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

OPERATION AND MAINTENANCE MANUAL

GSE-924

EXCITER HF/SSB SYNTHESIZED

FOURTH EDITION 1 JULY 1987
MANUAL PART NUMBER 8039000505

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SECTION 1
GENERAL INFORMATION

1.1 SCOPE

This instruction manual contains the necessary information to install, operate and service the GSE-924 Exciter.

1.2 EXCITER DESCRIPTION

1.2.1 GENERAL

The GSE-924 is a high quality single sideband exciter 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. An ISB option is available. The exciter 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 95% relative humidity.

The GSE-924 is composed of seven major subassemblies, (1) front panel 1A1, (2) antenna coupler control panel 1A2 (optional), (3) 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 front panel contains all controls necessary to operate the exciter. All wiring from the panel terminates on plug-in connectors (meter panel lamp terminates on a quick disconnect connector).

This allows the front panel to be easily removed for servicing or remotely located and connected to the exciter by a control cable. This method of construction thus allows the front panel to be used as a remote control unit over a multi-conductor cable. A compartment in the front panel accepts the meter panel (standard) or the optional control panels discussed in Section 1.2.3.

1.2.3 OPTIONAL PLUG-IN CONTROL HEADS (1A2)

Three optional control heads are available and are supplied when the accessory equipment listed below is used:

1. GCU-910A remote controlled antenna coupler
2. GCU-935 automatic antenna coupler
3. GSL-1900A kilowatt power amplifier.

The installed control head provides all control and indication functions required to control and operate the corresponding accessory.

1.2.4 EXCITER – 1A3

The Exciter module contains the low level signal generation circuitry. The 1st I.F. frequency is well above the 30 MHz upper limit of the exciter 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 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 exciter 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.

For the most exacting applications, Sunair offers a proportional control oven frequency standard (part no. 5024013701) which is a direct plug-in replacement for the TCXO. With the oven standard, frequency stability is better than $\pm 1 \times 10^{-8}$ over the full specified ambient temperature range of the radio.

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.

1.2.7 POWER SUPPLY – 1A6

The GSE-924 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. module. The exciter can operate from both A.C. and D.C. power sources, with the D.C. 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 GSE-924 contains an all solid state broadband power amplifier which will operate into 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 providing 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 removable (as a module) from the rear of the radio.

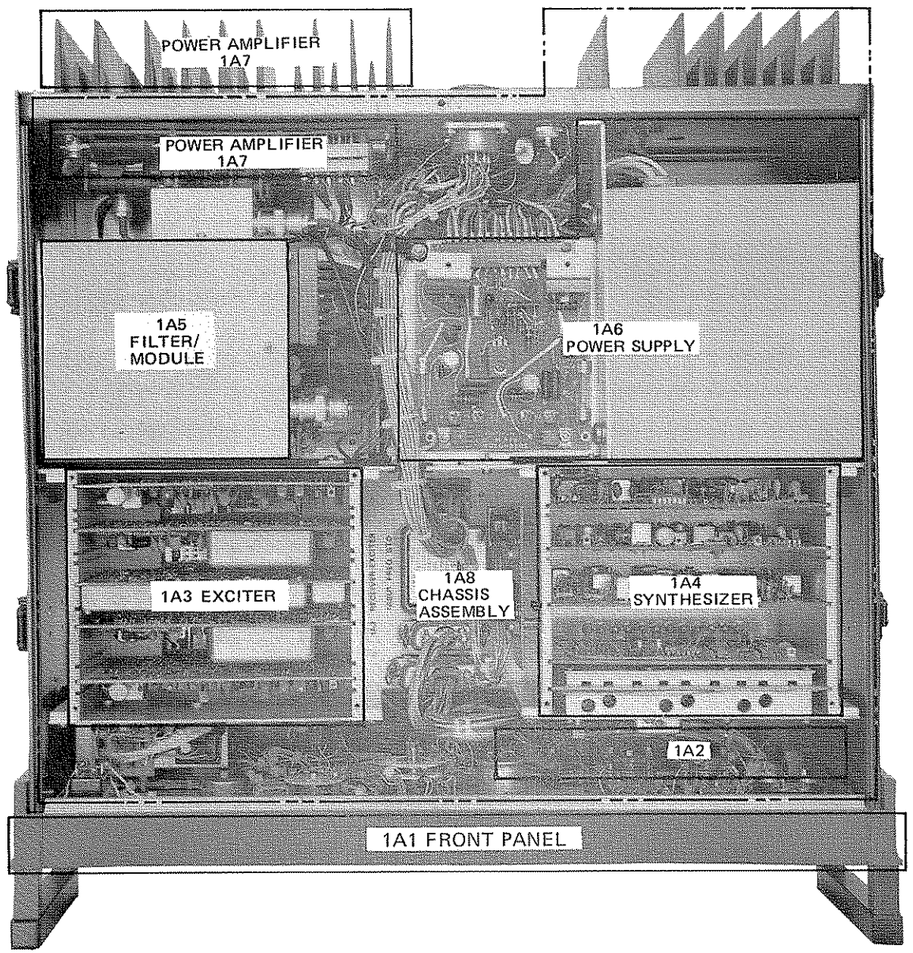


Figure 1.1 GSE-924, Major Assembly Locations

1.3 TECHNICAL SPECIFICATIONS

Electrical and physical specifications of the Sunair GSE-924 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. ($\pm 1 \times 10^{-8}$ optional, plug-in Proportional Oven).

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

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

DUTY CYCLE: Continuous.

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

HUMIDITY: 95% 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.

FRONT PANEL CONTROLS: Digital Frequency Control, VFO, Mode, Microphone Gain, Power on-off, USB/LSB MIC Selector, Light Dimmer, and optional plug-in antenna coupler control panel.

POWER INPUT: AC: 115/230 volts ±15%, 50-60 Hz; at 400 watts max.
DC: (optional) 13/26 volts,±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 TRANSMITTER

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

CARRIER SUPPRESSION: 50 db.

UNDESIRED SIDEBAND SUPPRESSION: 50 db at 1 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 GSE-924 Exciter.

		Sunair Part No.
1.4.1	Exciter, GSE-924 with 115/230 volt power supply.	8039001099 O.D. GREEN 8039001056 Gry
1.4.2	Hand Held Microphone Assembly	5024000609
1.4.3	Operating Manual ON AND maintenance manual	8039000505
1.4.4	Power Cord Assembly, 115V A.C. OR Power Cord Assembly, 230V A.C.	5024002059 5024002156
1.4.5	Ancilliary Kit, consisting of: ~~Extender card (to service P.C. boards)~~ ~~Spare bulbs~~ ~~Tuning tools~~	5024000455 115VAC 5024000498 230VAC
1.4.6	Temperature Compensated Crystal Oscillator (TCXO) Frequency Standard-mounts inside GSE-924	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 compatable equipment for the GSE-924. Part numbers and descriptions are given to facilitate ordering.

1.5.1	Antenna Coupler, Remote Controlled GCU-910A	5024200055 Gry 5024200098 O.D. GREEN
1.5.2	Control Cable for GCU-910A OR GCU-935 (specify length) Kilowatt Linear Power amp GSL-1900A	0588680001 6032001059 GRAY 6032001091 GREEN
1.5.3	Ancillary Kit for GCU-910A Includes: Connectors for item 1.5.2 above	5024300297

1.5.4	Antenna Coupler Tuning Control (mounts in Front Panel of GSE-924 to control item 1.5.1).	5024042352 Gry REFER TO 5024042395 O.D. Applicable manual
1.5.5	Coaxial Cable, type RG58/U (recommended for connecting antennas to the GSE-924, or for connecting the GSE-924 to the GCU-910A/GCU-935 where the length will be under 100 feet). SPECIFY LENGTH	0588130001
1.5.6	Coaxial Cable, type RG8/U (same as 1.5.5 above, but recommended where length will exceed 100 feet). SPECIFY LENGTH	0586640000
1.5.7	D.C. Inverter Module (Powers the GSB-900 from either 13 or 26 volt D.C. sources while still permitting operation from 115/230V A.C. mains). Module mounts inside GSE-924.	5024021304 98
1.5.8	Power Cord Assembly-D.C. (includes 10 feet of connecting cable). For use with item 1.57 above.	5024002296
1.5.9	C.W. Key (includes 3 foot cable and connector).	5024000994
1.5.10	Handset Assembly (with coiled cord and connector).	5024000790
1.5.11	ISB option.	8039004594
1.5.12	Desk Type Microphone with transistor amplifier (includes cable and connector).	5024000897
1.5.13	Shock Mount Assembly (recommended for mobile applications).	5024002598
1.5.14	Rack Mount Kit (adapts GSE-924 to mount in a standard 19 inch rack). Includes rack slides.	5024004051 Gry 5024004094 Grn
1.5.15	GCU-935 Automatic Antenna Tuner.	6035000096 O.D. 6035000053 Gry
1.5.16	Depot Spare Parts Kit for GCU-935	6035900097

1.5.17	Field Module Kit GSE-924	8039902002
1.5.18	Doublet Antenna Kit (Dipole)	0996240004
1.5.19	75 foot Long Wire Antenna Kit	0999200003
1.5.20	150 foot Long Wire Kit	0999210009
1.5.21	16 foot Mobile Fiberglass Whip Antenna (use with 1.5.22,1.5.23 or 1.5.24	0712950001
1.5.22	Heavy Duty Strap-Type Bumper Mount for 1.5.21 above.	0715730002
1.5.23	Right Angle Vehicular Mount for 1.5.21 above	5024402596
1.5.24	Heavy duty Feed-thru Mount for 1.5.21 above	5024402090
1.5.25	35 foot Fiberglass Base Station Whip Antenna.	0715850008
1.5.26	23 foot Fiberglass Marine Whip Antenna with Flange Base.	0715760009
1.5.27	23 foot Fiberglass Marine Whip Antenna.	0712980008
1.5.28	Laydown Mount for above.	0712990003
1.5.29	High Stability Proportional Oven Frequency Standard (replaces TCXO Standard inside GSE-924 to provide better than 1 x 10 Frequency Stability over full ambient termperature range).	5024013701
1.5.30	Depot Spares Kit GSE-924	8039000003
1.5.31	Depot Spare Parts Kit for GCU-910A Antenna Coupler.	5024900693
1.5.32	Blower Kit (mounts on rear panel). 115 VAC	5024006089
1.5.33	Blower Kit (mounts on rear panel) 220 VAC	5024006097

CAUTION

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

WARNING

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

SECTION 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 it's associated packing materials should it be necessary to reship damaged equipment.

Do not accept a shipment when there are visible signs of damage in 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 GSE-924 has been carefully designed to protect the exciter and its accessories during shipment. This carton and its associated packing materials should be used to reship 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

Satisfactory operation of this equipment will depend upon the care and throughness 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 separation between coupler output and the radio with its associated wiring. Coupler may be mounted up to 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 GSE-924 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 occuring.

2.4.2 BASE STATION INSTALLATION

The exciter is equipped with rubber feet so that it can be set directly on a table, desk or similar flat surface. The front feet are taller than the rear feet in order to tilt the transceiver at a convenient operating angle. Minimum clearances of 1 inch at the sides and 2 inches at the rear and top should be allowed to provide for adequate cooling of the rear panel 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 GSE-924 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.

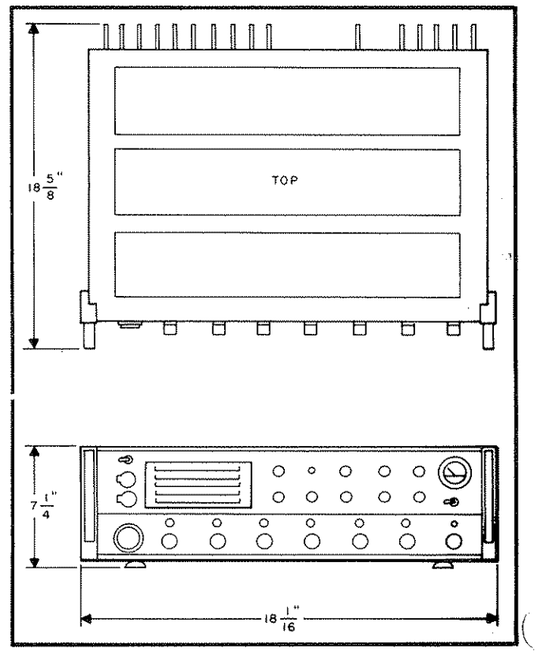


Figure 2.1 Outline Configuration

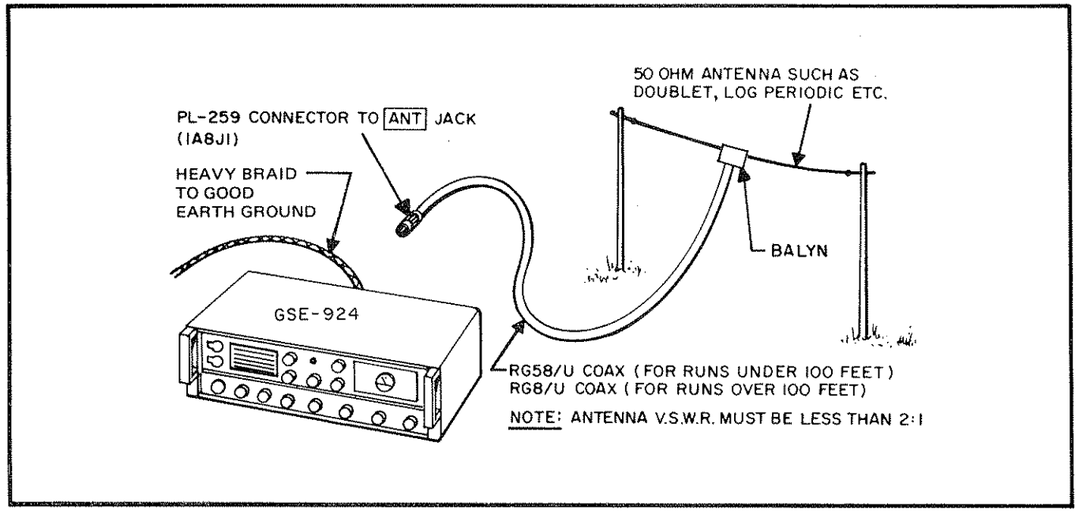


Figure 2.2 Base Station Installation (50 ohm Antenna)

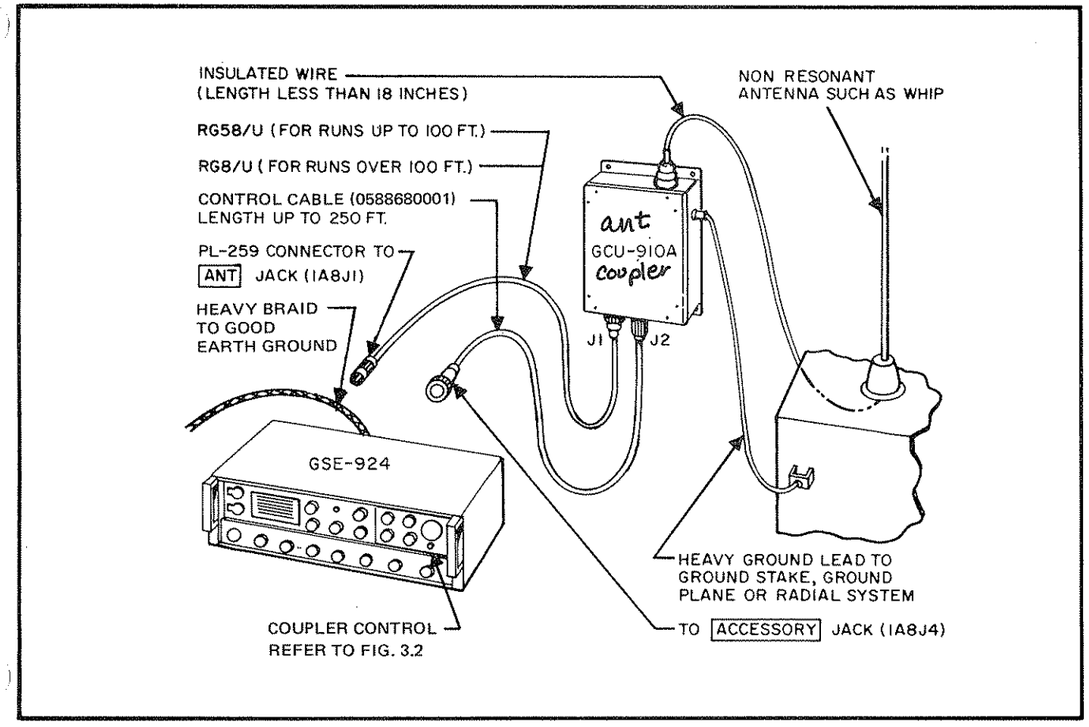


Figure 2.3 Base Station Installation (Non-Resonant Antennas)

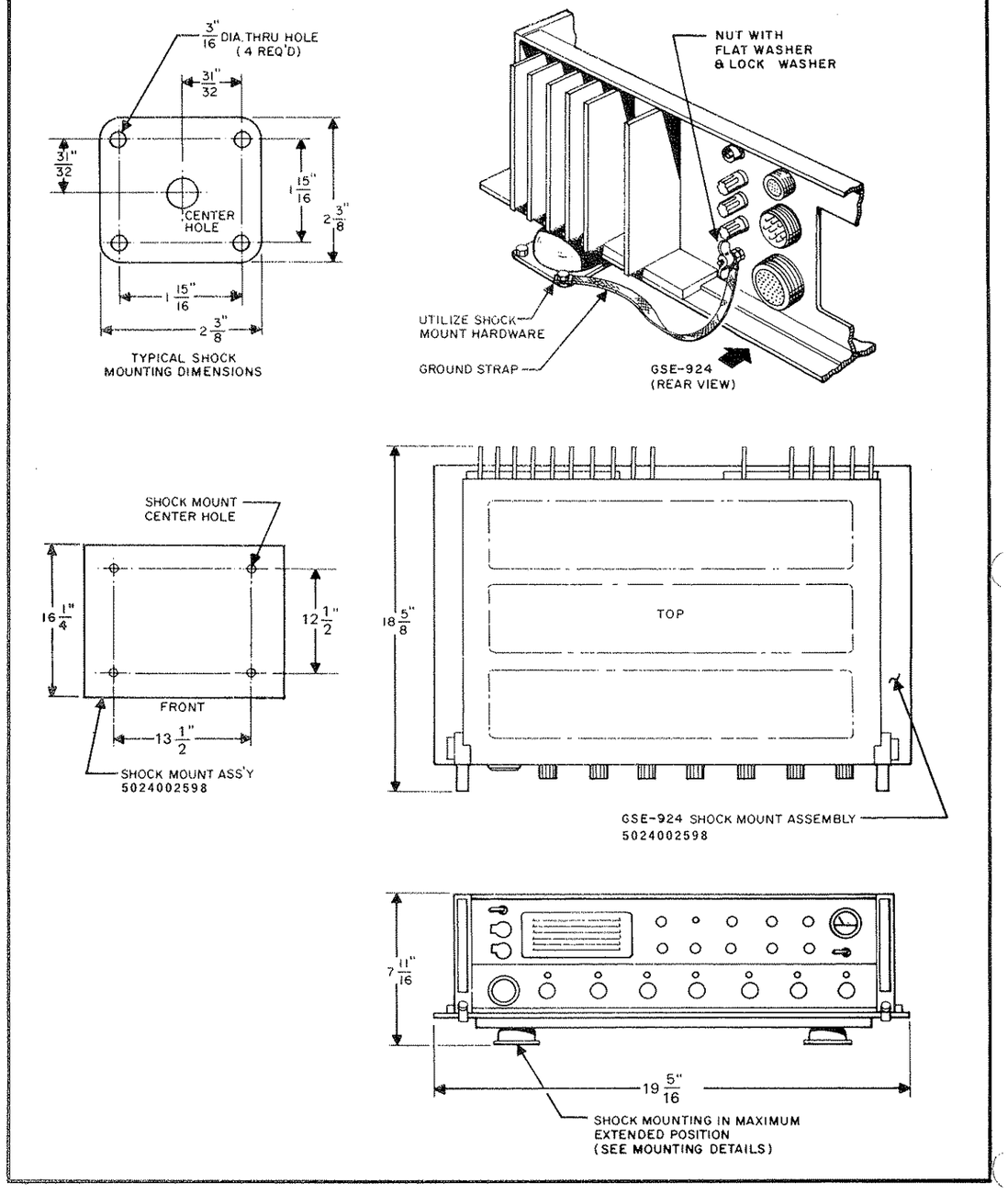


Figure 2.4 Shock Mount Assembly and Details

2.4.3 VEHICULAR INSTALLATIONS

The GSE-924 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 GSE-924 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.

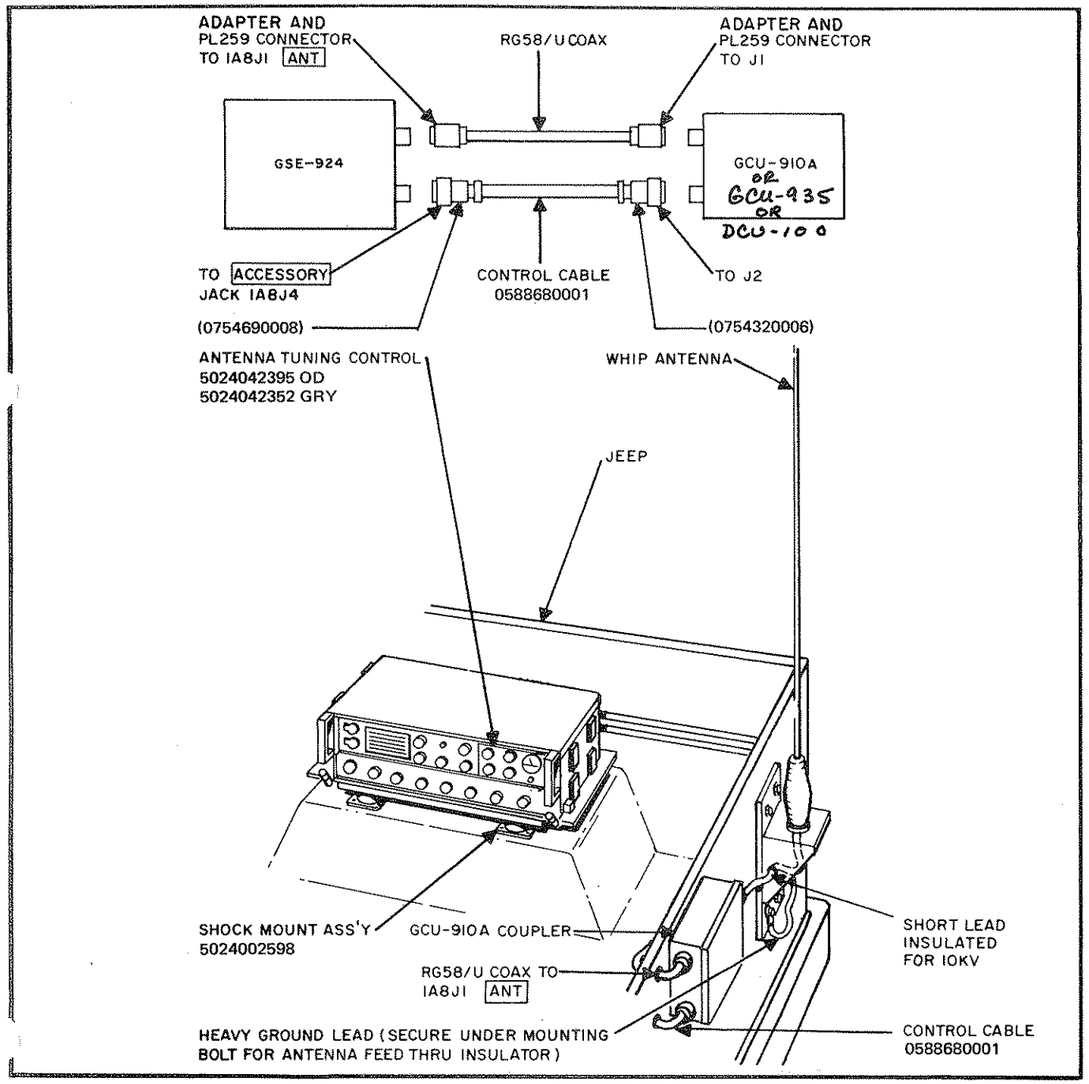


Figure 2.5 Typical Vehicular Installation

TOWER FASTENERS
Distributors of Quality Fasteners and Electronic Hardware
Kent Hawkins
Side rales for
where made
EMCOR.
2954 N.W. 60th Street Fort Lauderdale, FL 33309
Tel: 954-973-7133 Toll Free: 800-388-6937 Fax: 954-971-2265

.4.5 RACK MOUNTED INSTALLATIONS

he GSE-924 may be conveniently mounted in a andard 19 inch rack using the Rack Mount Kit 024004094 Grn, 5024004051 Gry). The kit in- des a pair of rack slides, associated hardware d filler panel. The GSE-924, in the rack mounted figuration, requires a standard panel space n inches high. Refer to figure 2.6 for assembly ils.

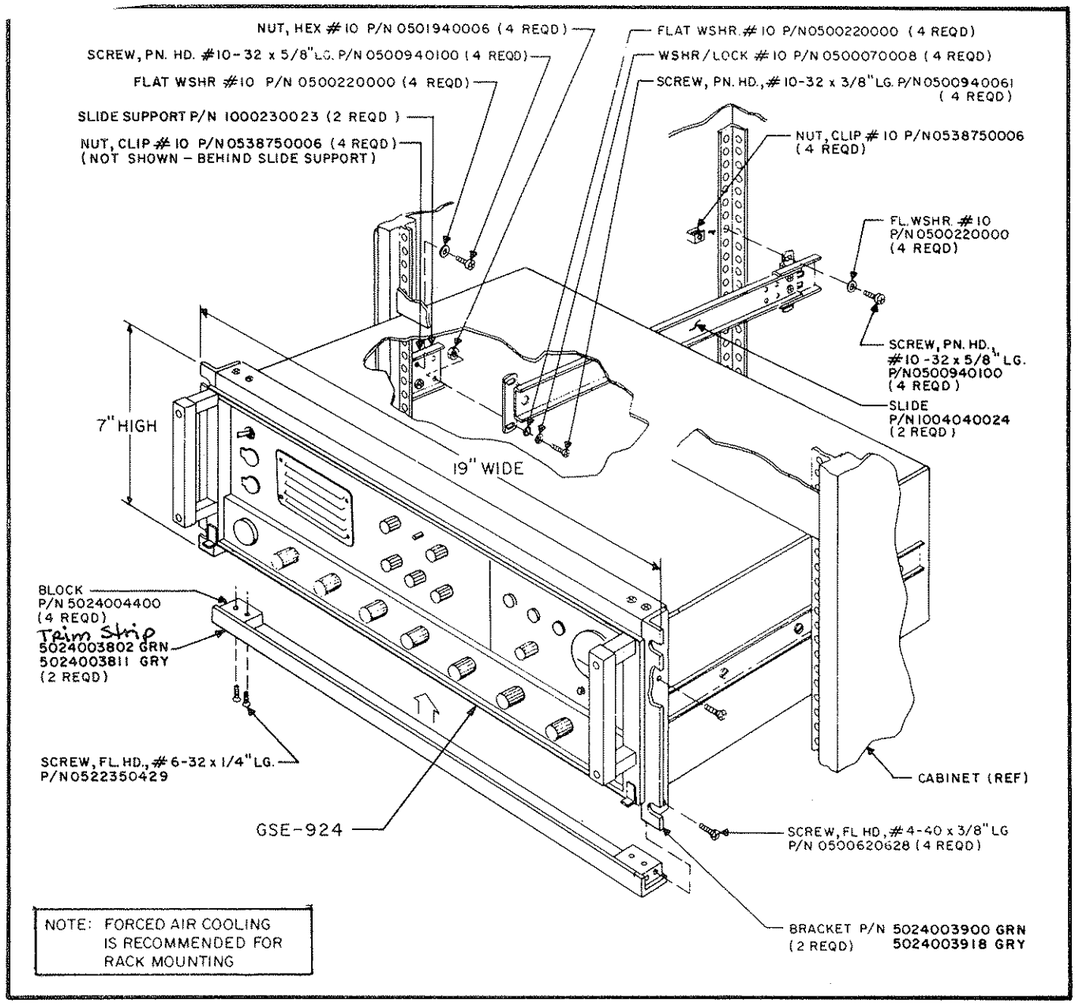


Figure 2.6 Rack Mounted Installation

2.5 ANTENNAS AND GROUND SYSTEMS

2.5.1 GENERAL

The GSE-924 system 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 Couplers, 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 Organization.

Some general "DO'S" and "DONT'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 couplers 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.

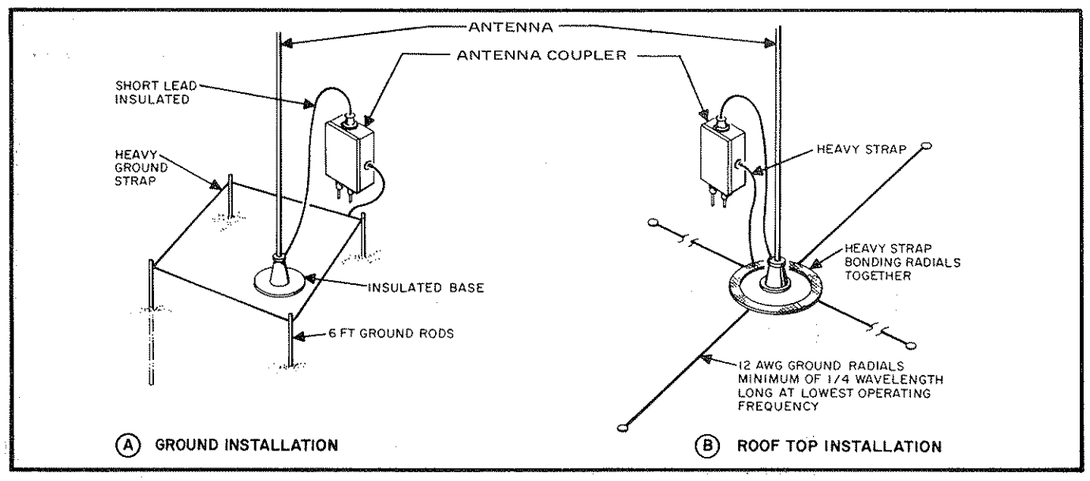


Figure 2.7 Whip Antenna

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 (PN0996240004). 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 exciter. 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 ship'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

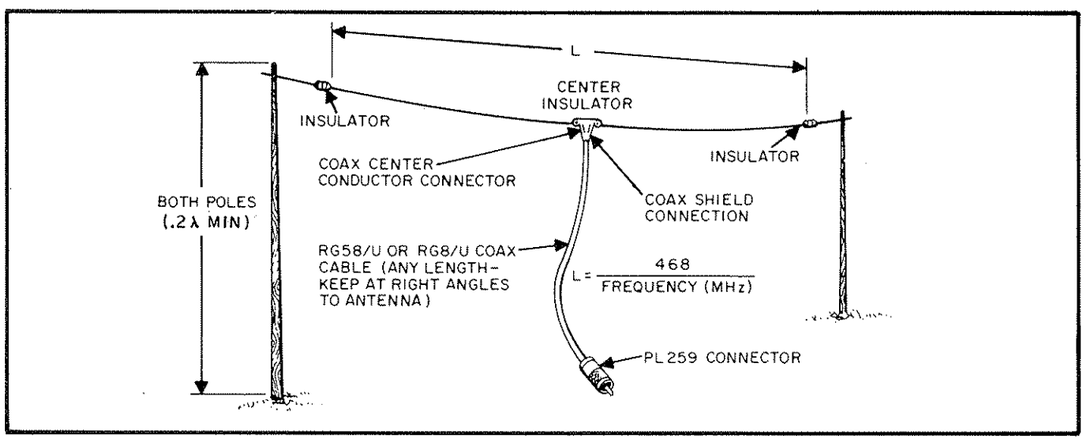


Figure 2.8 Doublet Antenna

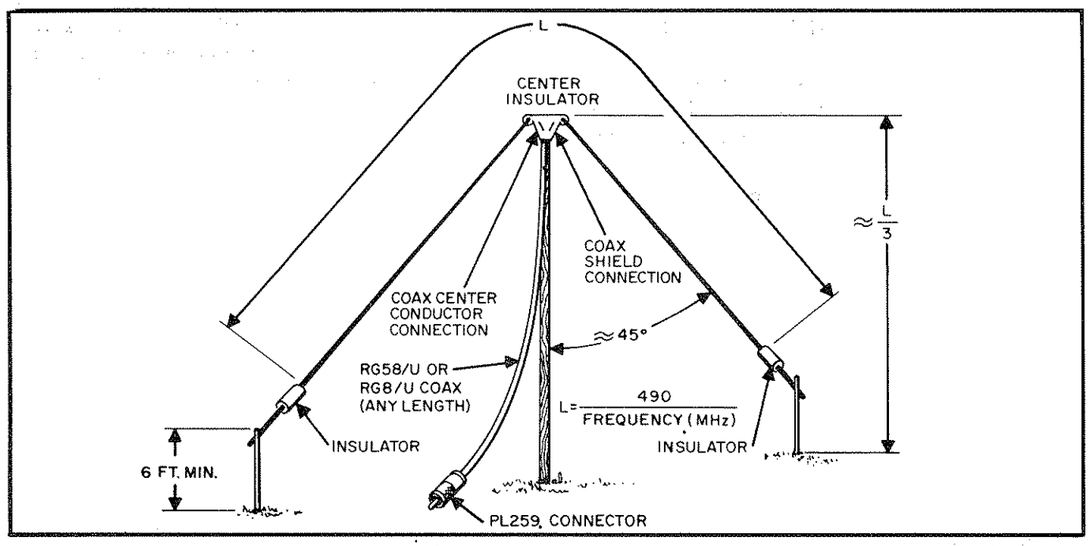


Figure 2.9 Inverted 'V' Antenna

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 exciter with an antenna coupler. The antenna couplers will efficiently match long wire antennas up to 150 foot 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.

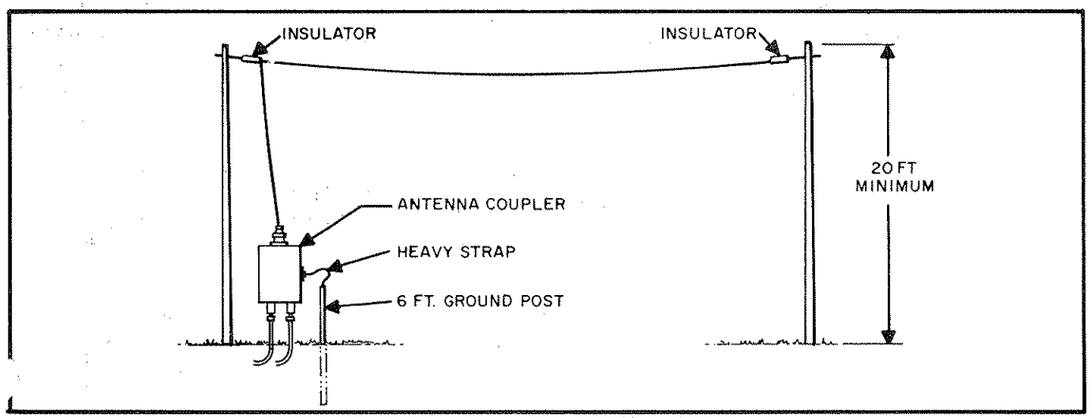


Figure 2.10 Long Wire Antenna

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.

2.6 POWER REQUIREMENTS

2.6.1 OPERATION FROM ALL A.C. POWER SOURCES

As supplied from the factory, the GSE-924 is wired for continuous operation from 115 or 230 volt ±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 2.11). The nominal line voltage is normally specified by the customer at the time of ordering and the proper A.C. power cord is shipped with the radio. Figure 2.12 shows the line cord assembly wiring for 115 volt operation while Figure 2.13 shows the 230 volt wiring.

CAUTION

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 2.14 and check fuses F1 and F2 on the rear apron to make sure the proper value has been inserted in the fuse holders.

2.6.2 A.C. OPERATION UNDER HIGH LINE VOLTAGE CONDITIONS

The GSE-924 power supply contains a special provision to allow continous operation at line voltages of 115 or 230 volts +35% or -5%. This feature allows cooler (and therefore more reliable) operation under these high line voltage conditions. The radio may be wired for high line voltage operation by changing connections on terminal strip 1A6TB1 on the power supply (refer to Figures 2.15 and 2.16). The GSE-924 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	2.12, 2.15
132	112 to 152	115V	2.12, 2.16
230	186 to 264	230V	2.13, 2.15
265	224 to 304	230V	2.13, 2.16

Figure 2.11 A.C. Line Voltage Range Table

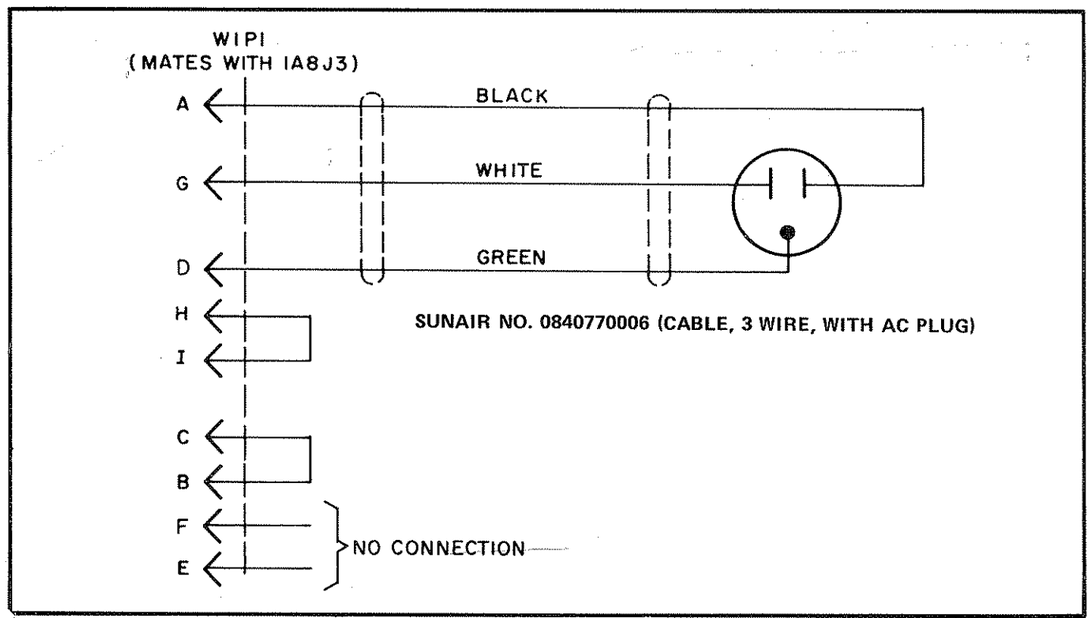


Figure 2.12 115 VAC Power Cord Schematic

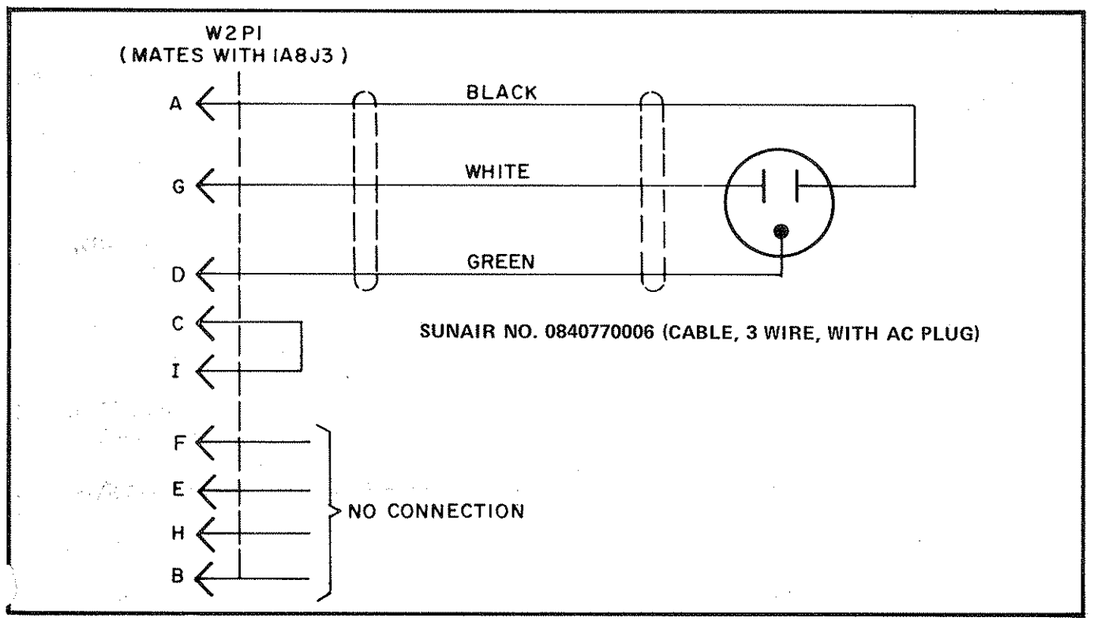


Figure 2.13 230 VAC Power Cord Schematic

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 2.16).

2.6.3 OPERATION FROM D.C. POWER SOURCE

If the GSE-924 is equipped with the optional D.C. Inverter Module (Sunair part no. 5024021398) operation from D. C. power sources of 13 or 26 volts ±10%, positive or negative ground, is possible. The GSE-924 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 the 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 2.17) on the power supply and on the D.C. Inverter assembly 1A6A2. The Power Cord wiring for D.C. operation is shown in figure 2.18.

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.

The GSB-924 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 Cable

DESIGNATOR	FUNCTION	LOCATION	TYPE AND RATING
1A8F1, 1A8F2	A.C. Line	Rear Apron	For nominal 115V input, use type MDL (SLO-BLO), 5 amp. P/N0858660008. For nominal 230V input, use type MDL SLO-BLO, 3 amp. P/N896660001
1A8F3	D.C. Line	Rear Apron	For nominal 13V input, use type MDL (SLO-BLO), 30 amp. P/N0846300001. For nominal 26V input, use type MDL (SLO-BLO), 15 amp. P/N0848500008.
1A6F1	+28V	Power Supply	Type 3AG, 15 amp. P/N0848740009
1A6F2	+12V	Power Supply	Type 3AG, 3 amp. P/N1002550009
1A6F3	+5V	Power Supply	Type 3AG, 3 amp. P/N1002550009

Figure 2.14 GSE-924 Fuse Table

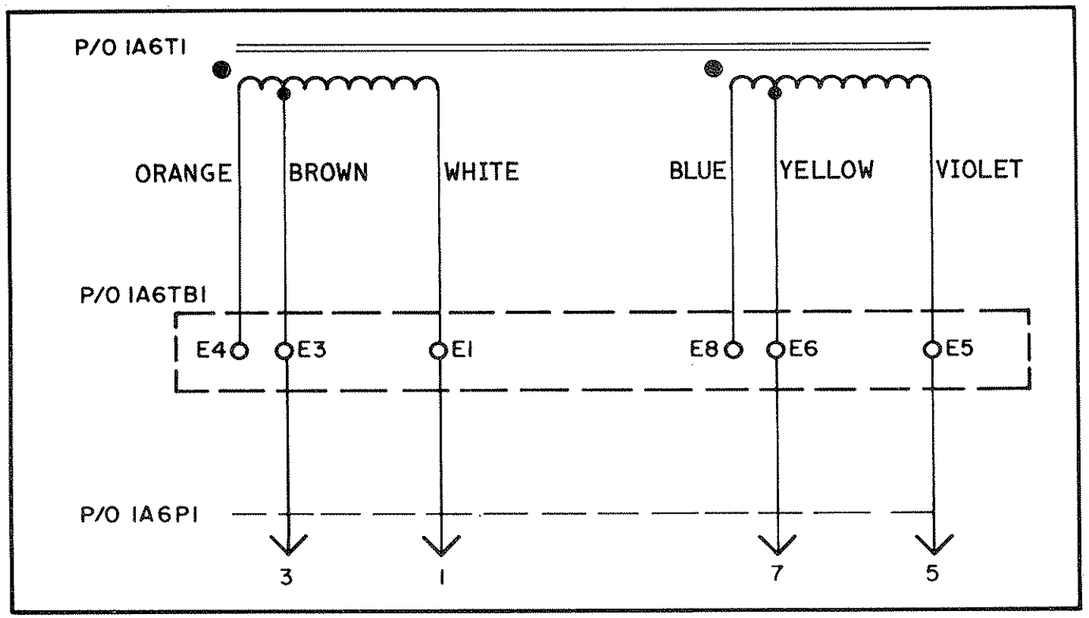


Figure 2.15 Power Supply Wiring – 115V or 230 VAC Inputs

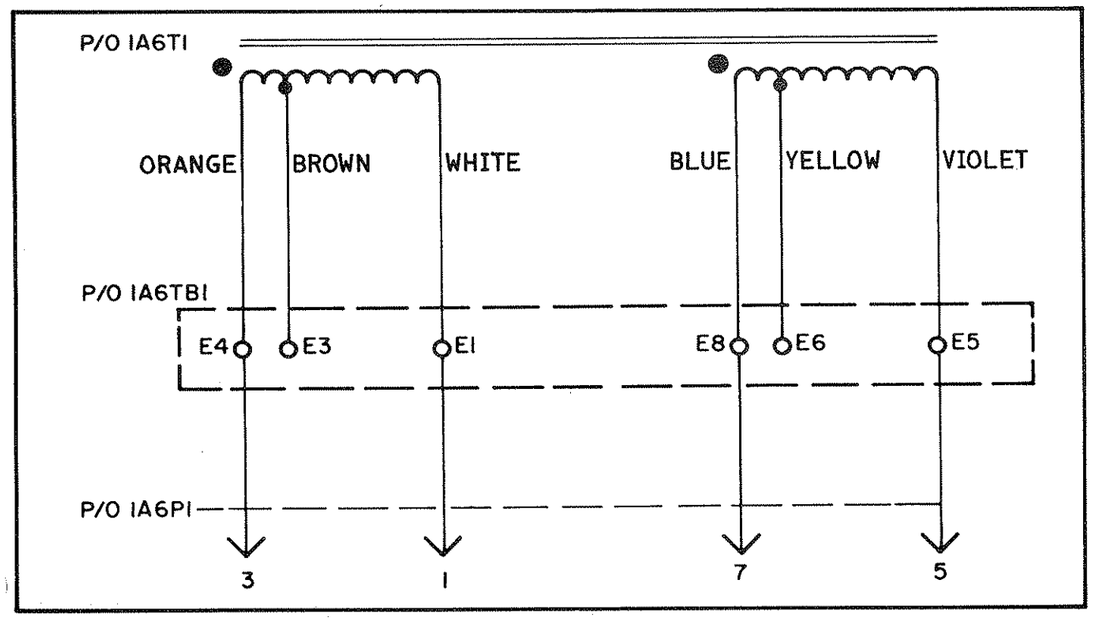
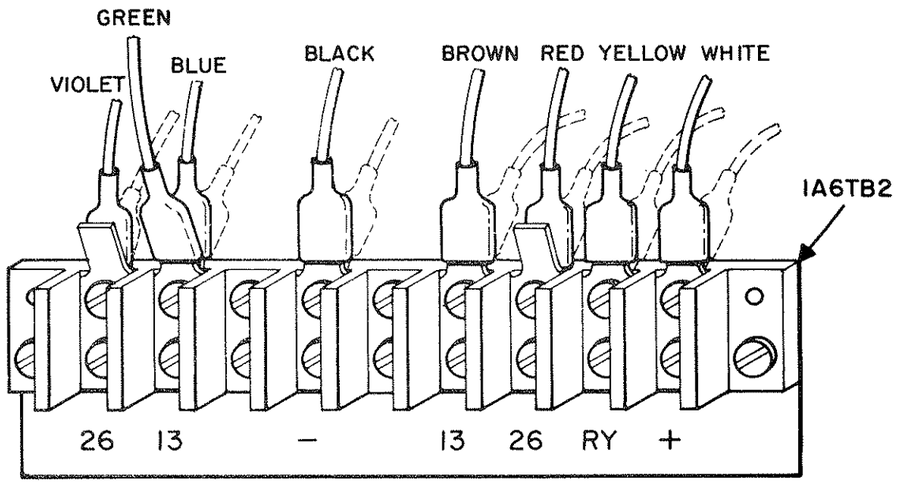
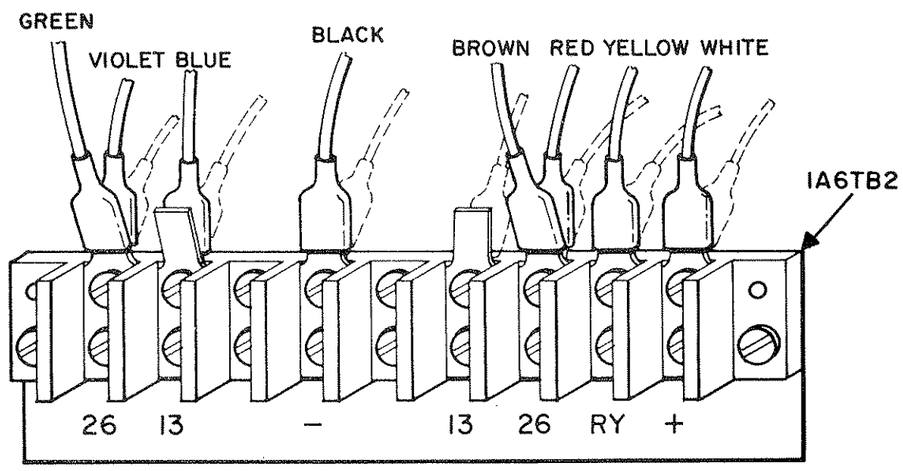


Figure 2.16 Power Supply Wiring – 132 V or 265 VAC Inputs



CONNECTIONS SHOWN ABOVE FOR 13VDC OPERATION
NOTE: SWITCH (S1) ON D. C. MODULE MUST BE SET TO 13V POSITION



CONNECTIONS SHOWN ABOVE FOR 26 VDC OPERATION
NOTE: SWITCH (S1) on D.C. MODULE MUST BE SET TO 26V POSITION

Figure 2.17 D.C. Inverter Connections to Power Supply Terminal Strip 1A6TB2

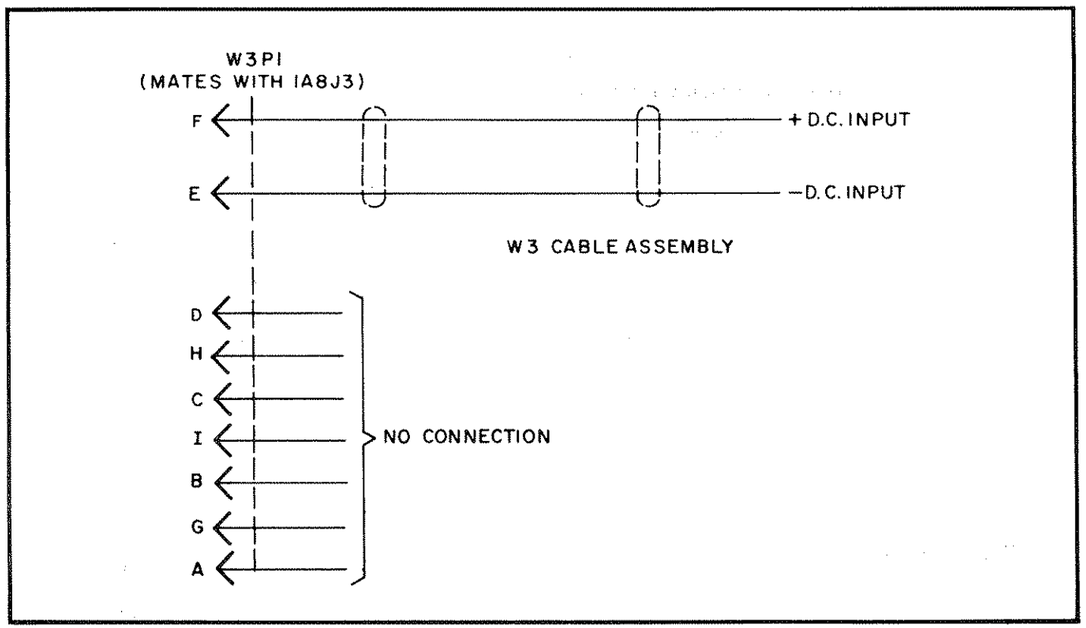


Figure 2.18 D.C. Power Connector Schematic

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 2.14 and check that the correct value of fuse F3 (on the rear apron of the radio) has been inserted in its fuse holder.

2.8 INSTALLATION CHECKOUT

When the installation is complete, refer to section 3 (OPERATION) and fully check the operation of the GSE-924 system. It is often helpful to have a second system in known good working order to listen to both the transmit and receive audio quality.

Table 2.1
MATING CONNECTORS TO GSE-924 AND ACCESSORIES

DESCRIPTION		DESIGNATOR	MATING PARTS		
			Connector	Cable Clamp	Rubber Boot(s)
			Sunair Part Numbers		
GSE-924	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-910 OR GCU-935 OR DCU-100	RF Input	J1	0747020001 (Note 2)	–	–
	Control Unit	J2	0747640009	Included with Connector	0700550054 0700540062 0700550071

NOTE

1. *When used with RG-58/U Coax, use Adapter No. 0742070000.*

2. *When used with RG-8/U Coax, use connector No. 075410008.*

SECTION 3
OPERATION

3.1 GENERAL

This section provides information and instructions required for proper operation of the GSE-924 Exciter and GCU-910A Antenna Coupler, Refer to the accessory section of the manual for operation of other optional equipment.

3.2 FRONT PANEL OPERATING CONTROLS

3.2.1 Listed below are description of all controls, indicators and connectors located on the front panel of the GSE-924 Exciter. They are illustrated in Figure 3.1.

