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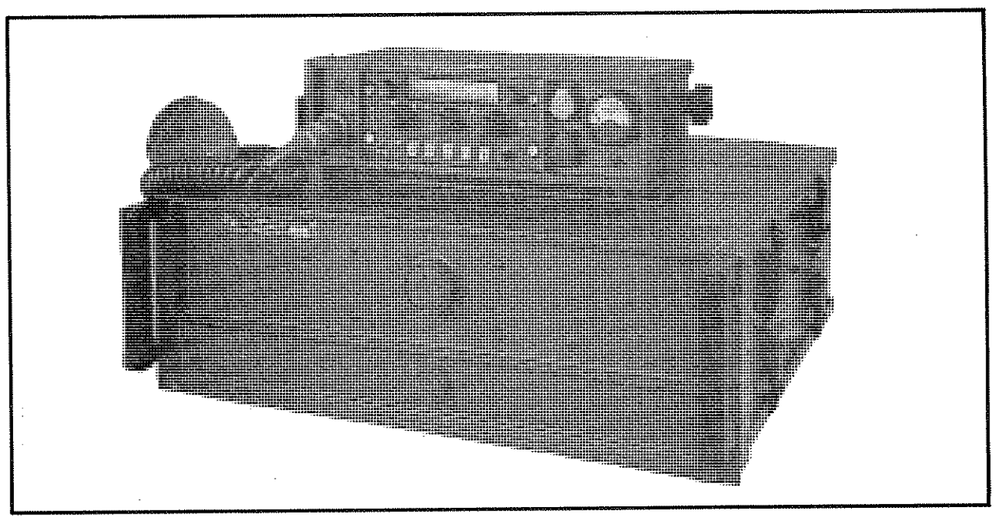
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sunair electronics, inc.
3101 S. W. 3rd Avenue, Ft. Lauderdale, Florida 33315 USA



OPERATION AND MAINTENANCE MANUAL

GSB-900R

TRANSCEIVER HF/SSB SYNTHESIZED

SECOND EDITION 1 DECEMBER 1978
MANUAL PART NUMBER 1001160002

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SECTION 1
GENERAL INFORMATION

1.1 SCOPE

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

1.2 TRANSCEIVER DESCRIPTION

1.2.1 GENERAL

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

The GSB-900R is composed of six major subassemblies, (1) front panel 1A1, (2) receiver/exciter 1A3, (3) synthesizer 1A4, (4) filter module 1A5, (5) power supply 1A6, (6) power amplifier 1A7. See Figure 1.1 for major assembly location.

The Remote Control Unit (GRC-955) contains the control head and audio circuits necessary for remote operation of the transceiver. It is connected to the front panel of the GSB-900R by two multiconductor cables.

1.2.2 FRONT PANEL – 1A1

The front panel contains the two connectors for interfacing with the remote control unit, two p-c boards for audio and antenna coupler interfacing and switching circuits for power input control.

1.2.3 RECEIVER/EXCITER – 1A3

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

1.2.4 SYNTHESIZER – 1A4

Frequency control is by means of a digital frequency synthesizer providing 100 Hz frequency steps. In addition, the operator can select a high stability VFO mode of operation, which provides continuous tuning between the 100 Hz synthesized increments. All frequencies in the transceiver are derived from a Temperature Compensated Crystal Oscillator (TCXO) which provides instant on-frequency operation with no warmup. The frequency stability is better than $\pm 1 \times 10^{-6}$ over the full specified ambient temperature range of the radio. The long term stability is $\pm 5 \times 10^{-7}$ per year; permitting long intervals between calibration.

For the most exacting applications, Sunair offers a proportional control oven frequency standard (part #5024-0137) 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.

1.2.5 FILTER MODULE–1A5

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

1.2.6 POWER SUPPLY –1A6

The GSB-900R 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 same transceiver can operate from both A.C. and D.C. power sources, with the D.C. Module installed, by changing the external power input cable and setting a toggle switch located on the inside of the front panel of the transceiver. The selection of 13 or 26 volt D.C. operation is easily accomplished by changing connections on a jumper strip in the power supply and setting a toggle switch on the d-c module. The power supply employs fully modularized construction for ease of maintenance.

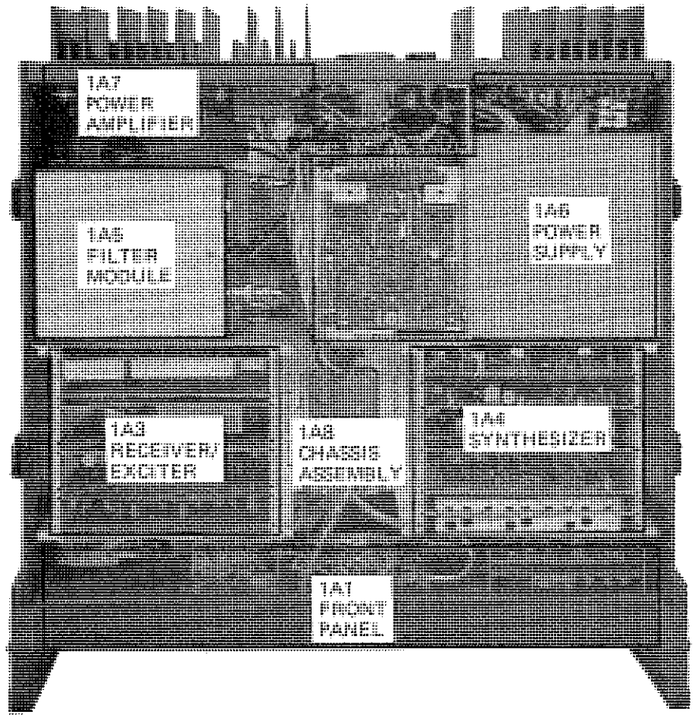
1.2.7 RF POWER AMPLIFIER – 1A7

The GSB-900R contains an all solid state broadband power amplifier which will match 50 ohm loads with voltage standing wave ratios (V.S.W.R.) under 2:1 over the entire frequency range of the radio with no additional operator tuning. Adequate cooling is 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 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.

1.2.8 REMOTE CONTROL UNIT GRC-955

The remote control unit contains the plug-in control head and audio circuits. The control head provides six frequency control switches, LED frequency readout, squelch and volume control, mode switching and a tune command switch to initiate the tune cycle of the GCU-935 automatic antenna coupler. The remote control unit also contains a meter to monitor receive signal strength and forward or reflected transmitter power, power on/off switch and audio input and output jacks.

A rack mount adaptor is available to allow the control unit to be mounted in a standard 19 inch equipment rack.



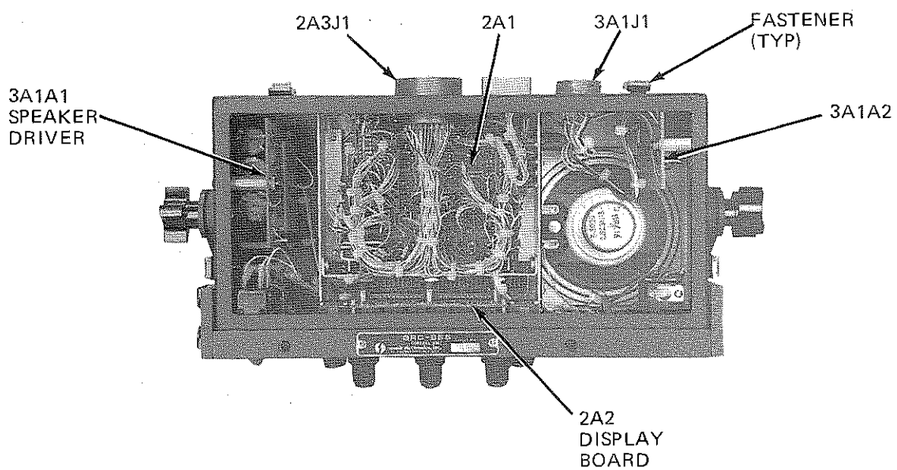


Figure 1.1 GSB-900R and Remote Control Major Assembly Locations

1.3 TECHNICAL SPECIFICATIONS

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

1.3.1 GENERAL

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

NUMBER of CHANNELS: 284,000, Synthesized.

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

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

OPERATING MODES: USB, LSB, AME, CW,

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

DUTY CYCLE: Continuous.

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

HUMIDITY: 100% at 50°C.

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

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

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

METER MONITORS: Relative power output, received signal strength.

REMOTE UNIT CONTROLS: Digital Frequency Control, Volume, Mode, On-Off, Squelch, Coupler Tune.

DIMENSIONS:

(Transceiver)	(CM) 15.2H x 46.6W x 45.7D
	(INCHES) 6H x 18.25W x 18D
(Control Head)	(CM) 9H x 27.5W x 17D
	(INCHES) 3.6H x 11W x 6.8D

WEIGHT: (Transceiver) 25.7 kgs (56 $\frac{1}{2}$ pounds)
(Control Head) 2.4 kgs (5 $\frac{1}{4}$ pounds)

POWER INPUT: AC: 115/230 volts ±15%, 50-60 Hz; at 400 watts max.
DC: (optional) 13/26 volts,±10%; at 480 watts max.

1.3.2 RECEIVER

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

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

SELECTIVITY: 2.6 kHz nominal (6db points), standard.

IF REJECTION: Not less than 70 db.

IMAGE REJECTION: Not less than 80 db.

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

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

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

1.3.3 TRANSMITTER

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

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

INTERMODULATION DISTORTION: 33db below PEP., typical.

CARRIER SUPPRESSION: 50 db.

UNDESIRED SIDEBAND SUPPRESSION: 50 db at 1.5 kHz.

HUM AND NOISE LEVEL: -50 db.

1.4 EQUIPMENT SUPPLIED

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

		Sunair Part No.
1.4.1	Transceiver, GSB-900R with 115/230 volt power supply.	
1.4.2	Control Unit, GRC-955	
1.4.3	Hand Held Microphone Assembly	5024-0006
1.4.4	Operating Manual	1001160002
1.4.5	Ancillary Kit, consisting of: Extender card (to service P.C. boards) Tuning tools, Lamps, Power Cord, Audio Connector	5024000498 (230 VAC) or 5024000455 (115 VAC)
1.4.6	Connector Kit 900R/955	1000530001
1.4.7	Temperature Compensated Crystal Oscillator (TCXO) Frequency Standard-mounts inside GSB-900.	5024-0127

1.5 EQUIPMENT REQUIRED – NOT SUPPLIED

1.5.1	Control Cable (57 conductor), transceiver to remote control unit (specify length)	8033008008
1.5.2	Control Cable (22 conductor), transceiver to remote control unit (specify length)	80330007505
1.5.3	Coaxial Cable, type RG58/U (for connecting GSB-900R to antenna, or for connecting GCU-935 to GSB-900R where length does not exceed 100 feet) specify length OR	58813
1.5.4	Coaxial Cable, type RG8/U (same as 1.5.3 above, but recommended where length exceeds 100 feet) specify length	58864

1.6 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 GSB-900R. Part numbers and descriptions are given to facilitate ordering.

1.6.1	Automatic Antenna Coupler, GCU-935 with connectors	
1.6.2	Control Cable for GCU-935 (specify length)	5024-9050
1.6.3	D.C. Inverter Module (Powers the GSB-900R from either 13 or 26 volt D.C. sources while still permitting operation from 115/230V A.C. mains). Module mounts inside GSB-900R.	5024-0213
1.6.4	Power Cord Assembly-D.C. (includes 10 feet of connecting cable). For use with item 1.6.3.	5024-0022
1.6.5	C.W. Key (includes 3 foot cable and connector).	5024-0009
1.6.6	Handset Assembly (with coiled cord and connector).	5024-0007
1.6.7	Headset (includes cable and connector).	84020
1.6.8	Desk Type Microphone with transistor amplifier (includes cable and connector).	5024-0008
1.6.9	Shock Mount Assembly (recommended for mobile applications).	5024-0025
1.6.10	Rack Mount Kit (adapts GSB-900R to mount in a standard 19 inch rack). Includes rack slides.	5024-0040
1.6.11	Doublet Antenna Kit	99624
1.6.12	75 foot Long Wire Antenna Kit	99920
1.6.13	150 foot Long Wire Kit	99921
1.6.14	16 foot Mobile Fiberglass Whip Antenna (use with para. 1.6.15, 1.6.16 or 1.6.17).	71295

1.6.15 Heavy Duty Strap-Type Bumper Mount for 1.6.14.	71573
1.6.16 Heavy Duty Feed Thru Mount (for 1.6.14).	5024-4020
1.6.17 Right Angle Vehicular mount for 1.6.14.	5024-4025
1.6.18 35 foot Fiberglass Base Station Whip Antenna.	71585
1.6.19 23 foot Fiberglass Marine Whip Anten -na with Flange Base.	71576
1.6.20 23 foot Fiberglass Marine Whip Antenna.	71298
1.6.21 Laydown Mount for above.	71299
1.6.22 Depot Spare Parts Kit for GSB-900R/ GRC-955 (to support 3 to 5 units in the field for 2 to 4 years).	80411090591
1.6.23 Depot Spare Parts Kit for GCU-935 Antenna Coupler.	6035-9000
1.6.24 Depot Spare Parts Kit for D.C. Inverter Module.	5024-9020
1.6.25 Blower Kit (mounts on rear panel).	5024-0060
1.6.26 Rack Mount Kit for mounting GRC-955 in 19" rack.	8041006051 (Grey) 8041006094 (Green)
1.6.27 Field Module Kit. P-C boards for GSB-900R/GRC-955.	8041090699

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 are 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 where there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage or any evidence of damage is noted, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier.

If concealed damage is discovered after a shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to Sunair. Include the following:

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

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

2.3 RESHIPPING

The shipping carton for the GSB-900R has been carefully designed to protect the transceiver 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, you must ship AIR PARCEL POST consigned to:

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

Plainly mark with indelible ink all mailing documents as follows:

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

and be sure to mark on all sides of the package

"FRAGILE - ELECTRONIC EQUIPMENT"

NOTE

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

2.4 GENERAL INSTALLATION AND MOUNTING INFORMATION

General installation procedures and mounting requirements are given for the GSB-900R transceiver. Satisfactory operation of this equipment will depend upon the care and throughness taken during installation. Figure 2.5 gives applicable cabling information.

2.4.1 GENERAL INSTALLATION

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

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

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

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

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

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

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

h. Linear amplifiers with low level modulation such as used in the GSB-900R 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 transceiver is equipped with rubber feet so that it can be set directly on a table, desk or similar flat surface. The front feet are longer than the rear feet in order to tilt the transceiver at a convenient operating angle. Minimum clearances of 1 inch at the sides and 2 inches at the rear and top should be allowed to provide for adequate cooling of the rear panel heat sinks. If extended periods of RTTY transmission are anticipated, forced air cooling of the heat sinks is recommended. Figure 2.1 shows the applicable GSB-900R outline dimensions for use in this installation. Figure 2.2 shows the outline dimensions for the Remote Control Unit, GRC-955. Refer to section 2.5 for recommendations of suitable antennas. See section 2.4.5 for rack mounted installations.

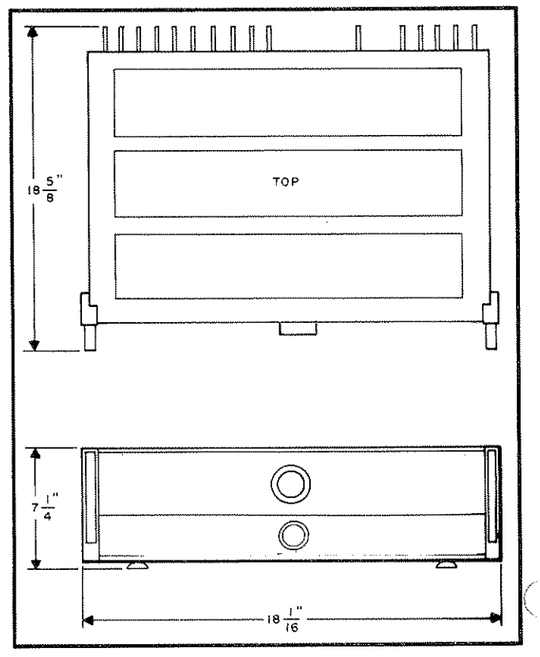


Figure 2.1 GSB-900R Outline Dimensions

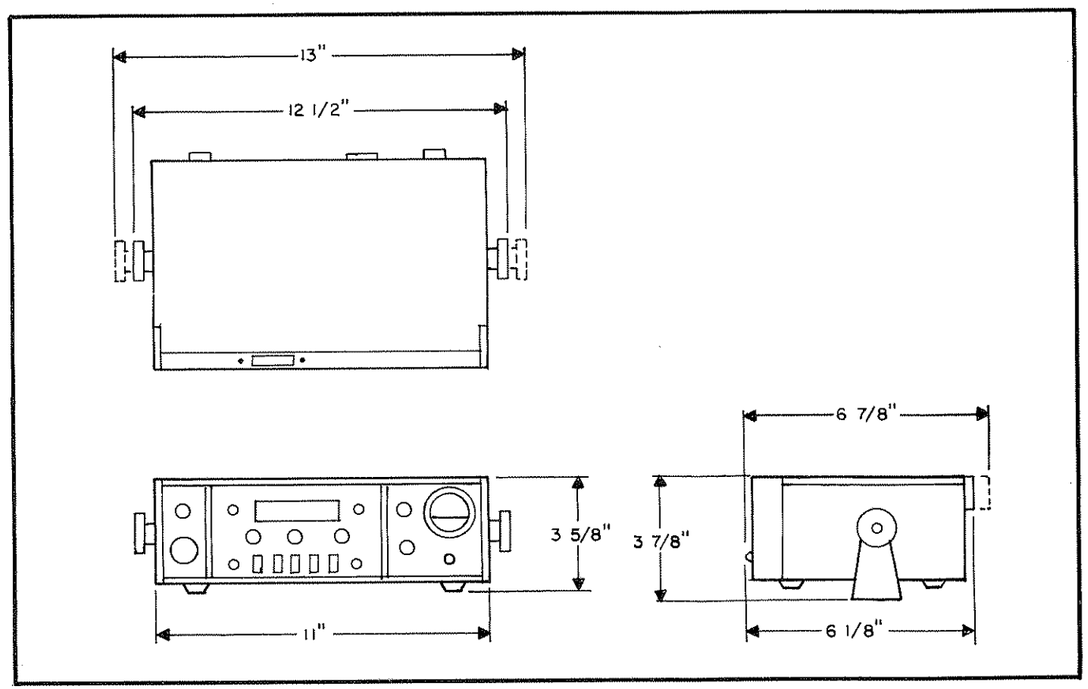


Figure 2.2 GRC-955 Remote Control Unit Outline Dimensions

2.4.3 VEHICULAR INSTALLATIONS

The GSB-900R Shock Mount Assembly (Sunair Part No. 5024-0025) is designed to mount the Transceiver in vehicular installations. Figure 2.3* gives the applicable outline dimensions for the GSB-900R coupled with the shock mount. Figure 2.4 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 2.3). It is also important to ground the antenna coupler to the frame of the vehicle by the shortest possible path.

2.4.4 MARINE INSTALLATIONS

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

2.4.5 RACK MOUNTED INSTALLATIONS

The GSB-900R may be conveniently mounted in a standard 19 inch rack using the Rack Mount Kit (5024-0040). The kit includes a pair of rack slides, associated hardware and filler panel. The GSB-900R, in the rack mounted configuration, requires a standard panel space seven inches high. Refer to figure 2.6 for assembly details.

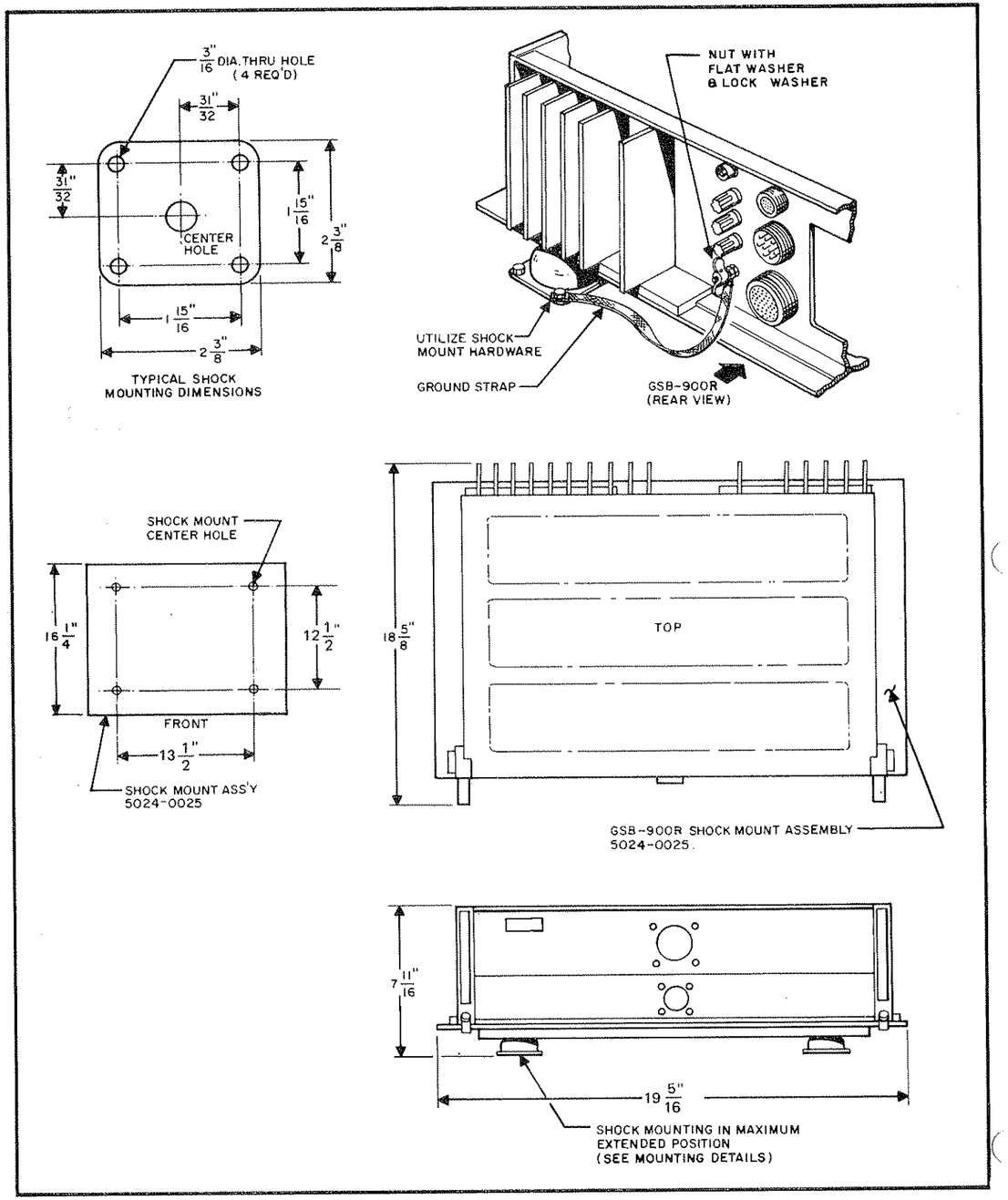


Figure 2.3 Shock Mount Assembly and Details

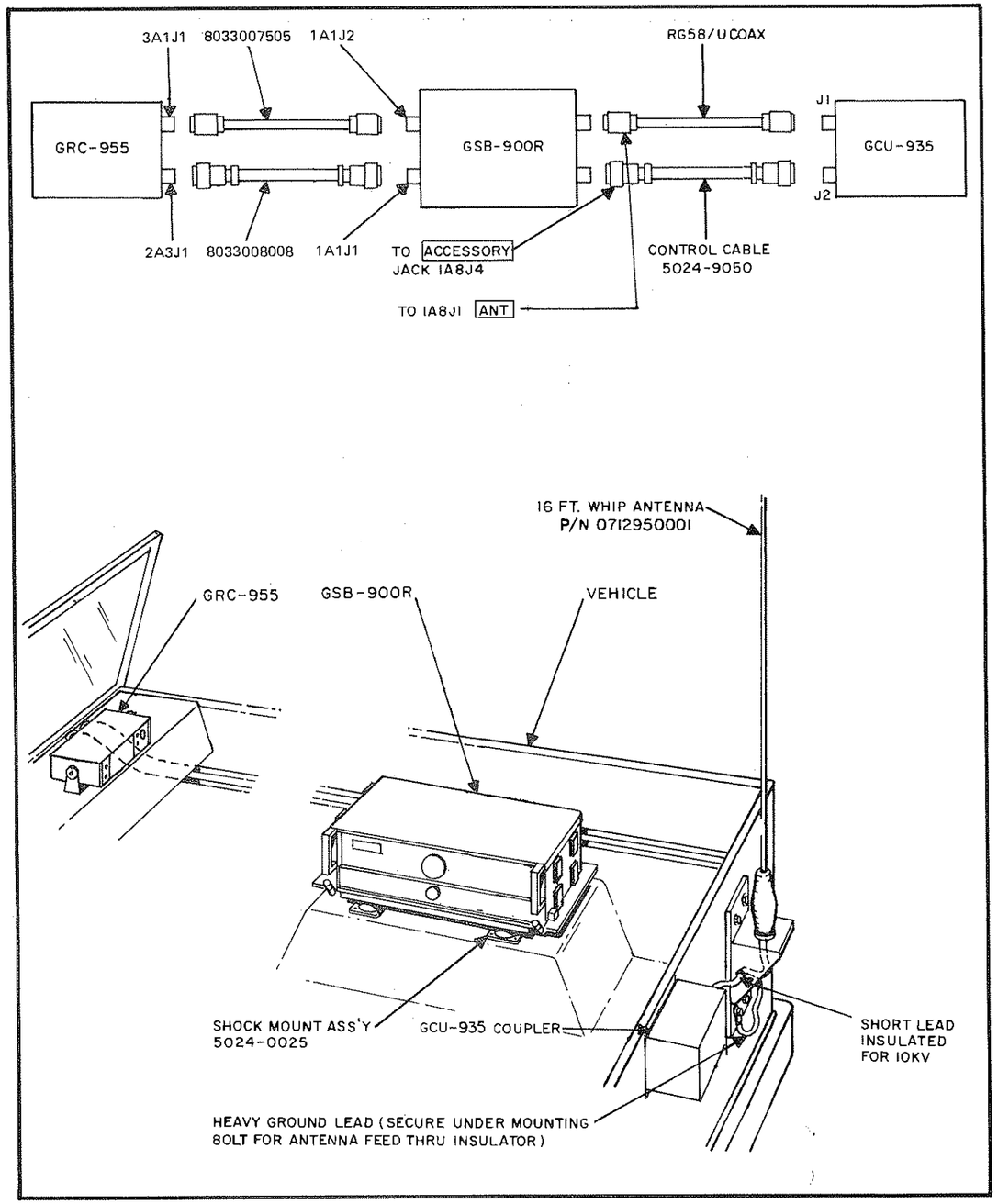


Figure 2.4 Typical Vehicular Installation

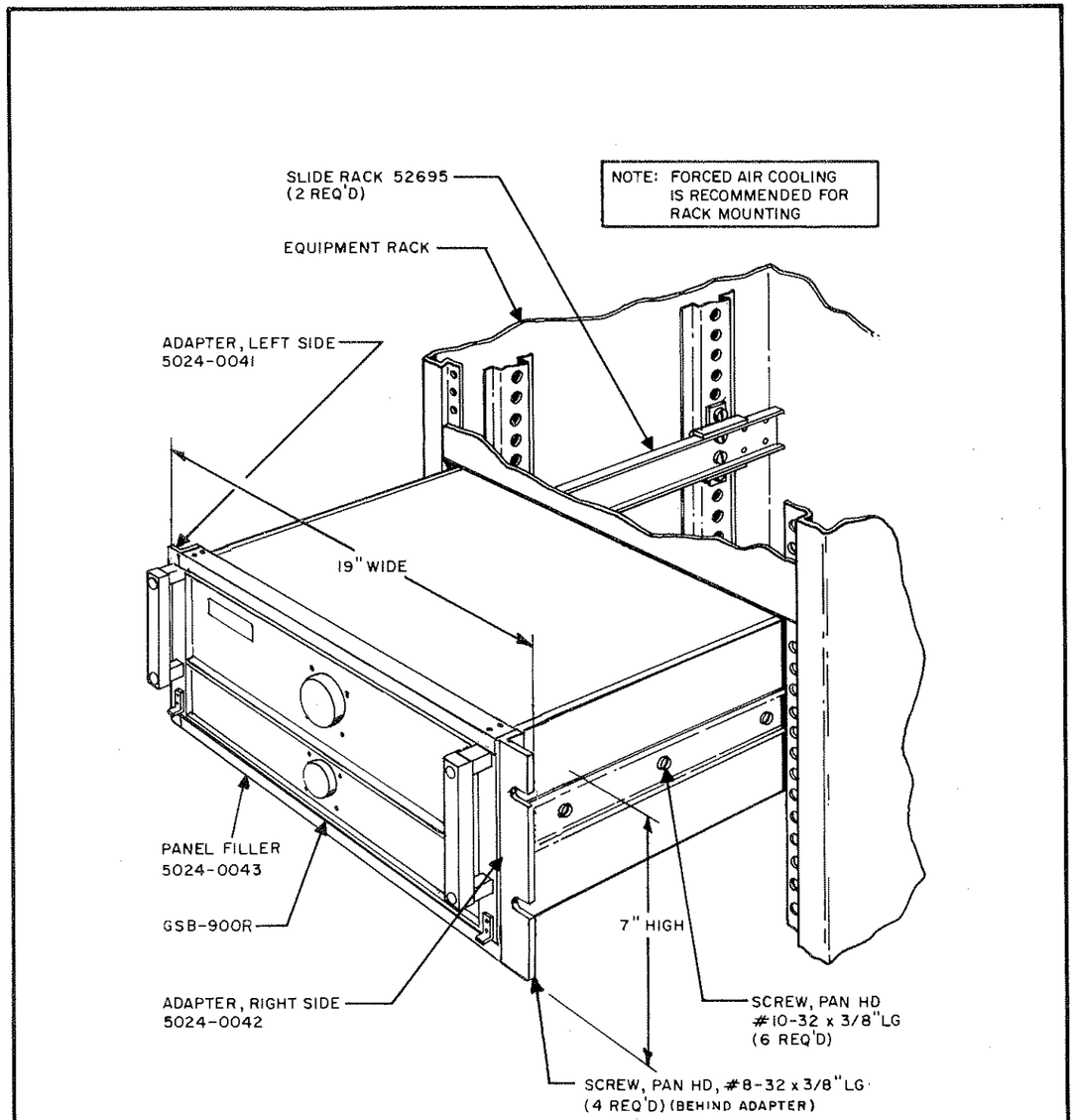
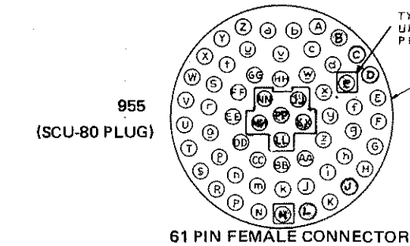
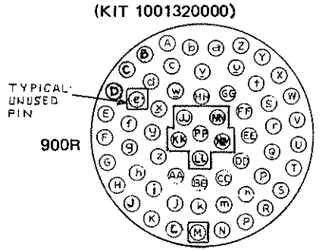


Figure 2.5 Rack Mounted Installation

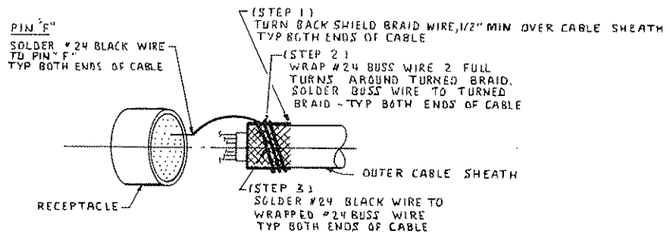


61 PIN FEMALE CONNECTOR
75451
(KIT 1001320000)

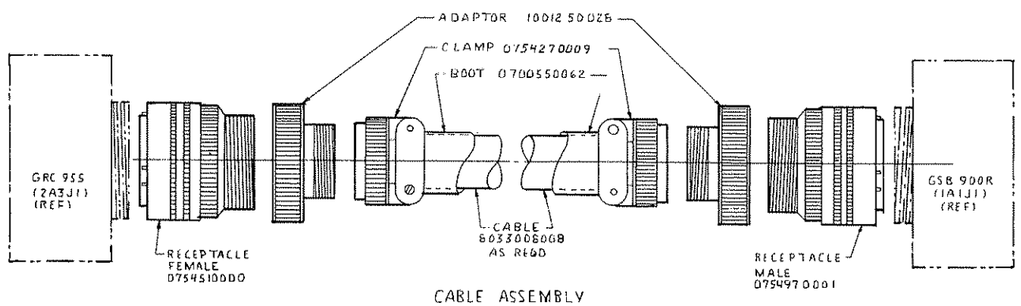


61 PIN MALE CONNECTOR
75497
(KIT 1001320042)

NOTES:
1. ALL WIRES SHOWN ARE PART OF CONDUCTOR 57 CABLE B033008008.
2. THERE WILL BE (4) UNUSED COAX AND (18) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE



PIN "F" GROUNDING PROCEDURE



CABLE ASSEMBLY

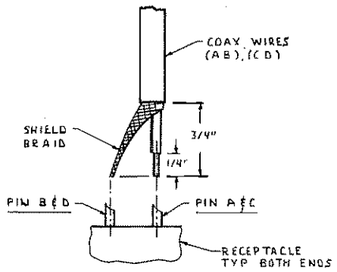
TRANSCEIVER (Mates with 1A1J1) 61 PIN MALE PLUG		REMOTE UNIT (Mates with 2A3J1) 61 PIN FEMALE PLUG
LOW LIMIT	A	A LOW LIMIT
SPARE	B	B SPARE
LAMP VOLTAGE	C	C LAMP VOLTAGE
SPARE	D	D SPARE
GROUND	E	E GROUND
SHIELD	F	F SHIELD
+12VDC (STEERING)	G	G +12VDC (STEERING)
GROUND (STEERING)	H	H GROUND (STEERING)
SPARE	J	J SPARE
SQUELCH	K	K SQUELCH
SPARE	L	L SPARE
	M	M
+12LSB	N	N +12LSB
+12AM	P	P +12AM
+12USB	R	R +12USB
+12VDC	S	S +12VDC
TUNE COMMAND	T	T TUNE COMMAND
VOLUME CONTROL	U	U VOLUME CONTROL
10 MHz "0"	V	V 10 MHz "0"
10 MHz "1"	W	W 10 MHz "1"
10 MHz "2"	X	X 10 MHz "2"
1 MHz 2^3	Y	Y 1 MHz 2^3
1 MHz 2^2	Z	Z 1 MHz 2^2
1 MHz 2^1	a	a 1 MHz 2^1
1 MHz 2^0	b	b 1 MHz 2^0
BAND 0 (1.6.2 MHz)	c	c BAND 0 (1.6.2 MHz)
VCO STEERING	d	d VCO STEERING
	e	e
1 KHz 2^0	f	f 1 KHz 2^0
1 KHz 2^1	g	g 1 KHz 2^1
FAULT	h	h FAULT
READY	l	l READY
100 Hz 2^0	j	j 100 Hz 2^0
TUNING	k	k TUNING
100 Hz 2^2	m	m 100 Hz 2^2
100 Hz 2^3	n	n 100 Hz 2^3
LOW DIGIT STEERING	p	p LOW DIGIT STEERING
BAND 1 (2-3 MHz)	q	q BAND 1 (2-3 MHz)
BAND 2 (3-4 MHz)	r	r BAND 2 (3-4 MHz)
BAND 3 (4-6 MHz)	s	s BAND 3 (4-6 MHz)
BAND 4 (6-9 MHz)	t	t BAND 4 (6-9 MHz)
BAND 5 (9-13 MHz)	u	u BAND 5 (9-13 MHz)
100 kHz 2^0	v	v 100 kHz 2^0
10 kHz 2^0	w	w 10 kHz 2^0
1 kHz 2^2	x	x 1 kHz 2^2
1 kHz 2^3	y	y 1 kHz 2^3
100 Hz 2^1	z	z 100 Hz 2^1
10 kHz 2^3	AA	AA 10 kHz 2^3
100 kHz 2^3	BB	BB 100 kHz 2^3
BAND 6 (13-20 MHz)	CC	CC BAND 6 (13-20 MHz)
BAND 7 (20-30 MHz)	DD	DD Band 7 (20-30 MHz)
100 kHz 2^1	EE	EE 100 kHz 2^1
10 kHz 2^1	FF	FF 10 kHz 2^1
10 kHz 2^2	GG	GG 10 kHz 2^2
100 kHz 2^2	HH	HH 100 kHz 2^2
	JJ	JJ
	KK	KK
	LL	LL
	MM	MM
	NN	NN
	PP	PP

NOTE

USE THIS DIAGRAM FOR CABLE ASSEMBLY IN PLACE OF FIGURE 2.6 A PAGE 2-7.

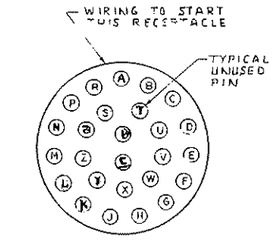
ALL WIRES SHOWN ARE PART OF 57 CONDUCTOR CABLE 8033-0080. ALL 53 WIRES WILL BE CONNECTED, THE 4 "COAX" WILL BE CUT OFF.

Figure 2.6A Interconnecting Cable Diagram and Ass'y (57 Wire)

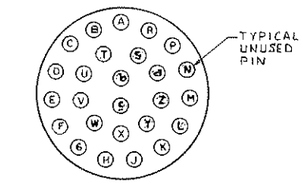


CABLE CONNECTION PROCEDURE

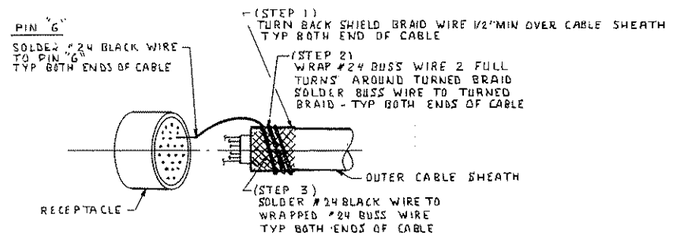
DETAIL I



WIRING FEMALE RECEPTACLE
P/N 0754470008

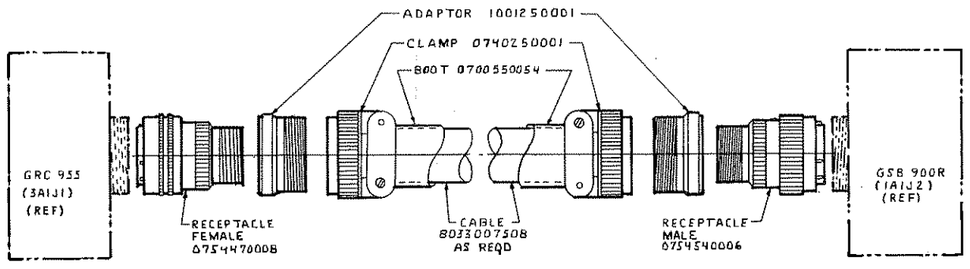


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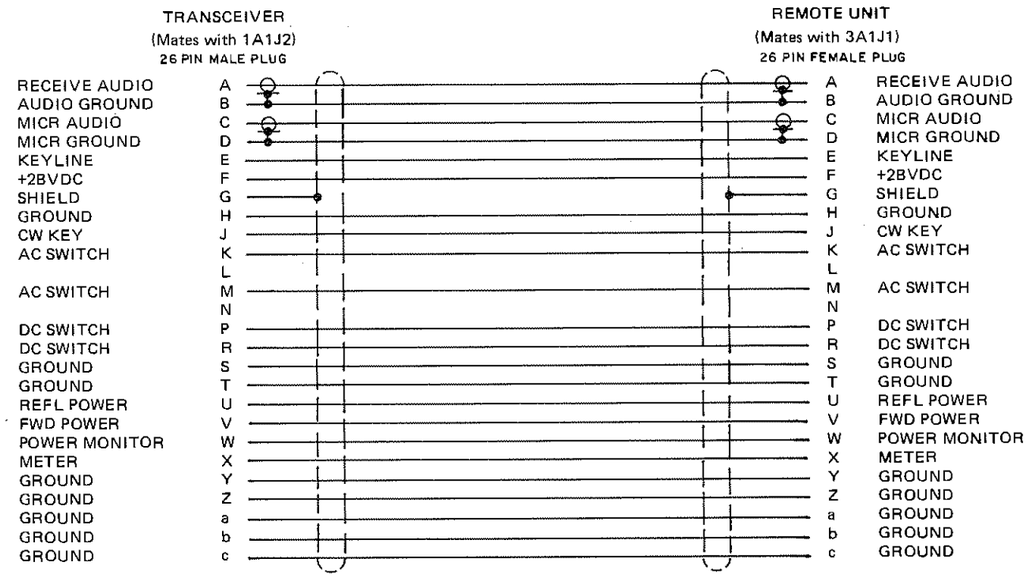


PIN "G" GROUNDING PROCEDURE

DETAIL II

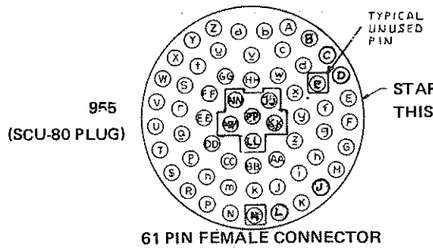


CABLE ASSEMBLY

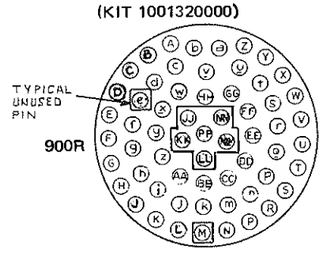


NOTES:
1. ALL WIRES SHOWN ARE PART OF A 22 CONDUCTOR CABLE P/N 8033007508
2. THERE WILL BE (2) UNUSED COAX AND (6) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE.

Figure 2.6B Interconnecting Cable Diagram and Ass'y (22 Wire)



61 PIN FEMALE CONNECTOR
75451
(KIT 1001320000)

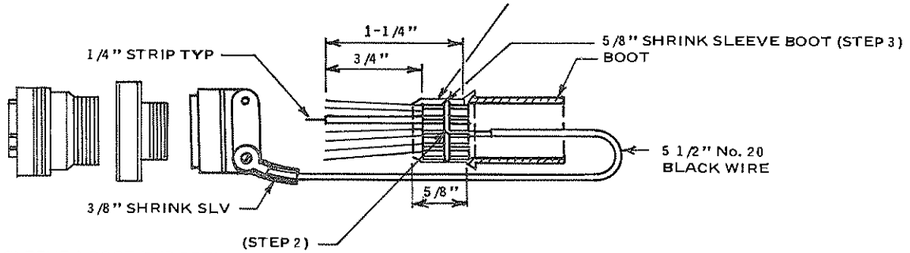


61 PIN MALE CONNECTOR
75497
(KIT 1001320042)

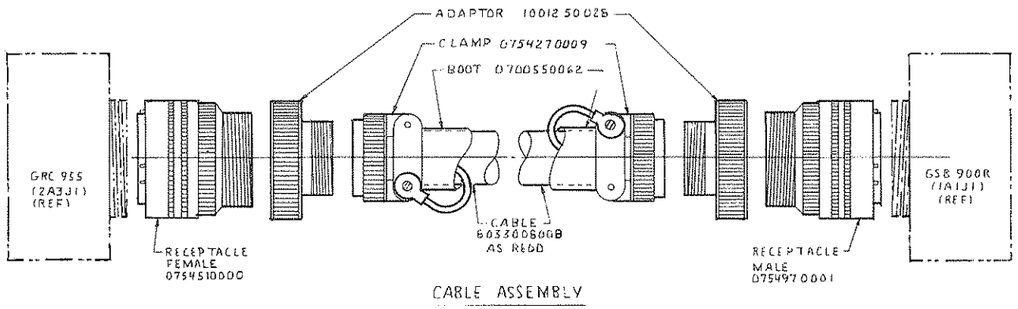
NOTES:
1. ALL WIRES SHOWN ARE PART OF CONDUCTOR 57 CABLE 8033008008.
2 THERE WILL BE (4) UNUSED COAX AND (10) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE

(STEP 2)
WRAP NO. 20 WIRE AROUND TURNED BRAID SOLDER WIRE TO BRAID TYP BOTH ENDS OF CABLE

(STEP 1)
TURN BACK SHIELD BRAID 1/2" OVER CABLE SHEATH TYP BOTH ENDS OF CABLE



(STEP 3)
INSTALL SHRINK SLEEVE & BOOT TYP BOTH ENDS OF CABLE



CABLE ASSEMBLY

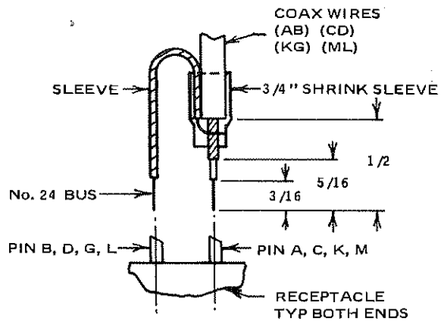
TRANSCEIVER (Mates with 1A1J1) 61 PIN MALE PLUG		REMOTE UNIT (Mates with 2A3J1) 61 PIN FEMALE PLUG
LOW LIMIT	A	A LOW LIMIT
SPARE	B	B SPARE
LAMP VOLTAGE	C	C LAMP VOLTAGE
SPARE	D	D SPARE
GROUND	E	E GROUND
GROUND	F	F GROUND
+12VDC (STEERING)	G	G +12VDC (STEERING)
GROUND (STEERING)	H	H GROUND (STEERING)
SPARE	J	J SPARE
SQUELCH	K	K SQUELCH
SPARE	L	L SPARE
	M	M
+12LSB	N	N +12LSB
+12AM	P	P +12AM
+12USB	R	R +12USB
+12VDC	S	S +12VDC
TUNE COMMAND	T	T TUNE COMMAND
VOLUME CONTROL	U	U VOLUME CONTROL
10 MHz "0"	V	V 10 MHz "0"
10 MHz "1"	W	W 10 MHz "1"
10 MHz "2"	X	X 10 MHz "2"
1 MHz 2^3	Y	Y 1 MHz 2^3
1 MHz 2^2	Z	Z 1 MHz 2^2
1 MHz 2^1	a	a 1 MHz 2^1
1 MHz 2^0	b	b 1 MHz 2^0
BAND 0 (1.6.2 MHz)	c	c BAND 0 (1.6.2 MHz)
VCO STEERING	d	d VCO STEERING
	e	e
1 KHz 2^0	f	f 1 KHz 2^0
1 KHz 2^1	g	g 1 KHz 2^1
FAULT	h	h FAULT
READY	l	l READY
100 Hz 2^0	j	j 100 Hz 2^0
TUNING	k	k TUNING
100 Hz 2^2	m	m 100 Hz 2^2
100 Hz 2^3	n	n 100 Hz 2^3
LOW DIGIT STEERING	p	p LOW DIGIT STEERING
BAND 1 (2-3 MHz)	q	q BAND 1 (2-3 MHz)
BAND 2 (3-4 MHz)	r	r BAND 2 (3-4 MHz)
BAND 3 (4-6 MHz)	s	s BAND 3 (4-6 MHz)
BAND 4 (6-9 MHz)	t	t BAND 4 (6-9 MHz)
BAND 5 (9-13 MHz)	u	u BAND 5 (9-13 MHz)
100 kHz 2^0	v	v 100 kHz 2^0
10 kHz 2^0	w	w 10 kHz 2^0
1 kHz 2^2	x	x 1 kHz 2^2
1 kHz 2^3	y	y 1 kHz 2^3
100 Hz 2^1	z	z 100 Hz 2^1
10 kHz 2^3	AA	AA 10 kHz 2^3
100 kHz 2^3	BB	BB 100 kHz 2^3
BAND 6 (13-20 MHz)	CC	CC BAND 6 (13-20 MHz)
BAND 7 (20-30 MHz)	DD	DD Band 7 (20-30 MHz)
100 kHz 2^1	EE	EE 100 kHz 2^1
10 kHz 2^1	FF	FF 10 kHz 2^1
10 kHz 2^2	GG	GG 10 kHz 2^2
100 kHz 2^2	HH	HH 100 kHz 2^2
	JJ	JJ
	KK	KK
	LL	LL
	MM	MM
	NN	NN
	PP	PP

NOTE

USE THIS DIAGRAM FOR CABLE ASSEMBLY IN PLACE OF FIGURE 2.6A PAGE 2-7.

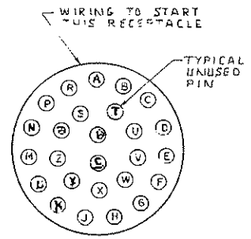
ALL WIRES SHOWN ARE PART OF 57 CONDUCTOR CABLE 8033-0080. ALL 53 WIRES WILL BE CONNECTED, THE 4 "CDAX" WILL BE CUT OFF.

Figure 2.6A Interconnecting Cable Diagram and Ass'y (57 Wire)

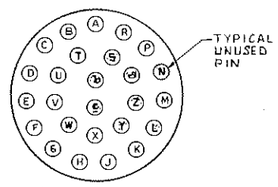


CABLE CONNECTION PROCEDURE

DETAIL I



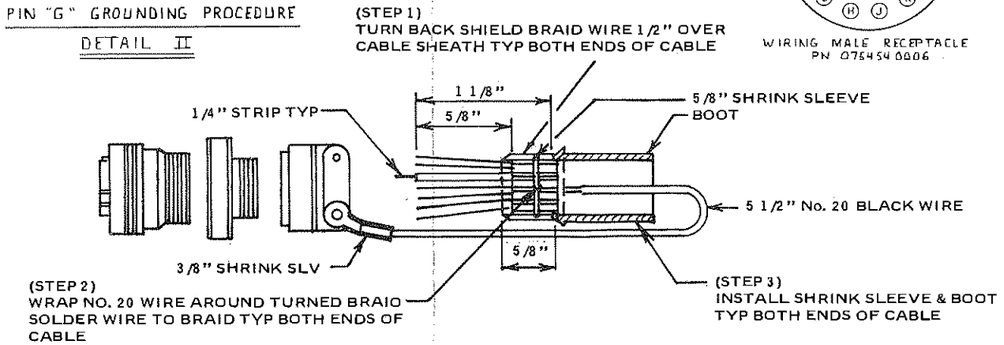
WIRING FEMALE RECEPTACLE
P/N 0754470008

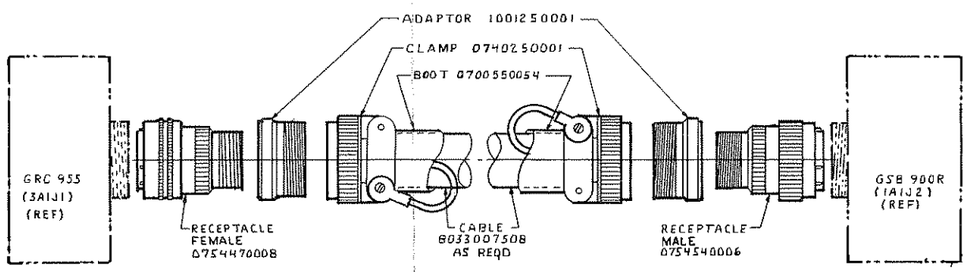


WIRING MALE RECEPTACLE
P/N 0754540006

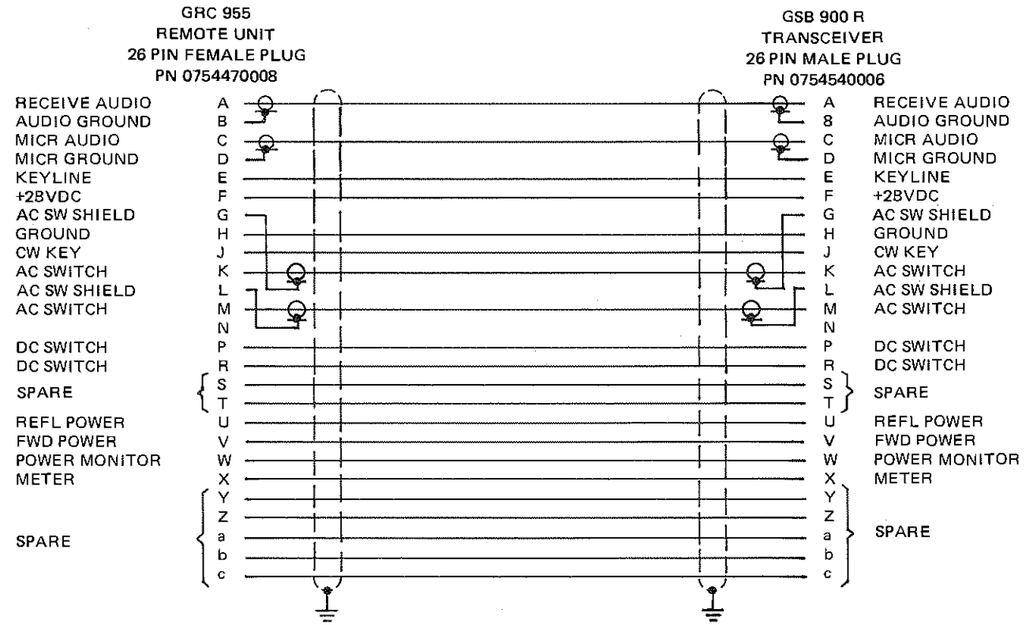
PIN "G" GROUNDING PROCEDURE

DETAIL II



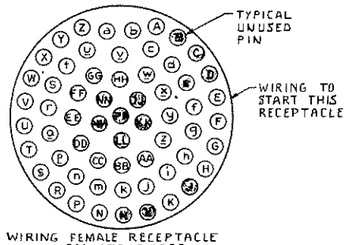


CABLE ASSEMBLY

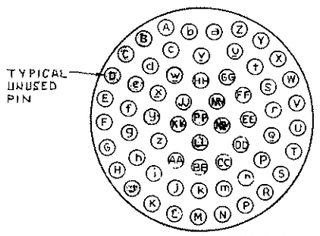


NOTES:
1. ALL WIRES SHOWN ARE PART OF A 22 CONDUCTOR CABLE PN 8033007508
2. THERE WILL BE (2) UNUSED COAX AND (6) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE.

