor, 82, 10%, 1/4 W	0184610001
R4	Resistor, 330, 5%, 1/4 W	0170910008
R5	Resistor, 330, 5%, 1/4 W	0170910008
R6	Resistor, 10, 5%, 1/4 W	0177160004
R7	Resistor, 10, 5%, 1/4 W	0177160004
R8	Resistor, 22, 10%, 1/4 W	0192690001
R9	Resistor, 300, 5%, 5 W	0161140009
R10	Resistor, 820, 10%, 1/2 W	0175600007
R11	Resistor, 1 K, 10%, 1/2 W	0167480006
R12	Resistor, 820, 10%, 1/2 W	0175600007
R13	Resistor, 1, 10%, 1/2 W	0194770001
R14	Resistor, 1, 10%, 1/2 W	0194770001
R15	Resistor, 1, 10%, 1/2 W	0194770001
R16	Resistor, 1, 10%, 1/2 W	0194770001
R17	Not used	
R18	Resistor, 1 K, 10%, 1/2 W	0167480006
R19	Resistor, 3.3 K, 5%, 1/2 W	0184090008
R20	Resistor, 3.3, 10%, 1/2 W	0186050003
R21	Resistor, 50, 10%, 30 W	0193240009
R22	Resistor, 39, 10%, 1/2 W	0165920009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R23	Pot., 10, 5%, 1/2 W, PC Mount	0346380006
R24	Resistor, 0.1, 10%, 15 W	0193360004
R25	Resistor, 470, 10%, 1/4 W	0172610001
R26	Resistor, 10, 10%, 2 W	0163840008
R27	Resistor, 10, 10%, 2 W	0163840008
R28	Resistor, 10, 10%, 2 W	0163840008
R29	Resistor, 10, 10%, 2 W	0163840008
R30	Resistor, 150, 10%, 1/4 W	0172730007
R31	Resistor, 5.1 K, 5%, 1/2 W	0183700007
R32	Resistor, 470, 10%, 1/4 W	0172610001
R33	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R34	Resistor, 2.2, 10%, 1/2 W	0178690007
R35	Resistor, 2.2, 10%, 1/2 W	0178690007
T1	Transformer Input	5024030401
T2	Transformer Interstage	5024030508
T3	Driver, Transformer Assy	5024030893
T4	Driver, Transformer Assy	5024030893
T5	Output, Transformer Assy	5024031199
T6	Output, Transformer Assy	5024031199



5024020073U



CHANGE DATE 1 OCTOBER 1985

Figure 5.37 Power Supply Schematic (1A6)

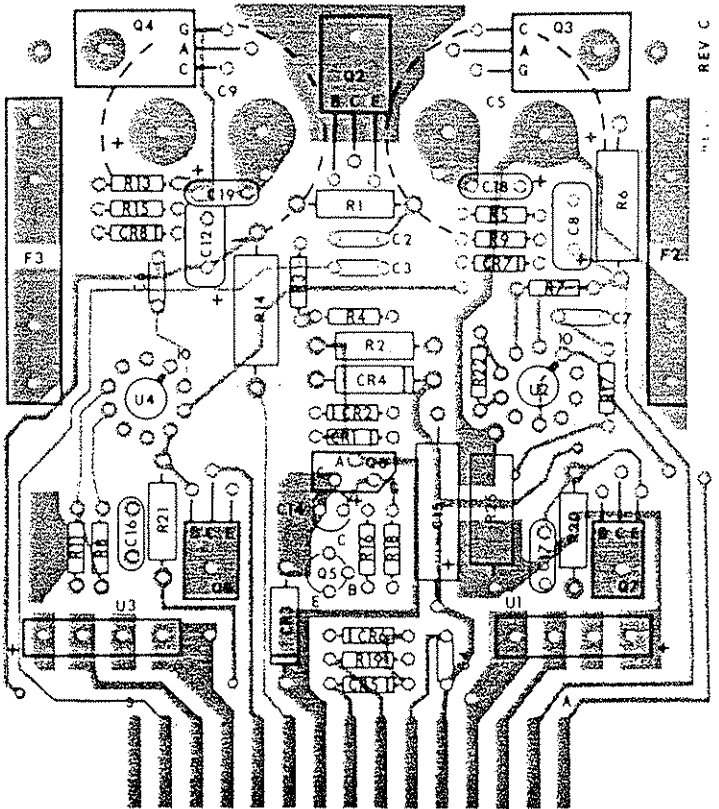
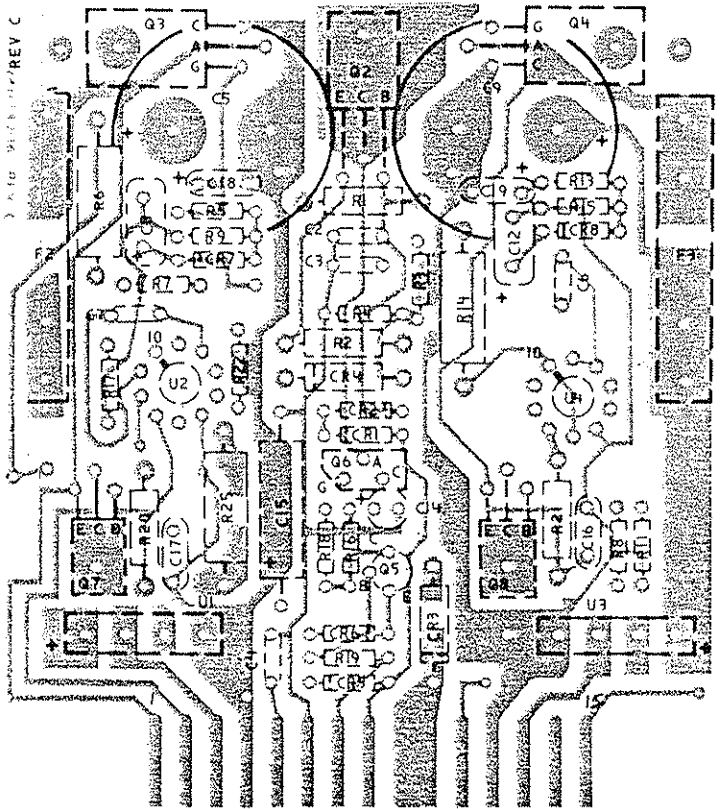
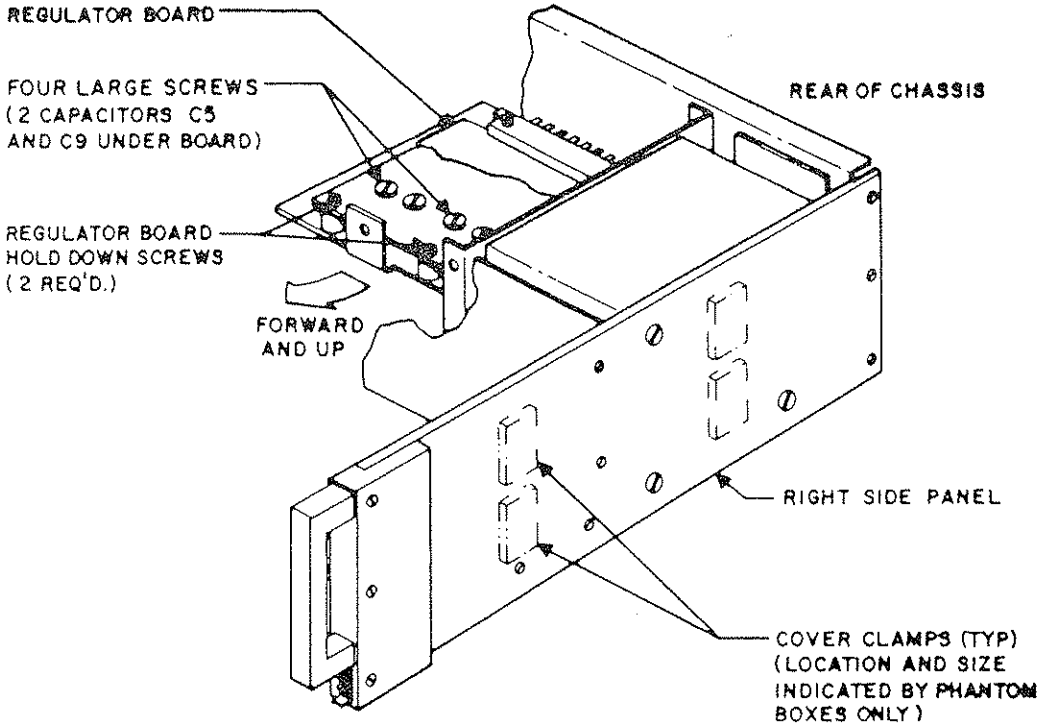
SUNAIR GSB-900DX

5024026098H PC ASSY REGULATOR 1A6A1

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY REGULATOR	5024026098
C2	Capacitor, 0.001µf, 250V, X5R, 10%	0286260000
C3	Capacitor, .01µf, 25V, X55/Y5P	0281627771
C4	Capacitor, 0.001µf, 250V, X5R, 10%	0286260000
C6	Capacitor, .01µf, 100V, 25V/Y5P	0273217771
C7	Capacitor, .01µf, 100V, 25V/Y5P	0273217771
C8	Capacitor, 68µf, 25V, T368	0282150005
C12	Capacitor, 68µf, 25V, T368	0282150005
C14	Capacitor, 6.8µf, 20V, T368	0296780006
C15	Capacitor, 47µf, 50V, CL65B	0245750002
C16	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C17	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C18	Capacitor, 3.3µf, 35V, 196D	0281680001
C19	Capacitor, 3.3µf, 35V, 196D	0281680001
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Zener	0405220006
CR4	Diode, Zener 1N5364B	0405230001
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Rectifier 1N5245B	0405210001
CR8	Diode, Zener 1N5235B	0405200005
F2	Fuse, AGC, 3 Amp, 250V	1002550009
F3	Fuse, AGC, 3 Amp, 250V	1002550009
Q2	Transistor, PNP, SIL. 11P-32A	0448200007
Q3	Diode, SCR C122A	0446920002
Q4	Diode, SCR C122A	0446920002
Q5	Transistor, PNP, SI. 2N4249	0446780006
Q6	Diode, SCR C106A2	0447070002
Q7	Transistor, PNP, SI. 2N4919	0445370009
Q8	Transistor, PNP, SI. 2N4919	0445370009
R1	Resistor, 6.8K, 10%, 1/4W	0162290004
R2	Resistor, 22, 10%, 1/4W	0186930003
R3	Resistor, 100, 5%, 1/4W	0171180003
R4	Resistor, 1K, 10%, 1/4W	0171560001
R5	Resistor, 100, 5%, 1/4W	0171180003
R6	Resistor, 0.22, 5%, 2W	0193620006
R7	Resistor, 6.81K, 1%, 1/8W	0196350000
R8	Resistor, 2.15K, 1%, 1/8W	1005530017
R9	Resistor, 1K, 10%, 1/4W	0171560001
R11	Resistor, 4.99K, 1%, 1/8W	1005510032
R13	Resistor, 100, 5%, 1/4W	0171180003
R14	Resistor, 0.22, 5%, 2W	0193620006
R15	Resistor, 1K, 10%, 1/4W	0171560001
R16	Resistor, 1K, 10%, 1/4W	0171560001
R17	Resistor, 10K, 1%, 1/8W	1003050026
R18	Resistor, 470, 5%, 1/4W	0184110009
R19	Resistor, 1K, 10%, 1/4W	0171560001
R20	Resistor, 1K, 10%, 1/4W	0167480006
R21	Resistor, 1K, 10%, 1/4W	0167480006
R22	Resistor, 3.9K, 10%, 1/4W	0178830003
R25	Resistor, 0.22, 5%, 2W	0193620006
U1	Diode, Bridge MDA970-1	0405260008
U2	IC Linear MC1723G	0448190001
U3	Diode, Bridge MDA970-1	0405260008
U4	IC Linear MC1723G	0448190001
	MISCELLANEOUS	
	Bracket	5024022301
	Fuseclip, PC Mount	0534610005
	Heatsink	0840730004