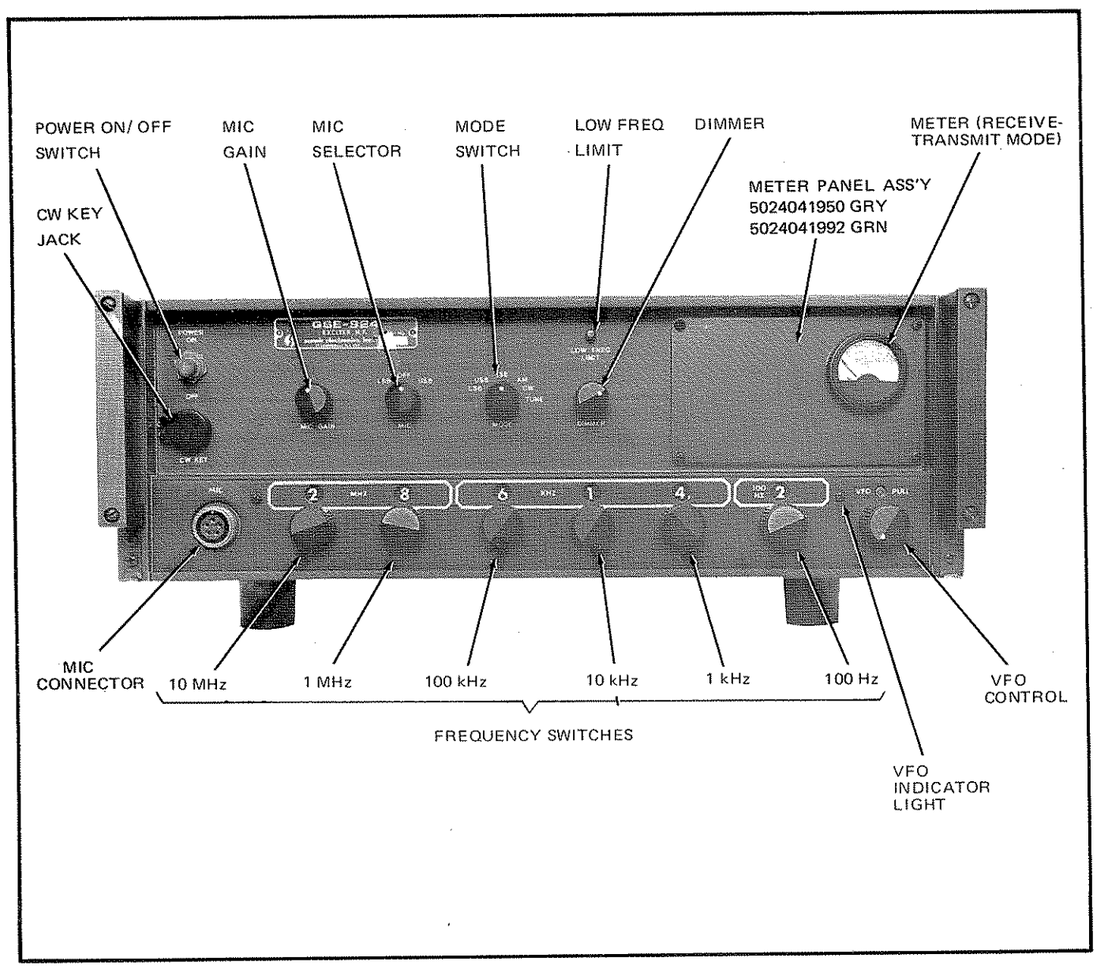


Figure 3.1 GSE-924, Exciter Front Panel

FREQUENCY SWITCHES (6) . . . . . Selects the operating frequency:

10 MHz switch, 1 MHz switch,
100 kHz switch, 10 kHz switch,
1 kHz switch, 100 Hz switch.

MODE SWITCH

SWITCH POSITION	EQUIPMENT RESPONSE
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.

MIC GAIN. . . . . Controls microphone input level to the exciter in TRANSMIT mode.

MIC SELECTOR. . . . . Connects MIC input for use with USB or LSB operation.

KEY jack ..... Accepts standard 1/4 inch 2 circuit plug (such as PJ-055B) from C.W. telegraph key.

DIMMER control ..... Controls intensity of frequency display and meter illumination.

MIC connector ..... For connection of dynamic microphone with built-in push-to-talk (PTT) switch. Mates with standard MS connector MS3106A (14S-O5P).

METER (if optional Coupler Control Panel is NOT supplied) ..... TRANSMIT mode: indicates relative power output.

VFO (potentiometer control with pull-on, push-off switch) ..... a) VFO OFF mode (control pushed in): frequency controlled solely by the 6 frequency knobs in 100 Hz steps.
b) VFO ON mode (control pulled out): vernier ±5 kHz range is provided. VFO ON indicator light is lit in this mode.

VFO indicator light ..... Lights when in VFO mode.

LOW FREQUENCY LIMIT indicator light ..... Lights when a frequency below 1.60000 MHz has been selected. The Exciter is also disabled when this condition occurs.

3.3 GCU-910A ANTENNA COUPLER CONTROLS (optional)

3.3.1 All operating controls and indicators contained in the Antenna Coupler Control Panel, which mounts on the front panel of the GSE-924, are described below. Refer to Figure 3.2

COARSE INPUT ..... Selects fixed input loading capacitors in Antenna Coupler: 7 position rotary switch. Position #1 selects lowest capacitor value. Capacitor values increase with clockwise rotation of switch. Used in conjunction with FINE INPUT switch.

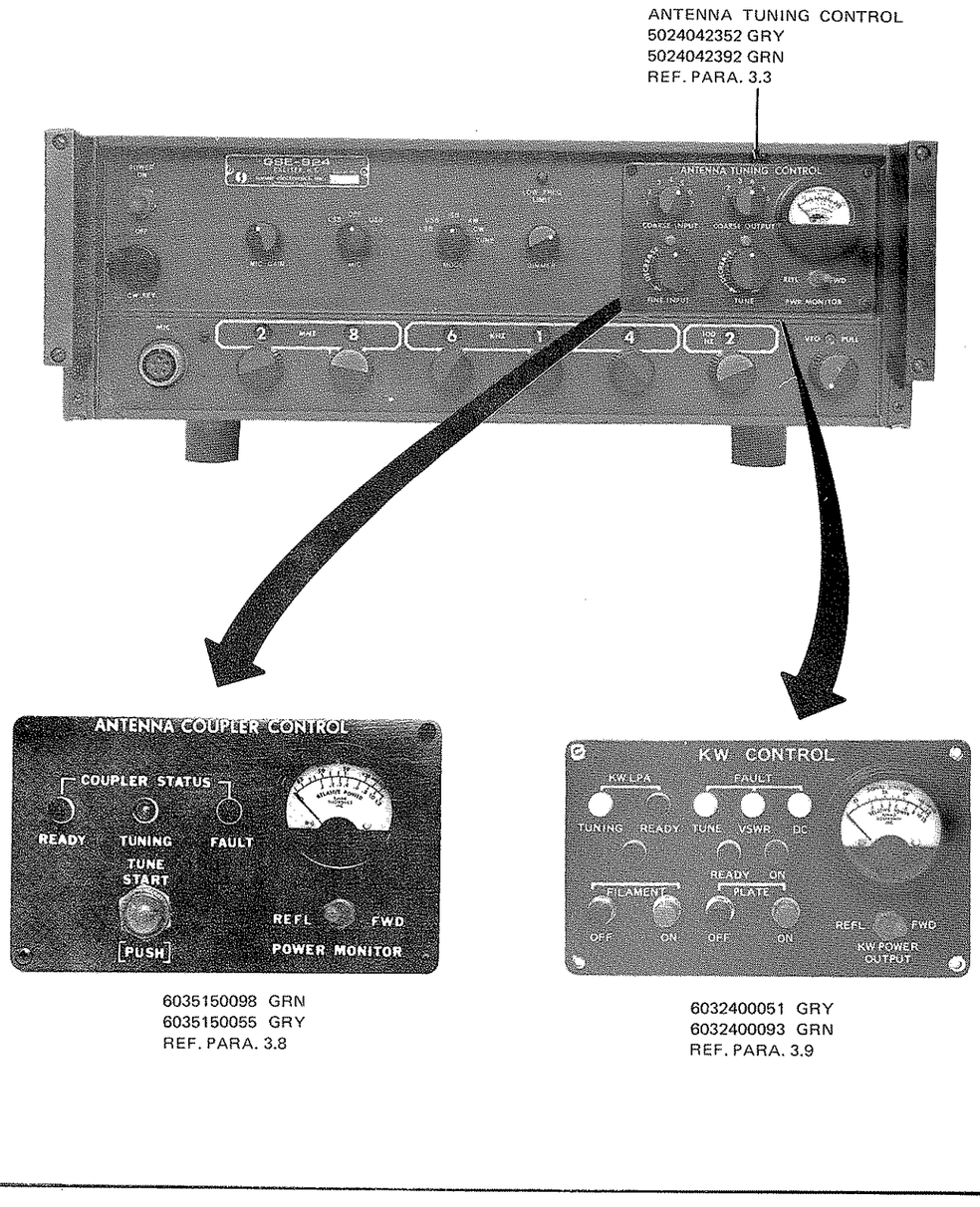


Figure 3.2 Optional Antenna Tuning Controls

COARSE OUTPUT ..... Selects fixed values of output loading capacitors in Antenna Coupler: 6 position rotary switch. Position #1 selects lowest capacitor value. Capacitor values increase with clockwise rotation.

FINE INPUT ..... Controls Fine Input (vernier) loading capacitor in Antenna Coupler: 4 position spring-loaded rotary switch with center-off position. Progressive rotation of switch in counter-clockwise direction produces first slow, then rapid decrease in input loading capacitance. Progressive rotation of switch in clockwise direction produces first slow, then rapid increase in input loading capacitance. Switch operates in conjunction with END LIMIT indicator light located directly over control.

FINE INPUT END LIMIT indicator light ..... Located directly over FINE INPUT switch. Indicates that the Fine Input loading capacitor is at either end of its adjustment range.

TUNE control ..... Operating similar to FINE INPUT switch above, except switch controls TUNE inductor in Antenna Coupler. Operates in conjunction with END LIMIT indicator light located directly over control.

TUNE END LIMIT indicator light ..... Located directly over TUNE switch. Indicates that the TUNE inductor in the Antenna Coupler is at either end of its adjustment range.

PWR MONITOR Switch ..... Switches meter indication. FWD indicates forward RF power on coax at input to Antenna Coupler.

REFL-indicates reflected RF power on coax at input to Antenna Coupler. A null in this reading indicates that the antenna is correctly matched to the exciter.

METER ..... Forward or Reflected Power Meter controlled by PWR MONITOR switch (see above).

3.4 REAR APRON FUSES AND CONNECTORS

3.4.1 Refer to Figure 3.3 for location.

ANT (1A8J1) ..... ANTENNA connector: R.F. input/output of unit. Mates with standard PL-259 RF connector.

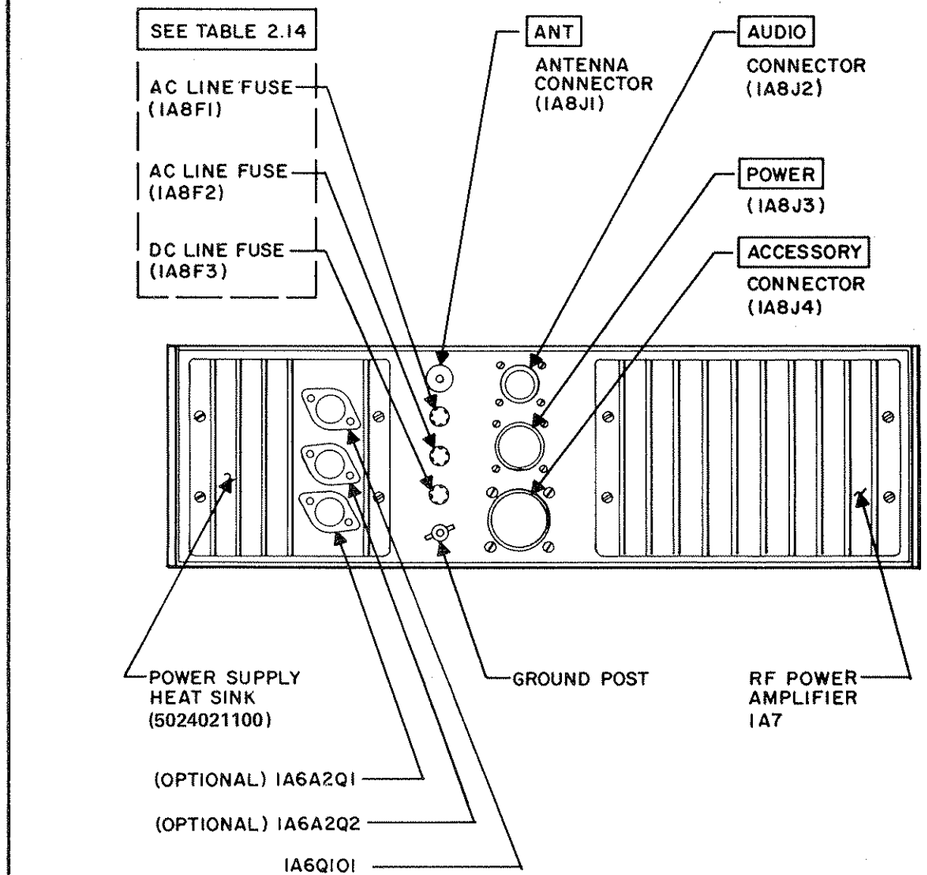


Figure 3.3 GSE-924 Rear Aprons Components and Connectors

AUDIO (1A8J2)	AUDIO connector: for connection of 600 ohm balanced AUDIO OUTPUT and AUDIO INPUT. Mates with standard MS connector MS3106A (18-19P).
POWER (1A8J3)	POWER connector: for connection of A.C. or D.C. power to the exciter (see Section 2.6). Mates with standard MS connector MS3106A (24-11S)
ACCESSORY (1A8J4)	ACCESSORY connector: For connecting accessory equipment such as the GCU-910 Antenna Coupler. Mates with standard MS connector MS3106A (28-21P).
FUSES (F1, F2, F3)	A.C. and D.C. input line fuses (see Table 2.14).
GROUND POST	Refer to Section 2, paragraph 2.4.1 (b).

3.5 OPERATING THE GSB-924 INTO A 50 OHM ANTENNA

3.5.1 PREPARATION FOR OPERATION

If the Antenna system is being used for the first time, it is important to check the Antenna voltage standing wave ratio (V.S.W.R.) by following the procedures outlined below:

a) Connect a "THRULINE" wattmeter with a 100 watt full scale range in the antenna line near the exciter. Make sure all connections are secure.

b) Connect a microphone to the MIC connector (1A1J1) on the front panel. If any inputs are connected to the AUDIO connector (1A8J2) on the rear apron, they should be temporarily disconnected.

c) Set the MIC GAIN control on the front panel fully counter-clockwise.

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

e) Refer to table 2.14 and check that the proper line fuses have been installed.

f) Connect the radio to its power source.

g) Place the MODE switch in the AM position.

h) Depress the "push-to-talk" (PTT) button on the microphone. Observe the forward power on the "THRULINE" wattmeter. The forward power should be approximately 30-40 watts.

i) Depress the PTT button and observe the reflected power on the "THRULINE" wattmeter. This reading should be less than 11% of the reading abtained in h) above.

NOTE

A reflected power ratio of 11% corresponds to a V.S.W.R. of 2:1

If the conditions of (i) above are met, the antenna system is adequate and the system may be placed in full operation (see section 3.5.2). If the reflected power ratio is greater than 11%, the antenna system impedance should be corrected before continuing.

NOTE

If the V.S.W.R. is extremely high the "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 the MODE switch to AM. If the condition persists, substitute a 100 watt, 50 ohm dummy load for the antenna system. If the problem clears up, an extremely high antenna V.S.W.R. should be suspected and the proper corrective measures taken before proceeding.

3.5.2 OPERATION (WITH 50 OHM ANTENNAS)

Check to see that the antenna is securely connected to the Exciter. 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 R58 on the AUDIO XFMR BOARD (1A8A1) to minimum by turning it at least 10 turns counterclockwise. Follow the steps outlined below:

a) Turn the MIC GAIN control fully counterclockwise.

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

c) Set the six frequency control switches to the desired operating frequency. Set the VFO control in the "in" (off) position.

d) If being used in LSB or USB modes: Speak into the microphone and advance the MIC GAIN until no further output (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 sidetone to the transmit section is preset at the factory. No adjustment of the MIC GAIN control is necessary.

NOTE

In CW position, the transmitted signal is acutally 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 GSE-924 frequency dials 1 KHz below the desired CW carrier frequency.

If the remote audio input is in use: Potentiometer 1A8A1-R1 is used to control the transmit audio level instead of the MIC GAIN control on the front panel. If the ISB option is in use, 1A8A1-R1 controls USB audio and 1A8A1-R2 controls LSB. When the point of maximum power is found, advance R1 2 turns further to set the ALC.

3.6 OPERATING THE GSE-924 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 using the GCU-910A antenna coupler. 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 2.14 and check that the proper line fuses have been installed.

d) Set the MIC 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.

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.

i) 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 fully 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, ISB, AM, or CW).

p) If being used in LSB or USB modes: Speak into the microphone and advance the MIC 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 MIC GAIN control is necessary.

NOTE

In 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 GSE-924 frequency dials 1 KHz below the desired CW carrier freq.

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 MIC 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 POWER switch in the OFF position, wait 15 seconds, and return POWER

switch to on. If the condition persists, repeat the antenna coupler tuning procedure.

CAUTION

Whenever the frequency is changed, the antenna coupler must be retuned. 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.

3.7 ISB OPERATION

3.7.1 USB AND LSB 500 OHM AUDIO

The upper and low sideband audio input levels must be reduced to a level which will provide a power output of 50 watts per channel when independent sideband operation is required. Separate 600 ohm inputs are provided on the audio jack, 1A8J2 mounted on the rear panel. Upper sideband audio is applied to pins B and C, lower to pins E and F. Level adjustments are provided on the audio transformer P.C. Board 1A8A1. Potentiometer 1A8A1R5 is used to set the USB level and 1A8A1R6 the LSB.

A peak reading VTVM calibrated in RMS units such as the Hewlett-Packard 410B may be used as an accurate power output indicator when the exciter is terminated with a non-inductive 50 ohm load. The audio input level to each sideband is adjusted to provide 50 volts RMS on the VTVM with no input to the other channel. A 1000 Hz and a 1800 Hz audio signal provides a 2-tone test signal. The VTVM should read 70.7 volts if the individual input levels are adjusted correctly.

If the VTVM or a suitable oscilloscope is not available, the relative power output meter on the GSE-924 can be used to set the input levels. Key the exciter in the CW mode and observe the output level on 1A2M1 which corresponds to 100 watts output. The upper and lower sideband levels should then be adjusted for 1/2 the indication previously obtained in the CW mode.

3.7.2 ISB MICROPHONE LEVEL ADJUSTMENT

If it is desired to use the microphone on one of the sidebands instead of one of the external audio inputs, position the front panel MIC selector to the desired sideband and use the MIC gain potentiometer to adjust the level for 50 watts output, as previously described.

3.7.3 ISB OPERATION WITH THE GSL-1900A

The audio input levels are adjusted in the same manner as previously described when the GSL-1900A kilowatt power amplifier is used with the exciter. If a VTVM is used as the output indicator, a level of 223 volts should be obtained for 1000 watts output and 150 volts indicates 500 watts. The GSL-1900A wattmeter, can of course be used to set the audio levels if so desired.

3.8 GCU-935 AUTOMATIC ANTENNA TUNER CONTROLS (OPTIONAL)

(Contained on Antenna Tuning Control Panel which mounts in the front panel of the GSE-924.)

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 GSE-924 MODE switch is switched from any position to CPLR TUNE or KW TUNE. 3. When the time delay runs out (approximately 40 seconds after initiation of a tune start pulse). 4. When a tune cycle has been initiated and the GSE-924 MODE switch is moved from CPLR TUNE or KW TUNE positions. 5. Any time the reflected power exceeds a threshold determined by the setting of the GAIN control. (This normallyis less than 5 watts reflected power.)
TUNING	This light is illuminated only during a tune cycle (when the transmitter is keyed on).
READY	This light is illuminated after a tuning cycle has been completed and the tuner has tuned to a VSWR less than 1.5:1.
POWER MONITOR	Switches meter input when in TRANSMIT mode:
Switch FWD	Indicates relative forward RF power in coax at the input to the antenna tuner.
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.

3.9 KW CONTROL UNIT, 1A2 (OPTIONAL)

The KW Control Panel 1A2, which is designed to mount in the space provided in the front panel of the GSE-924 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

The control and indicator locations are shown in Figure 3-2.

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

The discussion of the theory of operation of the GSE-924 will be presented in seven parts: synthesizer, exciter, RF power amplifier, power supply, filter module, antenna tuning control, and meter 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 GSE-924. 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 synthesized 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 Reference. 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 Reference.

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 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 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 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 5.12.

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(to 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 forth 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.

The 20 MHz reference from U3 is amplified by U8 and applied as the second input to the balanced mixer. The resultant 21 MHz signal 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, C48 and C49) and then matched to 50 ohms by emitter follower, Q4.

The flip-flop (U10) is disabled by switch (Q3) disabling 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 5.13.

4.2.3.1 GENERAL

The Low Digit Generator (1A4A2) generates the 100 Hz, 1 kHz and 100kHz 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

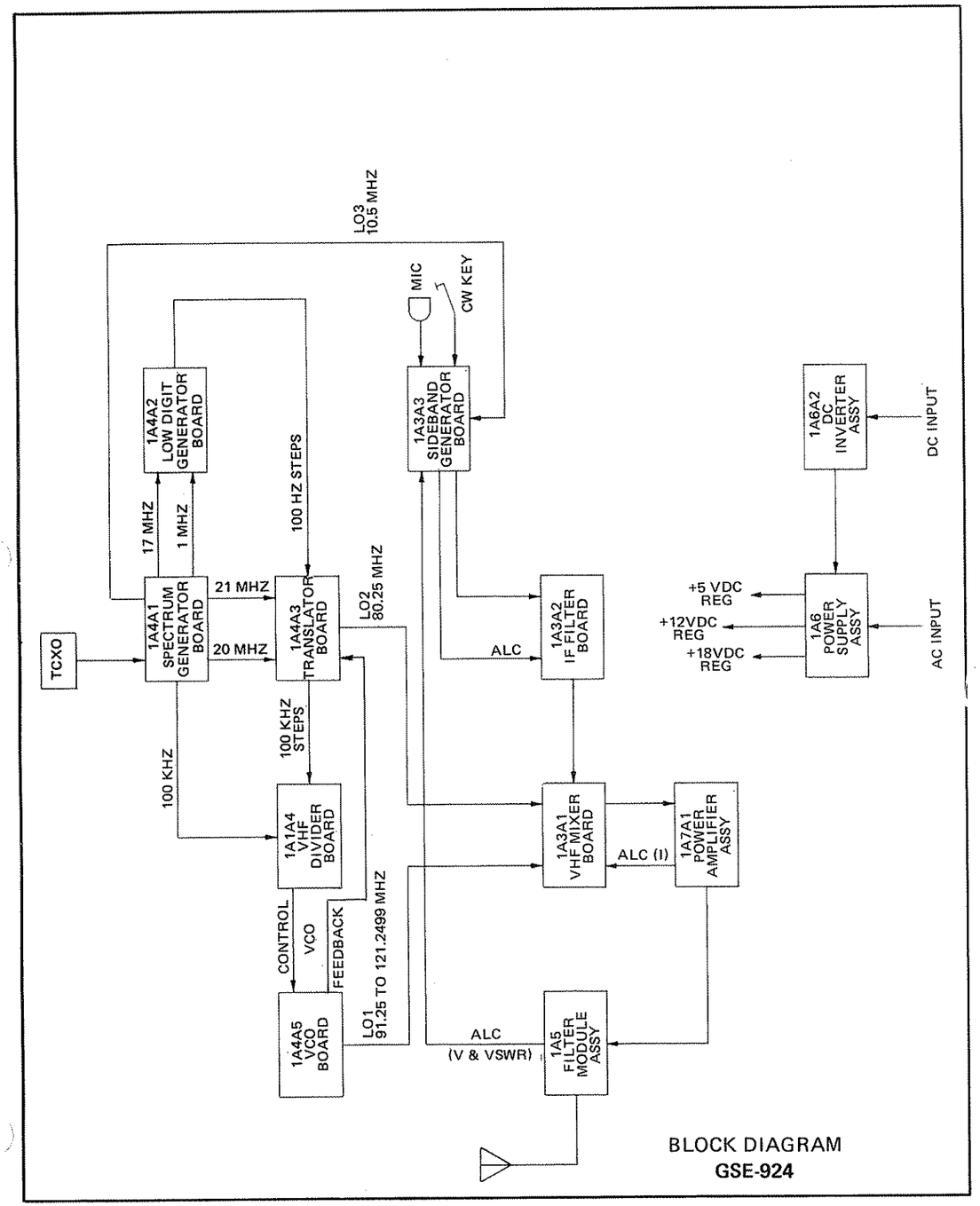


Figure 4.1 Overall Block Diagram GSE-924

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 7.6 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:

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

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 5.14.

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, C97 and C47 tunes the circuit to resonance at 80.75 MHz. A small sample of oscillator output is taken from the junction of C97, C47 and Y2 and is fed to Amplifier Q9. The 2nd L.O. output to the 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 100.75 MHz bandpass filter selects the desired sum frequency while rejecting the 80.75 MHz and 60.75 MHz components. 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 V.F.O. The mixer is a doubly-balanced mixer design using hot carrier diodes and balun transformers. 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. 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 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, C31, 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 5.15.

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 developes 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:

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

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

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

$N_{100\,kHz}$ = 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 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. It's output is buffered by NAND gate A1C so as not to place excessive loading on U2.

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 presetting 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 5.16.

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 100.2499
Band 1	10.0000 to 19.9999	101.2500 to 110.2499
Band 2	20.0000 to 29.9999	111.2500 to 121.2499

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 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) CR3 through the filter network (C10, R26, C11, and R27) and RF bypass network (R28, C12, R29 and C13). Fine steering voltage from the phase detector in the VHF Divider assembly, 1A4A4, is applied to varactor diode CR4 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 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	1	0
1	0	1
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 2^0 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.

4.3 EXCITER

The exciter is contained on three printed circuit boards; sideband generator board (1A3A3), IF/Filter board (1A3A2), and VHF mixer board (1A3A1). A block diagram is shown in Figure 4.5.

4.3.1 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 MIC 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 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-924 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. 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 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 preamplifier 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.

4.3.2 SIDEBAND GENERATOR BOARD–1A3A3

Refer to figure 5.20.

4.3.2.1 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.

4.3.2.2 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 MIC GAIN control. The microphone audio is amplified by Q4 and feeds into the balanced modulator, CR3, CR4, CR5, and CR6. 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. RF carrier energy for switching the balanced modulator is supplied through pin F of 1A3A3-P1 and amplified by Q1.

4.3.2.3 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. (A3H emission).

The +12AM(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 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 Q1 is required to disable the voltage ALC stage Q10, preventing unwanted ALC interaction.

4.3.2.4 600 OHM TRANSMIT AMPLIFIER

The 600 ohm transmit audio is supplied on Pin C of 1A3A3-P1 and passes through amplifier Q11 to the balanced modulator.

4.3.2.5 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. Q14 prevents the tone oscillator from being energized during normal keyline operation. Also prevents keying of external equipment when primary power is lost or removed.

Since the tone oscillator output is high impedance, an emitter follower, Q6, is required to drive the low impedance balanced modulator.

4.3.2.6 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. A discussion of the ALC operation will be presented in a later paragraph.

4.3.3 IF/FILTER BOARD–1A3A2

Refer to Figure 5.19

4.3.3.1 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.

4.3.3.2 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).

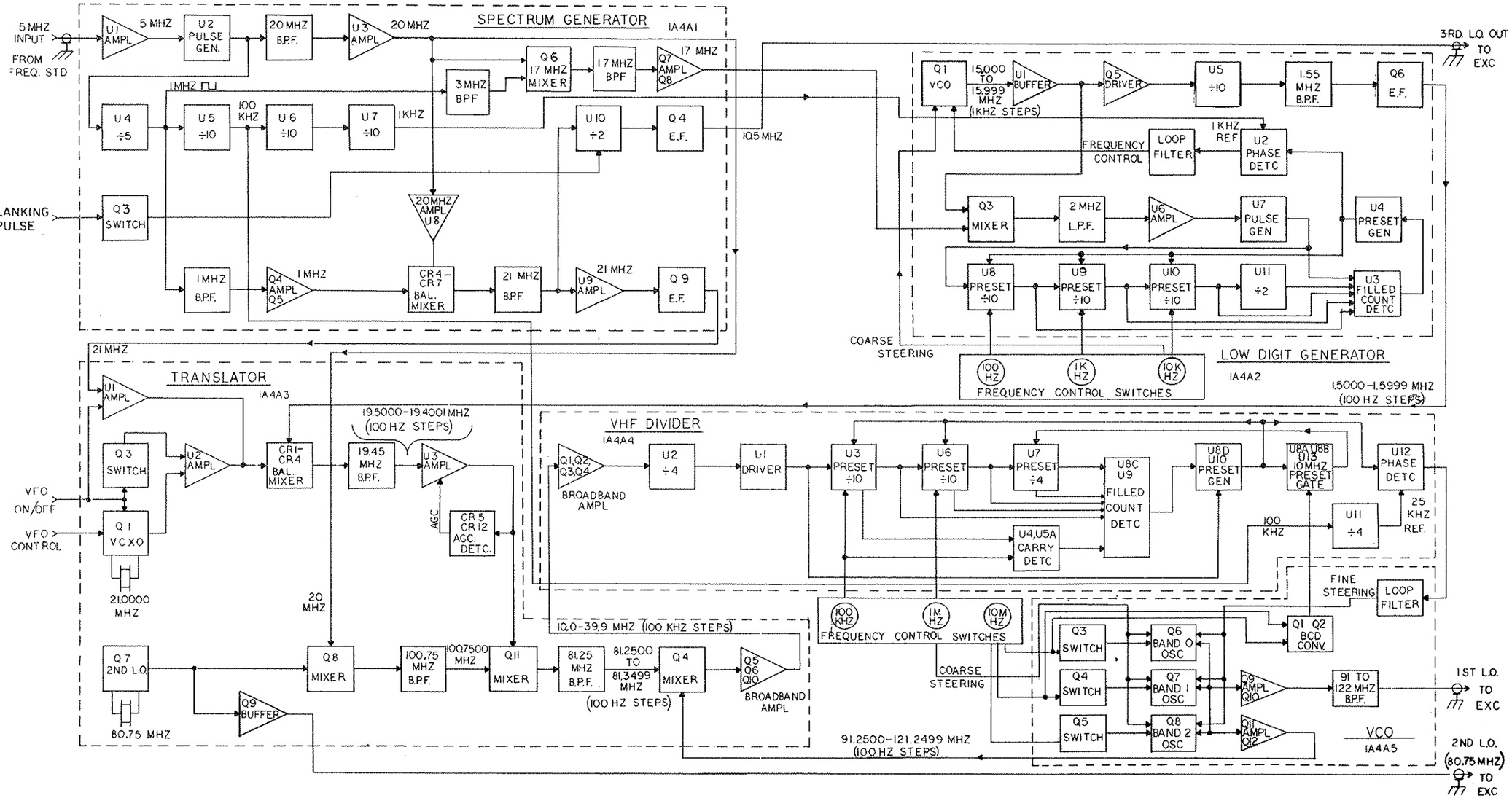


Figure 4.3 **Synthesizer Block Diagram and Details**

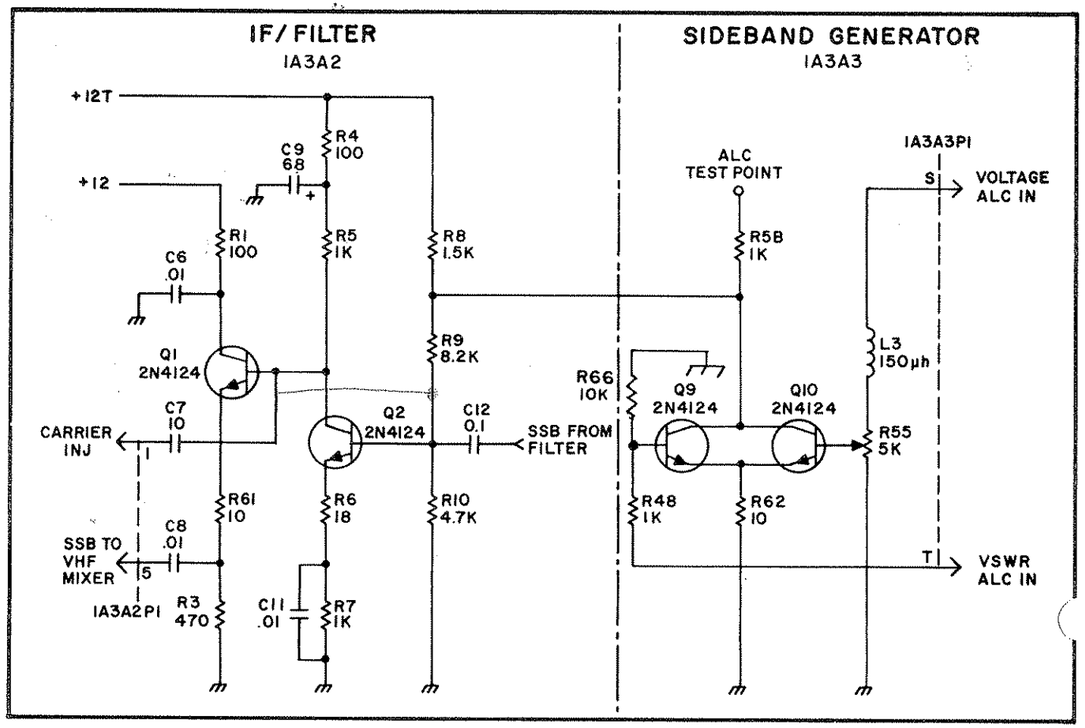


Figure 4.4 Voltage & VSWR ALC Control Schematic

4.3.3.3 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.

4.3.3.4 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 4.4 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 1A3A2-P1.

4.3.4 VHF MIXER –1A3A1 (Transmit)

Refer to Figure 5.18.

4.3.4.1 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.

4.3.4.2 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 a balanced mixer at the center tap of T9.

4.3.4.3 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. Input to Q7 is at T8, and the output is T7. 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 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, CR4 thru CR7.

4.3.4.4 BALANCED MIXER 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, 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.

4.3.4.5 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.

4.3.4.6 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~~ EXCITER ~~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 threshhold, 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.

4.3.5 EXCITER MOTHER BOARD

The schematic of the Exciter mother board is illustrated in Figure 5.23. This unit consists of four receptacles, their circuitry and related components. It is located under the chassis below the Exciter module to mount four printed circuit boards (1A3A1, 1A3A2, 1A3A4, and 1A3A5). Refer to Figure 5.7 for proper orientation.

4.4 R.F. POWER AMPLIFIER 1A7A1

4.4.1 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. A schematic diagram of the power amplifier is shown in Figure 5.24.

4.4.2 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 the single ended output is taken at 1A7J2 from T6.

4.4.3 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.

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

4.5 POWER SUPPLY 1A6

Refer to Figure 5.23.

4.5.1 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.

4.5.2 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 GSE-924 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 R 2 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 exciter 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 (See Figure 5.23), preventing damage to components using 28 VDC.

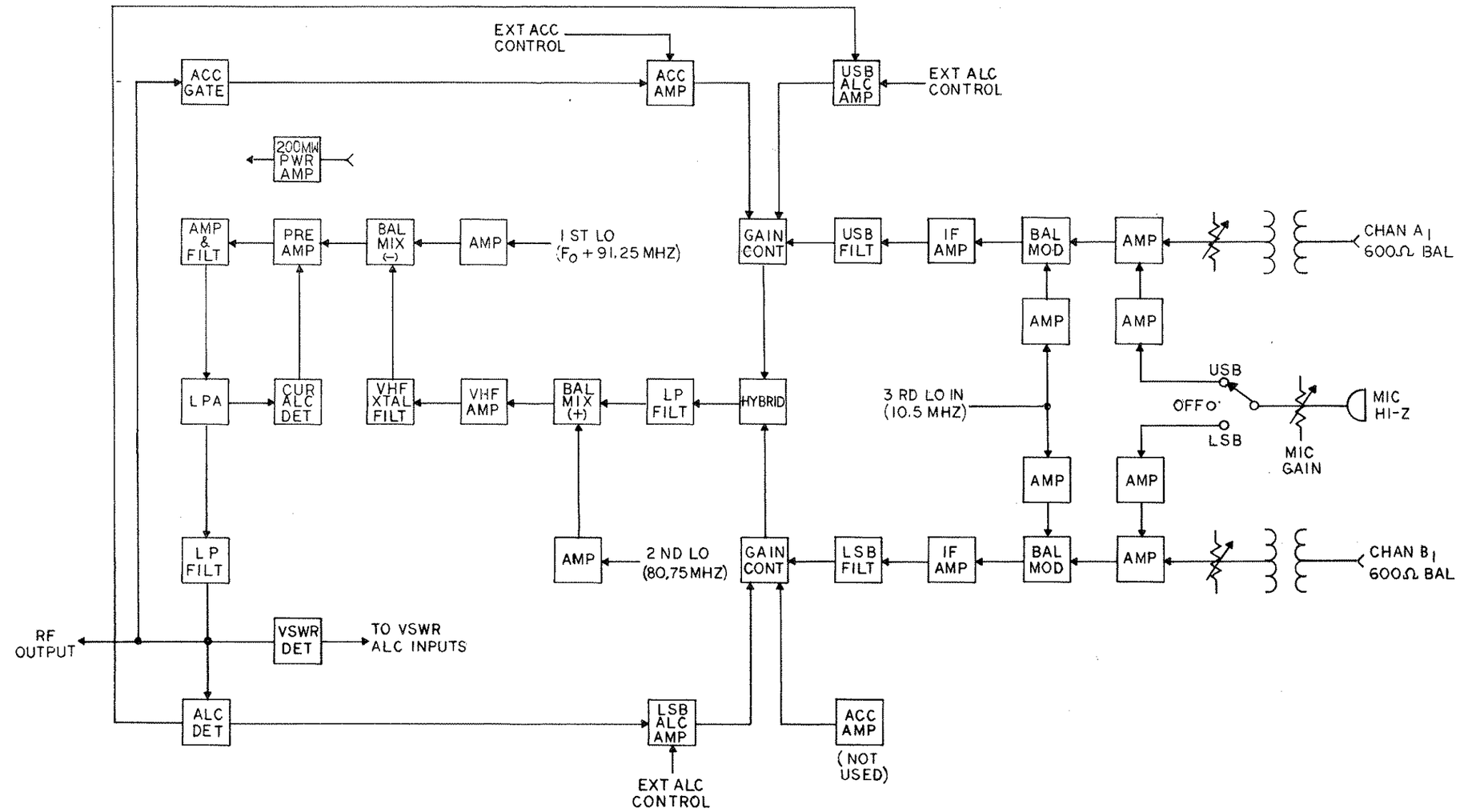


Figure 4.5 GSB-924 Exciter Block Diagram With ISB Option

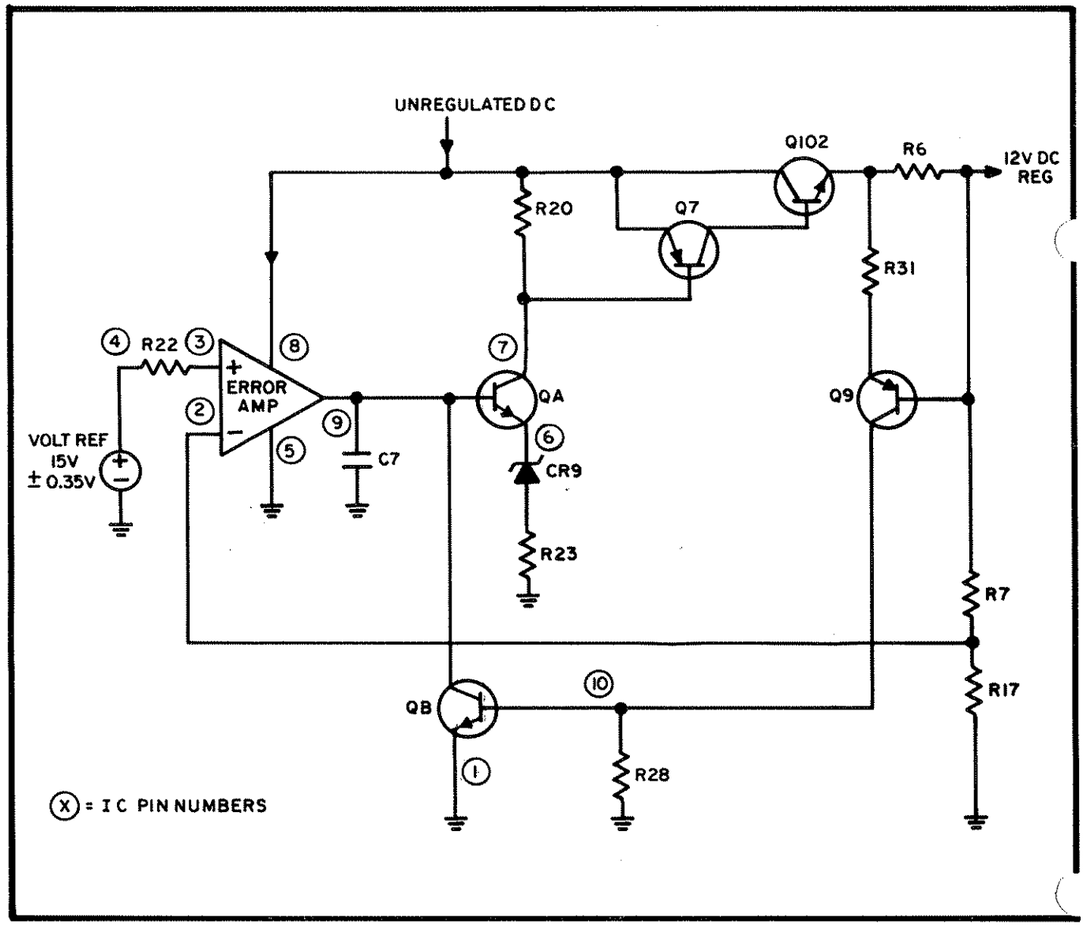
4.5.3 12 VDC AND 5 VDC REGULATORS

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 12VDC system is the 723IC regulator. Below is a simplified block 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 at 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.

4.5.4 REGULATOR TRANSISTOR LOCATIONS

The series regulator transistors for the +12 and +5 volt supplies are 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 exciter, (See Figure 3.3).

4.5.5 D.C. INVERTER -1A6A2

Figure 5.24 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 26 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 23 VDC operation, the transistor collectors (Q1 and Q2) are connected to the 13V 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 GSE-924 is floating with respect to ground. Figure 4.6

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 3.3). The DC relay and control circuit are located on a bracket attached to the front of the exciter assembly (See Figure 5.7).

4.6 FILTER MODULE 1A5

A block diagram of the filter module is given in Figure 4.7. The filter module consists of four printed circuit boards: odd channel filter board, even channel filter board, 200MW amp board, and motor control board. Figure 5.25 shows the position of each board within the module enclosure. An arrow has been etched into each board as an aid in keying all boards together.

an unused board

4.6.1 GENERAL

The filters are arranged to provide low pass filtering in the transmit mode and all are 5 pole 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 2,4,6, and 8. Figure 4.7 shows filter band numbers and their frequency ranges.

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

Schematic diagrams of the filter boards are given in Figures 5.27 and 5.28. Note that unused filters are shorted together and taken to ground through 10 ohm resistors. This effectively "de Q's"

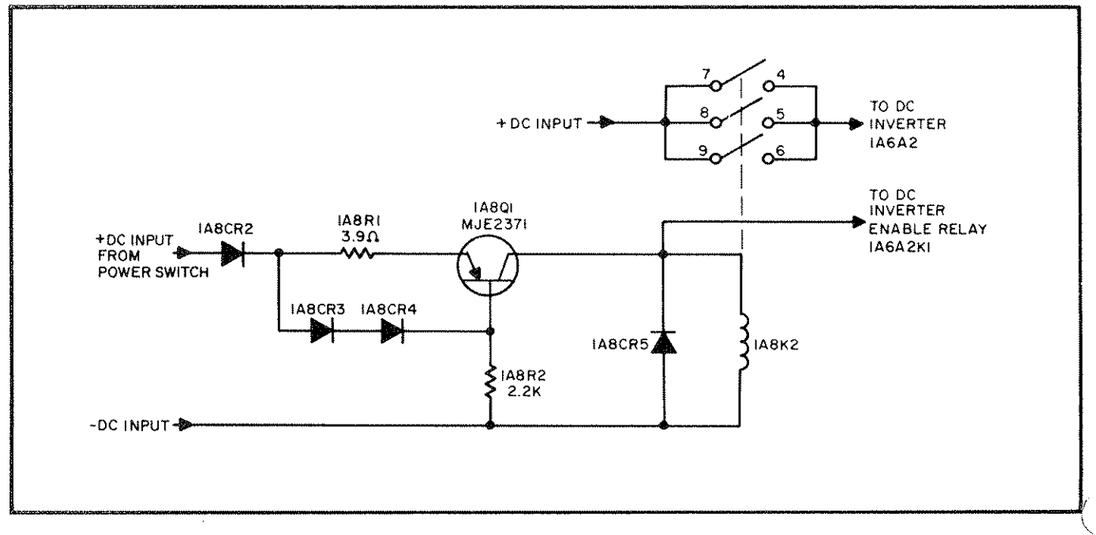


Figure 4.6 D.C. Relay Control Circuit

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

Filter Band Numbers & Frequency Range Table

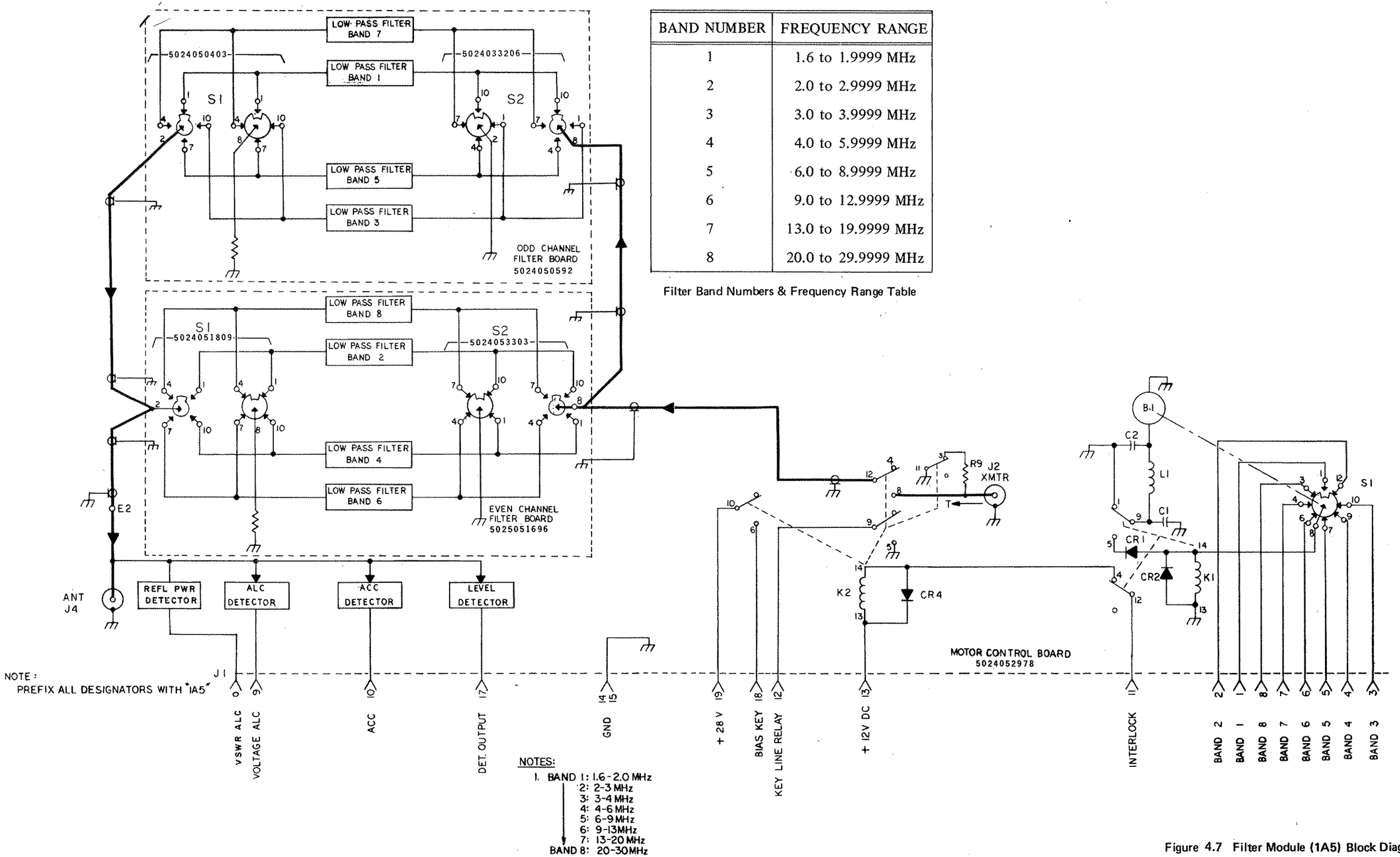


Figure 4.7 Filter Module (1A5) Block Diagram

the unused filters and prevents interaction with the filter that is active.

4.6.2 MOTOR CONTROL BOARD

The motor control board (1A5A4) incorporates components associated with the channeling circuitry. It also includes the voltage ALC detector, the ACC detector, and the output level detector. Refer to Figure 5.26.

Channeling of the band switch is accomplished by applying +12VDC to any of the band control lines. This causes the relay, K1, to be energized, in turn energizing the motor, B1, causing the open seeking wafer S1 to rotate until it finds the band line with the +12VDC. At this point the circuit is broken and the relay drops out, shorting out the motor. This provides dynamic braking which stops the motor very rapidly, preventing excessive overshoot. Diode CR1 prevents the back EMF of the motor from keeping the relay energized and allowing the motor to coast through the open position and again establish contact. Capacitors C1 and C2, and inductor L1 form a hash filter to remove brush noise from channeling motor.

4.6.3 VOLTAGE ALC DETECTOR

The voltage ALC detector consists of a resistive voltage divider R25 and R26, an RF detector CR17, 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 C28, which discharges through R24. The decay is long enough to eliminate the audio modulation from the ALC line. Capacitor C24 is adjusted to provide optimum ALC performance over the complete frequency range of the exciter.

4.6.4 ACC DETECTOR

The ACC detector derives its output by rectifying the voltage at the antenna connector with diode CR6 and diode CR12. The voltage is decreased by resistors R4 and R5. This detector has a fast rise and fast decay time at this point, so it is necessary to increase the time constant to maintain a constant carrier level. This averaging network is located on the sideband generator board.

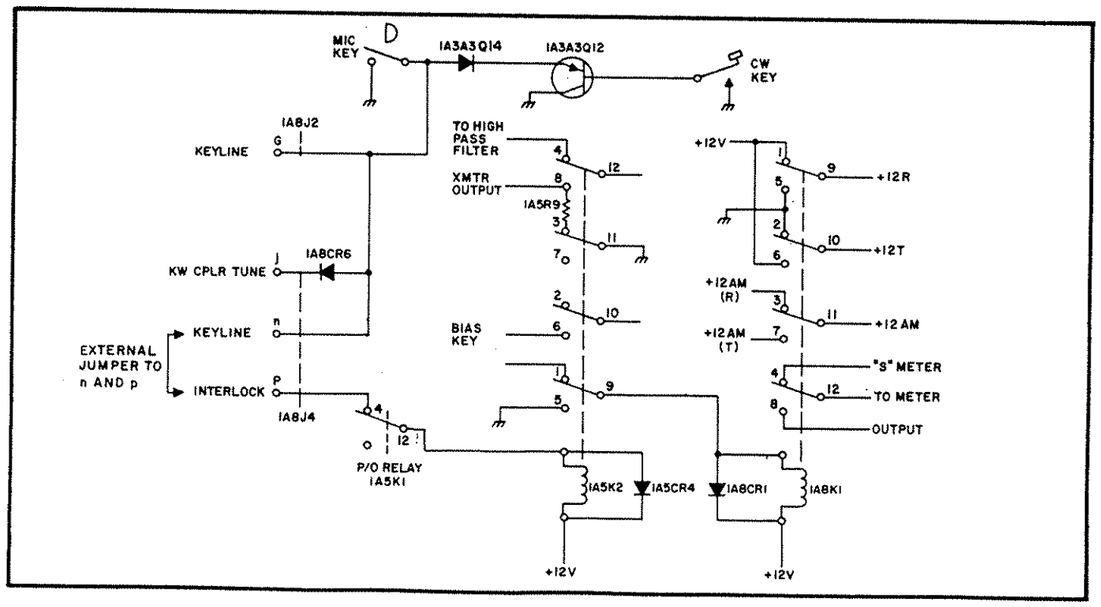


Figure 4.8 Keying Circuit

4.6.5 OUTPUT DETECTOR

The output detector CR5 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.

4.6.6 KEY LINE

Relay K2 is used in conjunction with relay 1A8K1 to key the exciter to transmit mode. A schematic of the keying circuit is shown in figure 4.8. 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 to 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 from receive to transmit (grounds +12R and energizes +12T), and switches the front panel meter from "S" meter to output monitor. This also discharges capacitor C10, placing the positive side of the capacitor at ground potential. When the keyline ground is removed, 1A8K1 drops out immediately, returning the low level stages to receive. Since C10 is discharged at the instant the keyline is ungrounded, it must charge through relay coil K2, keeping K2 energized for approximately 10 milliseconds. This minimizes transients by turning the R.F. power amplifier on before the low level stages, and turning it off after the low level stages. Diodes CR3 and CR11 prevent interaction between K2 and 1A8K1.

4.6.7 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 1.7 to 1, no ALC action is generated. As the VSWR increases above 1.7 to 1, the ALC voltage increases and reduces system gain, keeping the PA dissipation within safe limits.

4.7 METER PANEL 1A2

A schematic diagram of the meter panel is shown in Figure 5.10. The meter panel is used on GSE-924 Exciters 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.

4.8 ISB OPTION

See Figure 4.5

The Independent Sideband option allows for simultaneous transmission of both upper and lower sideband, with each sideband containing different information. A typical use of ISB is transmitting Teletype or Facsimile on one sideband while the other sideband transmits voice. Essentially ISB provides two channels of operation on one piece of equipment.

The ISB option consists of two Sideband Generator PCB and IF Filter PCB combinations which plug into the motherboard of the exciter. The USB IF Filter PCB has two filters installed, the USB operating filter and the AM Receive filter. The LSB IF Filter PCB has one filter installed, the LSB operating filter. (A special narrowband filter for CW may be ordered for the LSB PCB.)

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 screw 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.

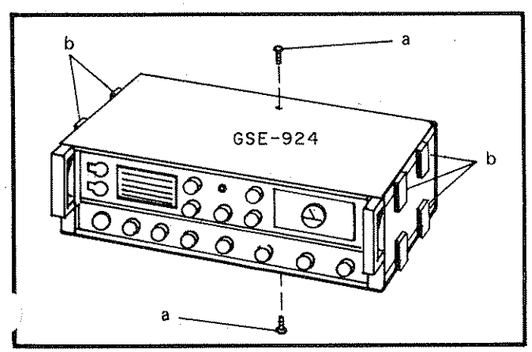


Figure 5.1 GSE-924 Cover Disassembly

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–HP model 606 B

b. VTVM–HP model 410 C

c. Dummy load, 50 ohms @ 150W–Bird model 8135

d. Coax Tee connector–HP 11042 A

e. Audio VTVM–HP model 400 D

f. Oscilloscope, 100 MHz Bandwidth–Tektronix 465

g. VOM–Simpson model 260 (20K ohms/volts)

h. 100 Watt Wattmeter–Bird model 43

j. VHF Signal Generator–HP model 608 E

k. RF Voltmeter–Boonton model 92 C with both open circuit probe tip and 50ohm BNC adapter.

l. Frequency Counter–Systron Donner model 6220A/option 12

m.DC Power Supply–O-28 VDC, 12 A

n. Spectrum Analyzer (optional)

HP 141T Display Section
HP 8554B RF Section
HP 8552A IF Section

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 5.8 for Front Panel wiring and Figure 5.9 for Main Frame wiring diagrams with their appropriate parts lists.

SWITCH or CONTROL	POSITION
FREQUENCY Switches	01.6000 MHz
MODE Switch	LSB
MIC Selector	LSB
MIC GAIN Control	Fully Counter Clockwise
DIMMER Control	Fully Counter Clockwise
POWER Switch	ON
VFO Control	PUSH IN

Table 5.1 Front Panel Control Test Positions

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 S.	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 5.000000 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 "0". 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 5.8) 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.