Figure 2.6B Interconnecting Cable Diagram and Ass'y (22 Wire)
Change Date 19 Feb 1981

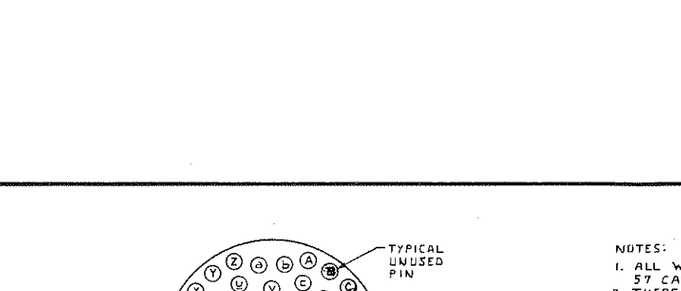


WIRING FEMALE RECEPTACLE
PN 0754510000

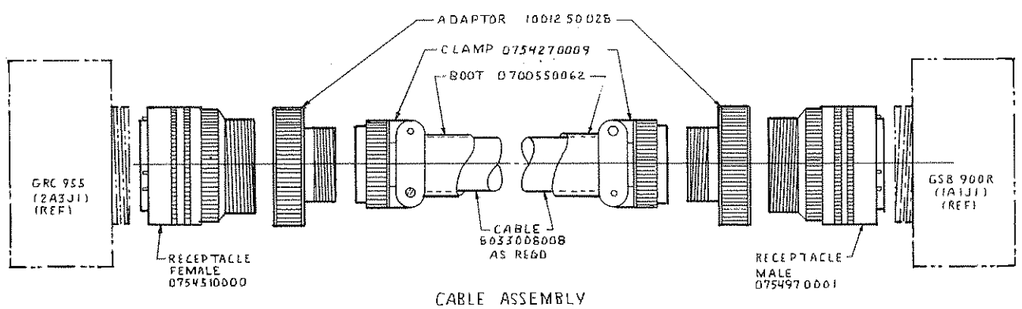


WIRING MALE RECEPTACLE
PN 0754970001

NOTES:
1. ALL WIRES SHOWN ARE PART OF CONDUCTOR 57 CABLE 8033008008.
2. THERE WILL BE (4) UNUSED COAX AND (10) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE



PIN "F" GROUNDING PROCEDURE

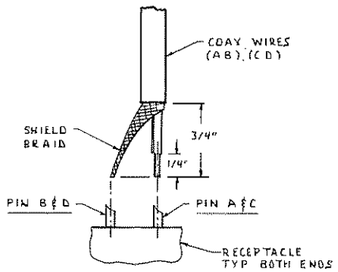


CABLE ASSEMBLY

TRANSCEIVER (Mates with 1A1J1) 61 PIN MALE PLUG		REMOTE UNIT (Mates with 2A3J1) 61 PIN FEMALE PLUG	
LOW LIMIT	A	A	LOW LIMIT
	B	B	
	C	C	
	D	D	
GROUND	E	E	GROUND
SHIELD	F	F	SHIELD
+12VDC (STEERING)	G	G	+12VDC (STEERING)
GROUND (STEERING)	H	H	GROUND (STEERING)
	J	J	
SQUELCH	K	K	SQUELCH
	L	L	
	M	M	
+12LSB	N	N	+12LSB
+12AM	P	P	+12AM
+12USB	R	R	+12USB
+12VDC	S	S	+12VDC
TUNE COMMAND	T	T	TUNE COMMAND
VOLUME CONTROL	U	U	VOLUME CONTROL
10 MHz "0"	V	V	10 MHz "0"
10 MHz "1"	W	W	10 MHz "1"
10 MHz "2"	X	X	10 MHz "2"
1 MHz 2^3	Y	Y	1 MHz 2^3
1 MHz 2^2	Z	Z	1 MHz 2^2
1 MHz 2^1	a	a	1 MHz 2^1
1 MHz 2^0	b	b	1 MHz 2^0
BAND 0 (1.6.2 MHz)	c	c	BAND 0 (1.6.2 MHz)
VCO STEERING	d	d	VCO STEERING
	e	e	
1 KHz 2^0	f	f	1 KHz 2^0
1 KHz 2^1	g	g	1 KHz 2^1
FAULT	h	h	FAULT
READY	l	l	READY
100 Hz 2^0	j	j	100 Hz 2^0
TUNING	k	k	TUNING
100 Hz 2^2	m	m	100 Hz 2^2
100 Hz 2^3	n	n	100 Hz 2^3
LOW DIGIT STEERING	p	p	LOW DIGIT STEERING
BAND 1 (2-3 MHz)	q	q	BAND 1 (2-3 MHz)
BAND 2 (3-4 MHz)	r	r	BAND 2 (3-4 MHz)
BAND 3 (4-6 MHz)	s	s	BAND 3 (4-6 MHz)
BAND 4 (6-9 MHz)	t	t	BAND 4 (6-9 MHz)
BAND 5 (9-13 MHz)	u	u	BAND 5 (9-13 MHz)
100 kHz 2^0	v	v	100 kHz 2^0
10 kHz 2^0	w	w	10 kHz 2^0
1 kHz 2^2	x	x	1 kHz 2^2
1 kHz 2^3	y	y	1 kHz 2^3
100 Hz 2^1	z	z	100 Hz 2^1
10 kHz 2^3	AA	AA	10 kHz 2^3
100 kHz 2^3	BB	BB	100 kHz 2^3
BAND 6 (13-20 MHz)	CC	CC	BAND 6 (13-20 MHz)
BAND 7 (20-30 MHz)	DD	DD	Band 7 (20-30 MHz)
100 kHz 2^1	EE	EE	100 kHz 2^1
10 kHz 2^1	FF	FF	10 kHz 2^1
10 kHz 2^2	GG	GG	10 kHz 2^2
100 kHz 2^2	HH	HH	100 kHz 2^2
	JJ	JJ	
	KK	KK	
	LL	LL	
	MM	MM	
	NN	NN	
	PP	PP	

Figure 2.6A Interconnecting Cable Diagram and Ass'y (57 Wire)

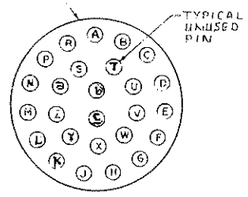
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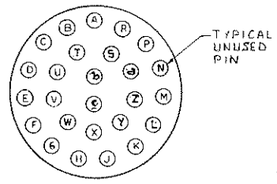
CABLE CONNECTION PROCEDURE

DETAIL I

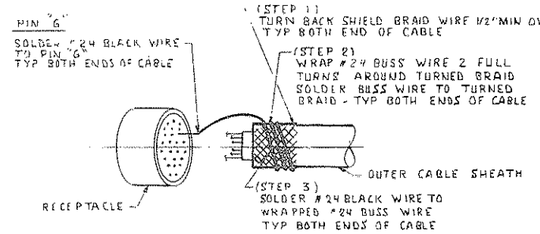
WIRING TO START THIS RECEPTACLE



WIRING FEMALE RECEPTACLE
P/N 0754470008

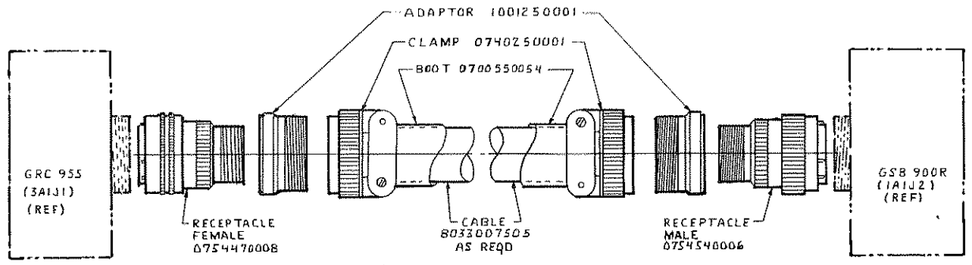


WIRING MALE RECEPTACLE
P/N 0754540006

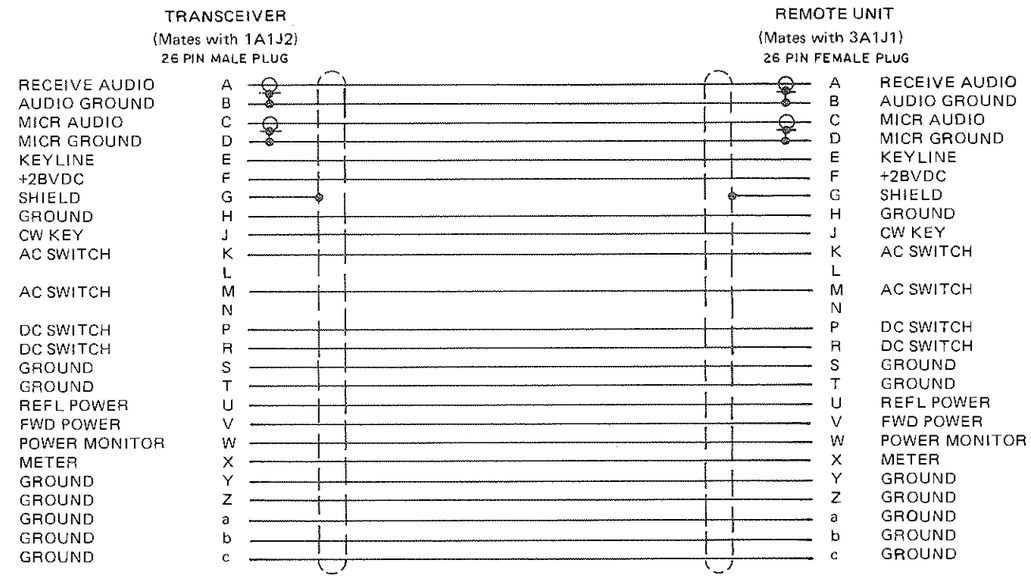


PIN "G" GROUNDING PROCEDURE

DETAIL II



CABLE ASSEMBLY



NOTES:
1. ALL WIRES SHOWN ARE PART OF A 22 CONDUCTOR CABLE P/N 8033007508
2. THERE WILL BE (2) UNUSED COAX AND (6) UNUSED WIRES.
3. UNUSED WIRES SHALL BE CUT SHORT TO PREVENT INTERFERENCE.

Figure 2.6B Interconnecting Cable Diagram and Ass'y (22 Wire)

2.5 ANTENNAS AND GROUND SYSTEMS

2.5.1 GENERAL

The GSB-900R 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-935, Automatic Antenna Coupler, the system will match antennas ranging from 15 foot whips to 150 foot long wires. The coupler will also efficiently match 9 foot whip antennas at frequencies above 4 MHz. The GCU-935 is unique in that it can be placed close to the antenna and controlled from the GRC-955 Control Unit. This optimizes both operator convenience and electrical performance.

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. Best performance will be obtained when the antenna is mounted as high as possible. The antenna should be clear of all large objects such as trees and buildings.

b. Although the GCU-935 coupler will match electrically short antennas (i.e. those under 1/8 wavelength), such antennas are not efficient radiators. If the installation permits, antennas over 1/8 wavelength long at the lowest operating frequency should be used. Antenna length generally limits system performance in vehicular applications at frequencies below 10 MHz as the size would be prohibitive.

c. When using whip antennas, the ground system actually forms part of the radiating system. Where space permits (such as in a base station installation) a good ground plane or radial system should be installed at the base of the antenna. (See Figure 2.7)

NOTE

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

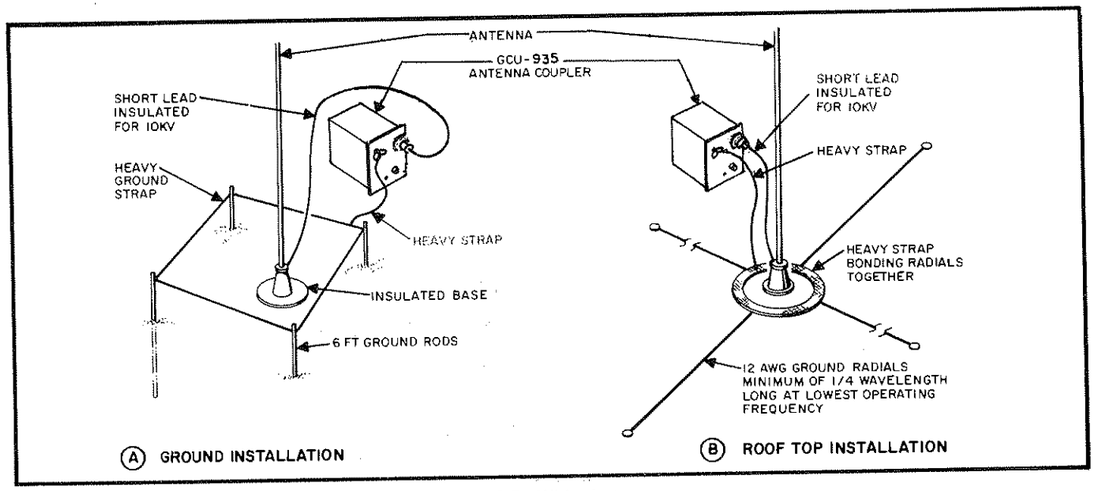


Figure 2.7 Whip Antenna

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

2.5.2 NARROW BAND 50 OHM ANTENNAS

Typical of this type of antenna are the doublet and the inverted V illustrated in Figures 2.8 and 2.9 respectively. Both types of antennas may be assembled from the Sunair Doublet Antenna Kit (part # 99624). Their operation is efficient for only a narrow band of frequencies within approximately 2 1/2% of their center frequency. The GCU-935 antenna coupler is NOT generally required if the above frequency span is not exceeded. Separate antennas must be erected for each small band of frequencies to be used. Both antennas exhibit somewhat directional characteristics. The direction of maximum radiation is perpendicular to the antenna wire. The inverted V antenna is particularly suitable for communication with nearby mobile stations (with vertical antennas) since a portion of the radiation is in a vertical direction.

2.5.3 RANDOM LENGTH NON RESONANT ANTENNAS

Whips and long wires are popular non resonant antennas. The whip antenna (illustrated in Figure 2.7) is often used in mobile, marine, portable or semi portable installations because it is rugged and self supporting. The antenna impedance is strongly dependent on the operating frequency and an antenna coupler, therefore, must be used to match the antenna to the transceiver. Best radiation efficiency will be obtained if the antenna is at least 1/8 wavelength long at the lowest operating frequency; however, this requirement does not result in a practical size antenna for low frequency operation. Thirty-five foot whip antennas offer a good compromise between practical height and good electrical performance at low frequencies. The GCU-935 Antenna Coupler is designed to efficiently match whip antennas of 15 foot length or greater. An efficient match may also be obtained for a 9 foot whip above 4 MHz. The whip's performance is greatly influenced by its ground system. For temporary base station installations, a minimum of four six foot long ground rods should be driven into the ground symmetrically placed around the antenna base. The rods should be bonded together with heavy strap and then connected to the antenna coupler ground by another short heavy strap. If the antenna is mounted on the roof of a building, where a short ground lead to the coupler cannot be obtained, a minimum of 4 symmetrically placed

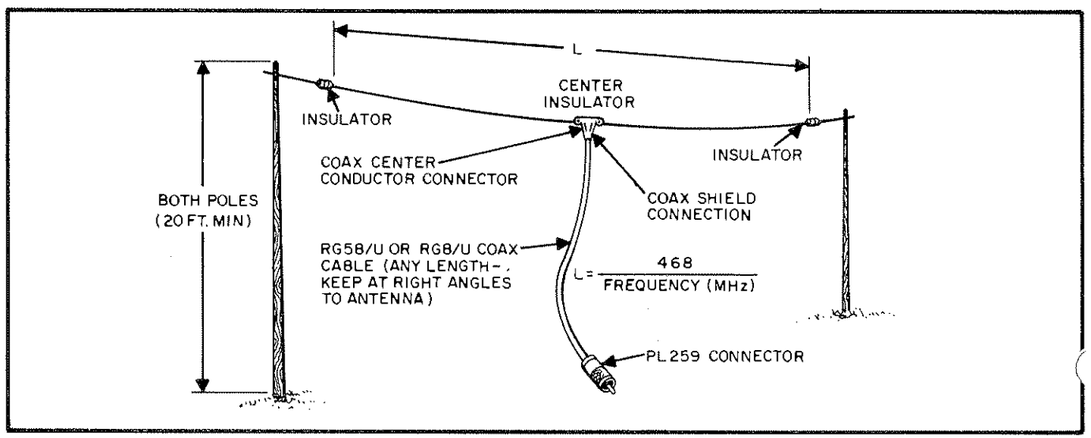


Figure 2.8 Doublet Antenna

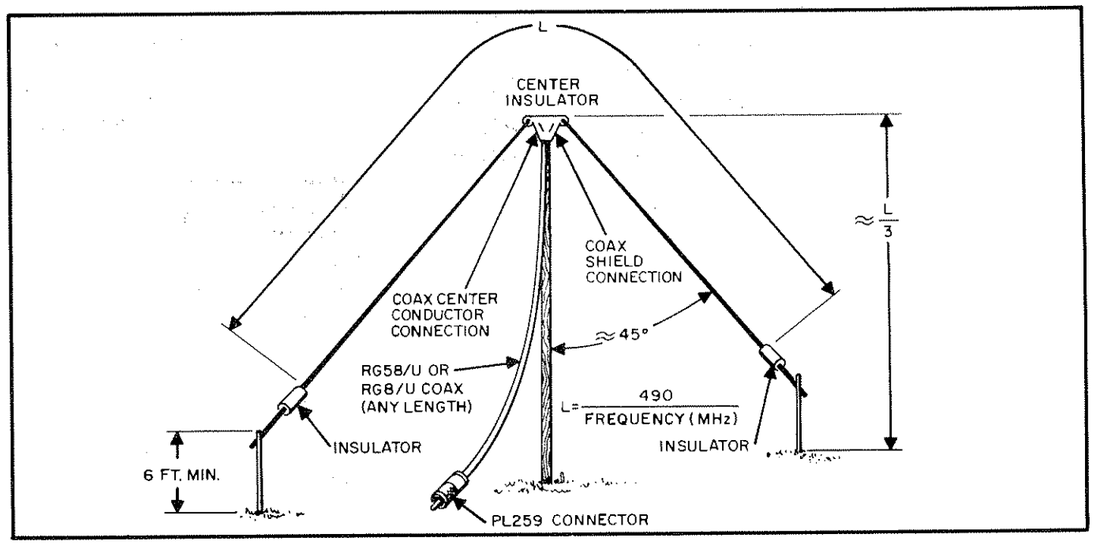


Figure 2.9 Inverted 'V' Antenna

ground radials should be installed at the base of the antenna, bonded together, and connected to the antenna coupler ground post. The radials should be made of number 12 gauge wire or larger and should be at least 1/4 wave long at the lowest operating frequency. The whip's radiation pattern is omni-directional.

The long wire antenna, illustrated in Figure 2.10, is a popular base station antenna where a wide range of operating frequencies are used. The antenna impedance varies greatly with frequency and, therefore, must be matched to the transceiver with an antenna coupler. The GCU-935 antenna coupler 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 99920 and 99921 respectively) exhibit excellent low frequency radiation efficiency.

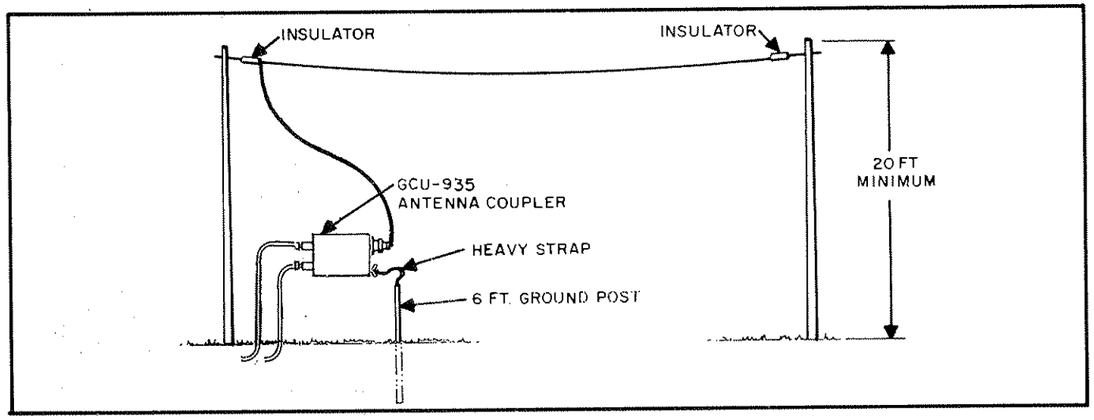


Figure 2.10 Long Wire Antenna

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 horizontal antenna with highly 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 GSB-900R is wired for continuous operation from 115 or 230 volt ±15%, 50-60 Hz, single phase A.C. power mains. Selection of D.C. or A.C. operation is accomplished by using the appropriate Power Cord Assembly and switching the toggle switch behind the transceiver front panel to the appropriate position.

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 Figure 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 Figure 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. Check the position of the toggle switch located behind the GSB-900R front panel. It must be in the A-C position when operating the radio from A-C mains.

2.6.2 A.C. OPERATION UNDER HIGH LINE VOLTAGE CONDITIONS

The GSB-900R power supply contains a special provision to allow continuous operation at line voltages of 132 or 265 volts. 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 GSB-900R 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	196 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

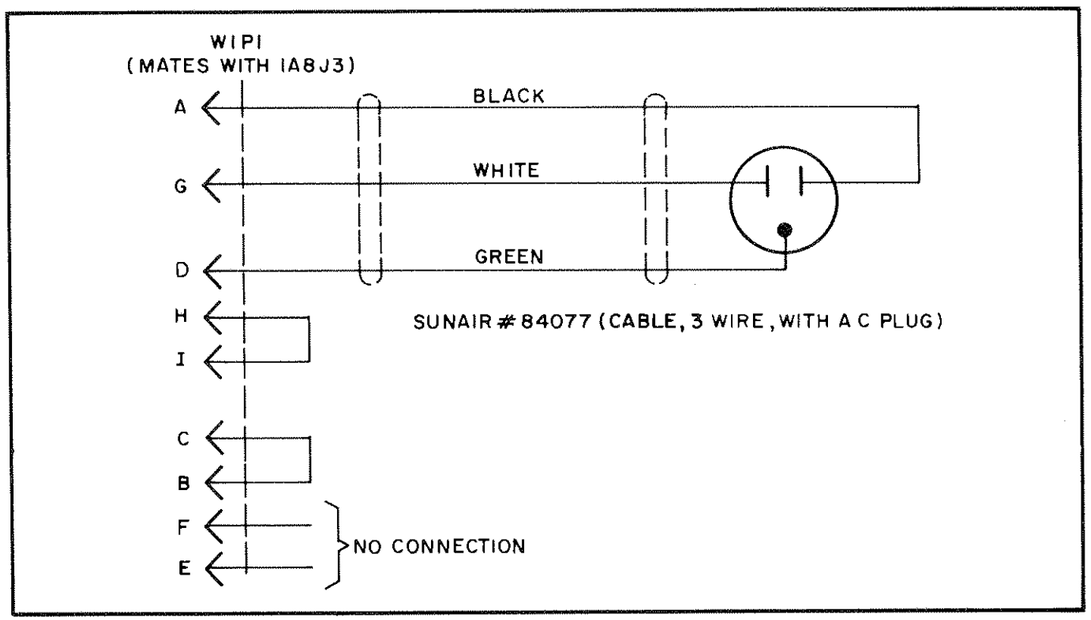


Figure 2.12 115 VAC Power Cord Schematic

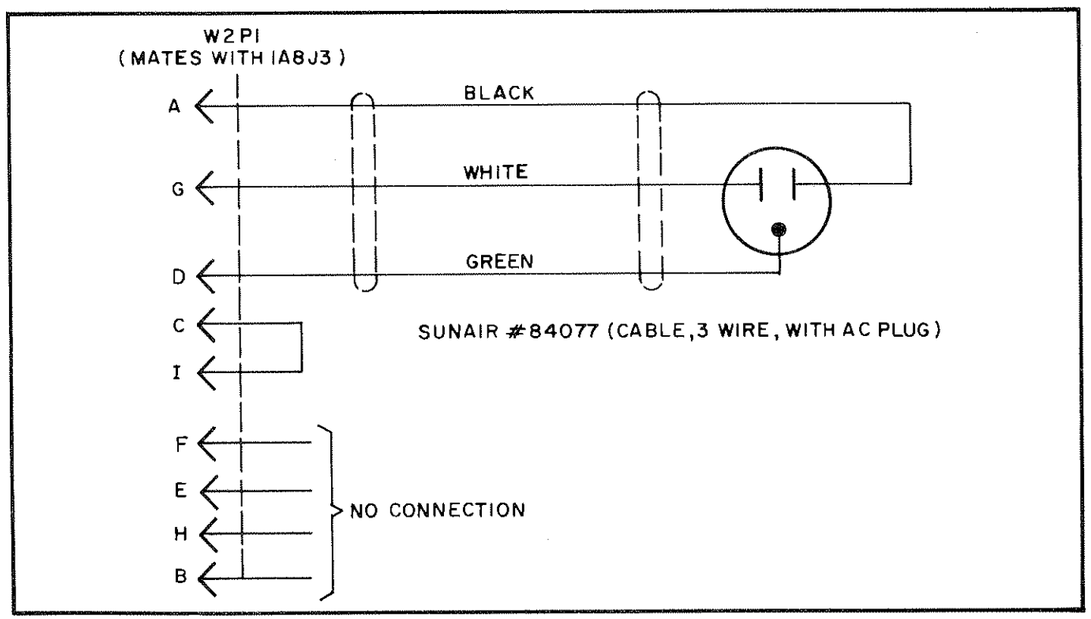


Figure 2.13 230 VAC Power Cord Schematic

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 GSB-900R is equipped with the optional D.C. Inverter Module (Sunair part no. 50240213) operation from D.C. power sources of 13 or 26 volts ±10%, positive or negative ground, is possible. The GSB-900R 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 using the appropriate Power Cord Assembly and switching the toggle switch behind the transceiver front panel to the appropriate position. 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 setting a toggle switch on the D.C. inverter. 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. Also it is necessary to place the toggle switch located behind the GSB-900R front panel in the D-C position.

The GSB-900R 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 Assembly is supplied from the factory with approximately 10 feet of connecting cable. However, if the installation permits, the 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. For nominal 230V input, use type MDL (SLO-BLO), 2 amp.
1A8F3	D.C. Line	Rear Apron	For nominal 13V input, use type MDL(SLO BLO), 30 amp. For nominal 26V input, use type MDL(SLO BLO), 15 amp.
1A6F1	+28V	Power Supply	Type 3AG, 15 amp.
1A6F2	+12V	Power Supply	Type 3AG, 2 amp.
1A6F3	+5V	Power Supply	Type 3AG, 2 amp.

Figure 2.14 GSB-900R Fuse Table

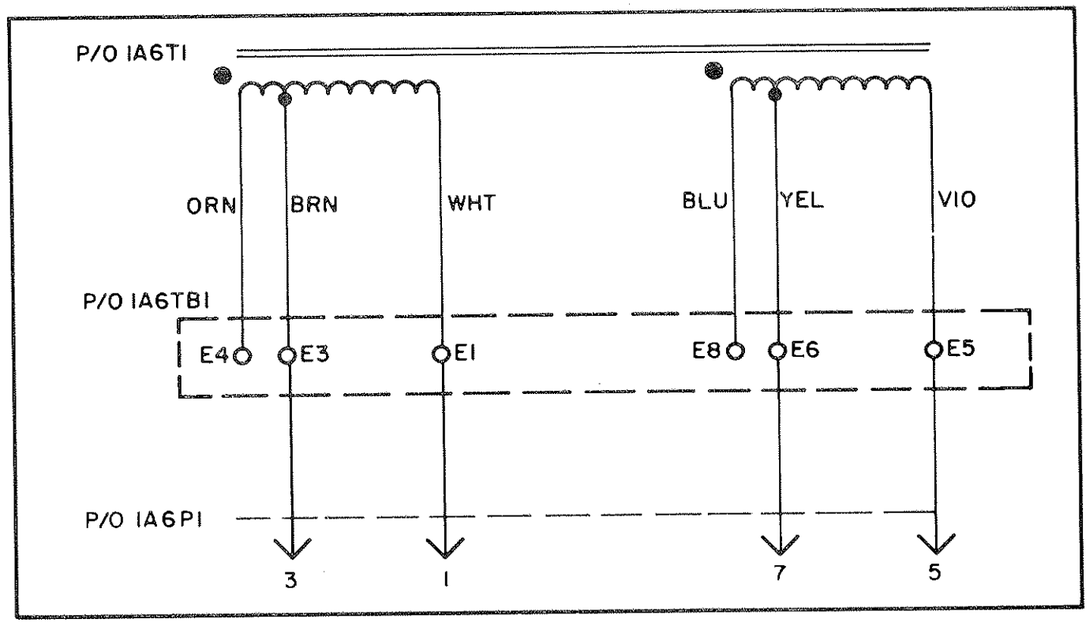


Figure 2.15 Power Supply Wiring – 115V or 230 VAC Inputs

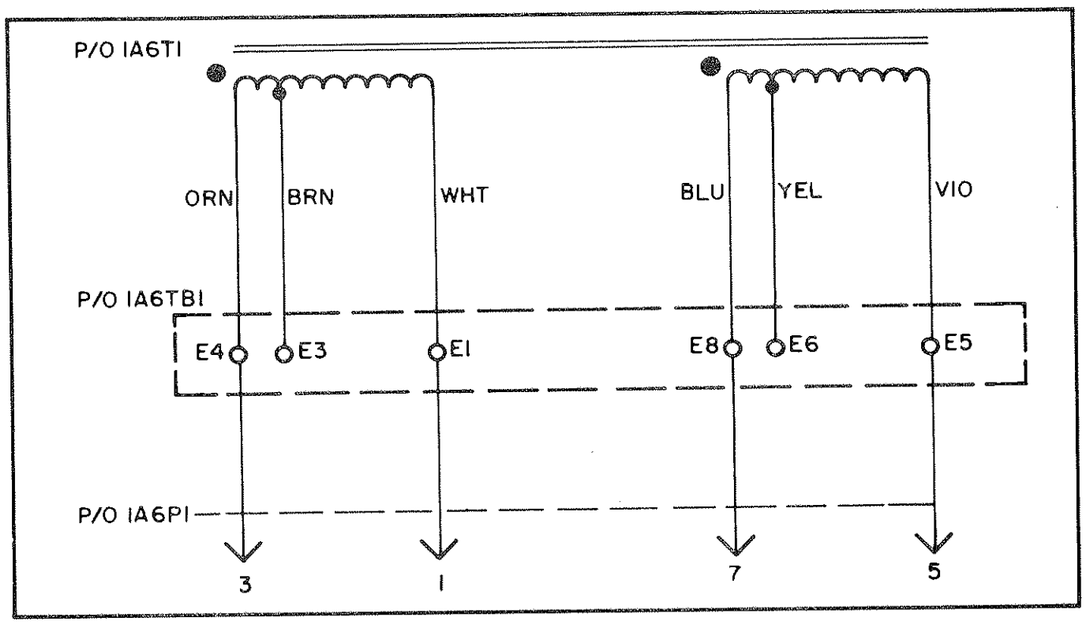
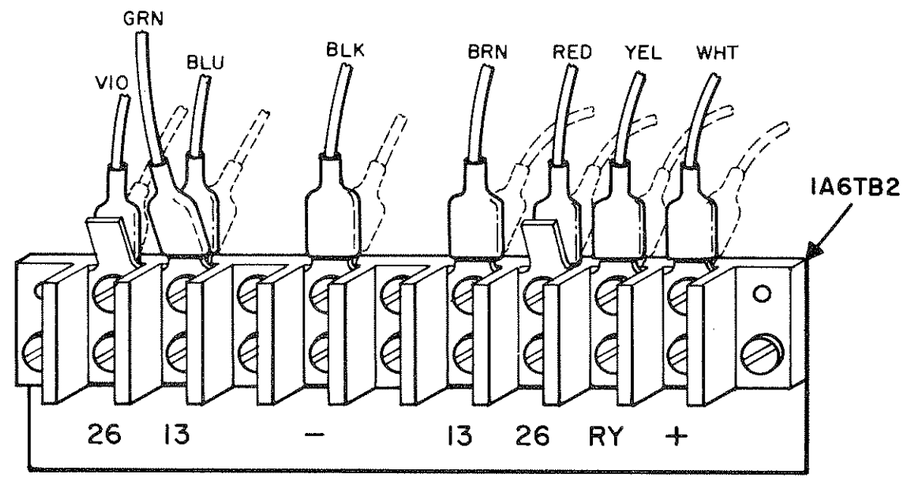
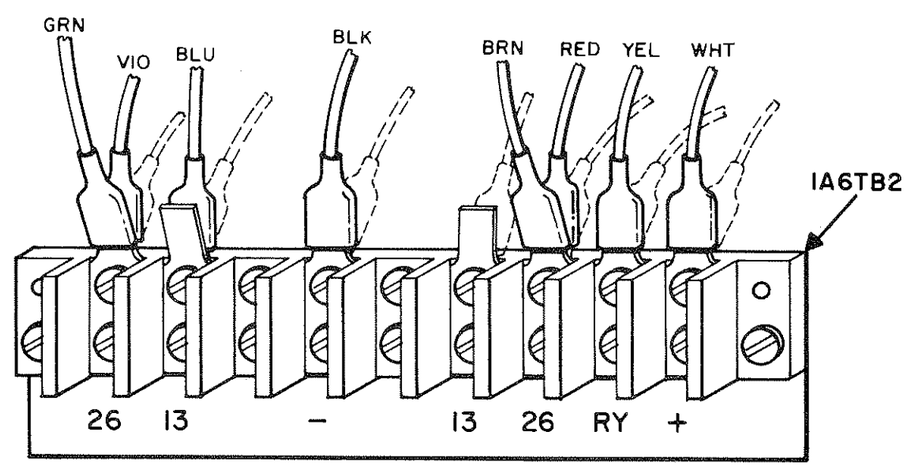


Figure 2.16 Power Supply Wiring – 132 V or 265 VAC Inputs



CONNECTIONS SHOWN ABOVE FOR 13 VDC 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

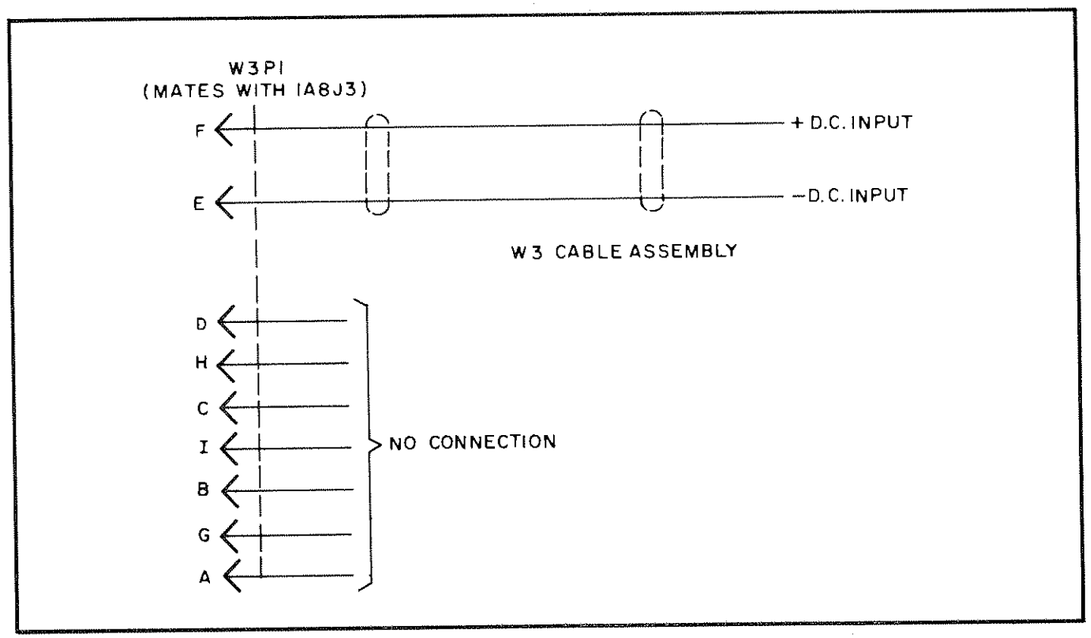


Figure 2.18 D.C. Power Connector Schematic

should be then 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 figure 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.

2.7 INSTALLATION CHECKOUT

When the installation is complete, refer to section 3 (OPERATION) and fully check the operation of the 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.

2.8 GCU-935 ANTENNA COUPLER

The GCU-935 is an automatic antenna coupler used in conjunction with a GSB-900R transceiver and Control Unit GRC-955. It is capable of matching the 50 ohm output of the GSB-900R to antennas ranging from 15 foot verticals to 150 foot long wires.

The GCU-935 is contained in a weatherproof case and is intended for outdoor mounting. Typical installations are shown in section 2.4.

Figure 2.19 shows outline dimensions of the GCU-935. For complete details, consult the GCU-935 Maintenance Manual (TM60350005).

SUNAIR GSB-900R

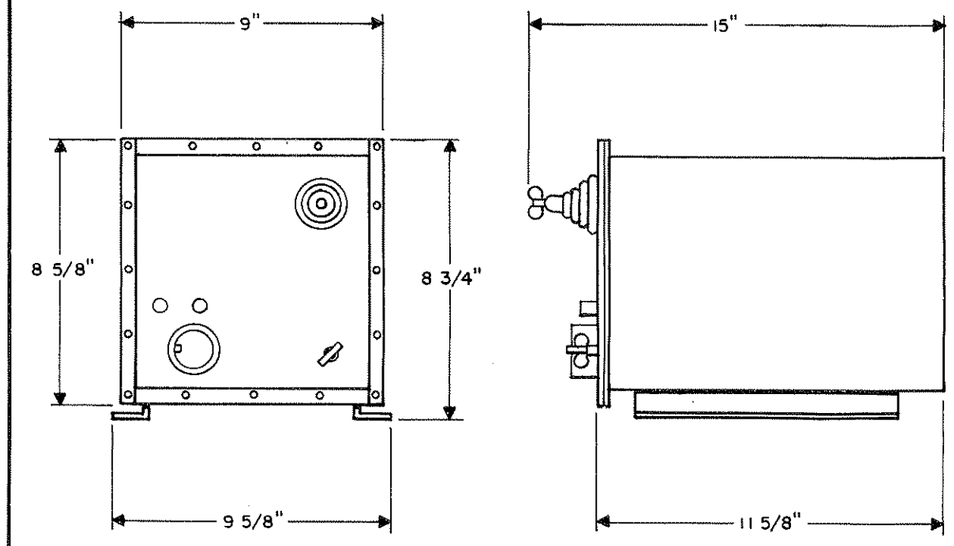


Figure 2.19 GCU-935, Antenna Coupler

DESCRIPTION		DESIGNATOR	MATING PARTS		
			Connector	Cable Clamp	Rubber Boot(s)
			Sunair Part Numbers		
GSB-900R	61 Pin	1A1J1	075497001	75445	70055-3
	26 Pin	1A1J2	075454006	–	–
				–	–
	Antenna	1A8J1	74219 (Note 1)	–	–
	Audio	1A8J2	75400	74025	70055-4
	Power	1A8J3	75358	75457	70055-3 70055-4 70055-5
	Accessory	1A8J4	75469	Included with Connector	70055-5 70055-6 70055-7
GRC 955	26 Pin	3A1J1	0754470008		
GRC-955	61 Pin	2A3J1	0754510000		
GCU-935		J2 J1	0754140008 0747640009		

Table 2.1 Mating Connectors to GSB-900R and Accessories

NOTE

1. For use with RG-58/U Coax. use Adapter #74207.

SECTION 3

OPERATION

3.1 GENERAL

This section provides information and instructions required for proper operation of the GSB-900R Transceiver.

3.2 REMOTE UNIT OPERATING CONTROLS

3.2.1 Listed below are description of all controls, indicators and connectors located on the front panel of the GRC-955 Remote Unit. They are illustrated in Figure 3.1.

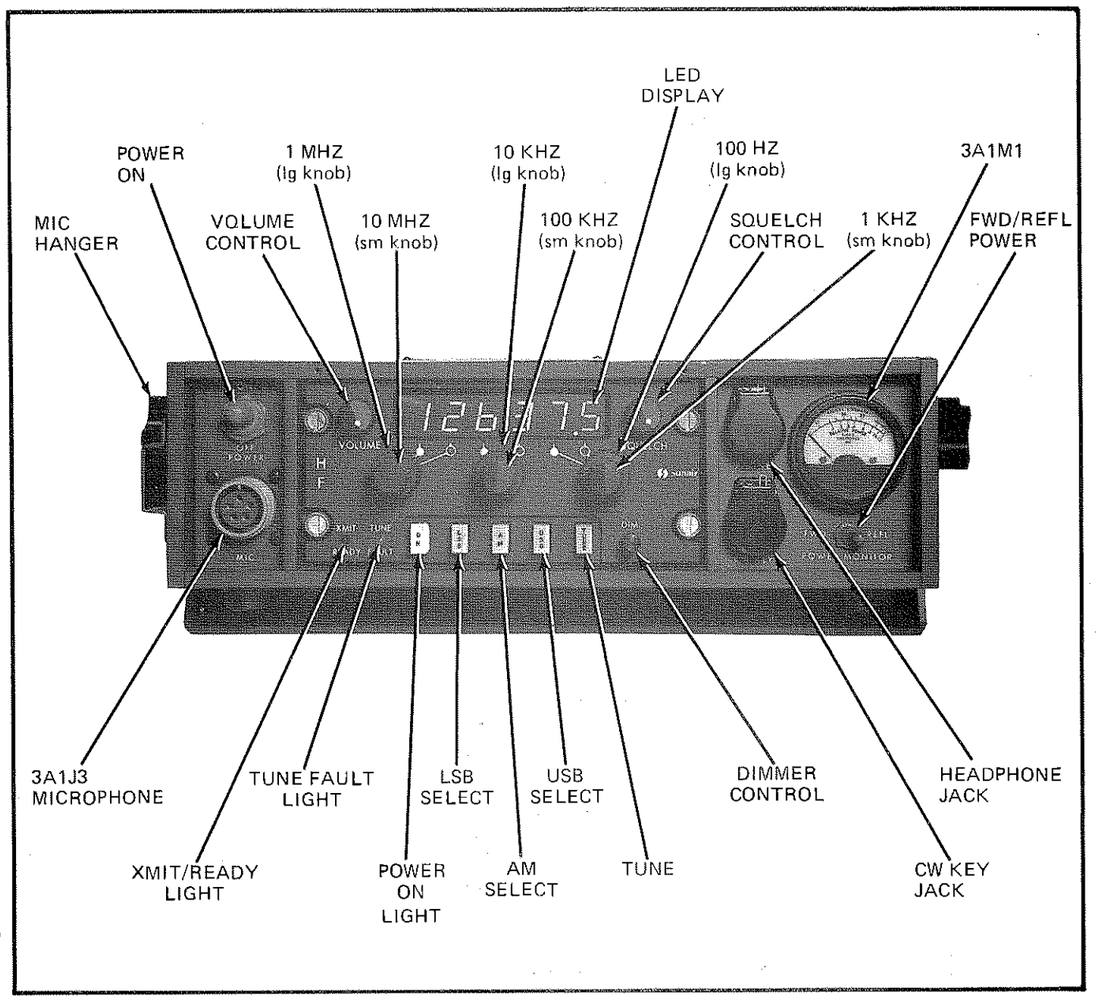


Figure 3.1 GRC-955, Front Panel

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

SWITCH	EQUIPMENT RESPONSE
OFF (Toggle)	Connects/Disconnects Primary Power
ON (Pushbutton)	No function – Lights when power is on
LSB (Pushbutton)	Selects Lower Sideband mode
USB (Pushbutton)	Selects Upper Sideband mode (used for CW operation also)
AM (Pushbutton)	Selects Amplitude Modulation mode
TUNE (Pushbutton)	a) Disconnects microphone and C.W. key b) Keys the radio in A.M. mode c) Enables the GCU-935

VOLUME . . . . . Controls the level of the receive audio signal to the speaker and PHONE jack.

SQUELCH . . . . . Sets the level of received signal that will break the squelch.

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

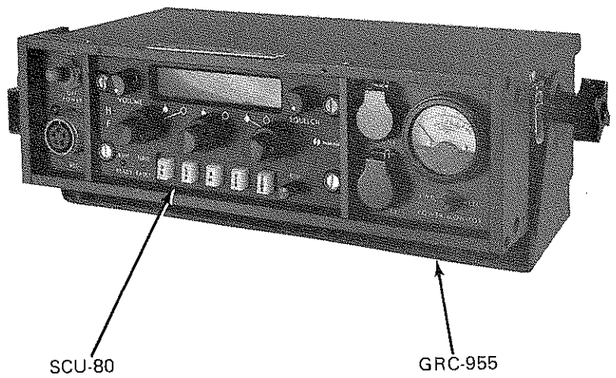
PHONE jack . . . . . Accepts standard 1/4 inch 2 circuit plug from earphones. Disconnects speaker when plug is inserted.

DIMMER control . . . . . Controls intensity of frequency display and panel 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 . . . . . a) RECEIVE mode, indicates relative signal strength in "S" units.
b) TRANSMIT mode: indicates relative power output, Forward or Reflected, as selected by Power Monitor Switch.

LED FREQUENCY DISPLAY. . . . . Indicates selected frequency. Blinks on and off if frequency below 1.6 MHz is selected.



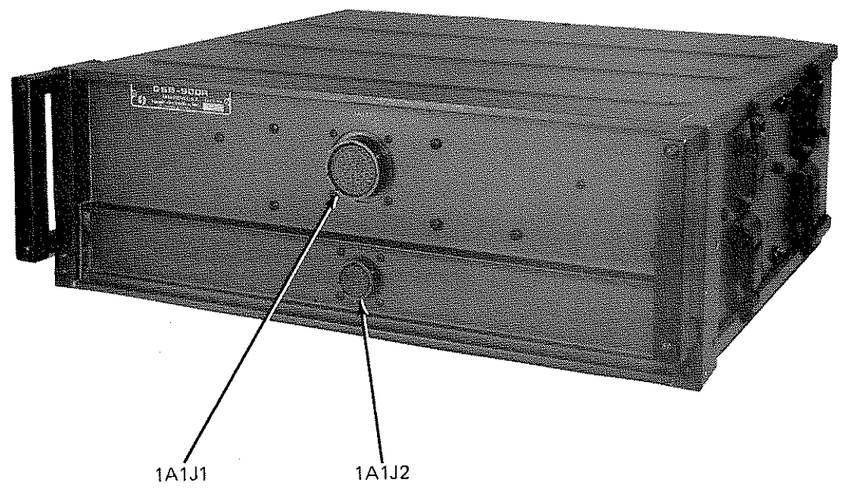


Figure 3.2 Transceiver and Remote Control Unit

3.3 REAR APRON FUSES AND CONNECTORS

3.3.1 Refer to Figure 3.3 for location.

ANT (1A8J1)	ANTENNA connector: R.F. input/output of unit. Mates with standard PL-259 RF connector.
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 Transceiver (see Section 2.6). Mates with standard MS connector MS3106A (24-11S)
ACCESSORY (1A8J4)	ACCESSORY connector: For connecting accessory equipment such as the GCU-935 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).

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

3.4.1 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 transceiver. Make sure all connections are secure.

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

c) Set the VOLUME control on the Remote front panel to approximately one half clockwise position.

d) Set the (6) FREQUENCY control switches to the desired operating frequency.

e) Set SQUELCH control to full CW position.

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

g) Connect the radio to its power source.

h) Place the MODE switch in the AM position.

i) Turn Power Switch to "ON".

j) Adjust the VOLUME control for a comfortable listening level.

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

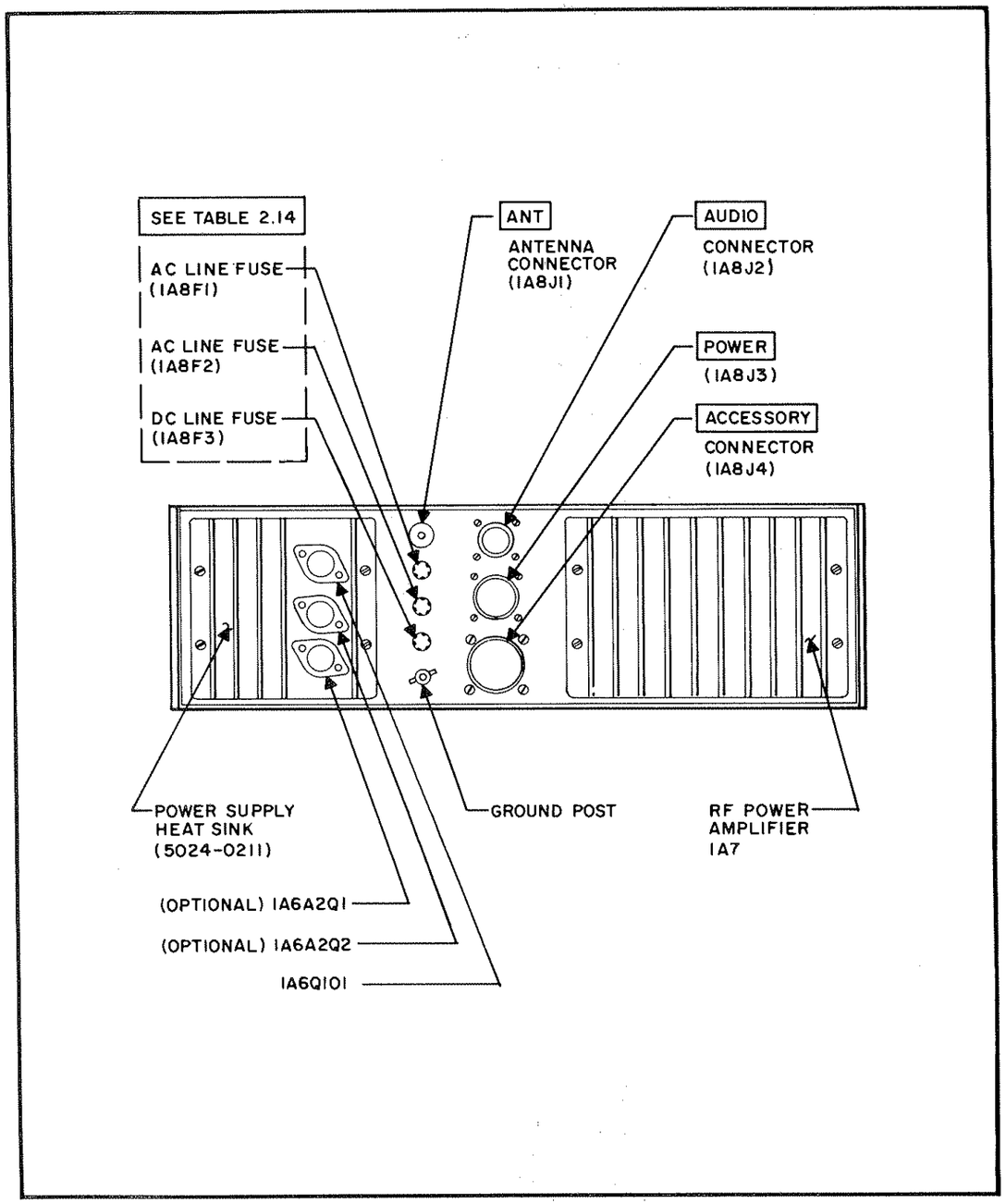


Figure 3.3 GSB-900R Rear Apron Components and Connectors

l) Depress the PTT button and measure the reflected power on the "THRULINE" wattmeter. This reading should be less than 11% of the reading obtained in k).