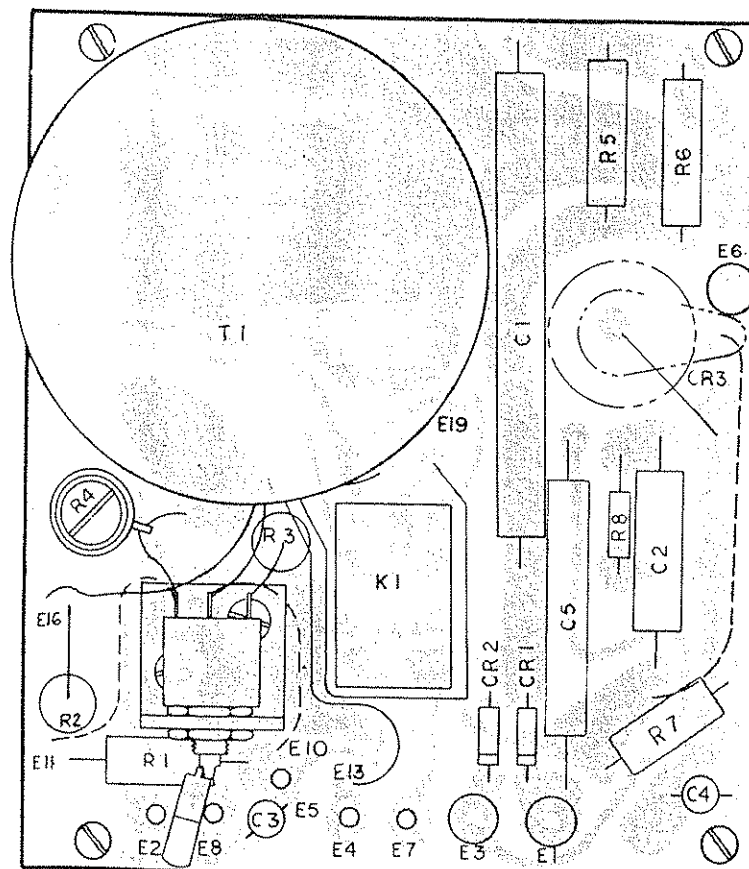
5024020090AN POWER SUPPLY ASSY 1A6

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	POWER SUPPLY ASSEMBLY	5024020090
1A6A1	PC Assy Regulator	5024026098
1A6C1	Capacitor, 0.001µf, 500V, X5F, 10%	0289350000
1A6C2	Capacitor, 0.001µf, 500V, X5F, 10%	0289350000
1A6C3	Capacitor, 0.001µf, 500V, X5F, 10%	0289350000
1A6C4	Capacitor, 0.001µf, 500V, X5F, 10%	0289350000
1A6C5	Capacitor, 10000µf, .50V	1001120027
1A6C6	Capacitor, 3.3µf, 35V, 196D	0281680001
1A6C21	Capacitor, 0.1µf, 50V	1001010027
1A6CR1	Diode, Rectifier 1N1184R	0405590008
1A6CR2	Diode, Rectifier 1N1184R	0405590008
1A6CR3	Diode, Rectifier 1N1184R	0405590008
1A6CR4	Diode, Rectifier 1N1184R	0405590008
1A6F1	Fuse, AGC, 15 Amp, 32V	0848740009
1A6Q102	Transistor, NPN, SI. 2N5877	1001240006
1A6Q103	Transistor, NPN, SI. 2N5877	1001240006
1A6Q104	Diode, SCR 2N6167	0405450001
1A6R1	Resistor, 1K, 5%, 3W	0162790007
1A6R2	Resistor, 0.1, 10%, 15W	0193360004
1A6T1	Transformer, Power	5024020308
C5	Capacitor, 5500µf, 40V, 36D	0280930003
C9	Capacitor, 5500µf, 40V, 36D	0280930003
	MISCELLANEOUS	
	Barrier Jumper, 140 Series	0508340004
	Barrier Strip, 9 Pos, 6-32	1006400001
	Bushing, Teflon, Diode Mounting	1001080033
	Clamp Power Supply	1004650019
	Connector, Power, 11 Pin Rect.	0753320002
	Connector, PC, 30 Pin Female	0753780003
	Connector, Shim Plate	5024024508
	Cover, Power Supply	5024022505
	Cushion Cap MTG Power Supply	1004650027
	Fusemount, 1 Pole w/terminals	0842490001
	Grommet, Plastic .937 OD	0534470009
	Marker Strip, 9 Pos.	5024021703
	Mounting Ring, Cap.	0282130004
	Plate Cap. Support Power Supply	1004650001
	Socket, Transistor	0766190005
	Socket, Xsistor TO-3 HI-PWR	1000130029
	Standoff, M-F, 4-40 .750 L	0508010004
	Terminal Strip, 8 Term. 2 GND	0848360001



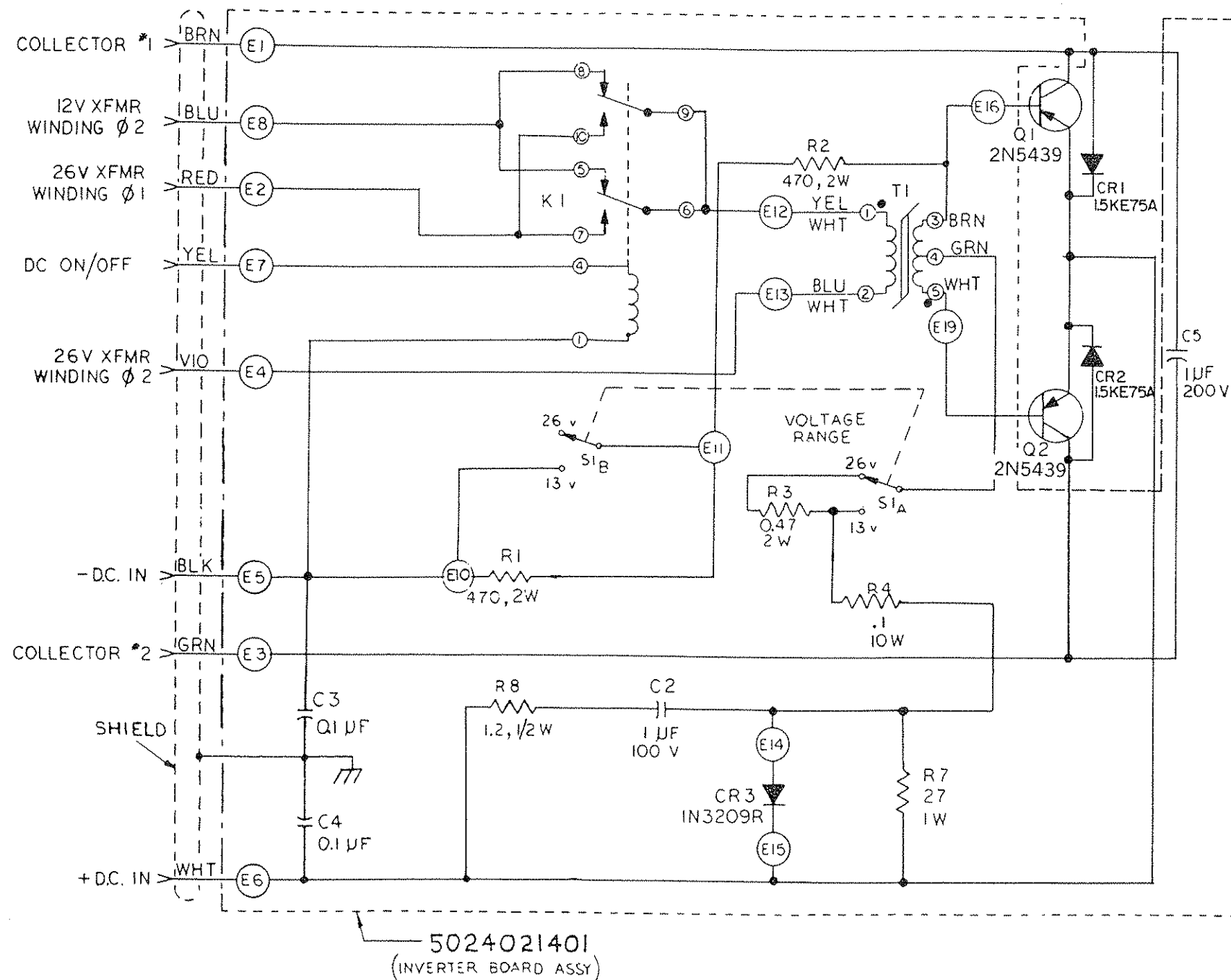
CHANGE DATE 1 OCTOBER 1985

55024021371G



5024021495S PC ASSY DC INV. W/HEAT SINK OP

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY DC INV. W/HEAT SINK OP	5024021495
C1	Capacitor, 12 UF, 100 V	0282020004
C2	Capacitor, 1 UF, 100 V, Mylar	0272300004
C3	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C5	Capacitor, 1 UF, 200 V, Mylar	0245250000
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N3209R	0405190000
K1	Relay, DPDT, 12 V	1000190030
Q1	Transistor, PNP, GE. 2N5439	0448320002
Q2	Transistor, PNP, GE. 2N5439	0448320002
R1	Resistor, 470, 10%, 2W	0163580006
R2	Resistor, 470, 10%, 2W	0163580006
R3	Resistor, 0.47, 5%, 2W	0197350003
R4	Resistor, 0.1, 10%, 12W	0197490000
R5	Resistor, 3.3K, 10%, 2W	0197220002
R6	Resistor, 3.3K, 10%, 2W	0197220002
R7	Resistor, 27, 10%, 1W	0197150004
R8	Resistor, 1.2, 10%, 1/2W	0188490001
S1	Switch, Toggle, DPDT	0346370001
T1	Transformer, Saturable	5024021509
	Mica Ins. TO-3 Transistor Mount, Transistor	0440940001
	Thermal Compound	0502740001
	Standoff, M-F, 4-40 .250 L	0840810008
	Heat Sink, DC Inverter	1003170005
		5024021100



- NOTES:
1. PREFIX ALL DESIGNATORS WITH "1A6A2"
 - 2.

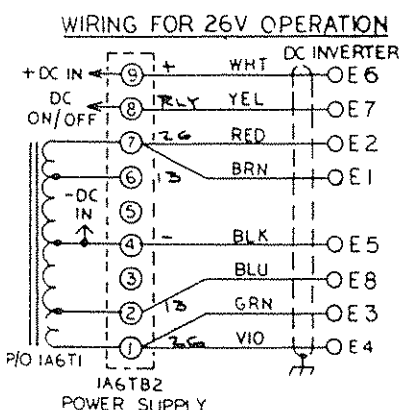
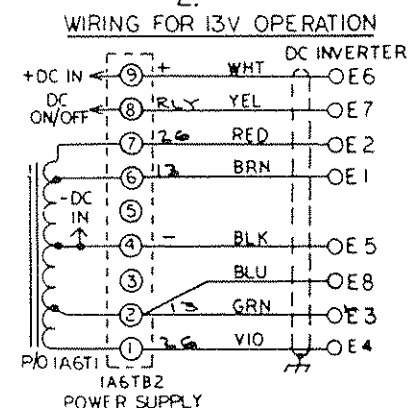


Figure 5.38 D.C. Inverter Schematic (1A6A2)

SUNAIR GSB-900DX

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5024050061A

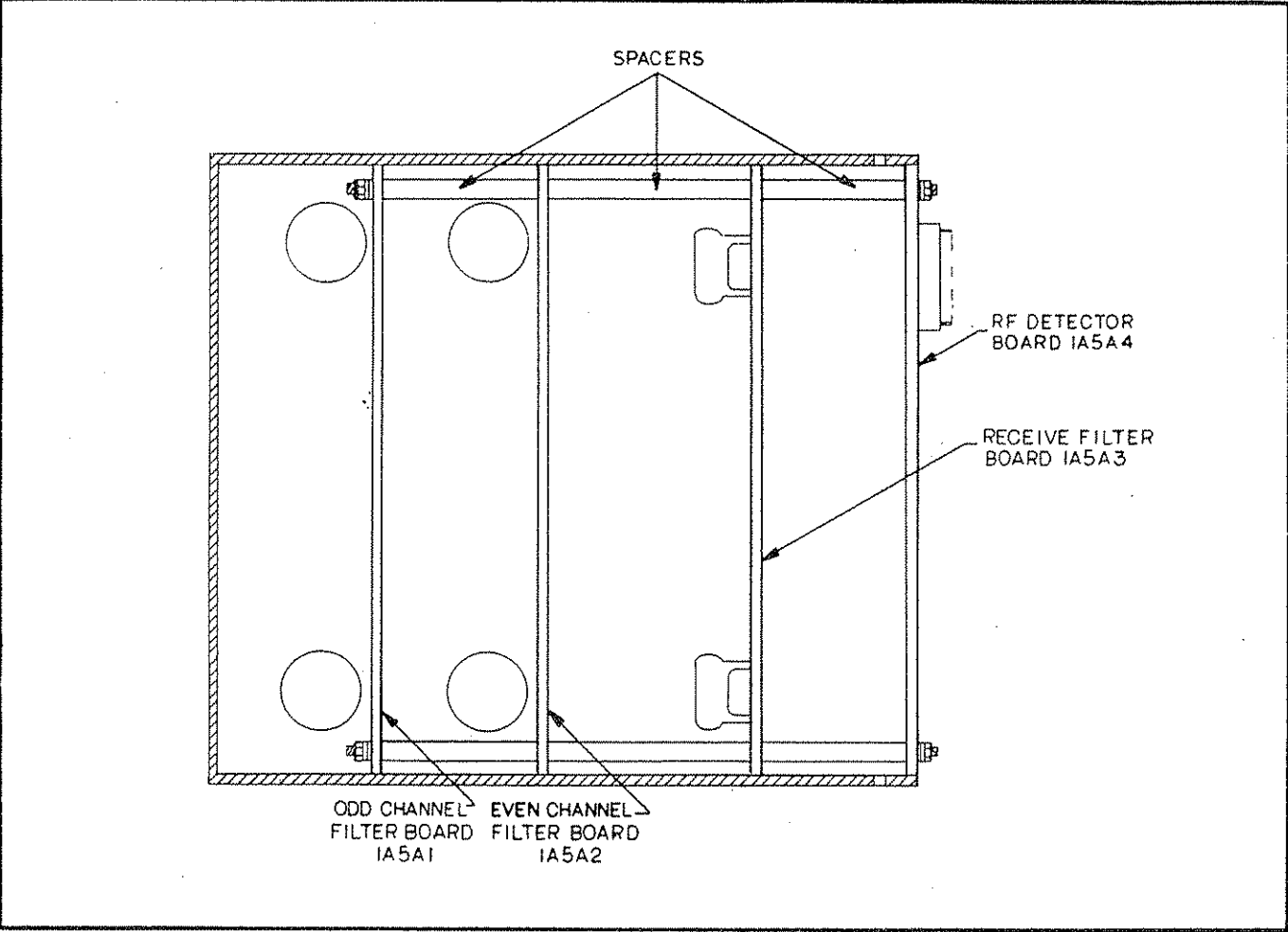
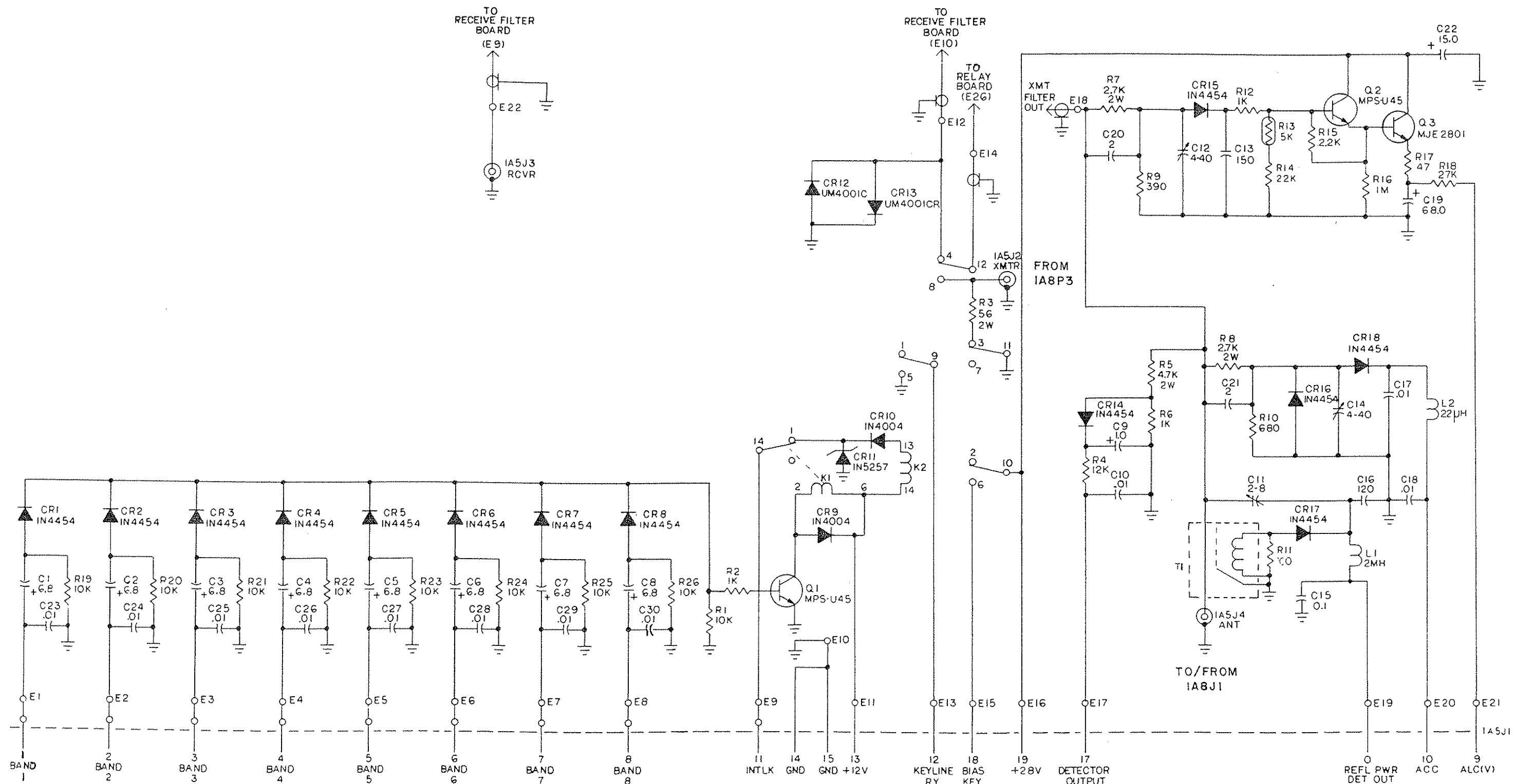