5.5.1.1 PRELIMINARY CHECKS (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
					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).
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	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 ±5% are permissable

Table 5.8 Coarse Steering Voltage Readings

5.5.2 SYNTHESIZER SUBASSEMBLY TESTING AND ALIGNMENT PROCEDURES

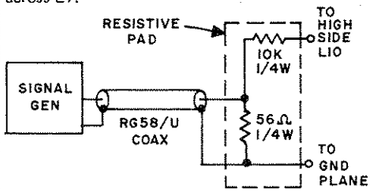
The following paragraphs give the testing and alignment procedures for the synthesizer printed circuit board subassemblies. It is assumed that the defective subassembly has first been isolated either by substitution or by following the preliminary checks of Section 5.5.1.1.During the following tests, 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.

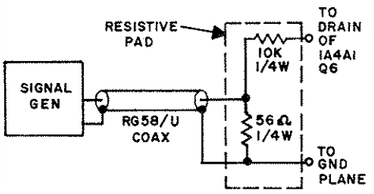
At any step in the procedure, if the required result cannot be obtained, refer to the schematic of the subassembly and make suitable voltage measurements to isolate the faulty component. When the faulty subassembly has been restored to operation the preliminary checks of Section 5.5.1.1 should be repeated 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** *Adjustments interact and must be repeated until no further increase in output can be obtained.*	Minimum output of 300 mv p-p (sine wave) on oscilloscope. Frequency of 20 MHz ±20 Hz on Frequency counter. **NOTE** *If proper output cannot be obtained, refer to the schematic and check U1, U2, U3 and their associated circuitry.*
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** *Adjustments interact and must be repeated until no further increase in output can be obtained.* 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. Repeak 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 repeak 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** *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.*
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

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
6a	17 MHz Ref. alignment and test	RF voltmeter with unterminated tip on 1A4A1 pin 6. Temporarily solder a short jumper between gate # 1 of Q6 and the ground plane of the printed circuit board. **NOTE** *Gate #1 is the junction of C56, C61 and R50.* Connect the signal generator as shown below. Set generator frequency to 17.000 MHz (using the frequency counter) and set its level to 250 mv RMS.  	Tune L16 and L17 for maximum output on the RF voltmeter. **NOTE** *Adjustments interact and must be repeated until no further increase in output can be obtained.*	
6b	17 MHz Ref. alignment and test	Leave RF voltmeter connected as in 6a above. Disconnect resistive pad and jumper.	Tune L14 for maximum output on the RF voltmeter. Carefully repeak L16 and L17 for maximum output.	Minimum output level of 90 mv RMS after tuning is completed **NOTE** *If proper output cannot be obtained, refer to the schematic and check Q5, Q6, Q7, Q8, and their associated circuitry.*

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:* *a) Voltage at TP1(see schematic) if incorrect, check CR5, Q2 and associated circuitry* *b) Refer to schematic and check waveform at TP2. If no signal is present, check Q1, U1 and associated circuitry* *c) Refer to schematic and check waveforms at U7, U8, U9, U10, U11, and U2.* *d) 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.*

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 5.9, 5.10, 5.11 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 ± 0.25V. **NOTE** *a) If V.O.M. indication is out of tolerance but frequency is correct, procede 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 ± 0.25V. **NOTE** *a) If V.O.M. indication is out of tolerance but frequency is correct, procede 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	

10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
0	0	1	1.5001 MHz
0	0	2	1.5002 MHz
0	0	3	1.5003 MHz
0	0	4	1.5004 MHz
0	0	5	1.5005 MHz
0	0	6	1.5006 MHz
0	0	7	1.5007 MHz
0	0	8	1.5008 MHz
0	0	9	1.5009 MHz

If the required frequencies cannot be obtained, refer to schematic and check U8.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4e	Output frequency	Same as Step 3 above	Follow the table below:	

10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
0	1	0	1.5010 MHz
0	2	0	1.5020 MHz
0	3	0	1.5030 MHz
0	4	0	1.5040 MHz
0	5	0	1.5050 MHz
0	6	0	1.5060 MHz
0	7	0	1.5070 MHz
0	8	0	1.5080 MHz
0	9	0	1.5090 MHz

If the required frequencies cannot be obtained, refer to schematic and check U9.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4f	Output frequency	Same as Step 3 above	Follow the table below:	

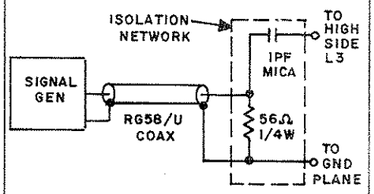
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
1	0	0	1.5100 MHz
2	0	0	1.5200 MHz
3	0	0	1.5300 MHz
4	0	0	1.5400 MHz
5	0	0	1.5500 MHz
6	0	0	1.5600 MHz
7	0	0	1.5700 MHz
8	0	0	1.5800 MHz
9	0	0	1.5900 MHz

See Note on following page.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
				NOTE *If the required frequencies cannot be obtained, refer to schematic and check U10.*
5a	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "0"	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"	Output level of 200 mv p-p minimum.
				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.*
			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.*	
6a	VCO alignment	Same as Step 3 above	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.

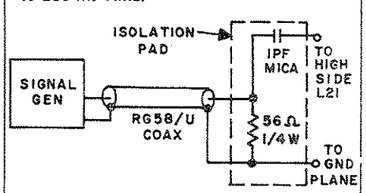
5.5.2.3 TRANSLATOR (1A4A3)

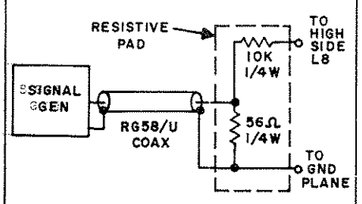
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	21 MHz Ampl. alignment and test	Oscilloscope probe on TP4.	Place front panel VFO control in "IN" position. Tune L13 for maximum output.	Sine wave, 800 mv p-p min. rep. rate=47.6 nsec. **NOTE** *If required output cannot be obtained, refer to schematic and check U1 and associated circuitry.*
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 (con'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 varv. as a minimum between 20.995 and 21.005 MHz. **NOTE** *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.*
3a	19.45 MHz Ampl.	Connect RF voltmeter to U3 pin 6. Temporarily unplug the Low Digit Generator, 1A4A2, from the mother board. Temporariiy 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.	



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 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 capaciter fron 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. **NOTE** *If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d*	Carefully repeak 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. **NOTE** *The V.O.M. is monitoring the Automatic Gain control (AGC) voltage on this amplifier.*	When tuning is complete, the RF voltmeter should read approximately 7 mv RMS. **NOTE** *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).*
	19.45 MHz Ampl. Alternate Alignment and test (using Spectrum Analyzer)	Connect spectrum analyzer to TP1 using 50 ohm coaxial cable. Set C.F. to 19.45 MHz and Scan width to 1 MHz/div. Set B.W. at 30 kHz. Set control for a Log display.	Tune L1, L2, L3 and L5 for max. output at 19.45 MHz on the spectrum analyzer. A point will be found where the output appears to level off and becomes insensitive to tuning adjustments. This is the onset of Automatic Gain control (AGC) action. Carefully adjust the above inductors for lowest levels of spurious responses. **NOTE** *The adjustments of L1, L2 and L3 interact and must be repeaked, in sequence for best spurious rejection and maximum output.*	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).

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TES 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 ±4 kHz. **NOTE** *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.*
5a	100.75 MHz Bandpass 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 Bandpass 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 Bandpass 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)	

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** *If a spectrum analyzer is available, the following tuneup and test procedure may be used in lieu of steps 5a through 5d*	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** *These adjustments interact and must be repeated until no further increase in output can be obtained.*	
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).	Indication of approximately 40 mv on RF voltmeter when tuning is complete. **NOTE** *If required output cannot be obtained, check Q11 and associated circuitry.*
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 (silghtly 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** *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)*

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 *If the proper indication in Steps 1a and 1b above cannot be obtained, refer to schematic and check all D.C. voltages and waveforms.*
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

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
0	0	1	10.1 MHz
0	0	2	10.2 MHz
0	0	3	10.3 MHz
0	0	4	10.4 MHz
0	0	5	10.5 MHz
0	0	6	10.6 MHz
0	0	7	10.7 MHz
0	0	8	10.8 MHz
0	0	9	10.9 MHz

NOTE

If the required results cannot be obtained, refer to schematic and check U3, U4, U5, U8, U9, U10, U13 and associated circuitry.

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

<table>
<tr><th>STEP NO.</th><th>TEST</th><th>TEST EQUIPMENT and TEST POINTS</th><th>PROCEDURE</th><th>REQUIRED PERFORMANCE</th></tr>
<tr><td>2</td><td>1MHz Dial test</td><td>Same as Step 1a above</td><td>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></td><td>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

NOTE

If required results cannot be obtained, refer to schematic and check U6, U5 and associated circuitry.</td></tr>
<tr><td>3</td><td>10 MHz Dial test</td><td>Same as Step 1a above</td><td>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></td><td>Transition Frequency (±1 kHz)

20.0 MHz
30.0 MHz
39.9 MHz

NOTE

If required results cannot be obtained, refer to schematic and check U7, U8A, U8B, U13 and associated circuitry.</td></tr>
</table>

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

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 dals at "9". 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 increse the generator frequency until the V.O.M. indicates greater than 4.5 volts.	Generator frequency greater than 50.0 MHz. **NOTE** *If the required results cannot be obtained, refer to schematic and check:* *a) Q1 through Q4* *b) Waveform at U2 pin 3* *If a) and b) above check o.k. U2 should be replaced.*
5.5.2.5 V.C.O. (1A4A5)				
1a	BAND "0" alignment and test	Connect frequency counter to 1st L.O. out put (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 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 "9". 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 "9".	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.

5.5.2.5 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 "9". 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 "9". 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.

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 EXCITER ALIGNMENT

The following paragraphs provide alignment instructions for Exciter printed boards.

5.6.1 SIDEBAND GENERATOR BOARD (1A3A3)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	BALANCED MODULATOR TUNING	Dummy load connected through coaxial cable to rear panel ANT connector, 1A8J1 through coax-tee connector. HP410B VTVM connected to remaining port of coaxtee for steps 1 thru 8.	Frequency dials set for 16.0000 MHz, mode switch at LSB, MIC GAIN fully counterclock-wise 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, approxim-ately 8 turns. CW. Turn MIC GAIN full CCW and set mode switch to USB. Key exciter 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. Perform carrier null alignment per par. Step 4.	If no carrier output is observed, check E16 on RCVR/ Exciter mother board to determine if 3rd L.O. is present (approximately OdBM). 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.
2	AM Carrier check & adjustment		Turn mode switch to TUNE. Adjust potentiometer, R18 (ACC Control), on sideband generator board (1A3A3) to give a VTVM read-ing of 42 VRMS.	VTVM should read 42 VRMS. If not, check relays 1A8K1 and 1A5K2, 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. Depress CW key and adjust ALC control, R55, on sideband generator board (1A3A3) to give a VTVM read-ing of 71 VRMS.	VTVM should read 71 VRMS. If not check Q6, Q7, Q8 and Q12, and associated circuitry on sideband generator board (1A3A3). 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 MIC 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 MIC 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 6 above.	VTVM should show a peak reading of 70 VRMS.
7	AM		Turn mode switch to AM repeat step 6 above.	VTVM should read approximately 42 VRMS until modulation is applied, then will rise to a peak of approximately 70 VRMS.

5.6.2 VHF MIXER BOARD 1A3A1

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	I.F. Gain adjustment	Dummy load connected through coaxial cable to rear panel ANT connector, 1A8J1 through coax-tee connector. HP410B VTVM connected to remaining port of coaxtee for steps 1 thru 8.	Set FREQUENCY dials 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.

5.6.3 EXTERNAL 600 OHM AUDIO INPUT

1	USB	Connect audio VTVM and audio OSC to pins B and C of 1A8J2 (real panel). Connect 50 ohm load, RF wattmeter and RF VTVM to 1A8J1 (ANT)	Set mode switch to USB, audio OSC to 1KHz at 800 mV RMS. Key exciter and adjust 1A8A1R5 for 100 watts output or 70 VRMS at 50 ohm PA output.	100 watts output. Check cabling between 1A8J2, components on board 1A8A1 and input to pin C of S.B. Gen.
2	LSB	Repeat procedure in 1 above except connect audio osc to pins E, F of 1A8J2 and adjust 1A8A1R6.		
3	ISB	Connect 1 audio osc to USB input, pins B and C of 1A8J2 and 1 audio osc to pins E and F for LSB input. Connect 50 ohm load, RF wattmeter and RF VTVM to 1A8J1 (ANT.).	Set MODE switch to ISB, turn off LSB audio osc and set USB audio osc to 1 KHz at 800mV. Adjust 1A8A1R5 for 50w RF output (50V rms). Turn off USB audio osc and set LSB audio oscillator to 1 KHz at 800mV and adjust 1A8A1R6 for 50 watts RF output. Turn on USB oscillator, set to 1 KHz at 800mV and check for 100W PEP (70V rms on RF VTVM or 40w on Bird type wattmeter). (If peak reading RF wattmeter is used, meter will read 100w).	

5.7 FAULT ANALYSIS

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
AM, or USB, or LSB, inoperative, other modes operative.	a. Mode switch defective.	a. Make continuity check. Repair or replace switch.
	b. IF/Filter board defective.	b. Check diode switches on IF/Filter board. Check filters. Repair or replace defective parts.
Transmitter will not key.	a. Defective microphone.	a. Repair or replace.
	b. 1A5K2 or 1A8K1 defective.	b. Replace defective part.
	c. Jumper between pins n and p missing on accessory socket-1A8J4.	c. Replace jumper.
Transmitter keys but no output or output low in all modes.	a. Defective sideband generator board.	a. Refer to section 4.3.2. Repair or replace defective assembly.
	b. Defective IF/Filter board.	b. Refer to section 4.3.3. Repair or replace defective assembly.
	c. Defective VHF mixer board.	c. Refer to section 4.3.4. Repair or replace defective assembly.
	d. Defective or disconnected coaxial cables.	d. Check all coaxial fittings. Perform continuity test on coaxial cables and repair or replace.
	e. Defective RF power amplifier module.	e. Refer to sections 4.4 and 5.8.4. Repair or replace defective assembly.
	f. Defective filter module.	f. Refer to section 4.6. 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.	a. Repair or replace.
	b. Broken or shorted wire between microphone and Exciter mother board.	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.	a. Check 1A3A3 Q2, Q3, and Q5 and associated circuitry.
	b. Defective ACC potentiometer.	b. Replace 1A3A3 R18.
	c. Defective ACC detector.	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 R18 in AM mode for 42 VRMS.

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	a. Defective or inoperative tone oscillator.	a. Check 1A3A3 Q6, Q7, Q8, and associated circuitry.
XMTR does not key in CW mode	a. Defective CW keying transistor.	a. Check 1A3A3 Q12, CR7, CR8, and associated circuitry.
	b. Defective T/R relay.	b. Check relays 1A8K1 and 1A5K2.
Unit inoperative with DC main power applied.	a. Main source polarity reversed.	a. Switch + and – leads to DC source.
	b. DC module not installed or installed improperly.	b. Refer to section 2.6.3.
	c. DC module defective.	c. Refer to section 4.5.5 and repair or replace defective module.
Power output ok, but no meter indication.	a. Inoperative or defective output detector circuit.	a. Check detector 1A5CR5 and associated circuitry.
	b. Broken wire in cable line.	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.	a. Continuity test and repair or replace.
	b. Defective or inoperative detector in coupler.	b. Repair or replace defective device. Consult coupler handbook.
	c. Broken wire in cabling.	c. Continuity test and repair.
Coupler does not tune - any control.	a. +28VDC missing in coupler.	a. Continuity test and repair.
	b. Coupler tune line not grounded in coupler tune mode.	b. Check mode switch wiring and continuity of cable and repair.
	c. Mode switch is not in coupler tune position.	c. Check position of mode switch.

5.7.1 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 Pin 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 1A6A1 Q2 and associated circuitry.

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

1	DIMMER		Advance DIMMER control 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 above VFO control should be lighted.
3b	Same as 3a above		Push in VFO control	Lamp above VFO control should be out.

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 exciter 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 (1A1) SERVICING AND REMOVAL

5.8.2.1 For minor servicing of the front panel, the two top screws, on both sides holding the front panel to the end caps, may be removed leaving one screw in the bottom of each side. This will allow the panel to pivot outward for servicing.

5.8.2.2 To remove the front panel, disconnect 1A1P1 and 1A2P1 on top of the chassis, and the two printed circuit edge connectors, 1A1P2 and 1A1P3, beneath the chassis. Remove all three forward screws on both sides of the front panel to disengage it from the end caps.

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.

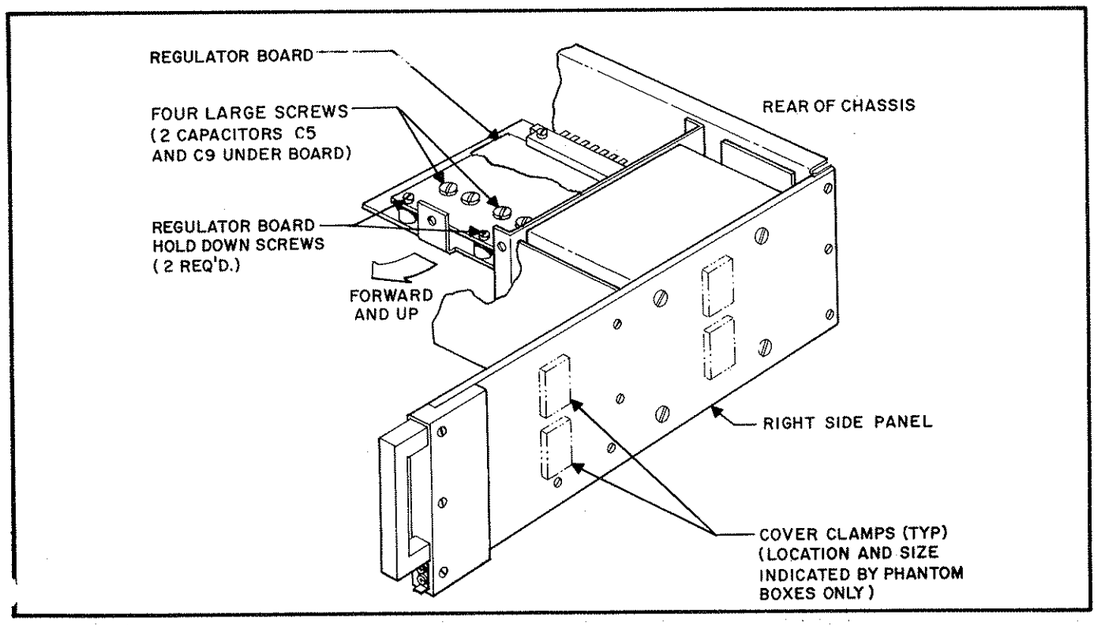


Figure 5.2 Power Supply Regulator Board (1A6A1)

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. Remove 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 accessable.

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.

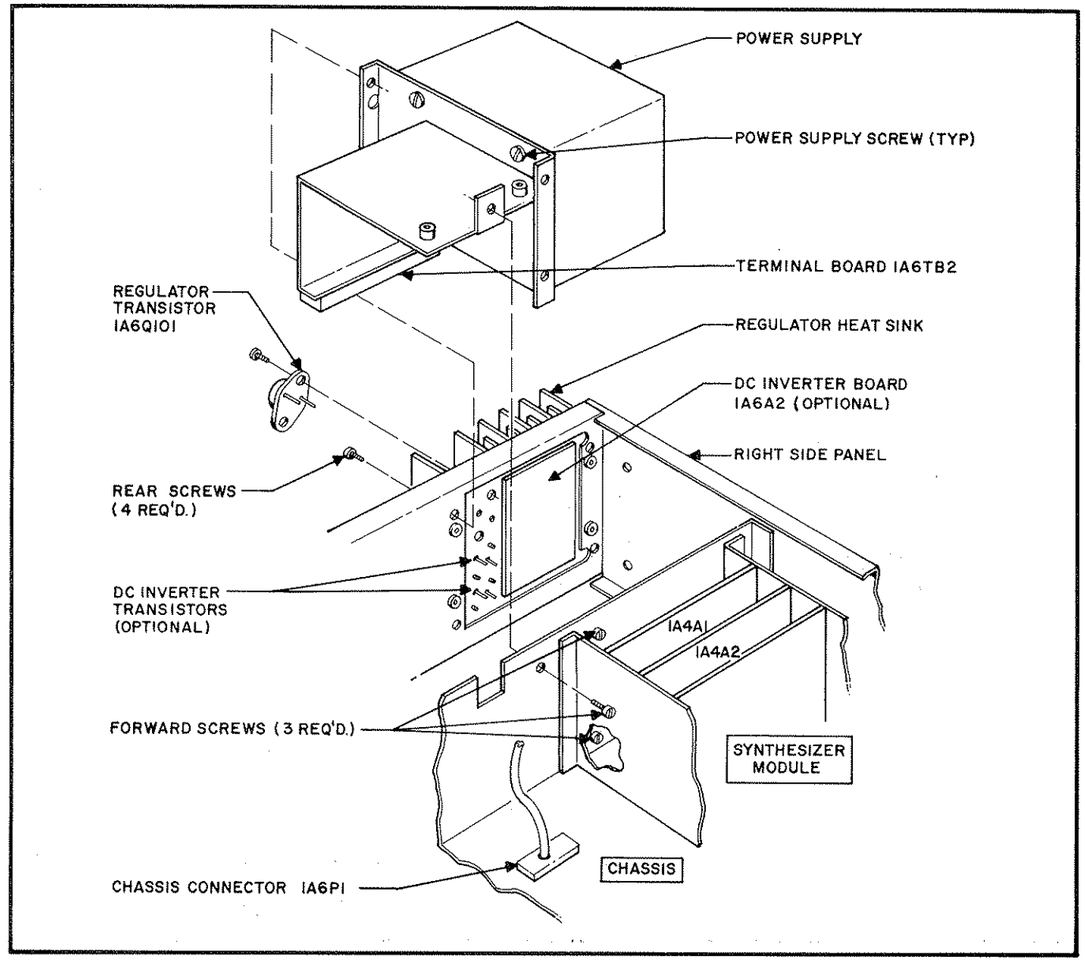


Figure 5.3 Power Supply Removal (1A6)

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 exciter rear panel. Power amplifier assembly removes from the rear of the exciter.

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 exciter 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.

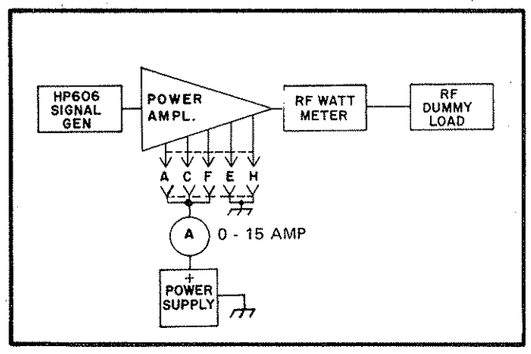


Figure 5.4 Power Amplifier Test Setup

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 turnside) 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 distroyed. 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.

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 exciter, 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 exciter mode switch to USB and XMIT GAIN fully CCW. Key exciter and observe voltage rise. Trace should appear as in Figure 5.5A. Now place MODE switch in AM position and key exciter. 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 to10 amperes. 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.

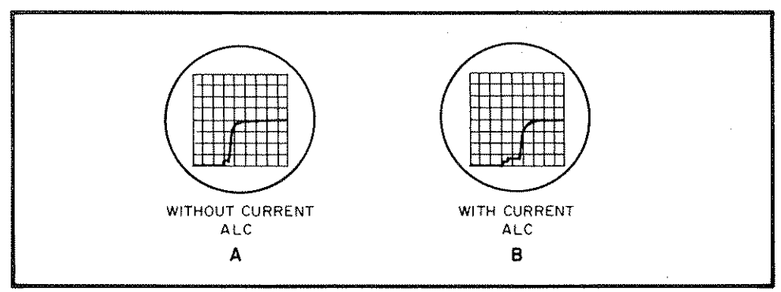


Figure 5.5 Current ALC Wave Form

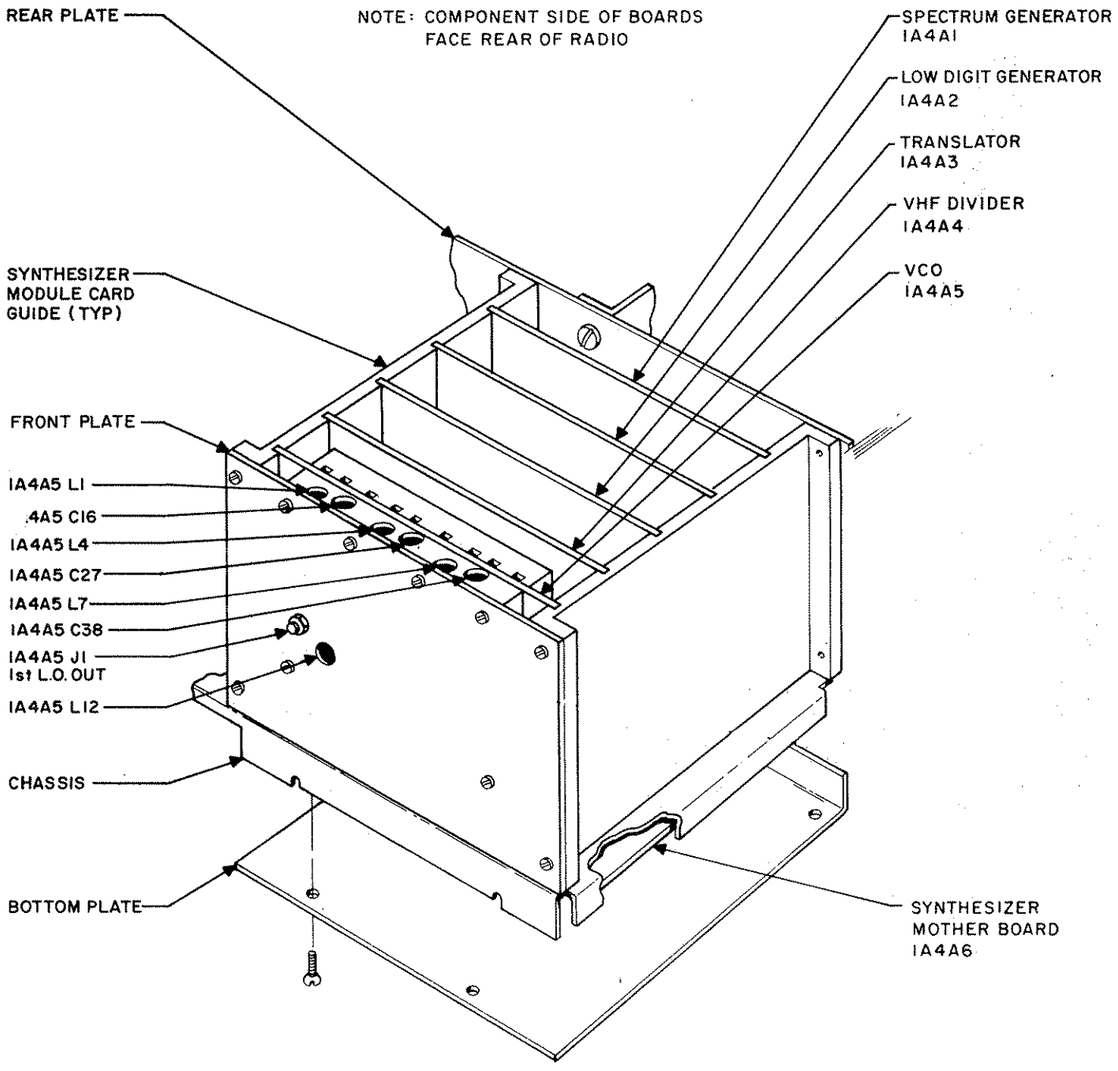


Figure 5.6 Synthesizer Mechanical Assembly

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER
ASSEMBLY	SUBASSEMBLY		
1A1		FRONT PANEL ASSEMBLY	8039040051 Gry 8039040094 Grn
1A2		METER PANEL ASSEMBLY (For Control Panel Options see Fig. 32)	5024041992 Grn 5024041950 Gry
1A3		EXCITER ASSEMBLY	----------
	1A3A1	VHF MIXER	5024110099
	1A3A2	IFFILTER OR	5024120094
		USB FILTER (ISB OPTION)	6028120090
	1A3A3A	SB GENERATOR	5024130090
	1A3A3	SB GENERATOR	5024130090
	1A3A4	LSB FILTER (ISB OPTION) (1A3A2)	6028121096
	1A3A5	EXCITER MOTHER BOARD	
	1A3A6	LSB GENERATOR (ISB OPTION) (1A3A3)	5024130090
1A4		SYNTHESIZER ASSEMBLY	----------
	1A4A1	SPECTRUM GENERATOR	5024060091
	1A4A2	LOW DIGIT GENERATOR	5024070097
	1A4A3	TRANSLATOR	5024080092
	1A4A4	V.H.F. DIVIDER	5024090098
	1A4A5	V.C.O.	5024100093
	1A4A6	SYNTHESIZER MOTHER BOARD d/07/91 HH by Bill Log.	5024011597
1A5		FILTER MODULE 8039051096	~~5024050096~~
	1A5A1	ODD CHANNEL FILTER BOARD	5024050592
	1A5A2	EVEN CHANNEL FILTER BOARD	5024051696
	1A5A3	NOT USED	8039054095
	1A5A4	MOTOR CONTROL BOARD	5024052994
1A6		POWER SUPPLY	5024020090
	1A6A1	REGULATOR BOARD ASSEMBLY	1001220005
	1A6A2	D.C. INVERTER (OPTION)	5024021398
		R.F. POWER AMPLIFIER ASSEMBLY 100W	5024030095
	1A7A1	R.F. POWER AMPLIFIER CIRCUIT BOARD	5024030290
		CHASSIS ASSEMBLY	5024010094 Grn 5024010051 Gry
	1A8A1	AUDIO XFMR BOARD	8039140099

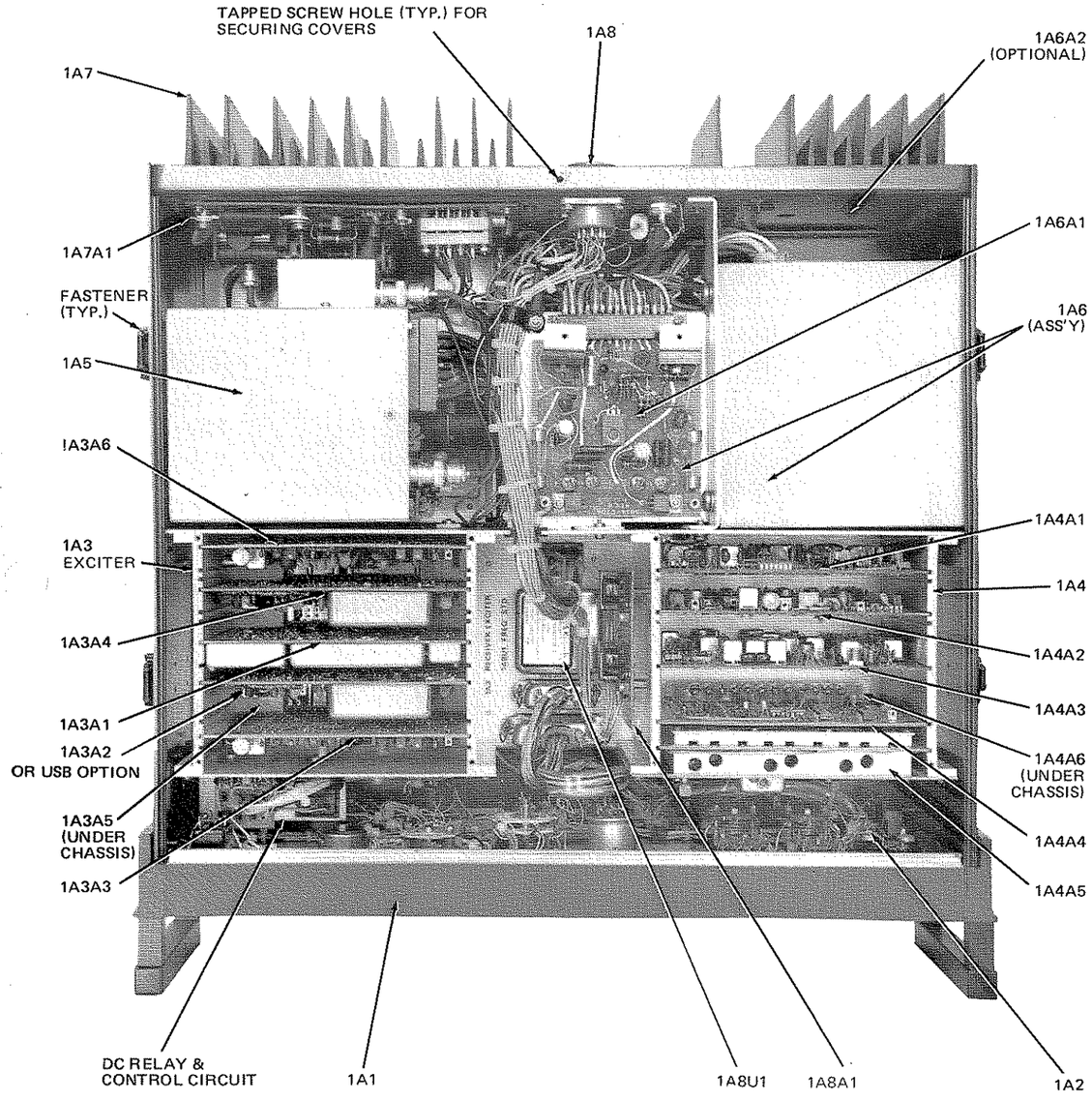
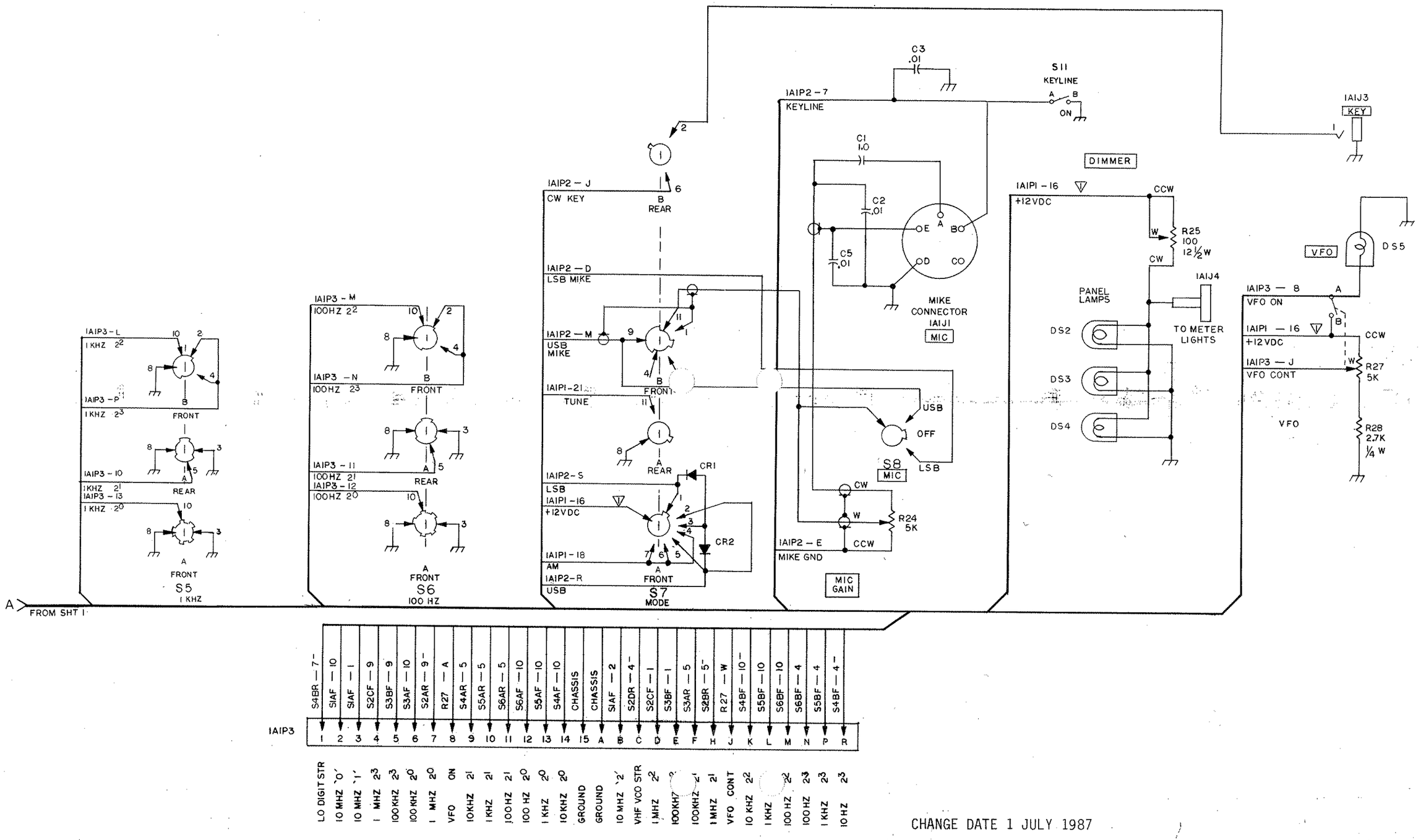


Figure 5.7 GSE-924 Top View and Table of Assemblies

5.9 SCHEMATIC DIAGRAMS

The following pages contain schematic diagrams, voltage charts, parts lists and depot spare parts requirements for all assemblies of the GSE-924

9040078A

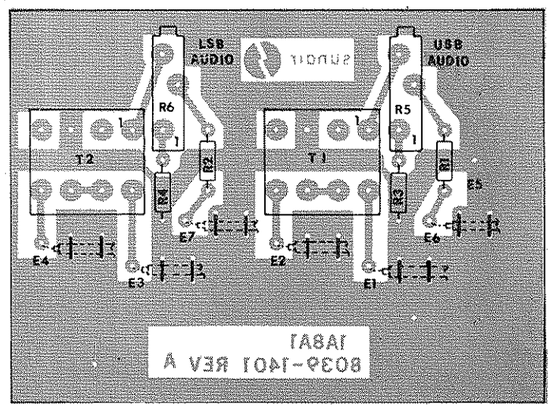


CHANGE DATE 1 JULY 1987

Figure 5.8 Front Panel (1A1) Wiring (Sheet 2 Of 2)

PARTS LIST AUDIO XFMR BOARD

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY AUDIO XFORMER	8039140099
R1	Resistor, 4.7K, 5%, 1/4W	0170770001
R2	Resistor, 4.7K, 5%, 1/4W	0170770001
R3	Resistor, 10, 5%, 1/4W	0177160004
R4	Resistor, 10, 5%, 1/4W	0177160004
R5	Pot. 500, 10%, 3/4W, 15 Turns	0338490078
R6	Pot. 500, 10%, 3/4W, 15 Turns	0338490078
T1	Transformer, Audio, PC Mount	0491650001
T2	Transformer, Audio, PC Mount	0491650001



REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CHASSIS ASSY, GREY	8039010055
1A8U1	TCXO, 5MHZ Ground Eqpt. 1A8U1	5024012704
J1	Connector, RF, UHF	0753300001
	Capacitor, 2UF, 100V, Mylar	0272420000
	Capacitor, 0.01UF, 25V, X5S	0281620008
	Clamp, Cable 1/4 ID, 3/8W	0501840001
	Clamp, Cable 1/4, ID, 3/8W	1601960007
	Clamp, Cable 1/2, ID, 3/8W	1502250003
	Pin, Drive No. 0 x 1/8 Lg.	0533180007
	Inductor, Molded, 47UH, 5%	0652680003
	Relay, 4PDT, 12V, Sensitive	0666640009
	Relay, 3PDT, 12V, Plug-in 10A	0666760004
	Socket, Tube 7 Pin	0764370006
	Channel Rubber	0853610002
	Gasket Kit, Chassis GSB-900	1002580013
	Gasket, Fuseholder	1004740000
	Fuseholder, Panel Mount	1004740018
	Shield Card	1004850012
	Bracket, Stiffener	5024010400
	Plate, RF/Exc	5024010906
	Bracket, M.B. Conn. Rec/Exc	5024011007
	Bracket, M.B. Connector, Synth.	5024011104
	Bracket, Filter Assy	5024011201
	TCXO, 5MHZ Ground Eqpt. 1A8U1	5024011704
	Card Guide, Machined	5024013808

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	HARNESS, MAIN GSE-924	8039012198
1A3P3	Connector, RF, Miniature	0753720001
1A8P5	Connector, RF, BNC	0753710005
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
Q1	Transistor, PNP, Sil. TIP-32A	0448200007
R1	Resistor, 3.9, 5%, 1/2W	0168270005
R2	Resistor, 2.2K, 10%, 1W	8164510001
	Capacitor, 0.01UF, 1000V, Z5U, 20%	0243550006
	Capacitor, , 0.01UF, 25V, X5S	0281620008
	Mica Insulator Mot. Case 199	0508700001
	Connector, Power, 37 Pin Round	0753430002
	Connector, Power, 9 Pin Round	0753440008
	Connector, Power, 11 Pin Rect.	0753460009
	Connector, Power, 24 Pin Rect.	0753510006
	Connector, Power, 36 Pin Rect.	0753520001
	Connector, Power, 7 Pin Rect.	0753530007
	Connector, Power, 20 Pin Rect.	0753550008
	Connector, RF, Coax Feedthru	0753690004
	Connector, RF, Subminiature	0753700000
	Connector, Power, 10 Pin Round	0753990008
	Socket, Relay, Spot Contacts	0754330001
	Socket Relay, 4PDT Contacts	0767000005
	Retainer, Relay Socket	0767500008
	Spring, Relay Hold-Down	0878140000
	Spring, Relay Hold-Down	0878260005
	Plate, Adapter Assy.	5024012895
	Bracket, Relay Assy.	5024014791
J1	Connector, RF, UHF	0753300001

NOTES: UNLESS OTHERWISE SPECIFIED

1. PREFIX ALL PARTIAL DESIGNATORS WITH "1A8".
2. ALL CAPACITORS ARE IN MICROFARADS (UF).
3. TO OPERATE UNIT WITHOUT COUPLER OR KW AMPLIFIER, A JUMPER IS REQUIRED BETWEEN PINS N AND P OF 1A8J4.
4. [1] INDICATES SHEET NUMBER.
5. IN THE STANDARD GSE-924, 1A8U1 IS TCXO PART NO. 5024012704. WHEN DELIVERED WITH OPTIONAL PART NO. 5024013701, 1A8U1 IS "HIGH STABILITY OVEN OSCILLATOR".
6. IN THE STANDARD GSE-924, 1A2 IS METER PANEL PART NO. 5024041950 GRY, 5024041992 GRN. WHEN DELIVERED WITH OPTIONAL PART NO.:

   5024042352 GRY 1A2 IS COUPLER CONTROL
   5024042395 GRN PANEL (GCU-910A)

   6035150098 GRN 1A2 IS COUPLER CONTROL
   6035150055 GRY PANEL (GCU-935)

   6032400051 GRY 1A2 IS KW CONTROL
   6032400093 GRN PANEL

7. FUSE RATINGS

   F1 5A FOR 115VAC INPUT
   & OR
   F2 3A FOR 230VAC INPUT

   30A SLO BLO FOR 130VDC INPUT
   F3 OR
   15A SLO BLO FOR 26VDC INPUT

8039012171B

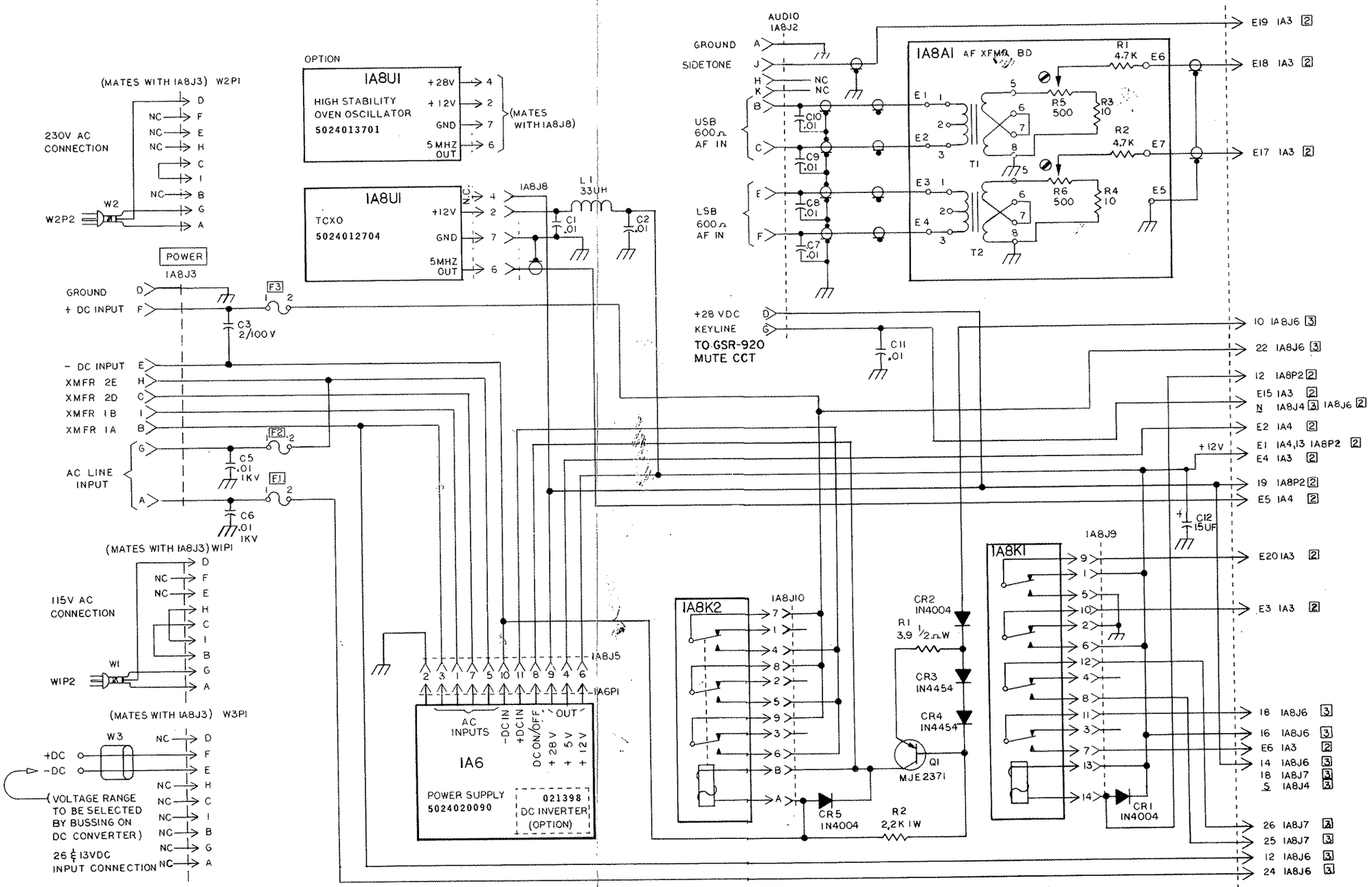
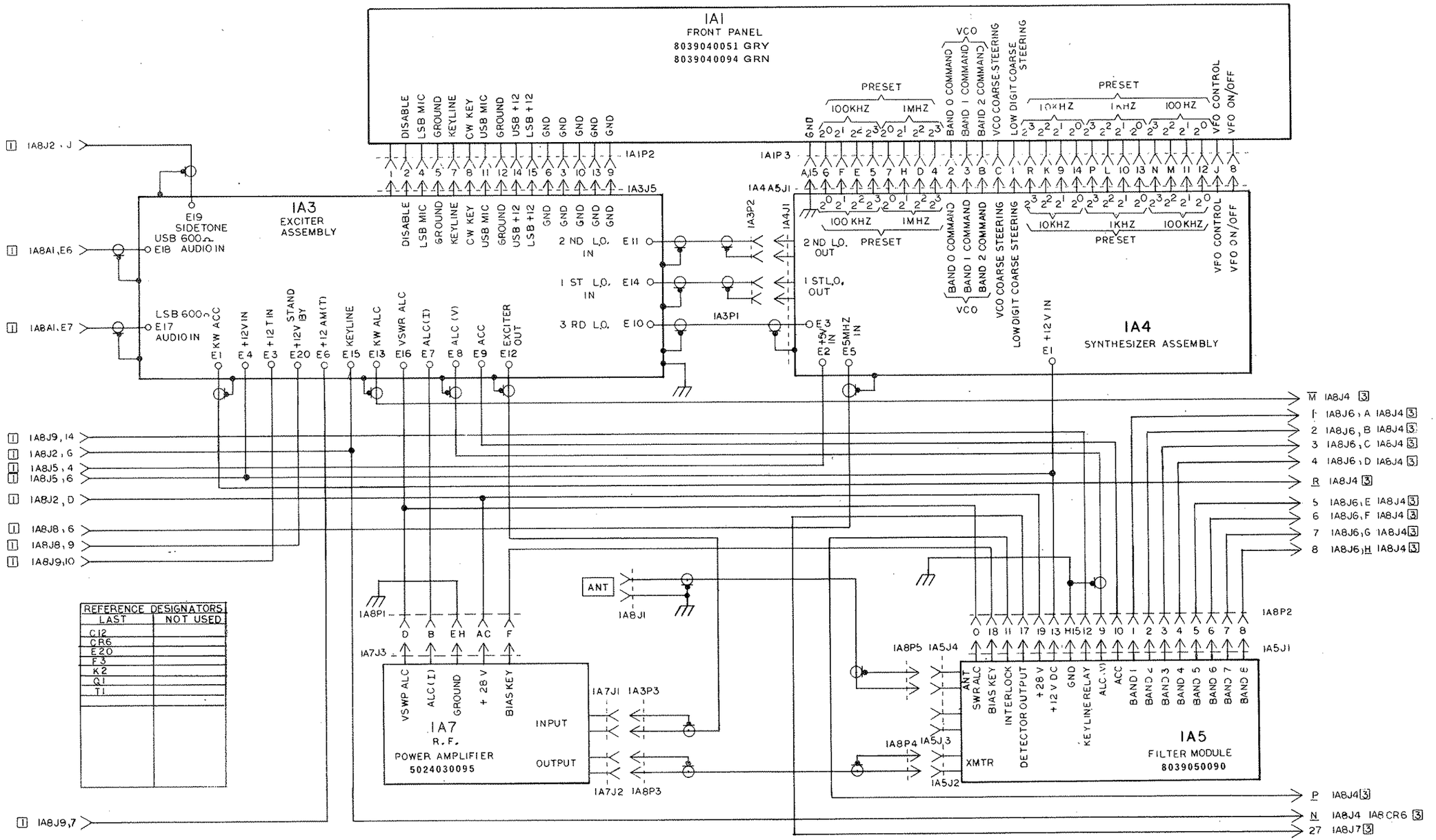


Figure 5.9 Main Frame Wiring (Sheet 1 of 3)

8039012171B



REFERENCE DESIGNATORS	
LAST	NOT USED
C12	
CR6	
E20	
F3	
K2	
Q1	
T1	

Figure 5.9 Main Frame Wiring (Sheet 2 of 3)

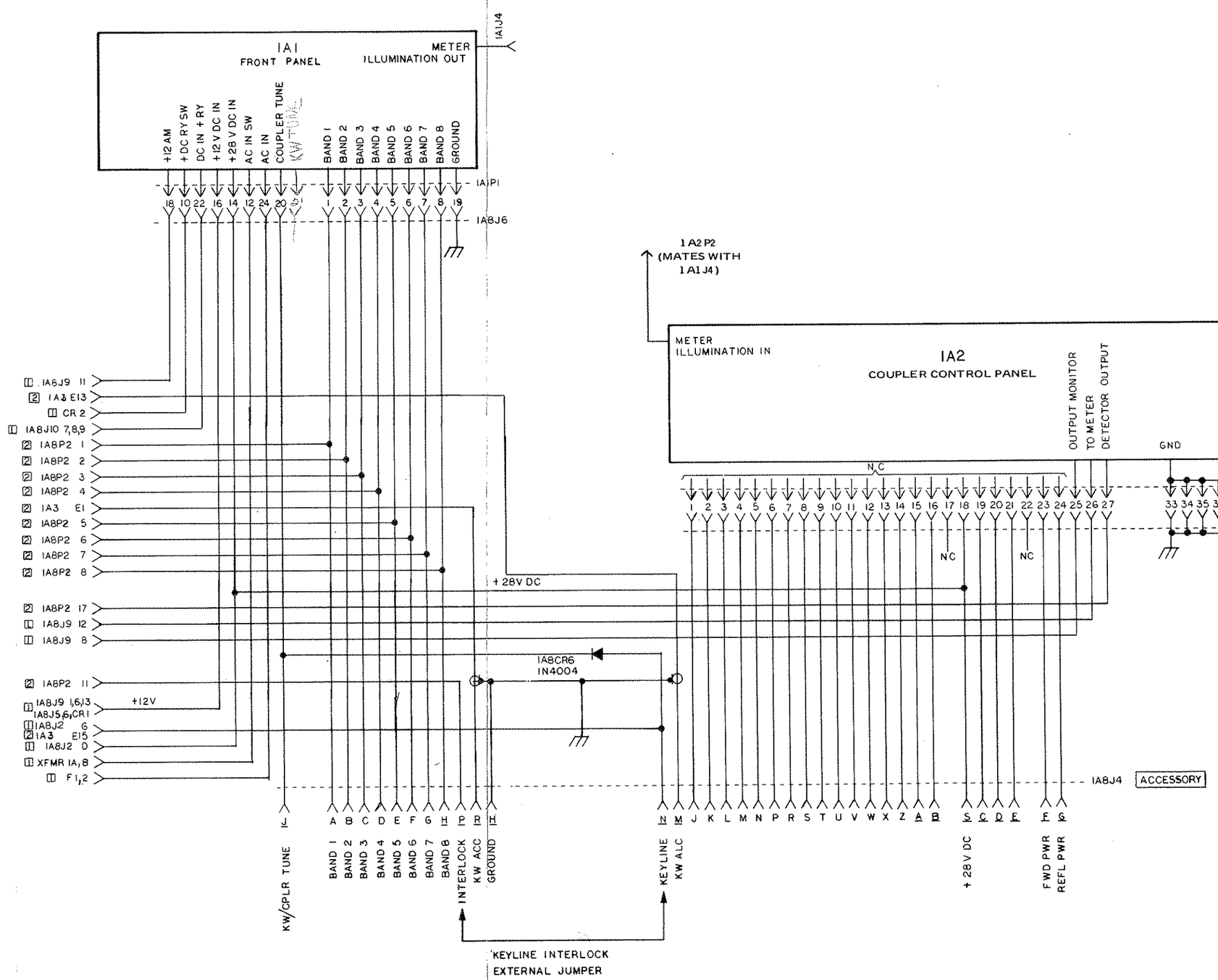


Figure 5.9 Main Frame Wiring (Sheet 3 of 3)