NOTE

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

If the conditions of (l) are met, the antenna system is adequate and the system may be placed in full operation (see section 3.4.2). 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 and no audio from the speaker when the unit is returned to receive. 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.

3.4.2 OPERATION (WITH 50 OHM ANTENNAS)

Check to see that the antenna is securely connected to the Transceiver. Connect a microphone (to 3A1J3), a C.W. key (to 3A1J2) or 600 ohm audio source (to 1A8J2). If the 600 ohm source is used, preset R58 on the AUDIO BOARD (1A3A4) to minimum by turning it at least 10 turns counterclockwise. Follow the steps outlined below:

a) Set the VOLUME control to mid-range and the SQUELCH control fully C.W.

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

c) Set the six frequency control switches to the desired operating frequency.

d) Turn Power Switch to "ON".

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

f) If being used in LSB or USB modes: Depress PTT switch and speak into the microphone. Note that the panel meter shows power output.

If being used in the AM mode: Note carrier level (approximately 30 to 40 watts when not talking) on meter. When talking the meter "bounces" slightly with voice peaks.

If being used in the CW mode: The level of sidetone to the transmit section is preset at the factory. Automatic switching of the Transceiver from receive to transmit will occur when the key is depressed. When the key is depressed, a sidetone (approximately 1 kHz) should be audible.

NOTE

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

If being used with a remote audio input: Potentiometer R58 on the AUDIO board (1A3A4) should be used to adjust the transmit audio level. If 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 R58 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 and no audio from the speaker when the unit is then returned to receive. If this condition occurs, place the POWER switch in the OFF position, wait 15 seconds, and return POWER switch to desired mode.

3.5 OPERATING THE GSB-900R WITH THE GCU-935 ANTENNA COUPLER

If the antenna in use does not present a 50 ohm load to the transceiver within the allowable 2:1 V.S.W.R. range, the antenna must be "matched" to the transceiver using the GCU-935 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 3A1J3), a C.W. key (to 3A1J2) or 600 ohm audio source (to 1A8J2). If the 600 ohm source is used, preset R58 on the AUDIO board (1A3A4) to minimum by turning it at least 10 turns counter-clockwise.

c) Refer to Figure 2.14 and check that the proper line fuses have been installed.

d) Set the VOLUME control fully counter-clockwise. Set the SQUELCH control fully clockwise. Check to see that the POWER switch is in OFF position.

e) Connect the Transceiver to its power source.

f) Turn POWER switch "ON".

g) Set the (6) FREQUENCY control switches to the desired operating frequency.

h) Place the PWR MONITOR switch on the front panel in the FWD (forward power) position.

i) Select USB mode and push TUNE pushbutton switch. The relative power meter should indicate approximately 0.4 relative power. TUNE pushbutton light should remain on and TUNING FAULT light should be extinguished.

j) GCU-935 antenna coupler should start its tune cycle. Move POWER MONITOR switch to REFL (Reflected Power) position. When antenna coupler completes the tune cycle the meter should indicate 0 and the green READY light should be lit.

k) If TUNE FAULT light comes on, this indicates the antenna coupler did not tune. Repeat the tuning process. If the condition persists check that the transmitter is putting out power and that all connections are correct. Consult maintenance section of the manual.

l) Set the MODE switch for the desired operating mode (LSB, USB, AM).

m) Adjust the VOLUME control for a comfortable listening level.

n) If being used in LSB or USB modes: Speak into the microphone and note the forward power indication on the meter.

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

If being used in the CW mode: The level of sidetone to the transmit section is preset at the factory. Automatic switching of the Transceiver from receive to transmit will occur when the key is depressed, a sidetone (approximately 1 kHz) should be audible.

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 CW on a true carrier frequency, set the GSB-900R frequency dials 1 KHz below the desired CW carrier frequency.

If being used with a remote audio input: Potentiometer R58 on the AUDIO board (1A3A4) should be used to adjust the transmit audio level. If 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 R58 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 and no audio from the speaker when the unit is returned to receive. If this condition occurs, place the POWER switch in the OFF position, wait 15 seconds, and return POWER switch to desired mode. 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.

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

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

4.1.1 OVERALL BLOCK DIAGRAM

Figure 4.1 shows an overall block diagram of the GSB-900R. 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 4.2 shows an overall block diagram of the synthesizer. An isometric drawing of the physical components of the synthesizer unit is shown in Figure 5.6.

4.2.1 GENERAL

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

The 3rd L.O. (10.5 MHz reference) is derived by direct synthesis techniques (i.e. by dividing and mixing). This local oscillator signal is used as a product detector injection on receive and as a carrier generator on transmit. This reference is derived in the Spectrum Generator assembly, 1A4A1.

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

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

$$F_1 = 91.2500 + F_0 + e \ (MHz)$$

Where: F_1=1st L.O. frequency

F_0=dialed frequency

e=2nd L.O. error

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

4.2.2 SPECTRUM GENERATOR -1A4A1

Refer to Figure 5.12.

4.2.2.1 GENERAL

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

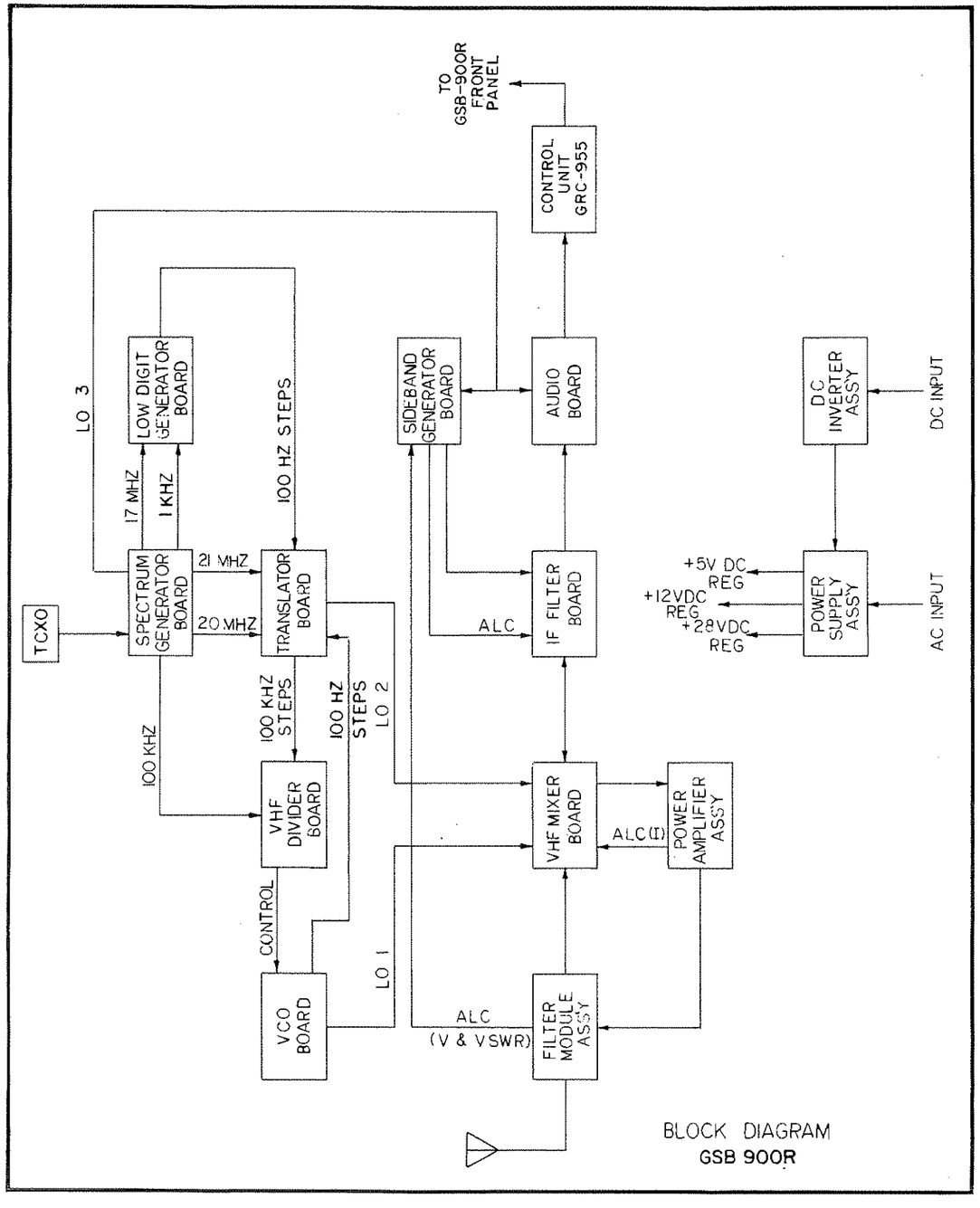


Figure 4.1 Overall Block Diagram, GSB-900R

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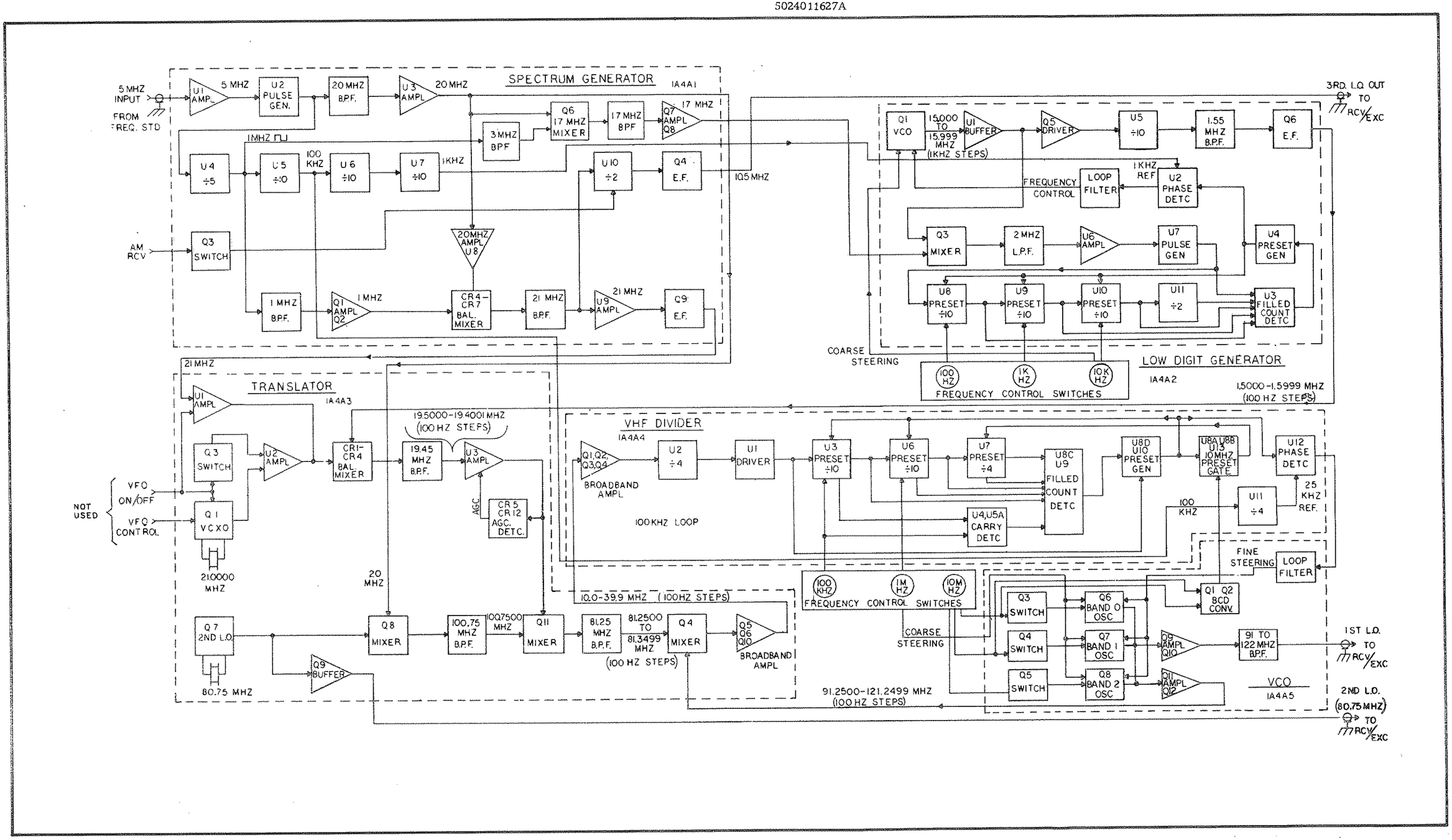


Figure 4.2 Synthesizer Block Diagram and Details

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

4.2.2.2 20 MHz REFERENCE GENERATOR

The 5 MHz Reference from the Frequency Standard is amplified by U1 and formed into a short pulse by pulse generator U2. The 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, L13, C48 and C49) and then matched to 50 ohms by emitter follower, Q4.
The flip-flop (U10) is disabled by switch (Q3) in the AM receive mode to prevent a "beat"note from appearing at the receiver output. +12 volts, applied to the "Blanking Pulse In" line in these modes, saturates Q3; thereby disabling the flip-flop and effectively removing the 10.5 MHz output. At all other times there is no voltage on the "Blanking Pulse In" line. Q3 is therefore cut off and the flip-flop (U10) operates in its normal divide-by-2 mode. A blanking pulse from the L.O. blanker on mother board 1A4A6 also disables the flip-flop for approximately 100 milliseconds whenever the setting of the 1 MHz frequency switch on the front panel is changed.

4.2.3 LOW DIGIT GENERATOR – 1A4A2

Refer to Figure 5.13.

4.2.3.1 GENERAL

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

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. signal is 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); and 1.5000-1.5999 MHz (from the Low Digit Generator). The output is the 10.0-39.9 MHz reference signal which is fed to the VHF Divider.

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 21 MHz REFERENCE AMPLIFIER

The 21 MHz reference from the spectrum generator is amplified by U1.

Since this board is also used in other products requiring VFO capability, a VFO consisting of Q1, U2, and associated components exists on this board. However, the VFO is disabled in the GSB-900R.

4.2.4.4 2nd L.O. CIRCUITRY

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

4.2.4.5 100.75 MHz MIXER

The 100.75 MHz mixer (Q8) heterodynes the 2nd L.O. output from Q7 and the 20 MHz reference from the Spectrum Generator. The triple tuned 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, C77, L31) to the broadband amplifier (Q5, Q6). Negative feedback around the the amplifier (R17, R19, R6) provides flat gain to well beyond 50 MHz as well as a constant input impedance, stable D.C. operating point, and low output impedance.

4.2.5 V.H.F. DIVIDER–1A4A4

Refer to Figure 5.15.

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 AlC 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):

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

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

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

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

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 Receiver/Exciter module.

4.2.6.4 TRANSLATOR BUFFER AMPLIFIER

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

4.2.6.5 LOGIC SWITCHING

Transistors Q3, Q4 and Q5 apply +12 volts to the appropriate oscillator circuit when the respective band command line is connected to ground by the 10 MHz switch on the front panel. Transistors Q1 and Q2 generate the required 10 MHz preset code for the VHF Divider (1A4A4) in the following sequence:

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

NOTE

The TTL compatible logic levels are as follows:

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

4.2.6.6 MECHANICAL

Refer to figure 5.6.

The V.C.O. board is secured between two metal plates (front and rear) that serve as a support and

an electrical shield. This unit is rigidly mounted to the end plate of the synthesizer card guides to ensure superior performance under extreme vibration and shock conditions. Ability to make alignment adjustments is provided by access holes where necessary.

4.2.7 SYNTHESIZER MOTHER BOARD-1A4A6

Refer to figure 5.17.

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

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

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

When the setting of the 1 MHz switch is changed, the "preset 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.

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

4.3 RECEIVER

The receiver electronics are divided among four printed circuit boards: VHF MIXER (1A3A1), IF/FILTER (1A3A2), AUDIO (1A3A4), and SPEAKER DRIVER (1A1A1). The first three boards are interconnected by plugging into the RECEIVER/EXCITER MOTHER BOARD, (1A3A5). The SPEAKER DRIVER is located in the Remote Control Unit. The block diagram is shown in figure 4.5.

4.3.1 GENERAL

Received signals are first passed through a band pass filter network in the filter module, then are fed into an 11 pole high pass filter on the VHF mixer board. This filter is a very sharp cut off broadcast band rejection network. The signal is then amplified and mixed in a balanced mixer with the first local oscillator, providing an output on 91.25 MHz.

In addition to 91.25 MHz, the mixer output contains several other significant mixing products, but because of the high frequencies involved they are separated in frequency from 91.25 MHz by a relatively large amount. The unwanted products are removed by passing the mixer output through a narrow band 91.25 MHz crystal filter. The resulting 91.25 MHz signal is then amplified and mixed again in another balanced mixer with the second local oscillator (80.75 MHz), which yields an output at 10.5 MHz. High frequency products from this mixing are removed by a low pass filter.

The 10.5 MHz I.F. signal is amplified, then fed to a diode gating network which selects the upper sideband filter (USB), lower sideband filter (LSB), or amplitude modulation filter (AM). These filters determine the receiver's bandwith and reduce the interference from adjacent channels. The filtered I.F. signal is passed through another diode gate, then is highly amplified in two integrated circuit I.F. amplifiers. The output of the second I.F. amplifier is coupled to a product detector when receiving sideband signals and to a fixed amplifier and an envelope detector for receiving amplitude modulated signals. The fixed amplifier also feeds into the AGC detector which develops a D.C. voltage proportional to the received signal amplitude. The AGC voltage is amplified and used to control the voltage gain of the RF amplifier and the two integrated circuit I.F. amplifiers.

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

The output of the fixed audio amplifier is connected to the Audio Processing board, then to the speaker driver (located in the Remote Control Unit), which supplies up to five watts of audio to the speaker.

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

The front panel SQUELCH control acts to establish a threshold level of received signal required to open the audio gate energizing the receive audio amplifier.

The VOLUME control remotely controls the audio through an attenuator on the Audio Processing board.

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

4.3.2 VHF MIXER BOARD –1A3A1

Figure 5.18 consists of a front view (component side) and a rear view (foil side) plus a schematic of the VHF MIXER printed circuit board. In addition a complete parts list is provided on the reverse side of the fold out page.

4.3.2.1 BROADCAST FILTER

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

4.3.2.2. RF AMPLIFIER

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

The output of T3 passes through diode CR3 to the input of balanced mixer transformer T4. Since the +12R voltage is +12V during receive (and ground during transmit) and the +12T voltage is ground during receive (and +12V during transmit), diode CR3 is switched on (conducts) by the voltage on T3, through the winding on T4, and R14 to the +12T line (which is at ground potential). Likewise, diode CR1 is turned off during receive and has no effect on the operation.

4.3.2.3 1st LO AMPLIFIER AND BALANCED MIXER

Local oscillator number 1 is injected at pin 18 of 1A3A1-P1 into amplifier Q5. The amplified L.O. is applied to T5 to switch hot carrier diodes CR4-7 on and off at the L.O. frequency. The injected R.F. signal at T4 now mixes with the L.O. signal to provide several outputs, one of which is 91.25 MHz. The balanced mixer is used to minimize the number of mixing products because of its inherent ability to virtually eliminate the even harmonics of the mixing frequencies and their sums and differences, as well as the mixing frequencies themselves. Therefore, the primary mixer output is L.O. number 1 plus the R.F. signal and L.O. number 1 minus the RF signal. L.O. number 1 frequency is variable between 92.85 MHz and 121.25 MHz, corresponding to 1.6 to 29.999 MHz selected by the front panel frequency dials. In the GSB-900R, the difference frequency is selected and a first I.F. of 91.25 MHz was picked to minimize spurious frequencies within the transceiver. Note that at the lowest frequency of operation, 1.6 MHz, the sum and difference frequencies in the mixer output are 3.2 MHz apart making it a simple task to remove the sum frequency with a narrow band crystal filter.

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

4.3.2.4 VHF FILTER AND BILATERAL AMPLIFIER

The mixer output is taken between the center taps of T4 and T5, fed through a matching network, L10 and C41, into filter FL1 at 91.25 MHz. The filter impedance is approximately 4000 ohms, hence the need for matching from the low impedance mixer output. Another matching network, C44 and L11, match the filter into the 50 ohm input impedance of the bilateral amplifier, Q6 and Q7. The amplifier is bilateral in that it amplifies in both directions, Q6 is active on receive, and Q7 is active on transmit.

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

impedance of Q6. When Q6 is turned on by +12R on gate 2; Q7 is turned off by the +12T ground on its gate 2 (for explanation see paragraph 4.3.2.2). As with the R.F. amplifier, the source is biased positively by 3.6V to allow gate 2 to turn the device on or off.

The output of amplifier Q6 is taken through impedance matching network T8, C55, and C56 to T9, the input to a second balanced mixer. Note that in the receive mode, T7 is the input transformer and T8 is the output transformer for Q6; while in transmit mode, T8 is the input transformer and T7 is the output transformer for Q7.

4.3.2.5 2ND LO AMPLIFIER AND BALANCED MIXER

The second mixer operates in a manner similar to the first mixer. The main difference is that the first mixer is an "up converter", that is, its output frequency is higher than the input frequency. The second mixer is a "down converter" changing the 91.25 MHz signal to 10.5 MHz. Transistor Q8 amplifies the second local oscillator signal, 80.75 MHz, and feeds it to the mixer through transformer T11. The output of the second mixer is taken from T9 center tap and passes through a low pass filter to eliminate the high frequency mixing products. The output of the VHF mixer board is on pin number 5 of 1A3A1-P1.

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

4.3.3 IF/FILTER BOARD –1A3A2

Refer to Figure 5.19

4.3.3.1 GENERAL

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

4.3.3.2 DIODE GATES AND IF FILTERS

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

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

The diode gates, which are also repeated at the filter outputs, operate as follows: Assume the LSB mode is selected. A +12VDC voltage is applied to pin 9 of 1A3A2-P1. This turns on CR8, CR1 and CR12. Using the input gate as an example, current flows through L8, CR8, R27, CR1 and R19. A voltage of approximately +5VDC exists across R19 as a result, which turns off CR3 and CR5. CR2 is turned off because the cathode is more positive (+6V) than the anode (+4V). So the signal is allowed to pass into the filter. Additionally, the other filter input gates are turned off. Using CR3 and CR4 as an example, CR4 is conducting, (+4 VDC on its anode), with a path to ground for the cathode through R28 and R32. This shorts any signal leakage across CR3 to ground through C19; and CR3 is turned off with +5V on the cathode and +4V on the anode.

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

4.3.3.3 INTEGRATED CIRCUIT IF AMPLIFIER

The filter output is fed through C37 to another diode gate, CR17 and CR18. This gate switches circuits from receive to transmit, so during receive, CR17 is turned on and CR18 is off. This allows the signal to go to pin 2 of U1, an integrated circuit amplifier. There it is amplified by approximately 30db and fed to pin 2 of U2, another integrated circuit amplifier. Schematics of U1 and U2,CA-3053, are given in Figure 4.3.

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

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

4.3.4 AUDIO BOARD – 1A3A4

See Figure 5.20.

4.3.4.1 GENERAL

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

4.3.4.2 FIXED IF AMPLIFIER AND AGC DETECTOR

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

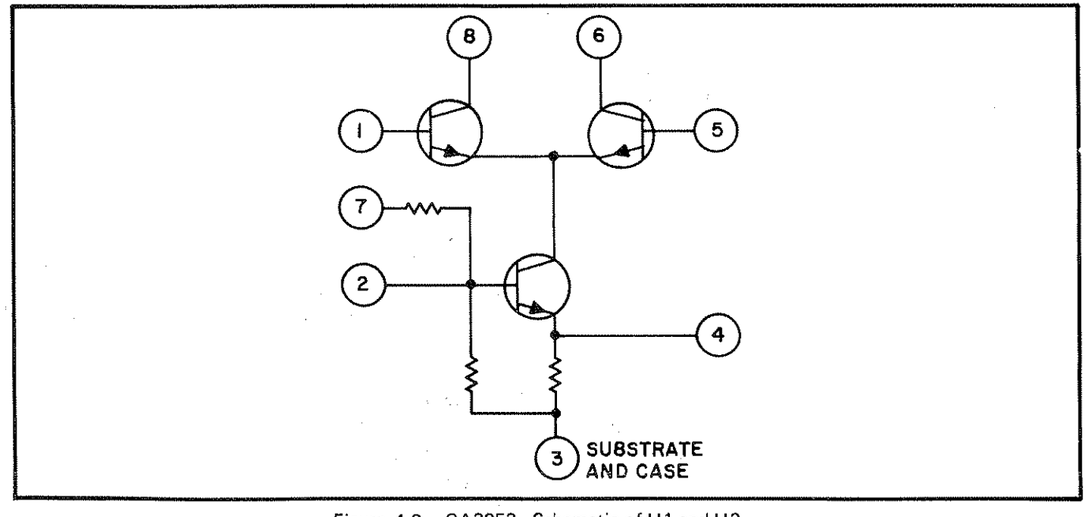


Figure 4.3 CA3053 Schematic of U1 and U2

4.3.4.3 "S" METER AMPLIFIER

Transistor Q5 is a D.C. amplifier which drives the "S" meter. Its threshold is set so that meter movement begins when a signal of approximately 2 or 3 uv is received, and provides full scale meter deflection for a 100,000 uv signal.

4.3.4.4 AM DETECTOR

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

4.3.4.5 PRODUCT DETECTOR

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

4.3.4.6 600 OHM LINE DRIVER

Both the product detector output and the envelope detector outputs are combined in R42 and feed integrated circuit 600 ohm line driver, U1, and fixed gain audio amplifier Q11. The CA3020 line driver is a conventional push-pull multistage amplifier feeding output transformer marked, T1. The input to U1 is controlled by R48 and the balanced 600 ohm output appears on pins R and T of 1A3A4-P1. Pin S is the output transformer center tap and is not normally used. A side tone is provided from the CW oscillator through pin 4 of 1A3A4-P1 to the audio system of the receiver to allow monitoring of the CW signal. This sidetone is injected into the junction of the product detector output and the envelope detector output through capacitor C49. Resistor R46 attenuates the side tone to provide a comfortable listening level for the 1 kHz tone when the volume control is in a normal position.

4.3.5 MOTHER BOARD - 1A3A5

Refer to figure 5.23.

4.3.5.1 GENERAL

The mother board provides interconnection for the RCV/EXC module printed boards. It also contains the delayed AGC front end attenuator and the tune modulation disable circuit.

4.3.5.2 DELAYED AGC ATTENUATOR

AGC voltage is applied to the base of Q2 through resistive divider R3, R4. Under weak signal conditions, the AGC voltage is high, causing Q2 to conduct and keep CR8 turned on. CR8 is a pin diode whose attenuation is inversely proportional to its forward current. As the rf signal level increases, the AGC voltage decreases until Q2 no longer conducts, decreasing the current in CR8, and increasing its forward resistance, attenuating the input rf signal.

4.3.5.3 MODULATION DISABLE CIRCUIT

In normal operation, Q1 is saturated, passing the +12T voltage to the Sideband Generator board, enabling the 3rd LO amplifier. However, during TUNE, E32 is grounded, shutting Q1 off, disabling the Sideband Generator. This prevents audio from any source from modulating the tune signal to the Antenna Coupler.

4.4 EXCITER

The exciter is contained on three printed circuit boards; sideband generator board (1A3A3), IF/Filter board (1A3A2), and VHF mixer board (1A3A1). Since the GSB-900R is a transceiver, a number of the same circuits and components are used in both the receive and transmit modes. A block diagram is shown in Figure 4.5.

4.4.1 GENERAL

Input to the exciter is available from three sources: microphone, 600 ohm balanced lines, or CW key. The microphone input signal is applied to an amplifier/compressor on the Audio Processing board, then is fed to the balanced modulator. The 600 ohm balanced input is level controlled by an internal adjustment, then amplified and fed to the balanced modulator. Keying the exciter, through the CW key, turns on a 1 kHz tone oscillator which is impedance matched through an emitter follower to the balanced modulator. The 1 kHz tone oscillator also supplies a side tone to the audio system to allow monitoring of the transmitted CW signal.

The balanced modulator takes an R.F. signal, 10.5 MHz, from the 3rd local oscillator amplifier, and "audio" from either of the above three sources. It then suppresses the R.F. carrier, 10.5 MHz, and supplies two signals as outputs: 10.5 MHz plus the audio frequencies (upper sideband, USB) and 10.5 MHz minus the audio frequencies (lower sideband, LSB). Hence, the output of the balanced modulator is double sideband, DSB. After amplification in a fixed gain I.F. amplifier, the DSB signal is gated into either the USB filter or LSB filter as selected on the front panel. AM operation in the GSB-900R 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. For AM operation the AM carrier is injected from the automatic carrier control (ACC) amplifier into the bilateral amplifier.

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

The transmit output of the balanced mixer is the second L.O. frequency (80.75 MHz) plus the I.F. frequency (10.5 MHz) or 91.25 MHz. This output is amplified in the transmit side of the VHF bilateral amplifier, filtered in the 91.25 MHz crystal filter, and mixed again in another balanced mixer (the first mixer described in the receiver section). The 91.25 MHz signal is combined with the first local oscillator frequency to provide the desired frequency output between 1.6 and 30 MHz. The desired frequency signal is amplified in a pre-amplifier and a linear amplifier, then passes through a low pass filter. This is now the exciter output.

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

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

4.4.2 SIDEBAND GENERATOR BOARD-1A3A3

Refer to figure 5.22.

4.4.2.1 GENERAL

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

4.4.2.2 AUDIO AND BALANCED MODULATOR

Microphone input is supplied to 1A3A5-E2. At this point the level has been set by the Audio Processing board controls. The microphone audio is amplified by Q11 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. R.F. carrier energy for switching the balanced modulator is supplied through pin F of 1A3A3-P1 and amplified by Q1.

4.4.2.3 AUTOMATIC CARRIER CONTROL (ACC)

A small amount of 10.5 MHz carrier is supplied to the automatic carrier control amplifier Q5 through a diode gate, CR1, CR2. This gate prevents carrier energy from being transmitted in USB, LSB, or CW modes, but allows the carrier to be passed and amplified in the AM mode (A3H emission).

The +12 AM(T) signal, on pin 5 of 1A3A3-P1, turns CR1 on and CR2 off. It also supplies operating voltage for ACC detector amplifiers Q2 and Q3, and carrier control amplifier Q5. At initial turn on in the AM mode, Q5 is operating at maximum gain supplying maximum carrier output on pin 1 of 1A3A3-P1. The ACC detector, located on 1A5A4, detects the output rise and when its output reaches a sufficient level at pin 17 of 1A3A3-P1, Q2 is turned on, which in turn causes Q3 to conduct. The conduction of Q3 lowers the emitter voltage on Q5, reducing its gain until stabilization is reached between carrier output level, ACC detector voltage, and carrier control amplifier gain. R18 adjusts the steady state current through Q3, which sets the gain of Q5, thereby establishing the value of carrier output from the transmitter.

Resistors R1 and R4 and capacitor C4 establish the attack and decay times for normal speech, while CR9 allows for a rapid decay in the event of excessive audio amplitude which would tend to "wipe out" the carrier.

4.4.2.4 600 OHM TRANSMIT AMPLIFIER

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

4.4.2.5 CW TONE OSCILLATOR

Transistors Q7 and Q8 form the 1 KHz tone oscillator. The frequency is determined by the "Twin T" notch filter C28, C29, C31, R38, R40, and R43. The oscillator is turned on by grounding pin 2 of 1A3A3-P1, causing transistor Q12 to conduct, which grounds the keyline and keys the transmitter. When the CW key is removed from ground, capacitor C37 and resistor R50 hold Q12 on for approximately one second. This prevents the keying relay from dropping out between normal CW characters and words, but automatically returns the transceiver to "Receive" after a key up of approximately one second. Diode CR8 prevents the tone oscillator from being energized during normal keyline operation.

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

4.4.2.6 VSWR AND VOLTAGE ALC AMPLIFIERS

Transistors Q9 and Q10 are ALC amplifiers for voltage ALC (Q10) and VSWR ALC (Q9). The VSWR ALC is set by a fixed resistance ratio, but the voltage ALC, which determines the peak power output of the transmitter, is set by potentiometer, R55. A discussion of the ALC operation will be presented in a later paragraph.

4.4.3 IF/FILTER BOARD–1A3A2

Refer to Figure 5.19

4.4.3.1 GENERAL

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

4.4.3.2 TRANSMIT IF AMPLIFIER

The double sideband suppressed carrier output from the sideband generator is injected at pin 16 of 1A3A2-P1. Here it is amplified by a fixed gain IF

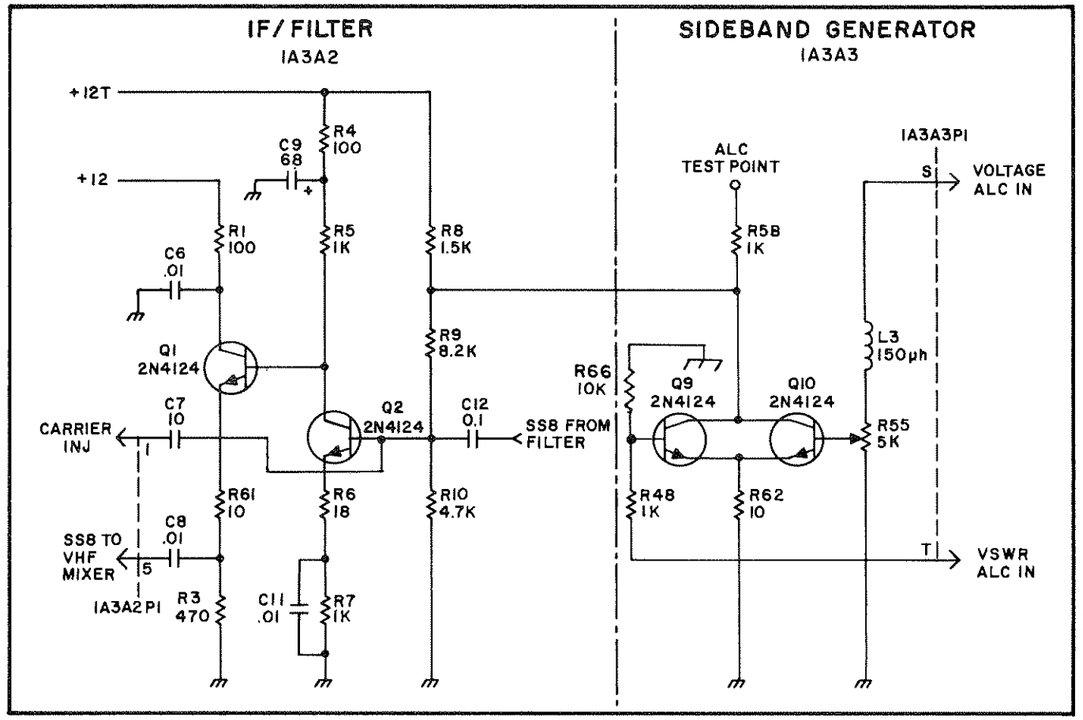


Figure 4.4 Voltage and VSWR ALC Control Schematic

amplifier, Q4. Application of +12 T to pin 10 of 1A3A2-P1 energizes Q4, turns CR18 on and turns CR17 off (+12R goes to ground during xmit, as +12T does during receive).

4.4.3.3 TRANSMIT FILTER SELECTION

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

4.4.3.4 TRANSMIT GAIN CONTROL AMPLIFIER

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

Since the base of Q2 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 of Q10 "on", the appropriate transistor conducts through R8, on 1A3A2, causing a large voltage drop to appear across R8. This decreases the bias voltage on the base of Q2, reducing its gain and the output from pin 5 of 1A3A2-P1.

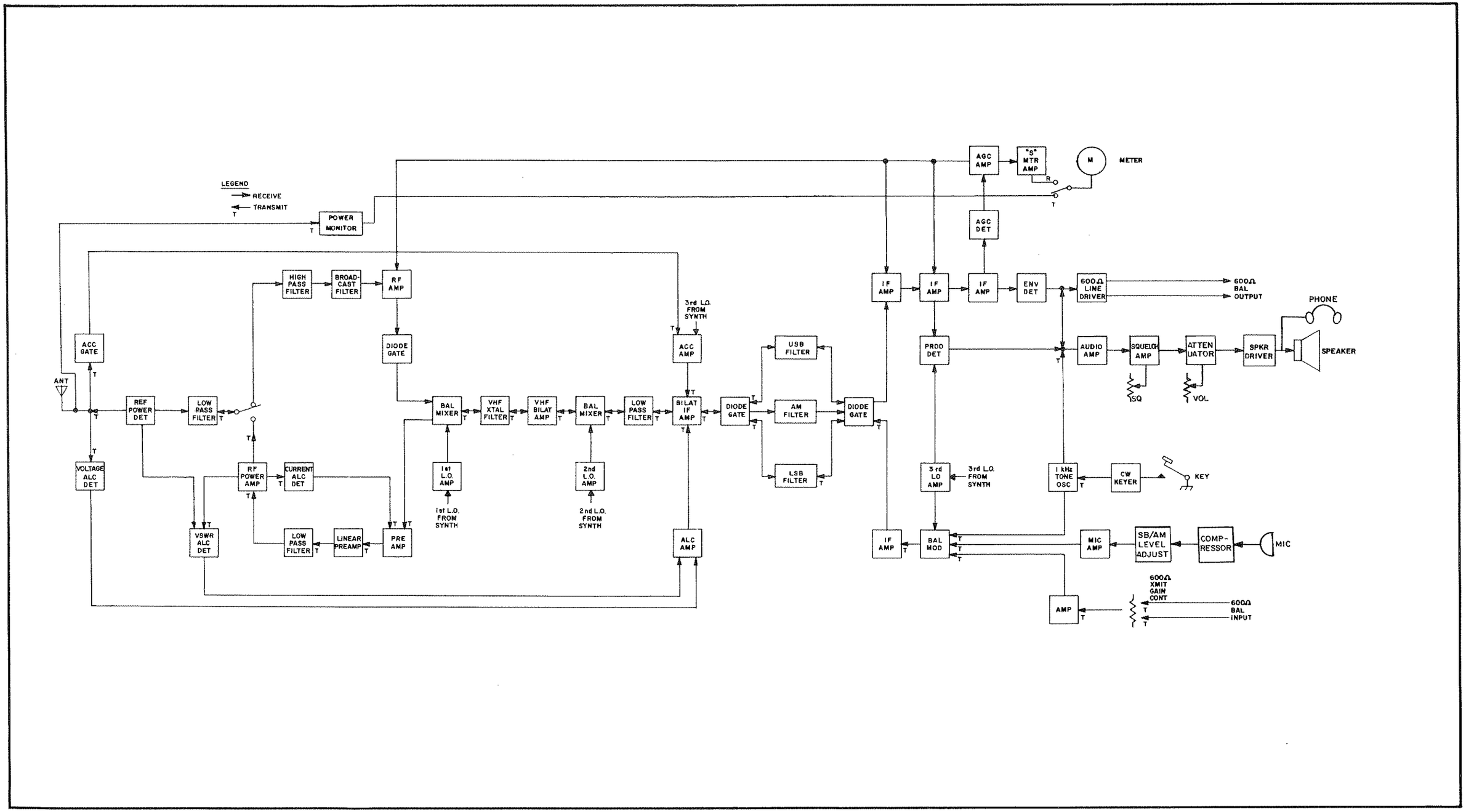


Figure 4.5 GSB-900R, Transceiver Block Diagram

4.4.4 VHF MIXER –1A3A1 (Transmit)

Refer to Figure 5.18.

4.4.4.1 GENERAL

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

4.4.4.2 LOW PASS FILTER AND BALANCED MIXER

The SSB (or AM) signal from the IF/Filter board enters the VHF mixer board on pin 5 of 1A3A1-P1. From there, it passes through a low pass filter, C62 thru C66, L14 and L15, to attenuate harmonics of the 10.5 MHz signal. Then it is injected into a balanced mixer at the center tap of T9. Operation of the balanced mixers is described in Section 4.3.2.

4.4.4.3 TRANSMIT BILATERAL AMPLIFIER AND FILTER

The 10.5 MHz signal is converted up to 91.25 MHz and fed to the bilateral amplifier. In transmit, Q7 is activated and Q6 is turned off (again see Section 4.3.3 for discussion). Input to Q7 is at T8, 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 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.

4.4.4.4 BALANCED MIXER AND RECEIVER SHUT DOWN

The balanced mixer combines the 91.25 MHz signal with the first L.O. providing a difference frequency equal to the desired output frequency. This signal now has the sideband reversed per the earlier discussion, in paragraph 4.3.3.2, and is fed to the pre-amplifier Q3. The +12T voltage at pin 10 of 1A3A1-P1 turns on Q1 and Q3 and turns off diode CR3. During transmit, +12R goes to ground, but the AGC voltage remains at approximately +9VDC on pin 13 of 1A3A1-P1, which turns diode CR1 on. This drops the voltage on gate 2 of Q2 to approximately +1 VDC, turning off Q2. This prevents transmit loop oscillations by breaking the path between RF input (Receive) on pin 15 of 1A3A1-P1 , and input to the transmitter preamplifier at C34.

4.4.4.5 EXCITER LINEAR AMPLIFIER

The signal is amplified in Q3 and Q1 and passed through a low pass filter, C10, C11, C12, C19, C20, L6, and L7, to pin 8 of 1A3A1-P1. R16 sets the overall system gain to the proper level.

4.4.4.6 CURRENT ALC AMPLIFIER

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

Whenever the P.A. current exceeds a preset 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.

4.5 R.F. POWER AMPLIFIER 1A7A1

4.5.1 GENERAL

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

amplifies this to the 100 watt level. A schematic diagram of the power amplifier is shown in Figure 5.24.

4.5.2 PREDRIVER, DRIVER AND POWER AMPLIFIER

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

4.5.3 CURRENT ALC DETECTOR

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

4.5.4 VSWR ALC DETECTOR

A detector circuit, R30, R31, CR4 and C28 is coupled to the collector of Q6 to monitor the collector AC voltage. If the voltage should exceed 65V peak (normally caused by high VSWR), the voltage appearing on pin D of 1A7A1-J3 causes the VSWR ALC amplifier on the sideband generator board, 1A3A3, to reduce the transmit I.F. gain to bring the output to within safe limits for the output power transistors.

4.6 POWER SUPPLY 1A6

Refer to Figure 5.25.

4.6.1 GENERAL

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

4.6.2 28VDC REGULATOR

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

Two protection circuits are provided to prevent damage to the regulator transistor and to the sections of the GSB-900R 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 transceiver input power and waiting approximately 15 seconds for 1A6C5 to discharge.

If the regulator transistor,1A6-Q101, should ever fail short circuit, approximately 42VDC would appear on the output causing damage to the audio speaker driver and the R.F. power amplifier. CR4 is a zener diode which will conduct when the output voltage reaches 35 VDC, sending a voltage pulse to SCR Q104. This will cause Q104 to conduct, blowing fuse F1 (See Figure 5.25), preventing damage to components using 28 VDC.

4.6.3 12 VDC AND 5 VDC REGULATORS

The +12 VDC and +5 VDC power supplies are very similar in design. Each uses a bridge rectifier assembly, U1 or U3, to obtain DC, then filters the AC component in capacitors C5 or C9. Both supplies

use integrated circuit voltage regulators for maximum ripple reduction and excellent regulation. The main circuit differences are the methods in which the I.C. internal reference sources are utilized to obtain the desired output voltage. The integrated circuits drive series regulator transistors to supply the normal 1 ampere currents.

Protection circuits are also built into these two supplies. Resistors R6 and R14 monitor the current and supply a feedback voltage to the regulator to limit the current to 3 amperes. A momentary short circuit on either supply (such as carelessness during troubleshooting) will go unnoticed.

In addition, should the series regulator fail short circuit for any reason, voltages higher than the regulated voltages could appear on the outputs causing damage, Zener diodes CR7 or CR8 will conduct if the voltages rise beyond safe points, and they then send a voltage pulse to SCR Q3 or Q4 causing it to conduct and blow its respective fuse.

4.6.4 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 transceiver, (See Figure 3.3).

4.6.5 D.C. INVERTER -1A6A2

Figure 5.26 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

If the input D-C voltage is changed (13V, 26V) it is necessary to move two wires on terminal strip 1A6TB2 and set switch S1 on the D-C module to the correct position.

Relay K1 is used to keep the oscillator transistors within allowable ratings during AC operation of the power supply. This allows the DC modules to remain connected to the power supply without damage during AC operation. Note that for 13 VDC operation, the transistor collectors (Q1 and Q2) are connected to the 13V power transformer input windings 2 and 6 on TB2, and S1 shorts out R1. For 26VDC operation, the transistor collectors (Q1 and Q2) are connected to the 26V power transformer input windings 1 and 7 on TB2 and S1 is open, inserting R1 into the bias circuit.

Either positive or negative ground DC sources may be used, since the DC input circuit on the GSB-900R 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 receiver/exciter assembly (See Figure 5.7).

4.7 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, receive filter board, and motor control board. Figure 5.27 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.

4.7.1 GENERAL

The filters are arranged to provide low pass filtering in the transmit mode and band pass filtering in the receive mode by switching in high pass filters during receive mode only. Therefore, only the transmit low pass elements must handle 100 watts of power and the high pass receive elements utilize small low power inductors. The low pass and high pass filters are all 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 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 5.29, 5.30, and 5.31. Note that unused

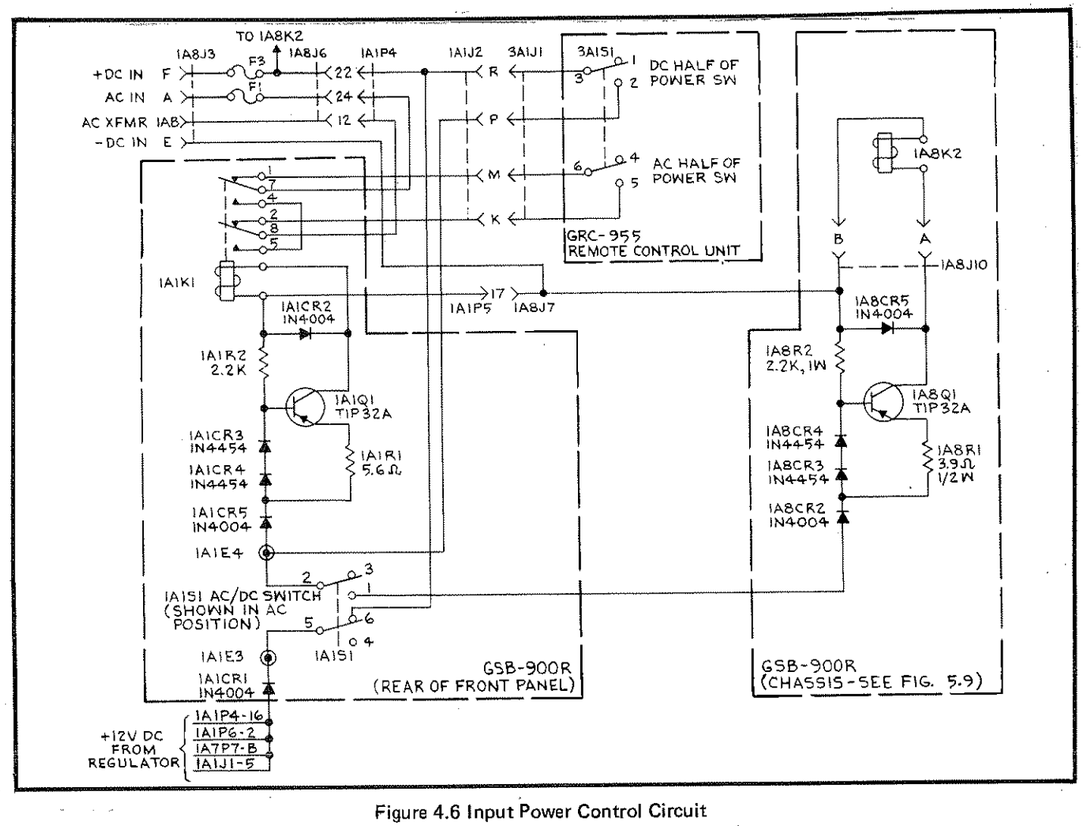


Figure 4.6 Input Power Control Circuit

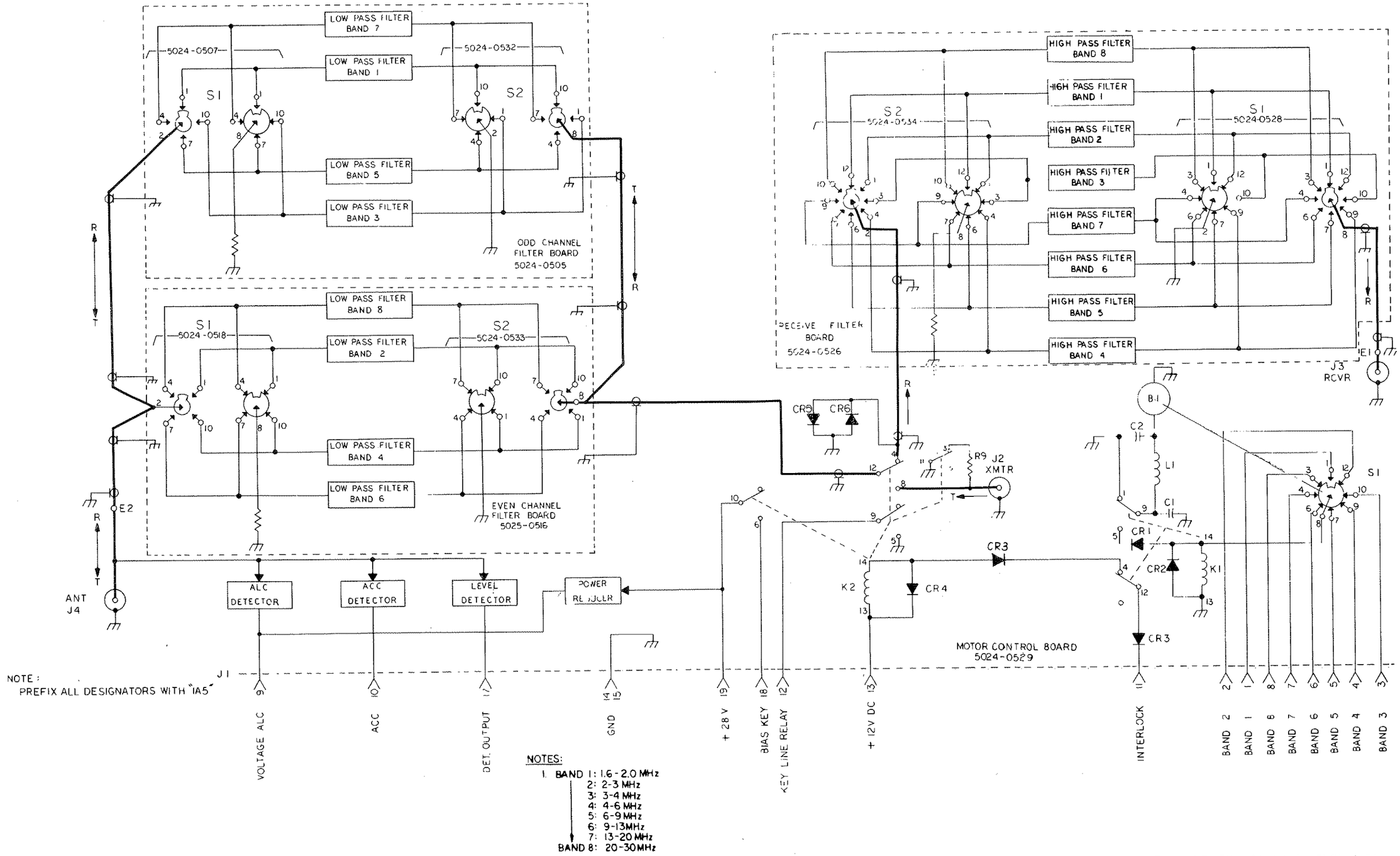


Figure 4.7 Filter Module (1A5) Block Diagram

BAND NUMBER		FREQUENCY RANGE
REMOTE	FILTER MODULE	
0	1	1.6 to 1.9999 MHz
1	2	2.0 to 2.9999 MHz
2	3	3.0 to 3.9999 MHz
3	4	4.0 to 5.9999 MHz
4	5	6.0 to 8.9999 MHz
5	6	9.0 to 12.9999 MHz
6	7	13.0 to 19.9999 MHz
7	8	20.0 to 29.9999 MHz

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

filters are shorted together and taken to ground through 10 ohm resistors. This effectively "de Q's" the unused filters and prevents interaction with the filter that is active.