Figure 5.39 Filter Module Assembly

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5024057571C



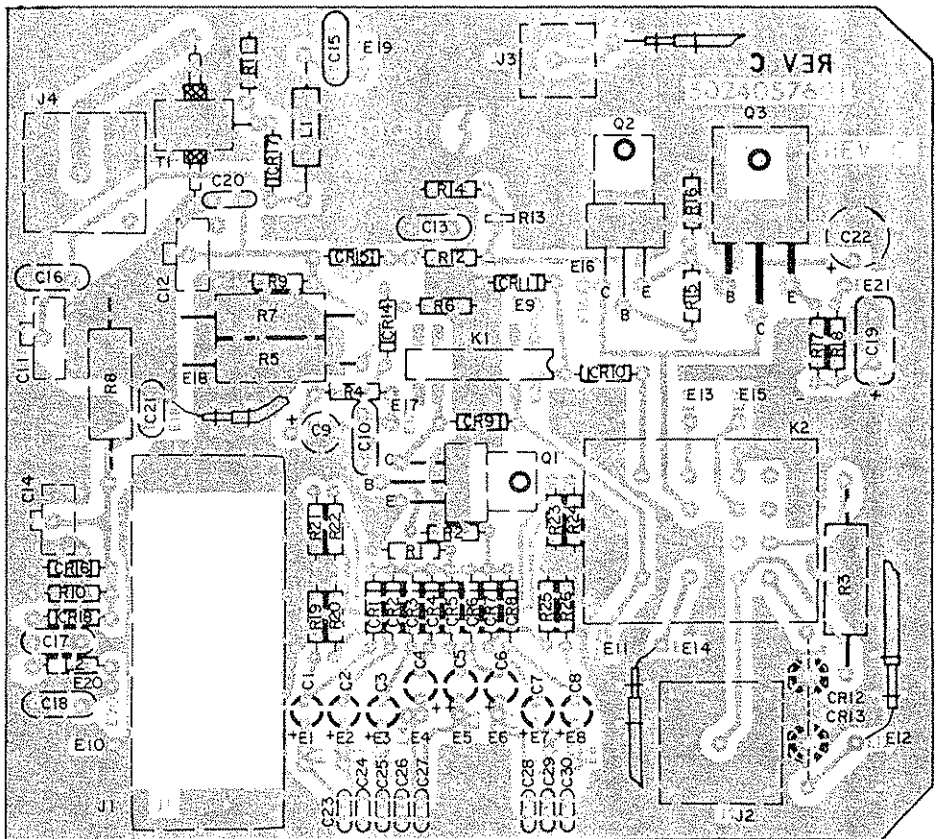
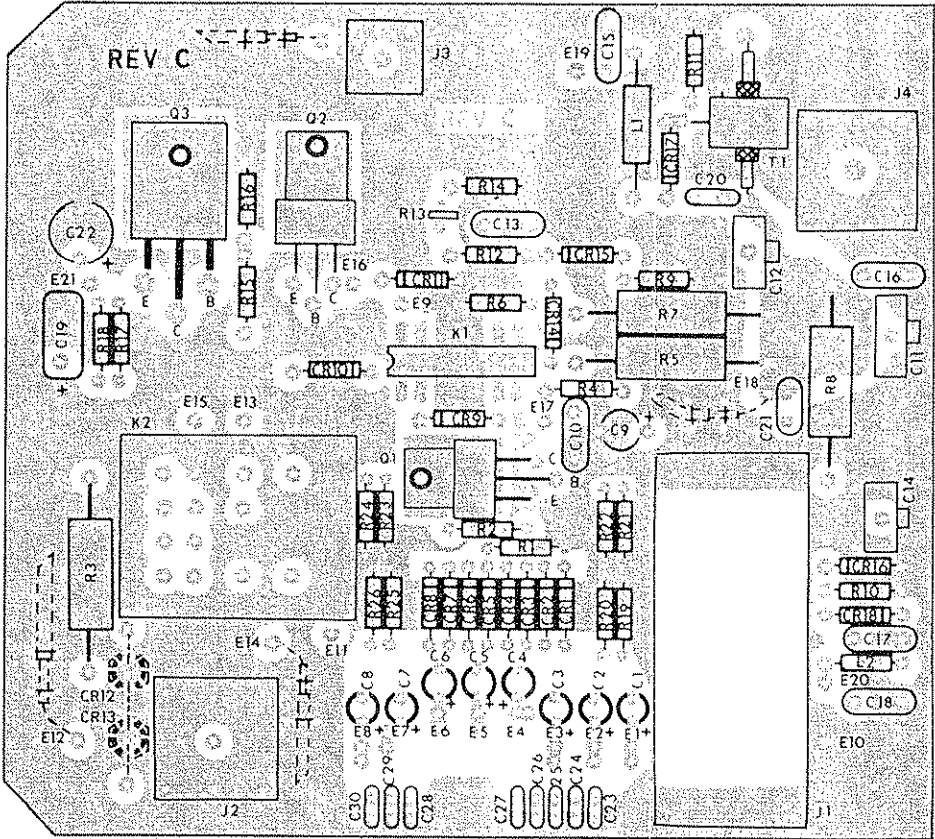
- NOTES:
 1. UNLESS OTHERWISE SPECIFIED:
 1. DECIMAL CAPACITORS ARE IN MICROFARADS, ALL OTHER PICO FARADS.
 2. RESISTORS ARE IN OHMS AND 1/4 WATT.
 3. LAST DESIGNATORS:
 C30, J4, L2, R26, CR18, K2, Q3, T1

Figure 5.40 RF Detector Board Schematic (1A5A4)

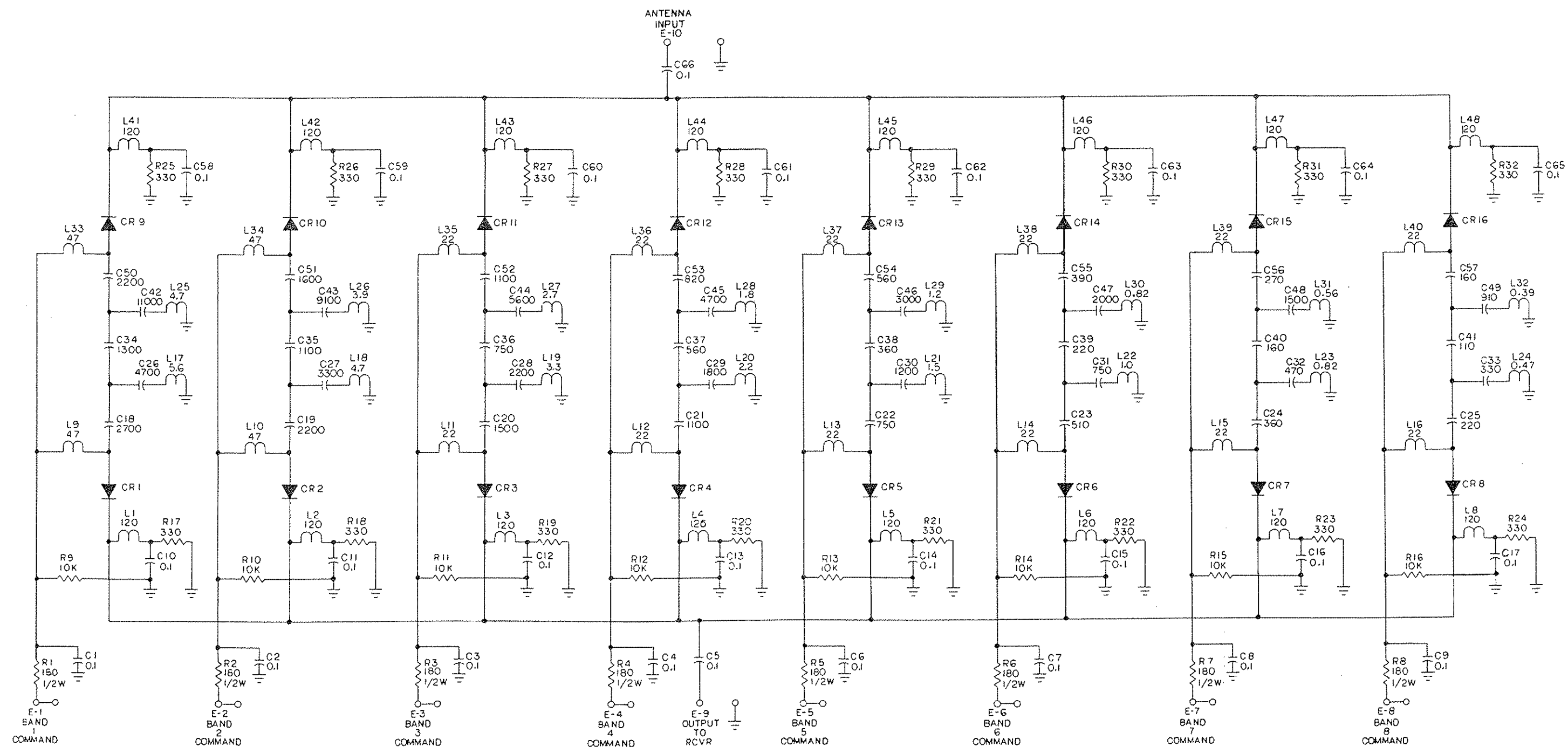
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY RF DETECTOR	5024057597
C1	Capacitor, 6.8 UF, 20 V, T368	0296780006
C2	Capacitor, 6.8 UF, 20 V, T368	0296780006
C3	Capacitor, 6.8 UF, 20 V, T368	0296780006
C4	Capacitor, 6.8 UF, 20 V, T368	0296780006
C5	Capacitor, 6.8 UF, 20 V, T368	0296780006
C6	Capacitor, 6.8 UF, 20 V, T368	0296780006
C7	Capacitor, 6.8 UF, 20 V, T368	0296780006
C8	Capacitor, 6.8 UF, 20 V, T368	0296780006
C9	Capacitor, 1 UF, 50 V, 198 D	0280910002
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C11	Capacitor, 2.8 PF, 200 V, NPO	0284300004
C12	Capacitor, 4.40 PF, 25 V	0295490004
C13	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C14	Capacitor, 4.40 PF, 25 V	0295490004
C15	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C16	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C17	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 68 UF, 25 V, T368	0282150005
C20	Capacitor, 2 PF, 500 V, DM10	0259710008
C21	Capacitor, 2 PF, 500 V, DM10	0259710008
C22	Capacitor, 15 UF, 50 V, 196 D	0274000008
C23	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C24	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C25	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C26	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C27	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C28	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C29	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C30	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
CR1	Diode, Signal, Sil. 1N4454	0405270003
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, Rectifier 1N4004	0405180004
CR10	Diode, Rectifier 1N4004	0405180004
CR11	Diode, Zener 1N5257 A	1005320012
CR12	Diode, Pin UM4001 C	0405430001
CR13	Diode, Pin UM4001 CR	0405440006
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
J1	Connector, Power, 20 Pin Rect.	0753470004
J2	Connector, RF, BNC	0753490005
J3	Connector, RF, JCM	0753600005
J4	Connector, RF, BNC	0753490005
K1	Relay, SPDT, 12 V, Reed	1004630026
K2	Relay, 4 PDT, 12 V, Sensitive	0666640009
L1	Inductor, Molded, 2000 UH, 5%	0653590008
L2	Inductor, Molded, 22 UH, 5%	0650000005
Q1	Transistor, NPN, Si MPSU45	0448570009
Q2	Transistor, NPN, Si MPSU45	0448570009
Q3	Transistor, NPN, Si, MJE2801	0448530007
R1	Resistor, 10 K, 10%, 1/4 W	0170410005
R2	Resistor, 1 K, 10%, 1/4 W	0171560001
R3	Resistor, 56, 10%, 2 W	0197210007
R4	Resistor, 12 K, 10%, 1/4 W	0183180003
R5	Resistor, 4.7 K, 10%, 2 W	0164130004
R6	Resistor, 1 K, 10%, 1/4 W	0171560001
R7	Resistor, 2.7 K, 5%, 2 W	0195940008
R8	Resistor, 2.7 K, 5%, 2 W	0195940008
R9	Resistor, 390, 10%, 1/2 W	0173260004
R10	Resistor, 680, 10%, 1/2 W	0167500007
R11	Resistor, 100, 5%, 1/4 W	0171180003
R12	Resistor, 1 K, 10%, 1/4 W	0171560001
R13	Resistor, 5 K at 25 C	1001340001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R14	Resistor, 22 K, 5%, 1/4 W	0172230004
R15	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R16	Resistor, 1 M, 10%, 1/4 W	0170650006
R17	Resistor, 47, 10%, 1/4 W	0179360001
R18	Resistor, 27 K, 10%, 1/4 W	0171200004
R19	Resistor, 10 K, 10%, 1/4 W	0170410005
R20	Resistor, 10 K, 10%, 1/4 W	0170410005
R21	Resistor, 10 K, 10%, 1/4 W	0170410005
R22	Resistor, 10 K, 10%, 1/4 W	0170410005
R23	Resistor, 10 K, 10%, 1/4 W	0170410005
R24	Resistor, 10 K, 10%, 1/4 W	0170410005
R25	Resistor, 10 K, 10%, 1/4 W	0170410005
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
T1	Transformer, Current	5024055608