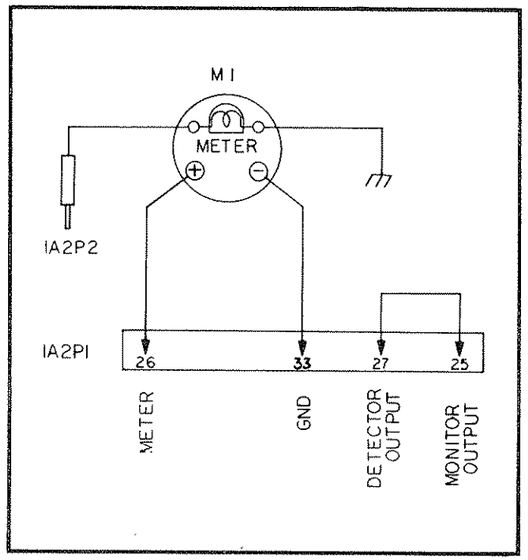


Figure 5.10 Meter Panel (1A2) Schematic

PARTS LIST, 1A2

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

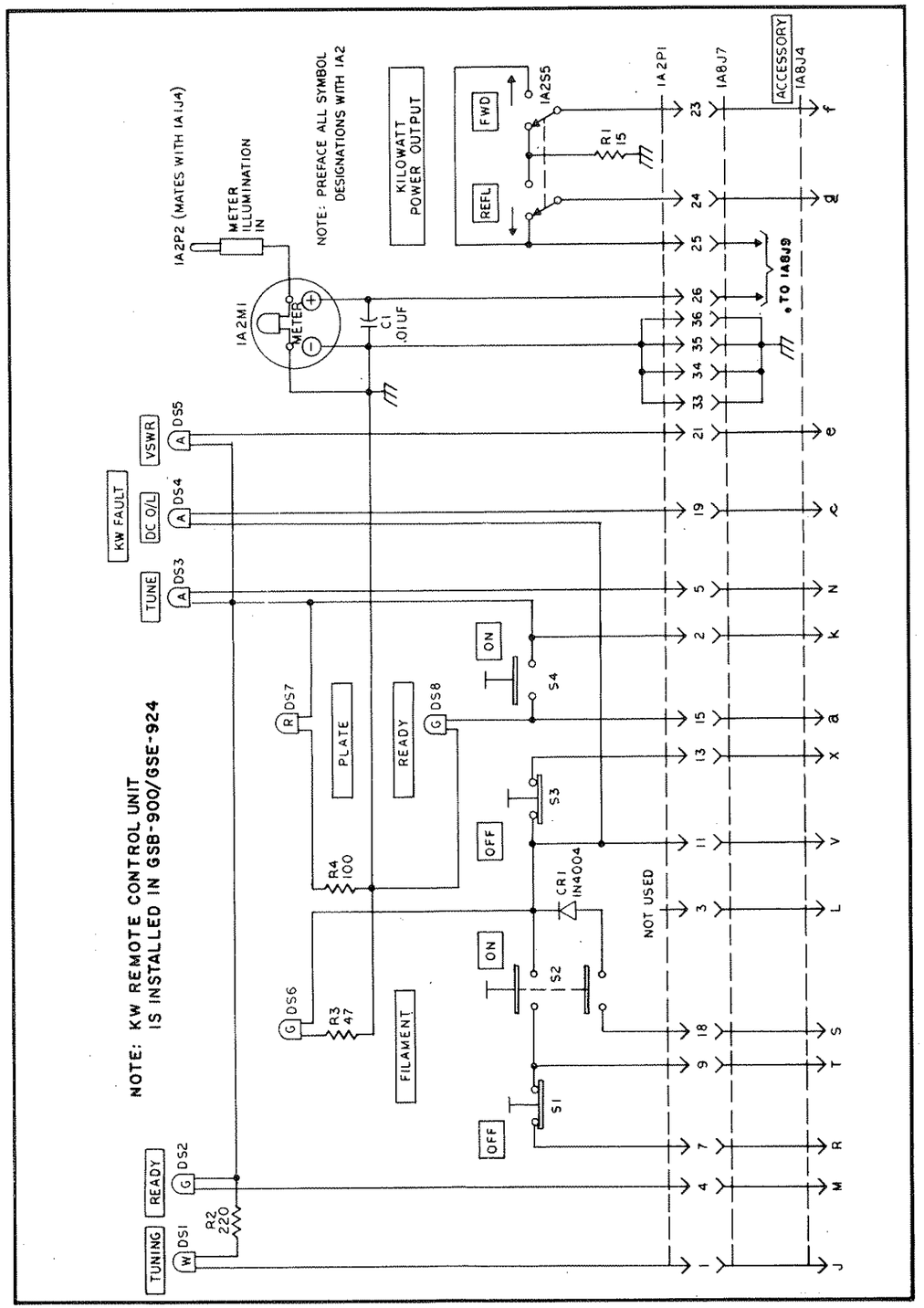


Figure 5.10A KW Remote Control (1A2) Schematic

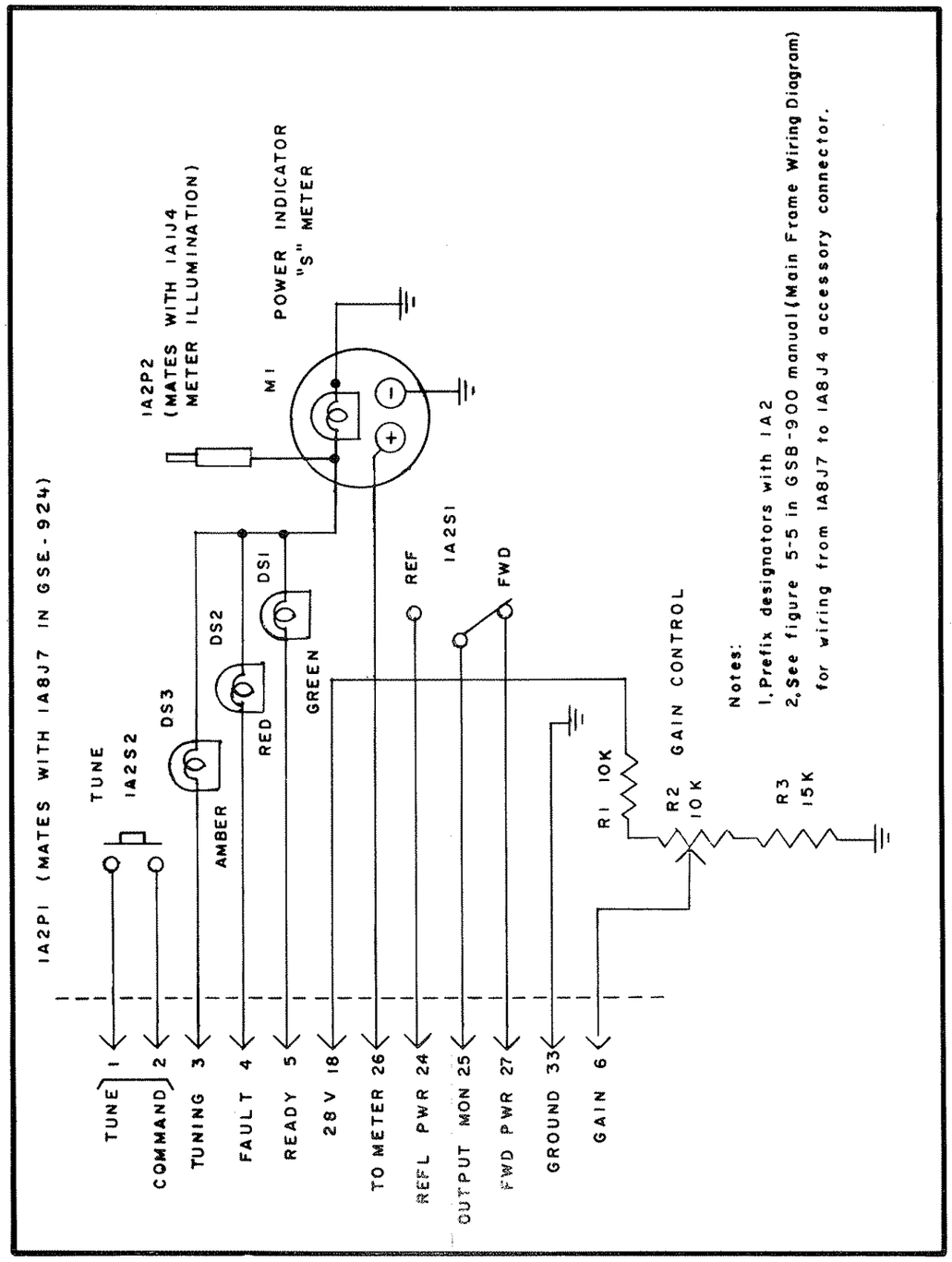
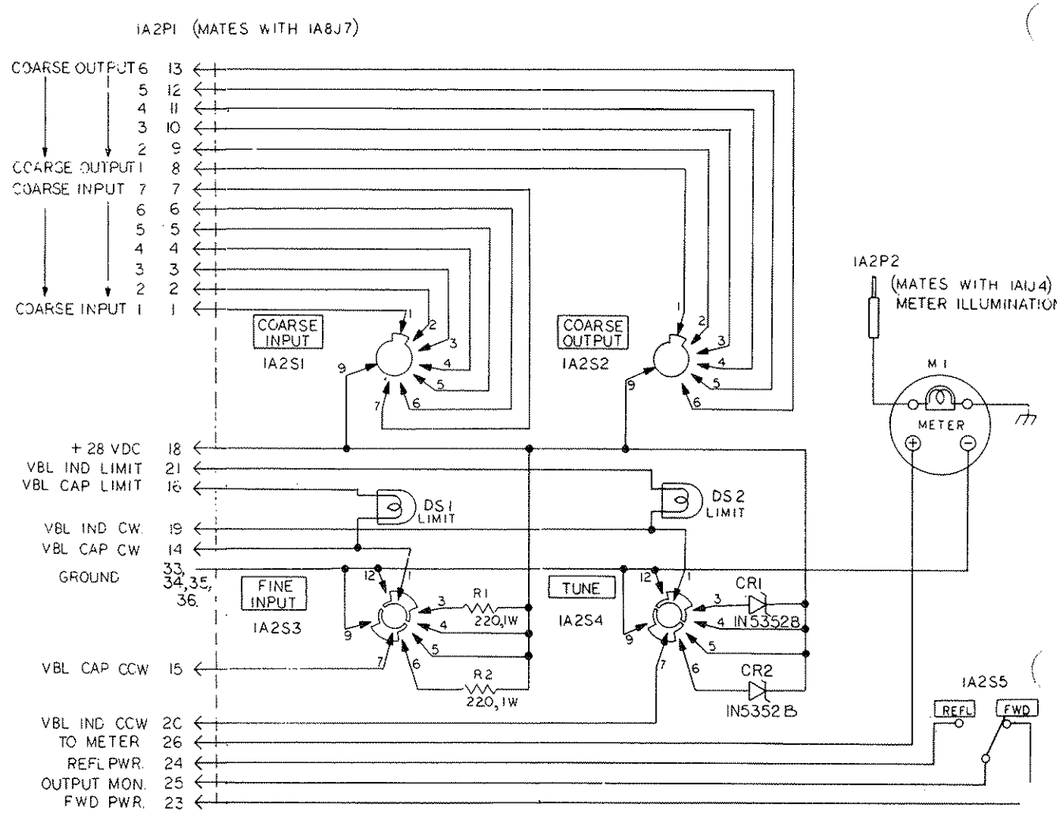


Figure 5.10B Schematic Diagram GCU-935 Antenna Tuning Control Unit

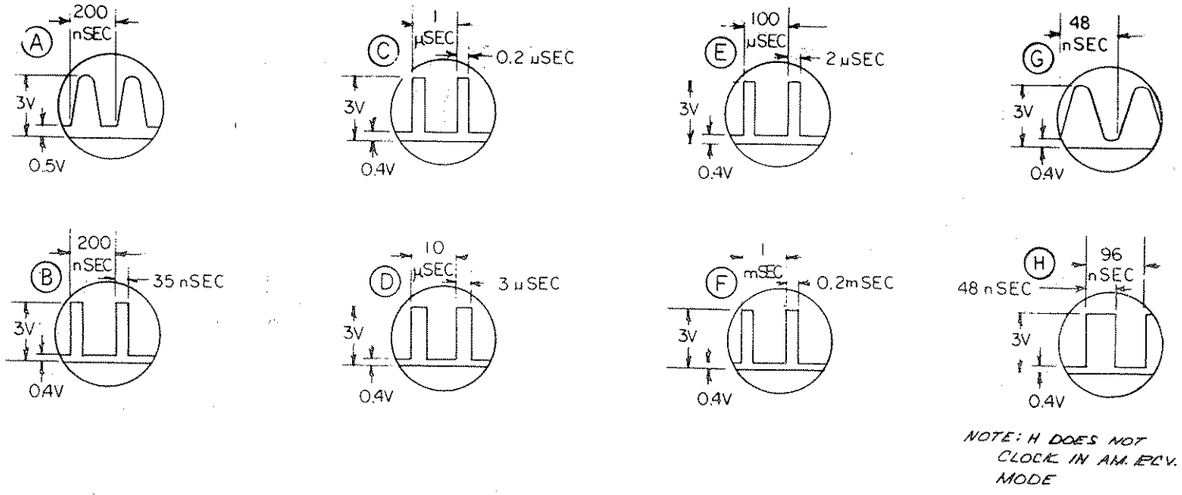
SUNAIR GSE-924



NOTE : ALL RESISTORS IN OHMS
PREFIX DESIGNATORS WITH "IA2"

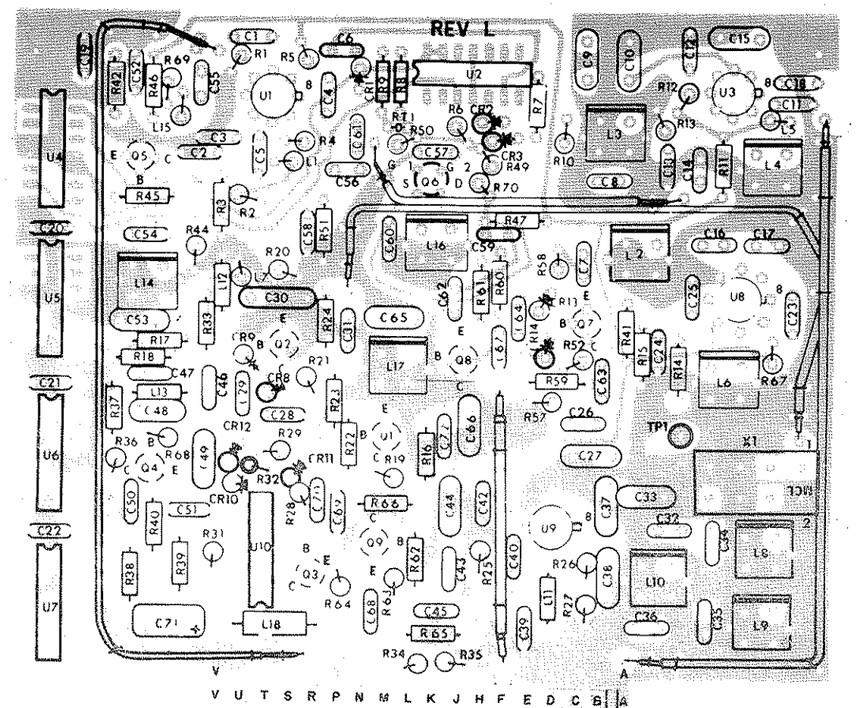
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR1	Diode, Zener, 1N5352B	0405110006
CR2	Diode, Zener, 1N5352B	0405110006
DS1	Lamp Assembly, Amber, 14V	0840870001
DS2	Lamp Assembly, Amber, 14V	0840870001
M1	Meter, Illuminated, 1MA	5024042204
P1	Connector, 36 Pin	0754090000
P2	Phone Tip Plug, Red	0753680009
S1	Switch, Rotary, Coarse Input	5024042701
S2	Switch, Rotary, Coarse Output	5024042808
S3	Switch, Rotary, Fine Input	5024042603
S4	Switch, Rotary, Tune	5024042603
S5	Switch, Toggle	0334610001
R1	Resistor, Carbon, 220 ohm, 10%, 1W	0197190006
R2	Resistor, Carbon, 220 ohm, 10%, 1W	0197190006
	Knob, 0.9 Dia. W/Dot	0346050006

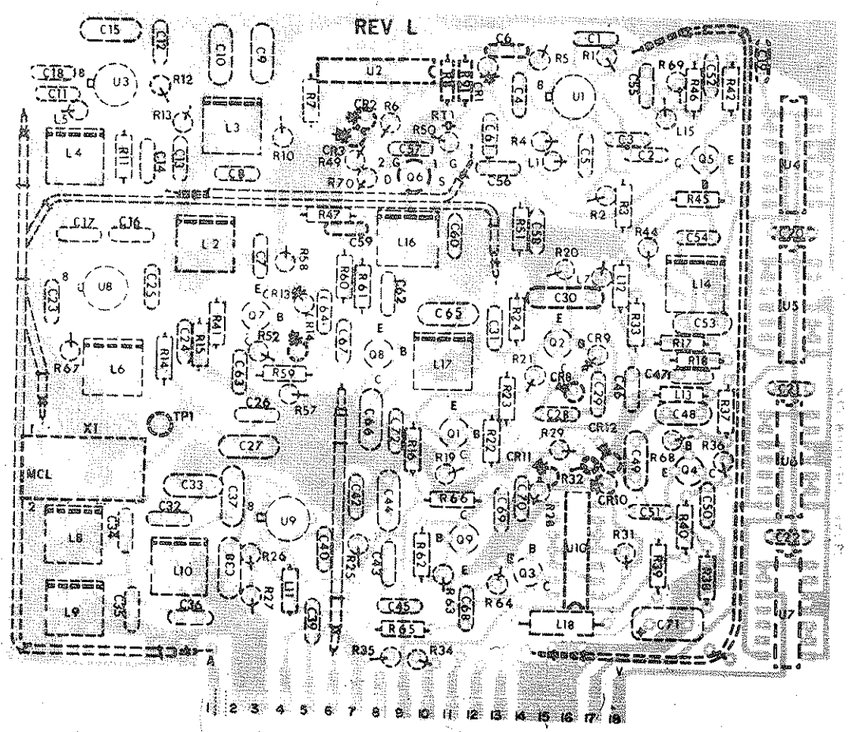
Figure 5.11 Antenna Tuning Control (1A2) Schematic



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

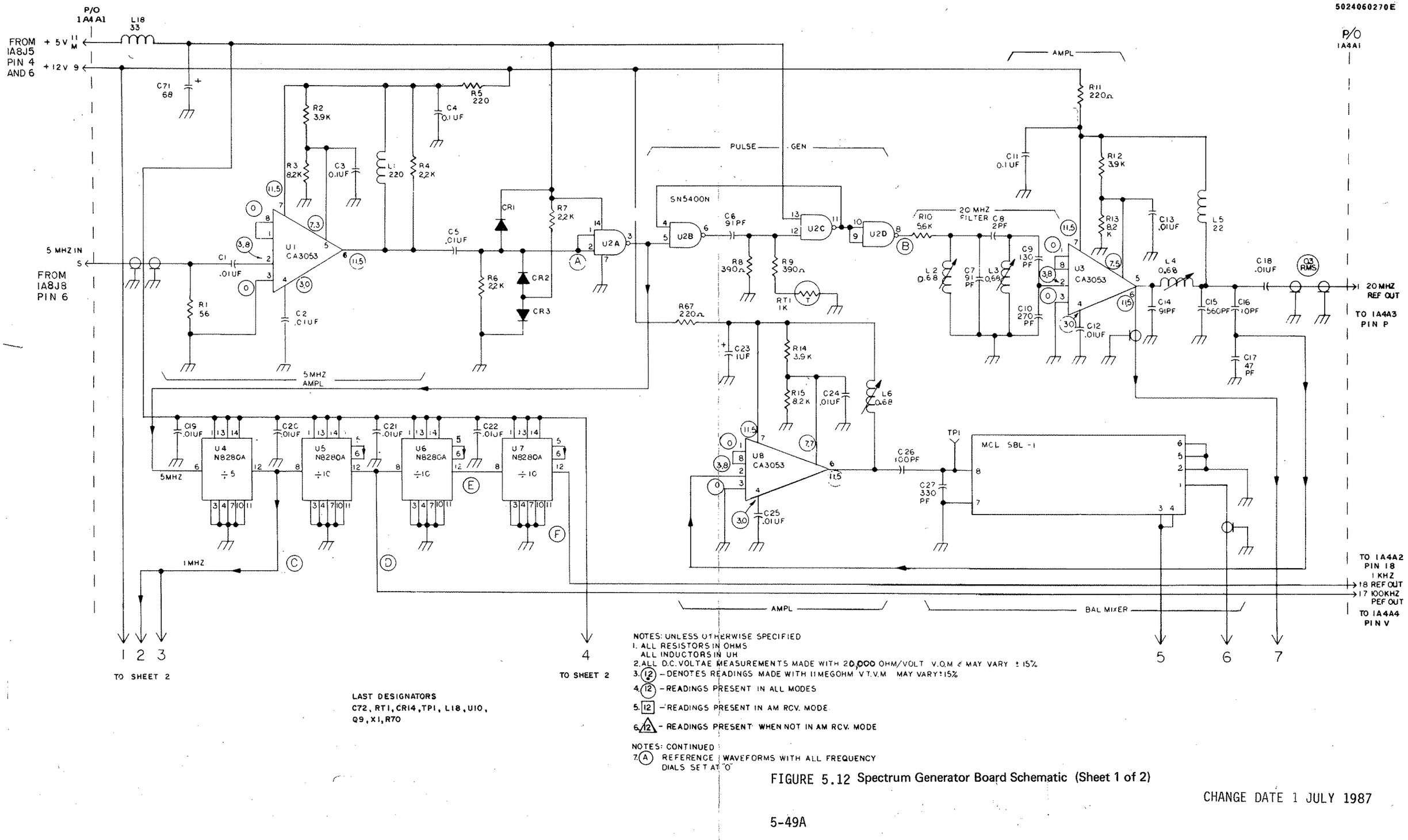
Spectrum Generator (1A4A1) Waveforms
(Frequency Dials at 00000.0 kHZ





CHANGE DATE 1 JULY 1987

5024060270E



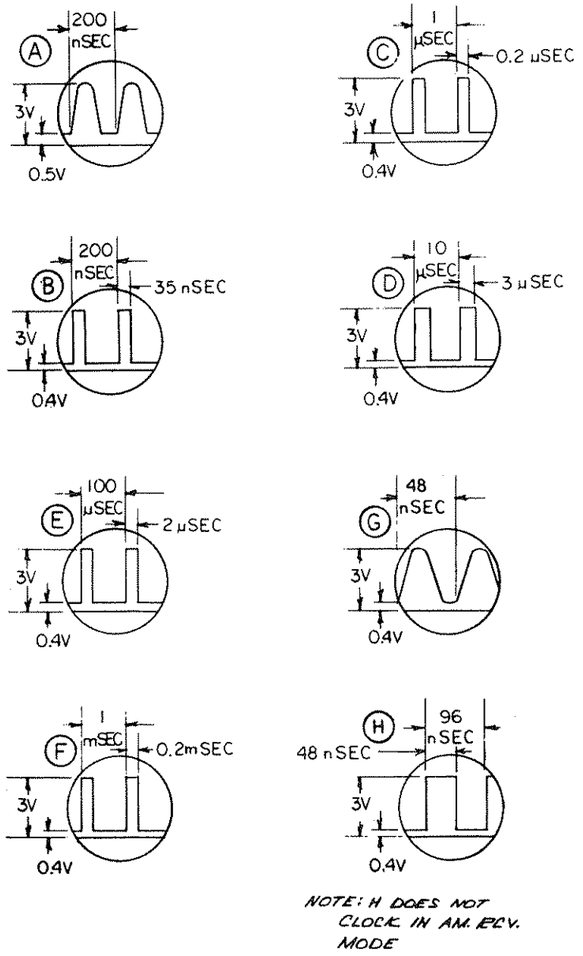
LAST DESIGNATORS
C72, RT1, CR14, TP1, L18, U10, Q9, X1, R70

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS IN OHMS
ALL INDUCTORS IN UH
2. ALL D.C. VOLTAE MEASUREMENTS MADE WITH 20,000 OHM/VOLT V.O.M & MAY VARY ± 15%
3. (12) – DENOTES READINGS MADE WITH 11 MEGOHM V.T.V.M MAY VARY ± 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 5.12 Spectrum Generator Board Schematic (Sheet 1 of 2)

CHANGE DATE 1 JULY 1987



NOTE: H DOES NOT CLOCK IN AM RCV. MODE

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

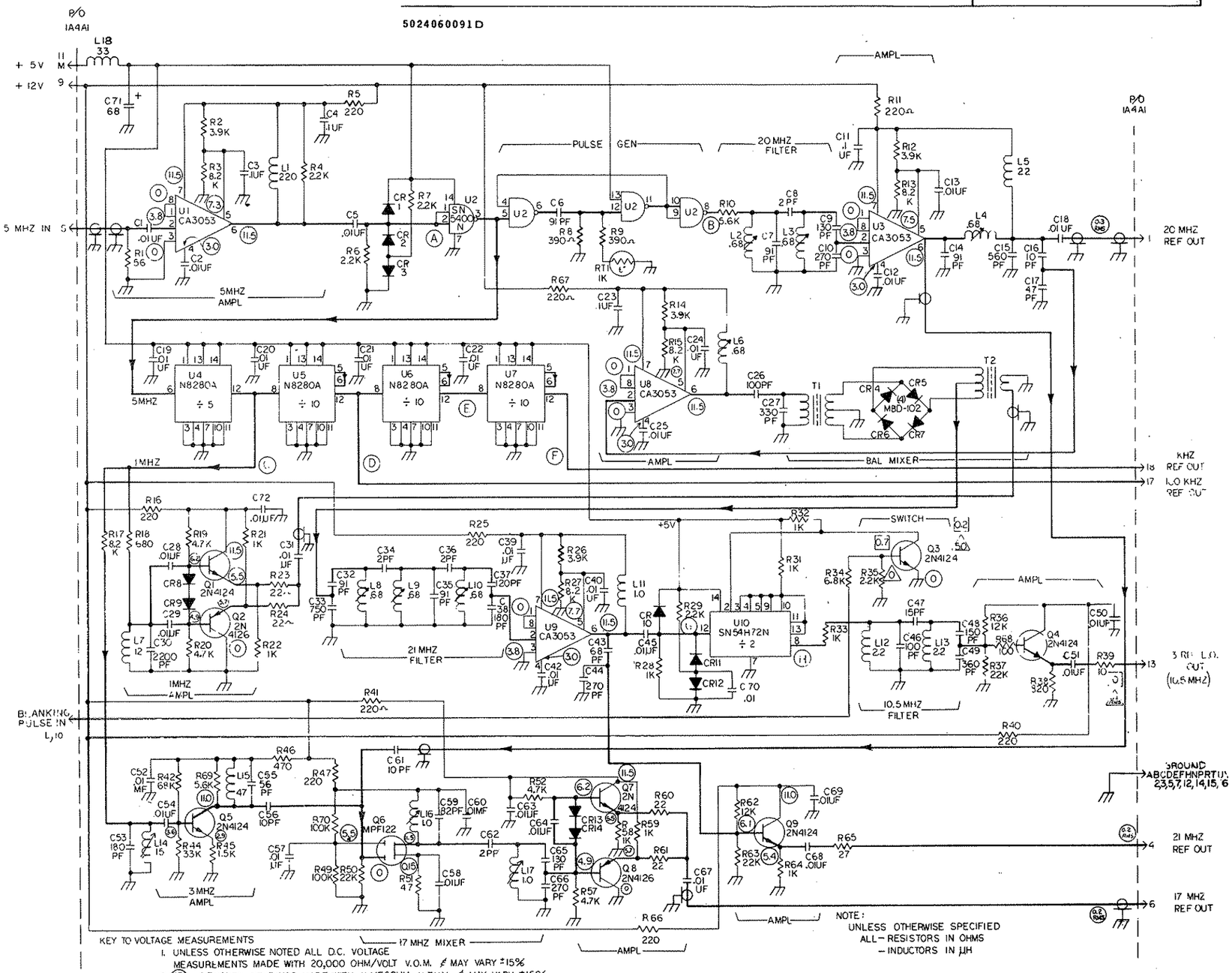


Figure 5.12 Spectrum Generator Schematic (1A4A1)

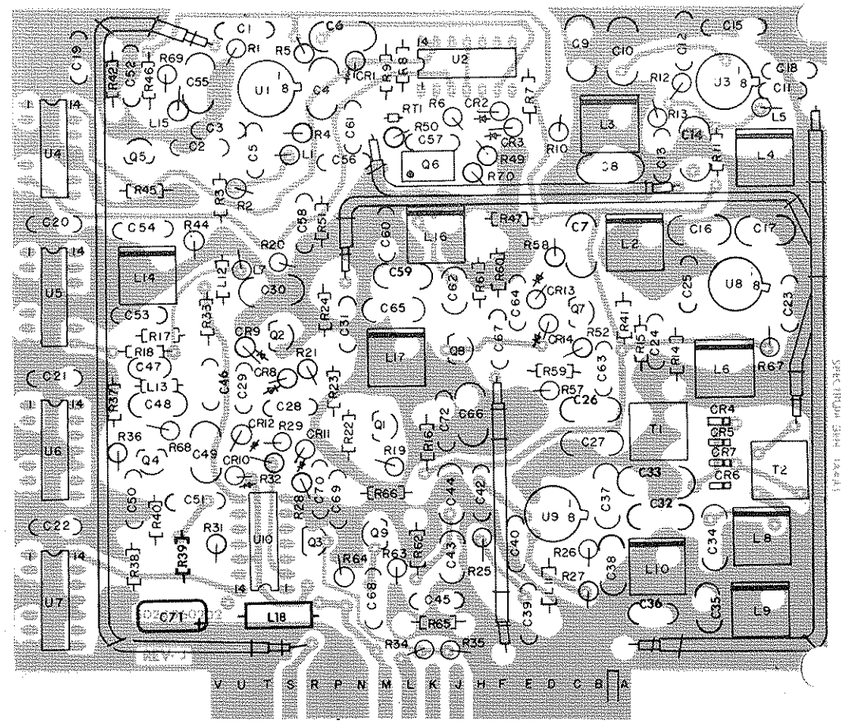
new

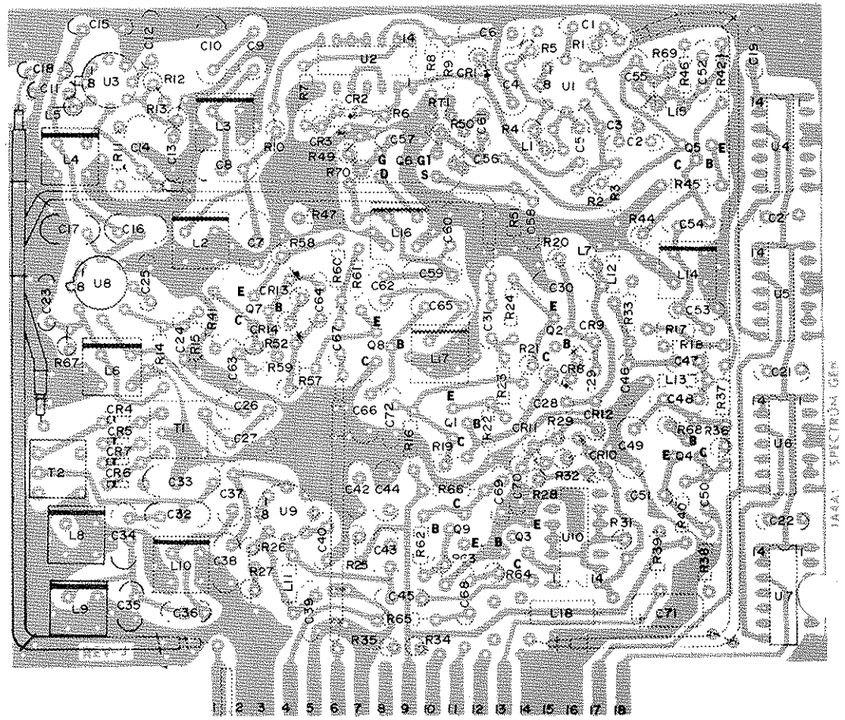
5024060091K PC ASSY SPECTRUM GENERATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SPECTRUM GENERATOR	5024060091
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 0.01 UF, 25 V, X5S	0281610002
C6	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C7	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C8	Capacitor, 2 PF, 500 V, DM10	0259710008
C9	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C10	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C11	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C14	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C15	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C16	Capacitor, 10 PF, 500 V, DM10	0259830003
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C27	Capacitor, 330 PF, 500 V, DM15, 5%	0299030008
C28	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C29	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C30	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006
C31	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C32	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C33	Capacitor, 750 PF, 300 V, DM15, 5%	0275410005
C34	Capacitor, 2 PF, 500 V, DM10	0259710008
C35	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C36	Capacitor, 2 PF, 500 V, DM10	0259710008
C37	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C38	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C41	Not used	
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 68 PF, 500 V, DM10, 5%	0261070002
C44	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C46	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C47	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009
C48	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C49	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C51	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C52	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C53	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C54	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C55	Capacitor, 56 PF, 500 V, DM10, 5%	0293170002
C56	Capacitor, 10 PF, 500 V, DM10	0259830003
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C58	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C59	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C60	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C61	Capacitor, 10 PF, 500 V, DM10	0259830003
C62	Capacitor, 2 PF, 500 V, DM10	0259710008
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C65	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C66	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C67	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C68	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C69	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C70	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C71	Capacitor, 68 UF, 15 V, T368	0296540005
C72	Capacitor, 0.01 UF, 25 V, 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	Diode, Hot Carrier, MBD-102	0405280009
CR5	Diode, Hot Carrier, MBD-102	0405280009
CR6	Diode, Hot Carrier, MBD-102	0405280009
CR7	Diode, Hot Carrier, MBD-102	0405280009
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, 220 UH, 5%	0650500008
L2	Inductor, Var. 0.68 UH	0647900009
L3	Inductor, Var. 0.68 UH	0647900009
L4	Inductor, Var. 0.68 UH	0647900009
L5	Inductor, Molded, 22 UH, 5%	0650000005
L6	Inductor, Var. 0.68 UH	0647900009
L7	Inductor, Molded, 12 UH, 5%	0652700004
L8	Inductor, Var. 0.68 UH	0647900009
L9	Inductor, Var. 0.68 UH	0647900009
L10	Inductor, Var. 0.68 UH	0647900009
L11	Inductor, Molded, 1.0 UH, 5%	0649150007
L12	Inductor, Molded, 2.2 UH, 5%	0649890001
L13	Inductor, Molded, 2.2 UH, 5%	0649890001
L14	Inductor, Var. 15.0 UH	0629790001
L15	Inductor, Molded, 47 UH, 5%	0652650003
L16	Inductor, Var, 1.00 UH	0647910004
L17	Inductor, Var, 1.00 UH	0647910004
L18	Inductor, Molded, 33 UH, 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%, 1/4 W	0174290004
R2	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R3	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R4	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R5	Resistor, 220, 10%, 1/4 W	0171320000
R6	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R7	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R8	Resistor, 390, 10%, 1/4 W	0178330001
R9	Resistor, 390, 10%, 1/4 W	0178330001
R10	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R11	Resistor, 220, 10%, 1/4 W	0171320000
R12	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R13	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R14	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R15	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R16	Resistor, 220, 10%, 1/4 W	0171320000
R17	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R18	Resistor, 680, 10%, 1/4 W	0176630007
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R21	Resistor, 1 K, 10%, 1/4 W	0171560001
R22	Resistor, 1 K, 10%, 1/4 W	0171560001
R23	Resistor, 22, 10%, 1/4 W	0192690001
R24	Resistor, 22, 10%, 1/4 W	0192690001
R25	Resistor, 220, 10%, 1/4 W	0171320000
R26	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R27	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R28	Resistor, 1 K, 10%, 1/4 W	0171560001
R29	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R30	Not used	
R31	Resistor, 1 K, 10%, 1/4 W	0171560001
R32	Resistor, 1 K, 10%, 1/4 W	0171560001
R33	Resistor, 1 K, 10%, 1/4 W	0171560001
R34	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R35	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R36	Resistor,, 12 K, 10%, 1/4 W	0183180003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R37	Resistor, 22 K, 5%, 1/4 W	0172230004
R38	Resistor, 820, 10%, 1/4 W	0178210005
R39	Resistor, 10, 5%, 1/4 W	0177160004
R40	Resistor, 220, 10%, 1/4 W	0171320000
R41	Resistor, 220, 10%, 1/4 W	0171320000
R42	Resistor, 68 K, 10%, 1/4 W	0173520006
R43	Not used	
R44	Resistor, 33 K, 10%, 1/4 W	0177920009
R45	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R46	Resistor, 470, 10%, 1/4 W	0172610001
R47	Resistor, 220, 10%, 1/4 W	0171320000
R48	Not used	
R49	Resistor, 100 K, 10%, 1/4 W	0170390004
R50	Resistor, 22 K, 5%, 1/4 W	0172230004
R51	Resistor, 47 K, 10%, 1/4 W	0179360001
R52	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R53	Not used	
R54	Not used	
R55	Not used	
R56	Not used	
R57	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R58	Resistor, 1 K, 10%, 1/4 W	0171560001
R59	Resistor, 1 K, 10%, 1/4 W	0171560001
R60	Resistor, 22, 10%, 1/4 W	0192690001
R61	Resistor, 22, 10%, 1/4 W	0192690001
R62	Resistor, 12 K, 10%, 1/4 W	0183180003
R63	Resistor, 22 K, 5%, 1/4 W	0172230004
R64	Resistor, 1 K, 10%, 1/4 W	0171560001
R65	Resistor, 27, 10%, 1/4 W	0172590001
R66	Resistor, 220, 10%, 1/4 W	0171320000
R67	Resistor, 220, 10%, 1/4 W	0171320000
R68	Resistor, 100, 5%, 1/4 W	0171180003
R69	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R70	Resistor, 100 K, 10%, 1/4 W	0170390004
RT1	Resistor, 1 K at 25 C	0196110009
T1	Transformer	5024110307
T2	Transformer	5024110307
U1	IC Digital SN5400 N	0448400006
U3	IC Linear CA3053	0448060001
U4	IC Digital SN74175/N8280 A	0448080001
U5	IC Digital SN74175/N8280 A	0448080001
U6	IC Digital SN74175/N8280 A	0448080001
U7	IC Digital SN74175/N8280 A	0448080001
U8	IC Linear CA3053	0448060001
U9	IC Linear CA3053	0448060001
U10	IC Digital SN54H72 N	0448410001
	Tubing, No. 22 Natural DNP	0579480003
	Wire Kit, Spectrum Gen. Assy.	5024060008
	PCB Spectrum Generator	5024060202





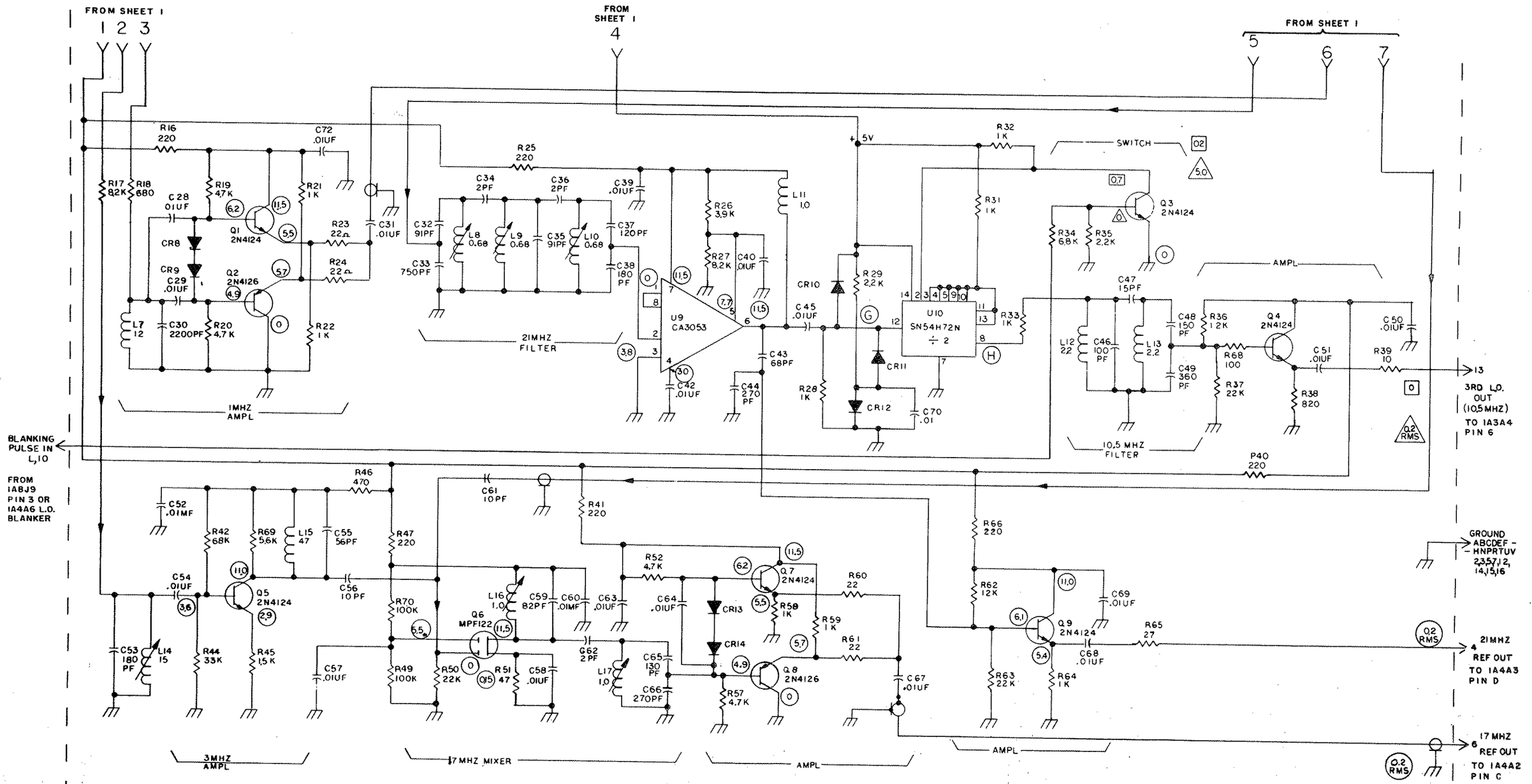


Figure 5.12 Spectrum Generator Board Schematic (Sheet 2 of 2)

CHANGE DATE 1 JULY 1987

5024060091M PC ASSY. SPECTRUM GENERATOR 1A4A1

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A4A1	PC ASSY SPECTRUM GENERATOR	5024060091
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 0.01UF, 25V, X5S	0281620008
C6	Capacitor, 91PF, 500 V, DM10, 5%	0284420000
C7	Capacitor, 91PF, 500V, DM10, 5%	0284420000
C8	Capacitor, 2 PF, 500 V, DM10	0259710008
C9	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C10	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C11	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C14	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C15	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C16	Capacitor, 10 PF, 500 V, DM10	0259830003
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C23	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C24	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C27	Capacitor, 330 PF, 500 V, DM15, 5%	0299030008
C28	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C29	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C30	Capacitor, 2200 PF, 500 V, DM19, 2%	0281360006
C31	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C32	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C33	Capacitor, 750 PF, 300 V, DM15, 5%	0275410005
C34	Capacitor, 2 PF, 500 V, DM10	0259710008
C35	Capacitor, 91 PF, 500 V, DM10, 5%	0284420000
C36	Capacitor, 2 PF, 500 V, DM10	0259710008
C37	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C38	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C41	Not used	
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 68 PF, 500 V, DM10, 5%	0261070002
C44	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C45	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C46	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C47	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009
C48	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C49	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C51	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C52	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C53	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C54	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C55	Capacitor, 56 PF, 500 V, DM10, 5%	0293170002
C56	Capacitor, 10 PF, 500 V, DM10	0259830003
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C58	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C59	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C60	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C61	Capacitor, 10 PF, 500 V, DM10	0259830003
C62	Capacitor, 2 PF, 500 V, DM10	0259710008
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C65	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C66	Capacitor, 270 PF, 500 V, DM15, 5%	0275030008
C67	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C68	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C69	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C70	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C71	Capacitor, 68 UF, 15 V, T368	0296540005
C72	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
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, 220 UH, 5%	0650500008
L2	Inductor, Var. 0.68 UH	0647900009
L3	Inductor, Var. 0.68 UH	0647900009
L4	Inductor, Var. 0.68 UH	0647900009
L5	Inductor, Molded, 22 UH, 5%	0650000005
L6	Inductor, Var. 0.68 UH	0647900009
L7	Inductor, Molded, 12 UH, 5%	0652700004
L8	Inductor, Var. 0.68 UH	0647900009
L9	Inductor, Var. 0.68 UH	0647900009
L10	Inductor, Var. 0.68 UH	0647900009
L11	Inductor, Molded, 1.0 UH, 5%	0649150007
L12	Inductor, Molded, 2.2 UH, 5%	0649890001
L13	Inductor, Molded, 2.2 UH, 5%	0649890001
L14	Inductor, Var. 15.0 UH	0629790001
L15	Inductor, Molded, 47 UH, 5%	0652680003
L16	Inductor, Var, 1.00 UH	0647910004
L17	Inductor, Var, 1.00 UH	0647910004
L18	Inductor, Molded, 33 UH, 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%, 1/4 W	0174290004
R2	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R3	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R4	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R5	Resistor, 220, 10%, 1/4 W	0171320000
R6	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R7	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R8	Resistor, 390, 10%, 1/4 W	0178330001
R9	Resistor, 390, 10%, 1/4 W	0178330001
R10	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R11	Resistor, 220, 10%, 1/4 W	0171320000
R12	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R13	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R14	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R15	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R16	Resistor, 220, 10%, 1/4 W	0171320000
R17	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R18	Resistor, 680, 10%, 1/4 W	0176630007
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R21	Resistor, 1 K, 10%, 1/4 W	0171560001
R22	Resistor, 1 K, 10%, 1/4 W	0171560001
R23	Resistor, 22, 10%, 1/4 W	0192690001
R24	Resistor, 22, 10%, 1/4 W	0192690001
R25	Resistor, 220, 10%, 1/4 W	0171320000
R26	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R27	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R28	Resistor, 1 K, 10%, 1/4 W	0171560001
R29	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R30	Not used	
R31	Resistor, 1 K, 10%, 1/4 W	0171560001
R32	Resistor, 1 K, 10%, 1/4 W	0171560001
R33	Resistor, 1 K, 10%, 1/4 W	0171560001
R34	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R35	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R36	Resistor,, 12 K, 10%, 1/4 W	0183180003
R37	Resistor, 22 K, 5%, 1/4 W	0172230004
R38	Resistor, 820, 10%, 1/4 W	0178210005
R39	Resistor, 10, 5%, 1/4 W	0177160004
R40	Resistor, 220, 10%, 1/4 W	0171320000
R41	Resistor, 220, 10%, 1/4 W	0171320000
R42	Resistor, 68 K, 10%, 1/4 W	0173520006
R43	Not used	
R44	Resistor, 33 K, 10%, 1/4 W	0177920009
R45	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R46	Resistor, 470, 5%, 1/4 W	0184110009
R47	Resistor, 220, 10%, 1/4 W	0171320000
R48	Not used	
R49	Resistor, 100 K, 10%, 1/4 W	0170390004
R50	Resistor, 22 K, 5%, 1/4 W	0172230004
R51	Resistor, 47 K, 10%, 1/4 W	0179360001
R52	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R53	Not used	
R54	Not used	
R55	Not used	
R56	Not used	
R57	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R58	Resistor, 1 K, 10%, 1/4 W	0171560001
R59	Resistor, 1 K, 10%, 1/4 W	0171560001
R60	Resistor, 22, 10%, 1/4 W	0192690001
R61	Resistor, 22, 10%, 1/4 W	0192690001
R62	Resistor, 12 K, 10%, 1/4 W	0183180003
R63	Resistor, 22 K, 5%, 1/4 W	0172230004
R64	Resistor, 1 K, 10%, 1/4 W	0171560001
R65	Resistor, 27, 10%, 1/4 W	0172590001
R66	Resistor, 220, 10%, 1/4 W	0171320000
R67	Resistor, 220, 10%, 1/4 W	0171320000
R68	Resistor, 100, 5%, 1/4 W	0171180003
R69	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R70	Resistor, 100 K, 10%, 1/4 W	0170390004
RT1	Resistor, 1 K at 25 C	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 SN54H72N	0448410001
X1	Balanced Mixer	1003300006

5024070097C

1A4A2

KEY TO VOLTAGE MEASUREMENTS

(12) D.C. VOLTAGE MEASURED WITH 20,000 OHM/VOLT V.O.M.

(12) D.C. VOLTAGE MEASURED WITH 11 MEGOHM V.T.V.M.