4.7.2 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 5.28.

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.

4.7.3 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 transceiver.

4.7.4 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.

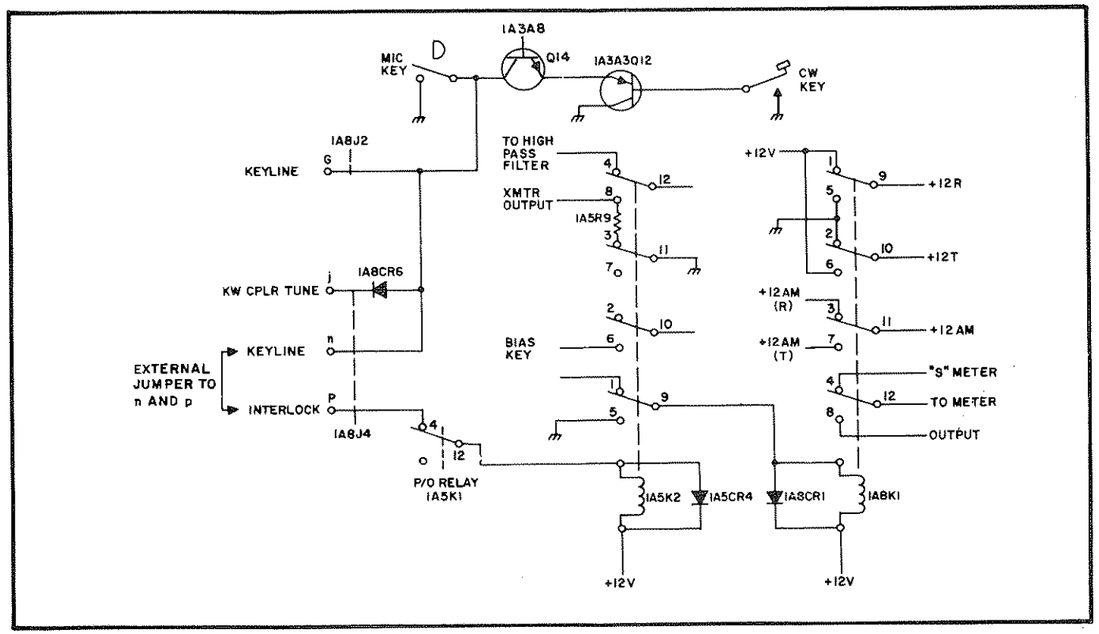


Figure 4.8 Keying Circuit

4.7.5 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.

4.7.6 KEY LINE

Relay K2 is used in conjunction with relay 1A8K1 to key the transceiver to transmit mode. A schematic of the keying circuit is shown in figure 4.8. 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. Diode CR3 prevents interaction between K2 and other units externally attached to the keyline.

4.7.7 REFLECTED POWER DETECTOR

The Reflected Power Detector provides an ALC output proportional to reflected power (VSWR) to protect the RF power amplifier. If the VSWR is less than 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.

4.8 COUPLER INTERFACE BOARD – 1A1A1

See Figure 5.10

4.8.1 GENERAL

This board contains the SSB and AM audio gain controls plus all logic required to energize the Antenna coupler from a TUNE command and shut off after completion of the tuning cycle. This board is located just inside the transceiver front panel.

The SSB audio from the speech compressor on the Audio Processing board is adjusted by R2. In AM mode, Q1 is energized to reduce the audio level to that required for 100% modulation. The modulation percentage for AM is adjusted by R4.

Relays K1 and K2 are energized by a TUNE command from the Remote Unit. K2 energizes the coupler tune relay, changes the mode to AM, and keys the transmitter. The coupler tune relay puts a ground on 1A1P6-pin 6 which makes Q3 and Q2 conduct, energizing K2. K2 in turn latches K1 to keep it energized during the tuning cycle.

Upon completion of the coupler tuning cycle, the coupler tune relay drops out, removing the ground from 1A1P6-pin 6. This makes Q3 and Q2 no longer conduct, releasing K2, which in turn unlatches K1, returning the radio to normal operation.

4.9 AUDIO PROCESSING BOARD – 1A1A2

See Figure 5.11

4.9.1 GENERAL

The Audio Processing board contains the receive squelch circuit, the receive volume control, and the transmit audio compressor. This board is located next to the Coupler Interface board.

Audio from the receiver is supplied to this board on 1A1P7-pin F. It is amplified by U1-2 and U1-4, then detected by CR1 and CR2. The resulting d.c. voltage turns on U1-5, which in turn opens the audio gate, Q1, unsquelching the receiver. U1-3 is an emitter follower to match impedances and drive the audio gate. Squelch sensitivity at maximum squelch position is adjustable by R23. This adjustment is set to insure a 30uV signal will break squelch when the Remote Unit Squelch Control is set to maximum squelch.

The squelch audio is injected into U2 where it is attenuated in proportion to the d.c. voltage on pin 2 of U2. Pin 2's voltage is proportional to the voltage on the base of Q3, which is obtained from the Remote Unit Volume control.

Transmitter audio from the microphone is compressed by U3 and Q2, then is fed to the Coupler Interface board for level control.

4.10 GRC-955 REMOTE CONTROL UNIT

See Figure 5.32

4.10.1 GENERAL

The remote control unit contains the switches which supply digital frequency information to the synthesizer and the digital display drivers. Also included are the VOLUME and SQUELCH controls, a DIMMER control, the Frequency Display, coupler status lights, a push button MODE switch, audio speaker driver and speaker, power on/off switch, PHONE and KEY jacks, microphone or handset connector, and meter.

4.10.2 CONTROL HEAD – Figure 5.33

The control head is removable from the remote control unit by disconnecting the large connector at the rear panel and turning the four Dzus fasteners on the front panel 1/4 turn CCW.

4.10.2.1 DECODER BOARD – 2A1 – Figure 5.34

Digital signals, ground for a "0" state and open circuit (+5VDC) for a "1" state are applied by the digital switches to display drivers U1 through U6. These in turn drive the appropriate seven segment LED display. The illuminated push button MODE switch is also a part of this board.

A "low limit" circuit is included on the board to warn the operator that he has dialed a frequency below 1.6 MHz. Q1, Q2 form a display flasher circuit which pulses the display on and off at a slow rate, allowing the operator to observe the incorrect dial setting. In conjunction with the flashing display, the transceiver is disabled at frequencies below 1.6 MHz.

4.10.2.2 DISPLAY BOARD – 2A2 – Figure 5.34

The display board contains the seven segment high intensity LED displays used to indicate the selected frequency. A decimal point is illuminated to show the frequency in kHz.

4.10.2.3 DIMMER

Transistor 2A3Q1 is a controllable regulator which supplies voltage to the lamps and the digital display. The voltage on Q1 base is decreased by the dimmer causing the dimmer output to decrease accordingly.

4.10.2.4 5VDC REGULATOR

U1 is a single packaged 5VDC regulator which supplies power to the display drivers.

4.10.2.5 CONTROL LIGHTS

Lamps DS1, DS2, DS3 and DS4 are located behind the ON, LSB, AM, and USB push buttons for button illumination, and are controlled by their respective push button switches. DS5 is located behind the TUNE push button to illuminate it, but it is controlled by the Antenna Coupler, and is illuminated only when the coupler is tuning.

Panel lamps 2A3DS1 and DS2 back light the front panel for night use.

Fault lamp 2A3DS3 (yellow) is illuminated only if the Antenna Coupler detects a fault, such as a failure to tune the antenna. Ready lamp 2A3DS4 (green) is illuminated when the coupler tuning sequence is successfully completed and the transceiver is ready to transmit.

4.10.3 SPEAKER DRIVER BOARD – 3A1A1
Figure 5.21

The speaker driver is a hybrid integrated assembly capable of delivering five watts of audio to an eight ohm speaker. Output to the speaker is taken through 1000uF capacitor (C22 and C3 in parallel), to provide good fidelity. The assembly incorporates protection against short circuits of small duration.

4.10.4 AUDIO GATE BOARD – 3A1A2

The speaker driver audio input is controlled by the audio gate board. In receive, the keyline is at +12V which saturates Q2, cutting off Q1 and permitting the audio to proceed to the speaker driver board. In transmit, the keyline is grounded, Q2 collector goes high turning on Q1, which provides a low impedance path for the audio to ground. During CW operation the 1kHz sidetone is required when keying the exciter. The cathode end of CR2 is switched to ground through the CW key, disabling the base drive to Q1 and allowing audio to pass to the speaker driver.
Zener diode, CR1, is on the +28VDC line and prevents "turn on" transients from damaging the speaker driver module.
Resistor R6 is a voltage dropping resistor used to reduce 28VDC to approximately 10-12V for the meter lamp.

4.11 INPUT POWER CONTROL CIRCUIT
See Figures 4.6, 5.8, 5.9

4.11.1 AC OPERATION

Input a-c power is connected to the power connector 1A8J3. Before power turn-on, one side of the a-c line is routed through the normally closed contacts of relay 1A1K1 (located on the front panel) and through the interconnect cable to the power ON-OFF switch, 3A1S1, in the GRC-955 remote control unit. When switch 3A151 is closed, a-c power is applied to the a-c power transformer, 1A6T1, located in the GSB-900R. This causes regulated +12VDC, from the power supply, to appear at switch 1A1S1 (the a-c/d-c switch located on the rear of the front panel). The switch should be in the a-c position which allows the 12V to be routed through the remote control interconnect cable and then through ½ of the power ON-OFF switch, 3A1S1. It then backs through the interconnect cable to the constant current amplifier, 1A1Q1, which pulls in relay 1A1K1. This removes a-c from the interconnect cable and the GRC-955 control box which increases reliability and prevents a-c hum from being coupled into other circuits.

4.11.2 D-C OPERATION

Input a–c power is connected to the power connector 1A8J3 and through the remote control interconnect cable to the power ON-OFF switch, 3A1S1. When 3A1S1 is closed and switch 1A1S1 (on rear of front panel) is in the d-c position, relay 1A8K2 is energized by amplifier Q1, (located on front of chassis). Relay 1A8K2 then routes d-c power to the d-c power supply module, 1A6, as shown in figure 5.9.

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).

5.3.1 TRANSCEIVER

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.

5.3.2 REMOTE UNIT

a. Unsnap the two fasteners on each side of the equipment and remove the cover.

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

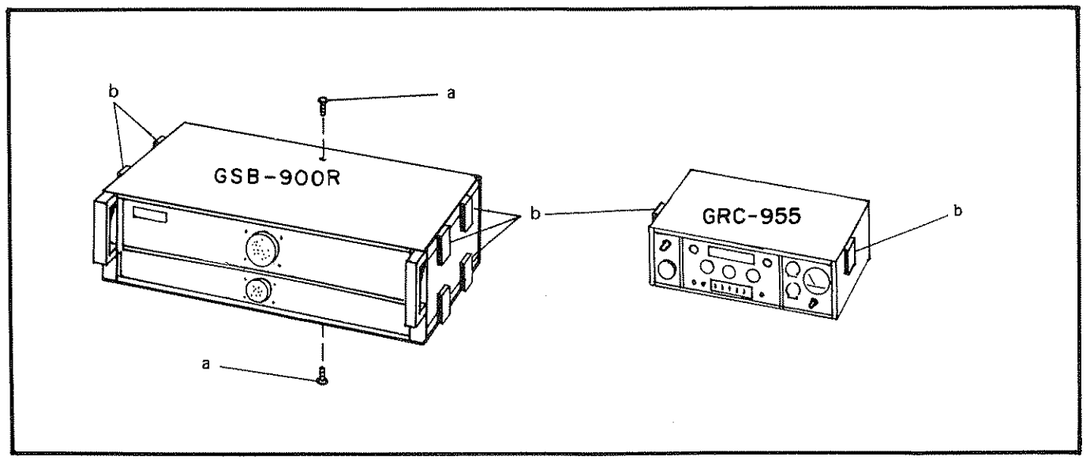


Figure 5.1 GSB-900R and GRC-955, Cover Disassembly

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). 1A1S1 must be in A-C position.

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 Transceiver Front Panel wiring, Figure 5.9 for Main Frame wiring and Figure 5.32 for Remote Control Unit wiring with their appropriate parts lists.

d. Connect the two interconnecting cables between the transceiver and the remote control unit. Check inside transceiver front panel to be certain that toggle switch is in AC position. (Note: If DC operation is used, toggle switch *must* be in DC position.

SWITCH or CONTROL	POSITION
FREQUENCY Switches	01.6000 MHz
MODE Switch	LSB
SQUELCH Control	Fully Clockwise
DIMMER Control	Fully Clockwise
VOLume Control	One Half Clockwise

Table 5.1 Front Panel Control Test Positions

5.4.3 POWER SUPPLY (1A6)

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

5.4.4 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.		Turn frequency switches to 1.5000 MHz	Frequency delay should flash "ON" and "OFF" 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	Frequency display should be steady and "S" meter should read zero. If not, check transistor 1A3A4 Q4 on audio board.
3	L.O. Blanker (1A8A1)		Sequence 1 MHz Frequency control switch through each of its positions (both clockwise and counterclockwise) with MODE switch in USB.	Brief blanking of receiver noise whenever switch position is changed. If faulty, refer to schematic and check voltages and waveforms.

5.4.5 RECEIVER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1			Perform steps a thru c of par. 5.4.2.	
2	Sensitivity	Audio VTVM on phone jack on front panel for steps 2 through 7.	Turn VOLUME control to 1/4 CW. Set RF signal generator to 50 microvolts at 16.0 MHz and adjust frequency for a peak audio signal on audio VTVM.	Peak indication. If none, consult sections 4.3.2, 4.3.3, and 4.3.4. Check for synthesizer outputs at LO 1, LO 2, and LO 3 on Receiver/Exciter Mother Board 1A3A5. See section 5.5.
3	Same		Remove coax cable from RF signal generator output. Adjust VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale.
4	Same		Reconnect coax cable to RF generator and set generator to 0.5 microvolts (into 50 ohms).	Minimum 10db increase over level in step 3. If not, realign VHF mixer board (1A3A1) and IF/Filter Board (1A3A2).See par. 5.6.1 and 5.6.2.
5	Same		Set MODE switch to USB and repeat steps 3 and 4 above.	If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter Board (1A3A2).
6	Same		Adjust RF signal generator frequency for "zero beat", and increase output to 3 microvolts (into 50 ohms). Set MODE switch to AM position and adjust VOLUME control for audio VTVM reading of -10db on 30 MV scale.	-10db on 30 MV scale. If no output, check MODE switch wiring for broken wire and check switching diodes on IF/Filter board (1A3A2).
7	AM Sensitivity		Turn on 30% modulation at 1 kHz on RF signal generator.	Minimum 10db increase over level in step 6.
8	AGC Control	Audio VTVM on PHONE jack on front panel and VOM set on 10 VDC range, between test point 1A3A4 TP1, on audio board and chassis ground for steps 8 thru 12.	Remove 1 kHz modulation and set signal generator output to zero, set MODE switch to USB.	VOM should read between +7.5 and +9.0 VDC, and "S" meter should read zero. If "S" meter reads full scale, check wiring and transistor Q4 on the audio board, (1A3A4).
9	Same		Set signal generator output to 5 microvolts and adjust frequency for peak audio VTVM reading.	VOM should read down scale and "S" meter should begin to read upscale.
10	AGC Control		Adjust Remote Unit VOLUME control for audio VTVM reading of -10db on the 1 volt scale.	-10db on 1 volt scale.
11	Same		Increase RF signal generator output to 500,000 microvolts.	VTVM should increase 15db or less from reading in step 10, and "S" meter should read full scale. If not, check 1A3A4 Q5 and associated circuitry.
12	600 ohm AUDIO OUTPUT	Audio VTVM between pins E and F of rear panel AUDIO connector 1A8J2.	Set RF signal generator to 100 mocrovolts. Adjust potentiometer, R48, on the audio board (1A3A4), to provide a VTVM level of +10 dBM (2.5V RMS).	+10 dBM reading. If not, check integrated circuit, 1A3A4 U1, and associated circuitry.
13				

5.4.6 TRANSMITTER TEST

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1		Dummy load connected through coaxial cable to rear panel ANT connector, 1A8J1 through 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, XMIT GAIN fully counterclock-wise	
2	AM Carrier check & adjustment		Turn mode switch to AM and key microphone. Adjust potentiometer, R18 (ACC Control), on sideband generator board (1A3A3) to give a VTVM reading of 42 VRMS.	VTVM should read 42 VRMS. If not, check relays 1A8K1 and 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 USB position, insert CW key in KEY jack on front panel. Adjust VOLUME control to 1/3 CW. Depress CW key and adjust ALC control, R55, on sideband generator board (1A3A3) to give a VTVM reading of 71 VRMS.	VTVM should read 71 VRMS. If not check Q6, Q7, Q8 and Q12, and associated circuitry on sideband generator board (1A3A3). A 1 kHz tone should be heard through the speaker when the key is depressed and the transmitter should remain keyed for approx-imately one second after the CW key is released. If not, check 1A3A3 Q12 and associated circuitry.
4	CARRIER NULL		Turn MODE switch to USB and depress micro-phone 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		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.
8	600 ohm input	Connect audio VTVM and audio oscillator, set to 1 kHz, to pins B and C of AUDIO connector 1A8J2 located on the rear panel.	Adjust audio oscillator output for '0' dBM on the audio VTVM. Set MODE switch to USB. Key transmitter with microphone and adjust R58 on audio board 1A3A4, until RF VTVM reads 70 VRMS.	If no output is obtained, check cabling, 1A3A4 T2, 1A3A4 R58, 1A3A3 Q11, and associated circuitry.
9	I.F. Gain adjustment	Same as in 1 above	Set FREQUENCY dials for 29.99 MHz. Extend VHF Mixer out of card basket using extender card. Turn 1A3A1R16 fully CCW. Place MODE switch in USB and depress CW key. Turn 1A3A1R16 CW until power output levels off. Advance 1A3A1R16 approx.15 °beyond this point. Replace VHF Mixer in card basket.	VTVM reading between 67 and 71 volts RMS.

5.5 SYNTHESIZER

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

5.5.1 FAULT ANALYSIS

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

5.5.1.1 PRELIMINARY CHECKS

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
1	Freq. Std. output	Oscilloscope probe at X1A4A1 pin 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 5.9) If faulty, check R12 through R22 located on the back of the 10 kHz switch (1A1S4). Also check associated front panel wiring. b) 1 kHz and 17 MHz references (consult Spectrum Gen., 1A4A1 schematic). If faulty, check Spectrum Gen.

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE	IF FAULTY, CHECK-
					c) Frequency Control lines (consult tables 5.3 thru 5.9). 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 5.9). 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 5.3 thru 5.9) 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)			
	7 (2^3 1 MHz)	8 (2^2 1 MHz)	H (2^1 1 MHz)	J (2^0 1 MHz)
0	1	0	0	1
1	1	0	0	0
2	0	1	1	1
3	0	1	1	0
4	0	1	0	1
5	0	1	0	0
6	0	0	1	1
7	0	0	1	0
8	0	0	0	1
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

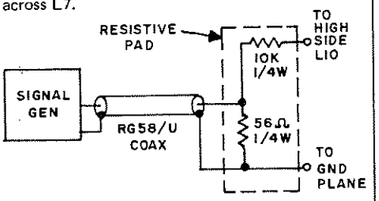
5.5.2 SYNTHESIZER SUBASSEMBLY TESTING AND ALIGNMENT PROCEDURES

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 # 5024-0030) supplied in the ancillary kit.

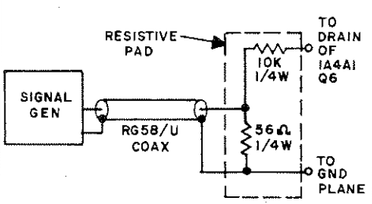
At any step in the procedure, if the required result cannot be obtained, refer to the schematic of the subassembly and make suitable voltage measurements to isolate the faulty component. When the faulty subassembly has been restored to operation the preliminary checks of Section 5.5.1.1 should be repeated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

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

5.5.2.1 SPECTRUM GENERATOR TESTING AND ALIGNMENT (CONT'D)

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 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.*

5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4a	Output frequency	Same as Step 3 above	Measure output frequency	Output frequency of 1.5000 MHz ±2 Hz. If out of tolerance: a) Refer to tables 5.9, 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.*

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:	

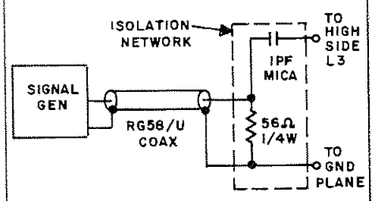
10 kHz DIAL	1 kHz DIAL	100 Hz DIAL	FREQUENCY (+2 Hz)
1	0	0	1.5100 MHz
2	0	0	1.5200 MHz
3	0	0	1.5300 MHz
4	0	0	1.5400 MHz
5	0	0	1.5500 MHz
6	0	0	1.5600 MHz
7	0	0	1.5700 MHz
8	0	0	1.5800 MHz
9	0	0	1.5900 MHz

See Note on following page.

5.5.2.2 LOW DIGIT GENERATOR (CONT'D)

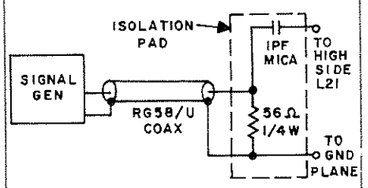
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
				NOTE *If the required frequencies cannot be obtained, refer to schematic and check U10.*
5a	Output Level	Same as Step 3 above	Set 10 kHz, 1 kHz and 100 Hz dials to "0"	Output level of 200 mv p-p minimum.
5b	Output Level	Same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

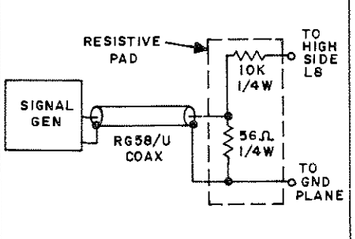
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	21 MHz Ampl. alignment and test	Oscilloscope probe on TP4.	Tune L13 for maximum output.	Sine wave, 800 mv p-p min. rep. rate=47.6 nsec. **NOTE** *If required output cannot be obtained, refer to schematic and check U1 and associated circuitry.*
2a	19.45 MHz Ampl.	 Connect RF voltmeter to U3 pin 6. Temporarily unplug the Low Digit Generator, 1A4A2, from the mother board. Temporarily solder a short jumper from U1 pin 2 to the printed circuit board ground plane. Set the signal generator frequency to 19.45 MHz using the Frequency Counter. Set the generator level to 250 mv RMS and connect as shown above.	Tune L3 and L5 for max. RF voltmeter reading. As tuning progresses, reduce signal generator level to keep RF voltmeter reading below 100 mv RMS.	

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
2b	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.	
2c	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.	
2d	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).

STEP NO.	TEST	TES EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
3	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.*
4a	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.	
4b	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).	
4c	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)	

5.5.2.3 TRANSLATOR (1A4A3) (CONT'D)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
4d	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.
5a	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.	

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5b	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.*	
5c	81.25 MHz 8.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.*
6a	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 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)
6b	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)

STEP NO.	TEST	TEST EQUIPMENT and TEST POINTS	PROCEDURE	REQUIRED PERFORMANCE
2	1MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9 volts above the transition frequency.	

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
0	1	0	11.0 MHz
0	2	0	12.0 MHz
0	3	0	13.0 MHz
0	4	0	14.0 MHz
0	5	0	15.0 MHz
0	6	0	16.0 MHz
0	7	0	17.0 MHz
0	8	0	18.0 MHz
0	9	0	19.0 MHz

NOTE

If required results cannot be obtained, refer to schematic and check U6, U5 and associated circuitry.

3	10 MHz Dial test	Same as Step 1a above	Follow the table below. In each case the V.O.M. should indicate greater than 4.5V below the transition frequency and less than 0.9V above the transition frequency	

10 MHz DIAL	1 MHz DIAL	100 kHz DIAL	Transition Frequency (±1 kHz)
1	0	0	20.0 MHz
2	0	0	30.0 MHz
2	9	9	39.9 MHz

NOTE

If required results cannot be obtained, refer to schematic and check U7, U8A, U8B, U13 and associated circuitry.

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 "O" alignment and test	Connect frequency counter to 1st L.O. out put (J1). Connect extemal +1.95 volts D.C. from power supply to X1A4A5 pin 4.	Set 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 10 MHz frequency selector switch (1A1S1) set at "0". Set 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 10 MHz frequency selector switch (1A1S1) to "1". Set 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 10 MHz frequency selector switch (1A1S1) set at "1". Set 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 10 MHz frequency selector switch (1A1S1) to "2". Set 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 10 MHz frequency selector switch (1A1S1) set at "2". Set 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 10 MHz frequency selector switch (1A1S1) to "1". Set 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 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 10 MHz frequency selector switch (1A1S1) to "2". Set 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.

5.5.2.5 VCO (1A4A5) (CONT'D)

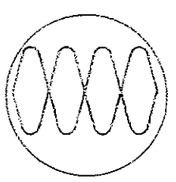
STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5a	1st L.O. output level to translator	Tack solder 47 ohm 1/4 or 1/2 watt carbon resistor from X1A4A5 pin 2 to ground. Connect open circuit probe tip from R.F. Voltmeter to X1A4A5 pin 2. Place a 50 ohm load on 1st L.O. output connector J1. Connect +1.95 volts D.C. from external power supply to X1A4A5 pin 4.	Set 10 MHz frequency selector switch (1A1S1) to "0". 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. 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 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 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.	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.	10 MHz frequency selector switch (1A1S1) position: "0" "1" "2"	 greater than 2.2 V.D.C. less than 0.5 V.D.C. less than 0.5 V.D.C. If these readings cannot be obtained, consult the schematic and check logic switches Q1, Q2, and associated circuitry.

5.6 RECEIVER/EXCITER BOARD ALIGNMENT

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

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
5.6.1	V.H.F. MIXER BOARD (1A3A1)			
1	1st IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1 and set frequency for 29.9 MHz.	Remove VHF Mixer Board from RCVR/ Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J1 and plug VHF mixer into extender card. Set Frequency switches at 29.9000. Mode switch at USB. Set RF generator level to 100 uV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust capacitors C41 and C44 for peak on the "S" meter. Next adjust Transformer T7 and T8 for peak on the "S"' meter. Recheck C44 and T7 for meter peak.	If no peaking is observed ckeck E24 and E18 on the RCVR/Exciter Mother board, using a high frequency oscilloscope to determine if 1st L.O. and 2nd L.O. are present (approximate OdBM). If not, check synthesizer sections 4.2 and 5.5. If 1st L.O. and 2nd L.O. are present, check outputs of Q5 and Q8 on VHF mixer board, then check Q2 and associated circuitry.
2	Overall Gain	Remove RF signal generator. Connect dummy 50 ohm load to Antenna connector along with HP410B VTVM.	Check output at 29.9 MHz in USB and AM. Adjust R16 until rated output is obtained in both modes. Check carrier at 42VRMS ±5VRMS and SSB (with microphone) at 71 VRMS ± 8 VRMS. Replace VHF mixer board in the card basket.	If rated output cannot be obtained, check setting of ALC control, R55, on Sideband Generator board, 1A3A3.
5.6.2	IF/FILTER BOARD (1A3A2)			
1	2nd IF alignment	Connect RF Signal Generator to Antenna connector 1A8J1, and set frequency for 16.0 MHz.	Remove IF/Filter board from RCVR/Exctr card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J2, and plug IF/Filter board into extender card. Set frequency switches at 16,000, mode switch at USB. Set RF Generator level to 100 uV and adjust frequency until a tone of approximately 1 kHz is heard in the speaker. Adjust inductors L3 and L4 for peak on the "S" meter. Remove Extender card and replace IF/Filter board in its connector in the card basket.	If no peak is observed, check U1 and U2 plus associated circuitry on IF/Filter board. Also check O3 and associated circuitry.
5.6.3	SIDEBAND GENERATOR BOARD (1A3A3)			
1	BALANCED MODULATOR TUNING	Connect RF VTVM and dummy load to antenna connector, 1A8J1.	Remove sideband generator board from RCVR/ Exciter card basket by grasping corners of board and pulling upward. Install extender card in slot for connector 1A3J3, and plug sideband generator board into extender card. Turn potentiometer 1A3A3, R34, approximately 8 turns. CW. Turn XMIT GAIN full CCW and set mode switch to USB. Key transceiver with microphone and, observing RF VTVM, tune Transformer T1 for maximum output. Remove extender card and replace sideband generator board in its connector in the card basket. Repeat carrier null alignment per par. 5.4.6, step 4.	If no carrier output is observed, check E16 on RCVR/ Exciter mother board to determine if 3rd L.O. is present (approximately 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.

5.6.4 COUPLER INTERFACE BOARD – 1A1A1

STEP NO.	TEST	TEST EQUIPMENT and TEST POINT	PROCEDURE	REQUIRED PERFORMANCE
1	Sideband Modulator Level	Connect a VOM between the ALC test point on the SB Generator board and ground. Connect microphone to MIC connector. Connect 50n dummy load to output rf connector.	Set frequency switches to 29.9 MHz. Set MODE to USB. Key microphone and speak normally. Adjust R2 to give an ALC voltage reading of 7VOC on voice peaks.	VOM should read 7VDC or less on voice peaks. If not, check 1A1A2 U2 and associated circuitry. Also check cabling for a broken or shorted connection.
2	AM Modulation Level	Connect the oscilloscope across the dummy load. Set scope on 50V/DV scale	Depress AM MODE switch. Key microphone and whistle into it with a steady tone. Turn R4 until the scope pattern just closes per sketch.	

5.6.5 AUDIO PROCESSING BOARD – 1A1A2

1	Squelch level adjust	Connect an rf signal generator to the antenna connector. Set frequency to 4.1 MHz and modulate 30% at 1 KHz.	Set frequency dials to 4.1000 MHz and MODE to AM. Adjust signal generator frequency to center of receiver pass-band. Turn SQUELCH control fully CCW. Adjust R23 so that SQUELCH just opens for a signal level between 30 and 50 uV.	Squelch opens for signal level between 30 and 50 uV with SQUELCH Control fully CCW.

5.7 FAULT ANALYSIS TABLE

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Receiver inoperative, meter not illuminated.	a. Primary power fuse F1, F2 or (for DC operation) F3 not installed or open.	a. Replace fuse.
	b. +12VDC fuse (1A6A1 F2) open in power supply.	b. Replace fuse.
	c. Power cord defective or not connected.	c. Make continuity check of cable, replace or repair cable.
	d. Power supply defective.	d. Refer to sections 4.6 and 5.4.3. Repair or replace regulator board or entire power supply module if required.
No audio or background noise at speaker or phones jack. Meter indicates RF signal present.	a. 28VDC protective crowbar has operated.	a. Turn off main power. Wait 15 seconds and re-energize radio. If still no audio, check 28VDC power supply for short circuited ouput.
	b. Speaker driver board defective.	b. Refer to section 4.10.3. Repair or replace defective assembly.
	c. Amplifier 1A3A4 Q11 defective.	c. Replace defective transistor.
No audio or background noise at speaker in all modes. meter does not indicate, but is illuminated.	a. +5 VDC fuse open in power supply.	a. Replace fuse. If fuse blows again, check +5V line for short circuit.
	b. VHF mixer board defective.	b. Refer to section 4.3.2. Repair or replace defective assembly.
	c. IF/Filter board defective.	c. Refer to section 4.3.3. Repair or replace defective assembly.
	d. Audio board defective.	d. Refer to section 4.3.4. Repair or replace defective assembly.
	e. Synthesizer defective.	e. Refer to section 4.2. Repair or replace defective assembly.
	f. Defective interconnecting cable	f. Check cable continuity.
AM mode normal, other modes inoperative.	a. 3rd L.O. injection absent at 1A3A4 audio board.	a. Make continuity test of cable. Repair or replace.
	b. Synthesizer defective.	b. Refer to section 4.2. Repair or replace defective assembly.
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.
No audio at speaker. Meter at full scale.	a. Transistor 1A3A4 Q12 defective.	a. Replace defective component.
Distorted audio at speaker. Meter remains at full scale.	a. Transistor 1A3A4 Q4 defective.	a. Replace transistor.
Received signals weak in all modes "S" meter also low.	a. Filter module defective or does not channel.	a. Refer to section 4.7. Repair or replace defective component.
	b. VHF mixer board defective.	b. Refer to section 4.3.2. Repair or replace defective assembly.

5.7 FAULT ANALYSIS TABLE (CONT'D)

SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
Received signals weak in all modes-Cont.	c. IF/Filter board defective.	c. Refer to section 4.3.3. Repair or replace defective assembly.
	d. Local oscillator injection levels low.	d. Refer to section 4.2. Repair or replace defective assembly.
	e. Coaxial cables defective.	e. Make continuity tests, repair or replace defective cable.
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 4.4.2. Repair or replace defective assembly.
	b. Defective IF/Filter board.	b. Refer to section 4.4.3. Repair or replace defective assembly.
	c. Defective VHF mixer board.	c. Refer to section 4.4.4. 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 4.5 and 5.8.4. Repair or replace defective assembly.
	f. Defective filter module.	f. Refer to section 4.7. Repair or replace defective assembly.
Transmitter keys, output ok in CW, carrier ok in AM, but no modulation or output in USB or LSB.	a. Defective microphone.	a. Repair or replace.
	b. Broken or shorted wire between microphone and RCVR/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.

5.7 FAULT ANALYSIS TABLE (CONT'D)

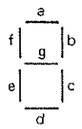
SYMPTOM	POSSIBLE TROUBLE	CHECKS AND CORRECTIVE ACTION
AM operation or coupler tune causes 28VDC crowbar to act, disabling 28V.	a. Inoperative or defective current ALC loop.	a. Check transistor 1A7Q7 and associated circuitry. Check 1A3A1 Q4 and associated circuitry. Continuity test cable between 1A3A1 P1 U and 1A7J3 B.
No CW or side tone.	a. Defective or inoperative tone oscillator.	a. Check 1A3A3 Q6, Q7, Q8, and associated circuitry.
Sidetone ok. but XMTR does not key in CW mode	a. Defective CW keying transistor. b. Defective T/R relay.	a. Check 1A3A3 Q12, CR7, CR8, and associated circuitry. b. Check relays 1A8K1 and 1A5K2.
Unit inoperative with DC main power applied.	a. Main source polarity reversed. b. DC module not installed or installed improperly. c. DC module defective.	a. Switch + and – leads to DC source. b. Refer to section 2.3.2. c. Refer to section 4.6.2 and repair or replace defective module.
Power output ok, but no meter indication, meter ok on receive.	a. Inoperative or defective output detector circuit. b. Broken wire in cable line.	a. Check detector 1A5CR5 and associated circuitry. b. Make continuity checks and repair.
ANTENNA COUPLER PROBLEMS		
Power output ok, but no meter indication, meter ok on receive.	a. Defective or disconnected coaxial cable between transmitter and coupler. b. Defective or inoperative detector in coupler. c. Broken wire in cabling.	a. Continuity test and repair or replace. b. Repair or replace defective device. Consult coupler handbook. c. Continuity test and repair.
Coupler does not tune	a. +28VDC missing in coupler. b. Coupler tune line not grounded in coupler tune mode.	a. Continuity test and repair. b. Check mode switch wiring and continuity of cable and repair.

5.7.1 FAULT ANALYSIS - Remote Control

The remote control assembly consists primarily of switches and display drivers. The display drivers operate from a Standard BCD code (see table below) obtained from the switches directly. For instance, if a display segment is continuously illuminated, the problem may be located in the corresponding driver. Table 5.9 is provided as an aid to troubleshooting display problems.

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

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



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

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

Table 5.9 Display Segment Illumination vs Driver Input/Output

5.8 MODULE REMOVAL

This section provides special test information and module removal instructions.

5.8.1 REMOVAL OF FILTER MODULE-1A5

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

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

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

5.8.2 FRONT PANEL (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.

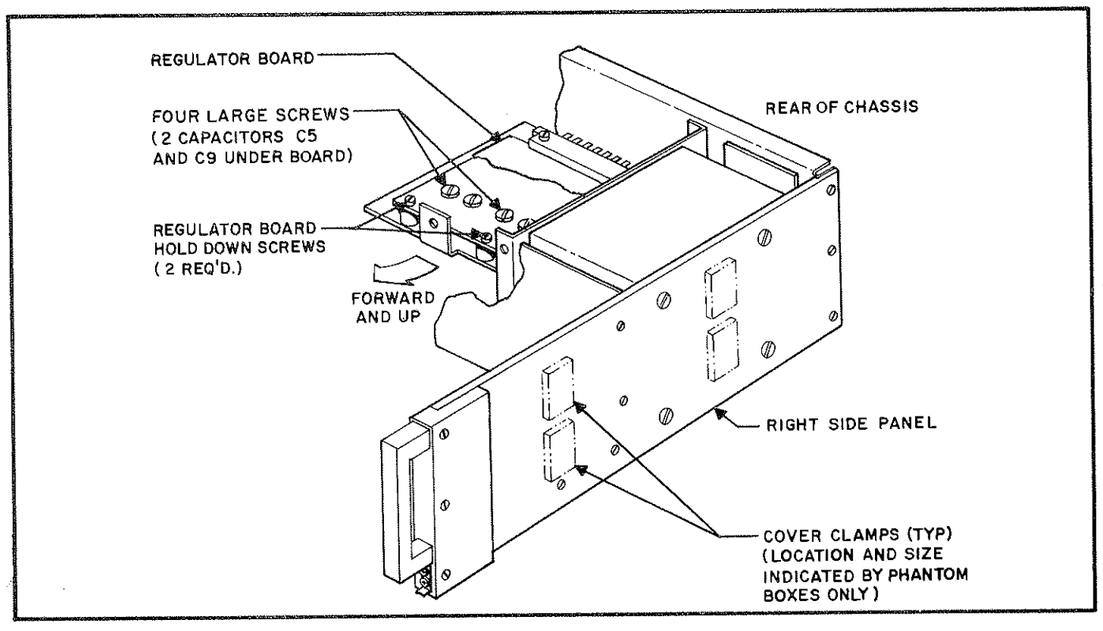


Figure 5.2 Power Supply Regulator Board (1A6A1)

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.

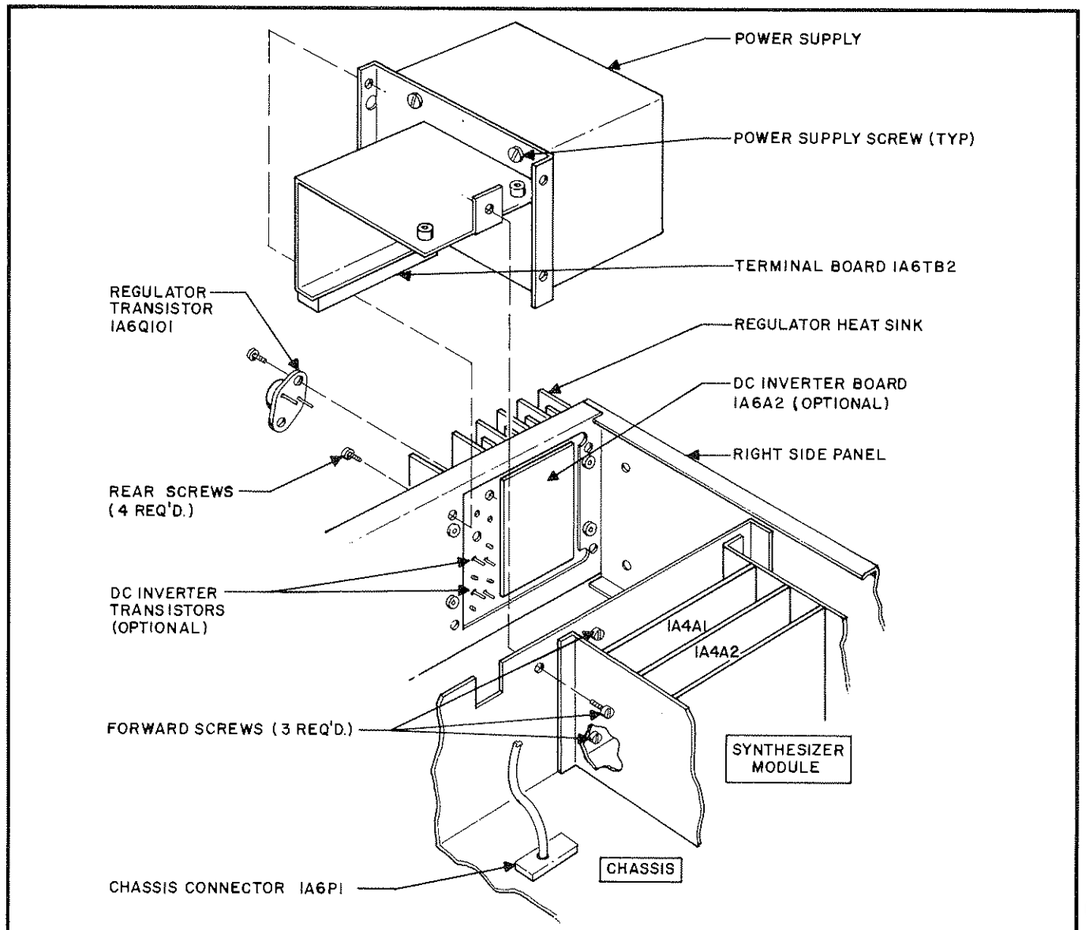


Figure 5.3 Power Supply Removal (1A6)

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

5.8.4.2 For servicing the power amplifier, it is desirable to use an external power source capable of 28VDC at 12 amperes, continuously variable from 0 to 28 VDC. If such a power source is not available, the transceiver power supply can be used. A typical test set up is shown in Figure 5.4.

CAUTION

When using a HP 606 or other RF signal generator to test the power amplifier, extreme caution should be exercised to prevent overdriving the unit and needlessly destroying transistors. Remember, the protection circuits are disconnected during tests of this type.

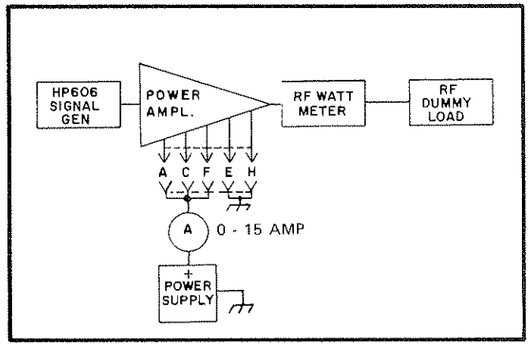


Figure 5.4 Power Amplifier Test Setup

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

5.8.4.4 If power output is low, the defective stage can be readily determined by observing with an oscilloscope the wave form at the input center tap of T2 (the 10 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. If Q5 and Q6 have been replaced it is recommended that the bias current be checked. This can be done by unsoldering the top wire of inductor L5 from the top of T5/T6. Connect a d-c ammeter from L5 to T5/T6. Apply 28VDC to the PA and adjust R23 until the meter reads 80 ma. Remove the ammeter and carefully resolder the inductor lead.

5.8.4.7 When transistor replacement is complete, test the power amplifier per test setup shown in figure 5.4. Apply D.C. power and slowly increase signal generator drive until 100 watts is shown on the wattmeter. The ammeter should indicate approximately 8.5 amperes. Allow the amplifier output to remain at 100 watts for one or two minutes. Remove the signal drive. The ammeter should drop to 1 ampere or slightly greater. If the current drops to 2 amperes or higher and slowly decays toward the 1 ampere level, this means that one or both output transistors has not been properly seated to the heat sink. They should be removed, examined for foreign particles and replaced carefully. Repeat the above test to insure proper installation.

5.8.4.8 After installing power amplifier in transceiver, check current ALC to be sure it is operational. This may be done by placing an oscilloscope probe on the collector of 1A3A1Q4 on the VHF mixer board. Set the vertical range to 2VDC per division, sweep speed at 50 milliseconds per division and set trace at lowest marker division. Set transceiver mode switch to USB and XMIT GAIN fully CCW. Key transceiver and observe voltage rise. Trace should appear as in Figure 5.5A. Now place MODE switch in AM position and key transceiver. Oscilloscope trace should appear as in Figure 5.5B. The additional step in the wave form is evidence that the current ALC is operational and is preventing overdrive to the power amplifier. If this additional step is not observed, trouble shoot the current ALC loop and correct the problem before rekeying the transmitter. Without the current ALC protection, the power amplifier can be destroyed. It is designed to limit the amplifier current to10 amperes.

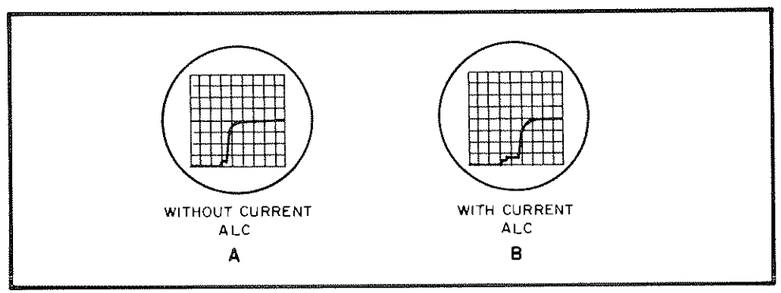


Figure 5.5 Current ALC Wave Form

This current can then be monitored across 1A7R24 in the power amplifier or 1A6R2 on the power supply regulator board. Since these resistors are 0.1 ohm resistance, a voltage of 1 volt across them represents 10 amperes current.

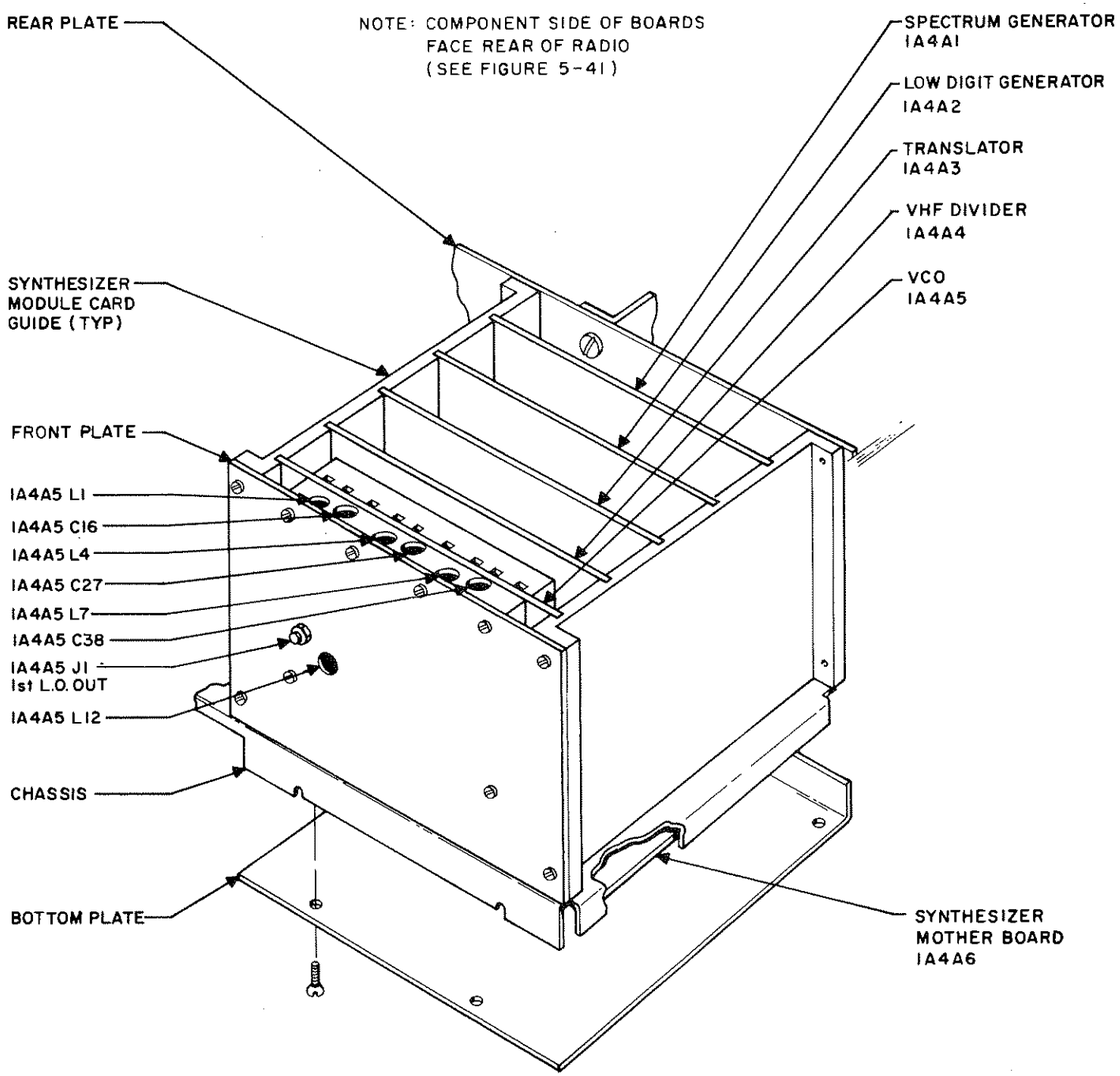


Figure 5.6 Synthesizer Mechanical Assembly

SUNAIR GSB-900R

DESIGNATOR		
ASSEMBLY	SUBASSEMBLY	
1A1		FRONT
	1A1A1	COUPLE
	1A1A2	AUDIO F
1A3		RECEIV
	1A3A1	V.H.F. M
	1A3A2	I.F./FIL
	1A3A3	SIDEBA
	1A3A4	AUDIO
	1A3A5	RECEIV
1A4		SYNTH
	1A4A1	SPECTR
	1A4A2	LOW DI
	1A4A3	TRANS
	1A4A4	V.H.F.
	1A4A5	V.C.O.
	1A4A6	SYNTH
1A5		FILTE
	1A5A1	ODD C
	1A5A2	EVEN
	1A5A3	RECEI
	1A5A4	MOTO
1A6		POWE
	1A6A1	REGU
	1A6A2	D.C. IN
1A7		R.F. P
	1A7A1	R.F. P
1A8		CHASS

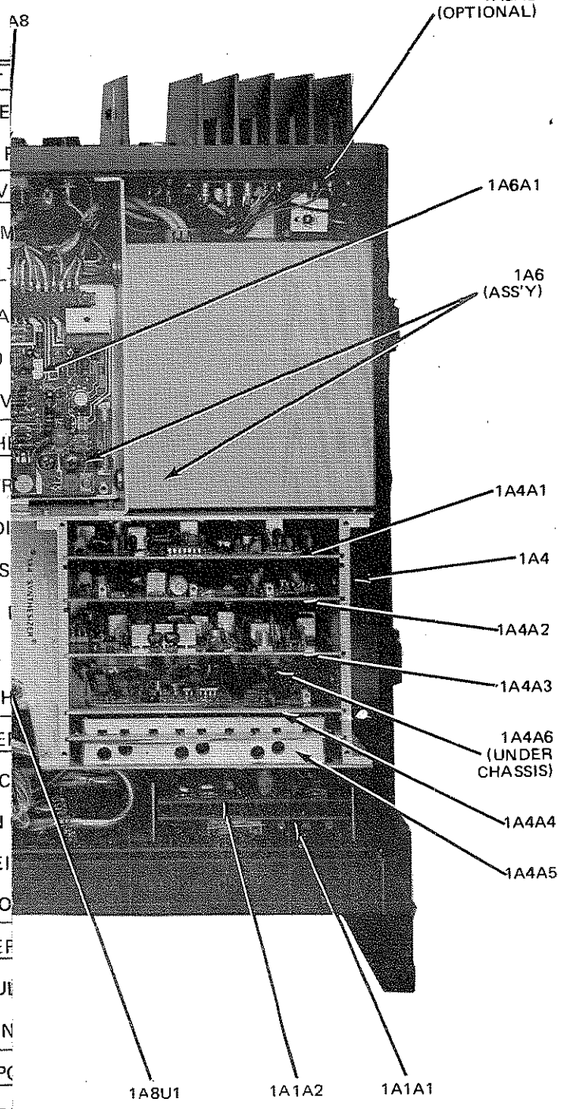


Figure 5.7 GSB-900R, Top View and Table of Assemblies

5.9 SCHEMATIC DIAGRAMS

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

FRONT PANEL ASSEMBLY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR1	Diode, Rectifier, 1N4004	0405180004
S1	Switch, Toggle, DPDT	0346370001
1A1P4	Connector, Power, 24 Pin Rect.	0753330008
1A1P1,P3	Connector, PC, 15 Pin Female	0753340003
1A1P5	Connector, Power, 36 Pin Rect.	0754070000
1A1P7	Connector, PC, 18 Pin Female	0754230007
1A1J2	Connector, Power, 26 Pin Round	0754550001
1A1J1	Connector, Power, 61 Pin Round	0754960005
1A1P6	Connector, PC, 18 Pin Female	0755980000
1A1A1	Coupler Interface Bd Ass'y	1000410005
1A1A2	Audio Processing Bd Ass'y	1000450007

OBSOLETE

5.9 SCHEMATIC DIAGRAMS

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

FRONT PANEL ASSEMBLY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FRONT PANEL ASSY, GRN	0754960005
1 A1 J1	Connector, Power, 61 Pin Round	0754550001
1 A1 J2	Connector, Power, 26 Pin Round	0753340003
1 A1 P1	Connector, PC, 15 Pin Female	0753340003
1 A1 P3	Connector, PC, 15 Pin Female	0753330008
1 A1 P4	Connector, Power, 24 Pin Rect.	0754070000
1 A1 P5	Connector, Power, 36 Pin Rect.	0755980000
1 A1 P6	Connector, PC, 18 Pin Female	0183200004
1 A1 R3	Resistor, 560, 5%, 1/4 W	0170410005
1 A1 R4	Resistor, 10 K, 10%, 1/4 W	0281610002
C1	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0283630001
C2	Capacitor, 1 UF, 35 V, T368	1001010027
C3	Capacitor, 0.1 UF, 50 V	0405180004
CR1	Diode, Rectifier 1 N4004	0346370001
S1	Switch, Toggle, DPOT	0447190008
	IC Linear, Vol. Reg. LM34005	0533180007
	Pin, Drive No. 0 x 1/8 Lg.	0749720000
	Connector, PC, 18 Pin Female	0753350009
	Jack, Phone Tip, Red	0753680009
	Plug, Phone Tip, Red	0841550000
	Socket, Transistor TO-3	0847210006
	Terminal Board, 6 Pos.	1000380009
	Relay Bracket Assy.	1000410005
	PC Assy Cplr Interface	1000450007
	PC Assy Audio Process	1001070003
	Gasket Kit, Front Panel Con.	1002580021
	Gasket Kit, Front Panel	5024021606
	Bracket Switch	5024043600
	Handle	5024642201
	Bracket, Transistor Mtg.	