SUNAIR GSB-900DX



50240572798

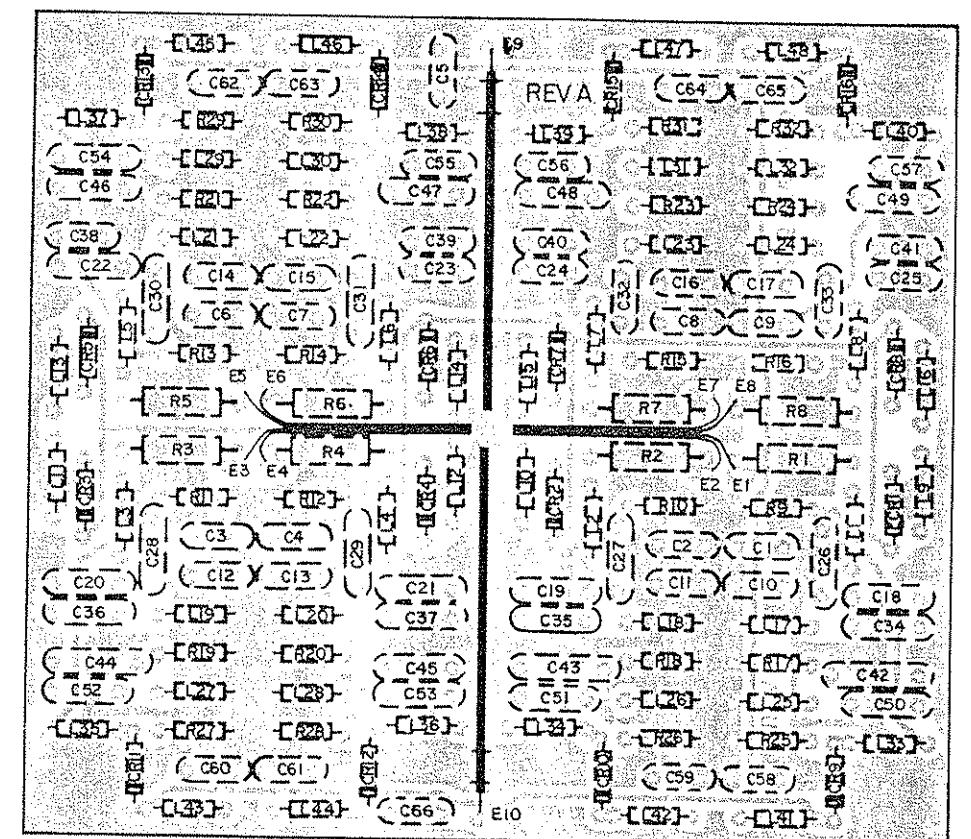
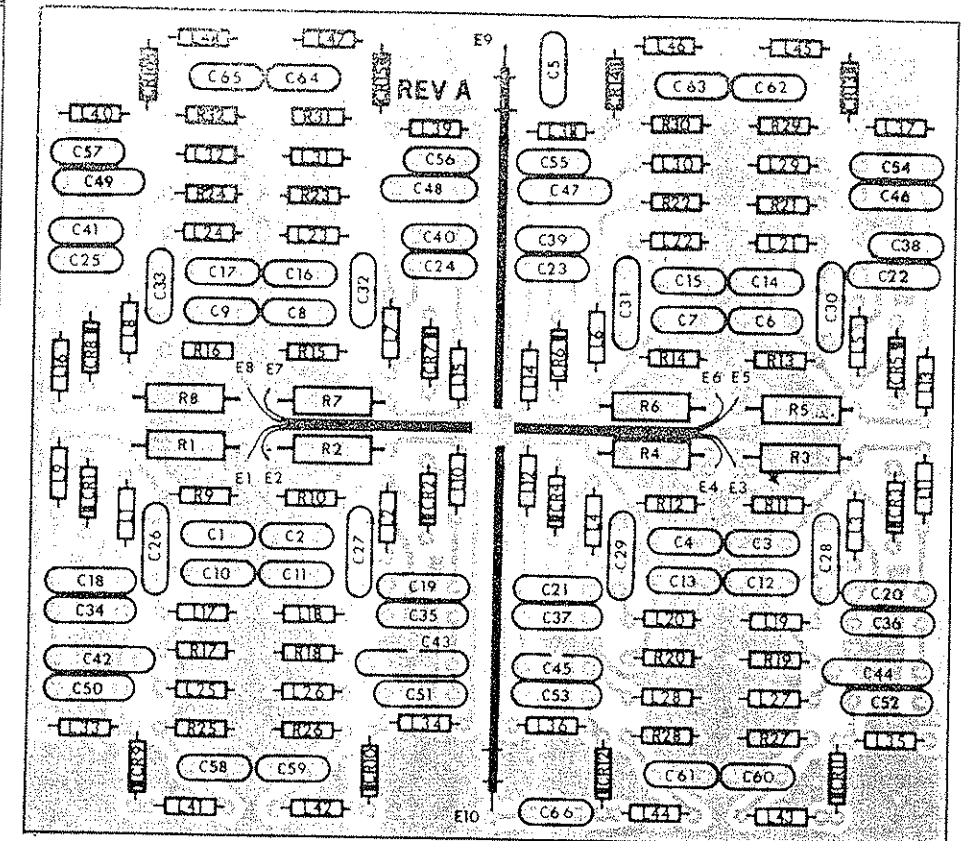


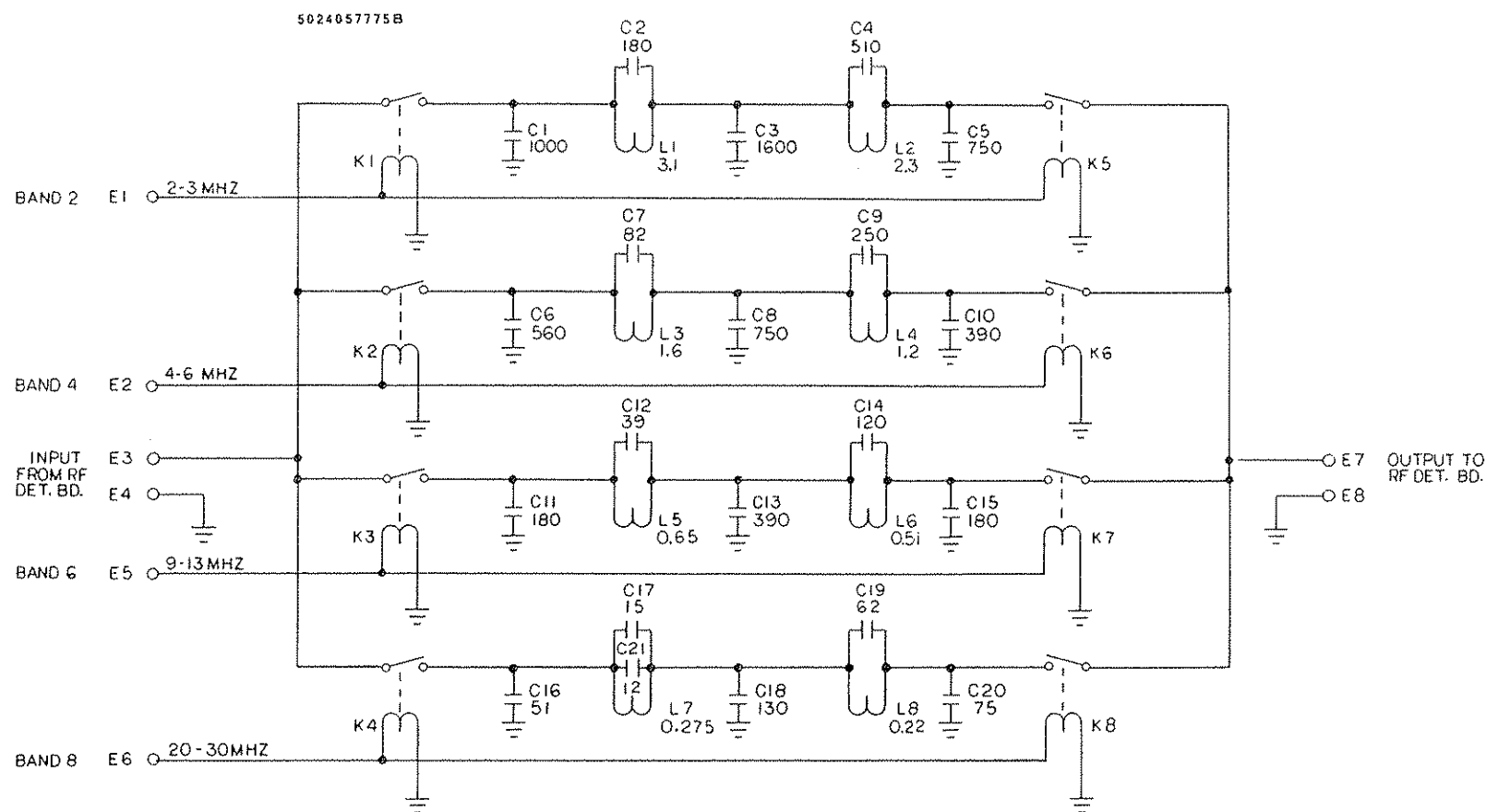
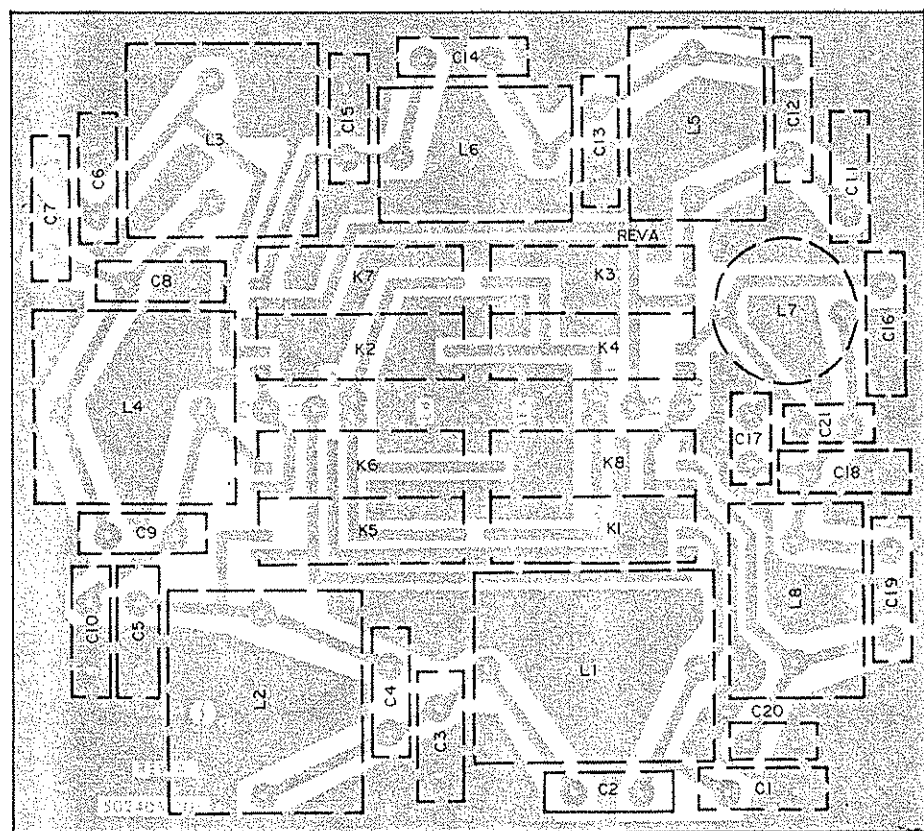
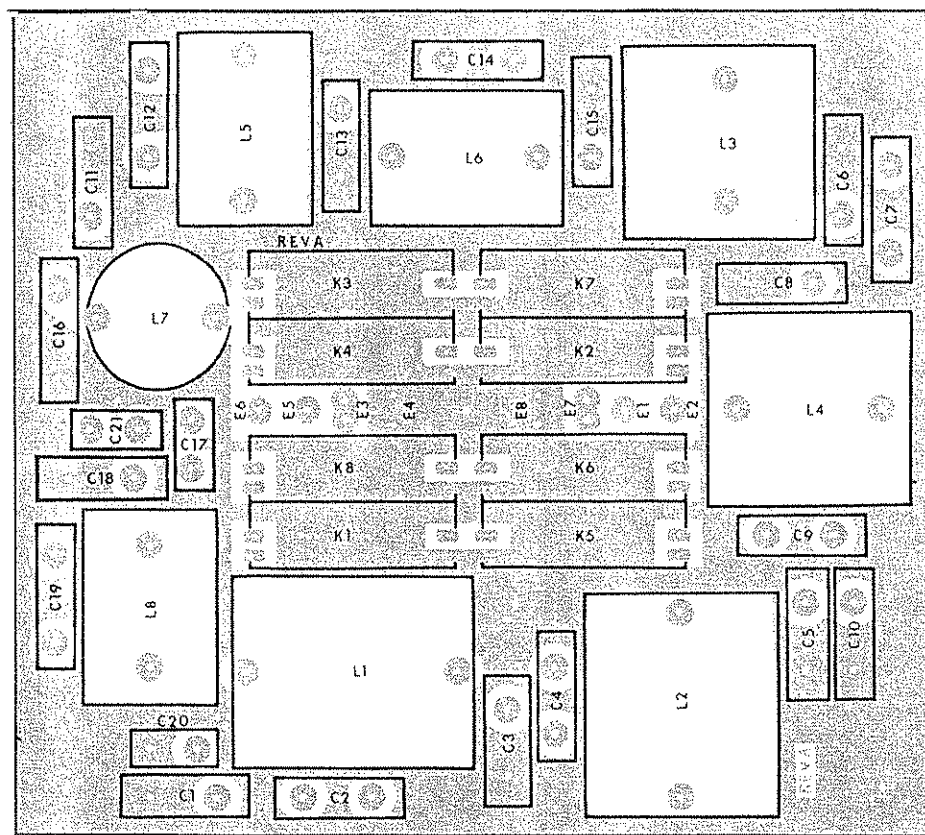
- NOTES:
 1. ALL DECIMAL CAPACITORS ARE IN MICROFARADS, ALL OTHERS PICO FARADS.
 2. ALL RESISTORS ARE $\pm 10\%$, 1/4 WATT.
 3. INDUCTANCE VALUES ARE IN MICROHENRIES.
 4. ALL DIODES ARE 40557.
 5. LAST DESIGNATORS: C66, CR16, L48, R32