(A) REFERENCE WAVEFORM MEASURED WITH 100 MHZ D.C. COUPLED SCOPE AND 9pF/1 MEGOHM PROBE

(2.9 RMS) RMS VOLTAGE MEASURED WITH RF VOLTMETER

NOTE: ALL VOLTAGES MAY NORMALLY VARY ±15% FROM NOMINAL SHOWN

UNLESS OTHERWISE SPECIFIED:
ALL DIODES ARE TYPE 1N4454
-DECIMAL CAPACITORS IN UF,
ALL OTHERS IN PF
-INDUCTORS IN UH
-RESISTORS IN OHMS

LAST DESIGNATORS
R69
C68
L13
CR18

PREFIX ALL DESIGNATORS WITH "1A4A2"

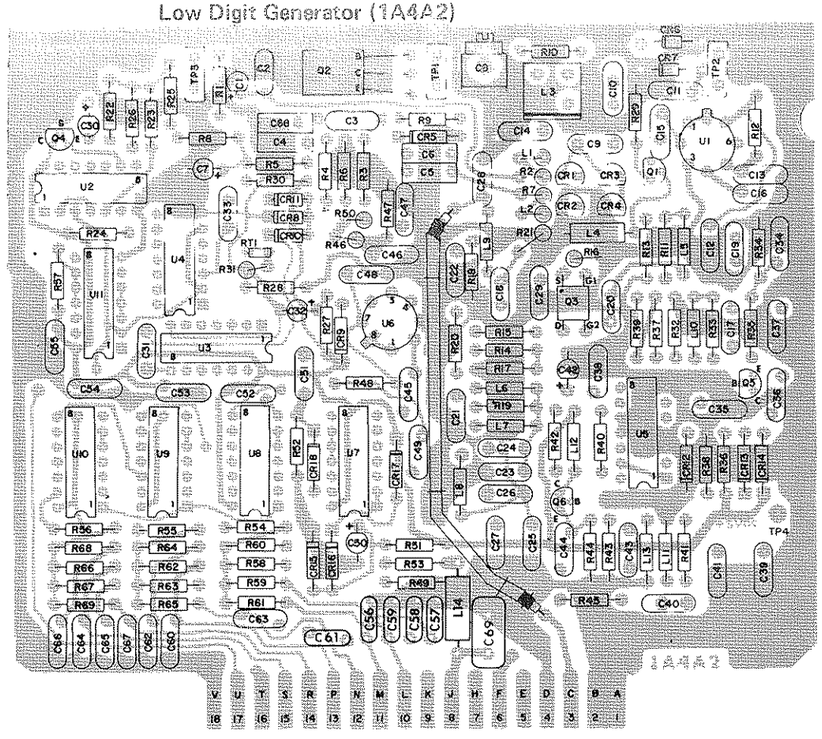
Figure 5.13 Low Digit Generator Schematic (1A4A2)

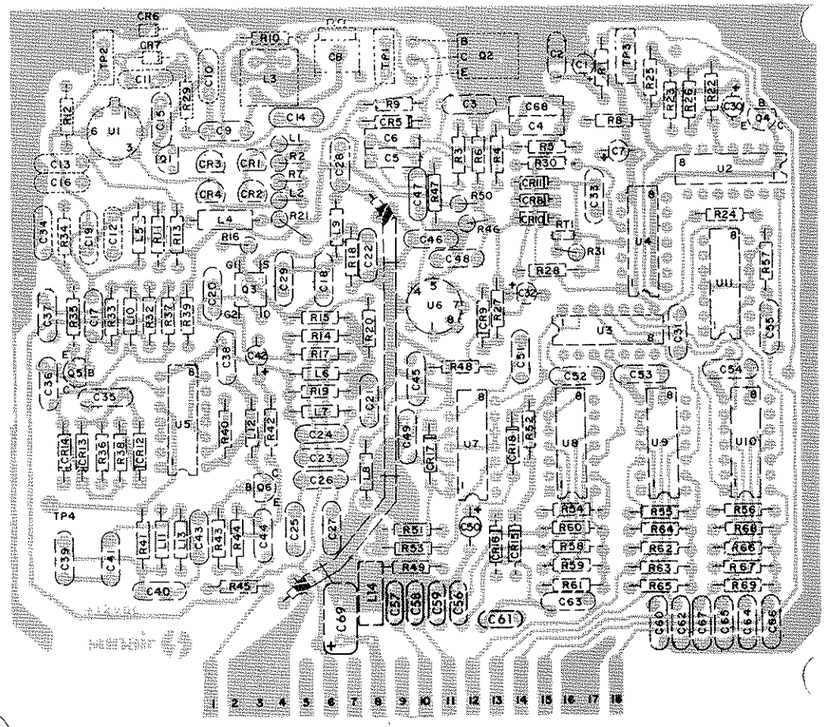
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY LOW DIGIT GENERATOR	5024070097
C1	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C2	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C3	Capacitor, .068 UF, 50 V, Mylar	0281640009
C4	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C5	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C6	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C7	Capacitor, 0.33 UF, 35 V, 196 D	0281650004
C8	Capacitor, 3-15 PF, 200 V, N650	0285710001
C9	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C10	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C11	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C12	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C13	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C14	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C15	Capacitor, 7 PF, 500 V, DM10	0292400004
C16	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C17	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C18	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C19	Capacitor, 27 PF, 500 V, DM10, 5%	0260660001
C20	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C21	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C22	Capacitor, , 0.1 UF, 50 V, X7 R, 20%	0281610002
C23	Capacitor, 68 PF, 500 V, DM10, 5%	0261070002
C24	Capacitor, 5 PF, 500 V, DM10	0261190008
C25	Capacitor, 110 PF, 500 V, DM10, 5%	0257750002
C26	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C27	Capacitor, 62 PF, 500 V, DM10, 5%	0283010002
C28	Capacitor, 130 PF, 500 V, DM15, 5%	0274860007
C29	Capacitor, 110 PF, 500 V, DM10, 5%	0257750002
C30	Capacitor, 15 UF, 15 V, 196 D	0281720002
C31	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C32	Capacitor, 1 UF, 35 V, 196 D	0281660000
C33	Capacitor, 910 PF, 100 V, CD7, 5%	0288660005
C34	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C35	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C36	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C37	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C38	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C39	Capacitor, 680 PF, 300 V, DM15, 5%	0286240009
C40	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C41	Capacitor, 680 PF, 300 V, DM15, 5%	0286240009
C42	Capacitor, 1 UF, 35 V, 196 D	0281660000
C43	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C44	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C45	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C46	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C47	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C48	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C49	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C50	Capacitor, 1 UF, 35 V, 196 D	0281660000
C51	Capacitor, 180 PF, 500 V, DM15, 5%	0258280000
C52	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C53	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C54	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C55	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C56	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C57	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C58	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C59	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C60	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C61	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C62	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C63	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C65	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C66	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C67	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C68	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C69	Capacitor, 68 UF, 15 V, 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

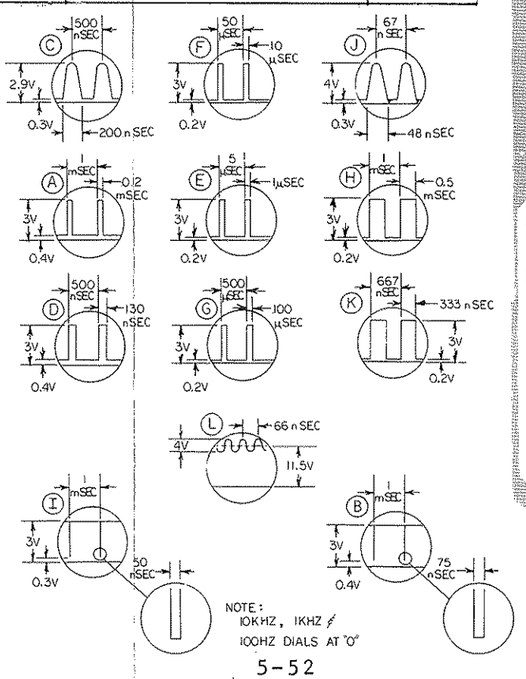
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Diode, Signal, Sil. 1N4454	0405270003
CR8	Diode, Signal, Sil. 1N4454	0405270003
CR9	Diode, Signal, Sil. 1N4454	0405270003
CR10	Diode, Signal, Sil. 1N4454	0405270003
CR11	Diode, Signal, Sil. 1N4454	0405270003
CR12	Diode, 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, 33 UH, 5%	0659690004
L2	Inductor, Molded, 33 UH, 5%	0659690004
L3	Inductor, Var, 1.00 UH	0647910004
L4	Inductor, Molded, 150 UH, 5%	0646780000
L5	Inductor, Molded, 3.3 UH, 5%	0658920006
L6	Inductor, Molded, 220 UH, 5%	0650500008
L7	Inductor, Molded, 82 UH, 5%	0659450003
L8	Inductor, Molded, 68 UH, 5%	0651650003
L9	Inductor, Molded, 1.0 UH, 5%	0649150007
L10	Inductor, Molded, 8.2 UH, 5%	0652060005
L11	Inductor, Molded, 15 UH, 5%	0659070006
L12	Inductor, Molded, 47 UH, 5%	0652680003
L13	Inductor, Molded, 15 UH, 5%	0659070006
L14	Inductor, Molded, 33 UH, 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%, 1/4 W	0178210005
R2	Resistor, 4.7 K, 10%, 1/4 W	0170770001
R3	Resistor, 33.2 K, 1%, 1/8 W	0196470005
R4	Resistor, 33.2 K, 1%, 1/8 W	0196470005
R5	Resistor, 3.9 K, 10%, 1/4 W	0178830003
R6	Resistor, 16.5 K, 1%, 1/8 W	0196590001
R7	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R8	Resistor, 820, 10%, 1/4 W	0178210005
R9	Resistor, 680, 10%, 1/4 W	0176630007
R10	Resistor, 22, 10%, 1/4 W	0192690001
R11	Resistor, 120, 10%, 1/4 W	0186550006
R12	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R13	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R14	Resistor, 220 K, 10%, 1/4 W	0177780002
R15	Resistor, 220 K, 10%, 1/4 W	0177780002
R16	Resistor, 22 K, 5%, 1/4 W	0172230004
R17	Resistor, 47 K, 10%, 1/4 W	0171060008
R18	Resistor, 150, 10%, 1/4 W	0172730007
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 120, 10%, 1/4 W	0186550006
R21	Resistor, 220, 10%, 1/4 W	0171320000
R22	Resistor, 10 K, 10%, 1/4 W	0170410005
R23	Resistor, 10 K, 10%, 1/4 W	0170410005
R24	Resistor, 1 K, 10%, 1/4 W	0171560001
R25	Resistor, 2.2 M, 10%, 1/4 W	0176870008
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
R27	Resistor, 1 K, 10%, 1/4 W	0171560001
R28	Resistor, 470, 10%, 1/4 W	0172610001
R29	Resistor, 47 K, 10%, 1/4 W	0171060008
R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R31	Resistor, 470, 10%, 1/4 W	0172610001
R32	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R33	Resistor, 15 K, 10%, 1/4 W	0172350000
R34	Resistor, 470, 10%, 1/4 W	0172610001
R35	Resistor, 100, 5%, 1/4 W	0171180003
R36	Resistor, 1 K, 10%, 1/4 W	0171560001
R37	Not used	
R38	Resistor, 1 K, 10%, 1/4 W	0171560001
R39	Resistor, 120, 10%, 1/4 W	0186550006
R40	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R41	Resistor, 1 K, 10%, 1/4 W	0171560001
R42	Resistor, 3.3 K, 10%, 1/4 W	0170890007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R43	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R44	Resistor, 220, 10%, 1/4 W	0171320000
R45	Resistor, 47, 10%, 1/4 W	0179360001
R46	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R48	Resistor, 560, 5%, 1/4 W	0183200004
R49	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R50	Resistor, 120, 10%, 1/4 W	0186550006
R51	Resistor, 1 K, 10%, 1/4 W	0171560001
R52	Resistor, 470, 10%, 1/4 W	0172610001
R53	Resistor, 1 K, 10%, 1/4 W	0171560001
R54	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R55	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R56	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R57	Resistor, 1 K, 10%, 1/4 W	0171560001
R58	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R59	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R60	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R61	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R62	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R63	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R64	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R65	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R66	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R67	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R68	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R69	Resistor, 5.6 K, 10%, 1/4 W	0183060008
RT1	Resistor, 1 K at 25 C	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 SN7430 N	0448110008
U4	IC Digital SN7400 N	0448070006
U5	IC Digital 74 LS196 N Selected	0448250004
U6	IC Linear CA3053	0448060001
U7	IC Digital SN7400 N	0448070006
U8	IC Digital SN74176 /N8280 A	0448080001
U9	IC Digital SN74176 /N8280 A	0448080001
U10	IC Digital SN74176 /N8280 A	0448080001
U11	IC Digital SN7472 N	0448120003
	Terminal, Turret SWGD .071 Mtg	0525580000

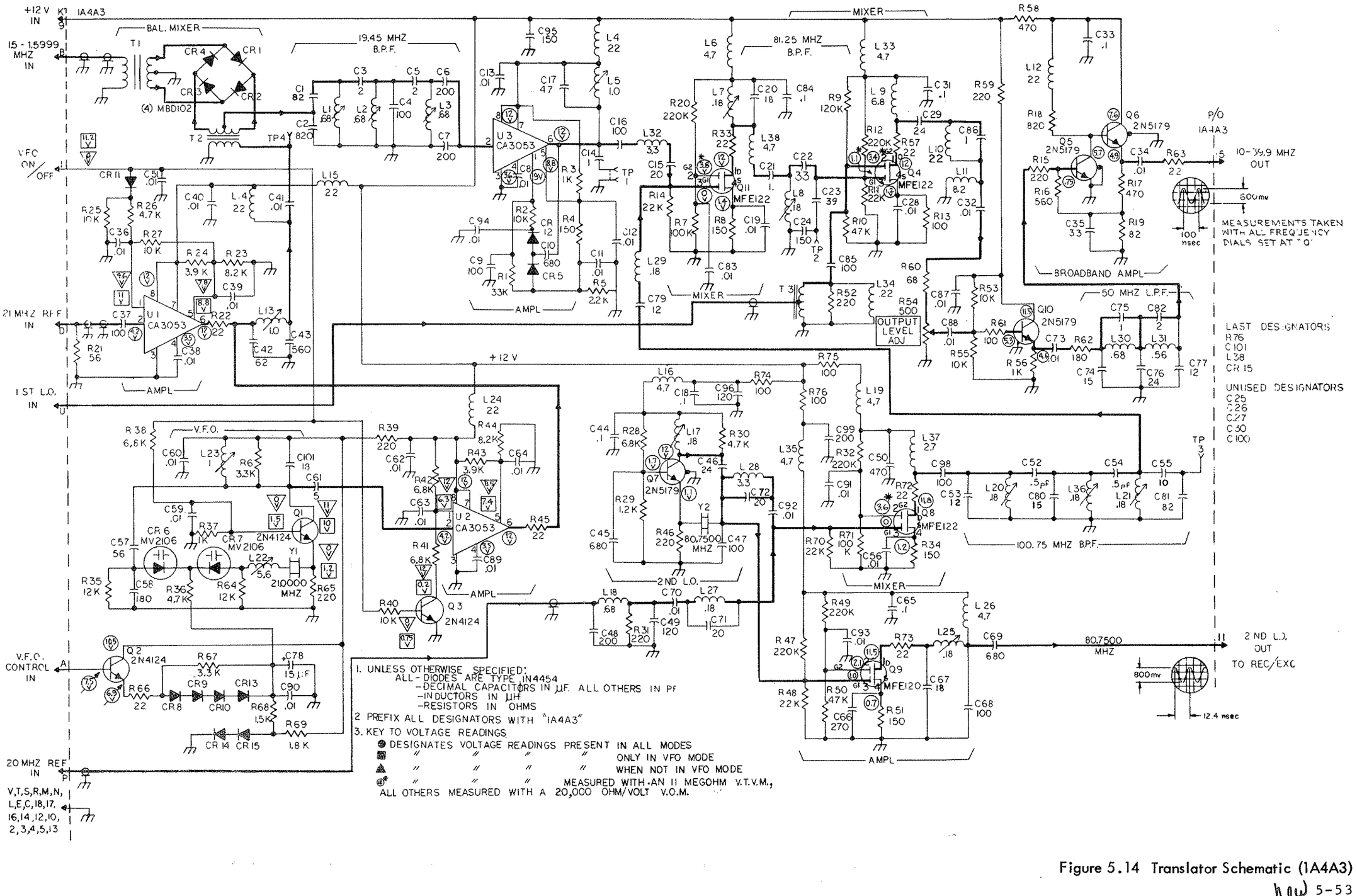
Low Digit Generator (1A4A2)







5024080076J



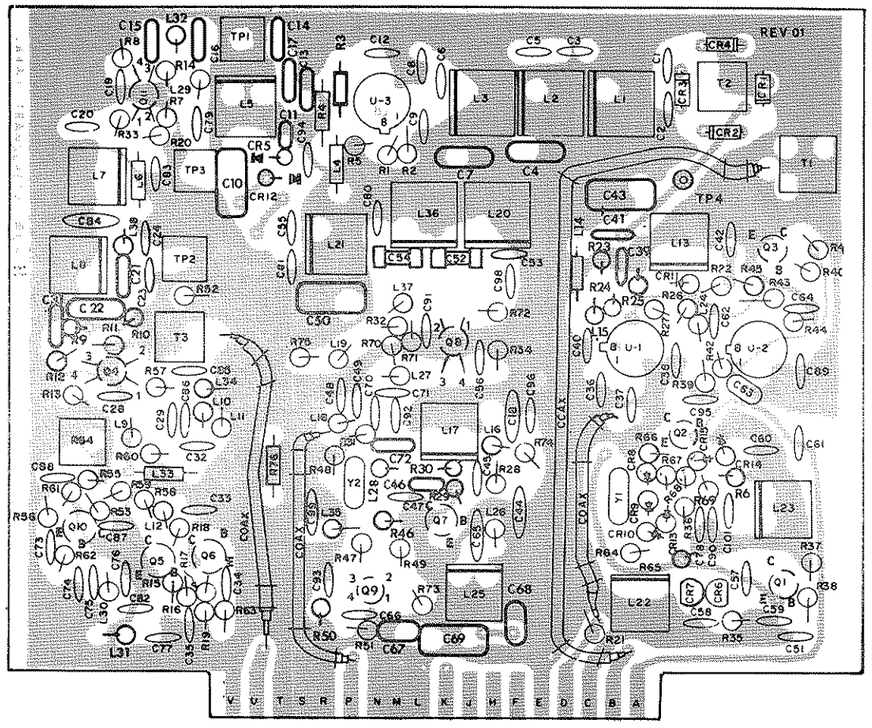
1. UNLESS OTHERWISE SPECIFIED:
   ALL - DIODES ARE TYPE 1N4454
   - DECIMAL CAPACITORS IN µF. ALL OTHERS IN PF
   - INDUCTORS IN µH
   - RESISTORS IN OHMS
2. PREFIX ALL DESIGNATORS WITH "1A4A3"
3. KEY TO VOLTAGE READINGS
   - ● DESIGNATES VOLTAGE READINGS PRESENT IN ALL MODES
   - ■ " " " " ONLY IN VFO MODE
   - ▲ " " " " WHEN NOT IN VFO MODE
   - ◎* " " " MEASURED WITH AN 11 MEGOHM V.T.V.M.,

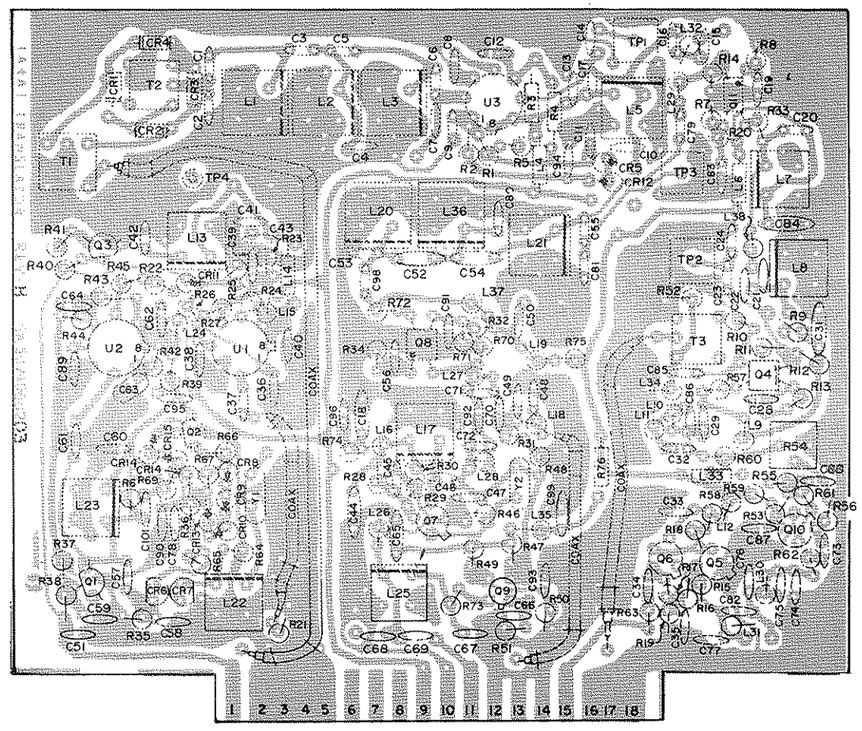
   ALL OTHERS MEASURED WITH A 20,000 OHM/VOLT V.O.M.

Figure 5.14 Translator Schematic (1A4A3)

new 5-53

Translator (1A4A3)





5024080092L PC ASSY TRANSLATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY TRANSLATOR	5024080092
C1	Capacitor, 82 PF, 300 V, CD6, 5%	0266520006
C2	Capacitor, 820 PF, 100 V, CD7, 5%	0283990007
C3	Capacitor, 2 PF, 500 V, DM10	0259710008
C4	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C5	Capacitor, 2 PF, 500 V, DM10	0259710008
C6	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C7	Capacitor, 200 PF, 300 V, CD7, 5%	0287150003
C8	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C9	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C10	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C11	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C12	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C13	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C14	Capacitor, 1 PF, 500 V, DM10	0260160008
C15	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C16	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C17	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C18	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C19	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C20	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C21	Capacitor, 1 PF, 500 V, DM10	0260160008
C22	Capacitor, 33 PF, 300 V, CD6, 5%	0286860007
C23	Capacitor, 39 PF, 500 V, DM10, 5%	0293290008
C24	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C25	Not used	
C26	Not used	
C27	Not used	
C28	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C29	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C30	Not used	
C31	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C32	Capacitor, 0.01 UF, 50 V, W5 R 20%	0281730008
C33	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C34	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C35	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C36	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C37	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C38	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C39	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C40	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C41	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C42	Capacitor, 62 PF, 500 V, DM10, 5%	0283010002
C43	Capacitor, 560 PF, 100 V, CD7, 5%	0285690001
C44	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C45	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C46	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C47	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C48	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C49	Capacitor, 120 PF, 500 V, DM10, 2%	0292880006
C50	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C51	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C52	Capacitor, 0.5 PF, 500 V, NPO	0281740003
C53	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C54	Capacitor, 0.5 PF, 500 V, NPO	0281740003
C55	Capacitor, 10 PF, 500 V, DM10	0259830003
C56	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C57	Capacitor, 56 PF, 500 V, DM10, 5%	0293170002
C58	Capacitor, 180 PF, 500 V, DM10, 5%	0294100008
C59	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C60	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C61	Capacitor, 5 PF, 500 V, DM10, 5%	0261190008
C62	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C63	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C64	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C65	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C66	Capaitor, 270 PF, 300 V, DM10, 5%	0294600001
C67	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C68	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C69	Capacitor, 680 PF, 100 V, CD7, 5%	0284280003
C70	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C71	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C72	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C73	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C74	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C75	Capacitor, 1 PF, 500 V, DM10	0260160008
C76	Capacitor, 24 PF, 500 V, DM10, 5%	0290060001
C77	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C78	Capacitor, 15 UF, 15 V, 196 D	0281720002
C79	Capacitor, 12 PF, 500 V, DM10, 5%	0260280003
C80	Capacitor, 15 PF, 500 V, DM10, 5%	0259950009
C81	Capacitor, 82 PF, 300 V, CD6, 5%	0266520006
C82	Capacitor, 2 PF, 500 V, DM10	0259710008
C83	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C84	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C85	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C86	Capacitor, 1 PF, 500 V, DM10	0260160008
C87	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C88	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C89	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C90	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C91	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C92	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C93	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C94	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C95	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C96	Capacitor, 120 PF, 500 V, DM10, 2%	0292880006
C97	Not used	
C98	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C99	Capacitor, 200 PF, 500 V, DM10, 5%	0293050007
C100	Not used	
C101	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
CR1	Diode, Hot Carrier MBD-102	0405280009
CR2	Diode, Hot Carrier MBD-102	0405280009
CR3	Diode, Hot Carrier MBD-102	0405280009
CR4	Diode, Hot Carrier MBD-102	0405280009
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, 0.68 UH	0647900009
L2	Inductor, Var, 0.68 UH	0647900009
L3	Inductor, Var, 0.68 UH	0647900009
L4	Inductor, Molded, 22 UH, 5%	0650000005
L5	Inductor, Var, 1.00 UH	0647910004
L6	Inductor, Molded, 4.7 UH, 5%	0651910005
L7	Inductor, Var, 0.18 UH	0647890003
L8	Inductor, Var, 0.18 UH	0647890003
L9	Inductor, Molded, 6.8 UH, 5%	0659210002
L10	Inductor, Molded, 2.2 UH, 10%	0659710005
L11	Inductor, Molded, 8.2 UH, 5%	0652060005
L12	Inductor, Molded, 22 UH, 5%	0650000005
L13	Inductor, Var, 1.00 UH	0647910004
L14	Inductor, Molded, 22 UH, 5%	0650000005
L15	Inductor, Molded, 22 UH, 5%	0650000005
L16	Inductor, Molded, 4.7 UH, 5%	0651910005
L17	Inductor, Var, 0.18 UH	0647890003
L18	Inductor, Molded, 0.68 UH, 5%	0649030001
L19	Inductor, Molded, 4.7 UH, 5%	0651910005
L20	Inductor, Var, 0.18 UH	0647890003
L21	Inductor, Var, 0.18 UH	0647890003
L22	Inductor, Var, 5.60 UH	0647880008
L23	Inductor, Var, 1.00 UH	0647910004
L24	Inductor, Molded, 22 UH, 5%	0650000005
L25	Inductor, Var, 0.18 UH	0647890003
L26	Inductor, Molded, 4.7 UH, 5%	0651910005
L27	Inductor, Molded, 0.18 UH, 10%	0651890004
L28	Inductor, Molded, 3.3 UH, 5%	0658920006
L29	Inductor, Molded, 0.18 UH, , 10%	0651890004
L30	Inductor, Molded, 0.68 UH, 5%	0659030001
L31	Inductor, Molded, 0.56 UH, 5%	0649530004
L32	Inductor, Molded, 3.3 UH, 5%	0659820006
L33	Inductor, Molded, 4.7 UH, 5%	0651910005

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

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R60	Resistor, 68, 10%, 1/4 W	0187960003
R61	Resistor, 100, 5%, 1/4 W	0171180003
R62	Resistor, 180, 10%, 1/4 W	0175220000
R63	Resistor, 22, 10%, 1/4 W	0192690001
R64	Resistor, 12 K, 10%, 1/4 W	0183180003
R65	Resistor, 220, 10%, 1/4 W	0171320000
R66	Resistor,, 22, 10%, 1/4 W	0192690001
R67	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R68	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R69	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R70	Resistor, 22 K, 5%, 1/4 W	0172230004
R71	Resistor, 100 K, 10%, 1/4 W	0170390004
R72	Resistor, 22, 10%, 1/4 W	0192690001
R73	Resistor, 22, 10%, 1/4 W	0192690001
R74	Resistor, 100, 5%, 1/4 W	0171180003
R75	Resistor, 100, 5%, 1/4 W	0171180003
R76	Resistor, 100, 5%, 1/4 W	0171180003
T1	Transformer	5024110307
T2	Transformer	5024110307
T3	Transformer	5024111401
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

5024090071E

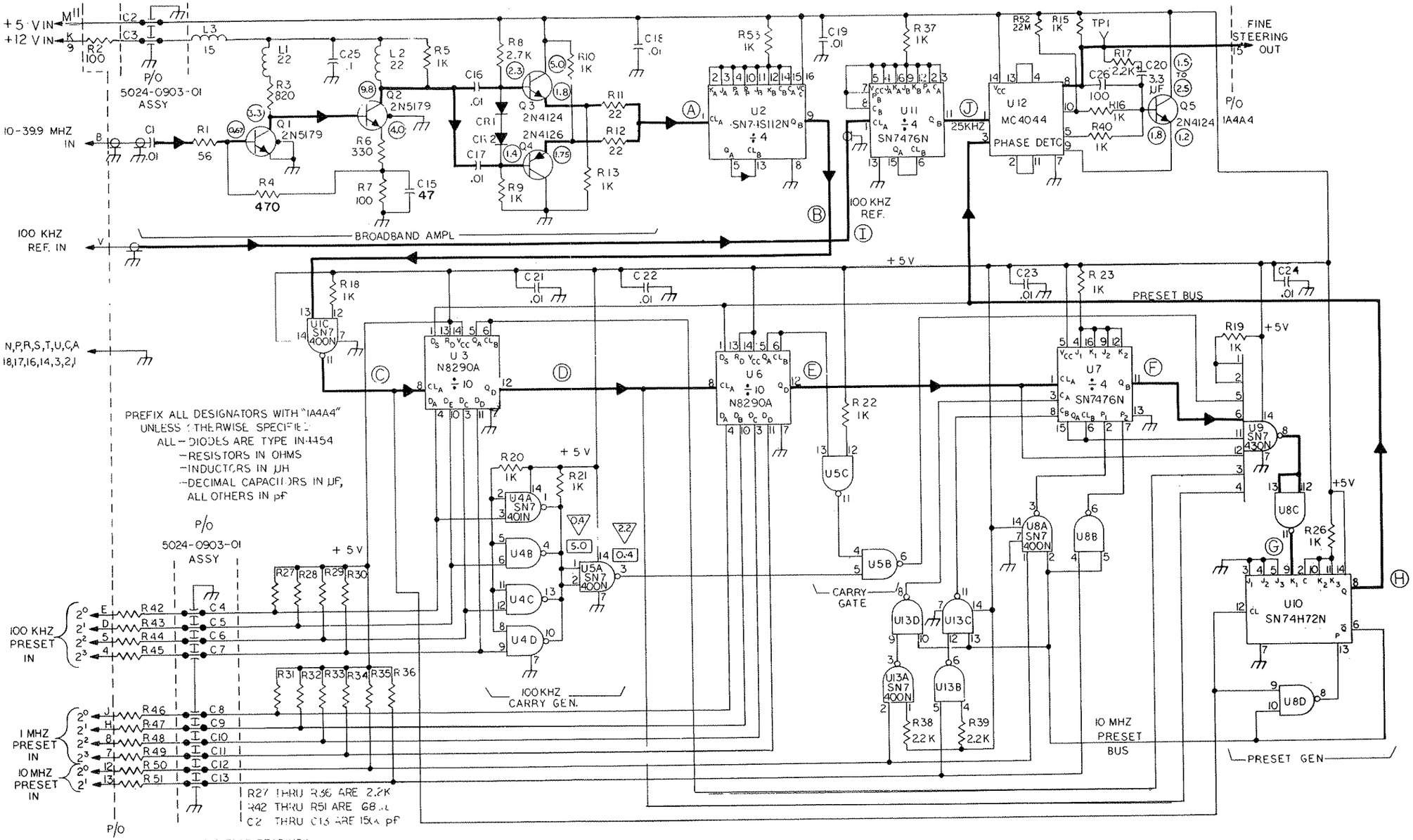
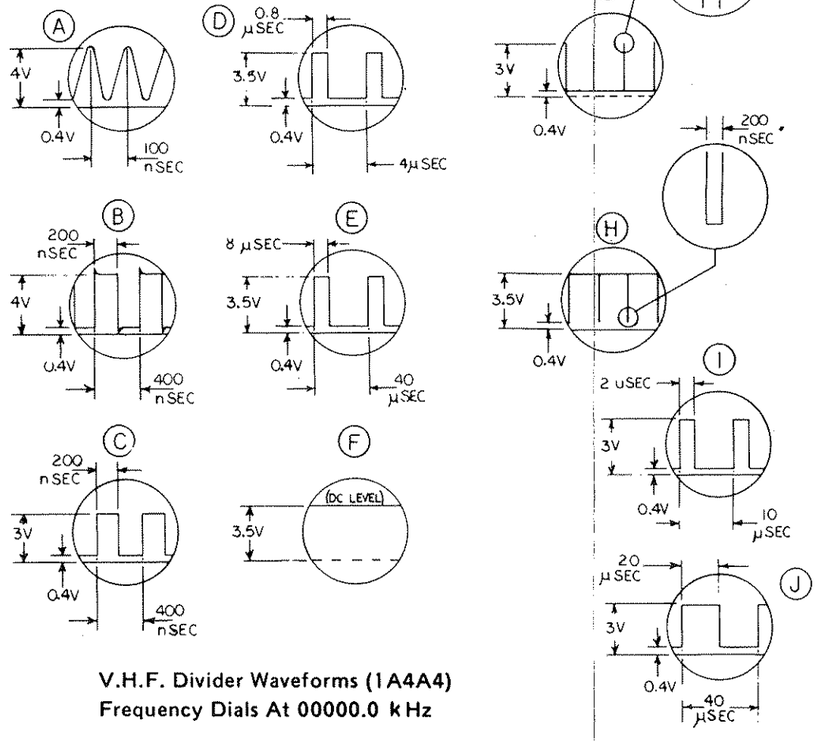


Figure 5.15 V.H.F. Divider Schematic (1A4A4)

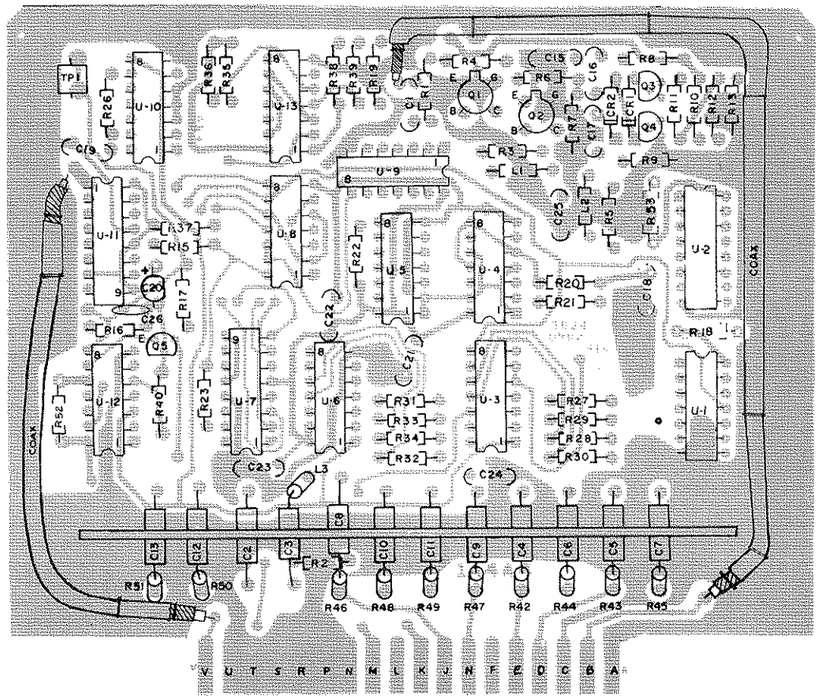
5024090098 PC ASSY VHF DIVIDER

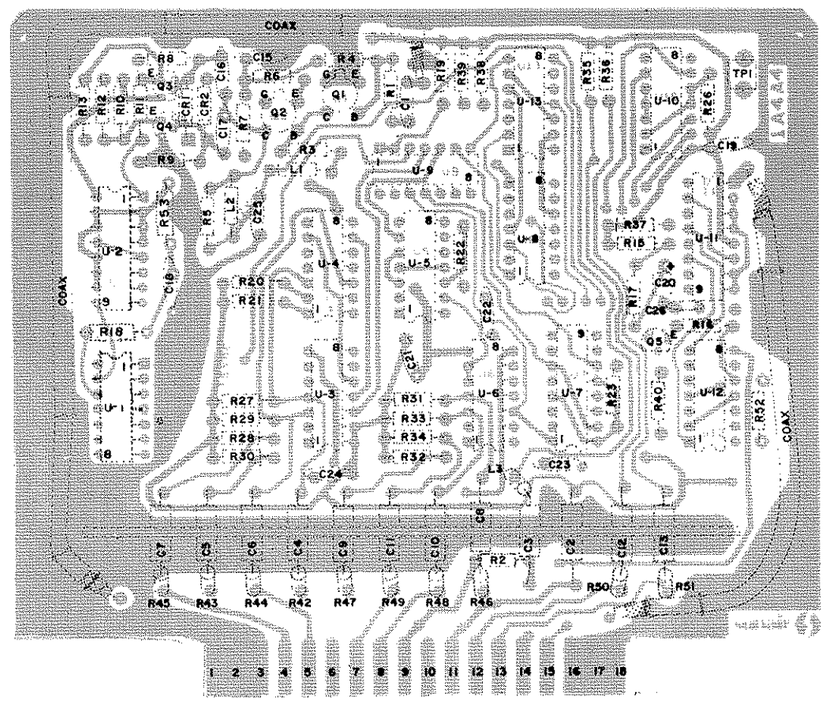
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF DIVIDER	5024090098
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C3	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C4	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C5	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C6	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C7	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C8	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C9	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C10	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C11	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C12	Capacitor, Feed Thru, 1500 PF, 500 V	0281760004
C13	Capacitor, Feed Thru, 1500 PF, 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, 1 K, 10%, 1/4 W	0171560001
R6	Resistor, 330, 5%, 1/4 W	0170910008
R7	Resistor, 100, 5%, 1/4 W	0171180003
R8	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R10	Resistor, 1 K, 10%, 1/4 W	0171560001
R11	Resistor, 22, 10%, 1/4 W	0192690001
R12	Resistor, 22, 10%, 1/4 W	0192690001
R13	Resistor, 1 K, 10%, 1/4 W	0171560001
R14	Not used	
R15	Resistor, 1 K, 10%, 1/4 W	0171560001
R16	Resistor, 1 K, 10%, 1/4 W	0171560001
R17	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R18	Resistor, 1 K, 10%, 1/4 W	0171560001
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 1 K, 10%, 1/4 W	0171560001
R21	Resistor, 1 K, 10%, 1/4 W	0171560001
R22	Resistor, 1 K, 10%, 1/4 W	0171560001
R23	Resistor, 1 K, 10%, 1/4 W	0171560001
R24	Not used	
R25	Not used	
R26	Resistor, 1 K, 10%, 1/4 W	0171560001
R27	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R28	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R29	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R31	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R32	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R33	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R34	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R35	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R36	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R37	Resistor, 1 K, 10%, 1/4 W	0171560001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R38	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R39	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R40	Resistor, 1 K, 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, 22 M, 10%, 1/4 W	0180950002
R53	Resistor, 1 K, 10%, 1/4 W	0171560001
TP1	Test Point, White	0753640007
U1	IC Digital SN7400 N	0448070006
U2	IC Digital SN74S112 N	0448450003
U3	IC Digital 74LS196 N Selected	0448250004
U4	IC Digital SN7401 N	0448230003
U5	IC Digital SN7400 N	0448070006
U6	IC Digital 74LS196 N Selected	0448250004
U7	IC Digital SN7476 N	0448240009
U8	IC Digital SN7400 N	0448070006
U9	IC Digital SN7430 N	0448110008
U10	IC Digital SN74H72 N	0448090007
U11	IC Digital SN7476 N	0448240009
U12	IC Digital MC4044 P	0448100002
U13	IC Digital SN7400 N	0448070006
	Bracket, Feedthru	5024090403



V.H.F. Divider Waveforms (1A4A4)
Frequency Dials At 00000.0 kHz





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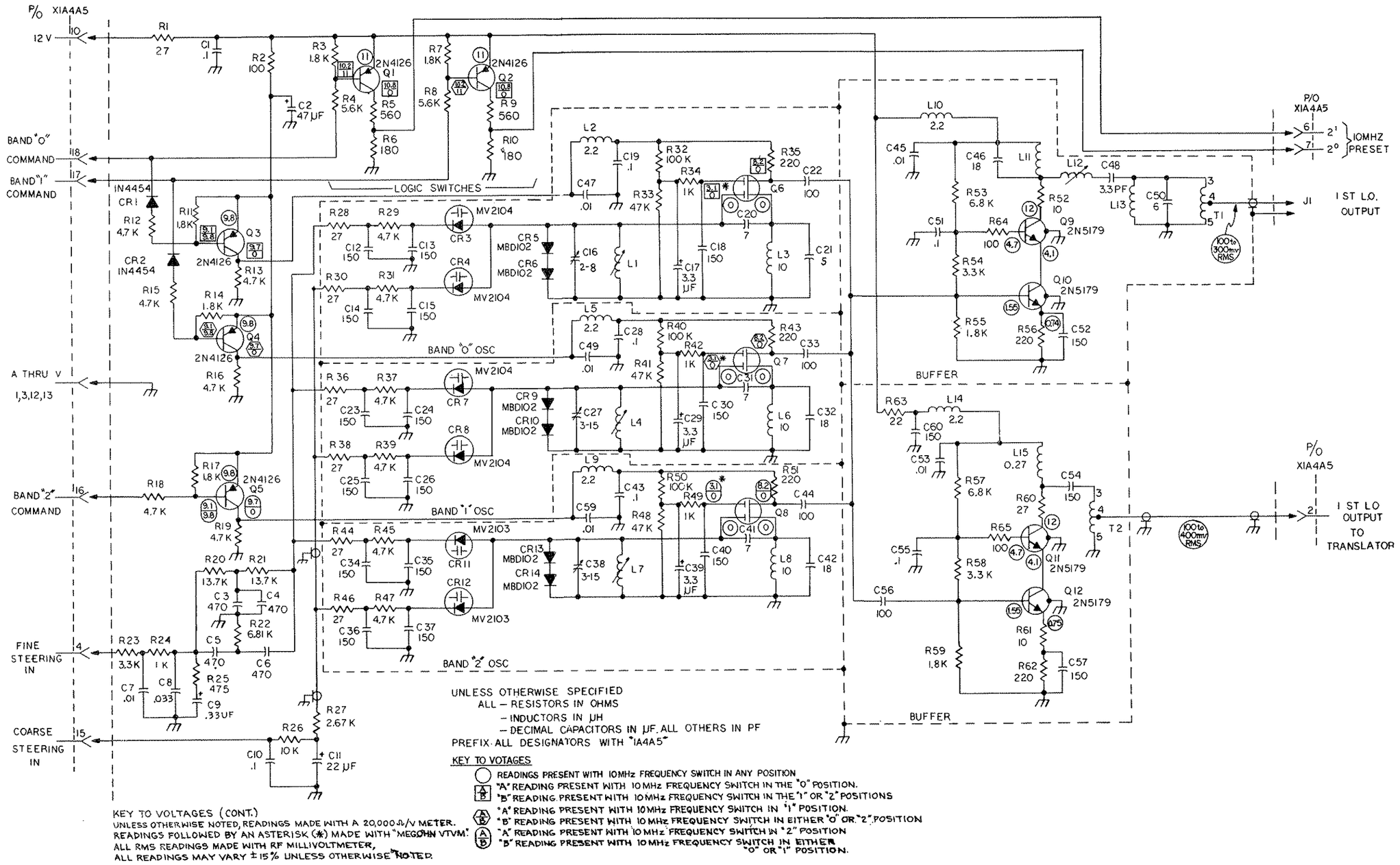


UNLESS OTHERWISE SPECIFIED
ALL – RESISTORS IN OHMS
– INDUCTORS IN μH
– DECIMAL CAPACITORS IN μF. ALL OTHERS IN PF
PREFIX ALL DESIGNATORS WITH "1A4A5"

KEY TO VOTAGES

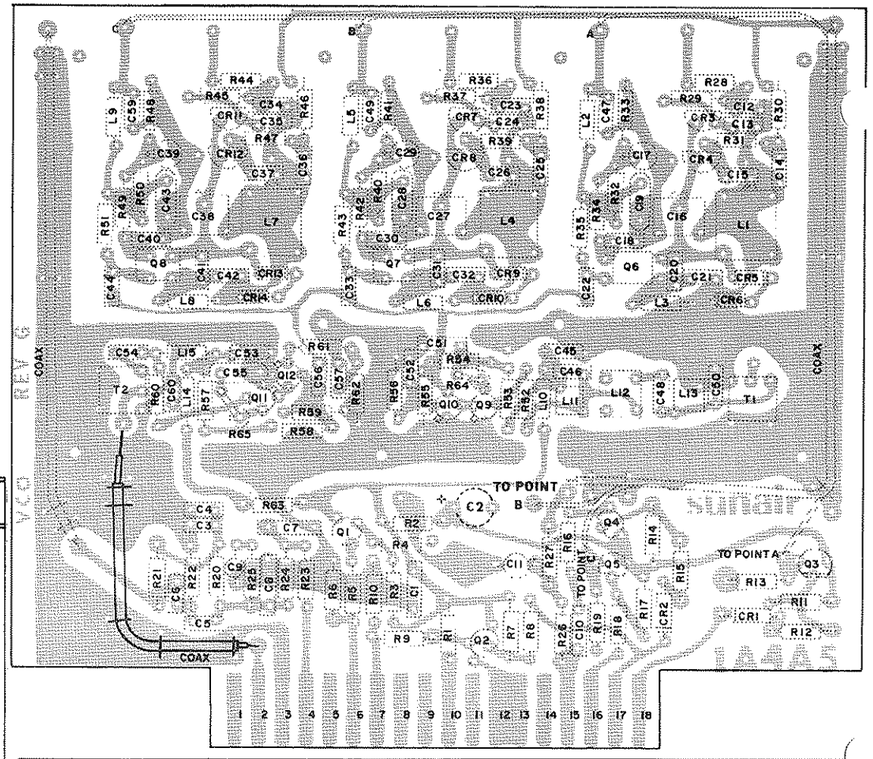
- ○ READINGS PRESENT WITH 10MHz FREQUENCY SWITCH IN ANY POSITION.
- (A/B) "A" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN THE "0" POSITION.
  "B" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN THE "1" OR "2" POSITIONS
- (A/B) "A" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN "1" POSITION.
  "B" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN EITHER "0" OR "2" POSITION
- (A/B) "A" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN "2" POSITION
  "B" READING PRESENT WITH 10 MHz FREQUENCY SWITCH IN EITHER "0" OR "1" POSITION.

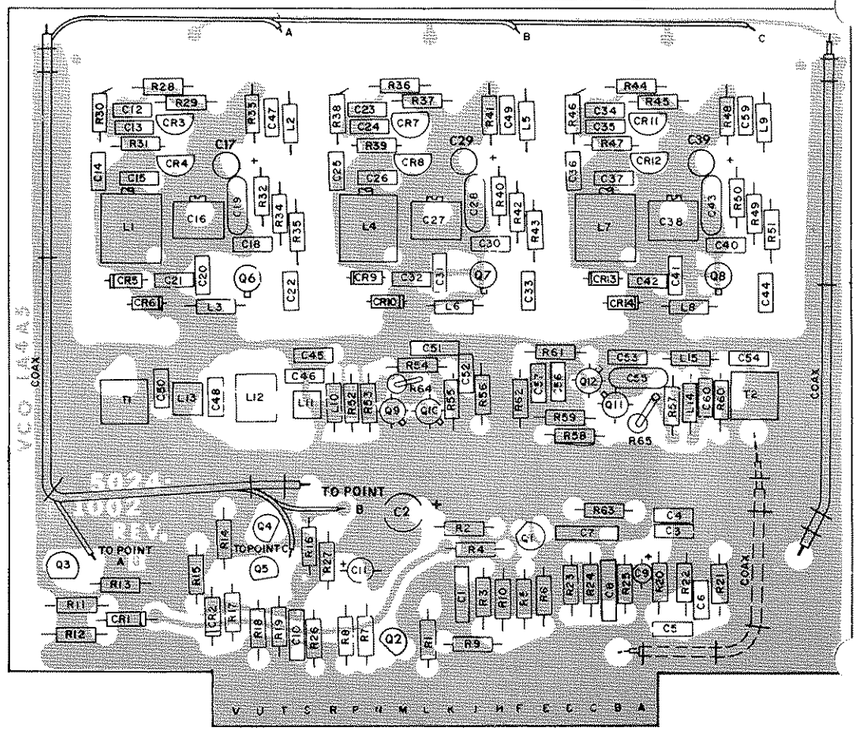
KEY TO VOLTAGES (CONT.)
UNLESS OTHERWISE NOTED, READINGS MADE WITH A 20,000Ω/V METER.
READINGS FOLLOWED BY AN ASTERISK (*) MADE WITH "MEGOHM VTVM."
ALL RMS READINGS MADE WITH RF MILLIVOLTMETER,
ALL READINGS MAY VARY ±15% UNLESS OTHERWISE NOTED.

Figure 5.16 VCO Schematic (1A4A5)

5024100093R PC ASSY VHF VCO

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHR VCO	5024100093
C1	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C2	Capacitor, 47 UF, 20 V, 196 D	0281700001
C3	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C4	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C5	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C6	Capacitor, 470 PF, 100 V, CD7, 5%	0285570005
C7	Capacitor, 0.01 UF, 50 V, Mylar	0281560005
C8	Capacitor, .033 UF, 50 V, Mylar	0281770000
C9	Capacitor, .33 UF, 35 V, 196 D	0281650004
C10	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C11	Capacitor, 22 UF, 15 V, 196 D	0281690006
C12	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C13	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C14	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C15	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C16	Capacitor, 2-8 PF, 200 V, NPO	0284300004
C17	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C18	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C19	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C20	Capacitor, 7 PF, 500 V, DM10	0292400004
C21	Capacitor, 5 PF, 500 V, DM10	0261190008
C22	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C23	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C24	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C25	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C26	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C27	Capacitor, 3-15 PF, 200 V, N650	0285710001
C28	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C29	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C30	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C31	Capacitor, 7 PF, 500 V, DM10	0292400004
C32	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C33	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C34	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C35	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C36	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C37	Capacitor, 150 PF, 300 V, CD7, 5%	0280900007
C38	Capacitor, 3-15 PF, 200 V, N650	0285710001
C39	Capacitor, 3.3 UF, 35 V, 196 D	0281680001
C40	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C41	Capacitor, 7 PF, 500 V, DM10	0292400004
C42	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C43	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C44	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C45	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C46	Capacitor, 18 PF, 500 V, DM10, 5%	0260300004
C47	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C48	Capacitor, 3.3 PF, 1000 V, NPO	0262240009
C49	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C50	Capacitor, 6 PF, 1000 V, NDO	0250360004
C51	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C52	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C53	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C54	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C55	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C56	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C57	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C58	Not used	
C59	Capacitor, 0.01 UF, 25 V, X5 S	0281620008
C60	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
CR1	Diode, Signal, Sil. 1N4454	0405270003
CR2	Diode, Signal, Sil. 1N4454	0405270003
CR3	Diode, Varicap MV2104	0405330006
CR4	Diode, Varicap MV2104	0405330006
CR5	Diode, Hot Carrier	0405280009
CR6	Diode, Hot Carrier	0405280009
CR7	Diode, Varicap MV 2104	0405330006
CR8	Diode, Varicap MV 2104	0405330006
CR9	Diode, Hot Carrier	0405280009
CR10	Diode, Hot Carrier	0405280009
CR11	Diode, Varicap MV2103	0405320001
CR12	Diode, Varicap MV2103	0405320001
CR13	Diode, Hot Carrier	0405280009
CR14	Diode, Hot Carrier	0405280009
J1	Connector, RF, Subminiature	0753670003
L1	Inductor, Var, VCO	5024100701
L2	Inductor, Molded, 2.2 UH, 10%	0659710005
L3	Inductor, Molded, 10 UH, 5%	0659570009
L4	Inductor, Var, VCO	5024100008
L5	Inductor, Molded, 2.2 UH, 10%	0659710005
L6	Inductor, Molded, 10 UH, 5%	0659570009
L7	Inductor, Var, VCO	5024100905
L8	Inductor, Molded, 10 UH, 5%	0659570009
L9	Inductor, Molded, 2.2 UH, 10%	0659710005
L10	Inductor, Molded, 2.2 UH, 10%	0659710005
L11	Inductor, Air Wound, VCO .125 D	5024101201
L12	Inductor, Var, VCO	5024100603
L13	Inductor, Air Wound, VCO .250 D	5024101308
L14	Inductor, Molded, 2.2 UH, 10%	0659710005
L15	Inductor, Molded, 0.27 UH, 5%	0649390008
Q1	Transistor, PNP, Si. 2N4126	0448020009
Q2	Transistor, PNP, Si. 2N4126	0448020009
Q3	Transistor, PNP, Si. 2N4126	0448020009
Q4	Transistor, PNP, Si. 2N4126	0448020009
Q5	Transistor, PNP, Si. 2N4126	0448020009
Q6	Transistor, N-CH, FET MFE120	0448000008
Q7	Transistor, N-CH, FET MFE120	0448000008
Q8	Transistor, N-CH, FET MFE120	0448000008
Q9	Transistor, NPN, Si. 2N5179	0445130008
Q10	Transistor, NPN, Si. 2N5179	0445130008
Q11	Transistor, NPN, Si. 2N5179	0445130008
Q12	Transistor, NPN, Si. 2N5179	0445130008
R1	Resistor, 27, 10%, 1/4 W	0172590001
R2	Resistor, 100, 5%, 1/4 W	0171180003
R3	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R4	Resistor, 5.6 K, 10%, 1/4 W	0180360008
R5	Resistor, 560, 5%, 1/4 W	0183200004
R6	Resistor, 180, 10%, 1/4 W	0175220000
R7	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R8	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R9	Resistor, 560, 5%, 1/4 W	0183200008
R10	Resistor, 180, 10%, 1/4 W	0175220000
R11	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R12	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R13	Resistor, 4.7 K, 1/4 W	0170770001
R14	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R15	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R16	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R17	Resistor, 1.8 K, 10%, 1/4 W	0178190004
R18	Resistor, 4.7 K, 5%, 1/4 W	0170700001
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 13.7 K, 1%, 1/8 W	0196230004
R21	Resistor, 13.7 K, 1%, 1/8 W	0196230004
R22	Resistor, 6.81 K, 1%, 1/8 W	0196350000
R23	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R24	Resistor, 1 K, 10%, 1/4 W	0171560001
R25	Resistor, 475, 1%, 1/8 W	0196610001
R26	Resistor, 10 K, 10%, 1/4 W	0170410005
R27	Resistor, 2670, 1%, 1/8 W	0196730007
R28	Resistor, 27, 10%, 1/4 W	0172590001
R29	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R30	Resistor, 27, 10%, 1/4 W	0172590001
R31	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R32	Resistor, 100 K, 10%, 1/4 W	0170390004
R33	Resistor, 47 K, 10%, 1/4 W	0171060008
R34	Resistor, 1 K, 10%, 1/4 W	0171560001
R35	Resistor, 220, 10%, 1/4 W	0171320000
R36	Resistor, 27, 10%, 1/4 W	0172590001
R37	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R38	Resistor, 27, 10%, 1/4 W	0172590001
R39	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R40	Resistor, 100 K, 10%, 1/4 W	0170390004
R41	Resistor, 47 K, 10%, 1/4 W	0171060008
R42	Resistor, 1 K, 10%, 1/4 W	0171560001
R43	Resistor, 220, 10%, 1/4 W	0171320000
R44	Resistor, 27, 10%, 1/4 W	0172590001
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, 6.8 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, 6.8 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	5024110103
	Q Dope, Polystyrene DNP	0841730008
	Clip	1004770006
	Shield Plate, Front, VCC	5024100506
	Shield, Rear	5024101804
	Shield, Front	5024101901





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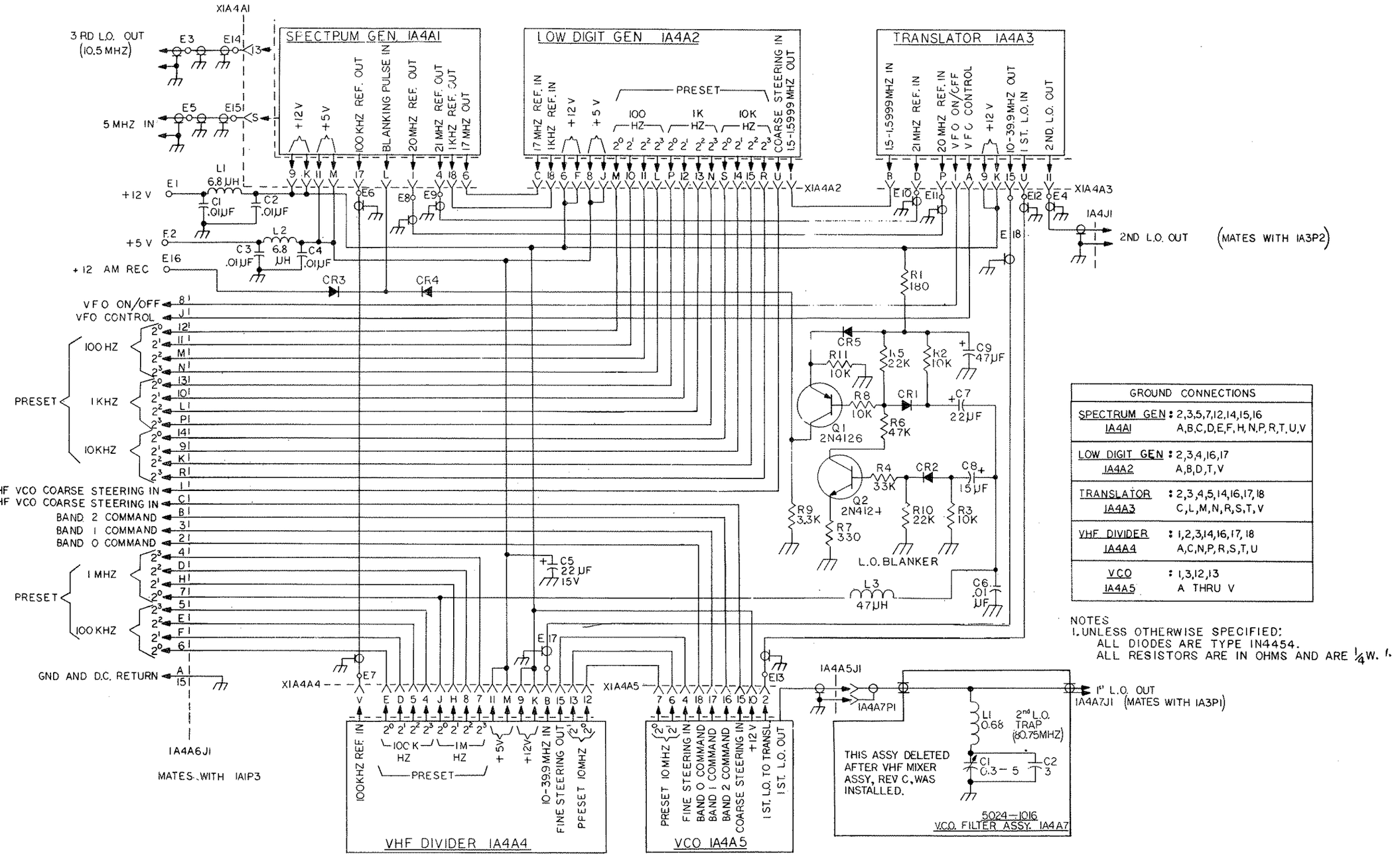


GROUND CONNECTIONS	
SPECTRUM GEN IA4AI	: 2,3,5,7,12,14,15,16 A,B,C,D,E,F,H,N,P,R,T,U,V
LOW DIGIT GEN IA4A2	: 2,3,4,16,17 A,B,D,T,V
TRANSLATOR IA4A3	: 2,3,4,5,14,16,17,18 C,L,M,N,R,S,T,V
VHF DIVIDER IA4A4	: 1,2,3,14,16,17,18 A,C,N,P,R,S,T,U
VCO IA4A5	: 1,3,12,13 A THRU V

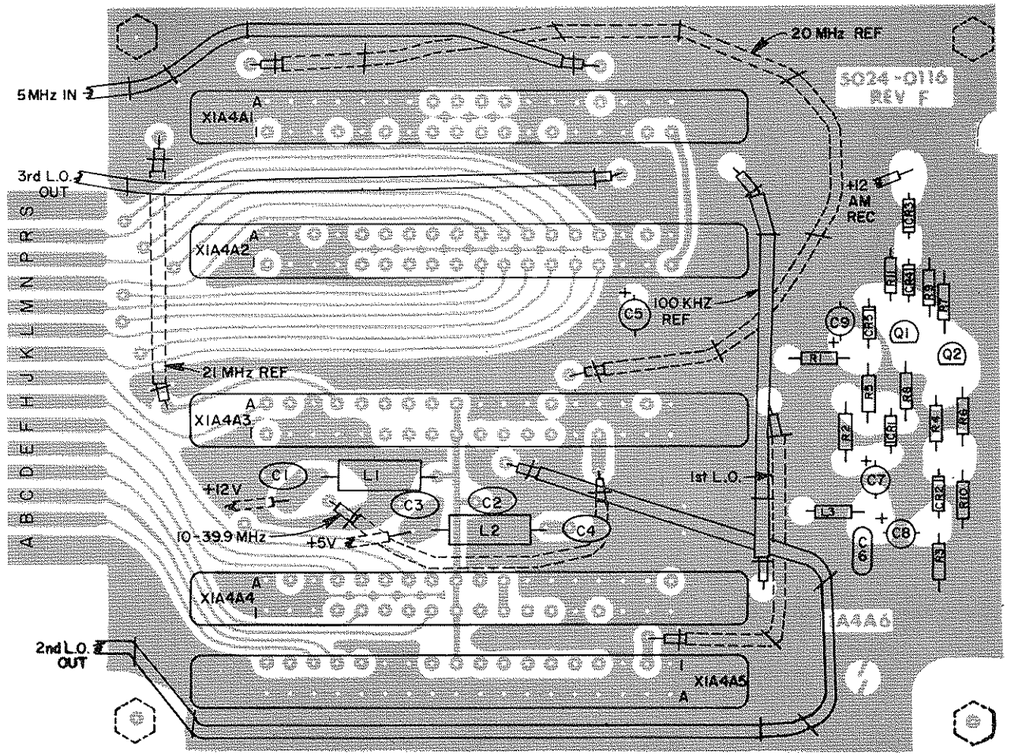
NOTES
1. UNLESS OTHERWISE SPECIFIED:
ALL DIODES ARE TYPE IN4454.
ALL RESISTORS ARE IN OHMS AND ARE ¼W. ±.