5.9 SCHEMATIC DIAGRAMS

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

FRONT PANEL ASSEMBLY

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	FRONT PANEL ASSY, GRN	
1 A1 J1	Connector, Power, 61 Pin Round	0754960005
1 A1 J2	Connector, Power, 26 Pin Round	0754550001
1 A1 P1	Connector, PC, 15 Pin Female	0753340003
1 A1 P3	Connector, PC, 15 Pin Female	0753340003
1 A1 P4	Connector, Power, 24 Pin Rect.	0753330008
1 A1 P5	Connector, Power, 36 Pin Rect.	0754070000
1 A1 P6	Connector, PC, 18 Pin Female	0755980000
1 A1 R3	Resistor, 560, 5%, 1/4 W	0183200004
1 A1 R4	Resistor, 10K, 10%, 1/4 W	0170410005
C1	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C2	Capacitor, 1 UF, 35 V, T368	0283630001
C3	Capacitor, 0.1 UF, 50 V	1001010027
CR1	Diode, Rectifier 1N4004	0405180004
S1	Switch, Toggle, DPDT	0346370001
	IC Linear, Vol. Reg. LM34005	0447190008
	Pin, Drive No. 0 x 1/8 Lg.	0533180007
	Connector, PC, 18 Pin Female	0749720000
	Jack, Phone Tip, Red	0753350009
	Plug, Phone Tip, Red	0753680009
	Socket, Transistor TO-3	0841550000
	Terminal Board, 6 Pos.	0847210006
	Relay Bracket Assy.	1000380009
	PC Assy Cplr Interface	1000410005
	PC Assy Audio Process	1000450007
	Gasket Kit, Front Panel Con.	1001070003
	Gasket Kit, Front Panel	1002580021
	Bracket Switch	5024021606
	Handle	5024043600
	Bracket, Transistor Mtg.	5024642201

1000250032M

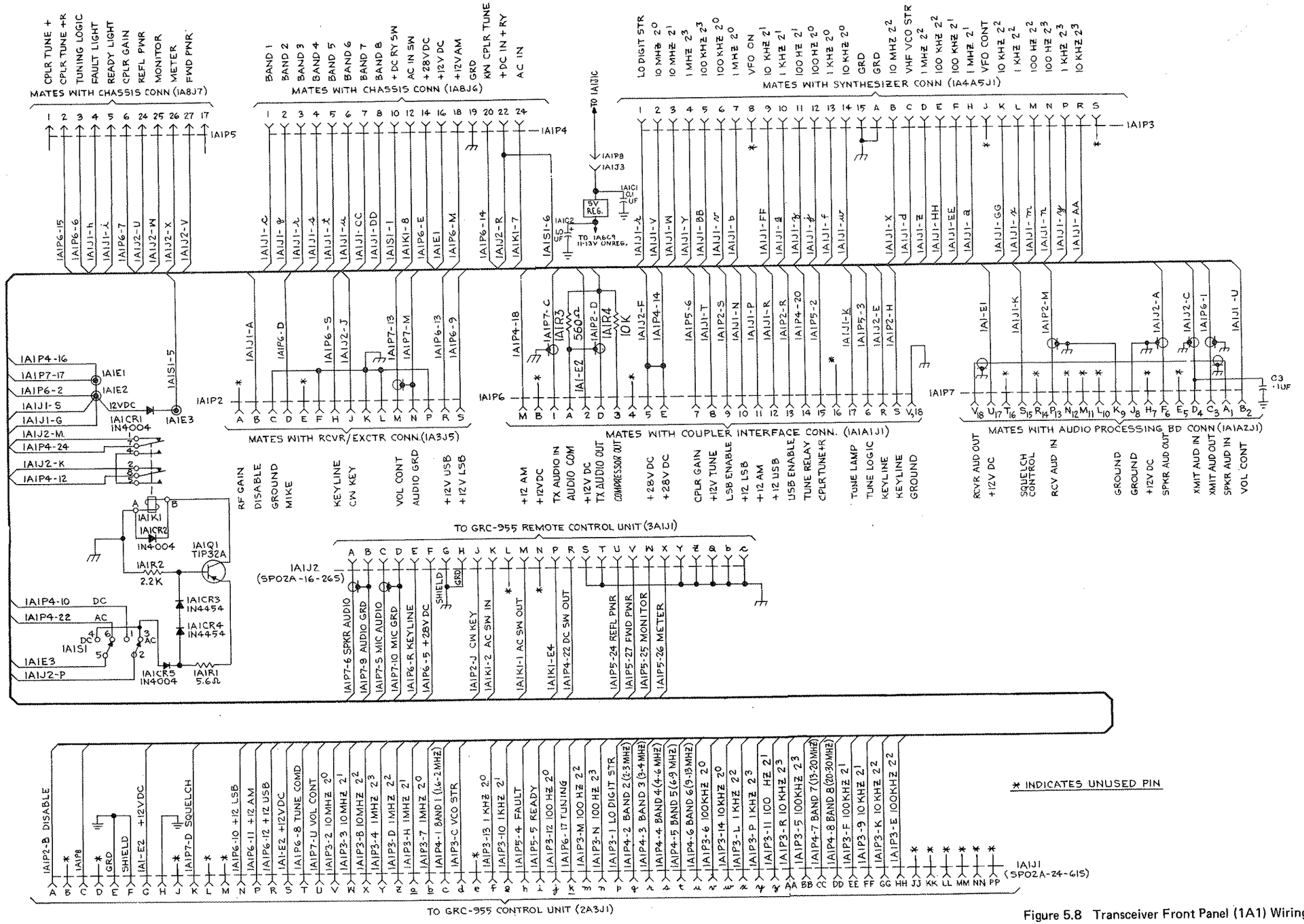


Figure 5.8 Transceiver Front Panel (1A1) Wiring

5024012119G

NOTES:

1. PREFIX ALL PART DESIGNATORS WITH "1A8."
2. UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE IN MICROFARADS (uf).

(MATES WITH 1A8J3) W2P1

230V AC CONNECTION

W2P2 — W2 — D, NC→F, NC→E, NC→H, C, I, NC→B, G, A

OPTION

1A8U1 HIGH STABILITY OVEN OSCILLATOR 5024-0137: +28V→4, +12V→2, GND→7, 5MHz OUT→6 (MATES WITH 1A8J8)

1A8U1 TCXO 5024-0127: N.C.→4, +12V→2, GND→7, 5MHz OUT→6

1A8J8

C1 .01

L1 33 uh

C2 .01

POWER 1A8J3

GROUND D

+DC INPUT F — F3 1A — 2 — C3 2/100V

-DC INPUT E

XMFR 2E H

XMFR 2D C

XMFR 1B I

XMFR 1A B

AC LINE INPUT G — F2 1A — 2 — C5 .01 1KV

AC LINE INPUT A — C6 .01 1KV — F1 1A — 2

(MATES WITH 1A8J3) W1P1

115V AC CONNECTION

W1P2 — W1 — D, NC→F, NC→E, NC→H, C, I, B, G, A

(MATES WITH 1A8J3) W3P1

+DC, -DC — W3 — D, F, E

(VOLTAGE RANGE TO BE SELECTED BY BUSSING ON DC CONVERTER)

26 & 13V DC INPUT CONNECTION

NC→H, NC→C, NC→I, NC→B, NC→G, NC→A

1A8J5 — 2 3 1 7 5 10 11 8 9 4 6 — 1A6P1

1A6 POWER SUPPLY 5024-0200

AC INPUTS | -DC IN | +DC IN | DCON/OFF | 'OUT' +28V | +5V | +12V

-0213 DC INVERTER (OPTION)

AUDIO 1A8J2

J NC, H NC, K NC, +28 VDC D, GND A, KEY LINE G

TO 1A1P6-3

C11 .01

600Ω AUDIO IN: B, C — C10 .01, C9 .01

600Ω AUDIO OUT: E, F — C8 .01, C7 .01

1A3 RECEIVER / EXCITER ASSEMBLY

MATES WITH 1A1P2

A B D E H J M N R S — 1A3J5

RF GAIN, DISABLE, MICROPHONE, SHIELD, KEYLINE, CW KEY, VOLUME CONTROL, AUDIO GND, USB +12, LSB +12

2 ND L.O. IN E18 X; E19

1 ST L.O. IN E24 Y; E25

3 RD L.O. E16 Z; E17

EXCITER OUT E21; RF INPUT E20 E22 E23

ACC E15; ALC (V) E14; EXT AUDIO MUTE E32; ALC (I) E13; VSWR ALC E27; KW ACC E30 E31; KEYLINE E26; "S" METER OUT E12; +12AM(T) E11; +12AM(R) E5; +12 I N E6; +12R IN E1; +12V IN E7; KW ALC E28 E29

600Ω AUDIO IN: E2, E4

600Ω AUDIO OUT: E8, E10

TO 1A1P6-17

DD, A, B, C, D, E, F, G, H, J, K, L, M, N

1A8K2 — 1A8J10 — 7, 1, 4, 8, 2, 5, 9, 3, 6, A, B

CR2 IN4004

R1 3.9Ω 1/2W

CR3 IN4454

CR4 IN4454

Q1 MJE 2371

CR5 IN4004

R2 2.2K 1W

1A8K1 — 1A8J9 — 9, 1, 5, 10, 2, 6, 12, 4, 8, 11, 3, 7, 13, 14

CR1 IN4004

+28V DC

+12V DC

P, EE, Q, R, S, FF, T, U, V, W, CC

1A8P1 — D B E, H A, C F — 1A7J3

1A7 R.F. POWER AMPLIFIER 5024-0300

VSWR ALC, ALC (I), GND, +28V, BIAS KEY

INPUT — 1A7J1 — 1A3P3 — AA

OUTPUT — 1A7J2 1A8P3 — BB

5024012119G

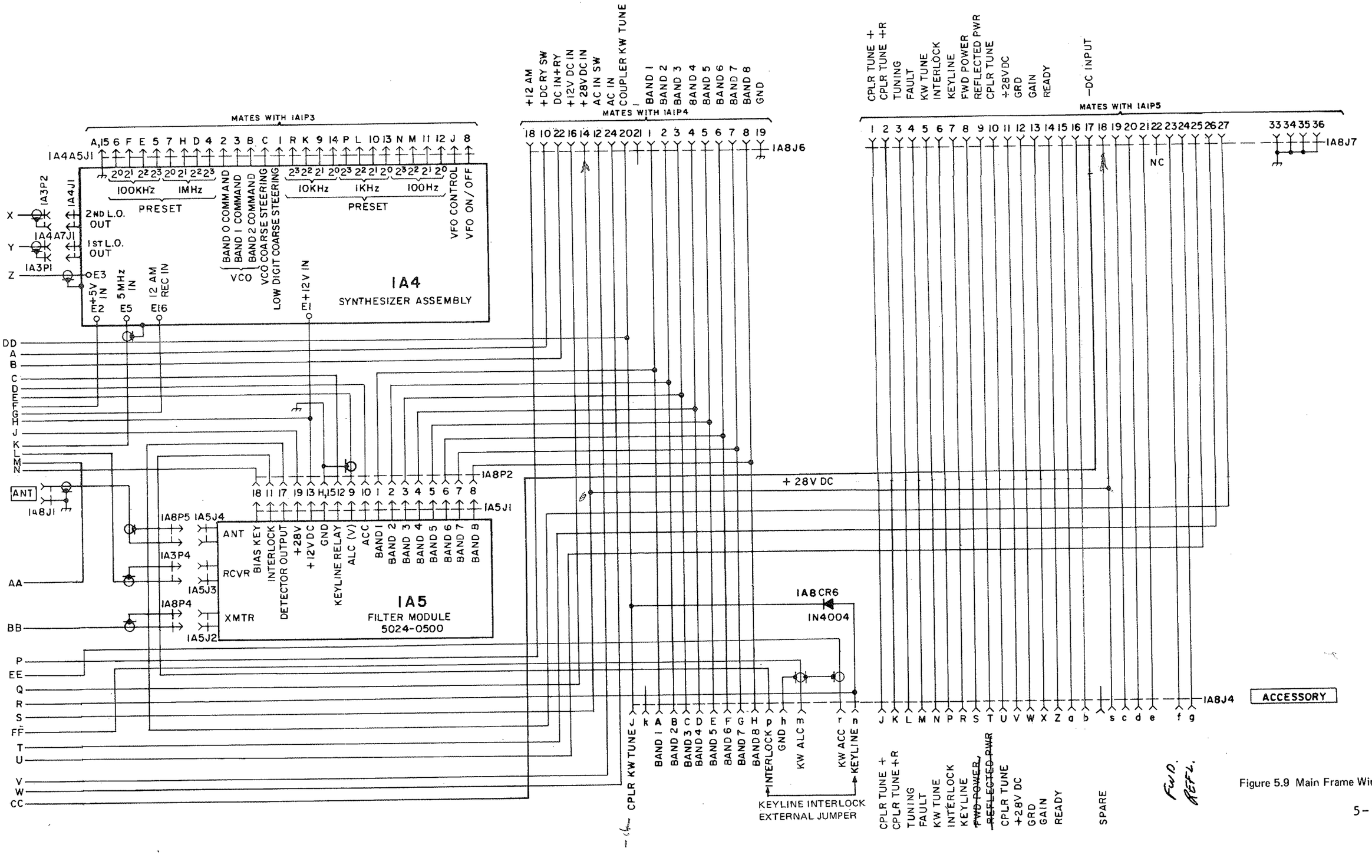


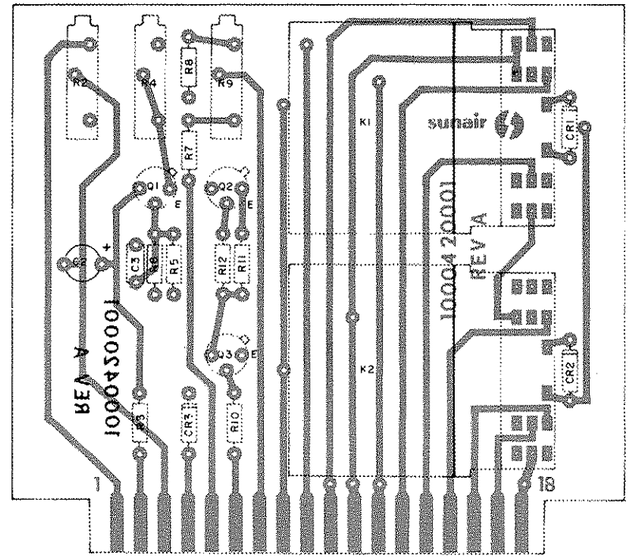
Figure 5.9 Main Frame Wiring

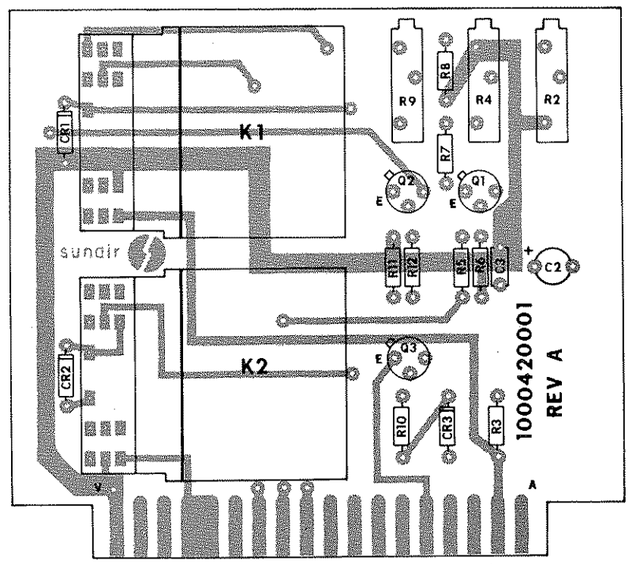
PARTS LIST, MAIN FRAME

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A8		
C1	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Mylar, 2 UF 10%, 100 V	27242
C5	Capacitor, Disc, Ceramic, .01 UF, 1 KV	29604
C6	Capacitor, Disc, Ceramic, .01 UF, 1 KV	29604
C7	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
C8	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
C9	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
C10	Capacitor, Disc, Ceramic, .01 UF, 25 V	28162
CR1	Diode, 1N4004	40518
CR2	Diode, 1N4004	40518
CR3	Diode, 1N4454	40527
CR4	Diode, 1N4454	40527
CR5	Diode, 1N4004	40518
CR6	Diode, 1N4004	40518
J1	Connector, RF, UHF	75330
J2	Connector, 10 Pin	75399
J3	Connector, 9 Pin	75344
J4	Connector, 37 Pin	75343
J5	Connector, 11 Pin	75346
J6	Connector, 24 Pin	75351
J7	Connector, 36 Pin	75352
J8	Socket, 7 Pin	76437
K1	Relay, 4 PDT, 12 VDC	66664
K2	Relay, 3 PDT, 12 VDC	66676
L1	Inductor, 47 UH 5%	65268
Q1	Transistor, TIP32A	44820
R1	Resistor, Carbon, 3.9 ohm 5%, 1/2 W	16827
R2	Resistor, Carbon, 2.2 K 10%, 1W	16451
U1	TCXO	5024-0127-00
	MISCELLANEOUS MECHANICAL PARTS	
J9	Socket, Relay (K1)	76700
J10	Socket, Relay (K2)	75433
P1	Connector, 7 Pin	75353
P2	Connector, 20 Pin	75355
P3	Connector, RF BNC	75371
P4	Connector, RF BNC	75371
P5	Connector, RF BNC	75371

CPLR INTERFACE BOARD ASSEMBLY (1A1A1)

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A1A1	PCB, Coupler Interface	1000420001
C3	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
C2	Capacitor, 22UF, 15V, 196D	0281690006
CR1-3	Diode, Rectifier, 1N4004	0405180004
K1,K2	Relay, 4PDT, 12V, PC MT 7.5A	0661610004
Q3	Transistor, PNP, Si., 2N2907A	0448390001
Q1-2	Transistor, NPN, Si., 2N2222A	0448580004
R3,7	Resistor, 10K, 10%, 1/4W	0170410005
R5,12	Resistor, 4.7K, 5%, 1/4W	0170770001
R11	Resistor, 27K, 10%, 1/4W	0171200004
R10	Resistor, 22K, 10%, 1/4W	0172230004
R8	Resistor, 15K, 10%, 1/4W	0172350000
R6	Resistor, 1.5K, 10%, 1/4W	0172470005
R1	Resistor, 560, 5%, 1/4W	0183200004
R2	Potentiometer, 1K, 10%, 3/4W, 15 Turns	0338490019
R9	Potentiometer, 10K, 10%, 3/4W, 15 Turns	0338490043
R4	Potentiometer, 500, 10%, 3/4W, 15 Turns	0338490078





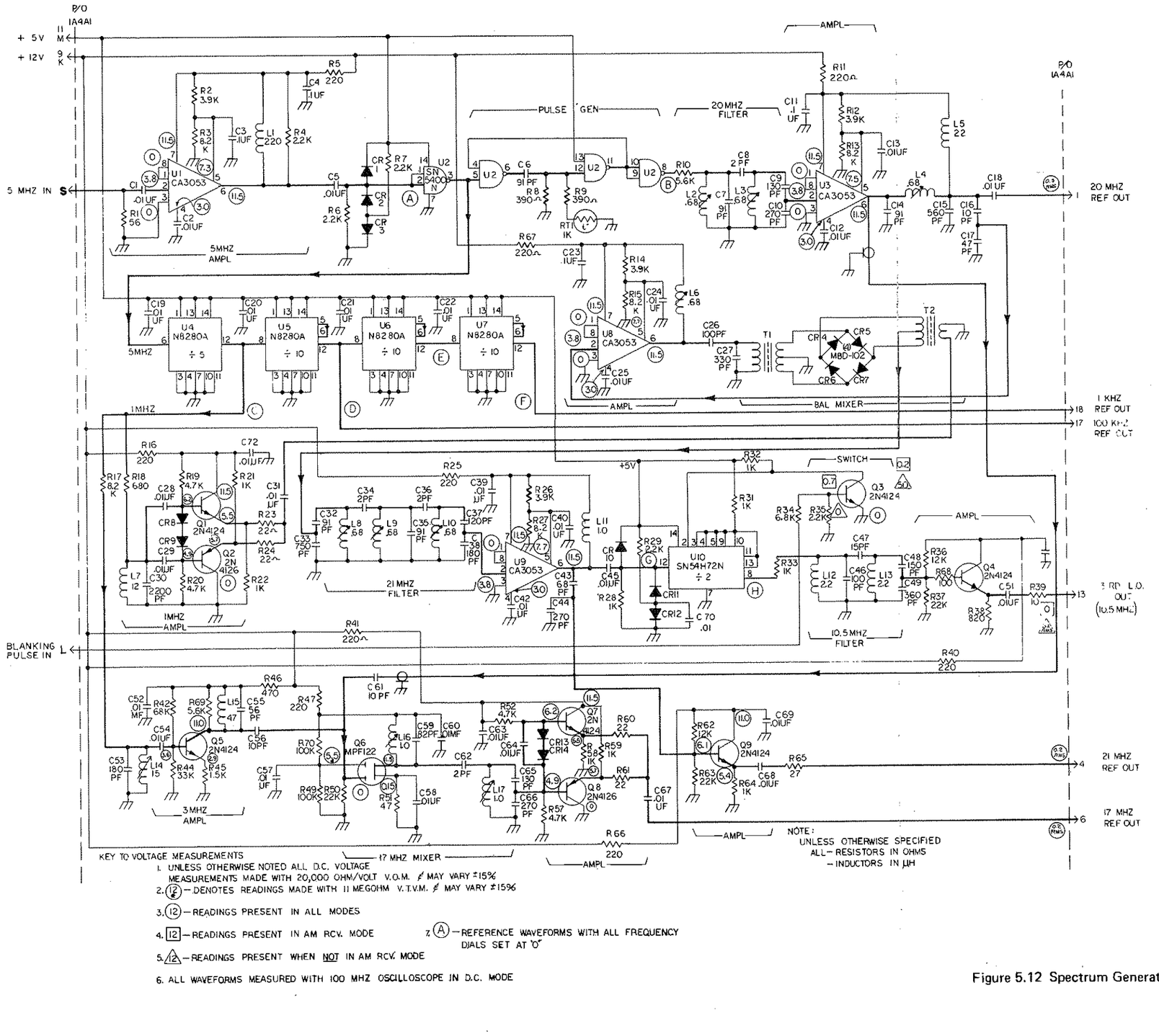


Figure 5.12 Spectrum Generator (1A4A1) Schematic

PARTS LIST, 1A4A1

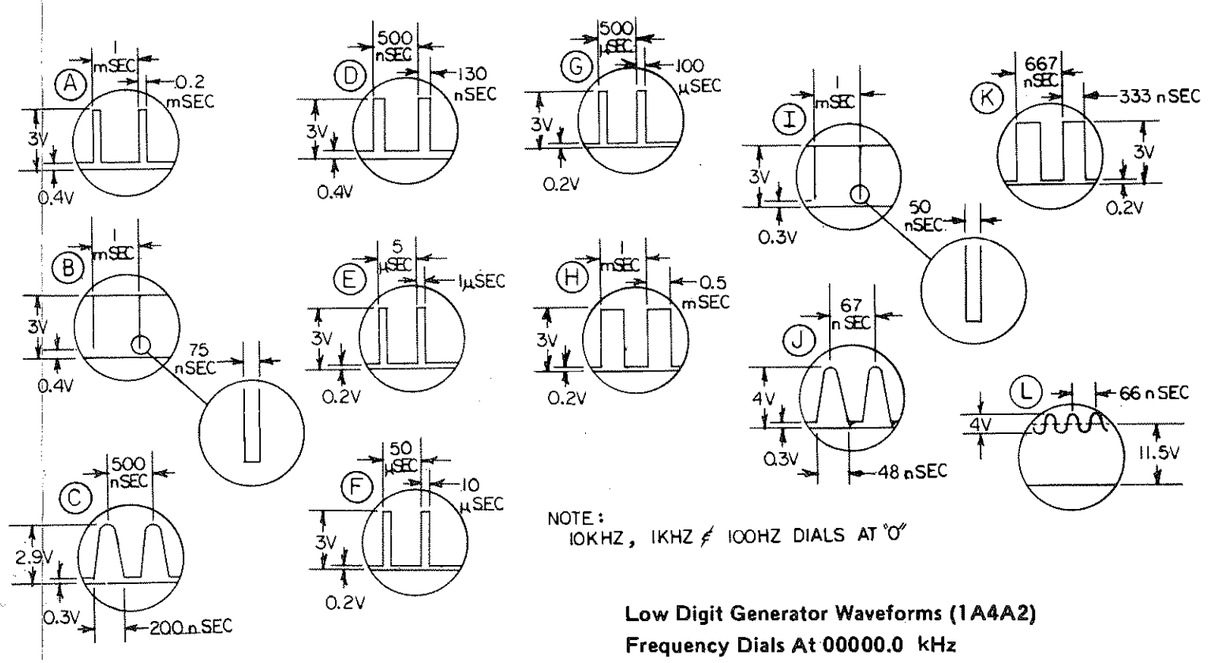
REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C4	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Mica, 91 PF 5%, 500 V	28442
C8	Capacitor, Mica, 2 PF 5%, 500 V	25971
C9	Capacitor, Mica, 130 PF 5%, 500 V	27486
C10	Capacitor, Mica, 270 PF 5%, 500 V	27503
C11	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C12	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C13	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C14	Capacitor, Mica, 91 PF 5%, 500 V	28442
C15	Capacitor, Mica, 560 PF 5%, 300 V	28375
C16	Capacitor, Mica, 10 PF 5%, 500 V	25983
C17	Capacitor, Mica, 47 PF 5%, 500 V	25698
C18	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C19	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C20	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C22	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C23	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C24	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C25	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C26	Capacitor, Mica, 100 PF 5%, 500 V	28545
C27	Capacitor, Mica, 330 PF 5%, 500 V	26951
C28	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C29	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C30	Capacitor, Mica, 2200 PF 2%, 300 V	28136
C31	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C32	Capacitor, Mica, 91 PF 5%, 500 V	28442
C33	Capacitor, Mica, 750 PF 5%, 300 V	27541
C34	Capacitor, Mica, 2 PF 5%, 500 V	25971
C35	Capacitor, Mica, 91 PF 5%, 500 V	28442
C36	Capacitor, Mica, 2 PF 5%, 500 V	25971
C37	Capacitor, Mica, 120 PF 5%, 500 V	28985
C38	Capacitor, Mica, 180 PF 5%, 500 V	25828
C39	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C40	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C41	Not Used	
C42	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C43	Capacitor, Mica, 68 PF 5%, 500 V	26107
C44	Capacitor, Mica, 270 PF 5%, 500 V	27503

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C45	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C46	Capacitor, Mica, 100 PF 5%, 500 V	28545
C47	Capacitor, Mica, 15 PF 5%, 500 V	25995
C48	Capacitor, Mica, 150 PF 5%, 500 V	27498
C49	Capacitor, Mica, 360 PF 5%, 500 V	27515
C50	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C51	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C52	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C53	Capacitor, Mica, 180 PF 5%, 500 V	25828
C54	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C55	Capacitor, Mica, 150 PF 5%, 500 V	28129
C56	Capacitor, Mica, 10 PF 5%, 500 V	25983
C57	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C58	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C59	Capacitor,	
C60	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C61	Capacitor, Mica, 10 PF 5%, 500 V	25983
C62	Capacitor, Mica, 2PF, 5%, 500V	0259710008
C63	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C64	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C65	Capacitor, Mica, 130 PF 5%, 500 V	27486
C66	Capacitor, Mica, 270 PF 5%, 500 V	27503
C67	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C68	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C69	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C70	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C71	Capacitor, 68UF, 15V	0296540005
C72	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, 1N4454	40527
CR4	Diode, MBD-102	40528
CR5	Diode, MBD-102	40528
CR6	Diode, MBD-102	40528
CR7	Diode, MBD-102	40528
CR8	Diode, 1N4454	40527
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
CR11	Diode, 1N4454	40527
CR12	Diode, 1N4454	40527
CR13	Diode, 1N4454	40527
CR14	Diode, 1N4454	40527

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R18	Resistor, Carbon, 680 ohm 10%, 1/4 W	17663
R19	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R20	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R21	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R22	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R23	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R24	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R25	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R26	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R27	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R28	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R29	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R30	Not Used	
R31	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R32	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R33	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R34	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R35	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R36	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R37	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R38	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R39	Resistor, Carbon, 10 ohm 10% 1/4 W	17716
R40	Resistor, Carbon, 2.20 ohm 10%, 1/4 W	17132
R41	Resistor, Carbon, 2.20 ohm 10%, 1/4 W	17132
R42	Resistor, Carbon, 68 K 10%, 1/4 W	17352
R43	Not Used	
R44	Resistor, Carbon, 33 K 10%, 1/4 W	17792
R45	Resistor, Carbon, 1.5 K 10%, 1/4 W	17247
R46	Resistor, Carbon, 470 ohm 10%, 1/4 W	17261
R47	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R48	Not Used	
R49	Resistor, Carbon, 100 K 10%, 1/4 W	17039
R50	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R51	Resistor, Carbon, 47 ohm 10%, 1/4 W	17936
R52	Resistor, Carbon, 4.7K 10%, 1/4 W	17077
R53	Not Used	
R54	Not Used	
R55	Not Used	
R56	Not Used	
R57	Resistor, Carbon, 47 K 10%, 1/4 W	17077
R58	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R59	Resistor, Carbon, 1 K 10%, 1/4 W	17156

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R60	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R61	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R62	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R63	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R64	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R65	Resistor, Carbon, 27 ohm 10%, 1/4 W	17259
R66	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R67	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R68	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R69	Resistor, Carbon, 5.6K 10% 1/4W	18306
R70	Resistor, Carbon, 100K 10%, 1/4 W	17039
RT1	Thermister, 1 K @ 25° C	19611
T1	Transformer, Balum 1:4	5024-1103-00
T2	Transformer, Balum 1:4	5024-1103-00
U1	Integrated Circuit, Linear, CA3053	44806
U2	Integrated Circuit, Digital, SN5400N	44840
U3	Integrated Circuit, Linear, CA3053	44806
U4	Integrated Circuit, Digital, N8280A	44808
U5	Integrated Circuit, Digital, N8280A	44808
U6	Integrated Circuit, Digital, N8280A	44808
U7	Integrated Circuit, Digital, N8280A	44808
U8	Integrated Circuit, Linear, CA3053	44806
U9	Integrated Circuit, Linear, CA3053	44806
U10	Integrated Circuit, Digital, SN54H72H	44841
L18	Inductor, Molded, 33UH, 5%	0646300008

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
L1	Inductor, 220 UH 5%	65050
L2	Inductor, Variable, 0.68 UH	64790
L3	Inductor, Variable, 0.68 UH	64790
L4	Inductor, Variable, 0.68 UH	64790
L5	Inductor, 22 UH 5%	65000
L6	Inductor, Variable, 0.68 UH	64790
L7	Inductor, 12 UH 5%	65270
L8	Inductor, Variable, 0.68 UH	64790
L9	Inductor, Variable, 0.68 UH	64790
L10	Inductor, Variable, 0.68 UH	64790
L11	Inductor, 1 UH 5%	64915
L12	Inductor, 2.2 UH 5%	64989
L13	Inductor, 2.2 UH 5%	64989
L14	Inductor, Variable, 15 UH	62979
L15	Inductor, 47 UH 5%	65268
L16	Inductor, Variable, 1 UH	64791
L17	Inductor, Variable, 1 UH	64791
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4126	44802
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4124	44801
Q5	Transistor, 2N4124	44801
Q6	Transistor, MPF-122	44803
Q7	Transistor, 2N4124	44801
Q8	Transistor, 2N4126	44802
Q9	Transistor, 2N4124	44801
R1	Resistor, Carbon, 56 ohm 10%, 1/4 W	17429
R2	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R3	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R4	Resistor, Carbon, 2.2K 10%, 1/4 W	17807
R5	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R6	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R8	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R9	Resistor, Carbon, 390 ohm 10%, 1/4 W	17833
R10	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R11	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R12	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R13	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R14	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R15	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R16	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R17	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162



NOTE:
10KHZ, 1KHZ & 100HZ DIALS AT "0"

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

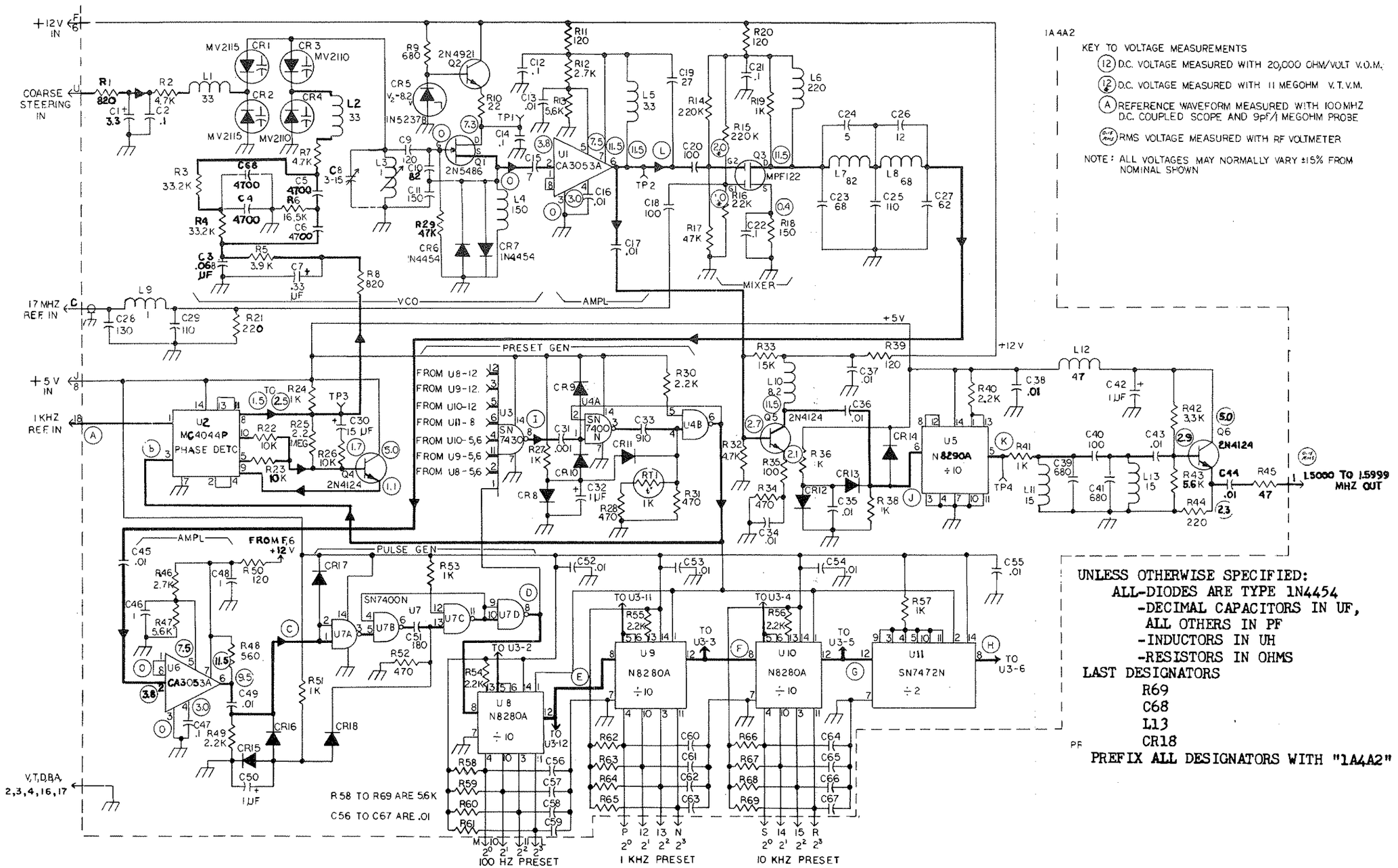


Figure 5.13 Low Digit Generator (1A4A2) Schematic

PARTS LIST, 1A4A2

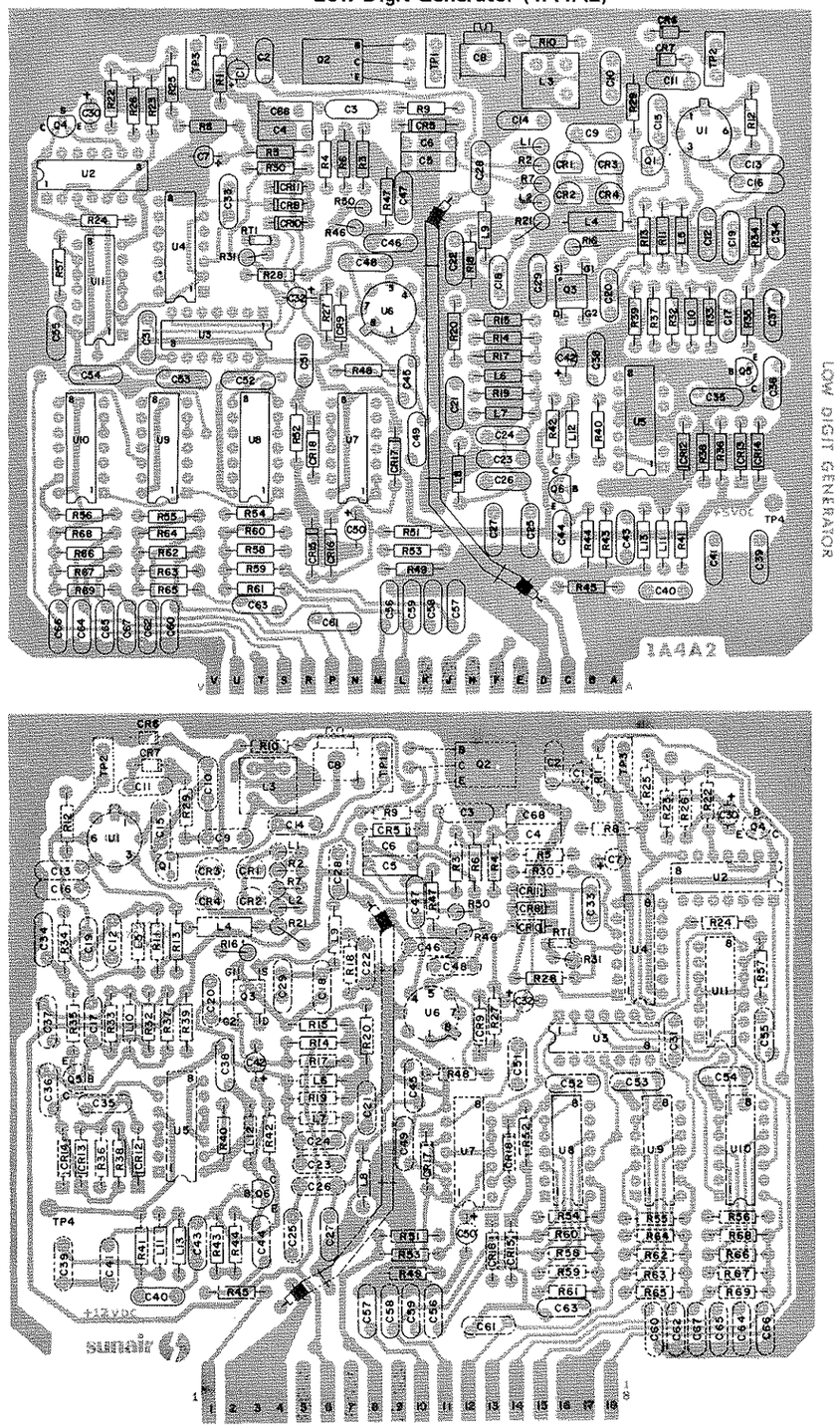
REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A4A2		
C1	Capacitor, Tantalum, 3.3 UF, 35 V	28168
C2	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C3	Capacitor, Mylar, 0.068 UF, 50 V	28164
C4	Capacitor, Mylar, 0.0047 UF, 50 V	28154
C5	Capacitor, Mylar, 0.0047 UF, 50 V	28154
C6	Capacitor, Mylar, 0.0047 UF, 50 V	28154
C7	Capacitor, Tantalum, 0.33 UF, 35 V	28165
C8	Capacitor, Variable, Ceramic, 3-15 PF	28571
C9	Capacitor, Mica, 120 PF 5%, 500 V	28985
C10	Capacitor, Mica, 82 PF 5%, 500V	28652
C11	Capacitor, Mica, 150 PF 5%, 500 V	28090
C12	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C13	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C14	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C15	Capacitor, Mica, 7 PF 5% 500 V	28858
C16	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C17	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C18	Capacitor, Mica, 100 PF 5%, 500 V	28545
C19	Capacitor, Mica, 27 PF 5%, 300 V	26066
C20	Capacitor, Mica, 100 PF 5%, 500 V	28545
C21	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C22	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C23	Capacitor, Mica, 68 PF 5%, 500 V	26107
C24	Capacitor, Mica, 5 PF 1/2 PF, 500 V	26119
C25	Capacitor, Mica, 110 PF 5%, 500 V	25775
C26	Capacitor, Mica, 12 PF 5%, 500 V	26028
C27	Capacitor, Mica, 62 PF 5%, 500 V	28301
C28	Capacitor, Mica, 130 PF 5%, 500 V	27486
C29	Capacitor, Mica, 110 PF 5%, 500 V	25775
C30	Capacitor, Tantalum, 15 UF, 15 V	28172
C31	Capacitor, Disc. Ceramic, 1000 PF, 50 V	28163
C32	Capacitor, Tantalum, 1UF, 35 V	28166
C33	Capacitor, Mica, 910 PF 5%, 100 V	28866
C34	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C35	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C36	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C37	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C38	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C39	Capacitor, Mica, 680 PF 5%, 500 V	28624
C40	Capacitor, Mica, 100 PF 5%, 500 V	28545
C41	Capacitor, Mica, 680 PF 5%, 500 V	28624
C42	Capacitor, Tantalum, 1 UF, 35 V	28166
C43	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C44	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
L7	Inductor, 82 UH 5%	65945
L8	Inductor, 68 UH 5%	65165
L9	Inductor, 1 UH 5%	64915
L10	Inductor, 8.2 UH 5%	65206
L11	Inductor, 15 UH 5%	65907
L12	Inductor, 47 UH 5%	65268
L13	Inductor, 15 UH 5%	65907
Q1	Transistor, 2N5486	44805
Q2	Transistor, 2N4921	44804
Q3	Transistor, MPF-122	44803
Q4	Transistor, 2N4124	44801
Q5	Transistor, 2N4124	44801
Q6	Transistor, 2N4124	44801
R1	Resistor, Carbon 820 ohm 10%, 1/4 W	17821
R2	Resistor, Carbon 4.7 K 10%, 1/4 W	17077
R3	Resistor, Film, 33.2 K 1%, 1/8 W	19647
R4	Resistor, Film, 33.2 K 1%, 1/8 W	19647
R5	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R6	Resistor, Film, 16.5 K 1%, 1/8 W	19659
R7	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R8	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R9	Resistor, Carbon, 680 ohm 10%, 1/4 W	17663
R10	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R11	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R12	Resistor, Carbon, 2.7 K 10%, 1/4 W	18667
R13	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R14	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R15	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R16	Resistor, Carbon, 22K 10%, 1/4 W	17223
R17	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R18	Resistor, Carbon, 150 ohm 10%, 1/4 W	17273
R19	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R20	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R21	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R22	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R23	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R24	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R25	Resistor, Carbon, 2.2 Meg 10%, 1/4 W	17687
R26	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R27	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R28	Resistor, Carbon, 470 ohm 10%, 1/4 W	17261
R29	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R30	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R31	Resistor, Carbon, 470 ohm 10%, 1/4 W	17261
R32	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R33	Resistor, Carbon, 15 K 10%, 1/4 W	17235
R34	Resistor, Carbon, 470 ohm 10%, 1/4 W	17261
R35	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C45	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C46	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C47	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C48	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C49	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C50	Capacitor, Tantalum, 1 UF, 35 V	28166
C51	Capacitor, Mica, 180 UF 5%, 500 V	25828
C52	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C53	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C54	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C55	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C56	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C57	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C58	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C59	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C60	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C61	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C62	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C63	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C64	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C65	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C66	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C67	Capacitor, Disc. Ceramic, 0.01 UF, 25 V	28162
C68	Capacitor, Mylar, 0.0047 UF, 50 V	28154
CR1	Diode, MV2115	40530
CR2	Diode, MV2115	40530
CR3	Diode, MV2110	40529
CR4	Diode, MV2110	40529
CR5	Diode, IN5237B	40524
CR6	Diode; Signal, 1N4454	40527
CR7	Diode; Signal, 1N4454	40527
CR8	Diode; Signal, IN4454	40527
CR9	Diode; Signal, IN4454	40527
CR10	Diode; Signal, IN4454	40527
CR11	Diode; Signal, IN4454	40527
CR12	Diode; Signal, IN4454	40527
CR13	Diode; Signal, IN4454	40527
CR14	Diode; Signal, IN4454	40527
CR15	Diode; Signal, IN4454	40527
CR16	Diode; Signal, IN4454	40527
CR17	Diode; Signal, IN4454	40527
CR18	Diode; Signal, IN4454	40527
L1	Inductor, 33 UH 5%	65969
L2	Inductor, 33 UH 5%	65969
L3	Inductor, Variable, 1 UH	64791
L4	Inductor, 150 UH 5%	64678
L5	Inductor, 3.3 UH 5%	65892
L6	Inductor, 220 UH 5%	65050

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R36	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R38	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R39	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R40	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R41	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R42	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R43	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R44	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R45	Resistor, Carbon, 47 ohm 10%, 1/4 W	17936
R46	Resistor, Carbon, 2.7 K 10%, 1/4 W	18667
R47	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R48	Resistor, Carbon, 560 ohm 10 %, 1/4 W	18320
R49	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R50	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R51	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R52	Resistor, Carbon, 470 ohm 10%, 1/4 W	17261
R53	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R54	Resistor, Carbon, 2.2K 10%, 1/4 W	17807
R55	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R56	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R57	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R58	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R59	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R60	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R61	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R62	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R63	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R64	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R65	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R66	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R67	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R68	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R69	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
RT1	Thermistor, 1 K @ 25° C	19611
U1	Integrated Circuit, Linear, CA3053	44806
U2	Integrated Circuit, Digital, MC4044P	44810
U3	Integrated Circuit, Digital, SN7430N	44811
U4	Integrated Circuit, Digital, SN7400N	44807
U5	Integrated Circuit, Digital, N8290A	44825
U6	Integrated Circuit, Linear, CA3053	44806
U7	Integrated Circuit, Digital, SN7400N	44807
U8	Integrated Circuit, Digital, N8280A	44808
U9	Integrated Circuit, Digital, N8280A	44808
U10	Integrated Circuit, Digital, N8280A	44808
U11	Integrated Circuit, Digital, SN7472N	44812

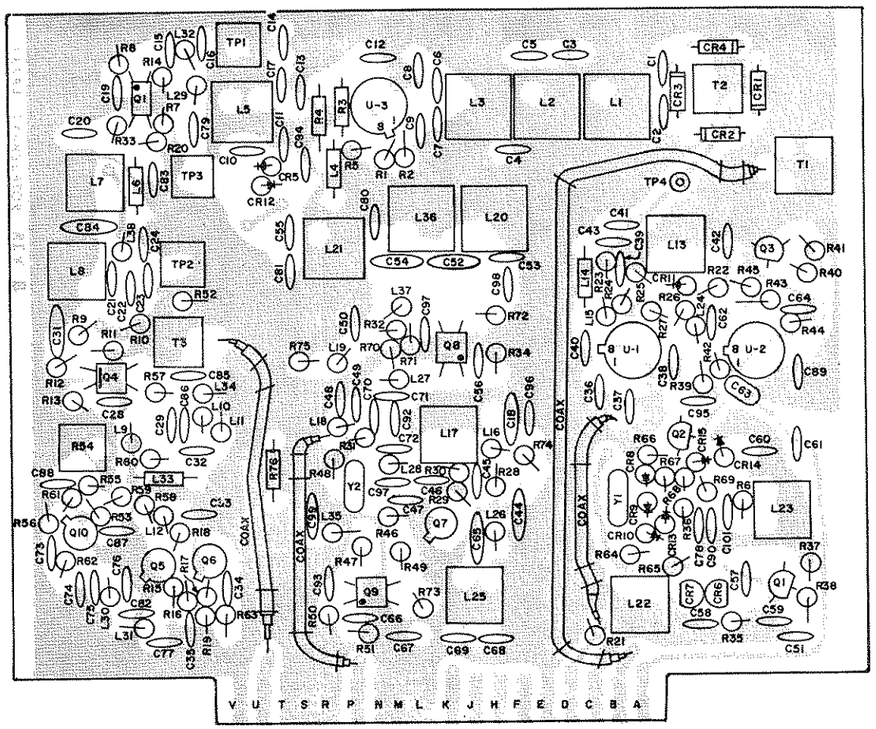
Low Digit Generator (1A4A2)