Figure 5.41 Receive Filter Board Schematic (1A5A3)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY RECEIVE FILTER BOARD	5024057295			
C1	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR4	Diode, Pin MPN3500	1005260001
C2	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR4	Diode, Pin MPN3500	1005260001
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR5	Diode, Pin MPN3500	1005260001
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR6	Diode, Pin MPN3500	1005260001
C5	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR7	Diode, Pin MPN3500	1005260001
C6	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR8	Diode, Pin MPN3500	1005260001
C7	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR9	Diode, Pin MPN3500	1005260001
C8	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR10	Diode, Pin MPN3500	1005260001
C9	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR11	Diode, Pin MPN3500	1005260001
C10	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR12	Diode, Pin MPN3500	1005260001
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR13	Diode, Pin MPN3500	1005260001
C12	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR14	Diode, Pin MPN3500	1005260001
C13	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR15	Diode, Pin MPN3500	1005260001
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	CR16	Diode, Pin MPN3500	1005260001
C15	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L1	Inductor, Molded, 120 UH, 10%	0659330008
C16	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L2	Inductor, Molded, 120 UH, 10%	0659330008
C17	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L3	Inductor, Molded, 120 UH, 10%	0659330008
C18	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001	L4	Inductor, Molded, 120 UH, 10%	0659330008
C19	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006	L5	Inductor, Molded, 120 UH, 10%	0659330008
C20	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007	L6	Inductor, Molded, 120 UH, 10%	0659330008
C21	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000	L7	Inductor, Molded, 120 UH, 10%	0659330008
C22	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006	L8	Inductor, Molded, 120 UH, 10%	0659330008
C23	Capacitor, 510 PF, 500 V, DM15, 2%	0281230005	L9	Inductor, Molded, 47 UH, 5%	0652680003
C24	Capacitor, 360 PF, 500 V, DM15, 2%	0281160007	L10	Inductor, Molded, 47 UH, 5%	0652680003
C25	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009	L11	Inductor, Molded, 22 UH, 5%	0650000005
C26	Capacitor, 4700 PF, 500 V, DM19, 2%	0281390002	L12	Inductor, Molded, 22 UH, 5%	0650000005
C27	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006	L13	Inductor, Molded, 22 UH, 5%	0650000005
C28	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006	L14	Inductor, Molded, 22 UH, 5%	0650000005
C29	Capacitor, 1800 PF, 500 V, DM19, 2%	0281300003	L15	Inductor, Molded, 22 UH, 5%	0650000005
C30	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006	L16	Inductor, Molded, 22 UH, 5%	0650000005
C31	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006	L17	Inductor, Molded, 5.6 UH, 5%	0650360001
C32	Capacitor, 470 PF, 500 V, DM15, 2%	0281440000	L18	Inductor, Molded, 4.7 UH, 5%	0651910005
C33	Capacitor, 330 PF, 500 V, DM15, 2%	0281070008	L19	Inductor, Molded, 3.3 UH, 5%	0658920006
C34	Capacitor, 1300 PF, 500 V, DM19, 2%	0281380007	L20	Inductor, Molded, 2.2 UH, 5%	0649890001
C35	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000	L21	Inductor, Molded, 1.5 UH, 5%	0649270002
C36	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006	L22	Inductor, Molded, 1.0 UH, 5%	0649150007
C37	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002	L23	Inductor, Molded, 0.82 UH, 5%	0652320007
C38	Capacitor, 360 PF, 500 V, DM15, 2%	0281160007	L24	Inductor, Molded, 0.47 UH, 5%	0649410009
C39	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009	L25	Inductor, Molded, 4.7 UH, 5%	0651910005
C40	Capacitor, 160 PF, 500 V, DM15, 2%	0281340005	L26	Inductor, Molded, 3.9 UH, 5%	0650480007
C41	Capacitor, 110 PF, 500 V, DM15, 2%	0281460001	L27	Inductor, Molded, 2.7 UH, 5%	0652180001
C42	Capacitor, 1100 PF, 500 V, DM30, 2%	0281370001	L28	Inductor, Molded, 1.8 UH, 5%	0652440002
C43	Capacitor, 9100 PF, 500 V, DM30, 2%	0280960000	L29	Inductor, Molded, 0.82 UH, 5%	0649910001
C44	Capacitor, 5600 PF, 500 V, DM20, 2%	0281260001	L30	Inductor, Molded, 0.56 UH, 5%	0649530004
C45	Capacitor, 4700 PF, 500 V, DM19, 2%	0281390002	L31	Inductor, Molded, 0.39 UH, 5%	0649770005
C46	Capacitor, 3000 PF, 500 V, DM19, 2%	0281320004	L32	Inductor, Molded, 47 UH, 5%	0652680003
C47	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003	L33	Inductor, Molded, 47 UH, 5%	0652680003
C48	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007	L34	Inductor, Molded, 22 UH, 5%	0650000005
C49	Capacitor, 910 PF, 500 V, DM19, 2%	0281450005	L35	Inductor, Molded, 22 UH, 5%	0650000005
C50	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006	L36	Inductor, Molded, 22 UH, 5%	0650000005
C51	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000	L37	Inductor, Molded, 22 UH, 5%	0650000005
C52	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000	L38	Inductor, Molded, 22 UH, 5%	0650000005
C53	Capacitor, 820 PF, 500 V, DM19, 2%	0281280002	L39	Inductor, Molded, 22 UH, 5%	0650000005
C54	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002	L40	Inductor, Molded, 22 UH, 5%	0650000005
C55	Capacitor, 390 PF, 500 V, DM15, 2%	0281040001	L41	Inductor, Molded, 120 UH, 10%	0659330008
C56	Capacitor, 270 PF, 500 V, DM15, 2%	0280970005	L42	Inductor, Molded, 120 UH, 10%	0659330008
C57	Capacitor, 160 PF, 500 V, DM15, 2%	0281340005	L43	Inductor, Molded, 120 UH, 10%	0659330008
C58	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L44	Inductor, Molded, 120 UH, 10%	0659330008
C59	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L45	Inductor, Molded, 120 UH, 10%	0659330008
C60	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L46	Inductor, Molded, 120 UH, 10%	0659330008
C61	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L47	Inductor, Molded, 120 UH, 10%	0659330008
C62	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	L48	Inductor, Molded, 120 UH, 10%	0659330008
C63	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R1	Resistor, 180, 10%, 1/2 W	0173640001
C64	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R2	Resistor, 180, 10%, 1/2 W	0173640001
C65	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R3	Resistor, 180, 10%, 1/2 W	0173640001
C66	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002	R4	Resistor, 180, 10%, 1/2 W	0173640001
CR1	Diode, Pin MPN3500	1005260001	R5	Resistor, 180, 10%, 1/2 W	0173640001
CR2	Diode, Pin MPN3500	1005260001	R6	Resistor, 180, 10%, 1/2 W	0173640001
CR3	Diode, Pin MPN3500	1005260001	R7	Resistor, 180, 10%, 1/2 W	0173640001
			R8	Resistor, 180, 10%, 1/2 W	0173640001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R9	Resistor, 10 K, 10%, 1/4 W	0170410005
R10	Resistor, 10 K, 10%, 1/4 W	0170410005
R11	Resistor, 10 K, 10%, 1/4 W	0170410005
R12	Resistor, 10 K, 10%, 1/4 W	0170410005
R13	Resistor, 10 K, 10%, 1/4 W	0170410005
R14	Resistor, 10 K, 10%, 1/4 W	0170410005
R15	Resistor, 10 K, 10%, 1/4 W	0170410005
R16	Resistor, 10 K, 10%, 1/4 W	0170410005
R17	Resistor, 330, 5%, 1/4 W	0170910008
R18	Resistor, 330, 5%, 1/4 W	0170910008
R19	Resistor, 330, 5%, 1/4 W	0170910008
R20	Resistor, 330, 5%, 1/4 W	0170910008
R21	Resistor, 330, 5%, 1/4 W	0170910008
R22	Resistor, 330, 5%, 1/4 W	0170910008
R23	Resistor, 330, 5%, 1/4 W	0170910008
R24	Resistor, 330, 5%, 1/4 W	0170910008
R25	Resistor, 330, 5%, 1/4 W	0170910008
R26	Resistor, 330, 5%, 1/4 W	0170910008
R27	Resistor, 330, 5%, 1/4 W	0170910008
R28	Resistor, 330, 5%, 1/4 W	0170910008
R29	Resistor, 330, 5%, 1/4 W	0170910008
R30	Resistor, 330, 5%, 1/4 W	0170910008
R31	Resistor, 330, 5%, 1/4 W	0170910008
R32	Resistor, 330, 5%, 1/4 W	0170910008





- NOTES:
UNLESS OTHERWISE SPECIFIED:
1. CAPACITORS ARE IN PICO FARADS.
2. INDUCTANCE VALUES ARE IN MICROHENRIES

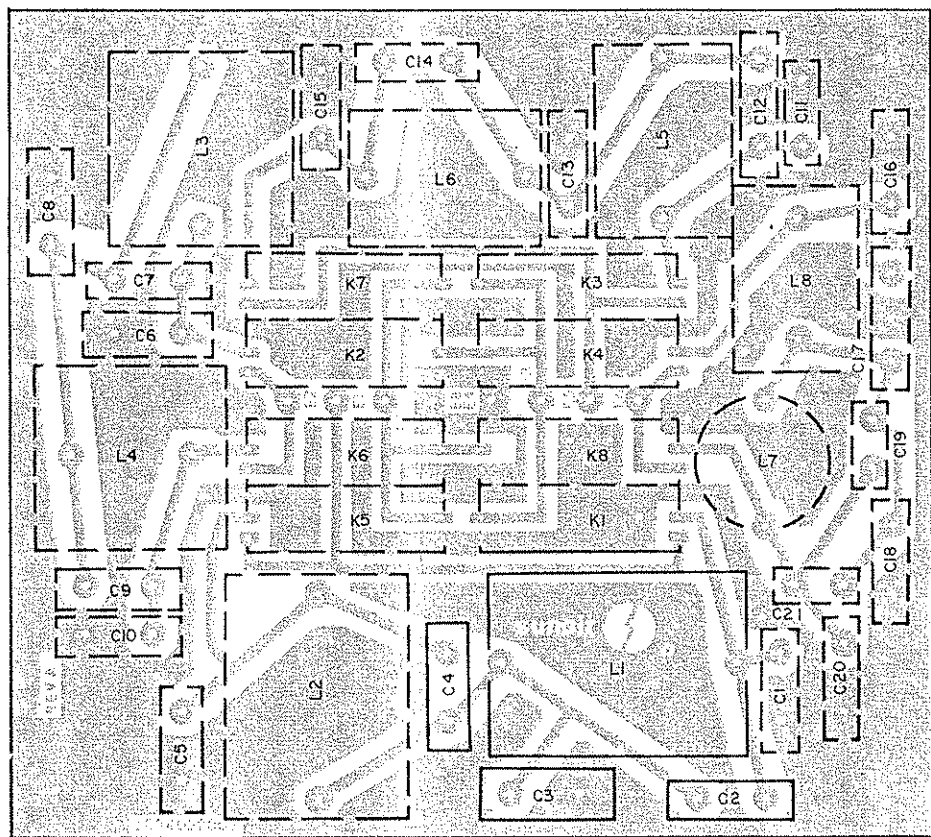
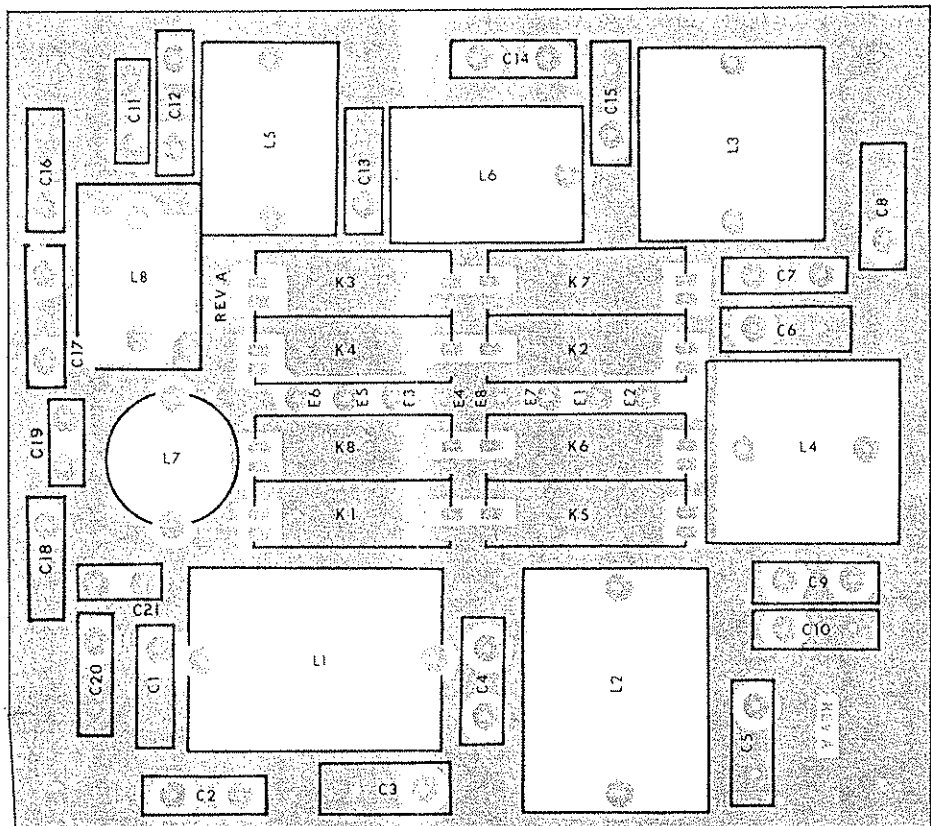
5024057791A PC ASSY EVEN CHANNEL FILTER 1A5A2