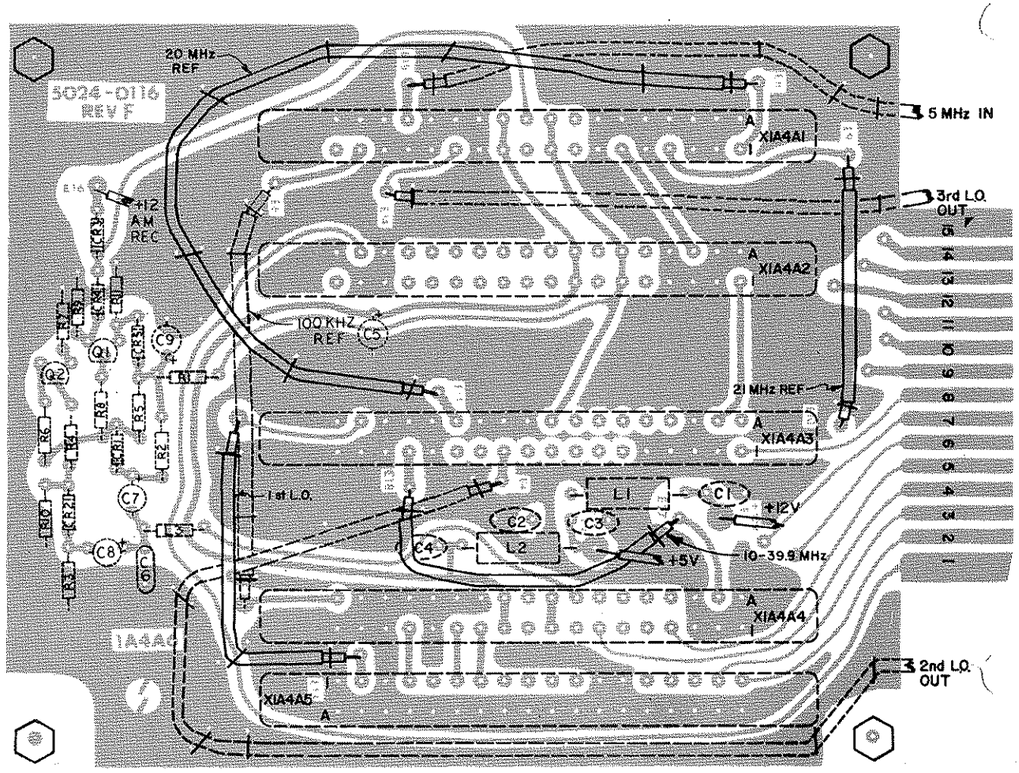
Figure 5.17 Synthesizer Mother Board Schematic (1A4A6)

5024011597B PC ASSY MOTHER BD. SYNTH.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTHER BD. SYNTH.	5024011597
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
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, 22 UF, 15 V, 196D	0281690006
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 22 UF, 15 V, 196D	0281690006
C8	Capacitor, 15 UF, 15 V, 196D	0281720002
C9	Capacitor, 47 UF, 20 V, 196D	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





5024110072J

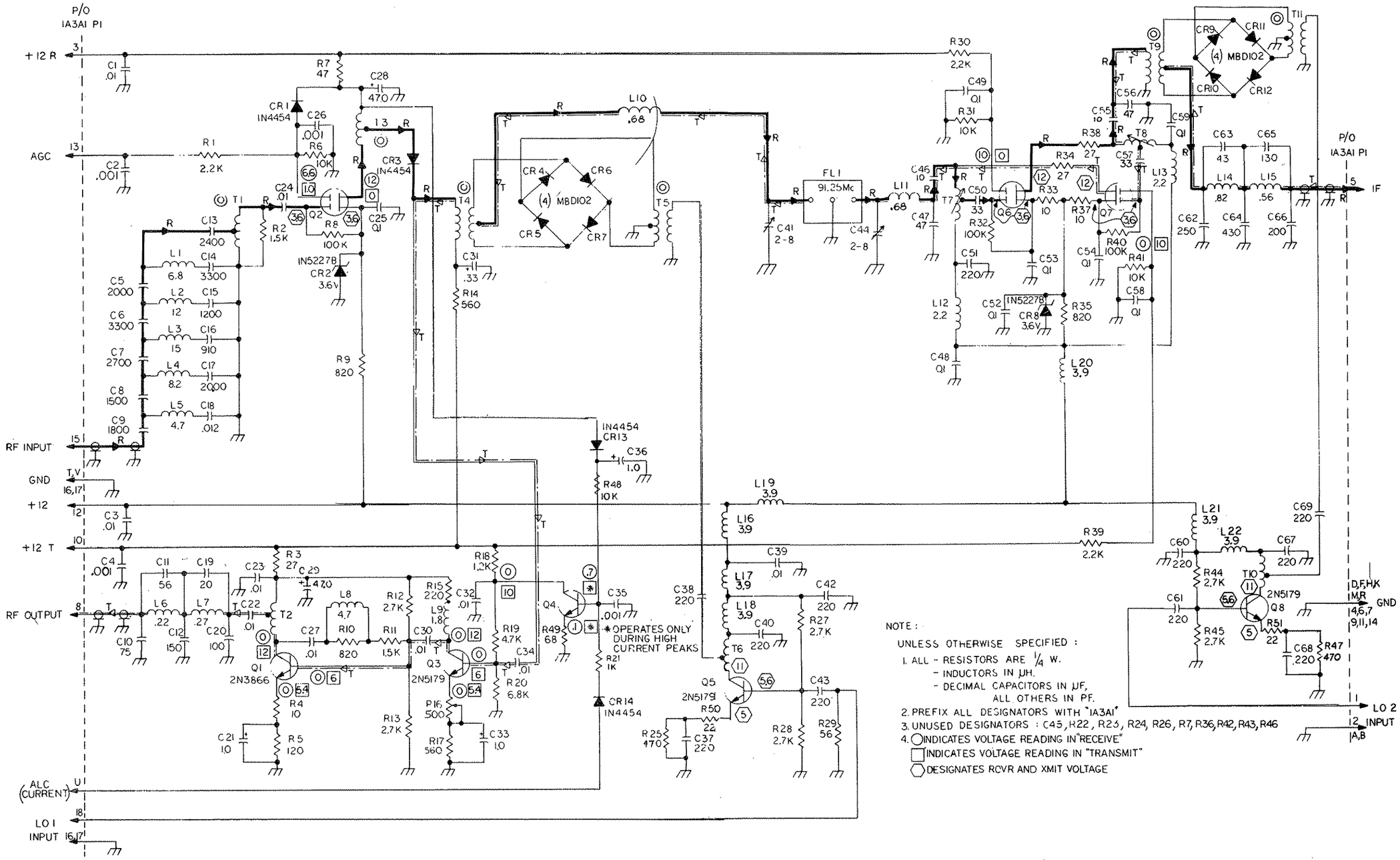
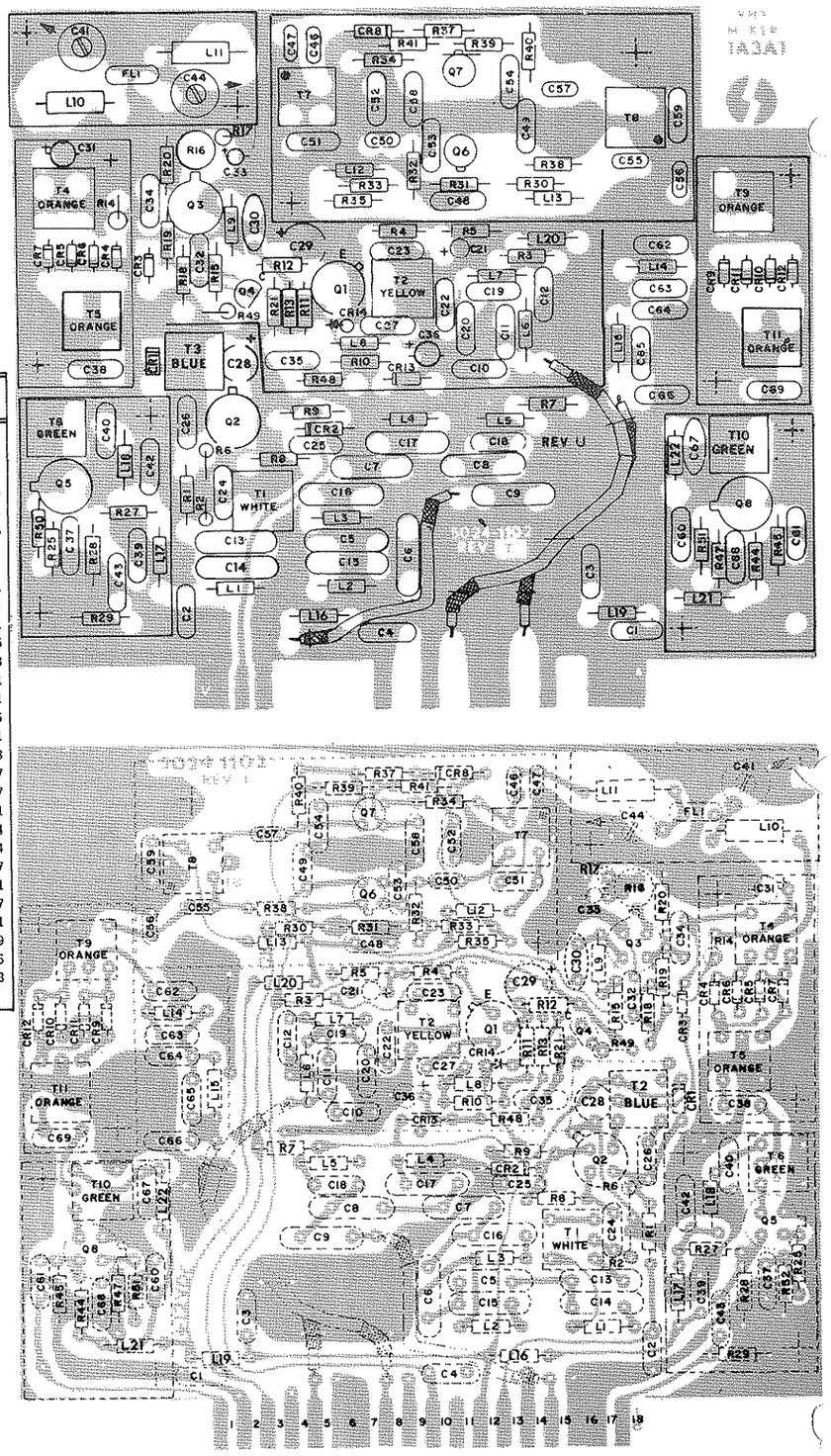


Figure 5.18 VHF Mixer Schematic (1A3A1)

New 5-63

5024110099L PC ASSY VHF MIXER

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHR MIXER	5024110099
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C5	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003
C6	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006
C7	Capacitor, 2700 PF, 500 V, DM19, 2%	0281240001
C8	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C9	Capacitor, 1800 PF, 500 V, DM19, 2%	0281300003
C10	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
C11	Capacitor, 56 PF, 500 V, DM15, 5%	0274620006
C12	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C13	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001
C14	Capacitor, 3300 PF, 500 V, DM19, 2%	0281250006
C15	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C16	Capacitor, 910 PF, 500 V, DM19, 2%	0281450005
C17	Capacitor, 2000 PF, 500 V, DM19, 2%	0281410003
C18	Capacitor, .012 UF, 50 V, Mylar	0281780005
C19	Capacitor, 20 PF, 500 V, DM10, 5%	0260420000
C20	Capacitor, 100 PF, 500 V, DM10, 5%	0274740001
C21	Capacitor, 1 UF, 50 V, 198 D	0280910002
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, 0.001 UF, 100 V, X5E, 10%	0282080007
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C28	Capacitor, 47 UF, 20 V, 196 D	0281700001
C29	Capacitor, 47 UF, 20 V, 196 D	0281700001
C30	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C31	Capacitor, 0.33 UF, 35 V, 196 D	0281650004
C32	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C33	Capacitor, 1 UF, 35 V, 196 D	0281660000
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C35	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C36	Capacitor, 1 UF, 50 V, 198 D	0280910002
C37	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C38	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C40	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C41	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C42	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C43	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C44	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C45	Not used	
C46	Capacitor, 10 PF, 500 V, DM10	0259830003
C47	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C48	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C49	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C50	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C51	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C52	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C53	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610002
C54	Capacitor, 0.01 UF, 50 V, X7 R, 20%	0281610008
C55	Capacitor, 10 PF, 500 V, DM10	0259830003
C56	Capacitor, 47 PF, 500 V, DM10, 5%	0294960007
C57	Capacitor, 33 PF, 500 V, DM10, 5%	0260780006
C58	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C59	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C60	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C61	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C62	Capacitor, 250 PF, 500 V, DM15, 2%	0281100004
C63	Capacitor, 43 PF, 500 V, DM10, 5%	0260800007
C64	Capacitor, 430 PF, 500 V, DM15, 5%	0289590001
C65	Capacitor, 130 PF, 500 V, DM15, 2%	0281010005
C66	Capacitor, 200 PF, 500 V, DM15, 5%	0258040009
C67	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C68	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C69	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Zener 1 N5227 B	0405250002
CR3	Diode, Signal, Sil. 1 N4454	0405270003
CR4	Diode, Hot Carrier	0405280009
CR5	Diode, Hot Carrier	0405280009
CR6	Diode, Hot Carrier	0405280009
CR7	Diode, Hot Carrier	0405280009
CR8	Diode, Zener 1 N5227 B	0405250002
CR9	Diode, Hot Carrier	0405280009
CR10	Diode, Hot Carrier	0405280009
CR11	Diode, Hot Carrier	0405280009
CR12	Diode, Hot Carrier	0405280009
CR13	Diode, Signal, Sil. 1 N4454	0405270003
CR14	Diode, Signal, Sil. 1 N4454	0405270003
FL1	Filter, Crystal, 91, 25 MHz	5024110501
L1	Inductor, Molded, 6.8 UH, 5%	0659210002
L2	Inductor, Molded, 12 UH, 5%	0652700004
L3	Inductor, Molded, 15 UH, 5%	0659070006
L4	Inductor, Molded, 8.2 UH, 5%	0652060005
L5	Inductor, Molded, 4.7 UH, 5%	0651910005
L6	Inductor, Molded, 0.22 UH, 5%	0650620003
L7	Inductor, Molded, 0.27 UH, 5%	0649390008
L8	Inductor, Molded, 4.7 UH, 5%	0651910005
L9	Inductor, Molded, 1.8 UH, 5%	0652440002
L10	Inductor, Molded, 0.68 UH, 5%	0651770009
L11	Inductor, Molded, 0.68 UH, 5%	0651770009
L12	Inductor, Molded, 2.2 UH, 5%	0649890001
L13	Inductor, Molded, 2.2 UH, 5%	0649890001
L14	Inductor, Molded, 0.82 UH, 5%	0652320007
L15	Inductor, Molded, 0.56 UH, 5%	0649530004
L16	Inductor, Molded, 3.9 UH, 5%	0650480007
L17	Inductor, Molded, 3.9 UH, 5%	0650480007
L18	Inductor, Molded, 3.9 UH, 5%	0650480007
L19	Inductor, Molded, 3.9 UH, 5%	0650480007
L20	Inductor, Molded, 3.9 UH, 5%	0605480007
L21	Inductor, Molded, 3.9 UH, 5%	0605480007
L22	Inductor, Molded, 3.9 UH, 5%	0605480007
Q1	Transistor, NPN, Si, 2 N3866	0448140004
Q2	Transistor, N-CH, FET 40673	0447450000
Q3	Transistor, NPN, Si. 2 N5179	0445130008
Q4	Transistor, NPN, Si. 2 N4124	0448010003
Q5	Transistor, NPN, Si. 2 N5179	0445130008
Q6	Transistor, N-CH, FET 40673	0447450000
Q7	Transistor, N-CH, FET 40673	0447450000
Q8	Transistor, NPN, Si. 2 N5179	0445130008
R1	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R2	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R3	Resistor, 27, 10%, 1/4 W	0172590001
R4	Resistor, 10, 5%, 1/4 W	0177160004
R5	Resistor, 120, 10%, 1/4 W	0186550006
R6	Resistor, 10 K, 10%, 1/4 W	0170410005
R7	Resistor, 47, 10%, 1/4 W	0179360001
R8	Resistor, 100 K, 10%, 1/4 W	0170390004
R9	Resistor, 820, 10%, 1/4 W	0178210005
R10	Resistor, 820, 10%, 1/4 W	0178210005
R11	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R12	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R13	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R14	Resistor, 560, 5%, 1/4 W	0183200004
R15	Resistor, 220, 10%, 1/4 W	0171320000
R16	Pot., 500, 20%, 1/2 W, PC Mount	0345980000
R17	Resistor, 560, 5%, 1/4 W	0183200004
R18	Resistor, 1.2 K, 10%, 1/4 W	0181860007
R19	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R20	Resistor, 6.8 K, 5%, 1/4 W	0174810008
R21	Resistor, 1 K, 10%, 1/4 W	0171560001
R22	Not used	
R23	Not Used	
R24	Not used	
R25	Resistor, 470, 10%, 1/4 W	0172610001
R26	Not used	
R27	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R28	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R29	Resistor, 56, 10%, 1/4 W	0174290004
R30	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R31	Resistor, 10 K, 10%, 1/4 W	0170410005
R32	Resistor, 100 K, 10%, 1/4 W	0170390004
R33	Resistor, 10, 5%, 1/4 W	0177160004
R34	Resistor, 27, 10%, 1/4 W	0172590001
R35	Resistor, 820, 10%, 1/4 W	0178210005
R36	Not used	
R37	Resistor, 10, 5%, 1/4 W	0177160004
R38	Resistor, 27, 10%, 1/4 W	0172590001
R39	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R40	Resistor, 100 K, 10%, 1/4 W	0170390004
R41	Resistor, 10 K, 10%, 1/4 W	0170410005
R42	Not used	
R43	Not used	
R44	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R45	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 470, 10%, 1/4 W	0172610001
R48	Resistor, 10 K, 10%, 1/4 W	0170410005
R49	Resistor, 68, 10%, 1/4 W	0187960003
R50	Resistor, 22, 10%, 1/4 W	0192690001
R51	Resistor, 22, 10%, 1/4 W	0192690001
T1	Transformer, Input	5024110706
T2	Transformer	5024111401
T3	Transformer, RF Amp	5024110803
T4	Transformer	5024110307
T5	Transformer	5024110307
T6	Transformer	5024110901
T7	Inductor	5024110404
T8	Inductor	5024110404
T9	Transformer	5024110307
T10	Transformer	5024110901
T11	Transformer	5024110307
	Shield Can	5024111001
	Shield Can	5024111109
	Shield Can	5024111206
	Shield Can	5024111303



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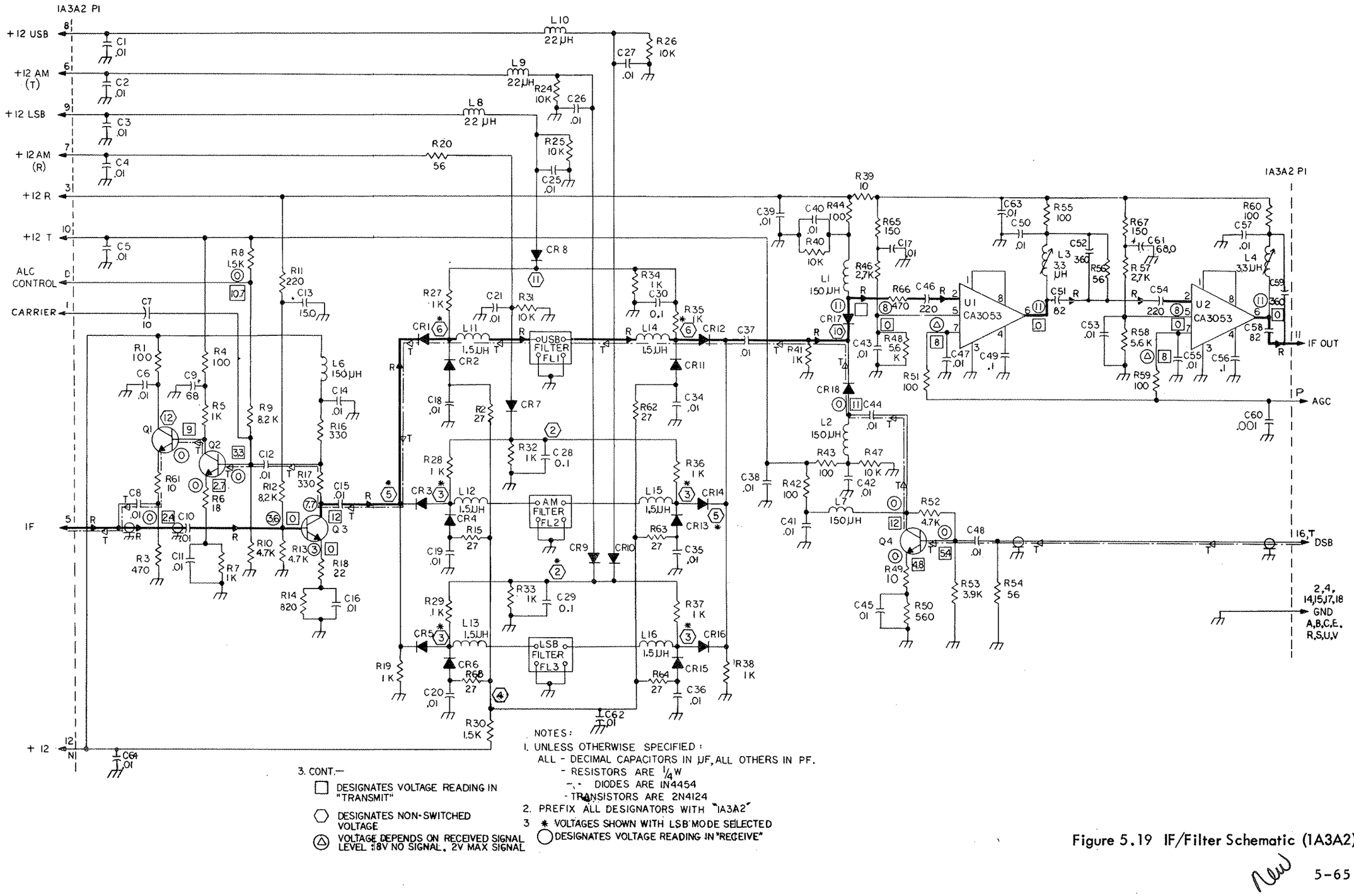


NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL - DECIMAL CAPACITORS IN µF, ALL OTHERS IN PF.
   - RESISTORS ARE 1/4 W
   - DIODES ARE IN4454
   - TRANSISTORS ARE 2N4124
2. PREFIX ALL DESIGNATORS WITH "1A3A2"
3. * VOLTAGES SHOWN WITH LSB MODE SELECTED
   ◯ DESIGNATES VOLTAGE READING IN "RECEIVE"

3. CONT.—
   □ DESIGNATES VOLTAGE READING IN "TRANSMIT"
   ⬡ DESIGNATES NON-SWITCHED VOLTAGE
   △ VOLTAGE DEPENDS ON RECEIVED SIGNAL LEVEL: 8V NO SIGNAL, 2V MAX SIGNAL

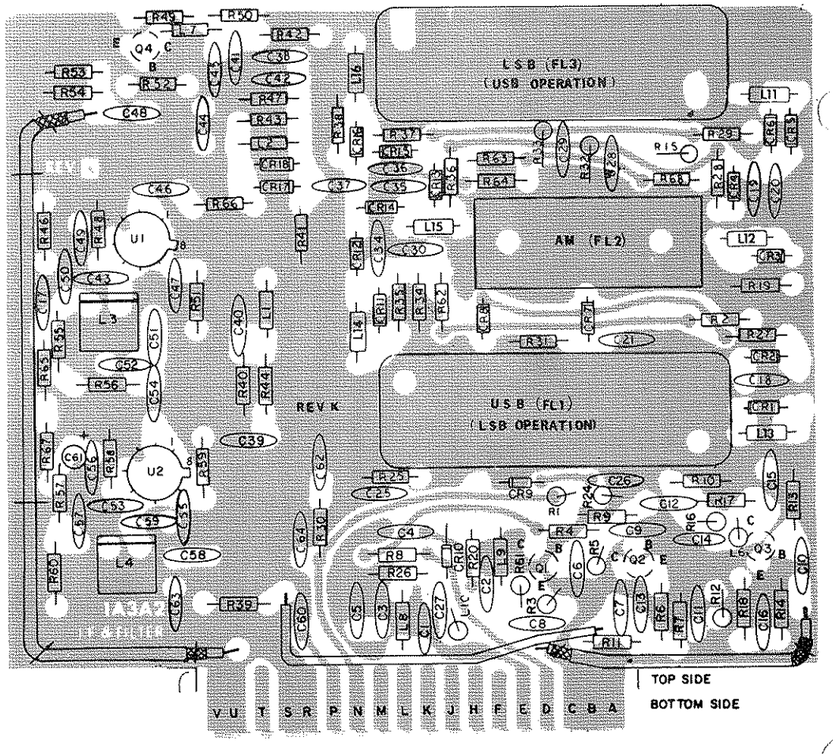
Figure 5.19 IF/Filter Schematic (1A3A2)

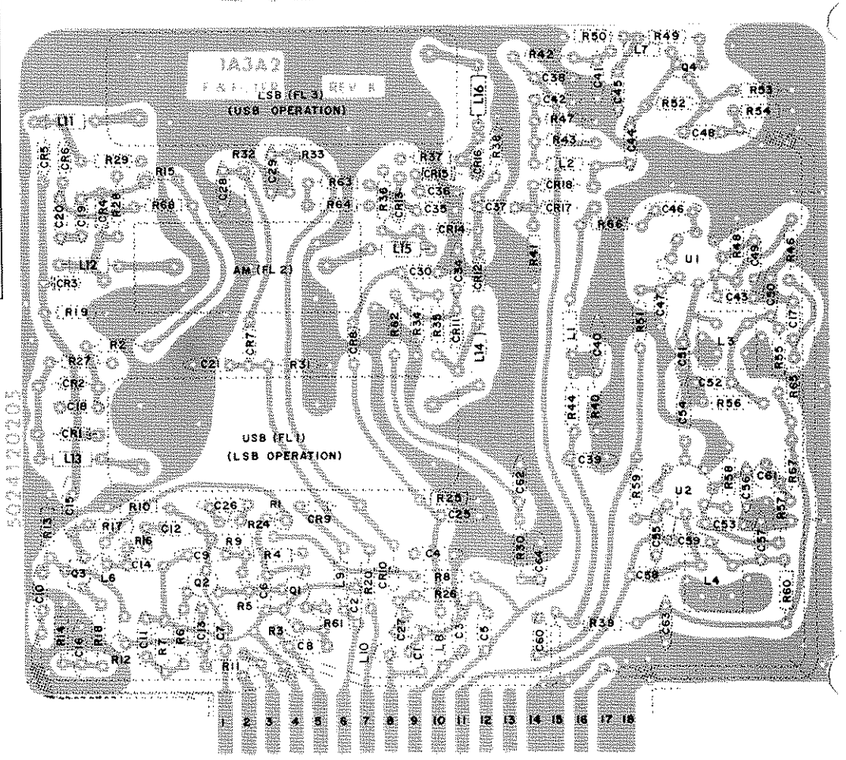
5024120191H PC ASSY IF FILTER W/O FILTERS

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY IF FILTER W/O FILTERS	5024120191
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
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, 10 PF, 500 V, DM10	0259830003
C8	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C9	Capacitor, 68 UF, 15 V, T368	0296540005
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C11	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 15 UF, 15 V, 196 D	0281720002
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008
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, 0.01 UF, 25 V, X5S	0281620008
C19	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C22	Not used	
C23	Not used	
C24	Not used	
C25	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C26	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C27	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C28	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C29	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C30	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C31	Not used	
C32	Not used	
C33	Not used	
C34	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C35	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C36	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C37	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C38	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C39	Capacitor, 0.01 UF, 25 V, X5S	0281620008
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, 220 PF, 500 V, DM15, 5%	0285950002
C47	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C48	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C49	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C50	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C51	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C52	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C53	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C54	Capacitor, 220 PF, 500 V, DM15, 5%	0285950002
C55	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C56	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C57	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C58	Capacitor, 82 PF, 500 V, DM10, 5%	0262120003
C59	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C60	Capacitor, 0.001 UF, 100 V, X5E, 10%	0282080007
C61	Capacitor, 68 UF, 15 V, T368	0296540005
C62	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C63	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C64	Capacitor, 0.01 UF, 25 V, X5S	0281620008
CR1	Diode, Signal, Sil. 1 N4454	0405270003
CR2	Diode, Signal, Sil. 1 N4454	0405270003
CR3	Diode, Signal, Sil. 1 N4454	0405270003
CR4	Diode, Signal, Sil. 1 N4454	0405270003
CR5	Diode, Signal, Sil. 1 N4454	0405270003
CR6	Diode, Signal, Sil 1 N4454	0405270003
CR7	Diode, Signal, Sil 1 N4454	0405270003
CR8	Diode, Signal, Sil 1 N4454	0405270003
CR9	Diode, Signal, Sil. 1 N4454	0405270003

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR10	Diode, Signal, Sil. 1 N4454	0405270003
CR11	Diode, Signal, Sil. 1 N4454	0405270003
CR12	Diode, Signal, Sil. 1 N4454	0405270003
CR13	Diode, Signal, Sil. 1 N4454	0405270003
CR14	Diode, Signal, Sil. 1 N4454	0405270003
CR15	Diode, Signal, Sil. 1 N4454	0405270003
CR16	Diode, Signal, Sil. 1 N4454	0405270003
CR17	Diode, Signal, Sil. 1 N4454	0405270003
CR18	Diode, Signal, Sil. 1 N4454	0405270003
FL1	Filter, Crystal, LSB, 10.5 MHz	0818250003
FL2	Filter, Crystal, AM, 10.5 MHz	0818270004
FL3	Filter, Crystal, USB, 10.5 MHz	0818260009
L1	Inductor, Molded, 150 UH, 5%	0659190001
L2	Inductor, Molded, 150 UH, 5%	0659190001
L3	Inductor, Var, 3.30 UH	0647930005
L4	Inductor, Var. 3.30 UH	0674930005
L5	Not used	
L6	Inductor, Molded, 150 UH, 5%	0659190001
L7	Inductor, Molded, 150 UH, 5%	0659190001
L8	Inductor, Molded, 22 UH, 5%	0650000005
L9	Inductor, Molded, 22 UH, 5%	0650000005
L10	Inductor, Molded, 22 UH, 5%	0650000005
L11	Inductor, Molded, 1.5 UH, 5%	0649270002
L12	Inductor, Molded, 1.5 UH, 5%	0649270002
L13	Inductor, Molded, 1.5 UH, 5%	0649270002
L14	Inductor, Molded, 1.5 UH, 5%	0649270002
L15	Inductor, Molded, 1.5 UH, 5%	0649270002
L16	Inductor, Molded, 1.5 UH, 5%	0649270002
Q1	Transistor, NPN, Si. 2 N4124	0448010003
Q2	Transistor, NPN, Si. 2 N4124	0448010003
Q3	Transistor, NPN, Si. 2 N4124	0448010003
Q4	Transistor, NPN, Si. 2 N4124	0448010003
R1	Resistor, 100, 5%, 1/4 W	0171180003
R2	Resistor, 27, 10%, 1/4 W	0172590001
R3	Resistor, 470, 5%, 1/4 W	0184110009
R4	Resistor, 100, 5%, 1/4 W	0171180003
R5	Resistor, 1 K, 10%, 1/4 W	0171560001
R6	Resistor, 18, 10%, 1/4 W	0184590001
R7	Resistor, 1 K, 10%, 1/4 W	0171560001
R8	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R9	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R10	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R11	Resistor, 220, 10%, 1/4 W	0171320000
R12	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R13	Resistor, 4.7 K,5%, 1/4 W	0170770001
R14	Resistor, 820, 10%, 1/4 W	0178210005
R15	Resistor, 27, 10%, 1/4 W	0172590001
R16	Resistor, 330, 5%, 1/4 W	0170910008
R17	Resistor, 330, 5%, 1/4 W	0170910008
R18	Resistor, 22, 10%, 1/4 W	0192690001
R19	Resistor, 1 K, 10%, 1/4 W	0171560001
R20	Resistor, 56, 10%, 1/4 W	0174290004
R21	Not used	
R22	Not used	
R23	Not used	
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
R27	Resistor, 1 K, 10%, 1/4 W	0171560001
R28	Resistor, 1 K, 10%, 1/4 W	0171560001
R29	Resistor, 1 K, 10%,1/4 W	0171560001
R30	Resistor, 1.5 K, 10%, 1/4 W	0172470005
R31	Resistor, 10 K, 10%, 1/4 W	0170410005
R32	Resistor, 1 K, 10%, 1/4 W	0171560001
R33	Resistor, 1 K, 10%, 1/4 W	0171560001
R34	Resistor, 1 K, 10%, 1/4 W	0171560001
R35	Resistor, 1 K, 10%, 1/4 W	0171560001
R36	Resistor, 1 K, 10%, 1/4 W	0171560001
R37	Resistor, 1 K, 10%, 1/4 W	0171560001
R38	Resistor, 1 K, 10%, 1/4 W	0171560001
R39	Resistor, 10, 5%, 1/4 W	0177160004
R40	Resistor, 10 K, 10%, 1/4 W	0170410005
R41	Resistor, 1 K, 10%, 1/4 W	0171560001
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, 2.7 K, 10%, 1/4 W	0186670001
R47	Resistor, 10 K, 10%, 1/4 W	0170410005
R48	Resistor, 5.6 K, 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, 4.7 K, 5%, 1/4 W	0170770001
R53	Resistor, 3.9 K, 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, 2.7 K, 10%, 1/4 W	0186670001
R58	Resistor, 5.6 K, 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





3039012074C

LSB GEN (ISB OPTION) 1A3XJ6

LSB FILTER (ISB OPTION) 1A3XJ4

VHF MIXER 1A3XJ1

I/F FILTER OR USB FILTER (ISB OPTION) 1A3XJ2

SB GENERATOR 1A3XJ3

LSB 600Ω AUDIO

L6 220

R2 56

2 ND L.O. IN

R1 56

L2 0.68

R4 100

C6 150

L3 0.68

C4 150

C5 150

E12 EXCITER OUT

+12T

CARRIER INJ

L1 220

E6 +12AM(T)

USB 600Ω AUDIO IN

R8 5.6K

R9 560

3RD LO IN

SIDETONE OUTPUT

CR5 CR4004

Q1 2N4124

C7 0.1UF

+12T

R10 10K

C9 .01

CR6 IN4454

TO PIN 21 OF 1A8J6 KW TONE

+12V E4

DSBSC

1ST LO IN

E14

CURRENT ALC

C1 2200

DSBSC

E16 VSWR ALC

L5 150

R7 100K

C3 1000

CR2 IN4454

VOLTAGE ALC IN

EXT ALC IN

CR3 IN4454

CR4 IN4454

R5 100

KEY LINE E15

ISB

SEE NOTE 1

SSB

E9 ACC IN

CR1 IN4454

R6 2.2K

L4 150

C2 1000

EXT ACC IN

NOTES: 1. JUMPER 1A3J5-S TO DESIRED FUNCTION (ISB SHOWN)
2. ALL INDUCTANCE VALUES IN UH
3. PREFIX ALL DESIGNATORS WITH 1A3A5

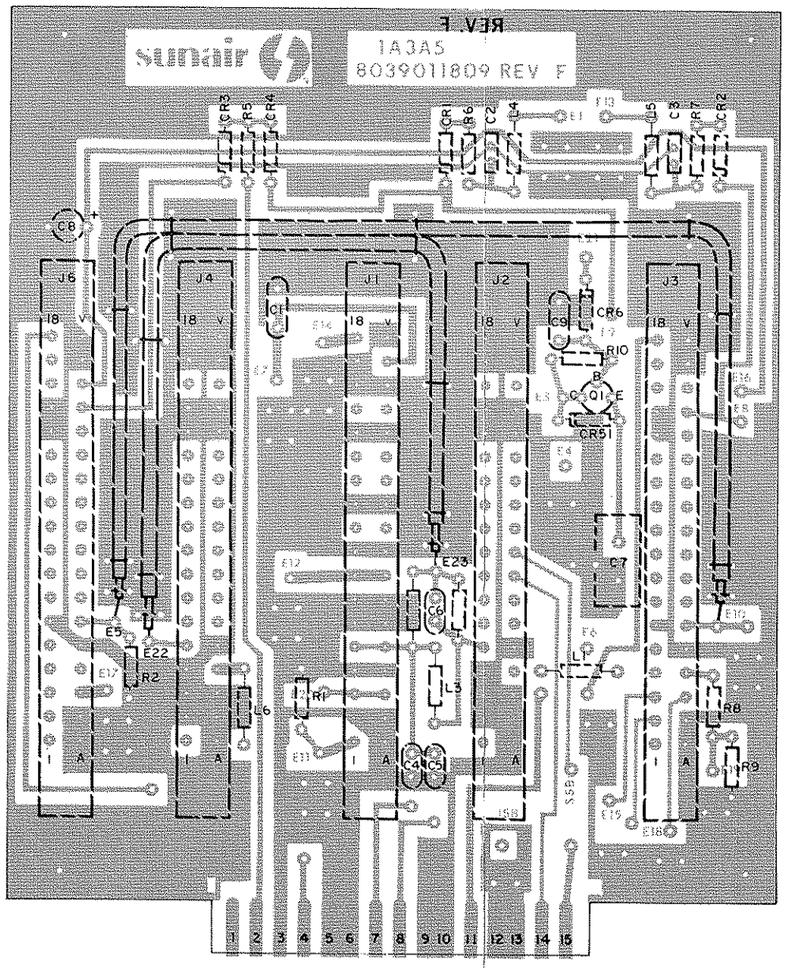
1A3J5

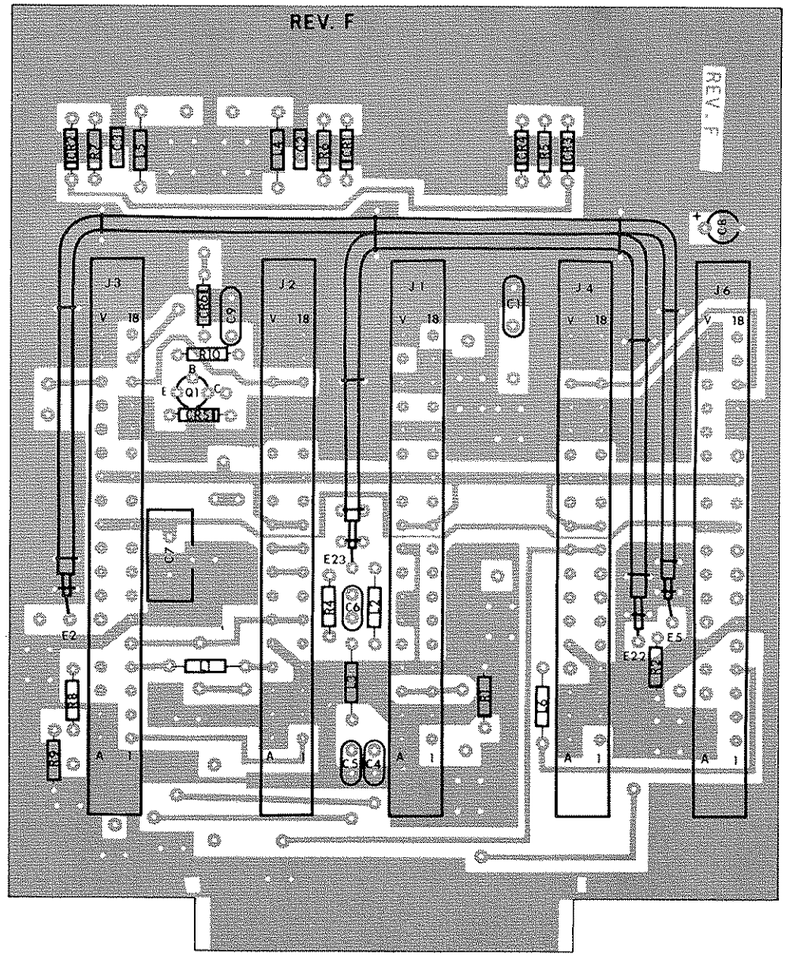
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	DIS-ABLE	GRD	LSB MIC	GND	GND	KEY LINE	CW KEY	GND	GND	USB MIC	GND	GND	+12 USB	+12 LSB

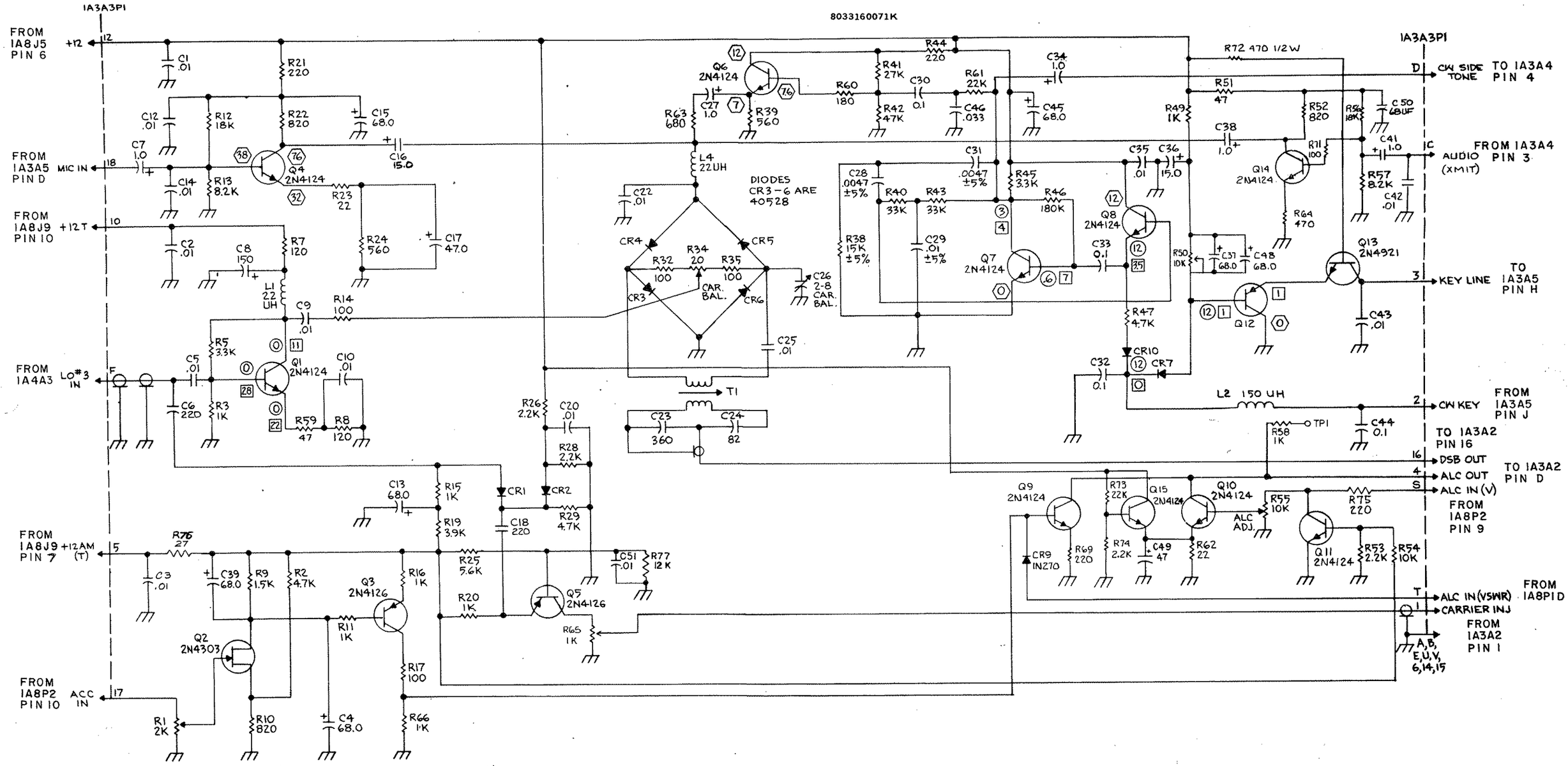
Figure 5.20 Exciter Mother Board (1A3A5) Schematic

8039012091 PC ASSY MOTHER BD EXCT GSE-924

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTHER BD EXCT GSE-924	8039012091
C1	Capacitor, 0.0022 UF, 200 V, Z5 F, 10%	0272800006
C2	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C3	Capacitor, 0.001 UF, 100 V, X7 R, 20%	0281630003
C4	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C5	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C6	Capacitor, 150 PF, 500 V, DM10, 5%	0293430004
C7	Capacitor, 66 UF, 25 V, T368	0282150005
C8	Capacitor, 1 UF, 35 V, 196 D	0281660000
C9	Capacitor, 0.01 UF, 100 V, Z5 V	0273210009
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, Rectifier 1N40004	0405180004
CR6	Diode, Signal, Sil. 1N4454	0405270003
L1	Inductor, Molded, 220 UH, 5%	0650500008
L2	Inductor, Molded, 0.68 UH, 5%	0649030001
L3	Inductor, Molded, 0.68 UH, 5%	0649030001
L4	Inductor, Molded, 150 UH, 5%	0659190001
L5	Inductor, Molded, 150 UH, 5%	0659190001
L6	Inductor, Molded, 220 UH, 5%	0650500008
Q1	Transistor, NPN, Si. 2N4124	0448010003
R1	Resistor, 56, 10%, 1/4 W	0174290004
R2	Resistor, 56, 10%, 1/4 W	0174290004
R3	Not used	
R4	Resistor, 100, 5%, 1/4 W	0171180003
R5	Resistor, 100, 5%, 1/4 W	0171180003
R6	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R7	Resistor, 100 K, 10%, 1/4 W	0170390004
R8	Resistor, 5.6 K, 10%, 1/4 W	0183060009
R9	Resistor, 560, 5%, 1/4 W	0183200004
R10	Resistor, 10 K, 10%, 1/4 W	0170410005
1 A3 A5 XJ1	Connector, PC, 18 Pin Female	0753610001
1 A3 A5 XJ2	Connector, PC, 18 Pin Female	0753610001
1 A3 A5 XJ3	Connector, PC, 18 Pin Female	0753610001
1 A3 A5 XJ4	Connector, PC, 18 Pin Female	0753610001
1 A3 A5 XJ5	Not used	
1 A3 A5 XJ6	Connector, PC, 18 Pin Female	0763610001
	Key, Polarizing, Connector	0753620006







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

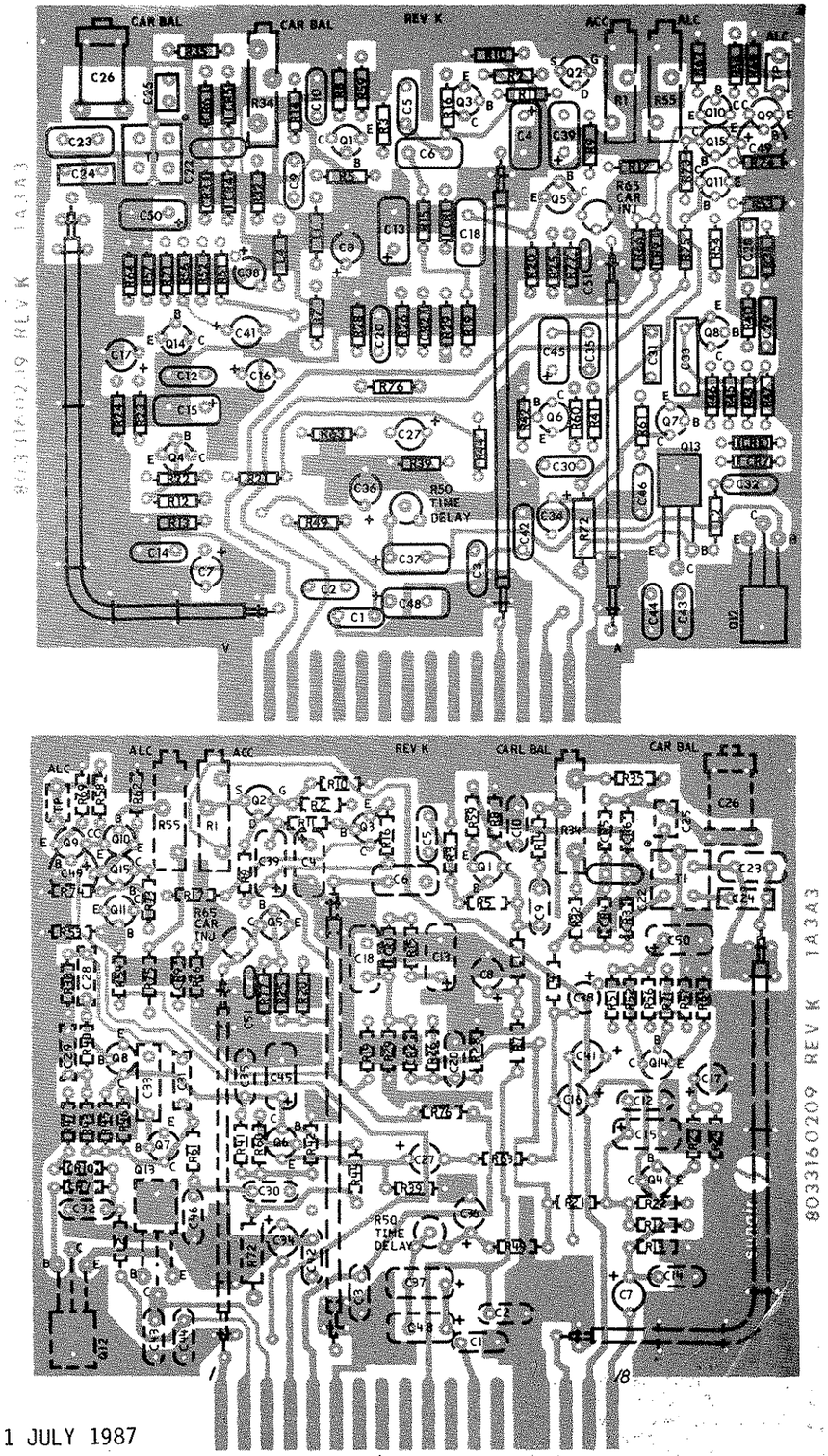
NOTES: CONT'D.
5. LAST DESIGNATORS: C51, CR10, L4, Q15, R77, T1

FIGURE 5.21 Sideband Generator Board Schematic (1A3A3)

CHANGE DATE 1 JULY 1987

8033160098S SIDEBAND GEN. 1A3A3

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1 A3 A3	PC ASSY SIDEBAND GEN.	8033160098
C1	Capacitor, 0.01UF, 25V, X5S	0281620008
C2	Capacitor, 0.01UF, 25V, X5S	0281620008
C3	Capacitor, 0.01UF, 25K, 25V, X5S	0281620008
C4	Capacitor, 68UF, 15V, T36B	0296540005
C5	Capacitor, 0.01UF, 25V, X5S	0281620008
C6	Capacitor, 220PF, 500V, DM15, 2%	0281420009
C7	Capacitor, 1UF, 50V, 198D	0280910002
C8	Capacitor, 15UF, 20V, 198D	0280920008
C9	Capacitor, 0.01UF, 25V, X5S	0281620008
C10	Capacitor, 0.01UF, 25V, X5S	0281620008
C11	Not used	
C12	Capacitor, 0.01UF, 25V, X5S	0281620008
C13	Capacitor, 68UF, 15V, T368	0296540005
C14	Capacitor, 0.01UF, 25V, X5S	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, X5S	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	1000060012
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, X5S	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, X5S	0281620008
C43	Capacitor, 0.01UF, 25V, X5S	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
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, PNP, Sil. TIP-32A	0448200007
Q13	Transistor, NPN, Si. 2N4921	0448040000
Q14	Transistor, NPN, Si. 2N4124	0448010003
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	0346770009
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	0171180003
R72	Resistor, 470, 10%, 1/2W	0173900003
R73	Resistor, 22K, 5%, 1/4W	0172230004
R74	Resistor, 2.2K, 5%, 1/4W	0178070009
R75	Resistor, 220, 10%, 1/4W	0171320000
R76	Resistor, 27, 10%, 1/4W	0172590001
R77	Resistor, 12K, 10%, 1/4W	0183180003
T1	Transformer, Balanced Mod	5024130303
	Test Point, White	0753640007



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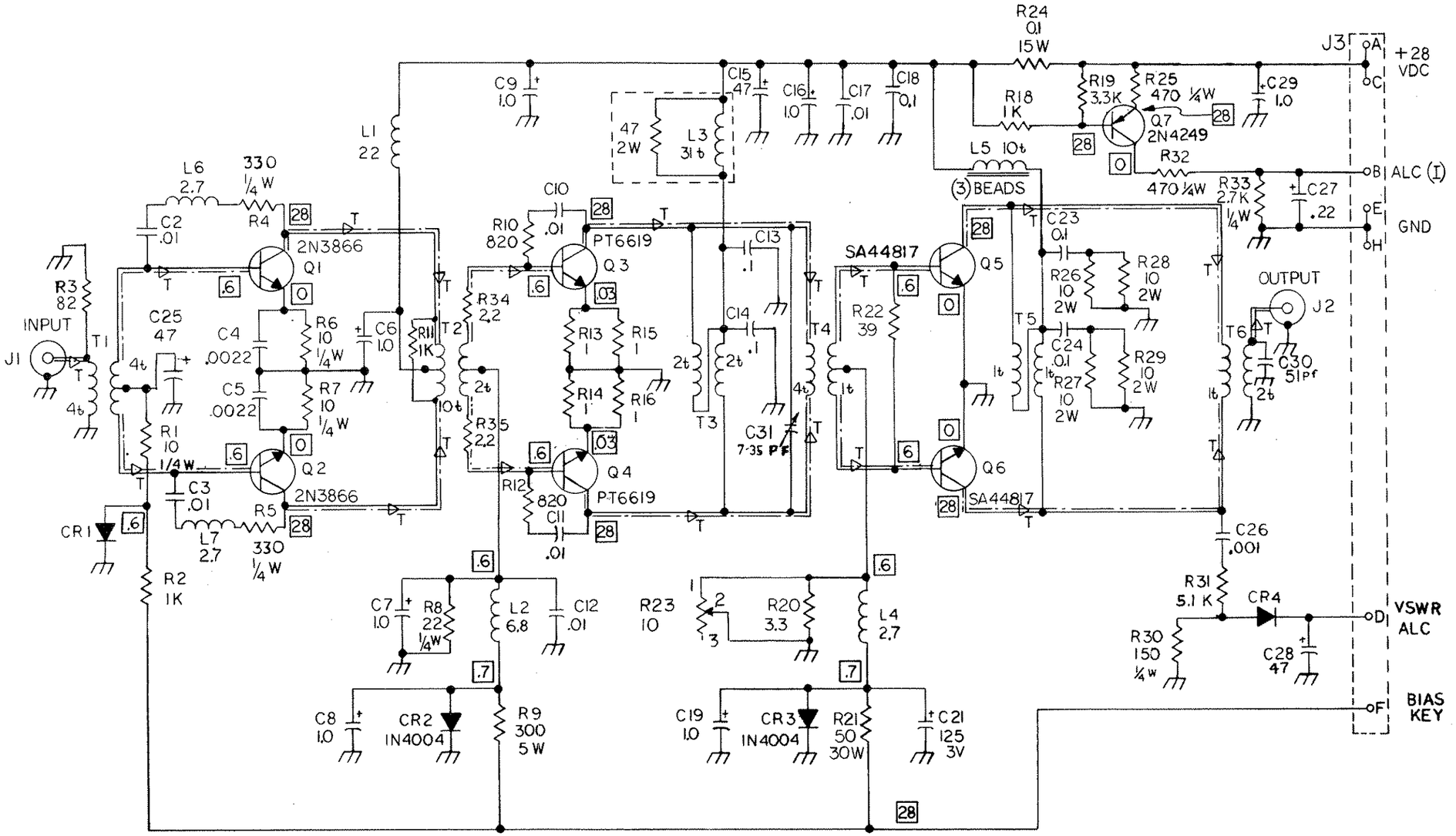