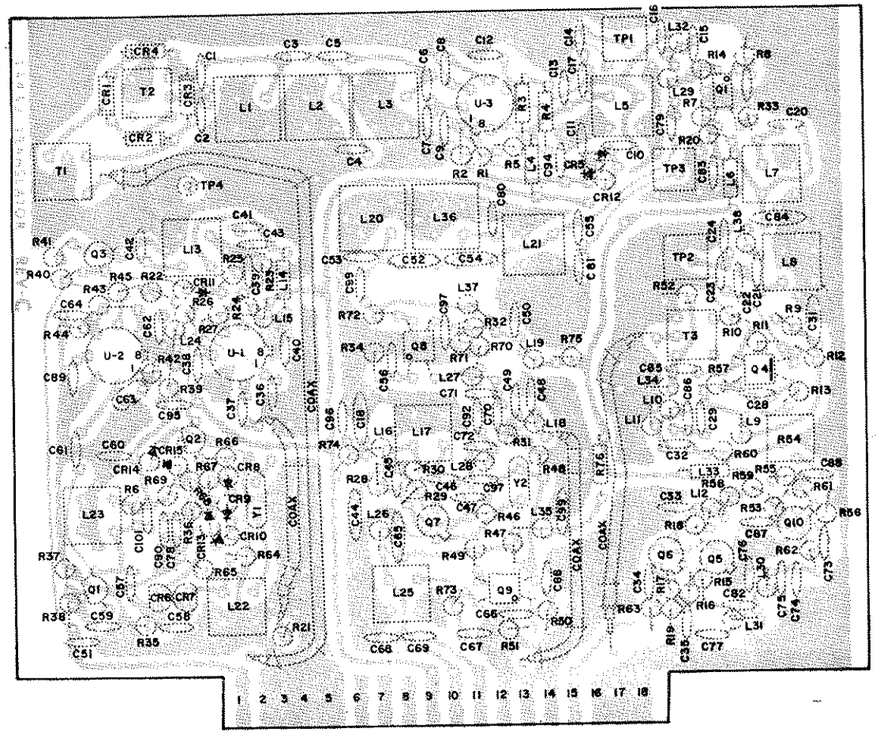


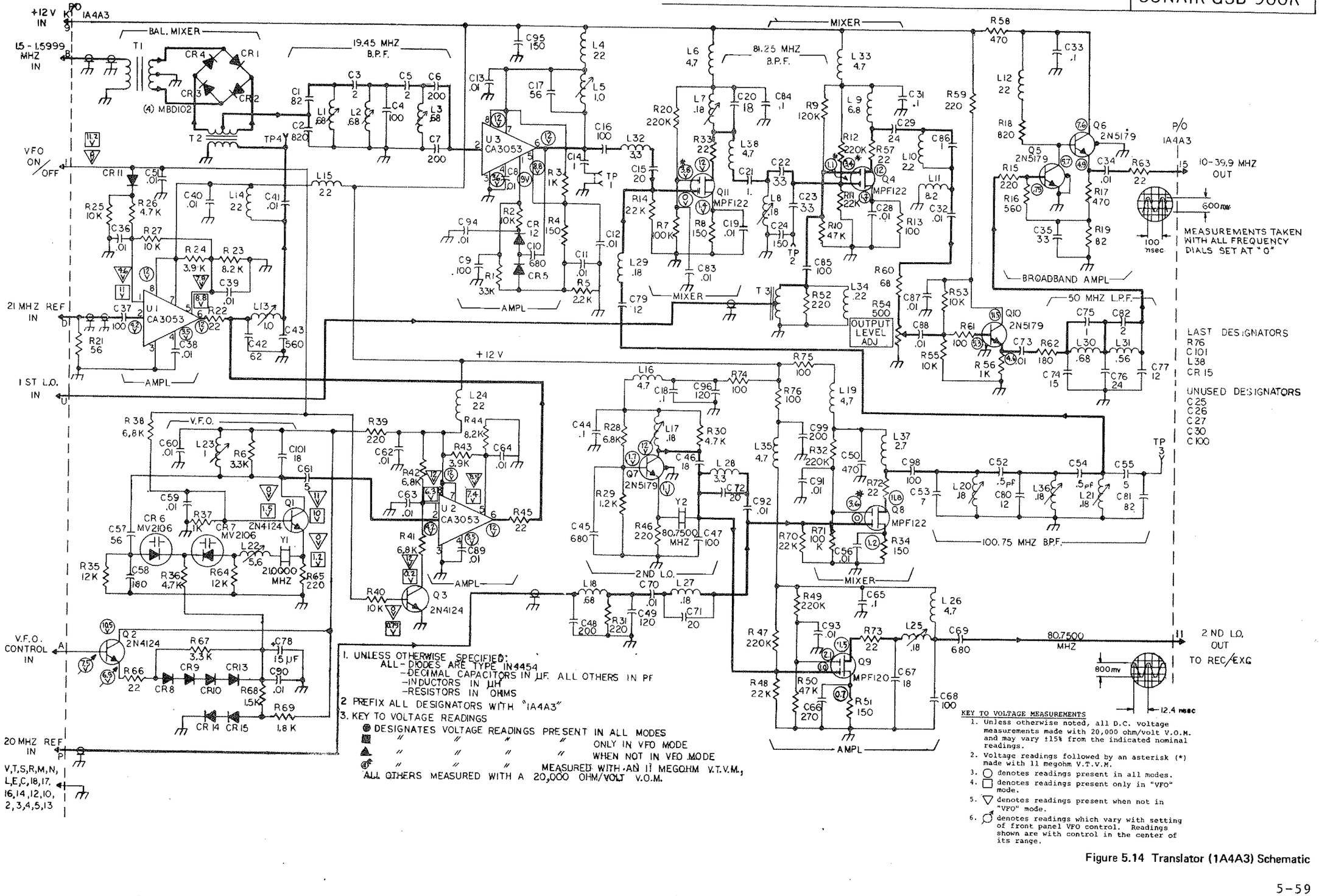
PARTS LIST, 1A4A3

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mica, 82 PF 5%, 500 V	26652
C2	Capacitor, Mica, 820 PF 5%, 500 V	28399
C3	Capacitor, Mica, 2 PF 0.5 PF, 500 V	25971
C4	Capacitor, Mica, 100 PF 5%, 500 V	28545
C5	Capacitor, Mica, 2 PF 0.5 PF, 500 V	25971
C6	Capacitor, Mica, 200 PF 5%, 300 V	28715
C7	Capacitor, Mica, 200 PF 5%, 300 V	28715
C8	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C9	Capacitor, Mica, 100 PF 5%, 500 V	28545
C10	Capacitor, Mica, 680 PF 5%, 100 V	28428
C11	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C12	Capacitor, Mica, 1 PF 0.5 PF, 500 V	28173
C13	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C14	Capacitor, Mica, 1 PF 0.5 PF, 500 V	26016
C15	Capacitor, Mica, 20 PF 5%, 500 V	28674
C16	Capacitor, Mica, 100 PF 5%, 500 V	28545
C17	Capacitor, Mica, 47 PF 5%, 500 V	29496
C18	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C19	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C20	Capacitor, Mica, 18 PF 5%, 500 V	28662
C21	Capacitor, Mica, 1 PF 0.5 PF, 500 V	26016
C22	Capacitor, Mica, 33 PF 5%, 500 V	28686
C23	Capacitor, Mica, 33 PF 5%, 500 V	28686
C24	Capacitor, Mica, 150 PF 5%, 500 V	28090
C25	Not Used	
C26	Not Used	
C27	Not Used	
C28	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C29	Capacitor, Mica, 24 PF 5%, 500 V	28149
C30	Not Used	
C31	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C32	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C33	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C34	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C35	Capacitor, Mica, 33 PF 5%, 500 V	28686
C36	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C37	Capacitor, Mica, 100 PF 5%, 500 V	28545
C38	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C39	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C40	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C41	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C42	Capacitor, Mica, 62 PF 5%, 500 V	28150
C43	Capacitor, Mica, 560 PF 5%, 100 V	28569
C44	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C45	Capacitor, Mica, 680 PF 5%, 100 V	28428
C46	Capacitor, Mica, 18 PF 5%, 500 V	28662
C47	Capacitor, Mica, 100 PF 5%, 500 V	28545
C48	Capacitor, Mica, 200 PF 5%, 300 V	28715
C49	Capacitor, Mica, 120 PF 5%, 500 V	28088
C50	Capacitor, Mica, 470 PF 5%, 100 V	28557
C51	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C52	Capacitor, Disc Ceramic, 0.5 PF, 500 V	28174
C53	Capacitor, Mica, 7 PF 5%, 500 V	28858
C54	Capacitor, Disc Ceramic, 0.5 PF, 500 V	28174
C55	Capacitor, Mica, 5 PF 0.5 PF, 500 V	28857
C56	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C57	Capacitor, Mica, 56 PF 5%, 500 V	28129
C58	Capacitor, Mica, 180 PF 5%, 500 V	28105
C59	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C60	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C61	Capacitor, Mica, 5 PF 0.5 PF, 500 V	28857
C62	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C63	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C64	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C65	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C66	Capacitor, Mica, 270 PF 5%, 500 V	28863
C67	Capacitor, Mica, 18 PF 5%, 500 V	28662
C68	Capacitor, Mica, 100 PF 5%, 500 V	28545
C69	Capacitor, Mica, 680 PF 5%, 100 V	28428
C70	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C71	Capacitor, Mic 20 PF 5%, 500 V	28674
C72	Capacitor, Mica, 20 PF 5%, 500 V	28674
C73	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C74	Capacitor, Mica, 15 PF 5%, 500 V	28650
C75	Capacitor, Mica, 1 PF 5%, 500 V	26016
C76	Capacitor, Mica, 24 PF 5%, 500 V	28149
C77	Capacitor, Mica, 120 PF 5%, 500 V	28648
C78	Capacitor, Tantalum, 15 UF, 15 V	28172
C79	Capacitor, Mica, 12 PF 5%, 500 V	28648
C80	Capacitor, Mica, 12 PF 5%, 500 V	28648
C81	Capacitor, Mica, 82 PF 5%, 500 V	26652
C82	Capacitor, Mica, 2 PF 0.5 PF, 500 V	25971
C83	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C84	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C85	Capacitor, Mica, 100 PF 5%, 500 V	28545
C86	Capacitor, Mica, 1 PF 0.5 PF, 500 V	26016
C87	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C88	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C89	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C90	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C91	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C92	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C93	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C94	Capacitor, Monolithic, 0.01 UF, 50 V	28173
C95	Capacitor, Mica, 150 PF 5%, 500 V	28090
C96	Capacitor, Mica, 120 PF 5%, 500 V	28088
C97		
C98	Capacitor, Mica, 100 PF 5%, 500 V	28545
C99	Capacitor, Mica, 200 PF 5%, 500 V	28715
C100	Not Used	
C101	Capacitor, Mica, 18 PF 5%, 500 V	28662
GR1	Diode, MBD-102	40528
GR2	Diode, MBD-102	40528
GR3	Diode, MBD-102	40528
GR4	Diode, MBD-102	40528
CR5	Diode, 1N4454	40527
CR6	Diode, MV2106	40531
CR7	Diode, MV2106	40531
CR8	Diode, 1N4454	40527
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
CR11	Diode, 1N4454	40527
CR12	Diode, 1N4454	40527
CR13	Diode, 1N4454	40527
CR14	Diode, 1N4454	40527
CR15	Diode, 1N4454	40527
L1	Inductor, Variable, 0.68 UH	64790
L2	Inductor, Variable, 0.68 UH	64790
L3	Inductor, Variable, 0.68 UH	64790
L4	Inductor, 22 UH 10%	65000
L5	Inductor, Variable, 1 UH	64791
L6	Inductor, 4.7 UH 10%	65191
L7	Inductor, Variable, 0.18 UH	64789
L8	Inductor, Variable, 0.18 UH	64789
L9	Inductor, 6.8 UH 5%	65921
L10	Inductor, 2.2 UH 10%	65971
L11	Inductor, 8.2 UH 5%	65206
L12	Inductor, 22 UH 15%	65000
L13	Inductor, Variable, 1 UH	64791
L14	Inductor, 22 UH 5%	65000
L15	Inductor, 22 UH 5%	65000
L16	Inductor, 4.7 UH 5%	65191
L17	Inductor, Variable, 0.18 UH	64789
L18	Inductor, 0.68 UH 5%	64903
L19	Inductor, 4.7 UH 5%	65191
L20	Inductor, Variable, 0.18 UH	64789
L21	Inductor, Variable, 0.18 UH	64789
L22	Inductor, Variable, 5.6 UH	64788
L23	Inductor, Variable, 1 UH	64791
L24	Inductor, 22 UH 5%	65000
L25	Inductor, Variable, 0.18 UH	64789
L26	Inductor, 4.7 UH 5%	65191
L27	Inductor, 0.18 UH 10%	65189
L28	Inductor, 3.3 UH 5%	65892
L29	Inductor, 0.18 UH 10%	65189
L30	Inductor, 0.68 UH 5%	64903
L31	Inductor, 0.56 UH 5%	64953
L32	Inductor, 3.3 UH 5%	65892
L33	Inductor, 4.7 UH 5%	65191
L34	Inductor, 0.22 UH 5%	65062
L35	Inductor, 4.7 UH 5%	65191
L36	Inductor, Variable, 0.18 UH	64789
L37	Inductor, 2.7 UH 5%	65218
L38	Inductor, 4.7 UH 5%	65191
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4124	44801
Q3	Transistor, 2N4124	44801
Q4	Transistor, MPF-122	44803
Q5	Transistor, 2N5179	44513
Q6	Transistor, 2N5179	44513
Q7	Transistor, 2N5179	44513
Q8	Transistor, MPF-122	44803
Q9	Transistor, MPF-120	44800
Q10	Transistor, 2N5179	44513
Q11	Transistor, MPF-122	44803
R1	Resistor, Carbon, 33 K 10%, 1/4	17792
R2	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R3	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R4	Resistor, Carbon, 150 ohm 10%, 1/4 W	17273
R5	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R6	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R7	Resistor, Carbon, 100 K 10%, 1/4 W	17039
R8	Resistor, Carbon, 150 ohm 10%, 1/4 W	17273
R9	Resistor, Carbon, 120 K 10%, 1/4 W	17510
R10	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R11	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R12	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R13	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R14	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R15	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R16	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R17	Resistor, Carbon, 470 ohm 10%, 1/4 W	18411
R18	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R19	Resistor, Carbon, 82 ohm 10%, 1/4 W	18461
R20	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R21	Resistor, Carbon, 56 ohm 10%, 1/4 W	17429
R22	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R23	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R24	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R25	Resistor, Carbon, 10K 10%, 1/4 W	17041
R26	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R27	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R28	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R29	Resistor, Carbon, 1.2 K 10%, 1/4 W	18186
R30	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R31	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R32	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R33	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R34	Resistor, Carbon, 150 ohm 10%, 1/4 W	17273
R35	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R36	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R37	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R38	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R39	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R40	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R41	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R42	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R43	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R44	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R45	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R46	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R47	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R48	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R49	Resistor, Carbon, 220 K 10%, 1/4 W	17778
R50	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R51	Resistor, Carbon, 150 ohm 10%, 1/4 W	17273
R52	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R53	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R54	Potentiometer, 1 Turn, 500 ohm, 1/2 W	34598
R55	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R56	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R57	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R58	Resistor, Carbon, 470 ohm 10%, 1/4 W	18411
R59	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R60	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R61	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R62	Resistor, Carbon, 180 ohm 10%, 1/4 W	17522
R63	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R64	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R65	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R66	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R67	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R68	Resistor, Carbon, 1.5 K 10%, 1/4 W	17247
R69	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R70	Resistor, Carbon, 22 K 10%, 1/4 W	17223
R71	Resistor, Carbon, 100 K 10%, 1/4 W	17039
R72	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R73	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R74	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R75	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R76	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
T1	Transformer, Balun, 1:4	5024-1103-00
T2	Transformer, Balun, 1:4	5024-1103-00
T3	Transformer, Balun, 1:4	5024-1010-00
U1	Integrated Circuit, Linear, CA3053	44806
U2	Integrated Circuit, Linear, CA3053	44806
U3	Integrated Circuit, Linear, CA3053	44806
Y1	Crystal, 21.0000 MHz	5024-0803-00
Y2	Crystal, 80.7500 MHz	5024-0804-00

Translator (1A4A3)







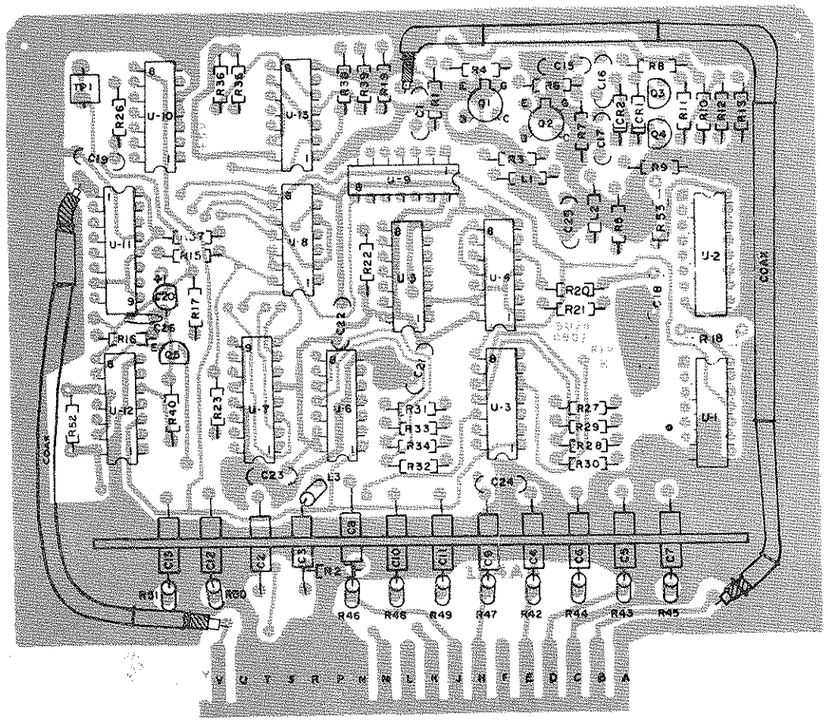
1. UNLESS OTHERWISE SPECIFIED:
   ALL-DIODES ARE TYPE IN4454
   -DECIMAL CAPACITORS IN μF. ALL OTHERS IN PF
   -INDUCTORS IN μH
   -RESISTORS IN OHMS
2. PREFIX ALL DESIGNATORS WITH "1A4A3"
3. KEY TO VOLTAGE READINGS
   - ● DESIGNATES VOLTAGE READINGS PRESENT IN ALL MODES
   - ■ " " " " ONLY IN VFO MODE
   - ▲ " " " " WHEN NOT IN VFO MODE
   - @ " " " " MEASURED WITH AN 11 MEGOHM V.T.V.M.,

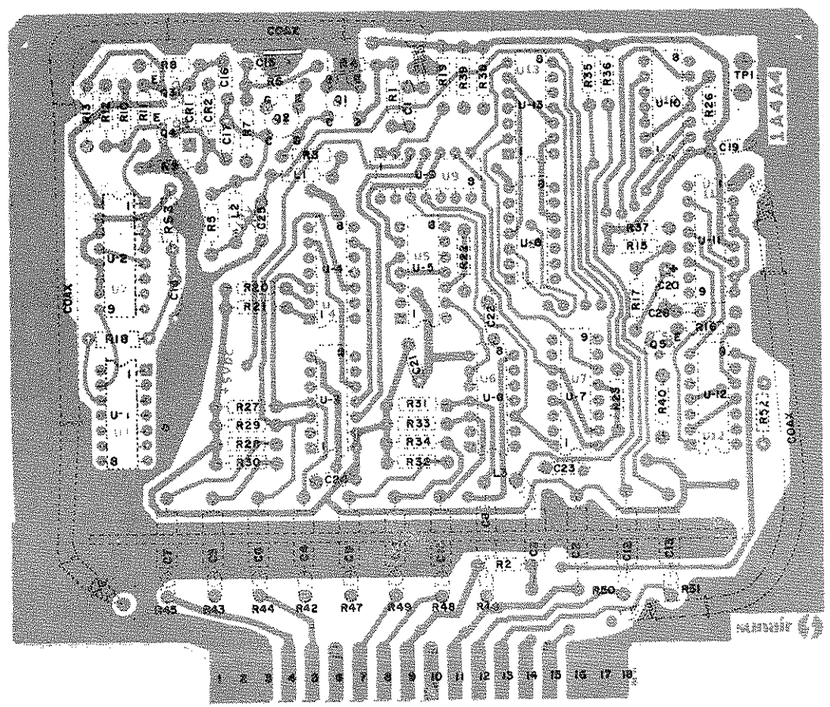
   ALL OTHERS MEASURED WITH A 20,000 OHM/VOLT V.O.M.

KEY TO VOLTAGE MEASUREMENTS

1. Unless otherwise noted, all D.C. voltage measurements made with 20,000 ohm/volt V.O.M. and may vary ±15% from the indicated nominal readings.
2. Voltage readings followed by an asterisk (*) made with 11 megohm V.T.V.M.
3. ○ denotes readings present in all modes.
4. □ denotes readings present only in "VFO" mode.
5. ▽ denotes readings present when not in "VFO" mode.
6. ◌ denotes readings which vary with setting of front panel VFO control. Readings shown are with control in the center of its range.

Figure 5.14 Translator (1A4A3) Schematic



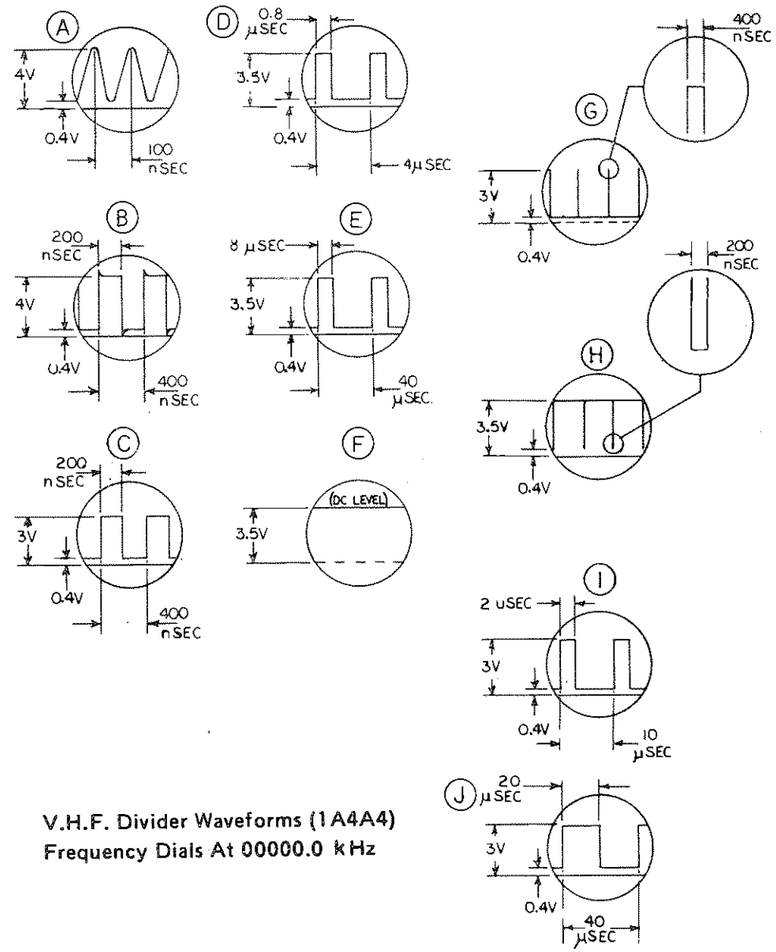


PARTS LIST, 1A4A4

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C2	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C3	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C4	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C5	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C6	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C7	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C8	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C9	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C10	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C11	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C12	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C13	Capacitor, Feed Thru, 1500 PF, 500 V	28176
C14	Not Used	
C15	Capacitor, Mica, 82 PF, 500 V	26212
C16	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C17	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C18	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C19	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C20	Capacitor, Tantalum, 3.3 UF, 15 V	28168
C21	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C22	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C23	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C24	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C25	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C26	Capacitor, Mica, 100 PF, 500 V	28545
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
L1	Inductor, 22 UH 5%	65000
L2	Inductor, 22 UH 5%	65000
L3	Inductor, 15 UH 5%	65907
Q1	Transistor, 2N5179	44513
Q2	Transistor, 2N5179	44513
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4126	44802
Q5	Transistor, 2N4124	44801
R1	Resistor, Carbon, 56 ohm 10%, 1/4 W	17429
R2	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R3	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R4	Resistor, Carbon, 180 ohm 10%, 1/4 W	17522
R5	Resistor, Carbon, 1K 10%, 1/4 W	17156
R6	Resistor, Carbon, 330 ohm 10%, 1/4 W	17091
R7	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R8	Resistor, Carbon, 2.7K 10%, 1/4 W	18667
R9	Resistor, Carbon, 1K 10%, 1/4 W	17156
R10	Resistor, Carbon, 1K 10%, 1/4 W	17156
R11	Resistor, Carbon, 22 ohm 10%, 1/4 W	19269
R12	Resistor, Carbon, 22 ohm 10%, 1/4W	19269
R13	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R14	Not Used	
R15	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R16	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R17	Resistor, Carbon, 4.7 K 5%, 1/4 W	17077
R18	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R19	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R20	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R21	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R22	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R23	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R24	Not Used	
R25	Not Used	
R26	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R27	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R28	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R29	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R30	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R31	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R32	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R33	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R34	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R36	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R37	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R38	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R39	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R40	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R42	Resistor, Carbon, 68 ohm 10%, 1/4W	18796
R43	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R44	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R45	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R46	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R47	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R48	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R49	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R50	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R51	Resistor, Carbon, 68 ohm 10%, 1/4 W	18796
R52	RESISTOR, CARBON 22M 10% 1/4W	18095
R53	RESISTOR, CARBON 1K 10% 1/4W	17156

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
U1	Integrated Circuit, Digital, SN7400N	44807
U2	Integrated Circuit, Digital, SN74S112N	44845
U3	Integrated Circuit, Digital, N8290A	44825
U4	Integrated Circuit, Digital, SN7401N	44823
U5	Integrated Circuit, Digital, SN7400N	44807
U6	Integrated Circuit, Digital, N8290A	44825
U7	Integrated Circuit, Digital, SN7476N	44824
U8	Integrated Circuit, Digital, 1SN7400N	44807
U9	Integrated Circuit, Digital, SN7430N	44811
U10	Integrated Circuit, Digital, SN74H72N	44809
U11	Integrated Circuit, Digital, SN7476N	44824
U12	Integrated Circuit, Digital, MC4044P	44810
U13	Integrated Circuit, Digital, SN7400N	44807



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

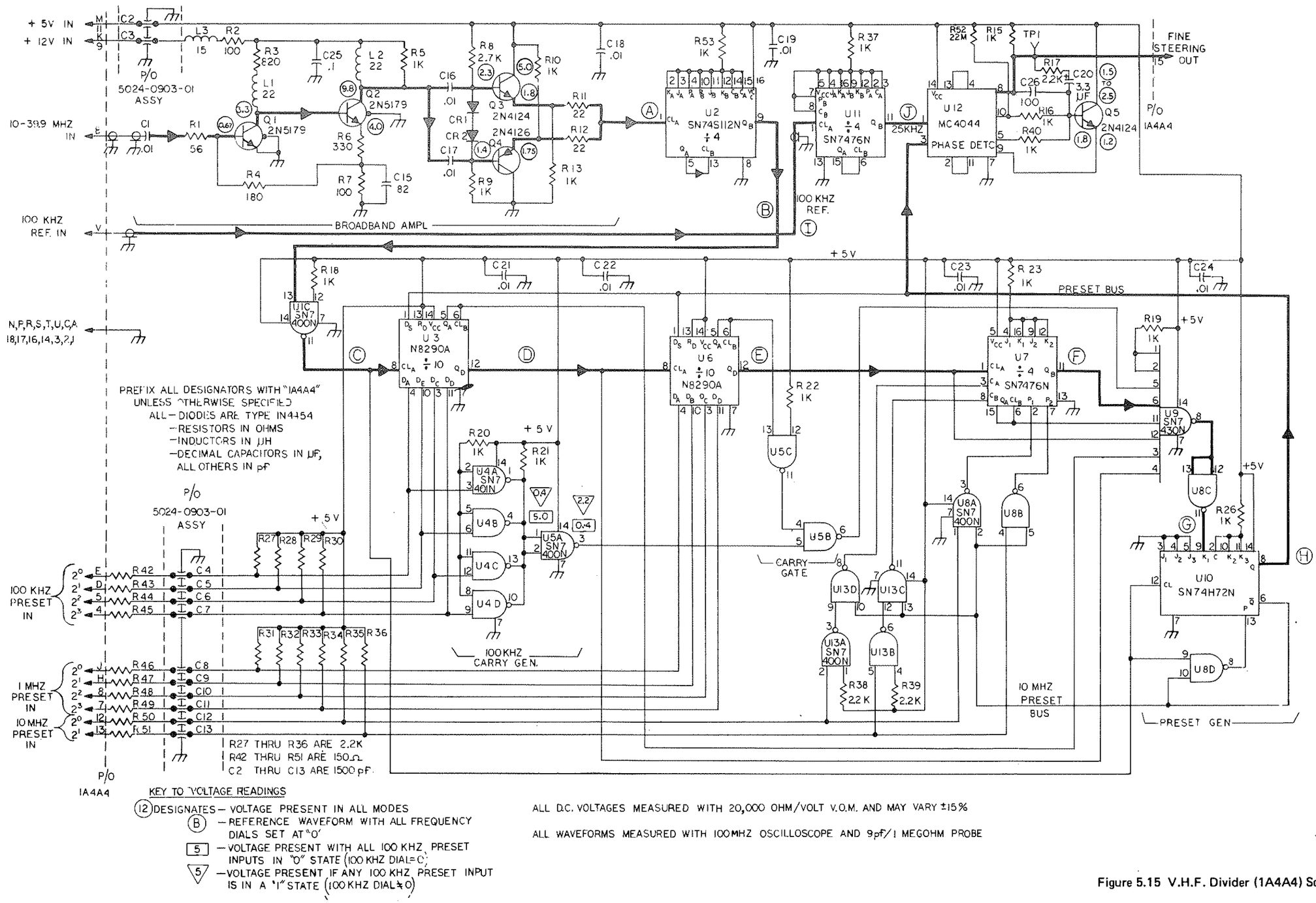
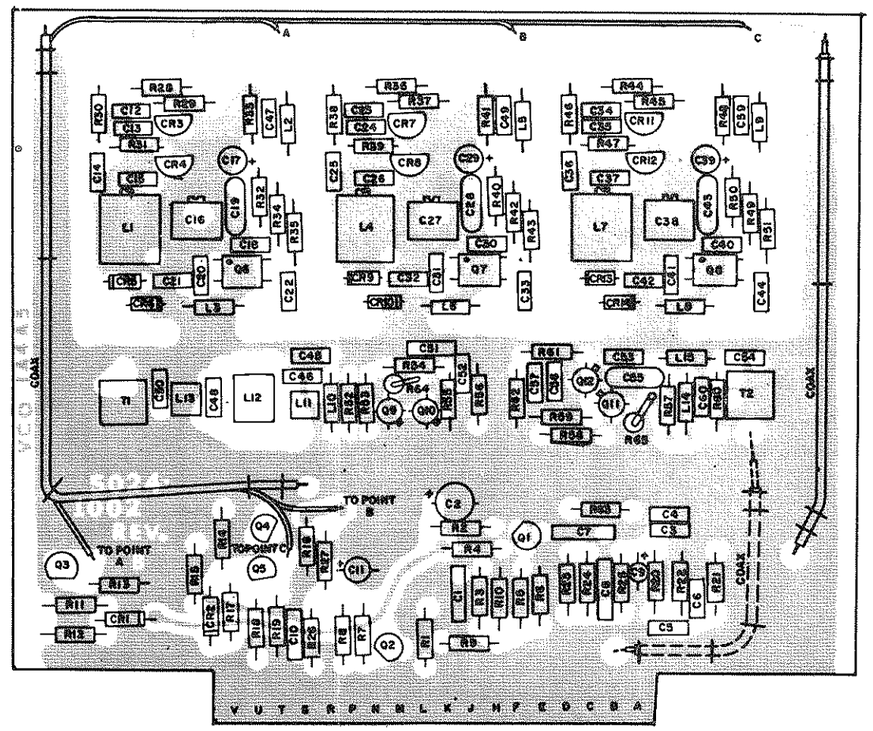
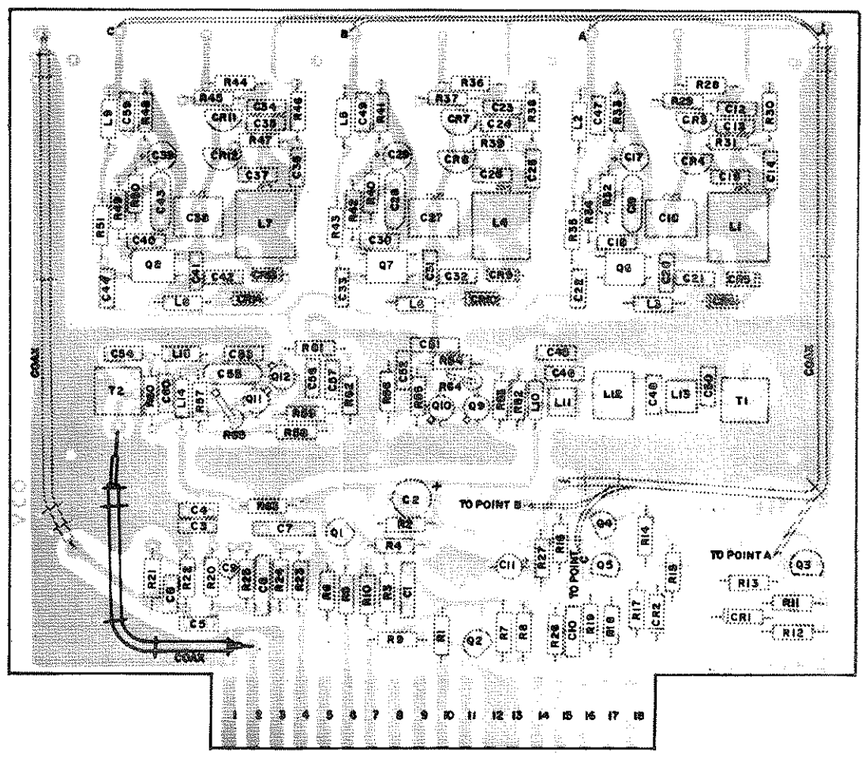


Figure 5.15 V.H.F. Divider (1A4A4) Schematic





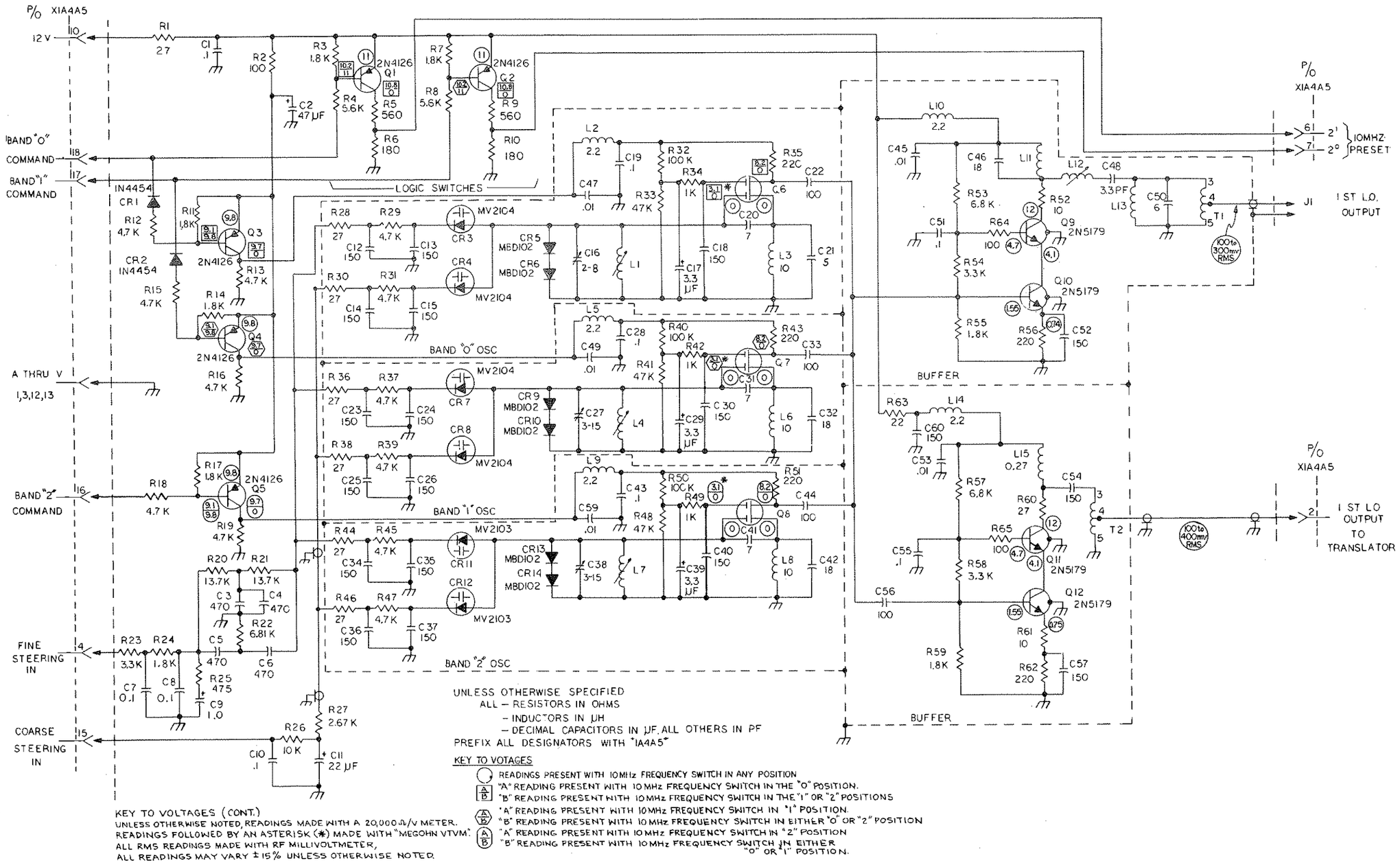
PARTS LIST, 1A4A5

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
1A4A5		
C1	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C2	Capacitor, Tantalum, 47 UF, 20 V	28170
C3	Capacitor, Mica, 470 PF, 5%, 100V	28557
C4	Capacitor, Mica, 470 PF, 5%, 100V	28557
C5	Capacitor, Mica, 470 PF, 5%, 100V	28557
C6	Capacitor, Mica, 470 PF, 5%, 100V	28557
C7	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C8	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C9	Capacitor, Tantalum, 1 UF, 35 V	28166
C10	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C11	Capacitor, Tantalum, 22 UF, 15 V	28169
C12	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C13	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C14	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C15	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C16	Capacitor, Variable, 2-8 PF	28430
C17	Capacitor, Tantalum, 3.3 PF, 35 V	28168
C18	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C19	Capacitor, Monolithic, 0.1 PF, 50 V	28161
C20	Capacitor, Mica, 7 PF, .5 PF, 500 V	28858
C21	Capacitor, Mica, 5 PF, 5%, 500 V	26119
C22	Capacitor, Mica, 100 PF, 5%, 500 V	28545
C23	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C24	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C25	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C26	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C27	Capacitor, Variable, 3-15 PF	28571
C28	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C29	Capacitor, Tantalum, 3.3 UF, 35 V	28168
C30	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C31	Capacitor, Mica, 7 PF, .5 PF, 500 V	28858
C32	Capacitor, Mica, 18 PF, 5%, 500 V	28662
C33	Capacitor, Mica, 100 PF, 5%, 500 V	28545
C34	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C35	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C36	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C37	Capacitor, Mica, 150 PF, 5%, 500 V	28090
C38	Capacitor, Variable, 3-15 PF	28571
C39	Capacitor, Tantalum, 3.3 UF, 35 V	28168
C40	Capacitor, Mica, 150 PF, 5%, 500 V	28090

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C41	Capacitor, Mica, 7 PF .5 PF, 500 V	28858
C42	Capacitor, Mica, 18 PF 5%, 500 V	28662
C43	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C44	Capacitor, Mica, 100 PF 5%, 500 V	28545
C45	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C46	Capacitor, Mica, 18 PF 5%, 500 V	28662
C47	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C48	Capacitor, Disc Ceramic, 3.3 PF, 500 V	26224
C49	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C50	Capacitor, Disc Ceramic, 6 PF .5 PF	25036
C51	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C52	Capacitor, Mica, 150 PF 5%, 500 V	28090
C53	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C54	Capacitor, Mica, 150 PF 5%, 500 V	28090
C55	Capacitor, Monolithic, 0.1 PF 50 V	28161
C56	Capacitor, Mica, 100 PF 5%, 500 V	28545
C57	Capacitor, Mica, 150 PF 5%, 500 V	28090
C58	Not Used	
C59	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C60	Capacitor, Mica, 150 PF 5%, 500 V	28090
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, MV2104	40533
CR4	Diode, MV2104	40533
CR5	Diode, MBD-102	40528
CR6	Diode, MBD-102	40528
CR7	Diode, MV2104	40533
CR8	Diode, MV2104	40533
CR9	Diode, MBD-102	40528
CR10	Diode, MBD-102	40528
CR11	Diode, MV2103	40532
CR12	Diode, MV2103	40532
CR13	Diode, MBD-102	40528
CR14	Diode, MBD-102	40528
L1	Inductor, Variable, Band "0"	5024-1007-00
L2	Inductor, 2.2 UH 10%	65971
L3	Inductor, 10 UH 5%	65957
L4	Inductor, Variable, Band "1"	5024-1008-00
L5	Inductor, 2.2 UH 10%	65971
L6	Inductor, 10 UH 5%	65957
L7	Inductor, Variable, Band "2"	5024-1009-00
L8	Inductor, 10 UH 5%	65957
L9	Inductor, 2.2 UH 10%	65971
L10	Inductor, 2.2 UH 10%	65971

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
L11	Inductor, Air	5024-1012-00
L12	Inductor, Variable	5024-1006-00
L13	Inductor, Air	5024-1013-00
L14	Inductor, 2.2 UH 10%	65971
L15	Inductor, 0.27 UH 5%	64939
Q1	Transistor, 2N4126	44802
Q2	Transistor, 2N4126	44802
Q3	Transistor, 2N4126	44802
Q4	Transistor, 2N4126	44802
Q5	Transistor, 2N4126	44802
Q6	Transistor, MPF-120	44800
Q7	Transistor, MPF-120	44800
Q8	Transistor, MPF-120	44800
Q9	Transistor, 2N5179	44513
Q10	Transistor, 2N5179	44513
Q11	Transistor, 2N5179	44513
Q12	Transistor, 2N5179	44513
R1	Resistor, Carbon, 27 ohm 10%, 1/4 W	17259
R2	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R3	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R4	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R5	Resistor, Carbon 560 ohm 10%, 1/4 W	18320
R6	Resistor, Carbon, 180 ohm 10%, 1/4 W	17522
R7	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R8	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R9	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R10	Resistor, Carbon, 180 ohm 10%, 1/4 W	17522
R11	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R12	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R13	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R14	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R15	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R16	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R17	Resistor, Carbon, 1.8 K 10%, 1/4 W	17819
R18	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R19	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R20	Resistor, Film, 13.7 K 1% 1/8 W	19623
R21	Resistor, Film, 13.7 K 1% 1/8 W	19623
R22	Resistor, Film, 6.81 K 1% 1/8 W	19635
R23	Resistor, Carbon, 3.3 K 10% 1/4 W	17089
R24	Resistor, Carbon, 1.8 K 10% 1/4 W	17819
R25	Resistor, Film, 475 ohm 1% 1/8 W	19661
R26	Resistor, Carbon, 10 K 10% 1/4 W	17041

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R27	Resistor, Film, 2670 ohm 1% 1/8 W	19673
R28	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R29	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R30	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R31	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R32	Resistor, Carbon, 100 K 10% 1/4 W	17039
R33	Resistor, Carbon, 47K 10% 1/4 W	17106
R34	Resistor, Carbon, 1 K 10% 1/4 W	17156
R35	Resistor, Carbon, 220 ohm 10% 1/4 W	17132
R36	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R37	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R38	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R39	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R40	Resistor, Carbon, 100 K 10% 1/4 W	17039
R41	Resistor, Carbon, 47 K 10% 1/4 W	17106
R42	Resistor, Carbon, 1 K 10% 1/4 W	17156
R43	Resistor, Carbon, 220 ohm 10% 1/4 W	17132
R44	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R45	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R46	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R47	Resistor, Carbon, 4.7 K 10% 1/4 W	17077
R48	Resistor, Carbon, 47 K 10% 1/4 W	17106
R49	Resistor, Carbon, 1 K 10% 1/4 W	17156
R50	Resistor, Carbon, 100 K 10% 1/4 W	17039
R51	Resistor, Carbon, 220 ohm 10% 1/4 W	17132
R52	Resistor, Carbon, 10 ohm 10% 1/4 W	17716
R53	Resistor, Carbon, 6.8 K 10% 1/4 W	17481
R54	Resistor, Carbon, 3.3 K 10% 1/4 W	17089
R55	Resistor, Carbon, 1.8 K 10% 1/4 W	17819
R56	Resistor, Carbon, 220 ohm 10% 1/4 W	17132
R57	Resistor, Carbon, 6.8 K 10% 1/4 W	17481
R58	Resistor, Carbon, 3.3 K 10% 1/4 W	17089
R59	Resistor, Carbon, 1.8K 10% 1/4 W	17819
R60	Resistor, Carbon, 27 ohm 10% 1/4 W	17259
R61	Resistor, Carbon, 10 ohm 10% 1/4 W	17716
R62	Resistor, Carbon, 220 ohm 10% 1/4 W	17132
R63	Resistor, Carbon, 22 ohm 10% 1/4 W	19269
R64	Resistor, Carbon, 100 ohm 10% 1/4 W	17118
R65	Resistor, Carbon, 100 ohm 10% 1/4 W	17118
T1	Transformer, Balun, 1:4	5024-1114-00
T2	Transformer, Balun, 1:9	5024-1011-00



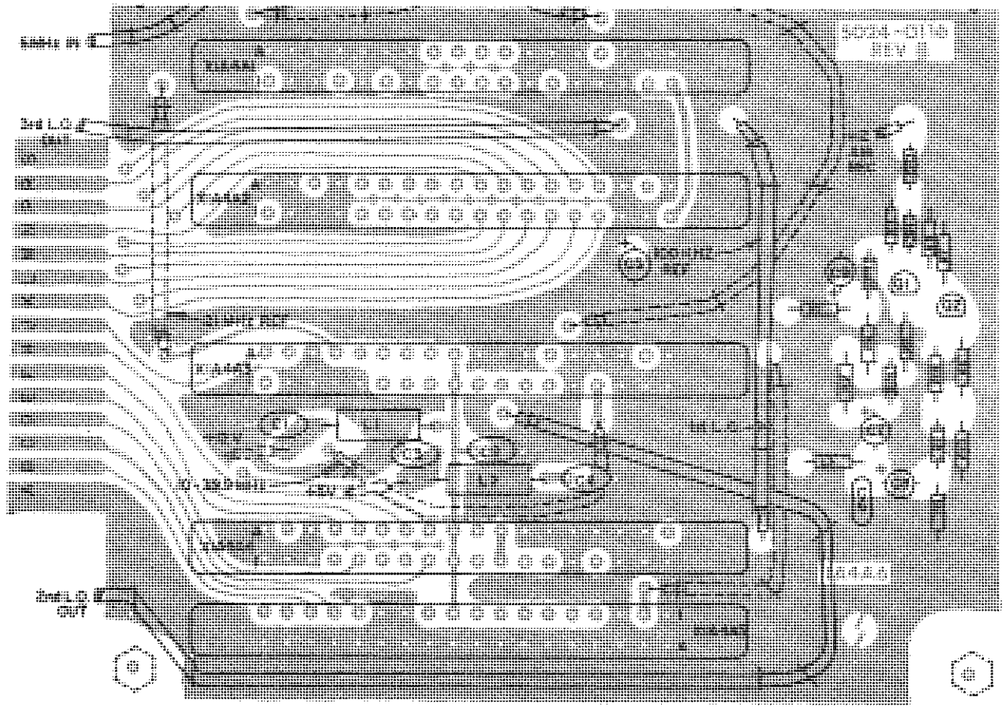
UNLESS OTHERWISE SPECIFIED
ALL – RESISTORS IN OHMS
– INDUCTORS IN µH
– DECIMAL CAPACITORS IN µF, ALL OTHERS IN PF
PREFIX ALL DESIGNATORS WITH "1A4A5"

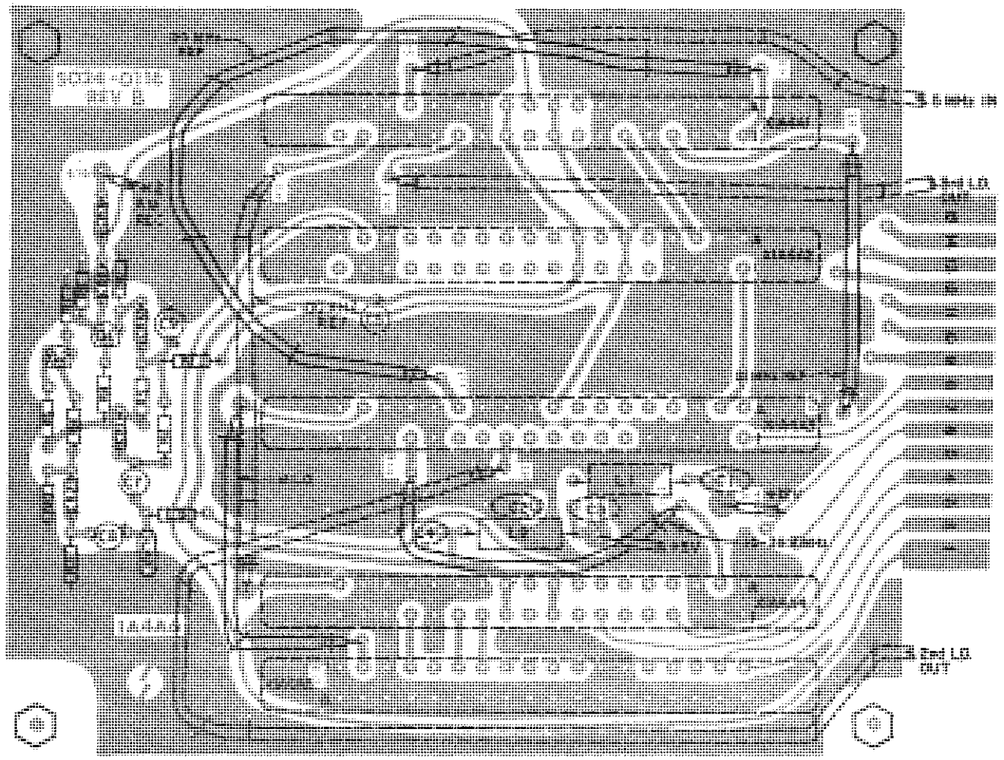
KEY TO VOTAGES

- 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 10MHz FREQUENCY SWITCH IN THE "1" OR "2" POSITIONS
- A/B: "A" READING PRESENT WITH 10MHz 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 "MEGOHN VTVM".
ALL RMS READINGS MADE WITH RF MILLIVOLTMETER,
ALL READINGS MAY VARY ±15% UNLESS OTHERWISE NOTED.