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A5A2	PC ASSY EVEN CHANNEL FILTER	5024057791
C1	Capacitor, 1000 PF, 500 V, DM19, 2%	0281210004
C2	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C3	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000
C4	Capacitor, 510 PF, 500 V, DM19, 2%	0282630007
C5	Capacitor, 750 PF, 500 V, DM19, 2%	0280990005
C6	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C7	Capacitor, 82 PF, 500 V, DM20, 2%	0282790004
C8	Capacitor, 750 PF, 500 V, DM19, 2%	0280990005
C9	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C10	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C11	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C12	Capacitor, 39 PF, 500 V, DM20, 2%	0282830006
C13	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C14	Capacitor, 120 PF, 500 V, DM19, 2%	0282750002
C15	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C16	Capacitor, 51 PF, 500 V, DM20, 2%	0282820001
C17	Capacitor, 15 PF, 500 V, DM15	1005320021
C18	Capacitor, 160 PF, 500 V, DM19, 2%	0281340005

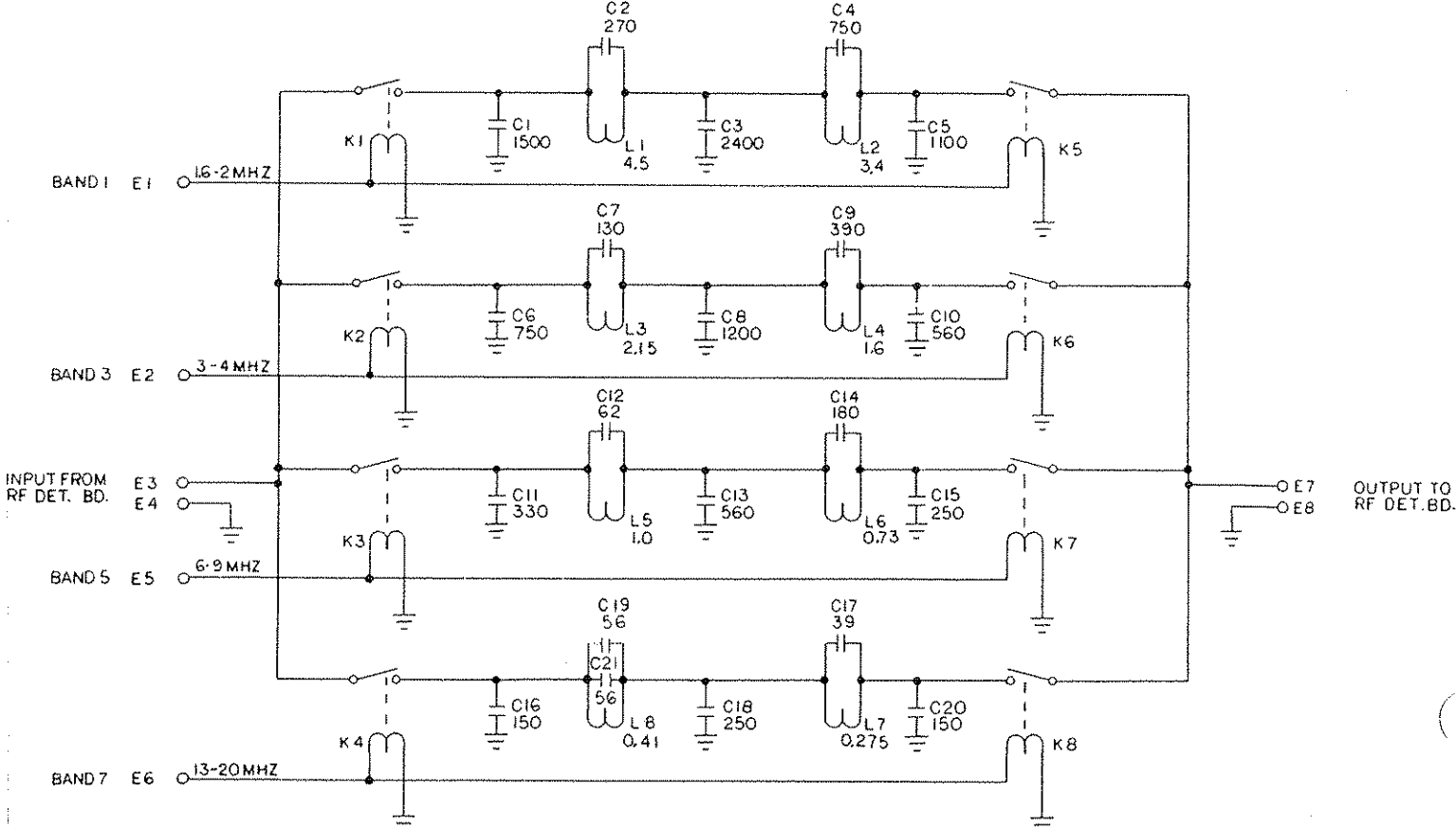
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C19	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005
C20	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
C21	Capacitor, 12 PF, 500 V, DM15	1005320039
K1	Relay, SPST, 12 V, Reed	1005330000
K2	Relay, SPST, 12 V, Reed	1005330000
K3	Relay, SPST, 12 V, Reed	1005330000
K4	Relay, SPST, 12 V, Reed	1005330000
K5	Relay, SPST, 12 V, Reed	1005330000
K6	Relay, SPST, 12 V, Reed	1005330000
K7	Relay, SPST, 12 V, Reed	1005330000
K8	Relay, SPST, 12 V, Reed	1005330000
L1	Inductor, Filter, 3.10 UH Gry	5024051904
L2	Inductor, Filter, 2.32 UH Wht	5025052005
L3	Inductor, Filter, 1.60 UH Orn	5024051106
L4	Inductor, Filter, 1.20 UH Wh/Red	5024052102
L5	Inductor, Filter, 0.65 UH Wh/Orn	5024052200
L6	Inductor, Filter, 0.51 UH Wh/Yel	5024052307
L7	Inductor, Filter, 0.275 UH, Vio	5025051505
L8	Inductor, Filter, 0.22 UH Wh/Grn	5024052501

Figure 5.42 Even Channel Filter Schematic (1A5A2)

SUNAIR GSB-900DX



5024057473B



NOTES:
UNLESS OTHERWISE SPECIFIED:
1. CAPACITORS ARE IN PICO FARADS.
2. INDUCTANCE VALUES ARE IN MICROHENRIES.

5024057490A PC ASSY ODD CHANNEL FILTER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.	REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY ODD CHANNEL FILTER	5024057490	C20	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
C1	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007	C21	Capacitor, 56 PF, 500 V, DM15, 2%	0282360000
C2	Capacitor, 270 PF, 500 V, DM19, 2%	0282670009	K1	Relay, SPST, 12 V, Reed	1005330000
C3	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001	K2	Relay, SPST, 12 V, Reed	1005330000
C4	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006	K3	Relay, SPST, 12 V, Reed	1005330000
C5	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000	K4	Relay, SPST, 12 V, Reed	1005330000
C6	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006	K5	Relay, SPST, 12 V, Reed	1005330000
C7	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007	K6	Relay, SPST, 12 V, Reed	1005330000
C8	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006	K7	Relay, SPST, 12 V, Reed	1005330000
C9	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002	K8	Relay, SPST, 12 V, Reed	1005330000
C10	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002	L1	Inductor, Filter, 4.5 UH Blk	5024050801
C11	Capacitor, 330 PF, 500 V, DM19, 2%	0282660003	L2	Inductor, Filter, 3.4 UH Brn	5024050908
C12	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005	L3	Inductor, Filter, 2.15 UH Red	5024051009
C13	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002	L4	Inductor, Filter, 1.60 UH Orn	5024051106
C14	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005	L5	Inductor, Filter, 1.00 UH Yel	5024051203
C15	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004	L6	Inductor, Filter, 0.73 UH Grn	5024051301
C16	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001	L7	Inductor, Filter, 0.275 UH Vio	5024051505
C17	Capacitor, 39 PF, 500 V, DM20, 2%	0282830006	L8	Inductor, Filter, 0.41 UH Blu	5024051408
C18	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004			
C19	Capacitor, 56 PF, 500 V, DM15, 2%	0282360000			

Figure 5.43 Odd Channel Filter Schematic (1A5A1)

SECTION 6

ACCESSORIES

6.1 PHONE PATCH OPTION

The Phone Patch option may be used to transfer information from the telephone lines through the GSB-900DX. The patch is not automatic and must be manually switched between receive and transmit functions. This requires that both conversing parties say "OVER" upon completion of each transmission to enable the radio operator to switch the patch unit.

6.1.1 INSTALLATION

The Phone Patch may be installed on either the left or right hand front panel end plates (See Figure 6.1). The mounting plate is installed first to the end plate (the microphone mounting clip must be relocated if patch is installed on the left side). Then the patch assembly is slid over the four mounting posts and the cover placed over the assembly. The telephone line is connected to the two outside terminals on the terminal strip on the rear apron of the patch. The patch control connector is then plugged into the audio connector, 1A8J2, on the rear panel of the GSB-900DX.

6.1.2 OPERATION

To operate the patch, turn on the GSB-900DX, then turn the patch power switch up to "ON". The TRANSMIT-RECEIVE switch should be in the center position. The power switch should light "WHITE" and the TRANSMIT-RECEIVE switch should light "RED". The receiver output is now patched to the telephone lines. Adjust the RCV GAIN control on the patch for a comfortable level in the telephone handset (if exceptionally lossy telephone lines are encountered, more receive gain may be obtained by turning 1A3A4 R48 on the GSB-900DX Audio Board clockwise 5 or 6 turns).

To transmit from the phone lines through the GSB-900DX, move the TRANSMIT-RECEIVE switch up to "TRANSMIT" position. The switch should now show a "RED" color and the transceiver should be keyed. Adjust the XMIT GAIN control clockwise until the GSB-900DX front panel meter (switch in FWD position) shows no further increase, indicating ALC has been reached. (If exceptionally lossy telephone lines are encountered, additional transmit gain may be obtained by turning 1A3A4 R58 on the GSB-900DX Audio Board, clockwise ten turns).

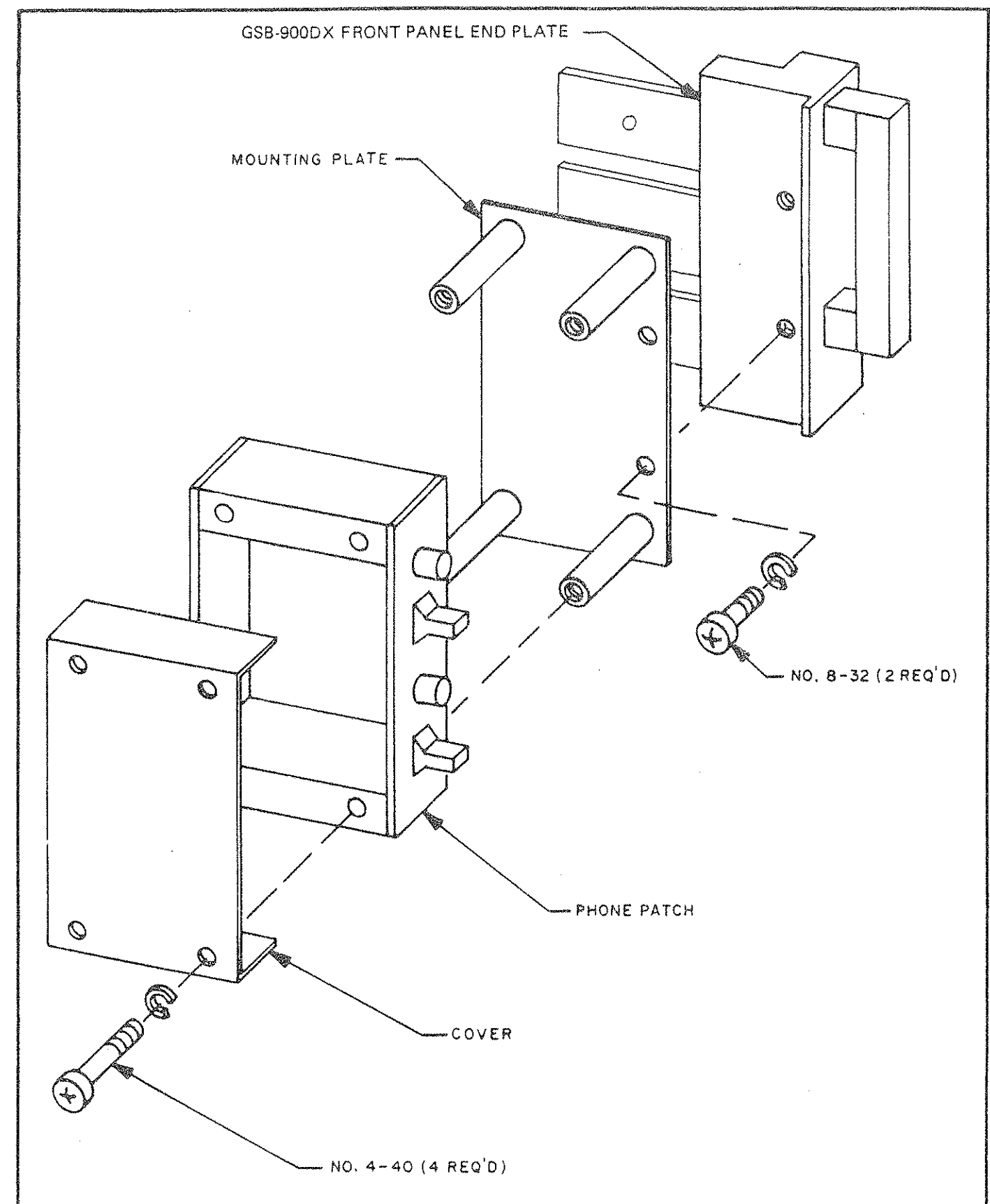


Figure 6.1 GSB-900DX Phone Patch Mounting Instructions

SUNAIR GSB-900DX

5024400087G PC ASSY/CHAS. PHONE PATCH

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY/CHAS. PHONE PATCH	50244000xx
C1	Capacitor, 15 UF, 20 V, 198 D	0280920008
C2	Capacitor, 68 UF, 15 V, T368	0296540005
C3	Capacitor, 1 UF, 50 V, 198 D	0280910002
C4	Capacitor, 68 UF, 15 V, T368	0296540005
C5	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C6	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C7	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C8	Capacitor, 0.001 UF, 250 V, X5 R, 10%	0286260000
C9	Capacitor, 3 UF, 200 V, Mylar	0278520006
C10	Capacitor, 3 UF, 200 V, Mylar	0278520006
L1	Inductor, Molded, 2000 UH, 5%	0653590008
L2	Inductor, Molded, 2000 UH, 5%	0653590008
P1	Connector, Power, 10 Pin Round	0754000001
Q1	Transistor, NPN, SI. 2N4124	0448010003
R1	Resistor, 470, 5%, 1/4 W	0184110009
R2	Resistor, 27, 10%, 1/4 W	0172590001
R3	Resistor, 270, 10%, 1/4 W	0178450006
R4	Resistor, 39 K, 10%, 1/4 W	0177800003
R5	Resistor, 10 K, 10%, 1/4 W	0170410005
R6	Resistor, 1 K, 10%, 1/4 W	0171560001
R7	Pot., 1 K, 10%, 3/4 W, 1/8 Shaft	0346610001
R8	Pot., 1 K, 10%, 3/4 W, 1/8 Shaft	0346610001
T1	Transformer, Audio	0491590008
TB1	Barrier Strip, 3 Pos. 6-32	0542330008
	Switch Assy.	0346390095
	Switch Assy.	0346400091
	Knob, .50 D, Blk, W/D Br. Screw	0346420008
	Clamp, Cable 1/4 ID, 3/8 W	0501840001
	Bushing, Telescoping, .31 ID	0700550038
	Bushing, Telescoping, .44 ID	0700550046
	Bushing, Telescoping, .56 ID	0700550054
	Clamp, Cable, Connector	0740250001
	Panel, Front	50244005xx
	Panel, Rear	50244007xx
	Plate, Mounting	50244009xx
	Bar, Mounting	50244010xx
	Plate, Cover	50244011xx