UNLESS OTHERWISE SPECIFIED:

1. ALL—RESISTORS IN OHMS, 1/2 W
   —CAPACITORS IN μF
   —INDUCTORS IN μH
   —DIODES ARE IN4454
2. PREFIX ALL DESIGNATORS WITH "1A7A1"
3. UNUSED DESIGNATORS:
   R17 C1, C20
4. VOLTAGES ARE GIVEN WITH XMTR KEYED IN SSB AND NO MODULATION

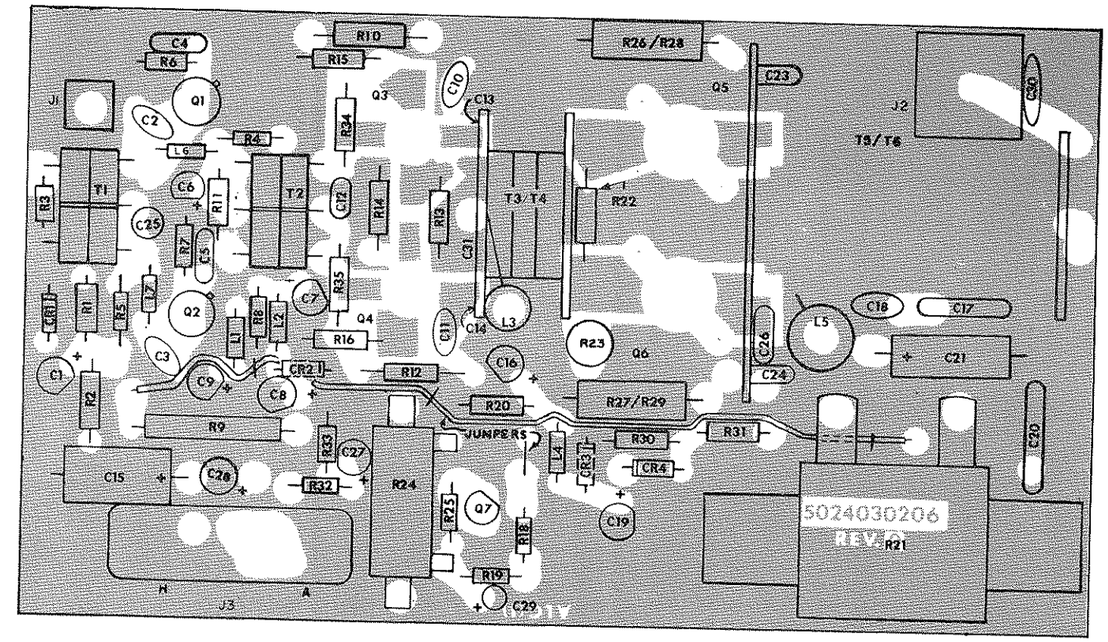
Figure 5.22 RF Power Amplifier Schematic (1A7A1)

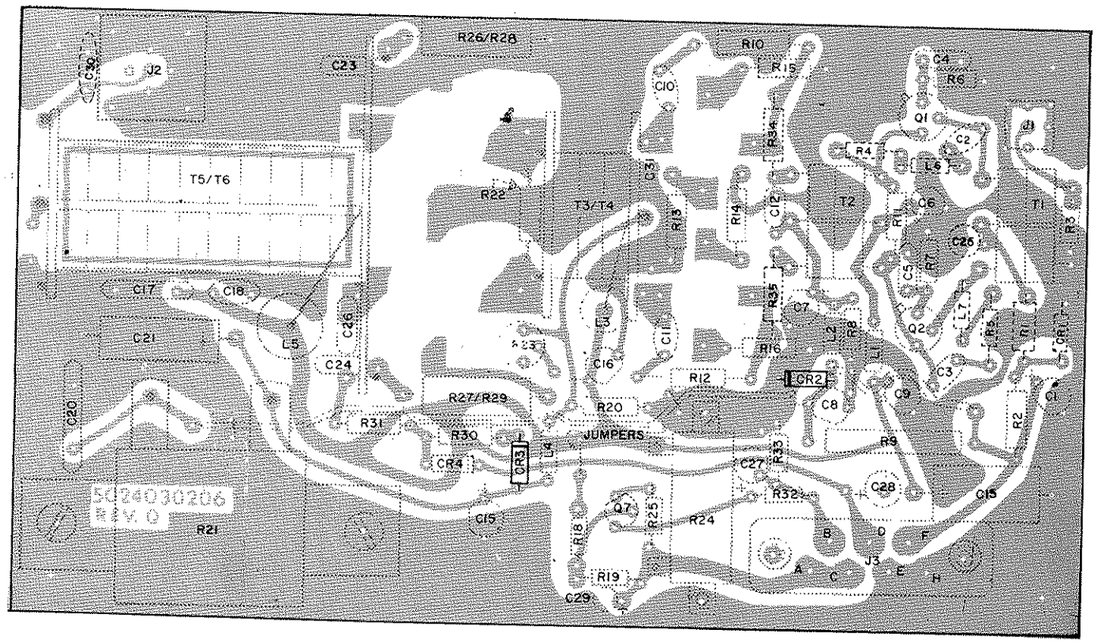
New 5-71

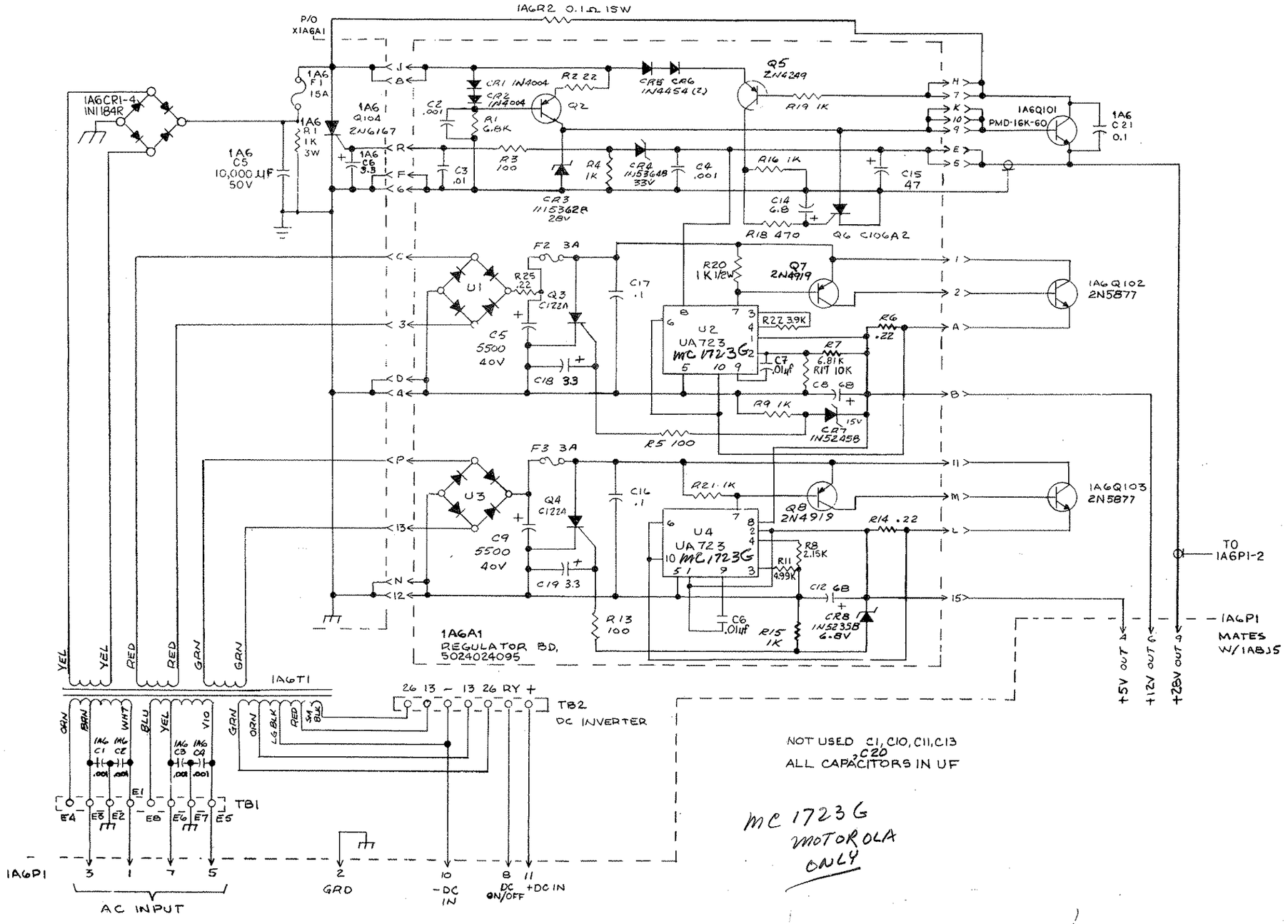
5024030192Q PC ASSY POWER AMPLIFIER

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
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
	Thermal Compound DNP	0840810008
	Heat Sink, PA	5024031407
	Heat Sink	840730004
	Clip, Component	0533320003







CHANGE DATE 1 JULY 1987

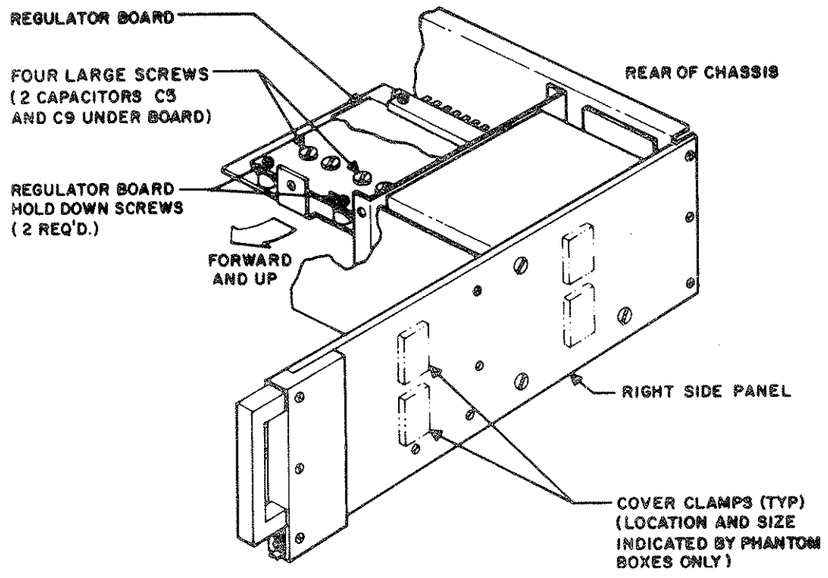
FIGURE 5.23 Power Supply Schematic (1A6)

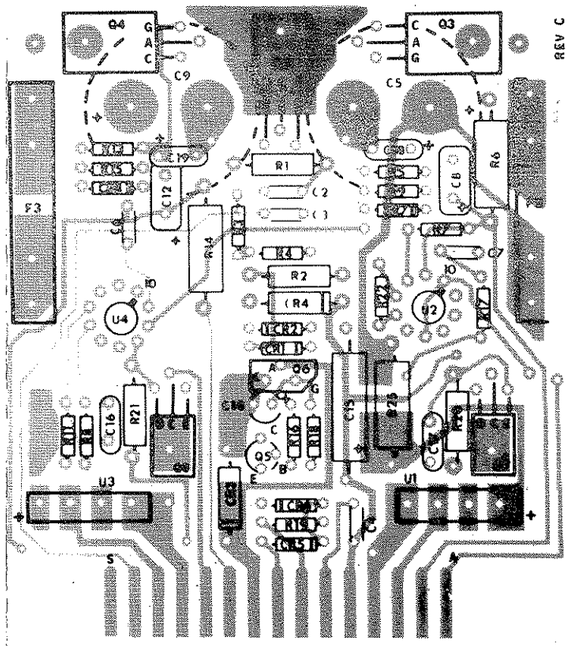
5024026098H PC ASSY REGULATOR 1A6A1

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, T36B	0282150005
C12	Capacitor, 68µf, 25V, T36B	0282150005
C14	Capacitor, 6.8µf, 20V, T36B	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	Transistsor, PNP, SIL. TIP-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%, ½W	0162290004
R2	Resistor, 22, 10%, ½W	0186930003
R3	Resistor, 100, 5%, ¼W	0171180003
R4	Resistor, 1K, 10%, ¼W	0171560001
R5	Resistor, 100, 5%, ¼W	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%, ¼W	0171560001
R11	Resistor, 4.99K, 1%, 1/8W	1005510032
R13	Resistor, 100, 5%, ¼W	0171180003
R14	Resistor, 0.22, 5%, 2W	0193620006
R15	Resistor, 1K, 10%, ¼W	0171560001
R16	Resistor, 1K, 10%, ¼W	0171560001
R17	Resistor, 10K, 1%, 1/8W	1003050026
R18	Resistor, 470, 5%, ¼W	0184110009
R19	Resistor, 1K, 10%, ¼W	0171560001
R20	Resistor, 1K, 10%, ½W	0167480006
R21	Resistor, 1K, 10%, ½W	0167480006
R22	Resistor, 3.9K, 10%, ¼W	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

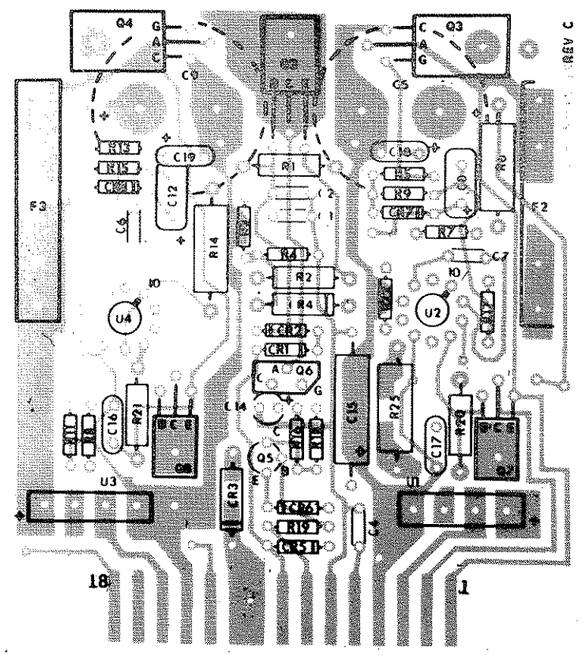
5024020090AN POWER SUPPLY ASSY 1A6

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





COMPONENT SIDE



CIRCUIT SIDE

CHANGE DATE 1 JULY 1987

5024020073K

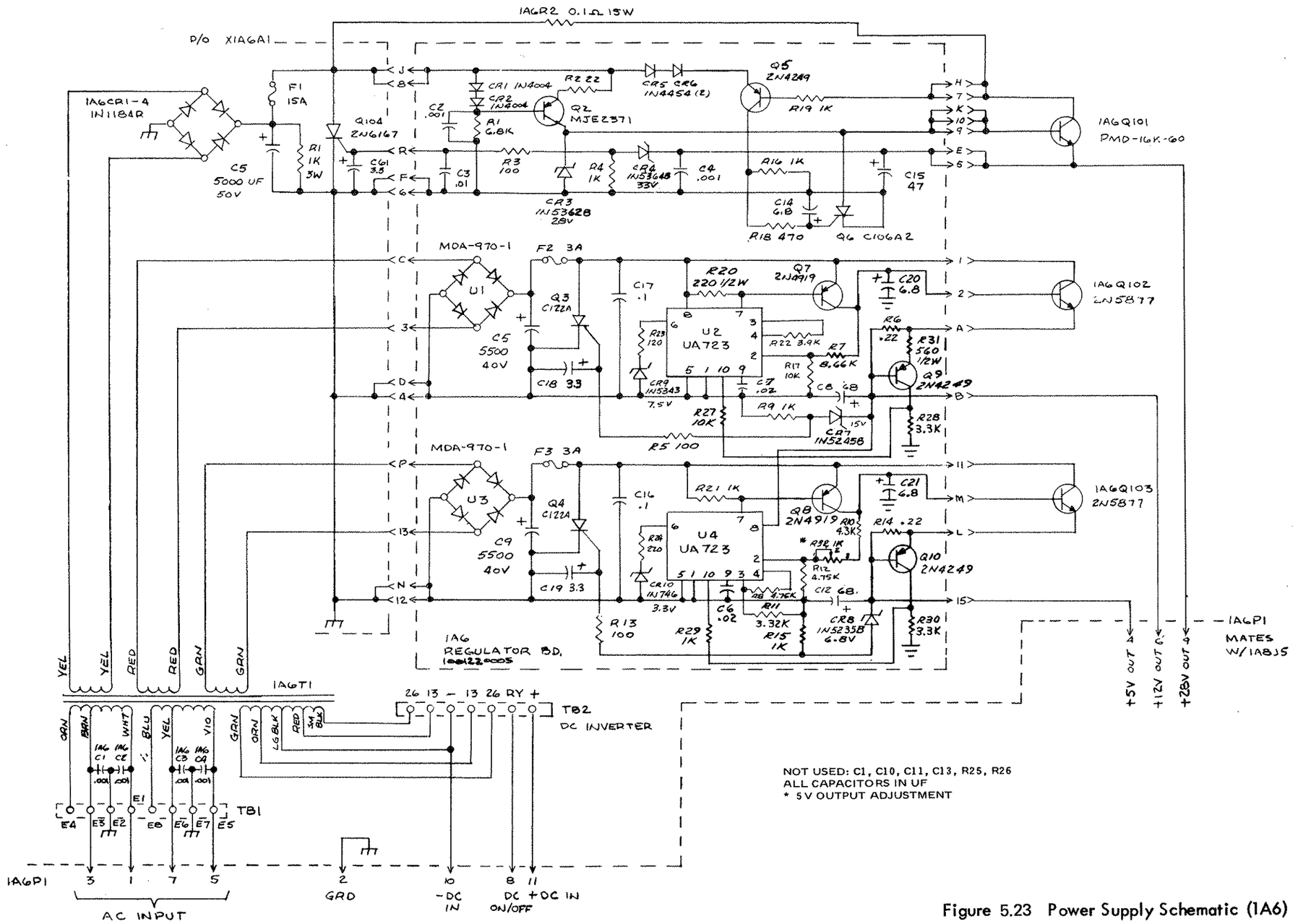


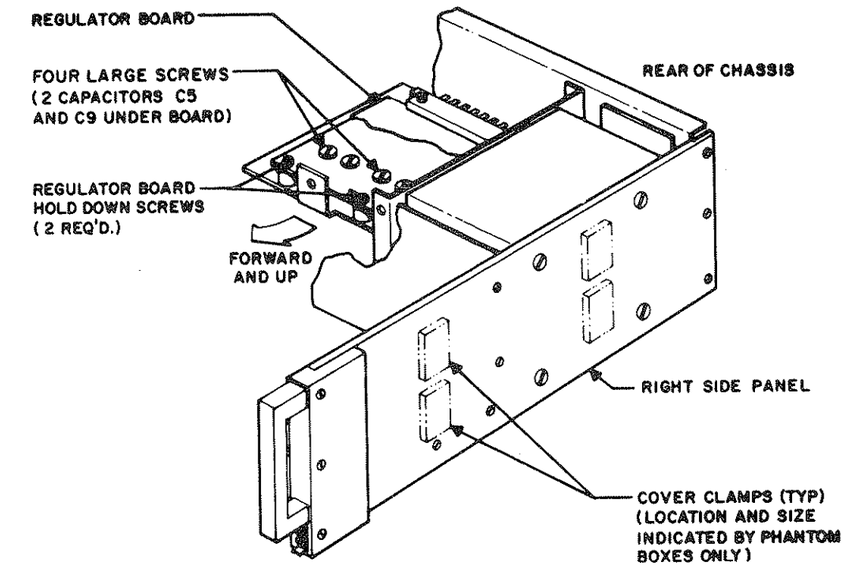
Figure 5.23 Power Supply Schematic (1A6)

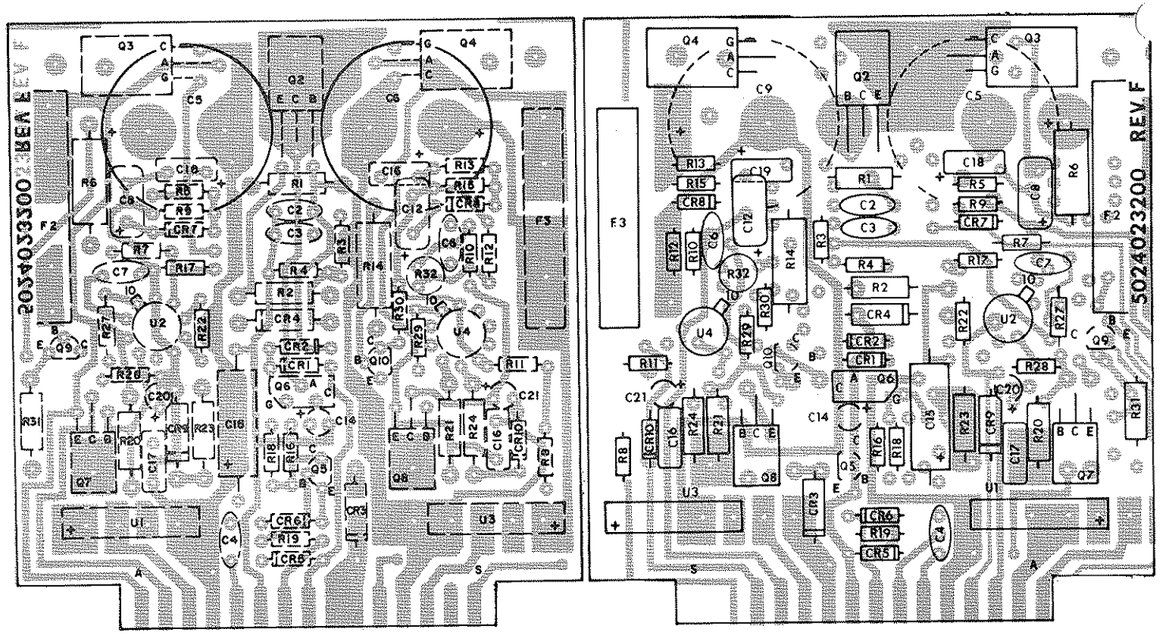
New

1001220005F PC ASS'Y REGULATOR

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Not used	
C2	Capacitor, Disc. Cer., .001 UF, 250 V	0286260000
C3	Capacitor, Disc Cer., .01 UF, 25 V	0281620008
C4	Capacitor, Disc. Cer., .001 UF, 250 V	0286260000
C5	Not used	
C6	Capacitor, 0.02 UH, 25 V, Y5 U	0269130004
C7	Capacitor, 0.02 UH, 25 V, Y5 U	0269130004
C8	Capacitor, Tantalum, 68 UF, 25 V	0282150005
C9	Not used	
C10	Not used	
C11	Not used	
C12	Capacitor, Tantalum, 68 UF, 25 V	0282150005
C13	Not used	
C14	Capacitor, Tantalum, 6.8 UF, 20 V	0296780006
C15	Capacitor, Tantalum, 47 UF, 50 V	0245750002
C16	Capacitor, Monolythic, 0.1 UF, 50 V	0281610002
C17	Capacitor, Monolythic, 0.1 UF, 50 V	0281610002
C18	Capacitor, Tantalum, 3.3 UF, 35 V	0281680001
C19	Capacitor, Tantalum, 3.3 UF, 35 V	0281680001
C20	Capacitor, Tantalum, 68 UF, 20 V	0296780006
C21	Capacitor, Tantalum, 68 UF, 20 V	0296780006
CR1	Diode, 1N4004	0405180004
CR2	Diode, 1N4004	0405180004
CR3	Diode, Zener	0405220006
CR4	Diode, Zener, 1N5364B	0405230001
CR5	Diode, Signal, 1N4454	0405270003
CR6	Diode, Signal, 1N4454	0405270003
CR7	Diode, Zener, 1N5245B	0405210001
CR8	Diode, 1N5235B	0405200005
CR9	Diode, Zener, 1N5343B	1003060005
CR10	Diode, Zener, 1N746	0402320000
F2	Fuse, 3 Amp, 250 V	1002550009
F3	Fuse, 3 Amp, 250 V	1002550009
Q2	Translation, PNP, Silicone	0448200007
Q3	Diode, SCR	0446920002
Q4	Diode, SCR	0446920002
Q5	Transistor, PNP, Silicone, 2N4249	0446780006
Q6	Diode, SCR	0447070002
Q7	Transistor, PNP, Si 2N4919	0445370009
Q8	Transistor, PNP, Si 2N4919	0445370009
Q9	Transistor, PNP, Si 2N4249	0446780006
Q10	Transistor, PNP, Si 2N4249	0446780006
R1	Resistor, Carbon, 6.8K, 10%, 1/2W	0162290004
R2	Resistor, Carbon, 22, 10%, 1/2W	0186930003
R3	Resistor, Carbon, 100, 5%, 1/4W	0171180003
R4	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R5	Resistor, Carbon, 100, 5%, 1/4W	0171180003
R6	Resistor, 22, 5%, 2W	0193620006
R7	Not used	
R8	Resistor, 4750, 1%, 1/8W	1003050018
R9	Resistor, 1K, 10%, 1/4W	0171560001
R10	Resistor, 4.3K, 5%, 1/4W	1005090025
R11	Resistor, 3320, 1%, 1/8W	1003050000
R12	Resistor, Carbon, 4750, 1%, 1/8W	1003050018
R13	Resistor, Carbon, 100, 5%, 1/4W	0171180003
R14	Resistor, 0.22, 5%, 2W	0193620006
R15	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R16	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R17	Resistor, 10K, 1%, 1/8W	1003050026
R18	Resistor, Carbon, 470, 5%, 1/4W	0184110009
R19	Resistor, Carbon, 1K, 10%, 1/4W	0171560001
R20	Resistor, 220, 10%, 1/2W	0172850002
R21	Resistor, 1K, 10%, 1/2W	0167480006
R22	Resistor, 3.9K, 10%, 1/4W	0178830003
R23	Resistor, 120, 10%, 1/2W	0186430001
R24	Resistor, 220, 10%, 1/2W	0172850002
R25	Not used	
R26	Not used	
R27	Resistor, 10K, 10%, 1/4W	0170410005
R28	Resistor, 3.3K, 10%, 1/4W	0170890007
R29	Resistor, 1K, 10%, 1/4W	0171560001
R30	Resistor, 3.3K, 10%, 1/4W	0170890007
R31	Resistor, 560, 10%, 1/2W	0185900003
R32	Pot., 1K, 10%, 1/2W, PC Mount	1004680007
U1	Diode Bridge, MDA970-1	0405260008
U2	Integrated Circuit, Linear, UA723	0448190001
U3	Diode, Bridge, MDA970-1	0405260008
U4	Integrated Circuit, Linear, UA723	0448190001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A6 C1	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C2	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C3	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C4	Capacitor, 0.001 UF, 500 V, 10%	0289350000
1A6 C5	Capacitor, 5000 UF, 50 V	0282140000
C5	Capacitor, 5500 UF, 40 V	0280930003
C6	Capacitor, 3.3 UF, 35 V	0281680001
C9	Capacitor, 5500 UF, 40 V	0280930003
CR1	Diode, Rectifier, 1N1184R	0405590008
CR2	Diode, Rectifier, 1N1184R	0405590008
CR3	Diode, Rectifier, 1N1184R	0405590008
CR4	Diode, Rectifier, 1N1184R	0405590008
Q102	Transistor, NPN, Si. 2N5877	1001240006
Q103	Transistor, NPN, Si. 2N5877	1001240006
Q104	Diode, SCR 2N6167	0405450001
R1	Resistor, 1K, 5%, 3W	0162790007
R2	Resistor, 0.1, 10%, 15W	0193360004
T1	Transformer, Power	5024020308
	Miscellaneous Mechanical Parts	
Q101	Transistor Power	0448210002
TB2	Barrier Strip, 9 Pos. 6-32	0508030005
	Connector, Power, 11 Pin Rect.	0753320002
	Connector, PC, 30 Pin Female	0753780002
	Socket, Transistor	0766190005
	Fuse, AGC, 15 Amp, 32 V	0848740009





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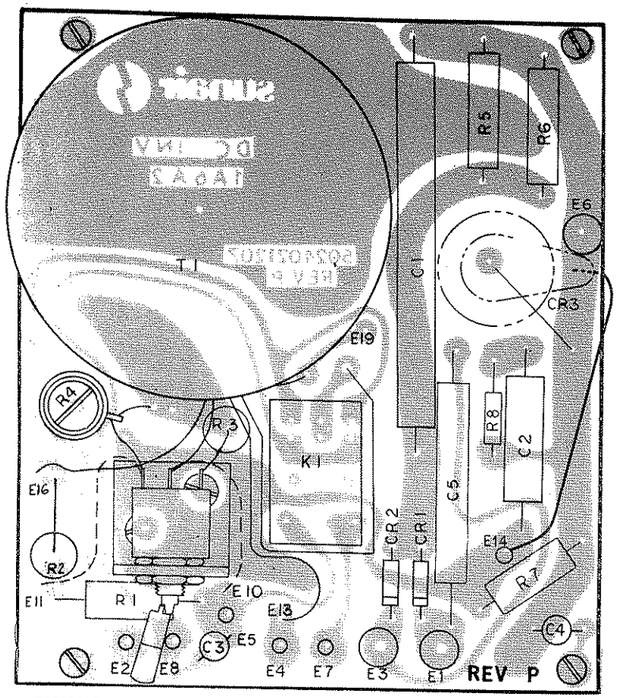
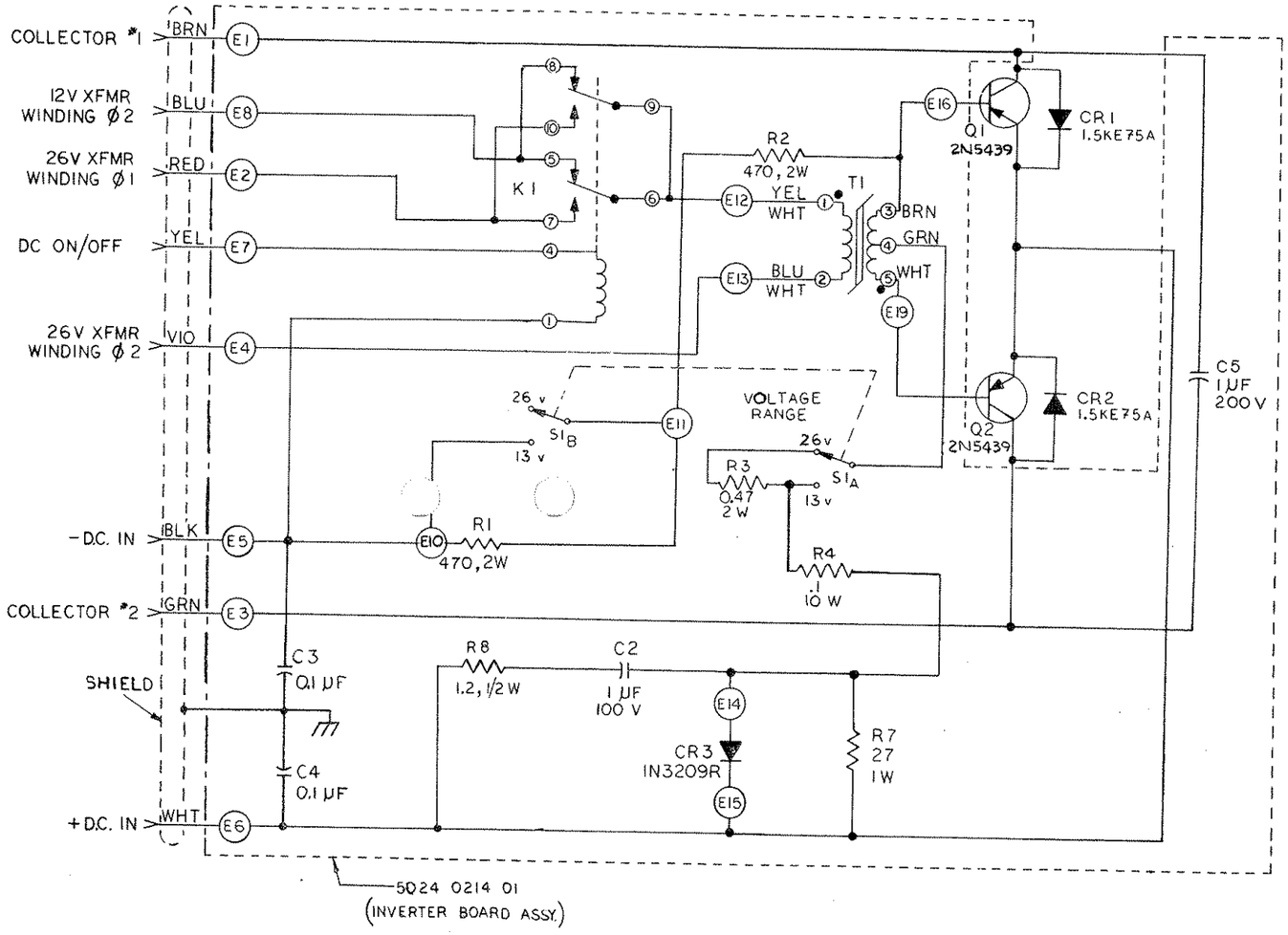
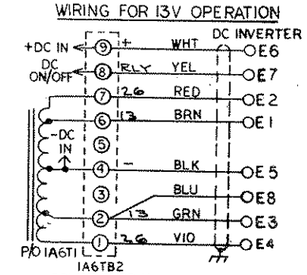


5024021495AB PC ASSY DC INVERTER W/HEAT SINK 1A6A2

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY DC INVERTER W/HEAT SINK	5024021495
C2	Capacitor, 1µf, 100V, 20%	0272300004
C3	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, 1µf, 200C, 20%	0245250000
CR1	Diode, Transzorb, 75V	1006050035
CR2	Diode, Transzorb, 75V	1006050035
CR3	Diode, Rectifier 1N3209R	0405190000
K1	Relay, DPDT, 12V	1000190030
Q1	Transistor, PNP, GE.	0448320002
Q2	Transistor, PNP, GE.	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
R7	Resistor, Fusible, 27, 2W	1001100034
R8	Resistor, 1.2, 10%, ½W	0188490001
S1	Switch, Toggle, DPDT	0346370001
T1	Transformer, Saturable	5024021509
	MISCELLANEOUS	
	Bracket Switch	5024021606
	Heat Sink, DC Inverter	5024021100
	Locking Ring	1001340027
	Mount, Transistor	0502740001
	Standoff, M-F, 4-40, .250 L	1003170005



NOTES:
1. PREFIX ALL DESIGNATORS WITH "1A6A2"
2. WIRING FOR 13V OPERATION



WIRING FOR 26V OPERATION

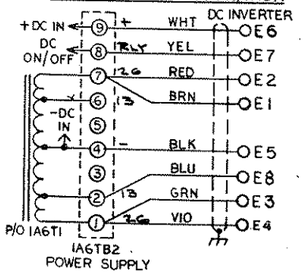


FIGURE 5.24 D.C. Inverter Schematic (1A6A2)

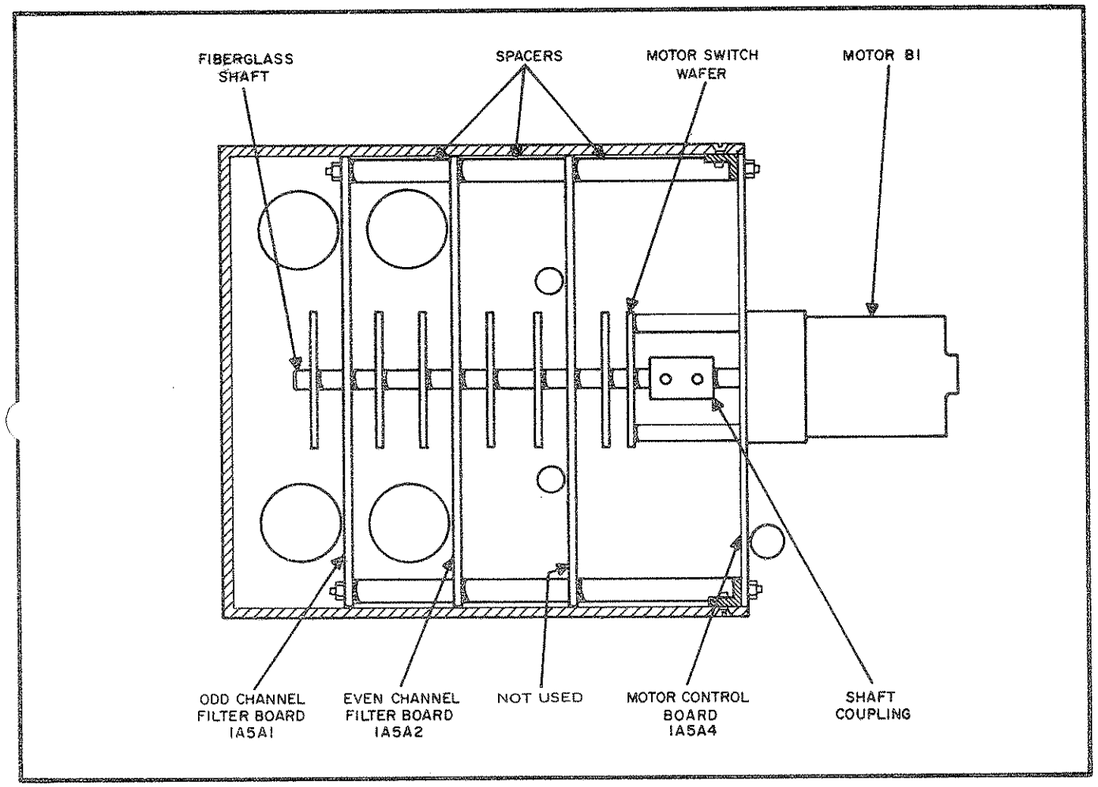
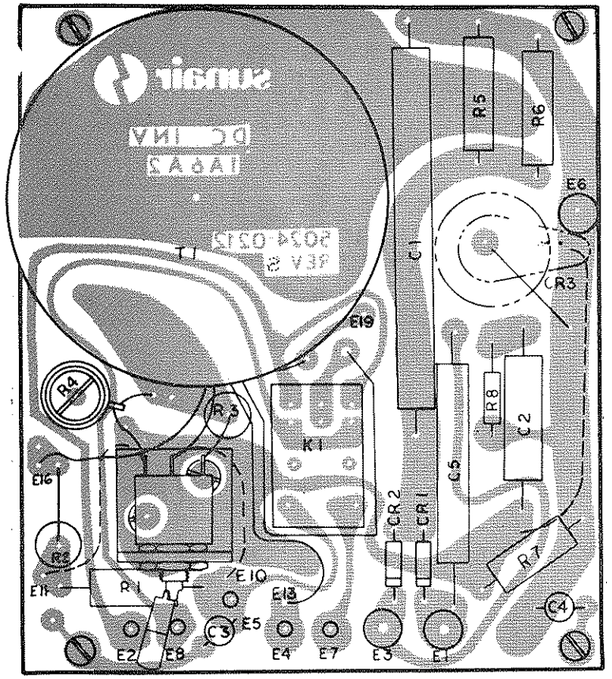


Figure 5.25 Filter Module Assembly

S5024021371G



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, X7 R, 20%	0281610002
C4	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C5	Capacitor, 1 UF, 200 V, Mylar	0245250000
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N3209 R	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	0440940001
	Lug, Solder, IT No. 6 3/4 L	0502050004
	Mount, Transistor	0502740001
	Terminal, Ring Tongue No. 6	0508460000
	Terminal, Crimp 1/4 Stud	0508680000
	Terminal, Crimp No. 6	0542750007
	Thermal Compound DNP	0840810008
	Standoff, M-F, 4-40 .250 L	1003170005
	Heat Sink, DC Inverter	5024021100
	Bracket Switch	5024021606

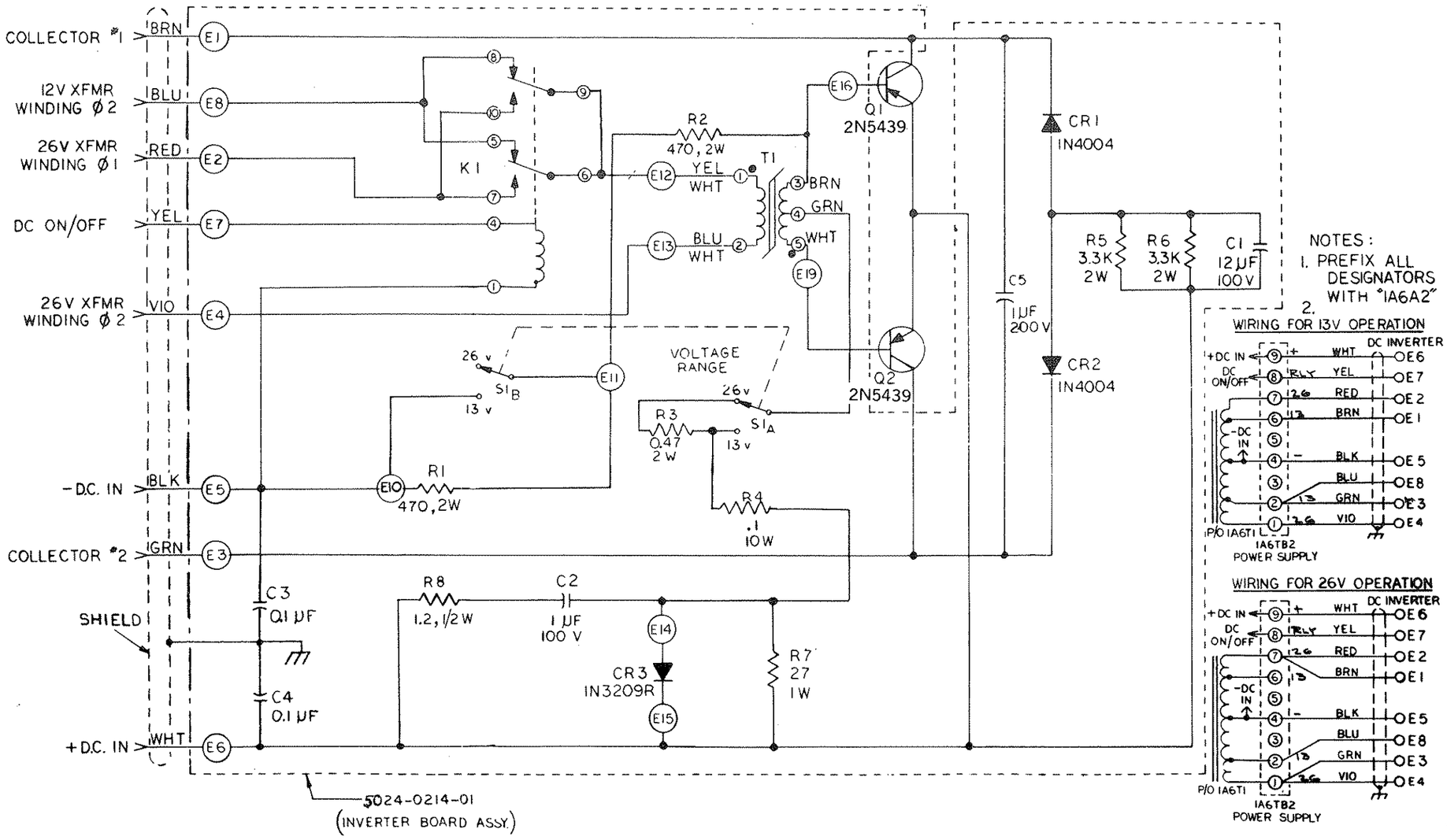


Figure 5.24 D.C. Inverter Schematic (1A6A2)

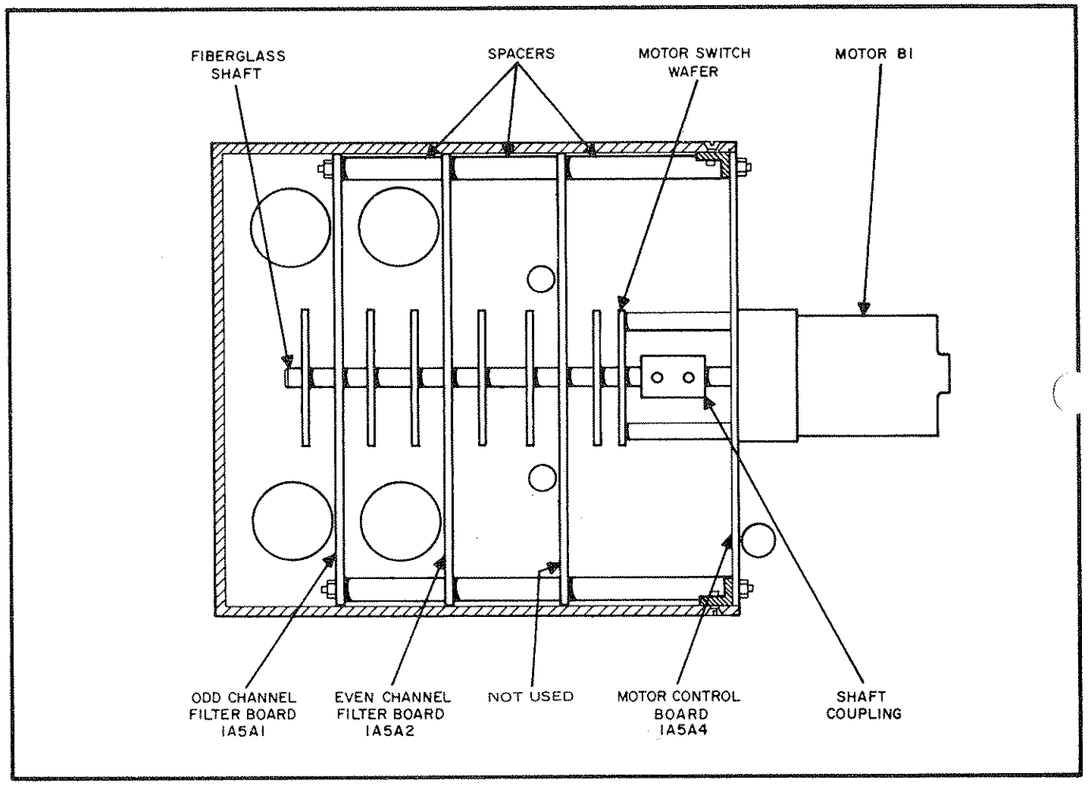
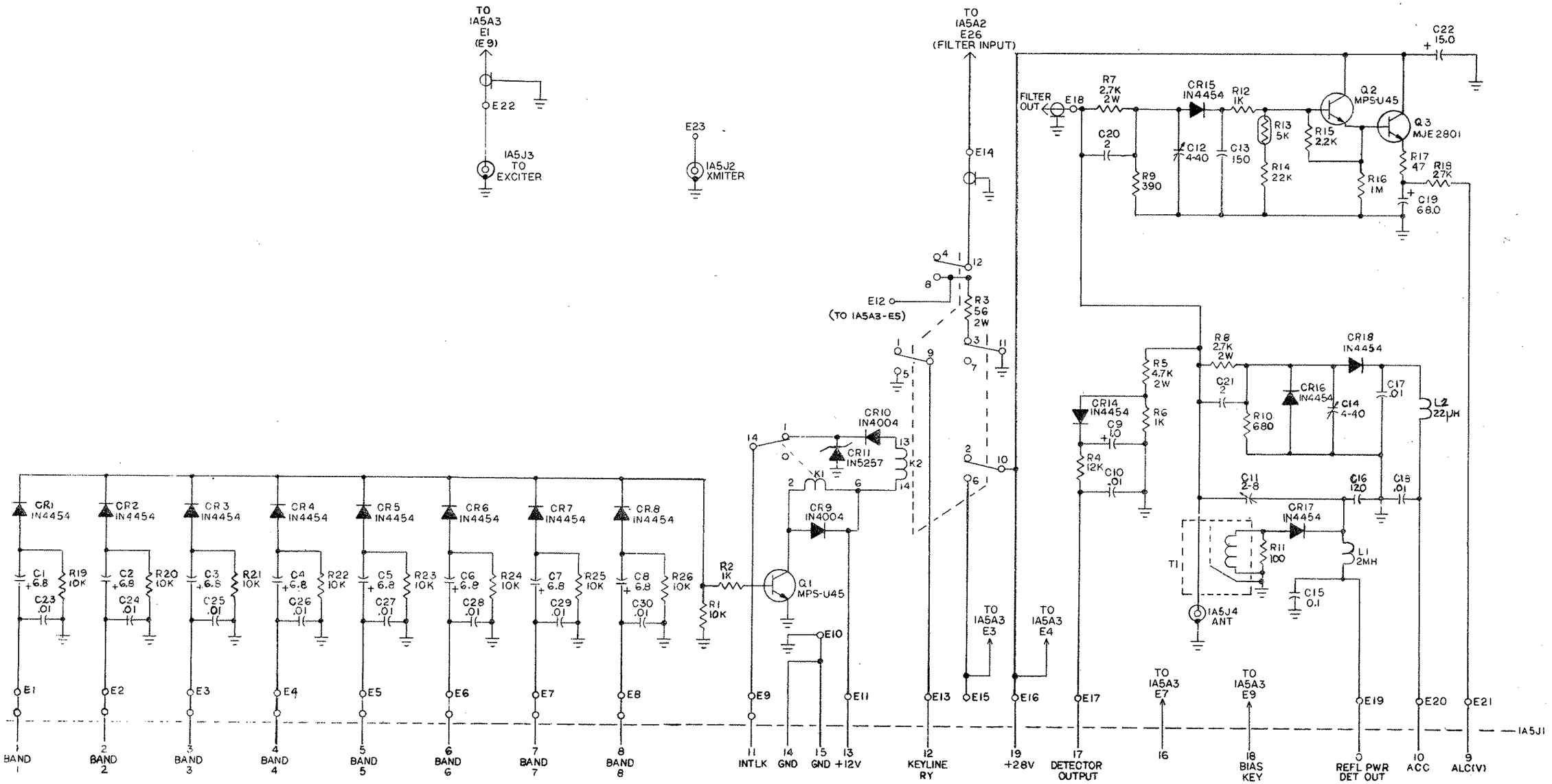


Figure 5.25 Filter Module Assembly

5.76



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

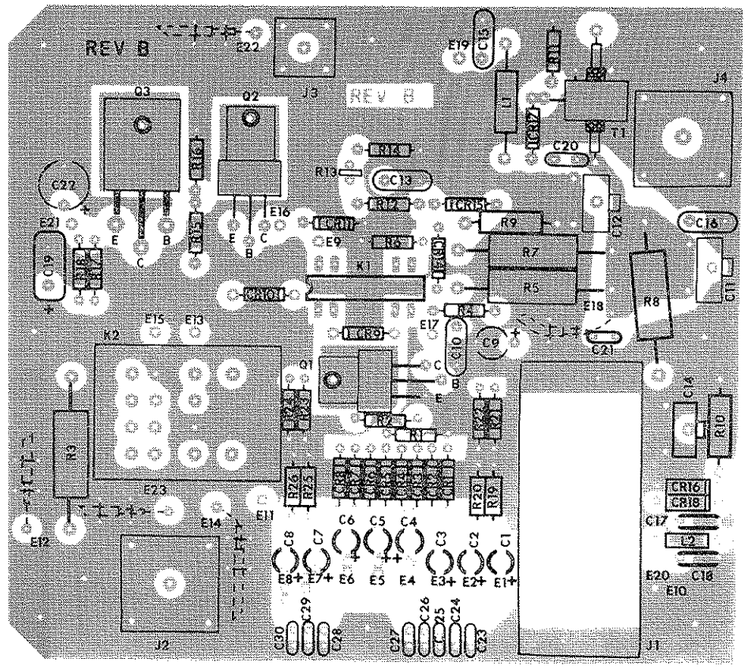
CHANGE DATE 1 JULY 1987

FIGURE 5.26 RF DETECTOR ASSEMBLY

8039052092B PC ASSY RF DETECTOR 1A5A4

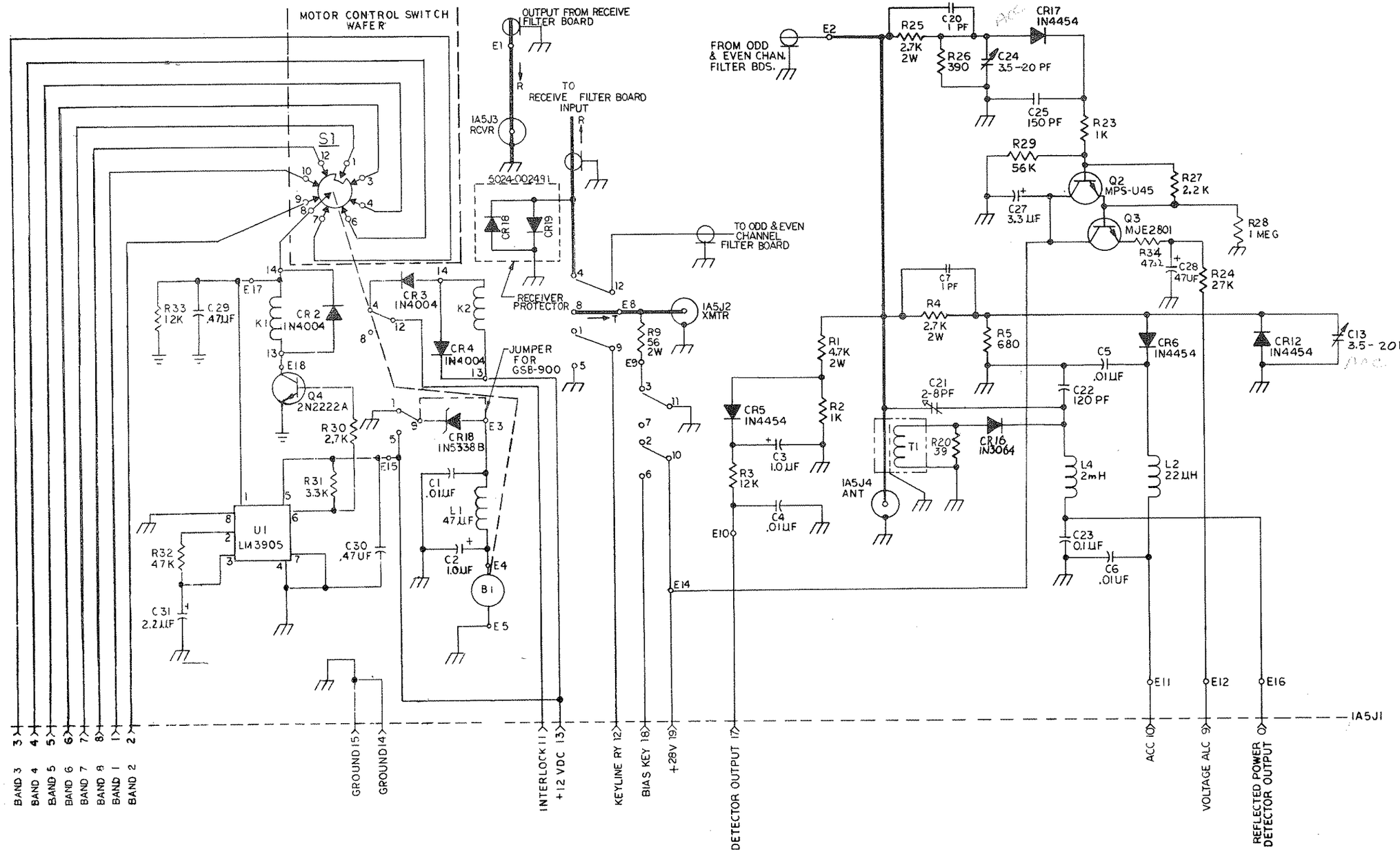
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY RF DETECTOR	0164130004
C1	Capacitor, 6.8µf, 20V, T368	0296780006
C2	Capacitor, 6.8µf, 20V, T368	0296780006
C3	Capacitor, 6.8µf, 20V, T368	0296780006
C4	Capacitor, 6.8µf, 20V, T368	0296780006
C5	Capacitor, 6.8µf, 20V, T368	0296780006
C6	Capacitor, 6.8µf, 20V, T368	0296780006
C7	Capacitor, 6.8µf, 20V, T368	0296780006
C8	Capacitor, 6.8µf, 20V, T368	0296780006
C9	Capacitor, 1µf, 50V, 198D	0280910002
C10	Capacitor, 0.01µf, 25V, X5S	0281620008
C11	Capacitor, 2-8pf, 200V, NPO	0284300004
C12	Capacitor, 4-40pf, 25V	0295490004
C13	Capacitor, 150pf, 500V, DM15, 5%	0274980002
C14	Capacitor, 4-40pf, 25V	0295490004
C15	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C16	Capacitor, 120pf, 500V, DM15, 5%	0289850002
C17	Capacitor, 0.01µf, 25V, X5S	0281620008
C18	Capacitor, 0.01µf, 25V, X5S	0281620008
C19	Capacitor, 68µf, 25V, T368	0282150005
C20	Capacitor, 2pf, 500V, DM10	0259710008
C21	Capacitor, 2pf, 500V, DM10	0259710008
C22	Capacitor, 15µf, 50V, 196D	0274000008
C23	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C24	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C25	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C26	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C27	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C28	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C29	Capacitor, .01µf, 50V, X7R, 20%	0281730008
C30	Capacitor, .01µf, 50V, X7R, 20%	0281730008
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 1N5257A	1005320012
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, Reed, 12VDC 1 Form C	1004630026
K2	Relay, 4PDT, 12V, Sensitive	0666640009
L1	Inductor, Molded, 2000µh, 5%	0653590008
L2	Inductor, Molded, 22µh, 5%	0650000005
Q1	Transistor, NPN, SI. MPSU45	0448570009
Q2	Transistor, NPN, SI. MPSU45	0448750009
Q3	Transistor, NPN, SI. MJE2801	0448530007
R1	Resistor, 10K, 10%, ½W	0170410005
R2	Resistor, 1K, 10%, ½W	0171560001
R3	Resistor, 56, 10%, 2W	0197210007
R4	Resistor, 12K, 10%, ½W	0183180003
R5	Resistor, 4.7K, 10%, 2W	0164130004
R6	Resistor, 1K, 10%, ½W	0171560001
R7	Resistor, 2.7K, 5%, 2W	0195940008
R8	Resistor, 2.7K, 5%, 2W	0195940008
R9	Resistor, 390, 10%, ½W	0173260004
R10	Resistor, 680, 10%, ½W	0167500007
R11	Resistor, 100, 5%, ½W	0171180003
R12	Resistor, 1K, 10%, ½W	0171560001

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R13	Resistor, 5K at 25C	1001340001
R14	Resistor, 22K, 5%, ½W	0172230004
R15	Resistor, 2.2K, 5%, ½W	0178070009
R16	Resistor, 1M, 10%, ½W	0170650006
R17	Resistor, 47, 10%, ½W	0179360001
R18	Resistor, 27K, 10%, ½W	0171200004
R19	Resistor, 10K, 10%, ½W	0170410005
R20	Resistor, 10K, 10%, ½W	0170410005
R21	Resistor, 10K, 10%, ½W	0170410005
R22	Resistor, 10K, 10%, ½W	0170410005
R23	Resistor, 10K, 10%, ½W	0170410005
R24	Resistor, 10K, 10%, ½W	0170410005
R25	Resistor, 10K, 10%, ½W	0170410005
R26	Resistor, 10K, 10%, ½W	0170410005
T1	Transformer, Current	5024055608
	MISCELLANEOUS	
	Bracket Assy, RF Det.	8039052599
	Socket, Relay, 4 PDT, PC Mount	1003420036
	Spring, Relay Hold-down	0878260005



CHANGE DATE 1 JULY 1987

5024052978W



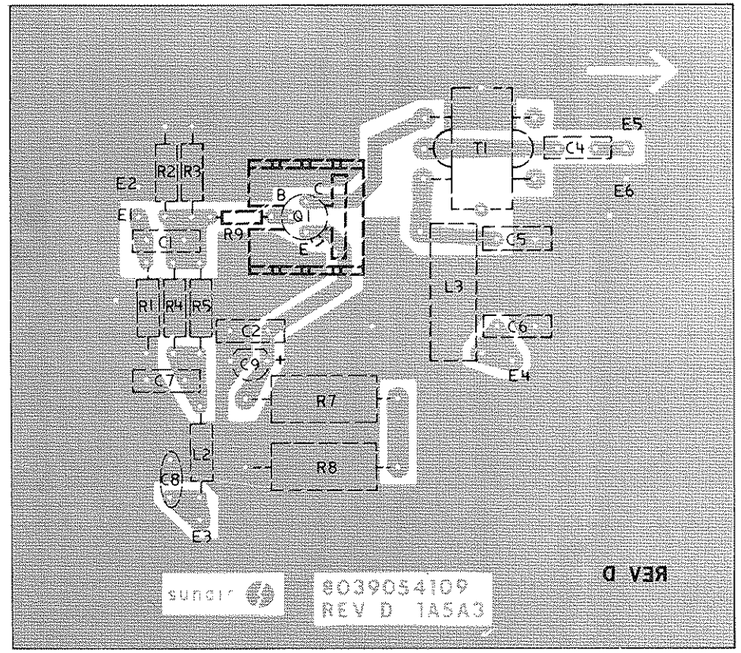
NOTES:

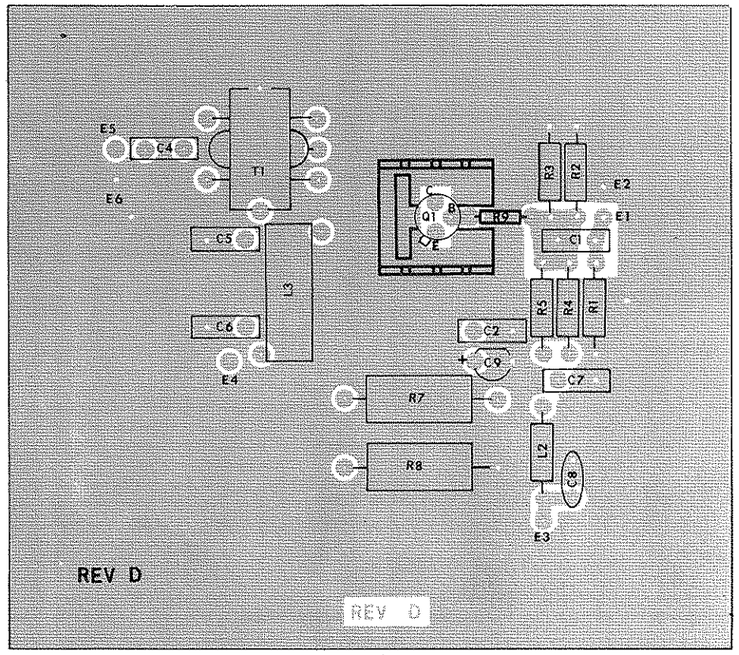
1) UNLESS OTHERWISE SPECIFIED:
   ALL RESISTORS ARE IN OHMS AND 1/4 WATT.
   INDUCTANCE VALUES ARE IN MICROHENIES.
   PREFIX ALL ITEMS WITH 1A5A4.