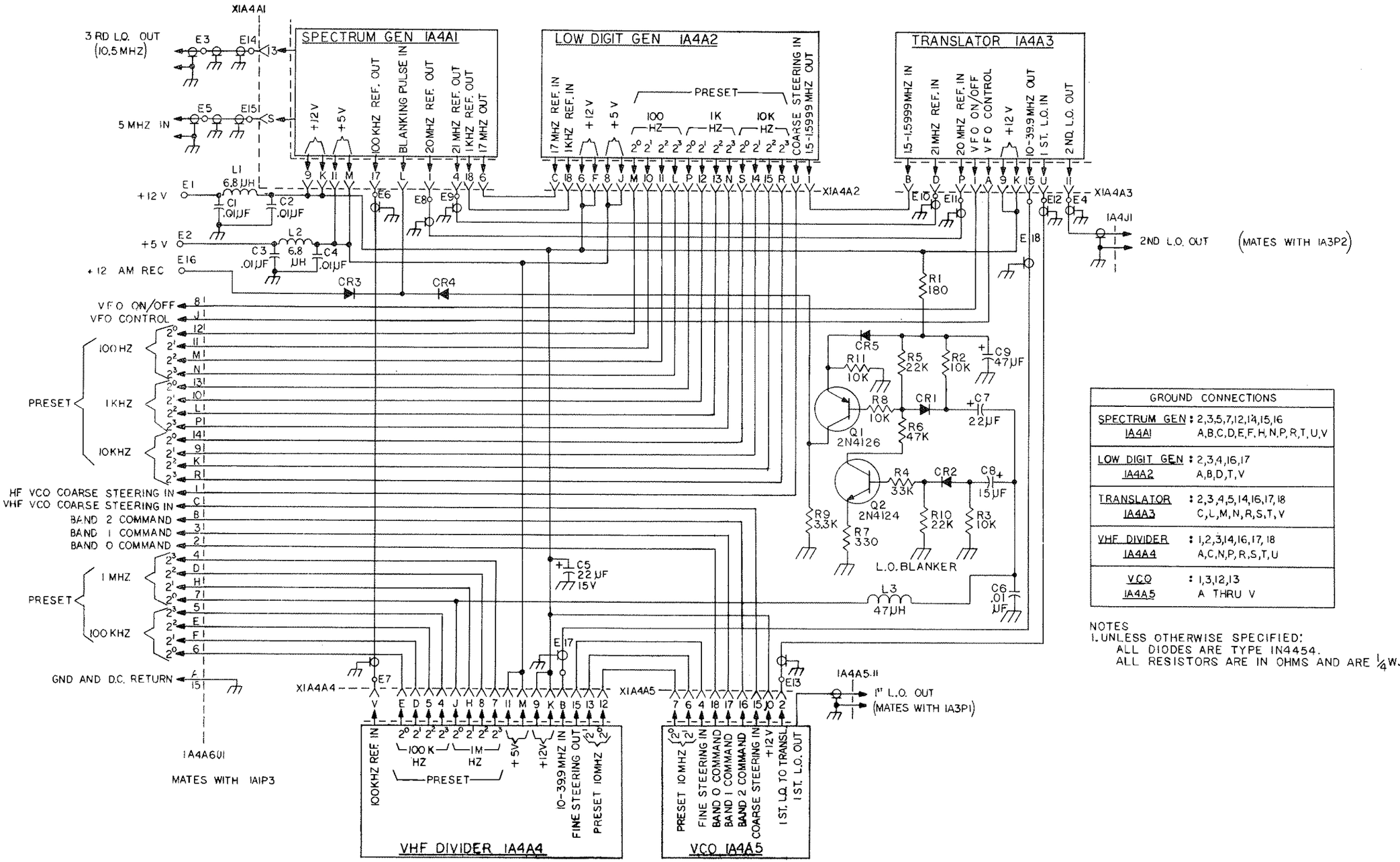
Figure 5.16 VCO (1A4A5) Schematic





PARTS LIST, 1A4A6

REF. SYMBOL	DESCRIPTION	REF. SYMBOL
C1	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C4	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C5	Capacitor, Tantalum, 22 UF, 15 V	28169
C6	Capacitor, Disc Ceramic, 0.01 UF, 25 V	28162
C7	Capacitor, Tantalum, 22 UF, 15 V	28169
C8	Capacitor, Tantalum, 15 UF, 15 V	28172
C9	Capacitor, Tantalum, 47 UF, 20 V	28170
CR1	Diode, Signal, 1N4454	40527
CR2	Diode, Signal, 1N4454	40527
CR3	Diode, Signal, 1N4454	40527
CR4	Diode, Signal, 1N4454	40527
CR5	Diode, Signal, 1N4454	40527
L1	Inductor, 6.8 UH, 10%	65220
L2	Inductor, 6.8 UH, 10%	65220
L3	Inductor, 47 UH, 5%	65268
Q1	Transistor, 2N4126	44802
Q2	Transistor, 2N4124	44801
R1	Resistor, Carbon, 180 ohm, 10%, 1/4W	17522
R2	Resistor, Carbon, 10K, 10%, 1/4W	17041
R3	Resistor, Carbon, 10K, 10%, 1/4W	17041
R4	Resistor, Carbon, 33K, 10%, 1/4W	17792
R5	Resistor, Carbon, 22K, 10%, 1/4W	17223
R6	Resistor, Carbon, 47K, 10%, 1/4W	17106
R7	Resistor, Carbon, 330 ohm, 10%, 1/4W	17091
R8	Resistor, Carbon, 10K, 10%, 1/4W	17041
R9	Resistor, Carbon, 3.3K, 10%, 1/4W	17089
R10	Resistor, Carbon, 22K, 10%, 1/4W	17223
R11	Resistor, Carbon, 10K, 10%, 1/4W	17041
X1A4A1	Connector, P.C., Edge, 18 pin	75361
X1A4A2	Connector, P.C.,Edge, 18 Pin	75361
X1A4A3	Connector, P.C.,Edge, 18 Pin	75361
X1A4A4	Connector, P.C.,Edge, 18 Pin	75361
X1A4A5	Connector, P.C.,Edge, 18 Pin	75361
1A4J1	Connector, RF, Bulkhead, Male	75363
E1	Not Used	
E2	Not Used	
E3	Feed Thru, Coax	75369
E4	Not Used	
E5	Feed Thru, Coax	75369



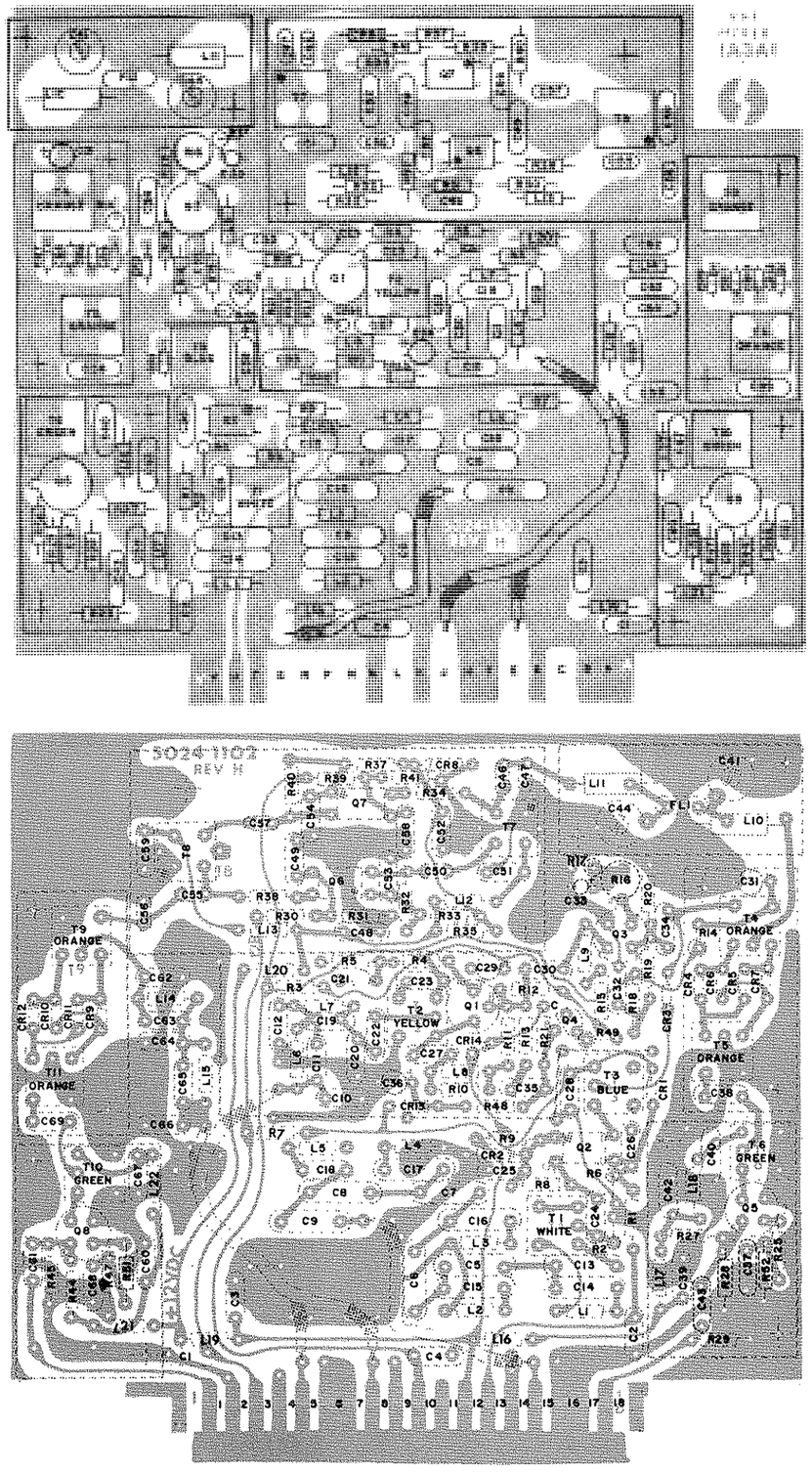
GROUND CONNECTIONS	
SPECTRUM GEN IA4AI	: 2,3,5,7,12,14,15,16 A,B,C,D,E,F,H,N,P,R,T,U,V
LOW DIGIT GEN IA4A2	: 2,3,4,16,17 A,B,D,T,V
TRANSLATOR IA4A3	: 2,3,4,5,14,16,17,18 C,L,M,N,R,S,T,V
VHF DIVIDER IA4A4	: 1,2,3,14,16,17,18 A,C,N,P,R,S,T,U
VCO IA4A5	: 1,3,12,13 A THRU V

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

Figure 5.17 Synthesizer Mother Board (1A4A6) Schematic

PARTS LIST, 1A3A1

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY VHF 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, 22	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 UH, 20 V, 196 D	0281700001
C29	Capacitor, 47 UH, 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, 0.1 UF, 50 V, X7 R, 20%	0281610002
C53	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C54	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
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	Not used	
CR5	Not used	
CR6	Not used	
CR7	Not used	
CR8	Diode, Zener 1 N5227 B	0405250002
CR9	Not used	
CR10	Not used	
CR11	Not used	
CR12	Not used	
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%	0650480007
L21	Inductor, Molded, 3.9 UH, 5%	0650480007
L22	Inductor, Molded, 3.9 UH, 5%	0650480007
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	0173960001
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	Not used	
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	0188670001
R45	Resistor, 2.7 K, 10%, 1/4 W	0188670001
R46	Not used	
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	Not used	
T3	Transformer, RF Amp	5024110803
T4	Not used	
T5	Not used	
T6	Transformer	5024110901
T7	Inductor	5024110404
T8	Inductor	5024110404
T9	Not used	
T10	Transformer	5024110901
X1	Mixer, Broadband, Balanced	1003300006
X2	Mixer, Broadband, Balanced	1003300006
	Shield, VHF Mixer	5024110609



5024110072K

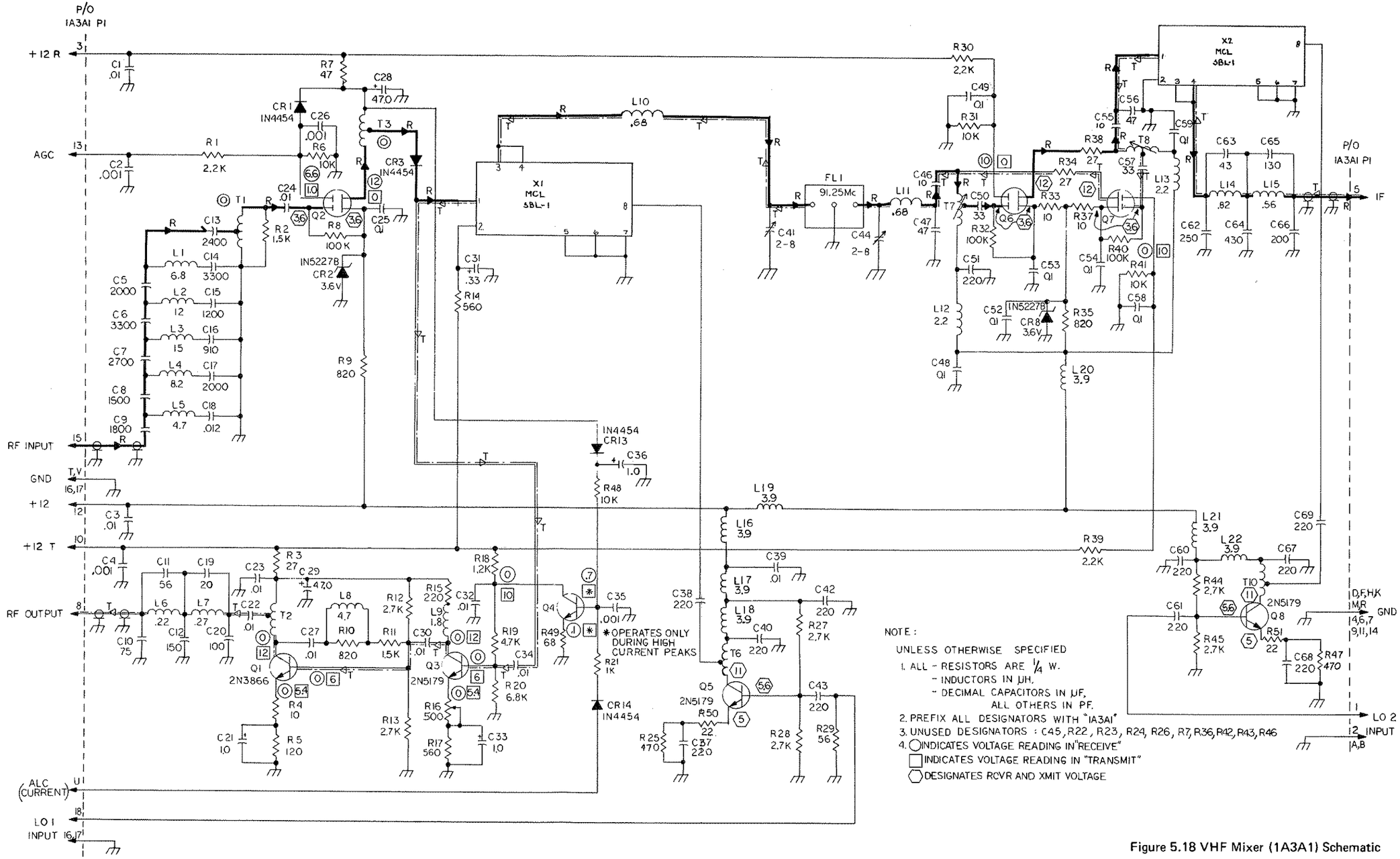
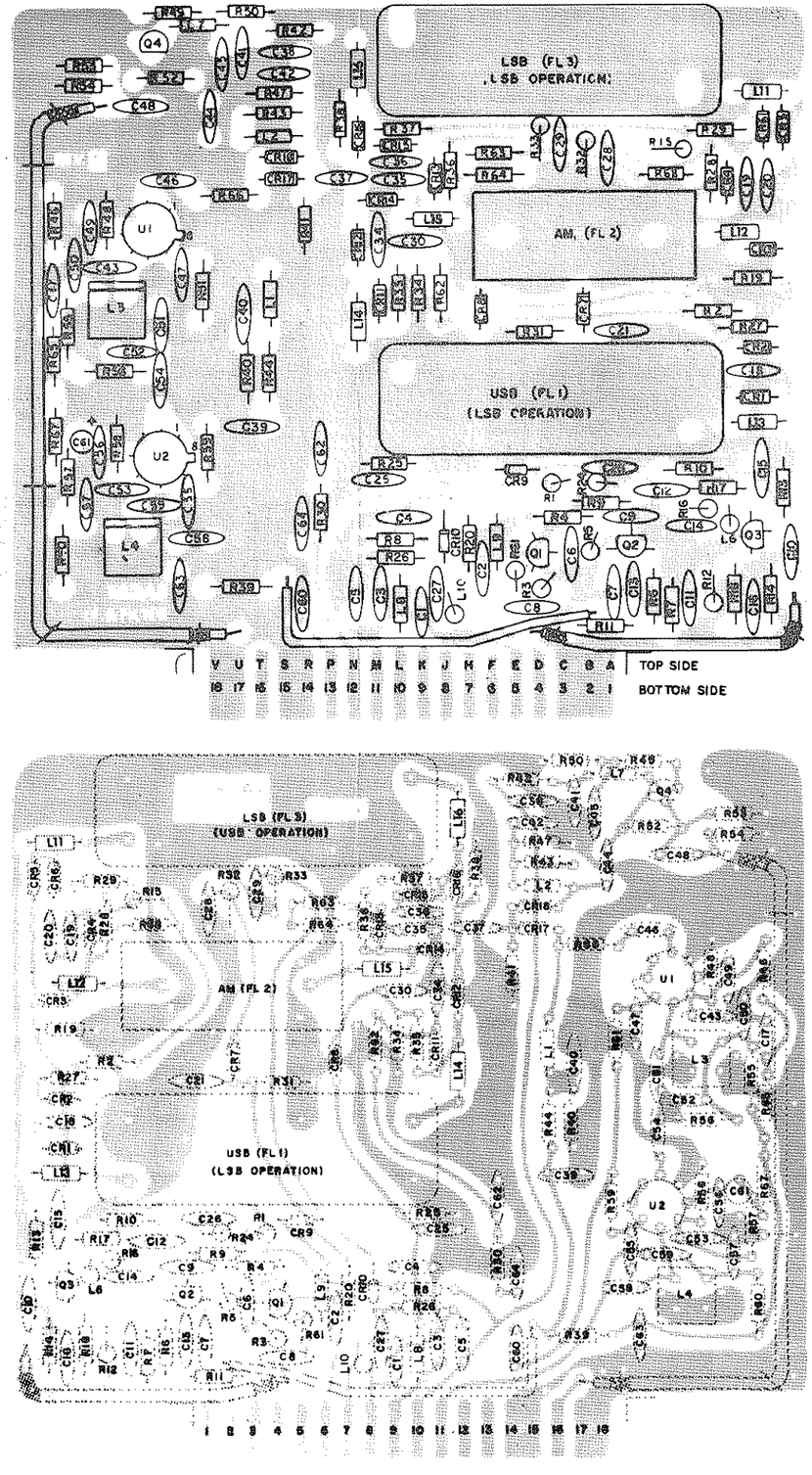


Figure 5.18 VHF Mixer (1A3A1) Schematic



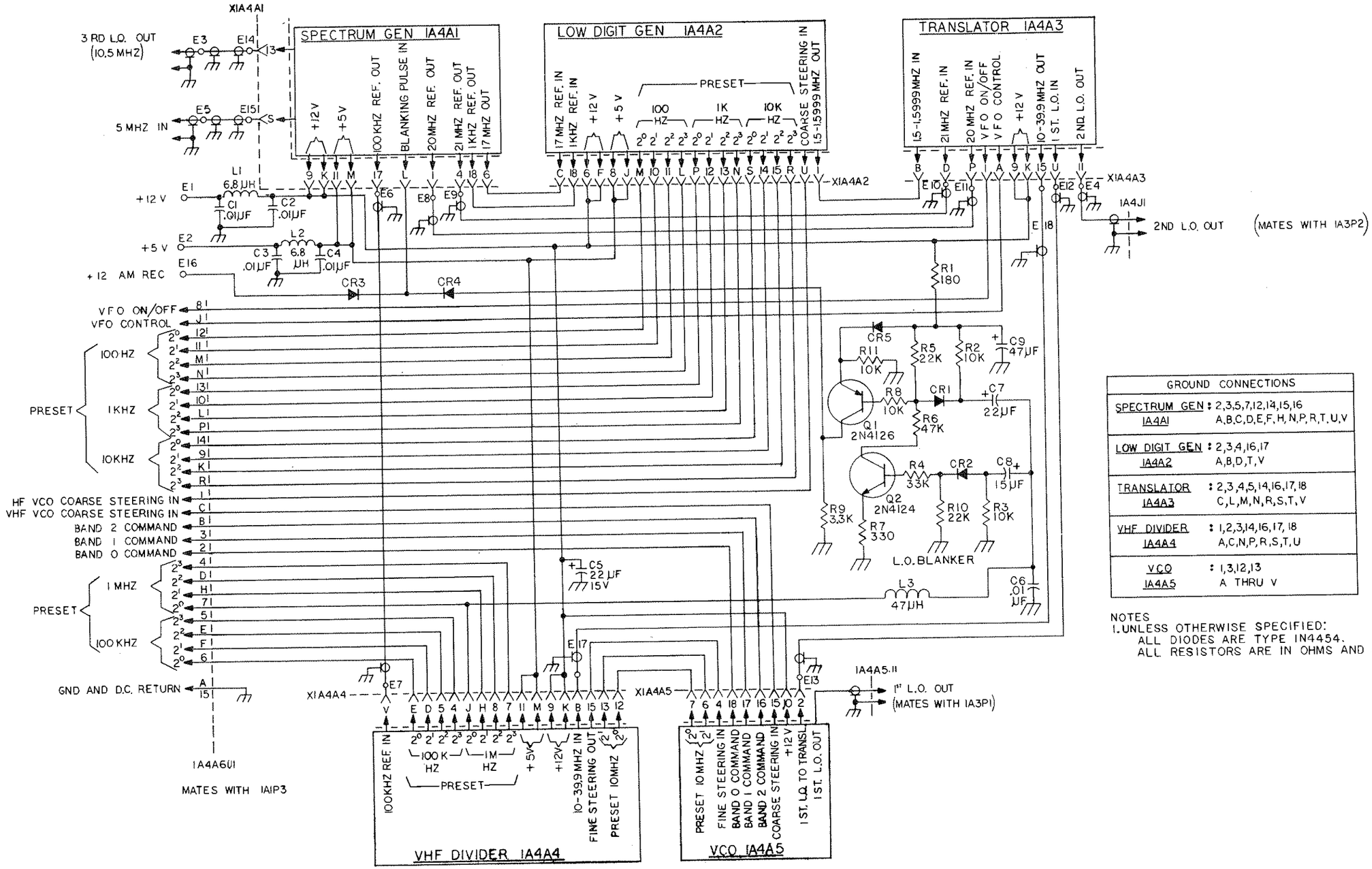
PARTS LIST, 1A3A2

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C4	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C7	Capacitor, Mica, 10 PF, 5%, 300 V	25983
C8	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C9	Capacitor, Tantalum, 68 UF, 15 V	29654
C10	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C11	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C12	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C13	Capacitor, Tantalum, 15 UF, 20 V	28092
C14	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C15	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C16	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C17	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C18	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C19	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C20	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C21	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C22		
C23		
C24		
C25	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C26	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C27	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C28	Capacitor, Disc Ceramic, 0.1 UF, 50V	0281610002
C29	Capacitor, Disc Ceramic, 0.1 UF, 50V	0281610002
C30	Capacitor, Disc Ceramic, 0.1 UF, 50V	0281610002
C31		
C32		
C33		
C34	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C35	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C36	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C37	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C38	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C39	Capacitor, Disc Ceramic, .01 UF, 25 V	28162

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C40	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C41	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C42	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C43	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C44	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C45	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C46	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C47	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C48	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C49	Capacitor, Disc Ceramic, 0.1 UF, 25 V	28161
C50	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C51	Capacitor, Mica, 82 PF, 5%, 500 V	26212
C52	Capacitor, Mica, 360 PF, 5%, 500 V	27515
C53	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C54	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C55	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C56	Capacitor, Disc Ceramic, 0.1 UF, 25 V	28161
C57	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C58	Capacitor, Mica, 82 PF, 5%,500 V	26212
C59	Capacitor, Mica, 360 PF, 5%, 500 V	27515
C60	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C61	Capacitor, Tantalum, 68 UF, 15 V	29654
C62	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C63	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C64	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C65	Capacitor, Disc Ceramic, 68 UF, 15 V	29654
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, 1N4454	40527
CR4	Diode, 1N4454	40527
CR5	Diode, 1N4454	40527
CR6	Diode, 1N4454	40527
CR7	Diode, 1N4454	40527
CR8	Diode, 1N4454	40527
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
CR11	Diode, 1N4454	40527
CR12	Diode, 1N4454	40527
CR13	Diode, 1N4454	40527
CR14	Diode, 1N4454	40527
CR15	Diode, 1N4454	40527
CR16	Diode, 1N4454	40527
CR17	Diode, 1N4454	40527
CR18	Diode, 1N4454	40527

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R30	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R31	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R32	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R33	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R34	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R35	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R36	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R37	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R38	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R39	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R40	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R41	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R42	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R43	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R44	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R45	Not Used	
R46	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R47	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R48	Resistor, Carbon, 5.6 K, 10%, 1/4 W	18306
R49	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R50	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R51	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R52	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R53	Resistor, Carbon, 3.9 K, 10%, 1/4 W	17883
R54	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R55	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R56	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R57	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R58	Resistor, Carbon, 5.6 K, 10%, 1/4 W	18306
R59	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R60	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R61	Resistor, Carbon, 10 ohm 10%, 1/4 W	17716
R62	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R63	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R64	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R65	Resistor, Carbon, 150 ohm, 10%, 1/4 W	17273
R66	Resistor, Carbon, 470 ohm, 10%, 1/4 W	18411
R67	Resistor, Carbon, 150 ohm, 10%, 1/4 W	17273
R68	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
U1	Integrated Circuit, Linear CA3053	44806
U2	Integrated Circuit, Linear CA3053	44806

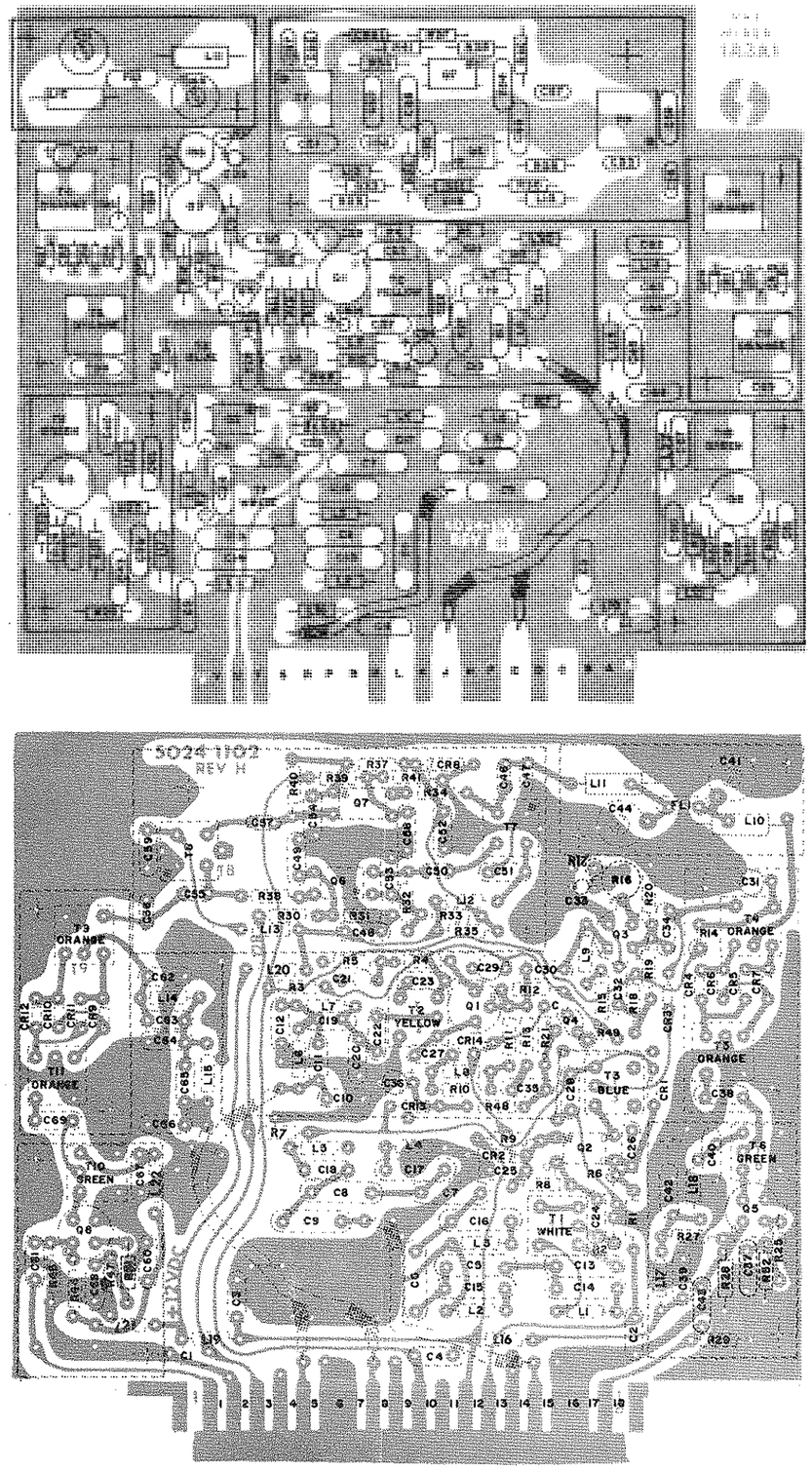
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
FL1	Filter, LSB Operation	81825
FL2	Filter, AM	81827
FL3	Filter, USB Operation	81826
L1	Inductor, 150 UH, 10%	65919
L2	Inductor, 150 UH, 10%	65919
L3	Inductor, Variable, 3.3 UH	64793
L4	Inductor, Variable, 3.3 UH	64793
L5	Not Used	
L6	Inductor, 150 UH, 10%	65919
L7	Inductor, 150 UH, 10%	65919
L8	Inductor, 22 UH, 10%	65000
L9	Inductor, 22 UH, 10%	65000
L10	Inductor, 22 UH, 10%	65000
L11	Choke, 1.5 UH, 5%	64927
L12	Choke, 1.5 UH, 5%	64927
L13	Choke, 1.5 UH, 5%	64927
L14	Choke, 1.5 UH, 5%	64927
L15	Choke, 1.5 UH, 5%	64927
L16	Choke, 1.5 UH, 5%	64927
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4124	44801
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4124	44801
R1	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R2	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R3	Resistor, Carbon, 470 ohm, 10%, 1/4 W	18411
R4	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R5	Resistor, Carbon, 1K, 10%, 1/4 W	17156
R6	Resistor, Carbon, 18 ohm, 10%, 1/4 W	18459
R7	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R8	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R9	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R10	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R11	Resistor, Carbon, 220 ohm, 10%, 1/4 W	17132
R12	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R13	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R14	Resistor, Carbon, 820 ohm, 10%, 1/4 W	17821
R15	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R16	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R17	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R18	Resistor, Carbon, 22 ohm, 10%, 1/4 W	19269
R19	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R20	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R21	Not Used	
R22	Not Used	
R23	Not Used	
R24	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R25	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R26	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R27	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R28	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R29	Resistor, Carbon, 1 K, 10%, 1/4 W	17156



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 (1A4A6) Schematic



SUNAIR GSB-900R

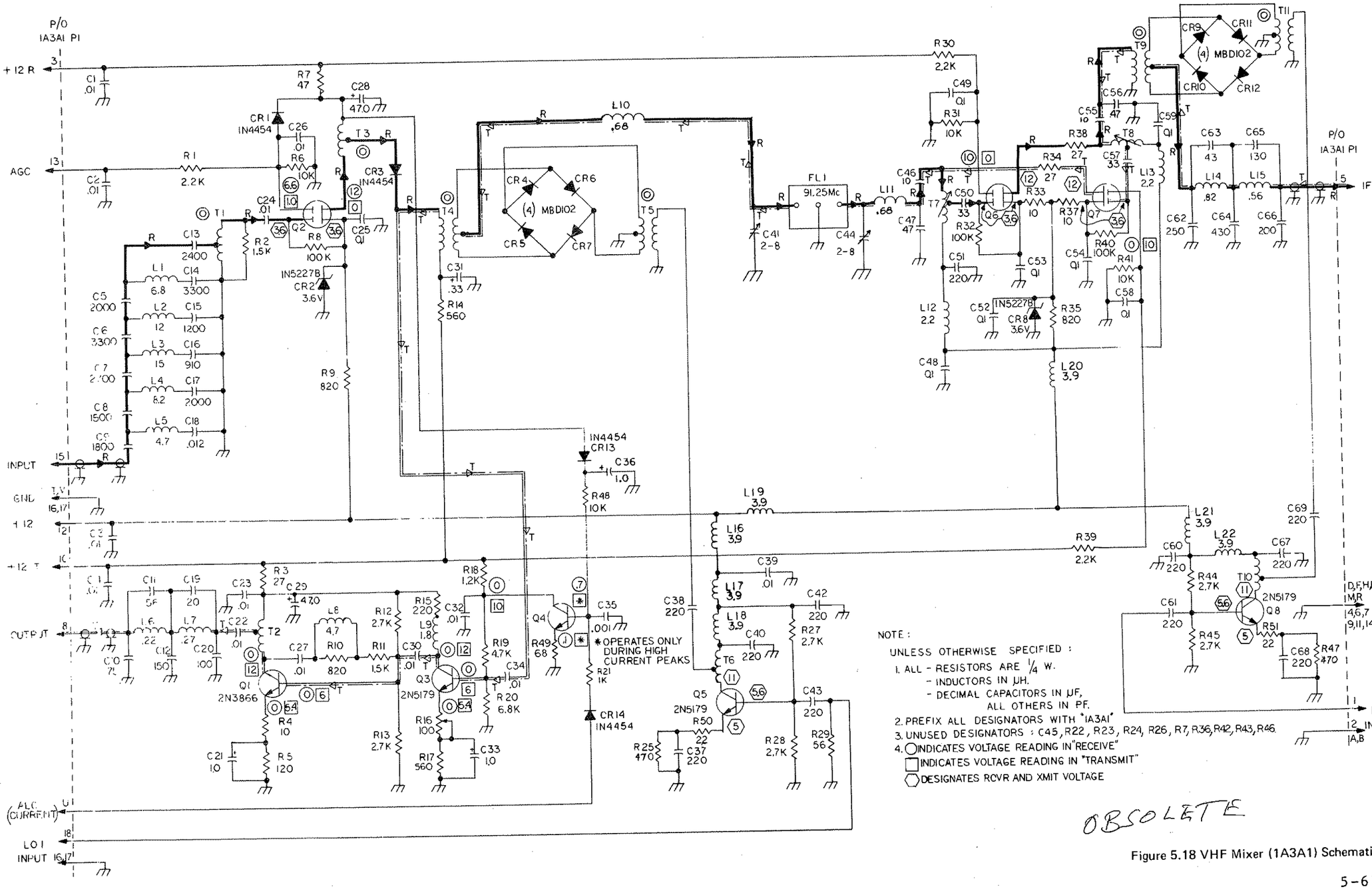
PARTS LIST, 1A3A1

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C4	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C5	Capacitor, Mica, 2000 PF, 2%, 500 V	28141
C6	Capacitor, Mica, 3300 PF, 2%, 500 V	28125
C7	Capacitor, Mica, 2700 PF, 2%, 500 V	28124
C8	Capacitor, Mica, 1500 PF, 2%, 500 V	28127
C9	Capacitor, Mica, 1800 PF, 2%, 500 V	28130
C10	Capacitor, Mica, 75 PF, 2%, 500 V	28111
C11	Capacitor, Mica, 56 PF, 5%, 500 V	27462
C12	Capacitor, Mica, 150 PF, 5%, 500 V	27498
C13	Capacitor, Mica, 2400 PF, 2%, 500 V	28098
C14	Capacitor, Mica, 3300 PF, 2%, 500 V	28125
C15	Capacitor, Mica, 1200 PF, 2%, 500 V	28103
C16	Capacitor, Mica, 910 PF, 2%, 500 V	28145
C17	Capacitor, Mica, 2000 PF, 2%, 500 V	28141
C18	Capacitor, Mylar, .12 UF, 5%, 50 V	28178
C19	Capacitor, Mica, 20 PF, 5%, 500 V	26042
C20	Capacitor, Mica, 100 PF, 5%, 500 V	27474
C21	Capacitor, Tantalum, 1 UF, 50 V	28091
C22	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C23	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C24	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C25	Capacitor, Monolithic, 0.1 MF 50 V	28161
C26	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C27	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C28	Capacitor, Tantalum, 47 UF, 20 V	28170
C29	Capacitor, Tantalum, 47 UF, 20 V	28170
C30	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C31	Capacitor, Tantalum, 0.33 UF, 35 V	28165
C32	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C33	Capacitor, Tantalum, 1 MF, 35 V	28166
C34	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C35	Capacitor, Monolithic, .001 UF, 50 V	28163
C36	Capacitor, Tantalum, 1 UF, 50 V	28091
C37	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C38	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C39	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C40	Capacitor, Mica, 220 PF, 5%, 500 V	28595

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C41	Capacitor, Variable, Ceramic, 2-8 PF	28430
C42	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C43	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C44	Capacitor, Variable, Ceramic, 2-8 PF	28430
C45	Not Used	
C46	Capacitor, Mica, 7 PF, 5%, 300 V	28858
C47	Capacitor, Mica, 47 PF, 5%, 300 V	28698
C48	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C49	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C50	Capacitor, Mica, 33 PF, 5%, 500 V	28686
C51	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C52	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C53	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C54	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C55	Capacitor, Mica, 7 PF, 5%, 300 V	28858
C56	Capacitor, Mica, 47 PF, 5%, 300 V	28698
C57	Capacitor, Mica, 33 PF, 5%, 500 V	28686
C58	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C59	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C60	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C61	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C62	Capacitor, Mica, 250 PF, 2%, 500 V	28110
C63	Capacitor, Mica, 43 PF, 5%, 500 V	26080
C64	Capacitor, Mica, 430 PF, 5%, 500 V	28959
C65	Capacitor, Mica, 130 PF, 2%, 500 V	28101
C66	Capacitor, Mica, 200 PF, 5%, 500 V	25804
C67	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C68	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C69	Capacitor, Mica, 220 PF, 5%, 500 V	28595
CR1	Diode, 1N4454	40527
CR2	Diode, 1N5229B, 3.6 V, 5%	40525
CR3	Diode, 1N4454	40527
CR4	Diode, MBD-102	40528
CR5	Diode, MBD-102	40528
CR6	Diode, MBD-102	40528
CR7	Diode, MBD-102	40528
CR8	Diode, 1N5227B, 3.6 V, 5%	40525
CR9	Diode, MBD-102	40528
CR10	Diode, MBD-102	40528
CR11	Diode, MBD-102	40528
CR12	Diode, MBD-102	40528
CR13	Diode, MBD-102	40528

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
CR14	Diode, 1N4454	40527
FL1	Filter, Crystal, 91.25 MHZ	5024-1105-00
L1	Inductor, 6.8 UH, 5%	65921
L2	Inductor, 12 UH, 5%	65270
L3	Inductor, 15 UH, 5%	65907
L4	Inductor, 8.2 UH, 5%	65206
L5	Inductor, 4.7 UH, 5%	65191
L6	Inductor, 0.22 UH, 5%	65062
L7	Inductor, 0.27 UH, 5%	64939
L8	Inductor, 4.7 UH, 5%	65191
L9	Inductor, 1.8 UH, 5%	65244
L10	Inductor, 0.68 UH, 5%	65177
L11	Inductor, 0.68 UH, 5%	65177
L12	Inductor, 2.2 UH, 5%	64989
L13	Inductor, 2.2 UH, 5%	64989
L14	Inductor, 0.82 UH, 5%	65232
L15	Inductor, 0.56 UH, 5%	64953
L16	Inductor, 3.9 UH, 5%	65048
L17	Inductor, 3.9 UH, 5%	65048
L18	Inductor, 3.9 UH, 5%	65048
L19	Inductor, 3.9 UH, 5%	65048
L20	Inductor, 3.9 UH, 5%	65048
L21	Inductor, 3.9 UH, 5%	65048
L22	Inductor, 3.9 UH, 5%	65048
L23		
Q1	Transistor, 2N3866	44814
Q2	Transistor, RCA40673	44745
Q3	Transistor, 2N5179	44513
Q4	Transistor, 2N4124	44801
Q5	Transistor, 2N5179	44513
Q6	Transistor, RCA40673	44745
Q7	Transistor, RCA40673	44745
Q8	Transistor, 2N5179	44513
R1	Resistor, Carbon, 2.2 K, 10%, 1/4 W	17807
R2	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R3	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R4	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R5	Resistor, Carbon, 120 ohm, 10%, 1/4 W	18655
R6	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R7	Resistor, Carbon, 47 ohm, 10%, 1/4W	17936
R8	Resistor, Carbon, 100 K, 10%, 1/4 W	17039
R9	Resistor, Carbon, 820 ohm, 10%, 1/4 W	17821
R10	Resistor, Carbon, 820 ohm, 10%, 1/4 W	17821
R11	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R12	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R13	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R14	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R15	Resistor, Carbon, 220 ohm, 10%, 1/4 W	17132
R16	Potentiometer, 100 ohm	34635
R17	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R18	Resistor, Carbon, 1.2 K, 10%, 1/4 W	18186
R19	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R20	Resistor, Carbon, 6.8 K, 10%, 1/4 W	17481
R21	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R22	Not Used	
R23	Not Used	
R24	Not Used	
R25	Resistor, Carbon, 470 ohm, 10%, 1/4 W	0172610001
R26	Not Used	
R27	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R28	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R29	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R30	Resistor, Carbon, 2.2 K, 10%, 1/4 W	17807
R31	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R32	Resistor, Carbon, 100 K, 10%, 1/4 W	17039
R33	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R34	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R35	Resistor, Carbon, 820 ohm, 10%, 1/4 W	17821
R36	Not Used	
R37	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R38	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R39	Resistor, Carbon, 2.2 K, 10%, 1/4 W	17807
R40	Resistor, Carbon, 100 K, 10%, 1/4 W	17039
R41	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R42	Not Used	
R43	Not Used	
R44	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R45	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R46	Not Used	
R47	Resistor, Carbon, 470 ohm, 10%, 1/4 W	0172610001
R48	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R49	Resistor, Carbon, 68 ohm, 10%, 1/4 W	18796
R50	Resistor, Carbon, 22 ohm, 10%, 1/4 W	19269
R51	Resistor, Carbon, 22 ohm, 10%, 1/4 W	19269
T1	Transformer, Input	5024-1107-00
T2	Transformer, Balun, 4:1	5024-1114-00
T3	Transformer, RF Amp	5024-1108-00
T4	Transformer, Mixer	5024-1103-00
T5	Transformer, Mixer	5024-1103-00
T6	Transformer, Balun, 9:1	5024-1109-00
T7	Transformer, Variable	5024-1104-00
T8	Transformer, Variable	5024-1104-00
T9	Transformer, Mixer	5024-1103-00
T10	Transformer, Balun, 9:1	5024-1109-00
T11	Transformer, Mixer	5024-1103-00



NOTE:

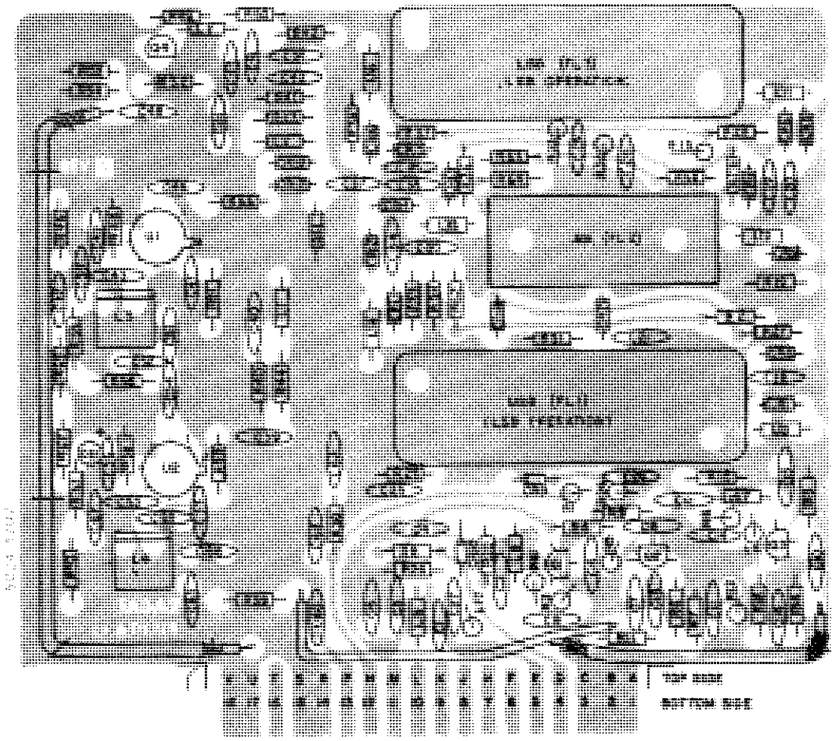
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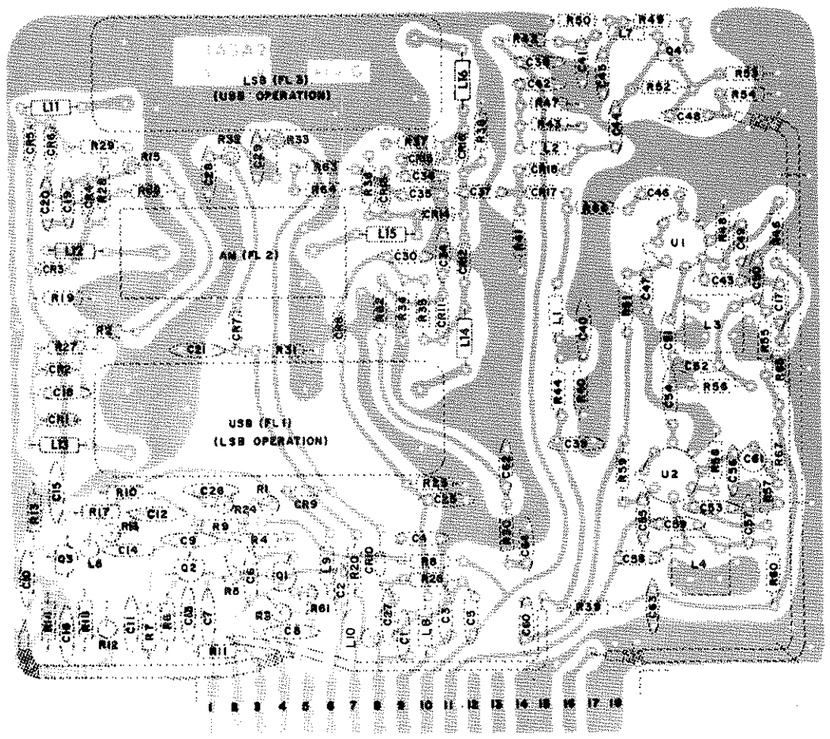
1. ALL - RESISTORS ARE 1/4 W.
   - INDUCTORS IN μH.
   - DECIMAL CAPACITORS IN μF, ALL OTHERS IN PF.
2. PREFIX ALL DESIGNATORS WITH "1A3A1"
3. UNUSED DESIGNATORS: C45, R22, R23, R24, R26, R7, R36, R42, R43, R46
4. ○ INDICATES VOLTAGE READING IN "RECEIVE"
   □ INDICATES VOLTAGE READING IN "TRANSMIT"
   ⬡ DESIGNATES RCVR AND XMIT VOLTAGE

* OPERATES ONLY DURING HIGH CURRENT PEAKS

OBSOLETE

Figure 5.18 VHF Mixer (1A3A1) Schematic





SUNAIR GSB-900R

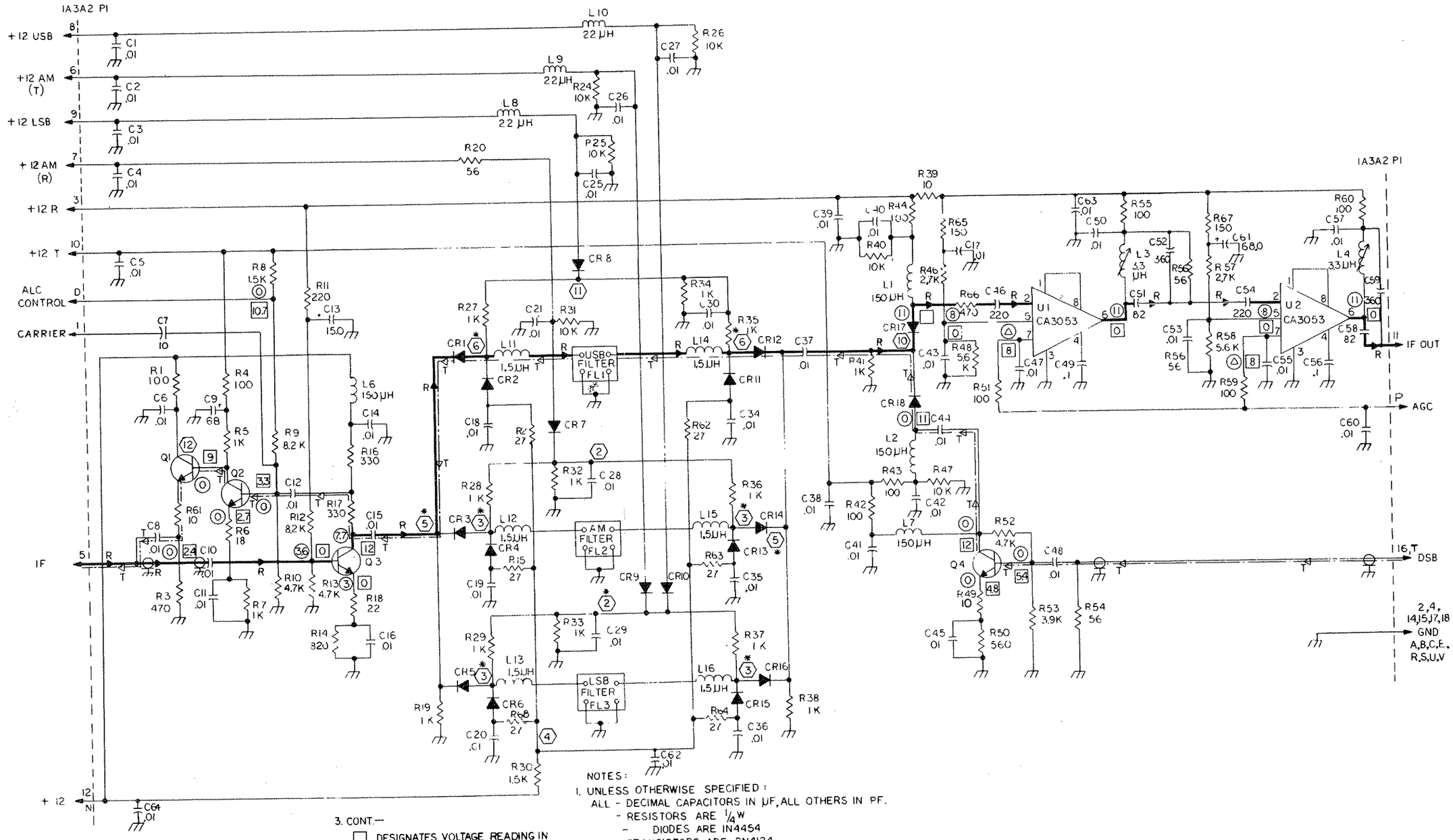
PARTS LIST, 1A3A2

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C4	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C7	Capacitor, Mica, 10 PF, 5%, 500 V	25983
C8	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C9	Capacitor, Tantalum, 68 UF, 15 V	29654
C10	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C11	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C12	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C13	Capacitor, Tantalum, 15 UF, 20 V	28092
C14	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C15	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C16	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C17	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C18	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C19	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C20	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C21	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C22		
C23		
C24		
C25	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C26	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C27	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C28	Capacitor, Disc Ceramic, 0.1 UF, 50V	0281610002
C29	Capacitor, Disc Ceramic, .0.1 UF, 50V	0281610002
C30	Capacitor, Disc Ceramic, .0.1 UF, 50V	0281610002
C31		
C32		
C33		
C34	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C35	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C36	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C37	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C38	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C39	Capacitor, Disc Ceramic, .01 UF, 25 V	28162

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C40	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C41	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C42	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C43	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C44	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C45	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C46	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C47	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C48	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C49	Capacitor, Disc Ceramic, 0.1 UF, 25 V	28161
C50	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C51	Capacitor, Mica, 82 PF, 5%, 500 V	26212
C52	Capacitor, Mica, 360 PF, 5%, 500 V	27515
C53	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C54	Capacitor, Mica, 220 PF, 5%, 500 V	28595
C55	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C56	Capacitor, Disc Ceramic, 0.1 UF, 25 V	28161
C57	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C58	Capacitor, Mica, 82 PF, 5%,500 V	26212
C59	Capacitor, Mica, 360 PF, 5%, 500 V	27515
C60	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C61	Capacitor, Tantalum, 68 UF, 15 V	29654
C62	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C63	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C64	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C65	Capacitor, Disc Ceramic, 68 UF, 15 V	29654
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, 1N4454	40527
CR4	Diode, 1N4454	40527
CR5	Diode, 1N4454	40527
CR6	Diode, 1N4454	40527
CR7	Diode, 1N4454	40527
CR8	Diode, 1N4454	40527
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
CR11	Diode, 1N4454	40527
CR12	Diode, 1N4454	40527
CR13	Diode, 1N4454	40527
CR14	Diode, 1N4454	40527
CR15	Diode, N4454	40527
CR16	Diode, 1N4454	40527
CR17	Diode, 1N4454	40527
CR18	Diode, N4454	40527