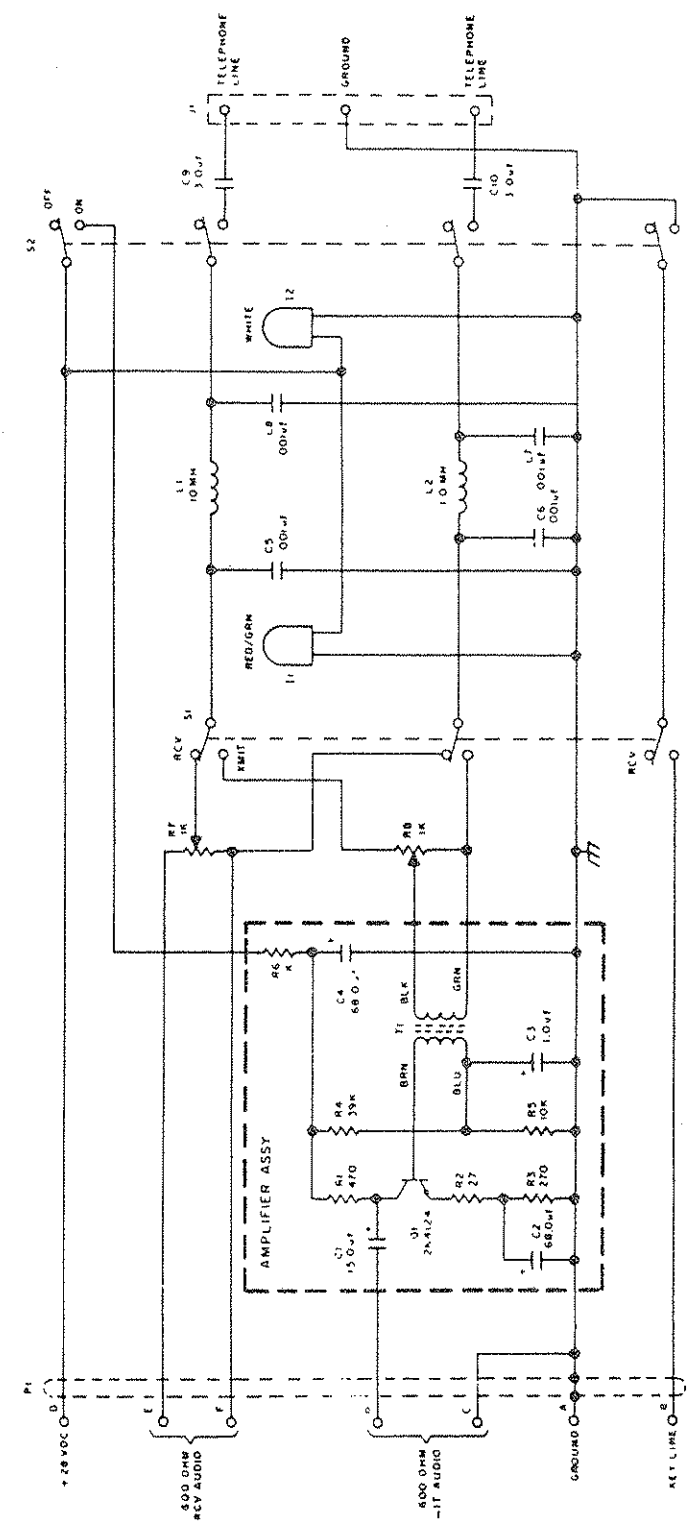


Figure 6.2 Manual Phone Patch Schematic Diagram

PANEL, FRONT

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	Panel, Front	5024400500
	Panel, Rear	5024400704
	Plate, Mounting	5024400909
	Bar, Mounting	5024401000
	Plate, Cover	5024401107
C5	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000
C6	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000
C7	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000
C8	Capacitor, Disc Ceramic, .001 UF, 250 V	0286260000
J1	Barrier Strip, 3 Terminal	0542330008
L1	Inductor, 2 MHz	0653590008
L2	Inductor, 2 MHz	0653590008
P1	Connector, 10 Pin	0754000001
R7	Potentiometer, Carbon, 1 K, 10%, 1/2 W	0346610001
R8	Potentiometer, Carbon, 1 K, 10%, 1/2 W	0346610001
S1	Switch, Illuminated, 4 PDT Red/Green, 28 V Bulb	0346400091
S2	Switch, Illuminated, 4 PDT Wht 28 V Bulb	0346390095
	Amplifier, Assembly (see separate parts list)	5024400097
		5024400054
	Cable, 7 Conductor	0604710003
	Knob, Black	0346420008
	Boot	0700550046
	Boot	0700550038
	Cable Clamp	0740250001

PHONE PATCH AMPLIFIER ASSY.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	Board, Printed Circuit	5024401697
C1	Capacitor, Tantalum, 15 UF, 20 V	0280920008
C2	Capacitor, Tantalum, 68 UF, 15 V	0296540005
C3	Capacitor, Tantalum, 1 UF, 35 V	0280910002
C4	Capacitor, Tantalum, 68 UF, 15 V	0296540005
Q1	Transistor, NPN, 2 N4124	0448010003
R1	Resistor, Carbon, 470 ohm, 10%, 1/4 W	0184110009
R2	Resistor, Carbon, 27 ohm, 10%, 1/4 W	0172590001
R3	Resistor, Carbon, 270 ohm, 10%, 1/4 W	0178450006
R4	Resistor, Carbon, 39 K, 10%, 1/4 W	0177800003
R5	Resistor, Carbon, 10 K, 10%, 1/4 W	0170410005
R6	Resistor, Carbon, 1 K, 10%, 1/4 W	0171560001
T1	Transformer, Audio, 150 ohm to 600 ohm	0491590008

GRN
GRY

6.2 RECEIVER PROTECTOR 5024002491

6.2.1 GENERAL

The Receiver Protector is an instant shunt peak power limiter which prevents damage to the sensitive receiver "front end" of the GSB-900DX from high level RF signals picked up by the antennas. The protector requires no operating power and is therefore effective even if the receiver is disconnected from the power mains.

As operation of the protector is extremely rapid, it affords adequate protection against out-of-band signals well up into the microwave region. The protector is installed in the filter module, 1A5 (see figure 5-40).

6.2.2 INSTALLATION

1. Remove the filter module, 1A5 from the GSB-900DX.
2. Remove the 4 flat head screws on the sides of the filter module case and carefully slide the PC assembly out of the case.
3. Apply a thin film of thermal compound to the mounting flange of each diode.
4. Reassemble filter module and replace in radio.
5. When assembly is complete, connect an ohmmeter such as a Simpson Model 260 on the RX1 range between the antenna jack and ground. The meter should indicate less than 20 ohms. Reverse the polarity of the ohm meter leads. Approximately the same reading should be obtained.

NOTE

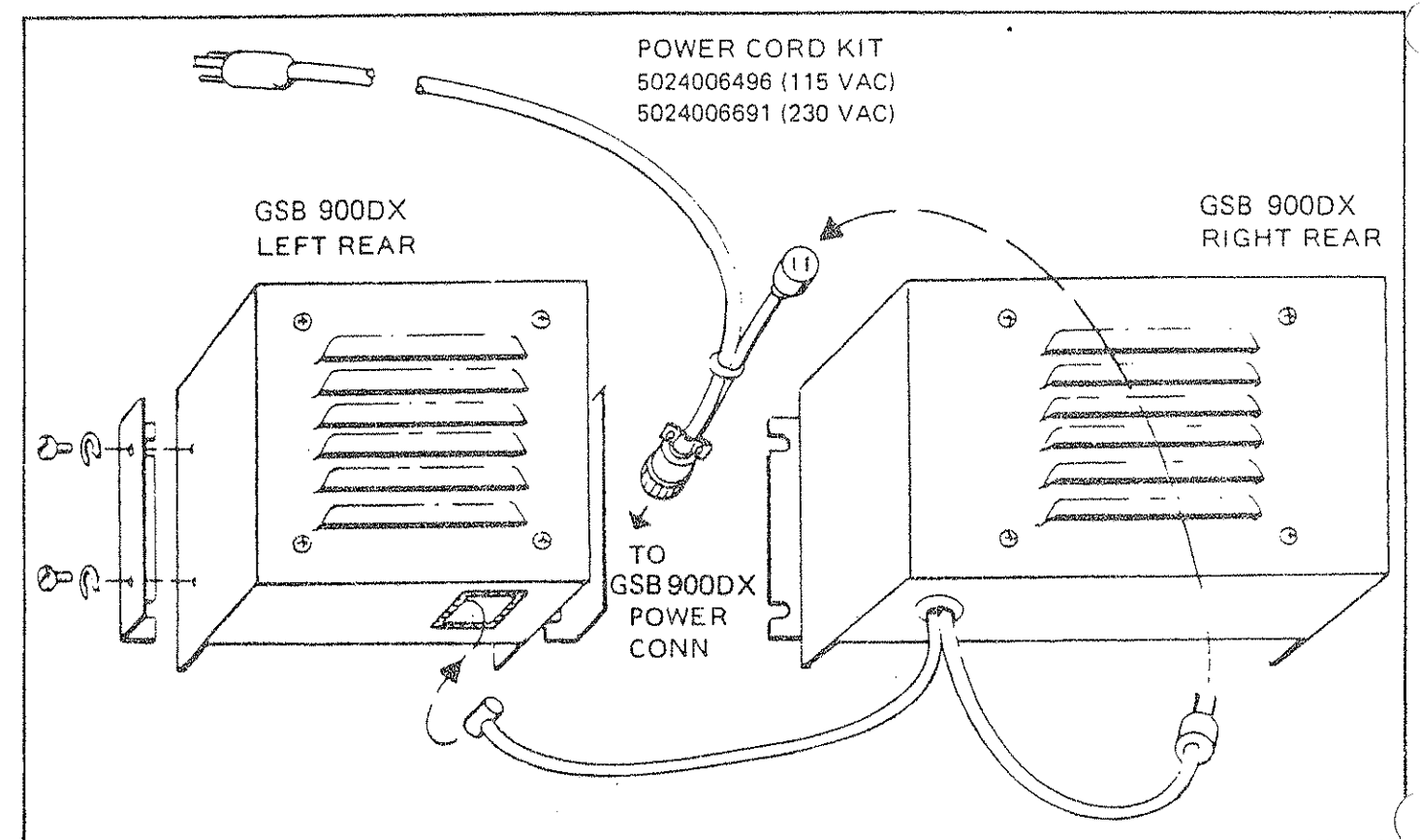
Since the diodes are connected across the coax, and one diode has its anode connected to its mounting stud while the other has its cathode connected to its stud, it does not matter which diode is mounted in which hole.

CAUTION

Use care not to apply excess heat to the diodes when soldering. Apply heat only to the top of the insulated terminals of the diodes. Because of the small size of the diodes, do not attempt to crimp the wires to the diodes, but, rather, lay the wires on the tops of the diodes and solder.

CAUTION

Do not apply excess torque.



6.3
INSTALL SMALL BRACKETS TO POWER
SUPPLY HEAT SINK (THE SMALLER ONE)
THEN INSTALL SMALL BLOWER AND
ENCLOSURE TO BRACKETS AS SHOWN.
INSTALL LARGE BLOWER TO POWER
AMPLIFIER HEAT SINK. CONNECT SMALL
CORD TO CONNECTOR ON SMALLER

BLOWER, THROUGH CUTOUT IN
ENCLOSURE AS SHOWN. CONNECT
POWER CONNECTOR (TWO PRONGED)
TO SOCKET ON PIGTAIL FROM GSB-900DX
POWER CONNECTOR. BLOWERS WILL
BE ENERGIZED WHENEVER GSB-900DX
POWER SWITCH IS TURNED ON.

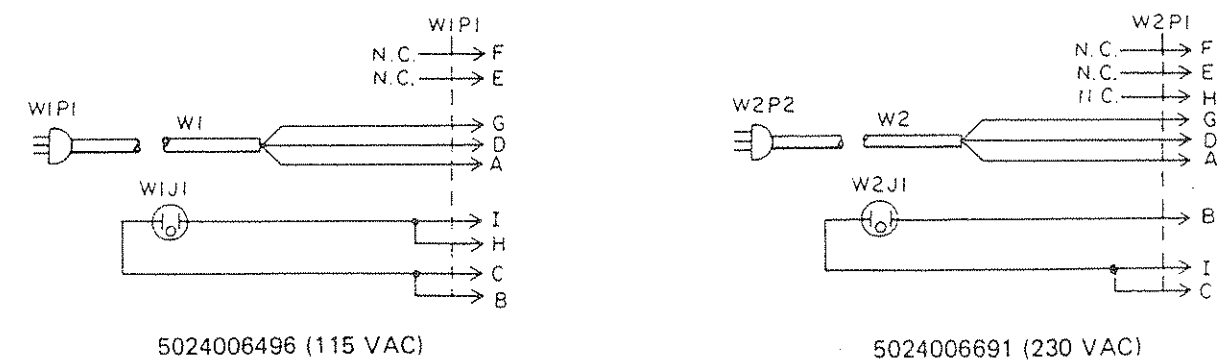


Figure 6.3 Blower Kit Installation Instructions

6.4 GRC-951 AUDIO REMOTE CONTROL

Refer to figure 6.6

6.4.1 THEORY

The receive audio from the remote 600 ohm audio of the GSB-900DX is applied to speaker driver U1 via remote control cable 0588690007. U1 is a hybrid integrated circuit audio amplifier identical to that used in the speaker driver. 1A1A1 (see section 4.3.5). On receive, the output of U1 is applied to speaker LS1 through relay K1. On transmit, K1 is energized and disconnects LS1 from the amplifier. Dummy load R6 is switched across the output of the amplifier to maintain the proper loading on the speaker driver.