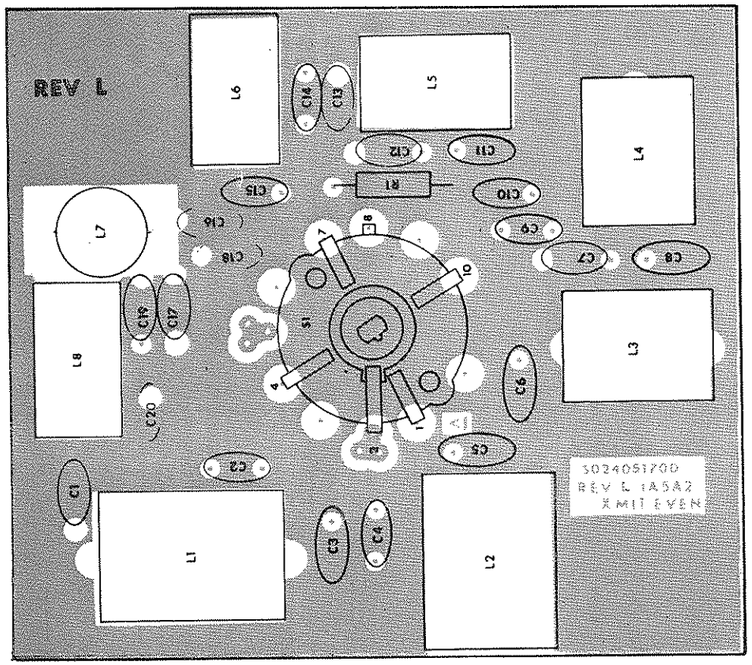
Figure 5.26 Motor Control Board (1A5A4) Schematic

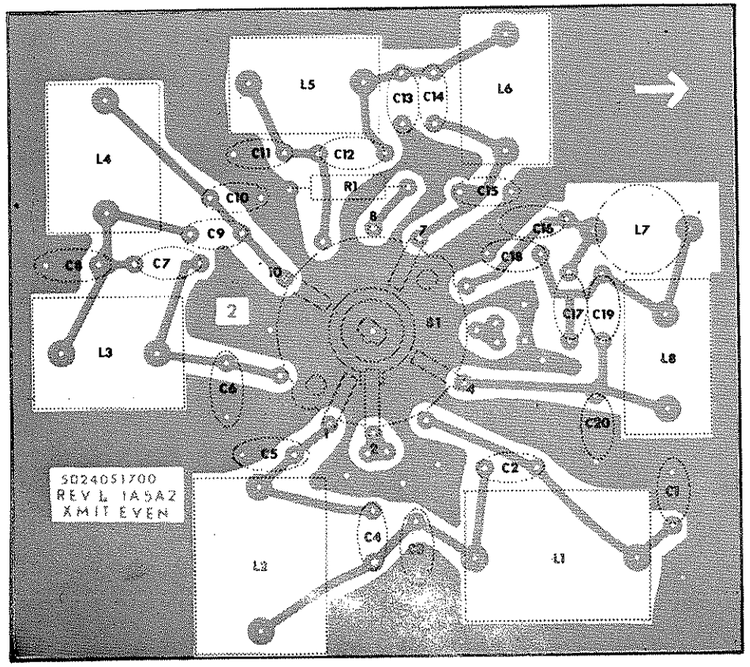
5024052994 PC ASSY MOTOR CONTROL

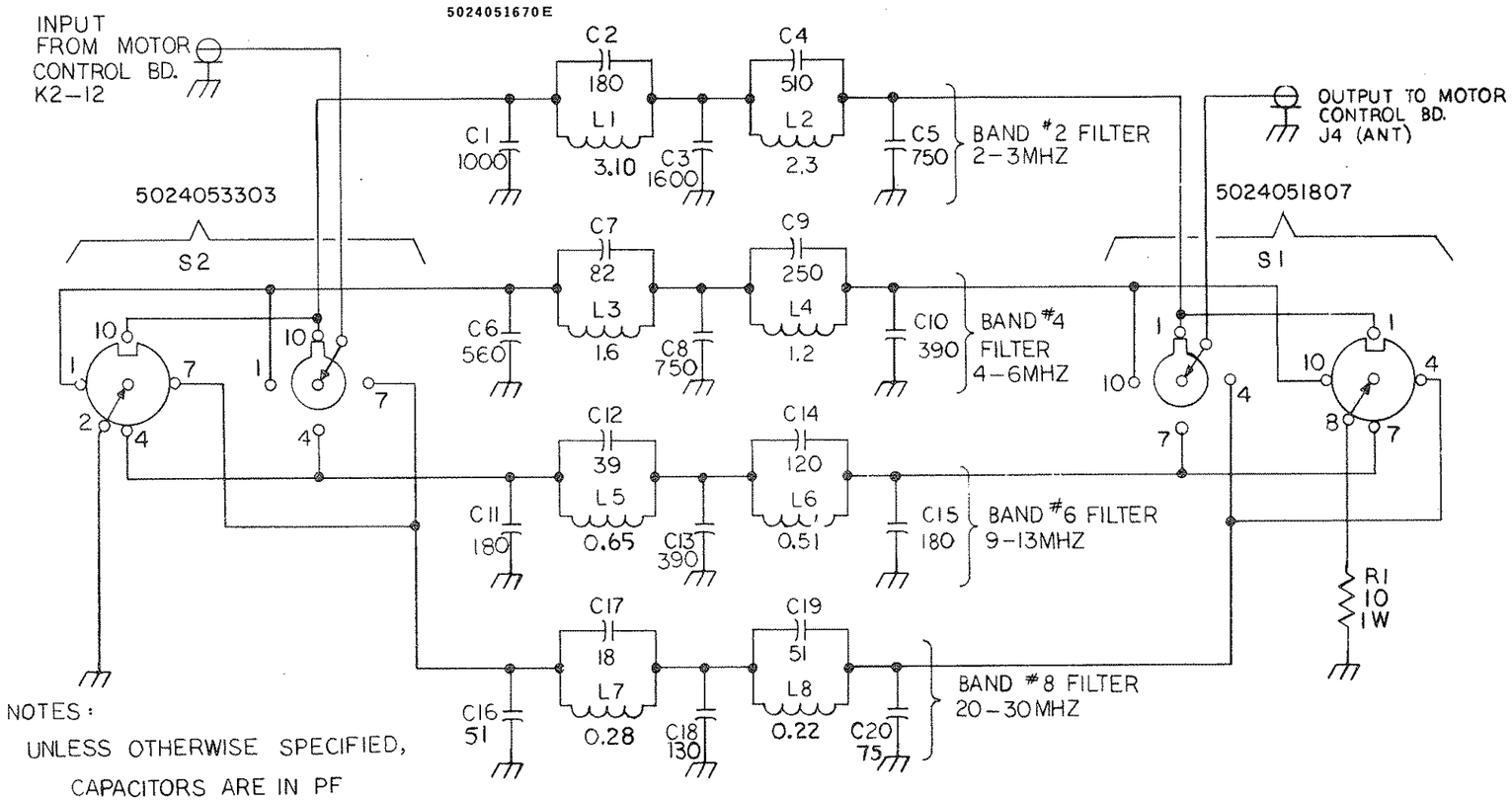
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY MOTOR CONTROL	5024052994
B1	Motor, 12 VDC, 96.7/1 Gear/Red	5024053508
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 1 UF, 50 V, 198D	0280910002
C3	Capacitor, 1 UF, 50 V, 198D	0280910002
C4	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C7	Capacitor, 1 PF, 500 V, DM10	0260160008
C8	Not used	
C9	Not used	
C10	Not used	
C11	Not used	
C12	Not used	
C13	Capacitor, 2.5-20 PF	1005140031
C14	Not used	
C15	Not used	
C16	Not used	
C17	Not used	
C18	Not used	
C19	Not used	
C20	Capacitor, 1 PF, 500 V, DM10	0260160008
C21	Capacitor, 2-8 PF, 350 V, NPO	0268220000
C22	Capacitor, 120 PF, 500 V, DM15, 5%	0289850002
C23	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C24	Capacitor, 2.4-20 PF	1005140031
C25	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C26	Not used	
C27	Capacitor, 3.3 UF, 35 V, 196D	0261680001
C28	Capacitor, 47 UF, 20 V, 196D	0281700001
C29	Capacitor, 0.47 UF, 50 V, X5V, 20%	0283370009
C30	Capacitor, 0.47 UF, 50 V, X5V, 20%	0283370009
C31	Capacitor, 2.2 UF, 35 V, T368	0273950002
CR1	Not used	
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
CR5	Diode, Signal, Sil. 1N4454	0405270003
CR6	Diode, Signal, Sil. 1N4454	0405270003
CR7	Not used	
CR8	Not used	
CR9	Not used	
CR10	Not used	
CR11	Not used	
CR12	Diode, Signal, Sil. 1N4454	0405270003
CR13	Not used	
CR14	Not used	
CR15	Not used	
CR16	Diode, Signal, Sil. 1N3064	0405460007
CR17	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
L1	Inductor, Molded, 47 UH, 5%	0646420003
L2	Inductor, Molded, 22 UH, 5%	0650000005
L3	Not used	
L4	Inductor, Molded, 2000 UH, 5%	0653590008
Q1	Not used	
Q2	Transistor, NPN, Si. MPSU45	0448570009
Q3	Transistor, NPN, Si. MJE2801	0448530007
Q4	Transistor, NPN, Si. 2N2222A	0448580004
R1	Resistor, 4.7 K, 10%, 2W	0164130004
R2	Resistor, 1 K, 10%, 1/4 W	0171560001
R3	Resistor, 12 K, 10%, 1/4 W	0163180003
R4	Resistor, 2.7 K, 5%, 2W	0195940008
R5	Resistor, 680, 10%, 1/4 W	0176630007
R6	Not used	
R7	Not used	
R8	Not used	
R9	Resistor, 56, 10%, 2W	0197210007
R10	Not used	
R11	Not used	
R12	Not used	
R13	Not used	
R14	Not used	
R15	Not used	
R16	Not used	
R17	Not used	
R18	Not used	
R19	Not used	
R20	Resistor, 39, 10%, 1/4 W	0182490007
R21	Not used	
R22	Not used	
R23	Resistor, 1 K, 10%, 1/4 W	0171560001
R24	Resistor, 27 K, 10%, 1/4 W	0171200004
R25	Resistor, 2.7 K, 5%, 2W	0195940008
R26	Resistor, 390, 10%, 1/2 W	0173260004
R27	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R28	Resistor, 1 M, 10%, 1/4 W	0170650006
R29	Resistor, 56 K, 10%, 1/4 W	0171440005
R30	Resistor, 2.7 K, 10%, 1/4 W	0186670001
R31	Resistor, 3.3 K, 10%, 1/4 W	0170890007
R32	Resistor, 47 K, 10%, 1/4 W	0171060008
R33	Resistor, 12 K, 10%, 1/4 W	0183180003
R34	Resistor, 47, 10%, 1/2 W	0167980009
T1	Transformer, Current	5024055608
U1	IC. Linear, LM3905N	0448470004
	Coupling, Flex. 3/16-1/4 ID	0346360005
	Socket, Relay, 4 PDT Contacts	0767000005
	Retainer, Relay Socket	0767500008
	Wire Kit, Motor Control Assy.	5024052901
	Switch, Wafer, Motor Control	5024053109











NOTES:

UNLESS OTHERWISE SPECIFIED,
CAPACITORS ARE IN PF
INDUCTORS ARE IN μH.

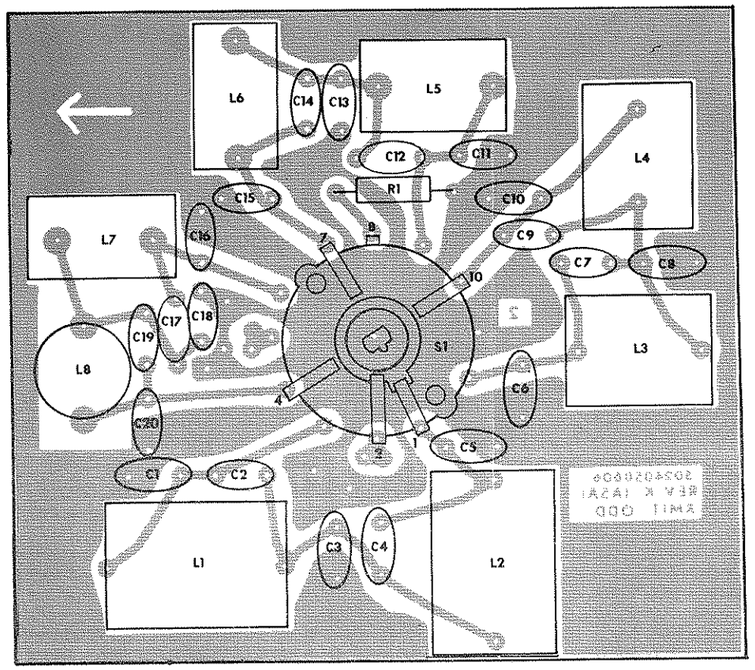
PREFIX ALL DESIGNATORS WITH "1A5A2"

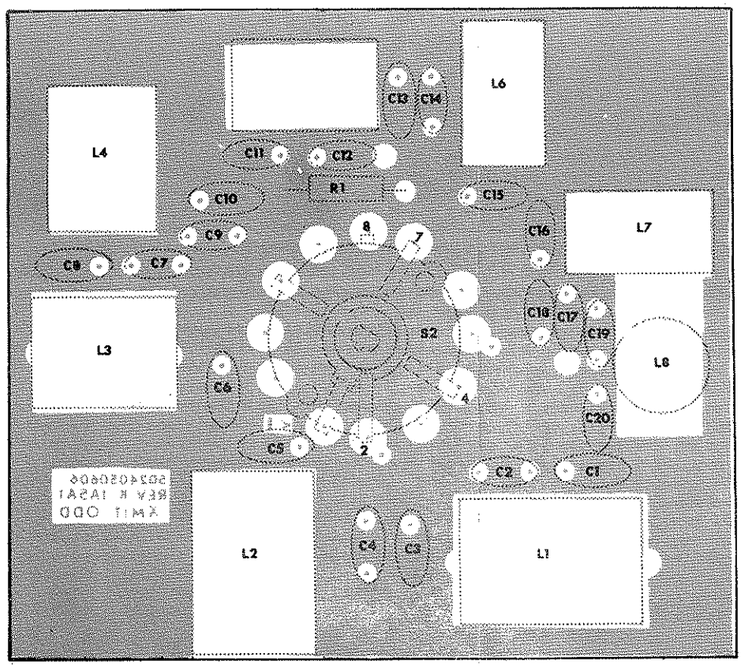
5024051696F PC ASSY EVEN CHANNEL FILTER

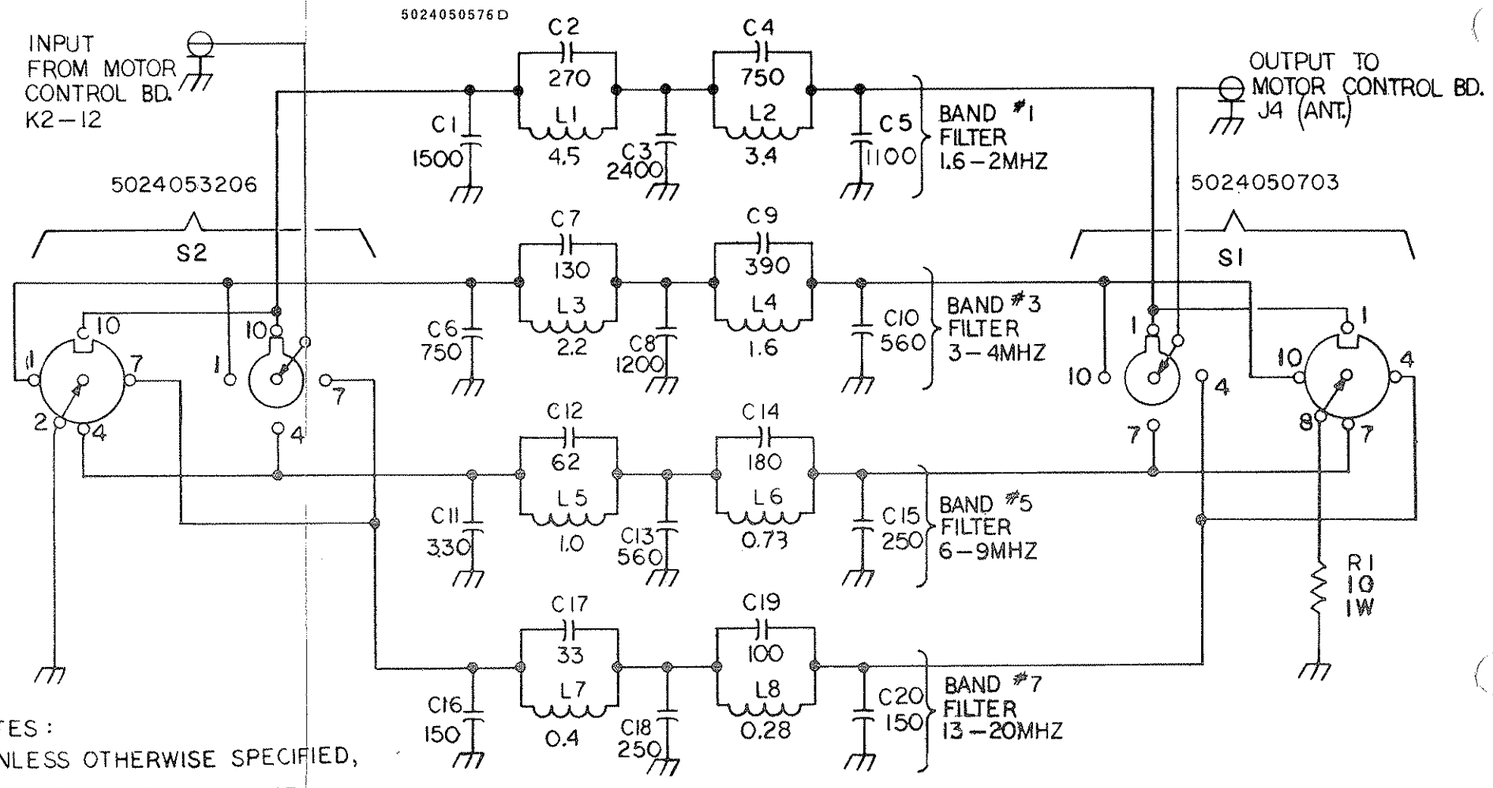
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY EVEN CHANNEL FILTER	5024051696
C1	Capacitor, 1000 PF, 500 V, DM19, 2%	0281210004
C2	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C3	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000
C4	Capacitor, 510 PF, 500 V, DM19, 2%	0282630007
C5	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
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%	0280990006
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, CM19, 2%	0282640002
C14	Capacitor, 120 PF, 500 V, DM19, 2%	0282750002
C15	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C16	Capacitor, 51 PF, 500 V, DM20, 2%	0282820001
C17	Capacitor, 18 PF, 500 V, DM20	0282860002
C18	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007
C19	Capacitor, 51 PF, 500 V, DM20	0282820001
C20	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
L1	Inductor, Filter, 3.10 UH Gry	5024051904
L2	Inductor, Filter, 2.32 UH Wht	5024052006
L3	Inductor, Filter, 1.60 UH Grn	5024051106
L4	Inductor, Filter, 1.20 UH Wh/Red	5024052102
L5	Inductor, Filter, 0.65 UH Wh/Grn	5024052200
L6	Inductor, Filter, 0.51 UH, Wh/Yel	5024052307
L7	Inductor, Filter, 0.275 UH Vio	5024051505
L8	Inductor, Filter, 0.22 UH, Wh/Grn	5024052501
R1	Resistor, 10, 10%, 1W	0196090008
S1	Switch, Wafer, Even Ch. Top	5024051807
S2	Switch, Wafer, Even Ch. Bottom	5024053303

Figure 5.27 Even Channel Filter (1A5A2) Schematic







NOTES :

UNLESS OTHERWISE SPECIFIED,

CAPACITORS ARE IN PF

INDUCTORS ARE IN μH

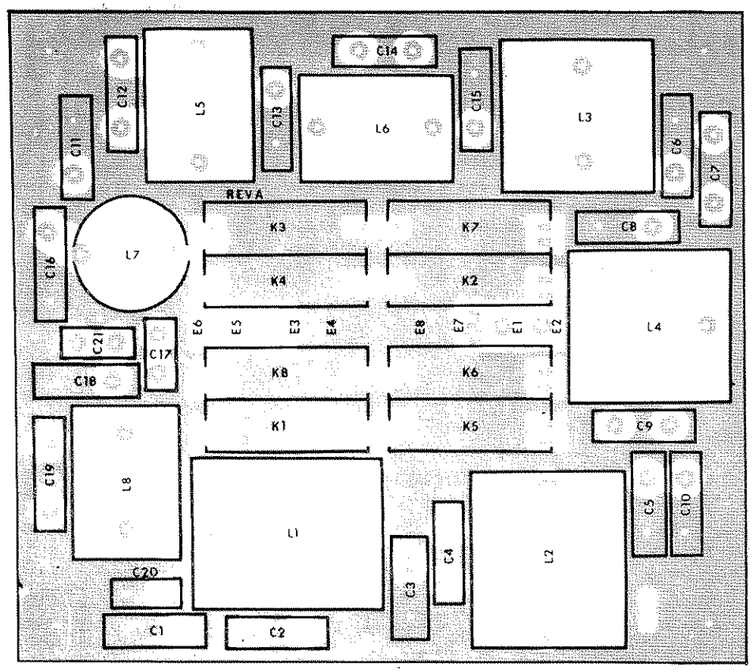
PREFIX ALL DESIGNATORS WITH "1A5A1."

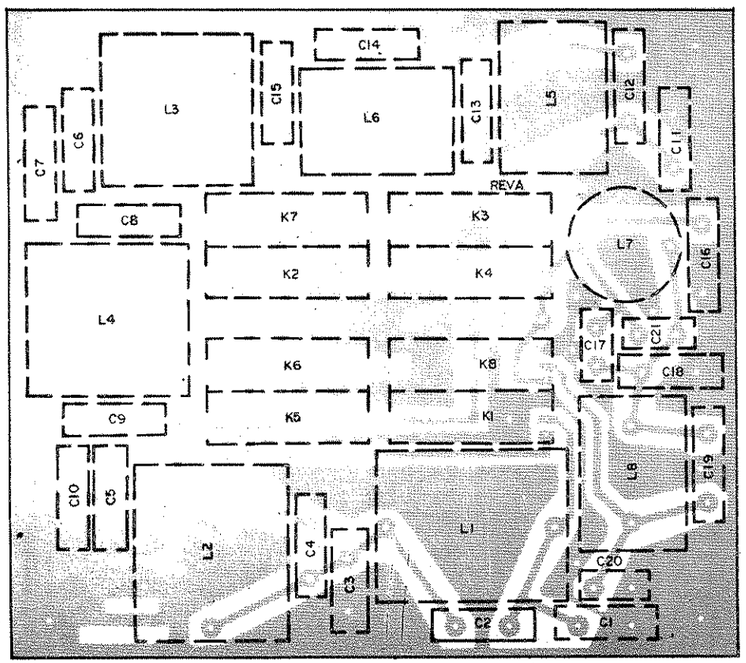
5024050592C PC ASSY ODD CHANNEL FILTER

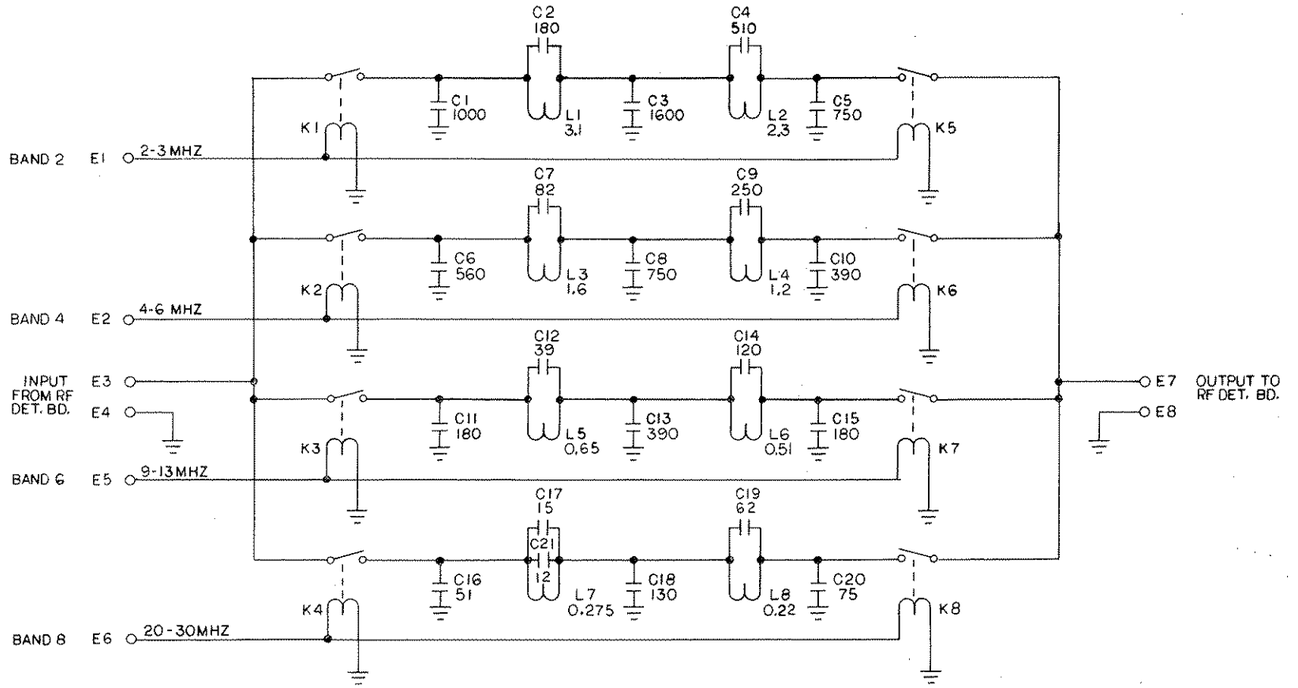
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY ODD CHANNEL FILTER	5024050592
C1	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C2	Capacitor, 270 PF, 500 V, DM19, 2%	0282670009
C3	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001
C4	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C5	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C6	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C7	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007
C8	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C9	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C10	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C11	Capacitor, 330 PF, 500 V, DM19, 2%	0282660003
C12	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005
C13	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C14	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C15	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C16	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
C17	Capacitor, 33 PF, 500 V, DM20, 2%	0282850007
C18	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C19	Capacitor, 100 PF, 500 V, DM19, 2%	0282770009
C20	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
L1	Inductor, Filter, 4.5 UH Blk	5024050801
L2	Inductor, Filter, 3.4 UH Brn	5024050908
L3	Inductor, Filter, 2.15 UH Red	5024051009
L4	Inductor, Filter, 1.60 UH Orn	5024051106
L5	Inductor, Filter, 1.00 UH Yel	5024051203
L6	Inductor, Filter, 0.73 UH Grn	5024051301
L7	Inductor, Filter, 0.41 UH Blu	5024051408
L8	Inductor, Filter, 0.275 UH Vio	5025051505
R1	Resistor, 10, 10%, 1W	0196090008
S1	Switch, Wafer, Odd Ch Top	5024050703
S2	Switch, Wafer, Odd Ch Top	5024053206

Figure 5.28 Odd Channel Filter (1A5a1) Schematic







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

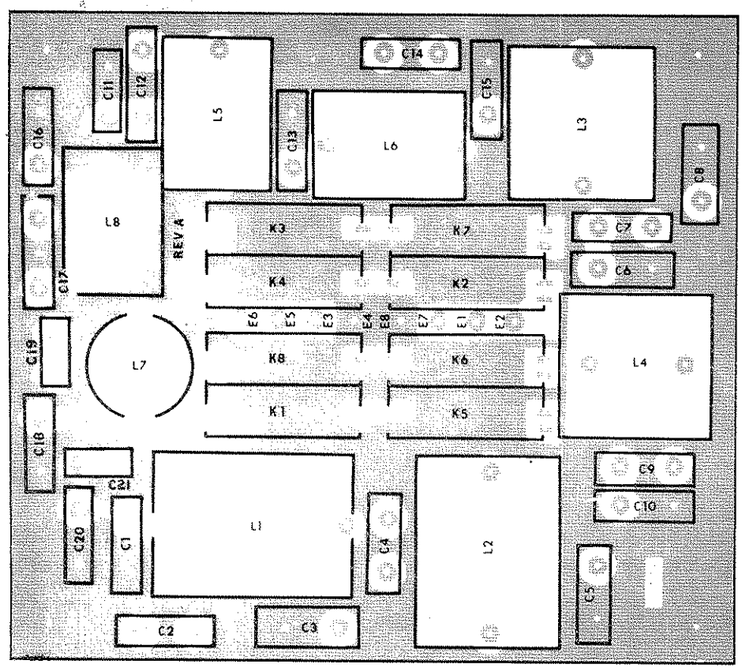
5024057791A PC ASSY EVEN CHANNEL FILTER 1A5A2

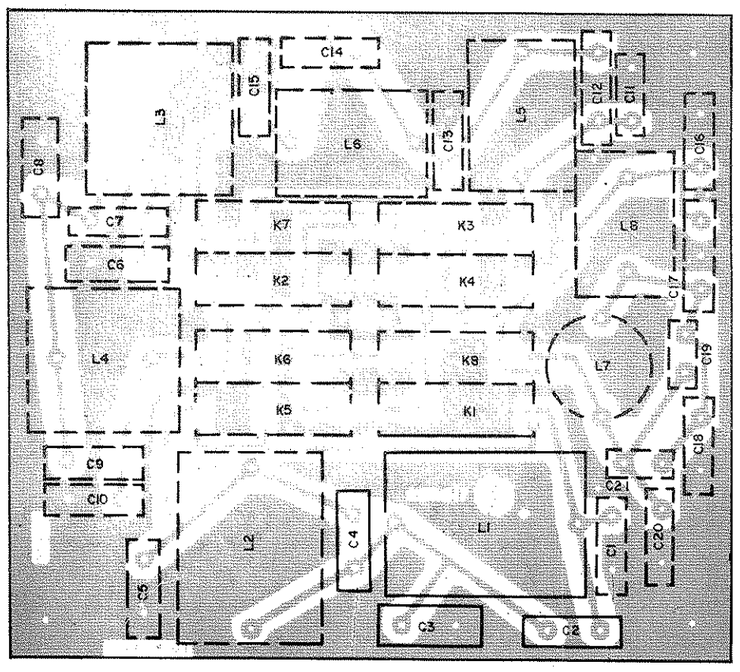
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A5A2	PC ASSY EVEN CHANNEL FILTER	5024057791
C1	Capacitor, 1000 PF, 500 V, DM19, 2%	0281210004
C2	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C3	Capacitor, 1600 PF, 500 V, DM19, 2%	0281220000
C4	Capacitor, 510 PF, 500 V, DM19, 2%	0282630007
C5	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
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%	0280990006
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

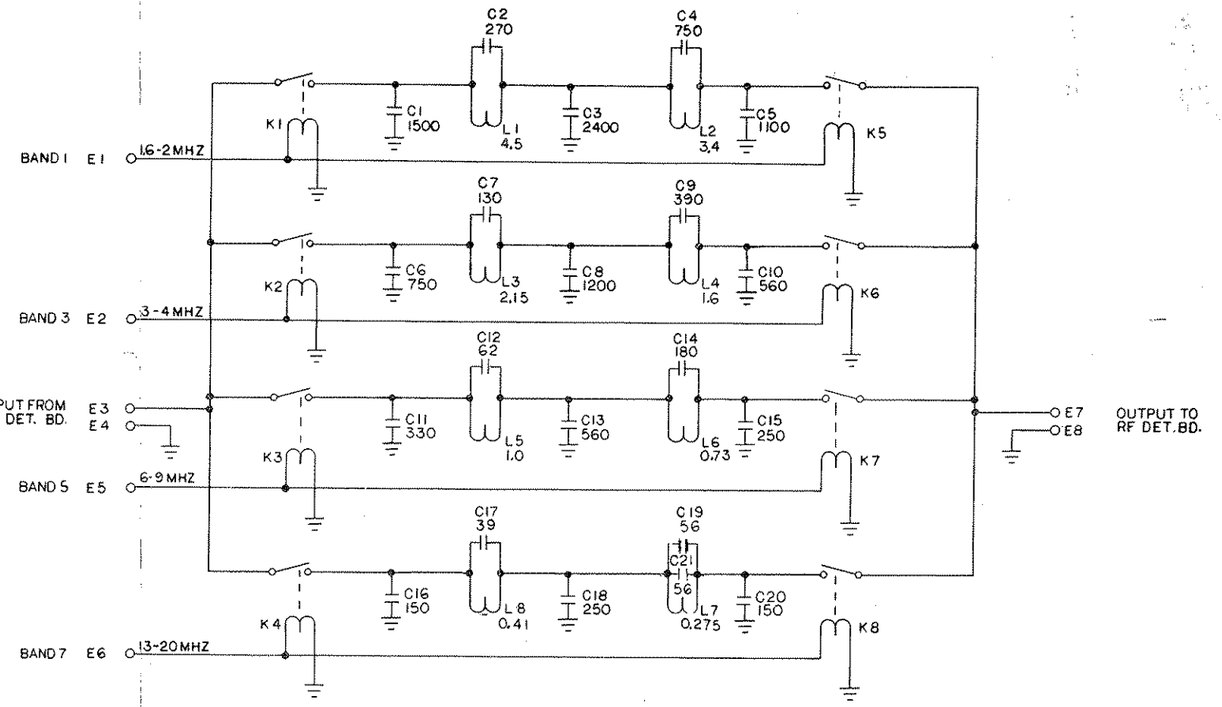
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C19	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005
C20	Capacitor, 75 PF, 500 V, DM15, 2%	0281110000
C21	Capacitor, 12 PF, 500 V, DM15	1005320039
K1	Relay, SPST, 12 V, Reed	1005330000
K2	Relay, SPST, 12 V, Reed	1005330000
K3	Relay, SPST, 12 V, Reed	1005330000
K4	Relay, 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 5.27 Even Channel Filter Board Schematic (1A5A2)

5024057473







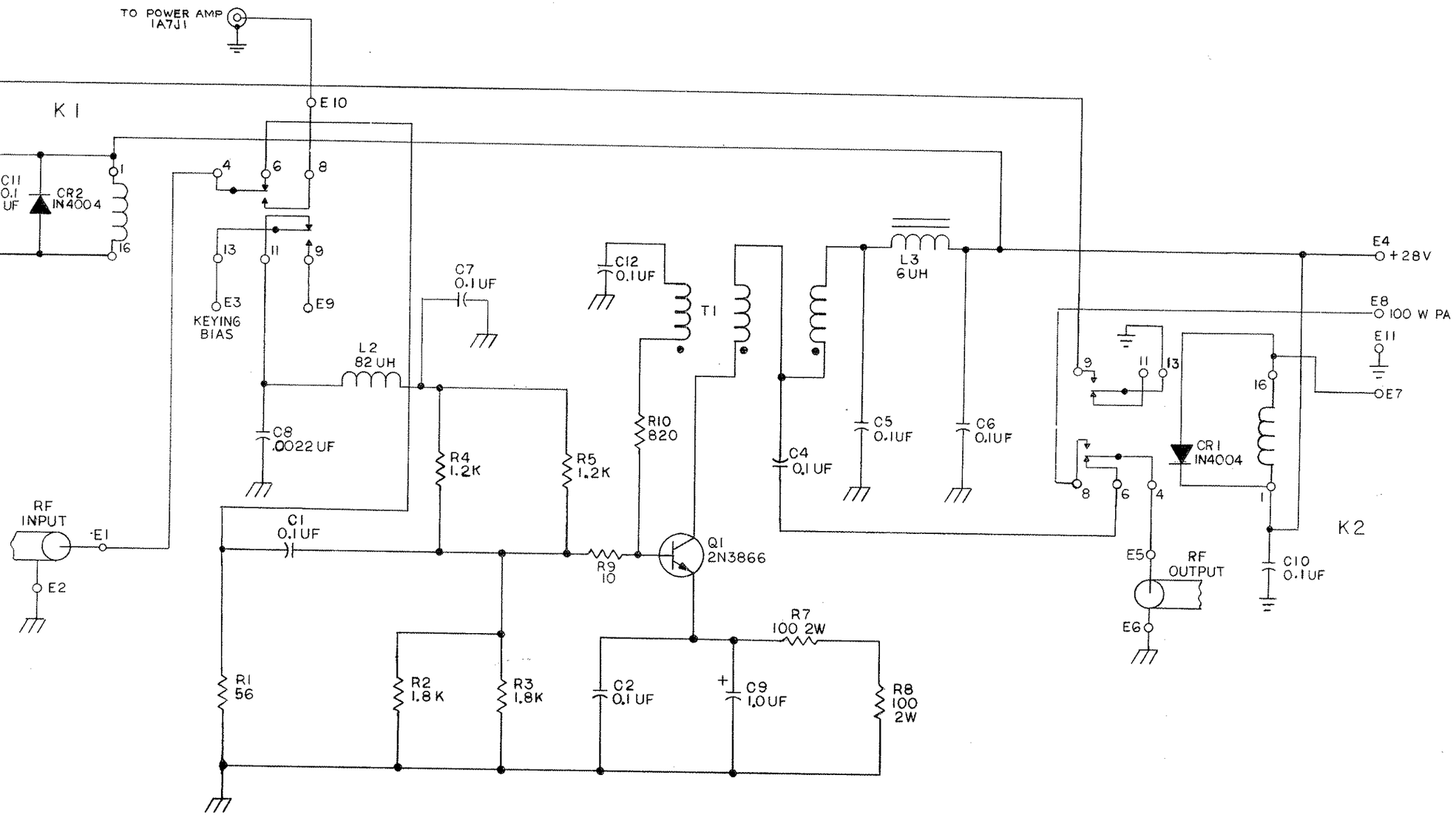
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. CAPACITORS ARE IN PICOFARADS.
2. INDUCTANCE VALUES ARE IN MICROHENRIES.

5024057490A PC ASSY ODD CHANNEL FILTER 1A5A1

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A5A1	PC ASSY ODD CHANNEL FILTER	5024057490
C1	Capacitor, 1500 PF, 500 V, DM19, 2%	0281270007
C2	Capacitor, 270 PF, 500 V, DM19, 2%	0282670009
C3	Capacitor, 2400 PF, 500 V, DM19, 2%	0280980001
C4	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C5	Capacitor, 1100 PF, 500 V, DM19, 2%	0281000000
C6	Capacitor, 750 PF, 500 V, DM19, 2%	0280990006
C7	Capacitor, 130 PF, 500 V, DM19, 2%	0282740007
C8	Capacitor, 1200 PF, 500 V, DM19, 2%	0281030006
C9	Capacitor, 390 PF, 500 V, DM19, 2%	0282640002
C10	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C11	Capacitor, 330 PF, 500 V, DM19, 2%	0282660003
C12	Capacitor, 62 PF, 500 V, DM20, 2%	0282810005
C13	Capacitor, 560 PF, 500 V, DM19, 2%	0281060002
C14	Capacitor, 180 PF, 500 V, DM19, 2%	0282700005
C15	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C16	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
C17	Capacitor, 39 PF, 500 V, DM20, 2%	0282830006
C18	Capacitor, 250 PF, 500 V, DM19, 2%	0282680004
C19	Capacitor, 56 PF, 500 V, DM15, 2%	0282360000

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C20	Capacitor, 150 PF, 500 V, DM19, 2%	0282730001
C21	Capacitor, 56 PF, 500 V, DM15, 2%	0282360000
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, 4.5 UH Blk	5024050801
L2	Inductor, Filter, 3.4 UH Brn	5024050908
L3	Inductor, Filter, 2.15 UH Red	5024051009
L4	Inductor, Filter, 1.60 UH Orn	5024051106
L5	Inductor, Filter, 1.00 UH Yel	5024051203
L6	Inductor, Filter, 0.73 UH Grn	5024051301
L7	Inductor, Filter, 0.275 UH Vio	5024051505
L8	Inductor, Filter, 0.41 UH Blu	5024051408

FIGURE 5.28 Odd Channel Filter Board Schematic (1A5A1)



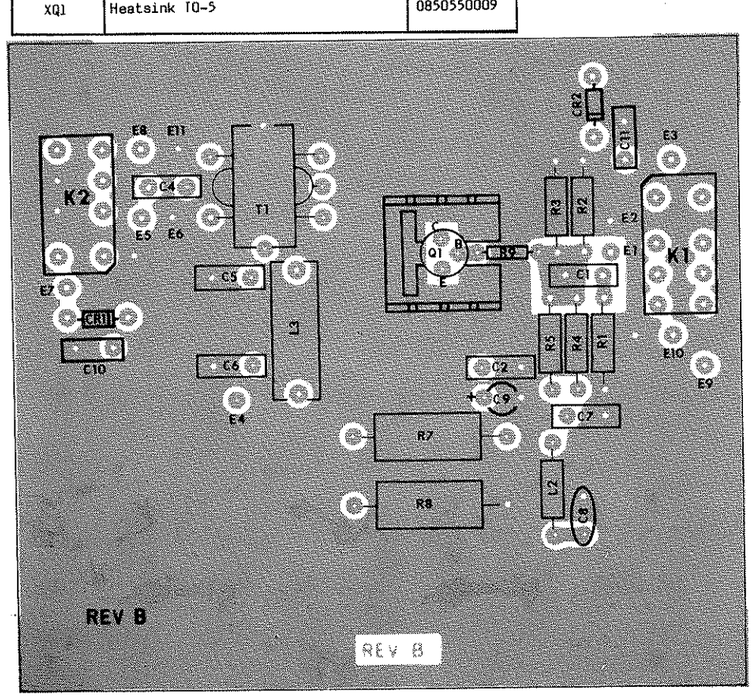
NOTES: UNLESS OTHERWISE SPECIFIED –
1. RESISTORS ARE IN OHMS AND 1/2 WATT.

CHANGE DATE 1 JULY 1987

FIGURE 5.29 200 MW AMPLIFIER ASSEMBLY

80390530998 PC ASSY 200 MW AMPLIFIER 1A5A3

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY 200 MW AMPLIFIER	8039053099
C1	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C2	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C4	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C5	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C6	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C7	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C8	Capacitor, 0.0022µf, 200V, Z5F, 10%	0272780006
C9	Capacitor, 1µf, 35V, T368	0283630001
C10	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C11	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
C12	Capacitor, 0.1µf, 50V, X7R, 20%	0281610002
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
K1	Relay, DPDT, 24VDC	1005250022
K2	Relay, DPDT, 24VDC	1005250022
L2	Inductor, Molded, 82µh, 5%	0646540009
L3	Inductor, Choke, 6.0µh	0563340002
Q1	Transistor, NPN, SI. 2N3866	0448140004
R1	Resistor, 56, 10%, ½W	0168850003
R2	Resistor, 1.8K, 5%, ½W	0184970008
R3	Resistor, 1.8K, 5%, ½W	0184970008
R4	Resistor, 1.2K, 5%, ½W	0175960003
R5	Resistor, 1.2K, 5%, ½W	0175960003
R7	Resistor, 100, 10%, 2W	0163600007
R8	Resistor, 100, 10%, 2W	0163600007
R9	Resistor, 10, 5%, ½W	0177160004
R10	Resistor, 820, 10%, ½W	0175600007
T1	Transformer Input	5024030401
XQ1	Heatsink TO-5	0850550009



CHANGE DATE 1 JULY 1987

SECTION 6
ACCESSORIES

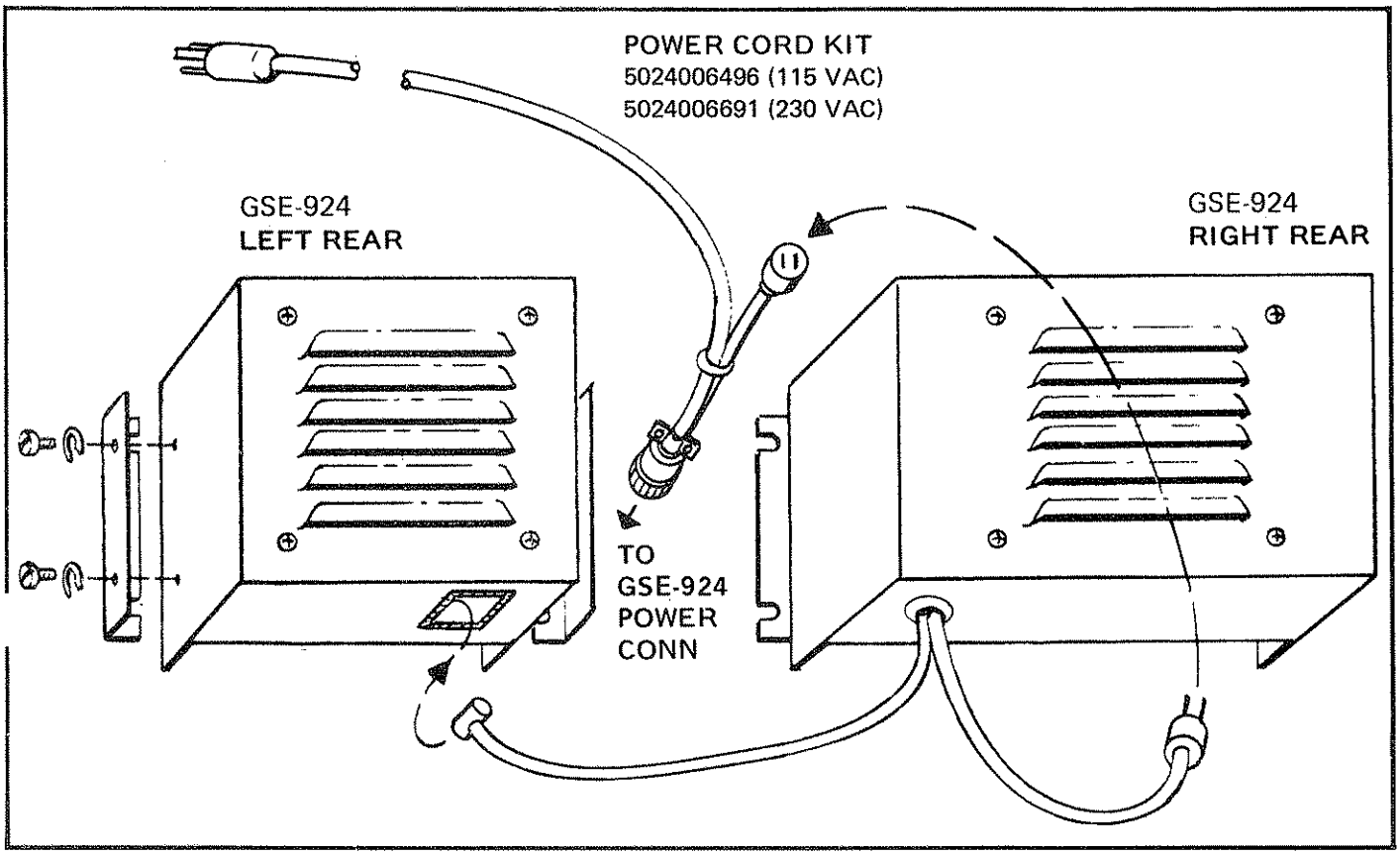


FIGURE 6.1— BLOWER KIT INSTALLATION INSTRUCTIONS

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 GSE-924 POWER CONNECTOR. BLOWERS WILL BE ENERGIZED WHENEVER GSE-924 POWER SWITCH IS TURNED ON.