On transmit, the audio from the microphone is amplified by Q1 and is applied to the 600 ohm audio input of the GSB-900DX via remote control cable 0588690007.

6.4.2 INSTALLATION

The GRC-951 Audio Remote Control unit provides for remote control of GSB-900DX audio and keyline functions at separations of up to 200 feet from the transceiver. The GRC-951 outline drawing is shown in figure 6.5. A universal swivel-type mounting bracket is supplied with the unit, permitting installation in a variety of locations. To install the GRC-951, procede as follows:

- a) Select the mounting location and mount universal mounting bracket.
- b) Route control cable (0588690007) through any conduits, walls, etc. Trim off any excess cable.
- c) Refer to figure 6.4 and wire connectors P1 and P2. Note that the cable shield is grounded to Pin A only at the end connected to the transceiver.
- d) Secure GRC-951 to the universal mounting bracket.
- e) Connect P2 to the GRC-951 remote control and P1 to the GSB-900DX. Connect Power cord and antenna to the GSB-900DX.

NOTE

The internal adjustments in the GSB-900DX have been set at the factory to supply proper audio levels to the GRC-951. In the case of insufficient audio levels, perform the following adjustments.

- f) Remove the top cover and receiver/exciter module top cover from the GSB-900DX.
- g) Set the VOLUME control of the remote control to the middle of the range. Connect a microphone to the remote control.
- h) Turn REMOTE AUDIO LEVEL control 1A3A-4R48 on the AUDIO board in the GSB-900DX at least 10 turns counterclockwise.
- i) Turn REMOTE TRANSMIT AUDIO LEVEL control 1A3A4R48 on the AUDIO board in the GSB-900DX at least 10 turns counterclockwise.
- j) Apply power on the GSB-900DX. Tune in a moderately strong signal on the GSB-900DX (using local speaker). Advance 1A3A4R48 clockwise until a comfortable listening level is achieved in the GRC-951 speaker.
- k) Select the highest transmit frequency anticipated (normally 29.9999 MHz), refer to section 3 and check out transmit operation using local controls.
- l) Depress the push-to-talk (PTT) button on the microphone connected to the remote control. Speaking in a normal voice, carefully advance 1A3A4R58 on the AUDIO board clockwise until no further increase in power output on the meter of the GSB-900DX is noted (this is the threshold of ALC). Advance 1A3A4R58 two turns beyond this point.
- m) Replace the receiver/exciter module top cover and the GSB-900DX top cover.

THE UNIT IS NOW READY FOR OPERATION

6.4.3 OPERATION

Before placing the GRC-951 Audio Remote Control unit into operation, make sure that the system adjustments outlined in section 6.3.2 have been performed. Connect the microphone or handset to connector J1 on the front of the GRC-951. Refer to section 3.6 through 3.7 and tune the GSB-900DX into its antenna at the operating frequency. When tuneup is complete, adjust the VOLUME control on the GRC-951 for a comfortable listening level.

NOTE

The level in the GRC-951 speaker is not affected by the setting of the GSB-900DX VOLUME control.

To transmit, first check that the MODE switch on the GSB-900DX is placed in the correct operating mode. Depress the push-to-talk (PTT) button on the handset or microphone connected to the GRC-951 and speak in a normal voice. Observe that the meter on the GSB-900DX indicates approximately 1.0 relative power on the voice peaks.

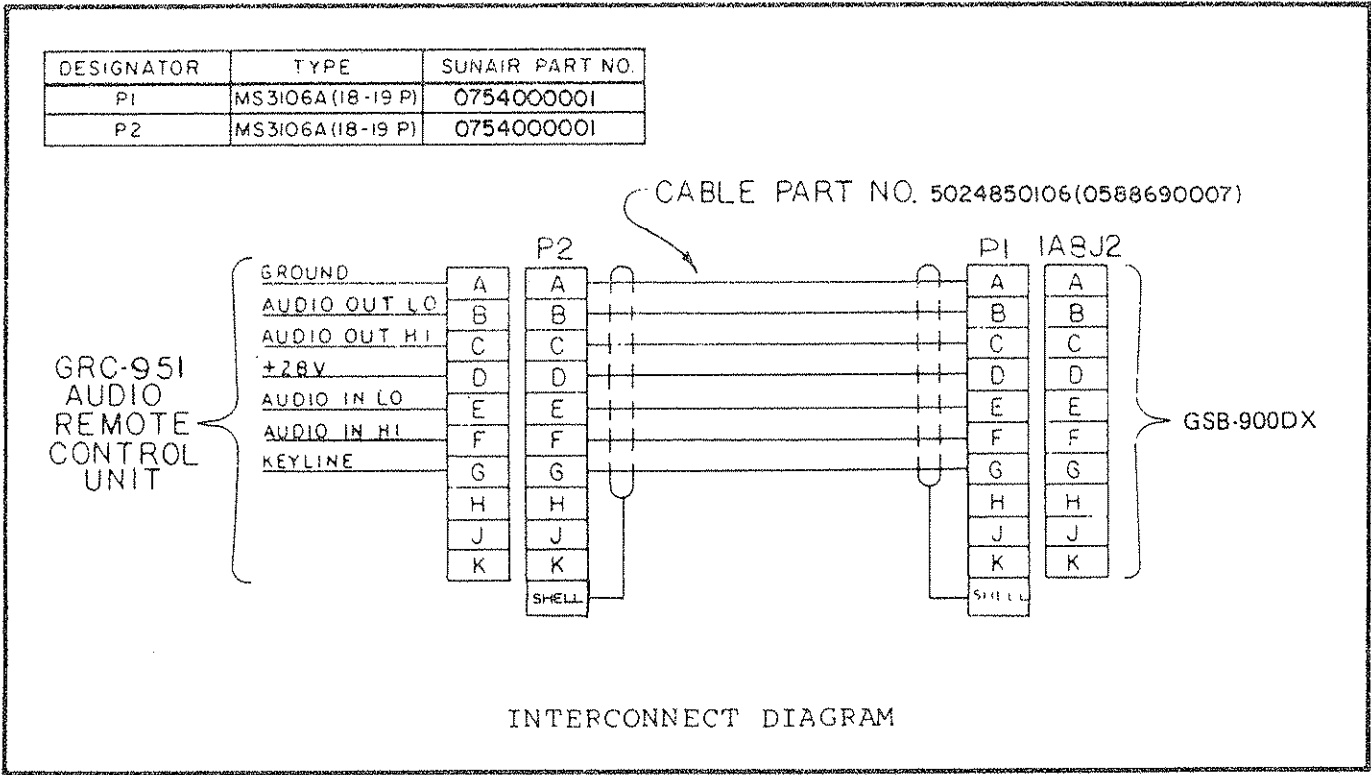


Figure 6.4 GRC-951 Audio Remote Control Unit Interconnect Diagram

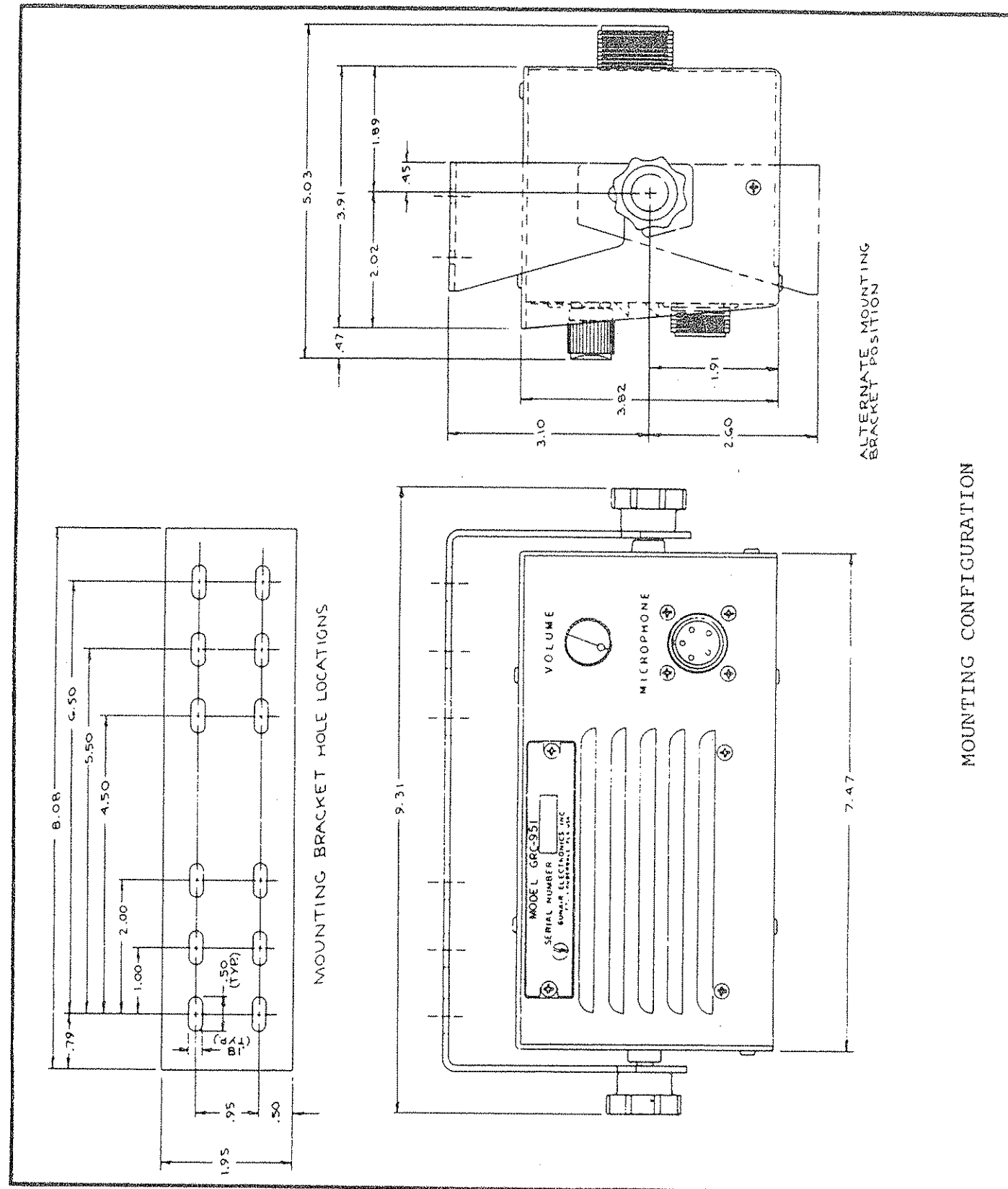


Figure 6.5 GRC-951 Audio Remote Control Unit Outline Configuration

6.4.4 TROUBLESHOOTING THE GRC-951

TABLE 6

SYMPTOM	CHECK	PROBABLE CAUSE
No Receive	28V	1. Loose Connection 2. Radio Faulty 3. F1 Blown
No Receive	Input to U1	1. R5 Bad 2. Wiring Bad
No Receive	Output of U1	1. U1 Bad 2. K1 Bad 3. LS1 Bad
No Transmit	28V	1. Loose Connection 2. Radio Faulty 3. F1 Blown
No Transmit	Mike Keyline	1. K1 Bad 2. Mike Bad
No Transmit	Mike Audio	1. Q1 Bad 2. Mike Bad

SUNAIR GSB-900DX

50248505XX AUDIO REMOTE

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	AUDIO REMOTE	50248500XX
C1	Capacitor, 0.005 UF, 100 V, Z5 V	0273330004
C2	Capacitor, 1 UF, 35 V, T368	0283630001
C3	Not used	
C4	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
C5	Capacitor, 0.47 UF, 50 V, X5 V, 20%	0283370009
C6	Not used	
C7	Capacitor, 470 UF, 50 V, Tal	0280890001
C8	Not used	
C9	Not used	
C10	Capacitor, 100 UF, 50 V	1004260016
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.005 UF, 100 V, Z5 V	0273330004
C13	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C14	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C15	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C16	Capacitor, 47 UF, 20 V, 196 D	0281700001
C17	Capacitor, 1 UF, 50 V, 198 D	0280910002
C18	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Rectifier 1N4004	0405180004
CR6	Diode, Zener 1N5242B	0400120003
F1	Fuse, Mdl, 1 Amp, 250 V	0841100004
J1	Connector, Power, 5 Pin Round	0753560003
J2	Connector, Power, 10 Pin Rnd. Female	0753990008
J2	Connector, Power, 10 Pin Rnd. Male	0754000001
K1	Relay, DPDT, 24 V, PC Mount	1005120013
LS1	Speaker, 3 X5, Oval, 8 ohm, 5W	0877970009
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Not used	
Q3	Capacitor, 100 UF, 50 V	1004260016
R1	Resistor, 10 K, 10%, 1/4 W	0170410005
R2	Resistor, 1.8 K, 5%, 1/2 W	0184970008
R3	Resistor, 33, 10%, 1/2	0171700007
R4	Not used	
R5	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R5	Pot. 5 K, 20%, 2W, 1/4 Shaft	0346020000
R6	Resistor, 10, 10%, 2W	0163840008
R7	Resistor, 680, 10%, 1/2 W	0167500007
R8	Resistor, 100, 5%, 1/4	0171180003
R9	Resistor, 470, 5%, 1/4 W	0184110009
R10	Resistor, 18 K, 10%, 1/4 W	0175720002
R11	Resistor, 180, 10%, 1/4 W	0175220000
R12	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R13	Not used	
R14	Resistor, 15 K, 10%, 1/4 W	0172350000
R15	Resistor, 470 K, 10%, 1/4 W	0180570005
U1	IC. Linear	1003140025
	Knob, Mounting Bracket, 1 1/8 D, Blk	0346060001
	Knob, Volume Control, .70 D, Blk, Wht	
	Dot, Skrt	0346060001
	Fuseclip, PC Mount	0534610005
	Bracket, Mounting	50248510XX
	Bushing, Telescoping, .44 ID	0700550046
	Clamp, Cable, Connector	0740250001