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R30	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R31	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R32	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R33	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R34	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R35	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R36	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R37	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R38	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R39	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R40	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R41	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R42	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R43	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R44	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R45	Not Used	
R46	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R47	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R48	Resistor, Carbon, 5.6 K, 10%, 1/4 W	18306
R49	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R50	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R51	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R52	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R53	Resistor, Carbon, 3.9 K, 10%, 1/4 W	17883
R54	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R55	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R56	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R57	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R58	Resistor, Carbon, 5.6 K, 10%, 1/4 W	18306
R59	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R60	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R61	Resistor, Carbon, 10 ohm 10%, 1/4 W	17716
R62	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R63	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R64	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R65	Resistor, Carbon, 150 ohm, 10%, 1/4 W	17271
R66	Resistor, Carbon, 470 ohm, 10%, 1/4 W	18411
R67	Resistor, Carbon, 150 ohm, 10%, 1/4 W	17271
R68	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
U1	Integrated Circuit, Linear CA3053	44806
U2	Integrated Circuit, Linear CA3053	44806

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
FL1	Filter, LSB Operation	81825
FL2	Filter, AM	81827
FL3	Filter, USB Operation	81826
L1	Inductor, 150 UH, 10%	65919
L2	Inductor, 150 UH, 10%	65919
L3	Inductor, Variable, 3.3 UH	64793
L4	Inductor, Variable, 3.3 UH	64793
L5	Not Used	
L6	Inductor, 150 UH, 10%	65919
L7	Inductor, 150 UH, 10%	65919
L8	Inductor, 22 UH, 10%	65000
L9	Inductor, 22 UH, 10%	65000
L10	Inductor, 22 UH, 10%	65000
L11	Choke, 1.5 UH, 5%	64927
L12	Choke, 1.5 UH, 5%	64927
L13	Choke, 1.5 UH, 5%	64927
L14	Choke, 1.5 UH, 5%	64927
L15	Choke, 1.5 UH, 5%	64927
L16	Choke, 1.5 UH, 5%	64927
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4124	44801
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4124	44801
R1	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R2	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R3	Resistor, Carbon, 470 ohm, 10%, 1/4 W	18411
R4	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R5	Resistor, Carbon, 1K, 10%, 1/4 W	17156
R6	Resistor, Carbon, 18 ohm, 10%, 1/4 W	18459
R7	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R8	Resistor, Carbon, 1.5 K, 10%, 1/4 W	17247
R9	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R10	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R11	Resistor, Carbon, 220 ohm, 10%, 1/4 W	17132
R12	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R13	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R14	Resistor, Carbon, 820 ohm, 10%, 1/4 W	17821
R15	Resistor, Carbon, 27 ohm, 10%, 1/4 W	17259
R16	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R17	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R18	Resistor, Carbon, 22 ohm, 10%, 1/4 W	19269
R19	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R20	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R21	Not Used	
R22	Not Used	
R23	Not Used	
R24	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R25	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R26	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R27	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R28	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R29	Resistor, Carbon, 1 K, 10%, 1/4 W	17156

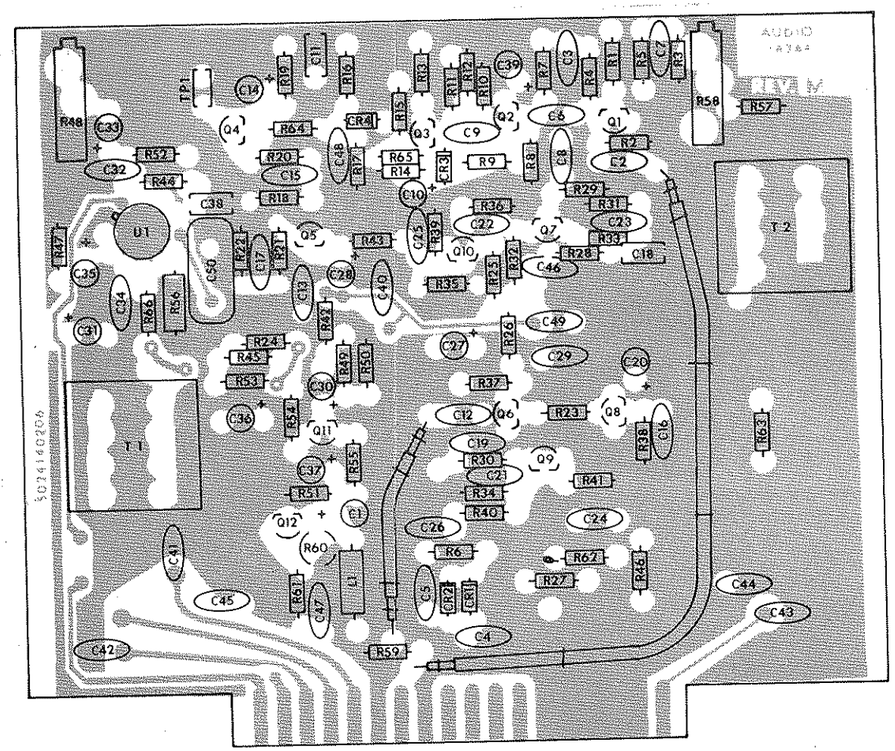


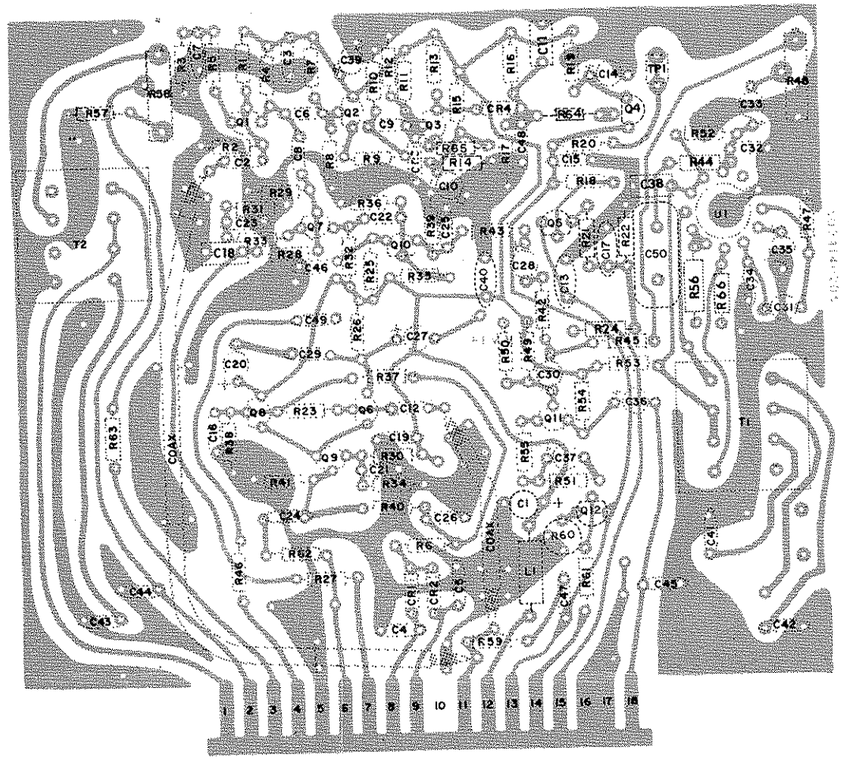
NOTES:

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 (1A3A2) Schematic





SUNAIR GSB-900R

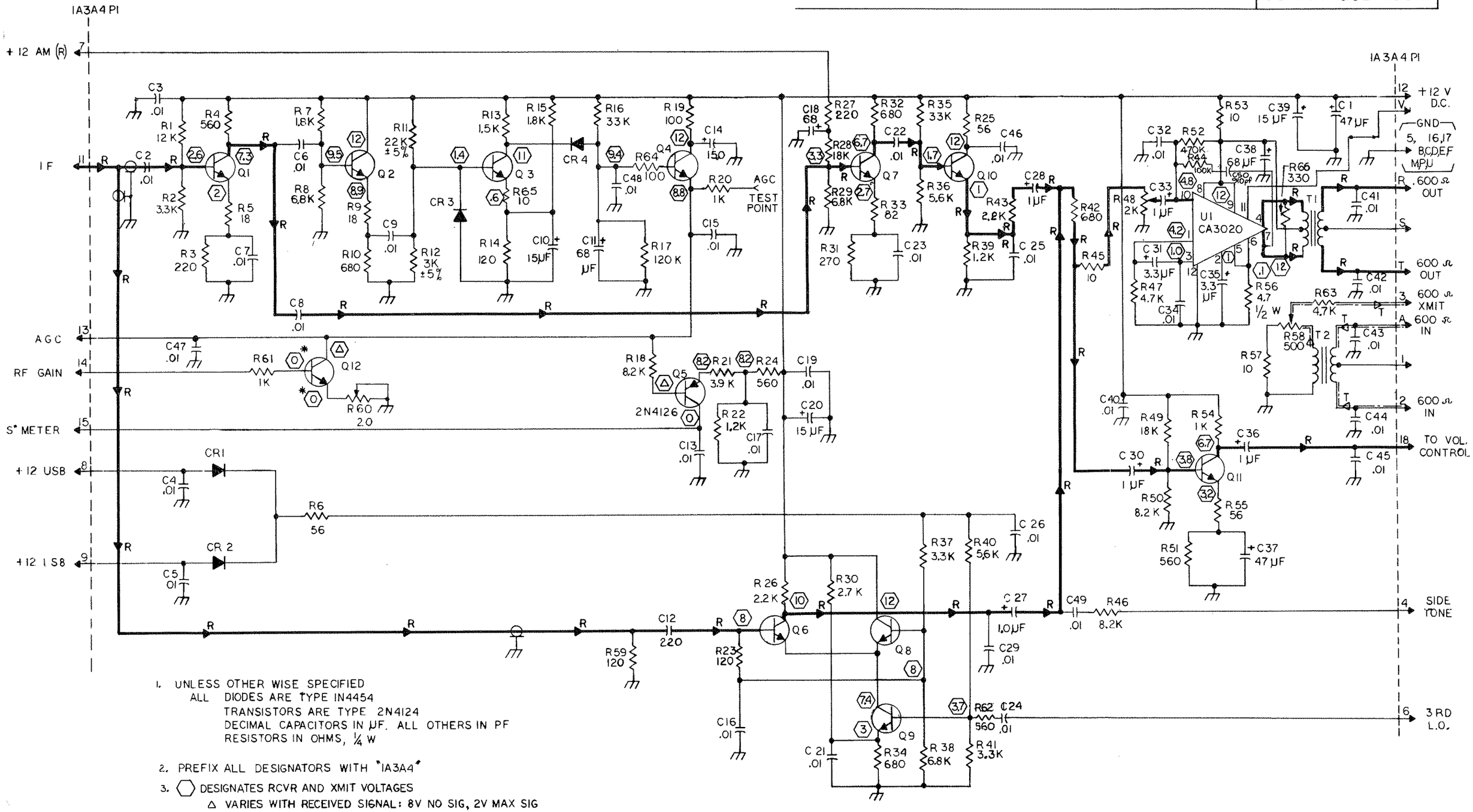
PARTS LIST, 1A3A4

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Tantalum, 47 UF, 20 V	28170
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C4	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C7	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C8	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C9	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C10	Capacitor, Tantalum, 15 UF, 20 V	28092
C11	Capacitor, Tantalum, 68 UF, 20V	28215
C12	Capacitor, Mica, 220 PF 5%, 500 V	28595
C13	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C14	Capacitor, Tantalum, 15 UF, 20 V	28092
C15	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C16	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C17	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C18	**Capacitor, Tantalum, 68 UF,** 20V	28215
C19	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C20	Capacitor, Tantalum, 15 UF, 20 V	28092
C21	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C22	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C23	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C24	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C25	Capacitor, Disc Ceramic, .01 UF, 25 V.	28162
C26	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C27	Capacitor, Tantalum, 1 UF, 50 V	28091
C28	Capacitor, Tantalum, 1 UF, 50 V	28091
C29	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C30	Capacitor, Tantalum, 1 UF, 50 V	28091
C31	Capacitor, Tantalum, 3.3 UF, 35 V	28159
C32	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C33	Capacitor, Tantalum, 1 UF, 50 V	28091
C34	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C35	Capacitor, Tantalum, 3.3 UF, 35 V	28159
C36	Capacitor, Tantalum, 1 UF, 50 V	28091
C37	Capacitor, Tantalum, 47UF, 20 V	28170
C38	Capacitor, Tantalum, 68 UF, 20V	28215
C39	Capacitor, Tantalum, 15 UF, 20 V	28092
C40	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C41	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C42	Capacitor, Disc Ceramic, .01 UF, 25 V	28162

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C43	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C44	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C45	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C46	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C47	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C48	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C49	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, 1N4454	40527
CR4	Diode, 1N4454	40527
R1	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R2	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R3	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R4	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R5	Resistor, Carbon, 18 ohm 10%, 1/4 W	18459
R6	Resistor, Carbon, 56 ohm 10%, 1/4 W	17429
R7	**Resistor, Carbon, 1.8 K 10%, 1/4 W**	17819
R8	**Resistor, Carbon, 6.8 K 10%, 1/4 W**	17481
R9	Resistor, Carbon, 18 ohm 10%, 1/4 W	18459
R10	Resistor, Carbon, 680 ohm 10%, 1/4 W	17663
R11	Resistor, Carbon, 22 K 5%, 1/4 W	19271
R12	Resistor, Carbon, 3K 5%, 1/4 W	19718
R13	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R14	**Resistor, Carbon, 120 ohm 10%, 1/4 W**	18655
R15	Resistor, Carbon, 1.8K 10%, 1/4 W	17819
R16	Resistor, Carbon, 33 K 10%, 1/4 W	17792
R17	Resistor, Carbon, 120 K 10%, 1/4 W	17510
R18	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R19	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R20	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R21	Resistor, Carbon, 3.9 K 10%, 1/4 W	17883
R22	Resistor, Carbon, 1.2 K 10%, 1/4 W	18186
R23	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R24	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R25	Resistor, Carbon, 56 ohm 10%, 1/4 W	17429
R26	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R27	**Resistor, Carbon, 220 ohm 10%, 1/4 W**	17132
R28	Resistor, Carbon, 18 K 10%, 1/4 W	17572
R29	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R30	Resistor, Carbon, 2.7 K 10%, 1/4 W	18667
R31	Resistor, Carbon, 270 ohm 10%, 1/4 W	17845

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R32	Resistor, Carbon, 680 ohm, 10%, 1/4 W	17663
R33	Resistor, Carbon, 82 ohm, 10%, 1/4 W	18461
R34	Resistor, Carbon, 680 ohm, 10%, 1/4 W	17663
R35	Resistor, Carbon, 33 K, 10%, 1/4 W	17792
R36	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R37	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R38	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R39	Resistor, Carbon, 1.2 K 10%, 1/4 W	18186
R40	Resistor, Carbon, 5.6 K 10%, 1/4 W	18306
R41	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R42	Resistor, Carbon, 680 ohm, 10%, 1/4 W	17663
R43	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R44	Not Used	
R45	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R46	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R47	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R48	Potentiometer, 15 Turn, 2 K, 1/2 W	34600
R49	Resistor, Carbon, 18 K, 10%, 1/4 W	17572
R50	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R51	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R52	Resistor, Carbon, 470 K, 10%, 1/4 W	18057
R53	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R54	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R55	Resistor, Carbon, 56 ohm, 10%, 1/4 W	17429
R56	Resistor, Carbon, 4.7 ohm, 10%, 1/4 W	19568
R57	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R58	Potentiometer, 15 Turn, 500 ohm, 1/2 W	34596
R59	Resistor, Carbon, 120 ohm, 10%, 1/4 W	18655
R60	Resistor, Carbon, 12 to 22 ohm, 10%, 1/4 W*	
R61	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R62	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R63	Resistor, Carbon, 4.7 K, 10%, 1/4 W	17077
R65	Resistor, 10 ohm, 10%, 1/4 W, m:600 ohm	17716
R66	Resistor, 330 ohm, 10%, 1/4 W, m:600 ohm	17091
T1	Transformer, Audio, 600 ohm: 600 ohm	49147
T2	Transformer, Audio, 150 ohm: 600 ohm	49159
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4124	44801
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4124	44801
Q5	Transistor, 2N4126	44802
Q6	Transistor, 2N4124	44801
Q7	Transistor, 2N4124	44801
Q8	Transistor, 2N4124	44801
Q9	Transistor, 2N4124	44801
Q10	Transistor, 2N4124	44801
Q11	Transistor, 2N4124	44801
Q12	Transistor, 2N4124	44801
L1	Inductor, Molded, 150UH, 5%	0646780000

*SELECTED VALUE

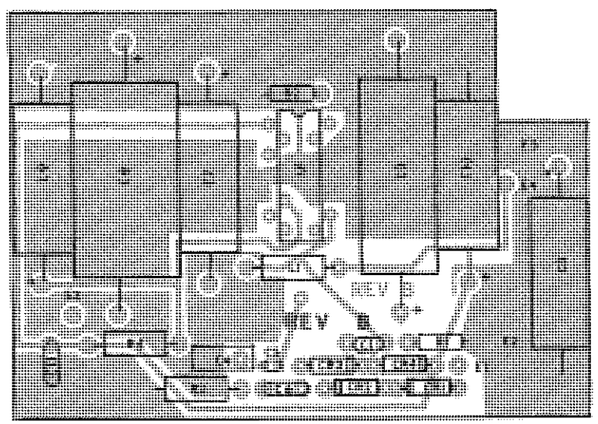


1. UNLESS OTHER WISE SPECIFIED
   ALL DIODES ARE TYPE IN4454
   TRANSISTORS ARE TYPE 2N4124
   DECIMAL CAPACITORS IN µF. ALL OTHERS IN PF
   RESISTORS IN OHMS, ¼ W
2. PREFIX ALL DESIGNATORS WITH "1A3A4"
3. ⬡ DESIGNATES RCVR AND XMIT VOLTAGES
   △ VARIES WITH RECEIVED SIGNAL: 8V NO SIG, 2V MAX SIG
4. * RF GAIN CONTROL FULLY CW

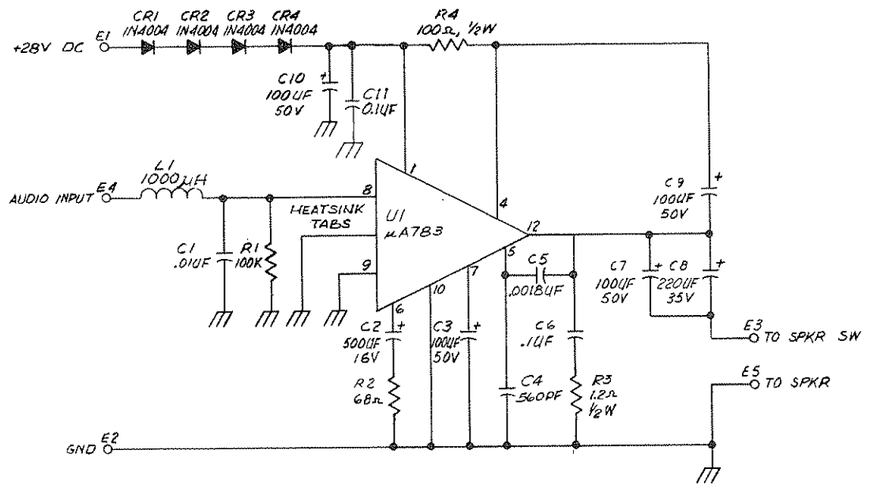
Figure 5.20 Audio Board (1A3A4) Schematic

5024041798N PC ASSY SPEAKER DRV.

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SPEAKER ORV.	5024041798
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 500 UF, 15 V, Br	0273070002
C3	Capacitor, 100 UF, 50 V	1004260016
C4	Capacitor, 560 PF, 300 V, DM15, 5%	0283750006
C5	Capacitor, 1800 PF, 100 V, X7 R, 10%	0288690001
C6	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C7	Capacitor, 100 UF, 50 V	1004260016
C8	Capacitor, 220 UF, 35 V	0258160004
C9	Capacitor, 100 UF, 50 V	1004260016
C10	Capacitor, 100 UF, 50 V	1004260016
C11	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
CR1	Diode, Rectifier 1N4004	0405180004
CR2	Diode, Rectifier 1N4004	0405180004
CR3	Diode, Rectifier 1N4004	0405180004
CR4	Diode, Rectifier 1N4004	0405180004
L1	Inductor, Molded, 1000 UH, 10%	0664940005
R1	Resistor, 100 K, 10%, 1/4 W	0170390004
R2	Resistor, 68, 10%, 1/4 W	0187960003
R3	Resistor, 1.2, 10%, 1/2 W	0188490001
R4	Resistor, 100, 10%, 1/2 W	0174790007
U1	IC Linear UA 783 P	1004260024



5024041771E



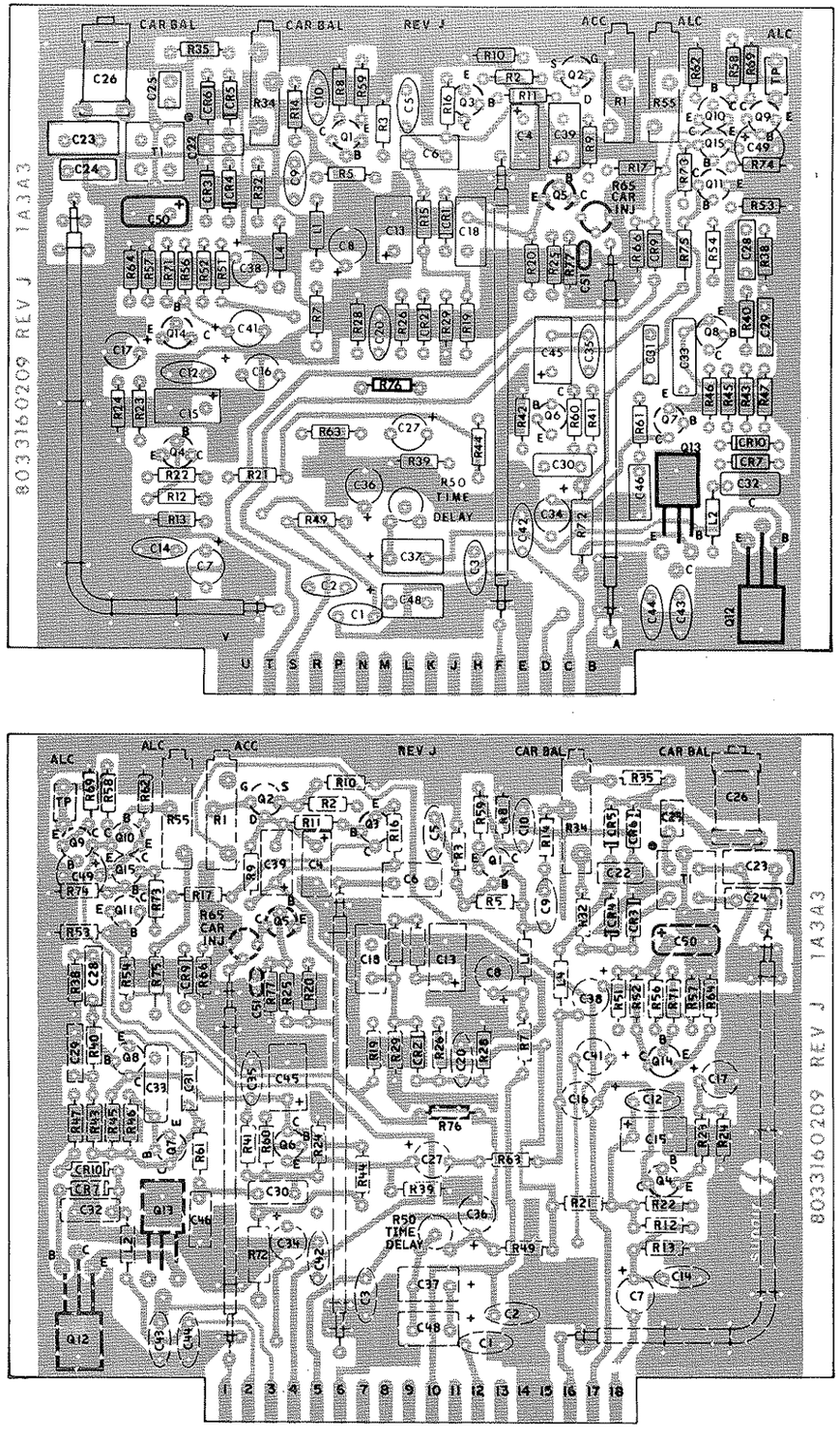
NOTE: UNLESS OTHERWISE SPECIFIED
1. RESISTORS ARE 1/4 WATT

Figure 5.21 Speaker Drive (3A1A1) Schematic

SIDEBAND GEN. (1A3A3) 8033160098

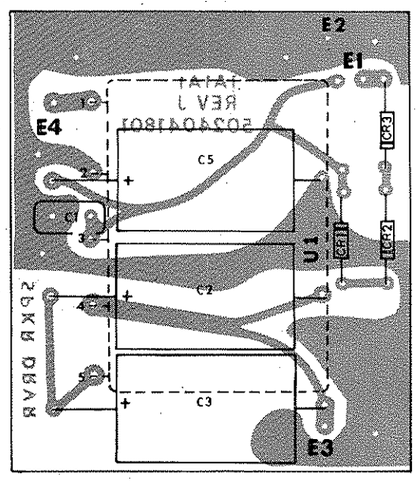
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PC ASSY SIDEBAND GEN.	8033160098
C1	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C2	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C3	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C4	Capacitor, 68 UF, 15 V, T368	0296540005
C5	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C6	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009
C7	Capacitor, 1 UF, 50 V, 198 D	0280910002
C8	Capacitor, 15 UF, 20 V, 198 D	0280920008
C9	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C10	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C11	Not used	
C12	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C13	Capacitor, 68 UF, 15 V, T368	0296540005
C14	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C15	Capacitor, 68 UF, 15 V, T368	0296540005
C16	Capacitor, 15 UF, 20 V, 198 D	0280920008
C17	Capacitor, 47 UF, 20 V, 196 D	0281700001
C18	Capacitor, 220 PF, 500 V, DM15, 2%	0281420009
C19	Not used	
C20	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C21	Not used	
C22	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C23	Capacitor, 360 PF, 500 V, DM15, 5%	0275150003
C24	Capacitor, 82 PF, 300 V, DM15, 5%	0289970008
C25	Capacitor, 0.01 UF, 50 V, W5 R, 20%	0281730008
C26	Capacitor, .8-8 PF, PC Mt. Glass	1000060012
C27	Capacitor, 1 UF, 50 V, 198 D	0280910002
C28	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C29	Capacitor, 0.01 UF, 50 V, Mylar	0281560005
C30	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C31	Capacitor, 0.0047 UF, 50 V, Mylar	0281540004
C32	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C33	Capacitor, 0.1 UF, 50 V, Mylar	0281580006
C34	Capacitor, 1 UF, 50 V, 198 D	0280910002
C35	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C36	Capacitor, 15 UF, 20 V, 198 D	0280920008
C37	Capacitor, 68 UF, 15 V, T368	0296540005
C38	Capacitor, 1 UF, 50 V, 198 D	0280910002
C39	Capacitor, 68 UF, 15 V, T368	0296540005
C40	Not used	
C41	Capacitor, 1 UF, 50 V, 198 D	0280910002
C42	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C43	Capacitor, 0.01 UF, 25 V, X5S	0281620008
C44	Capacitor, 0.1 UF, 50 V, X7 R, 20%	0281610002
C45	Capacitor, 68 UF, 15 V, T368	0296540005
C46	Capacitor, .033 UF, 50 V, Mylar	0281770000
C47	Not used	
C48	Capacitor, 68 UF, 15 V, T368	0296540005
C49	Capacitor, 47 UF, 20 V, 196 D	0281700001
C50	Capacitor, 68 UF, 15 V, T368	0296540005
C51	Capacitor, 0.01 UF, 50 V, W5 R, 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, 22 UH, 5%	0650000005
L2	Inductor, Molded, 150 UH, 5%	0659190001
L3	Not used	
L4	Inductor, Molded, 22 UH, 5%	0650000005
Q1	Transistor, NPN, Si. 2N4124	0448010003
Q2	Transistor, N-CH. FET 2N4303	0443930007
Q3	Transistor, PNP, Si. 2N4126	0448020009
Q4	Transistor, NPN, Si. 2N4124	0448010003
Q5	Transistor, PNP, Si 2N4126	0448020009
Q6	Transistor, 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

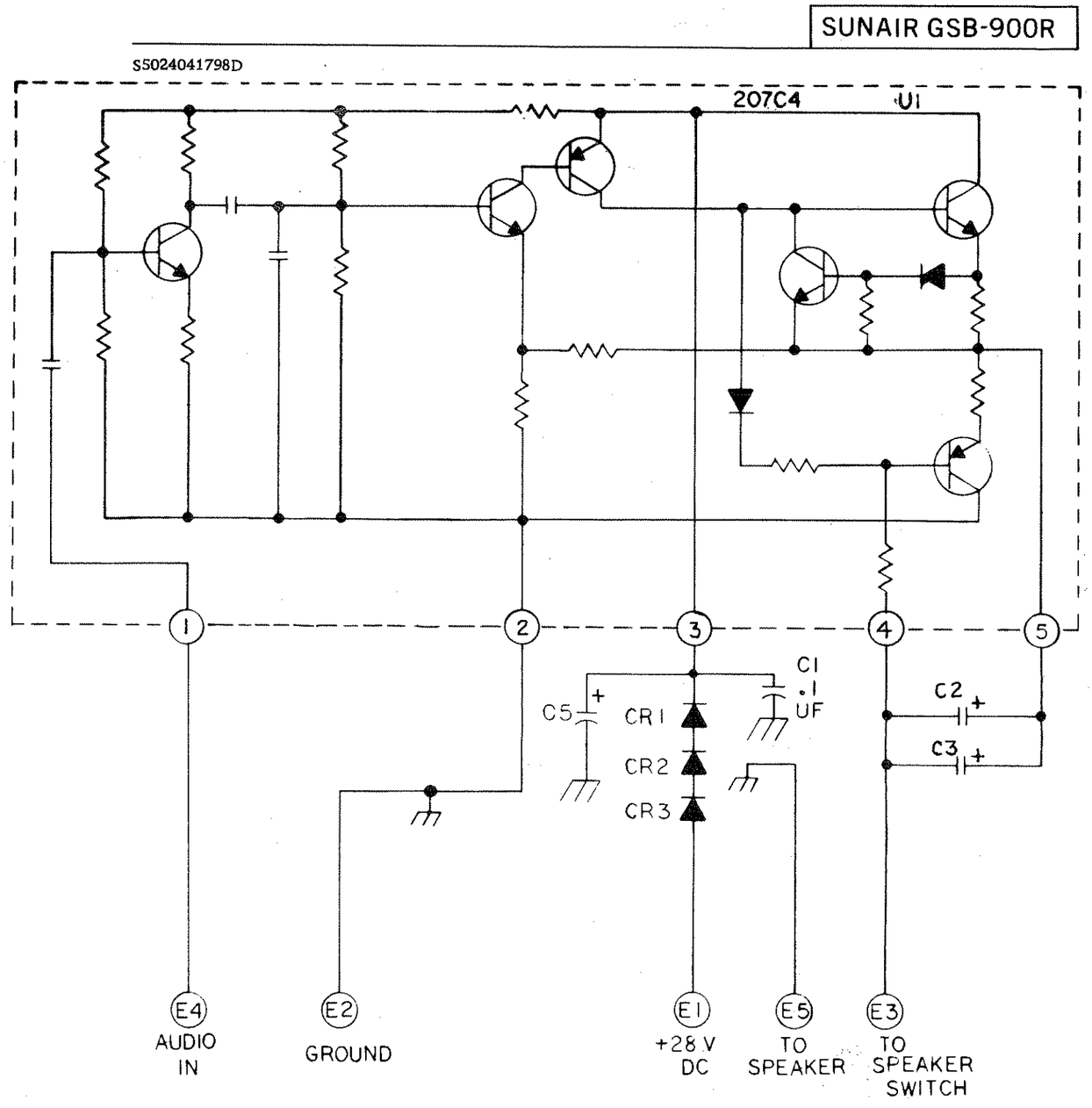
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
Q15	Transistor, NPN, Si. 2N4124	0448010003
R1	Pot., 2K, 10%, 3/4W, 15 Turns	0338490060
R2	Resistor, 4.7K, 5%, 1/4W	0170770001
R3	Resistor, 1K, 10%, 1/4W	0171560001
R4	Not used	
R5	Resistor, 3.3K, 10%, 1/4W	0170890007
R6	Not used	
R7	Resistor, 120, 10%, 1/4W	0186550006
R8	Resistor, 120, 10%, 1/4W	0186550006
R9	Resistor, 1.5K, 10%, 1/4W	0172470005
R10	Resistor, 820, 10%, 1/4W	0178210005
R11	Resistor, 1K, 10%, 1/4W	0171560001
R12	Resistor, 18K, 10%, 1/4W	0175720002
R13	Resistor, 8.2K, 10%, 1/4W	0181620006
R14	Resistor, 100, 5%, 1/4W	0171180003
R15	Resistor, 1K, 10%, 1/4W	0171560001
R16	Resistor, 1K, 10%, 1/4W	0171560001
R17	Resistor, 100, 5%, 1/4W	0171180003
R18	Not used	
R19	Resistor, 3.9K, 10%, 1/4W	0178830003
R20	Resistor, 1K, 10%, 1/4W	0171560001
R21	Resistor, 220, 10%, 1/4W	0171320000
R22	Resistor, 820, 10%, 1/4W	0178210005
R23	Resistor, 22, 10%, 1/4W	0192690001
R24	Resistor, 560, 5%, 1/4W	0183200004
R25	Resistor, 5.6K, 10%, 1/4W	0183060008
R26	Resistor, 2.2K, 5%, 1/4W	0178070009
R27	Not used	
R28	Resistor, 2.2K, 5%, 1/4W	0178070009
R29	Resistor, 4.7K, 5%, 1/4W	0170770001
R30	Not used	
R31	Not used	
R32	Resistor, 100, 5%, 1/4W	0171180003
R33	Not used	
R34	Pot. 20, 10%, 3/4W, 15 Turns	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	0183200004
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	5024130308
	Mica Insulator Mot Case 199	0508700001
	Test Point, White	0753640007



SPEAKER DRIVER BOARD

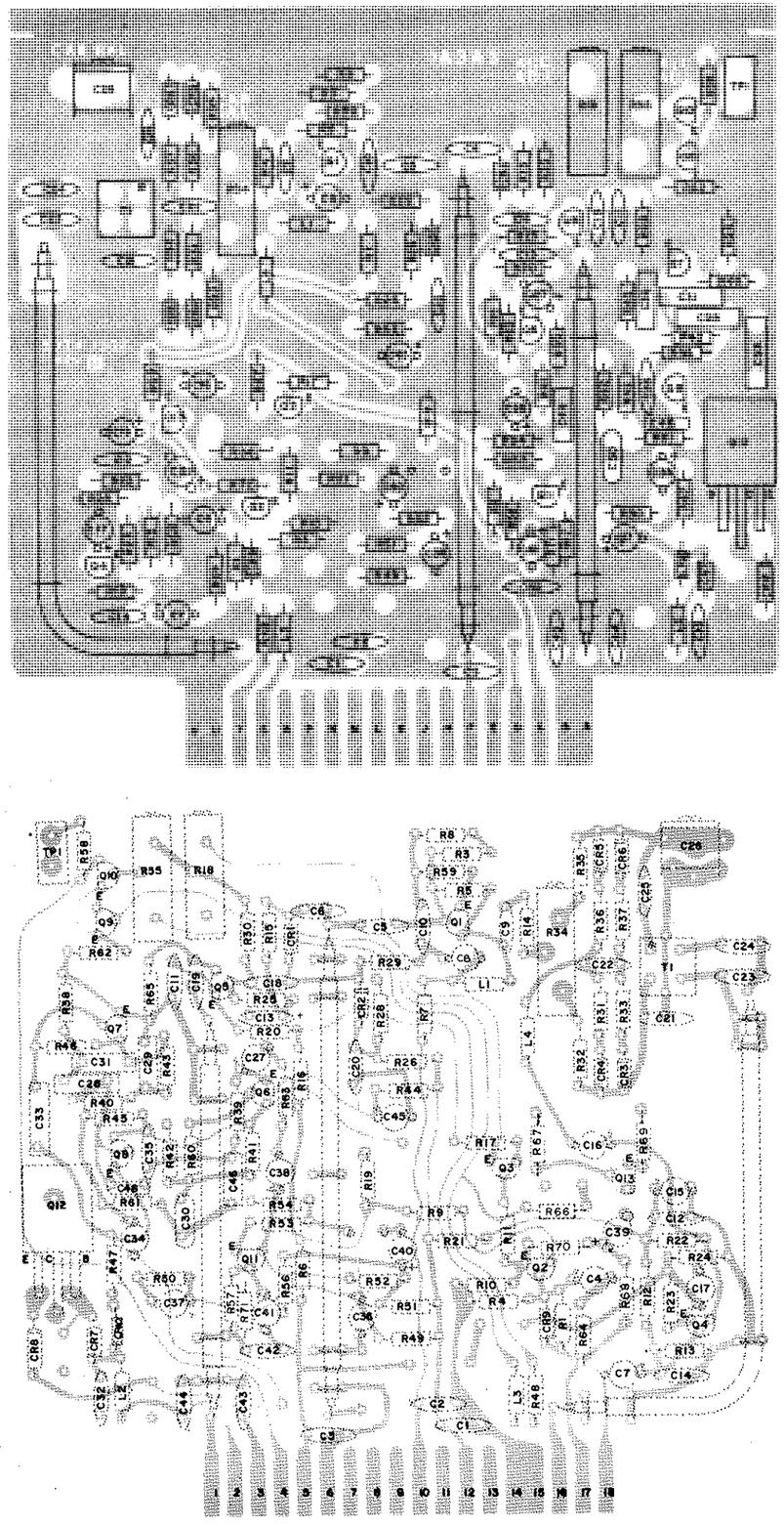
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	PCB, Speaker Driver	5024041801
C2,3,5	Capacitor, 470UF, 50V, TAL	0280890001
C1	Capacitor, 0.1UF, 50V, X7R, 20%	0281610002
CR1-3	Diode, Rectifier, 1N4004	0405180004
U1	IC, Linear, 207C4SC	0448260000





NOTES:
1. C2,C3 & C5 ARE 470 UF, 50V
2. ALL DIODES ARE IN4004

Figure 5.21 Speaker Drive (3A1A1) Schematic



SUNAIR GSB-900R

PARTS LIST, 1A3A3

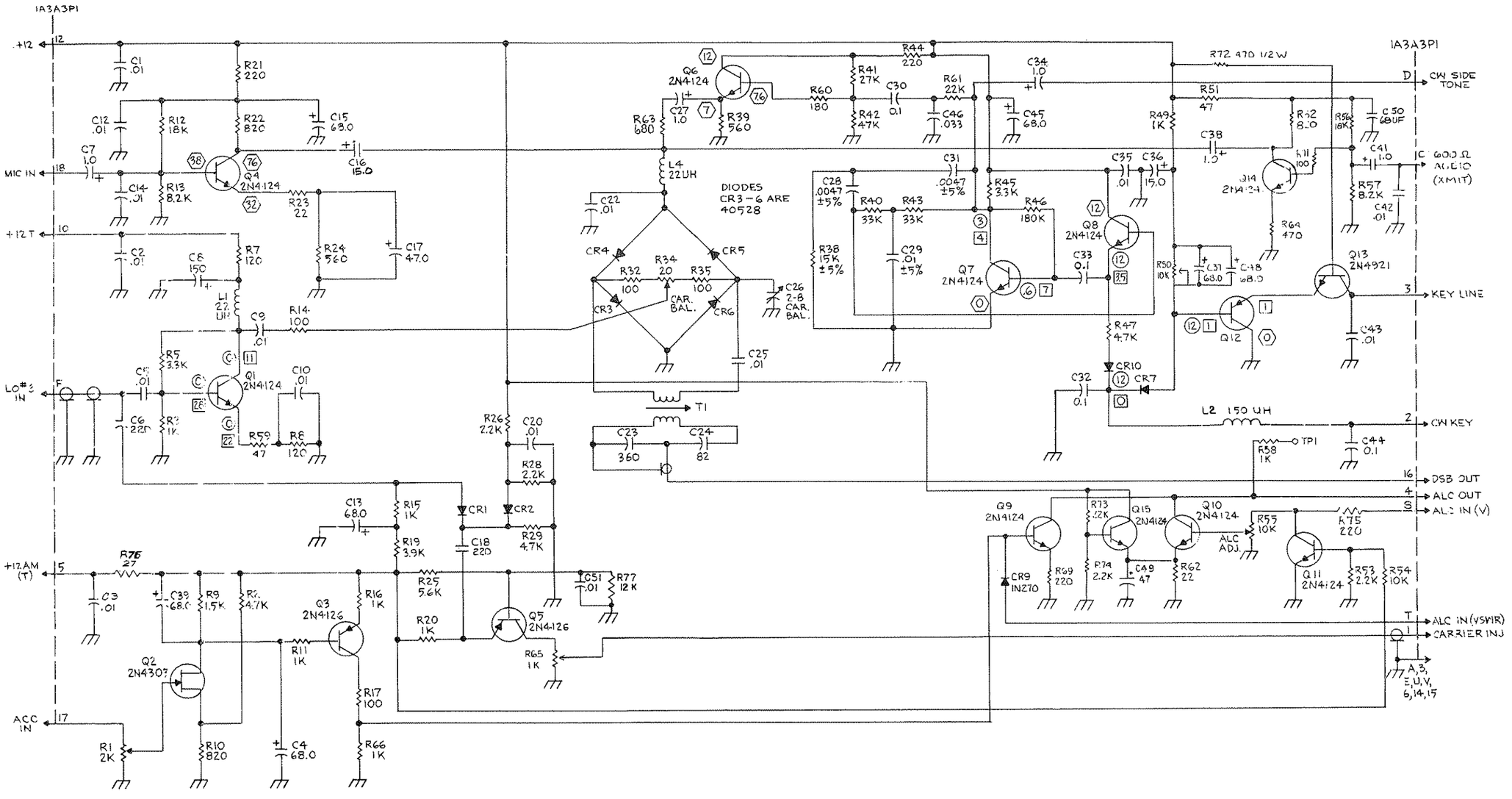
REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C3	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C4	Capacitor, Tantalum, 15 UF, 20 V	28092
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Mica, 10 PF 5%, 500 V	25983
C7	Capacitor, Tantalum, 1 UF, 50 V	28091
C8	Capacitor, Disc Ceramic, 15UF 20V	28092
C9	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C10	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C11	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C12	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C13	Capacitor, Tantalum, 68 UF, 15 V	29654
C14	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C15	Capacitor, Tantalum, 68 UF, 15 V	29654
C16	Capacitor, Tantalum, 1 UF, 50 V	28091
C17	Capacitor, Tantalum, 15 UF, 20 V	28092
C18	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C19	Capacitor, Mica, 10PF, 1/2 PF, 500 V	25983
C20	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C21	Capacitor, Mica, 15 PF 5%, 500 V	28650
C22	Capacitor, MONOLITHIC .01 UF, 50V	28173
C23	Capacitor, Mica, 820 PF 5%, 500 V	28875
C24	Capacitor, Mica, 82 PF 5%, 500 V	28997
C25	Capacitor, MONOLITHIC .01 UF, 20V	28173
C26	Capacitor, Variable Ceramic, 2-8 PF	28430
C27	Capacitor, Tantalum, 1 UF, 50 V	28091
C28	Capacitor, Mylar, .0047 UF 5%, 50 V	28154
C29	Capacitor, Mylar, .01 UF 5%, 50 V	28156
C30	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C31	Capacitor, Mylar, .0047 UF 5%, 50 V	28154
C32	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C33	Capacitor, Mylar, 0.1 UF 5%, 50 V	28158
C34	Capacitor, Tantalum, 1 UF, 50 V	28091
C35	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C36	Capacitor, Tantalum, 15 UF, 20 V	28092
C37	Capacitor, Tantalum, 68 UF, 15 V	29654
C38	Capacitor, Tantalum, 1 UF, 50 V	28091
C39	Capacitor, Tantalum, 47 UF, 20 V	28170
C40	Capacitor, Tantalum, 68 UF, 15 V	29654
C41	Capacitor, Tantalum, 1 UF, 50 V	28091
C42	Capacitor, Disc Ceramic, .01 UF, 25 V	28162

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C43	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C44	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C45	Capacitor, Tantalum, 68 UF, 15 V	29654
C46	Capacitor, Mylar, .033 UF 10%, 50 V	28177
C48		
C49		
CR1	Diode, 1N4454	40527
CR2	Diode, 1N4454	40527
CR3	Diode, 1N4454	40527
CR4	Diode, 1N4454	40527
CR5	Diode, 1N4454	40527
CR6	Diode, 1N4454	40527
CR7	Diode, 1N4454	40527
CR8	Diode, 1N4004	40518
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
L1	Inductor, 22 UH 5%	65000
L2	Inductor, 150 UH 10%	65919
L3	Inductor, 150 UH 10%	65919
L4	Inductor, 22 UH 5%	65000
Q1	Transistor, 2N4124	44801
Q2	Transistor, 2N4124	44801
Q3	Transistor, 2N4124	44801
Q4	Transistor, 2N4124	44801
Q5	Transistor, 2N4126	44802
Q6	Transistor, 2N4124	44801
Q7	Transistor, 2N4124	44801
Q8	Transistor, 2N4124	44801
Q9	Transistor, 2N4124	44801
Q10	Transistor, 2N4124	44801
Q11	Transistor, 2N4124	44801
Q12	Transistor, MJE2371	44820
Q13	Transistor, 2N4126	44802
R1	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R3	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R4	Resistor, Carbon, 68 K 10%, 1/4 W	17352
R5	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R6	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R7	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R8	Resistor, Carbon, 120 ohm 10%, 1/4 W	18655
R9	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R10	Resistor, Carbon, 10 K 10%, 1/4 W	17041
R11	Resistor, Carbon, 1 K 10%, 1/4 W	17156

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
R12	Resistor, Carbon, 18 K 10%, 1/4 W	17572
R13	Resistor, Carbon, 8.2 K 10%, 1/4 W	18162
R14	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R15	Resistor, Carbon, 1 K 10%, 1/4 W	17156
R16	Resistor, Carbon, 1.2 K 10%, 1/4 W	18186
R17	Resistor, Carbon, 1.5 K 10%, 1/4 W	17247
R18	Potentiometer, 15 Turn, 500 ohm, 1/2 W	34596
R19	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R20	Resistor, Carbon, 100 ohm 10%, 1/4 W	17118
R21	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R22	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R23	Resistor, Carbon, 22 ohm 10%, 1/4 W	19685
R24	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R25	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R26	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R28	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R29	Resistor, Carbon, 2.2 K 10%, 1/4 W	17807
R30	Resistor, Carbon, 6.8 K 10%, 1/4 W	17481
R32	Resistor, Carbon, 330 ohm 10%, 1/4 W	17091
R34	Potentiometer, 15 Turn, 100 ohm, 1/2 W	34597
R35	Resistor, Carbon, 330 10%, 1/4 W	17091
R38	Resistor, Carbon, 15 K 5%, 1/4 W	19570
R39	Resistor, Carbon, 560 ohm 10%, 1/4 W	18320
R40	Resistor, Carbon, 33 K 5%, 1/4 W	19582
R41	Resistor, Carbon, 27 K 10%, 1/4 W	17120
R42	Resistor, Carbon, 47 K 10%, 1/4 W	17106
R43	Resistor, Carbon, 33 K 5%, 1/4 W	19582
R44	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R45	Resistor, Carbon, 3.3 K 10%, 1/4 W	17089
R46	Resistor, Carbon, 180 K 10%, 1/4 W	17728
R47	Resistor, Carbon, 4.7 K 10%, 1/4 W	17077
R48	Resistor, Carbon, 1K 10%, 1/4 W	17156
R49	Resistor, Carbon, 1K 10%, 1/4 W	17156
R50	Resistor, Carbon, 12 K 10%, 1/4 W	18318
R51	Resistor, Carbon, 220 ohm 10%, 1/4 W	17132
R52	Resistor, Carbon, 820 ohm 10%, 1/4 W	17821
R53	Resistor, Carbon, 39 ohm 10%, 1/4 W	18289

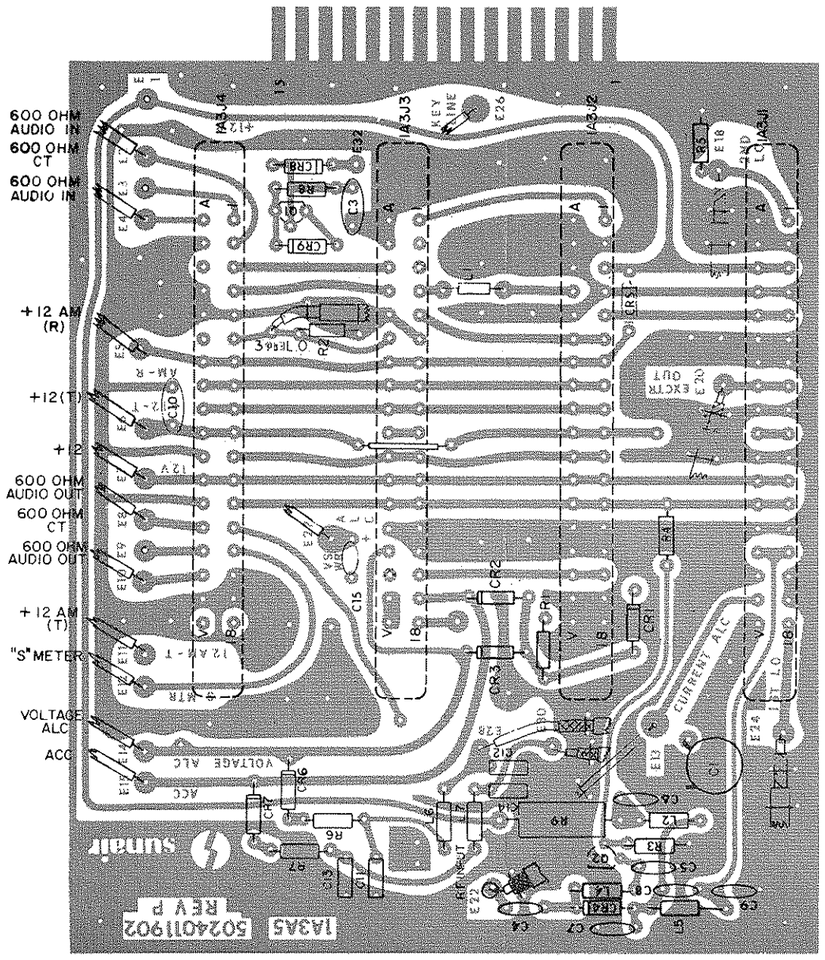
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
R54	Resistor, Carbon, 560 ohm, 10%, 1/4 W	18320
R55	Potentiometer, 15 Turn, 5 K, 1/2 W	34599
R56	Resistor, Carbon, 18 K, 10%, 1/4 W	17572
R57	Resistor, Carbon, 8.2 K, 10%, 1/4 W	18162
R58	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R59	Resistor, Carbon, 100 ohm, 10%, 1/4 W	17118
R60	Resistor, Carbon, 180 ohm, 10%, 1/4 W	17522
R61	Resistor, Carbon, 22 K, 10%, 1/4 W	17223
R62	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R63	Resistor, Carbon, 3.3 K, 10%, 1/4 W	17089
R64	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R65	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R66	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R67	Resistor, Carbon, 4.7 K, ±10%, 1/4 W	17077
R68	Resistor, Carbon, 2.7 K, 10%, 1/4 W	17077
R69	Resistor, Carbon 100 ohm ±10%, 1/4 W	17118
R70	Resistor, Carbon, 10 K, 10%, 1/4 W	17041
R71	Resistor, Carbon, 100 ohm, ±10%, 1/4 W	17118
T1	Transformer, Balanced Modulator	5024-1303-00
R73	Resistor, Carbon, 33 ohm, 10%, 1/4 W	18255

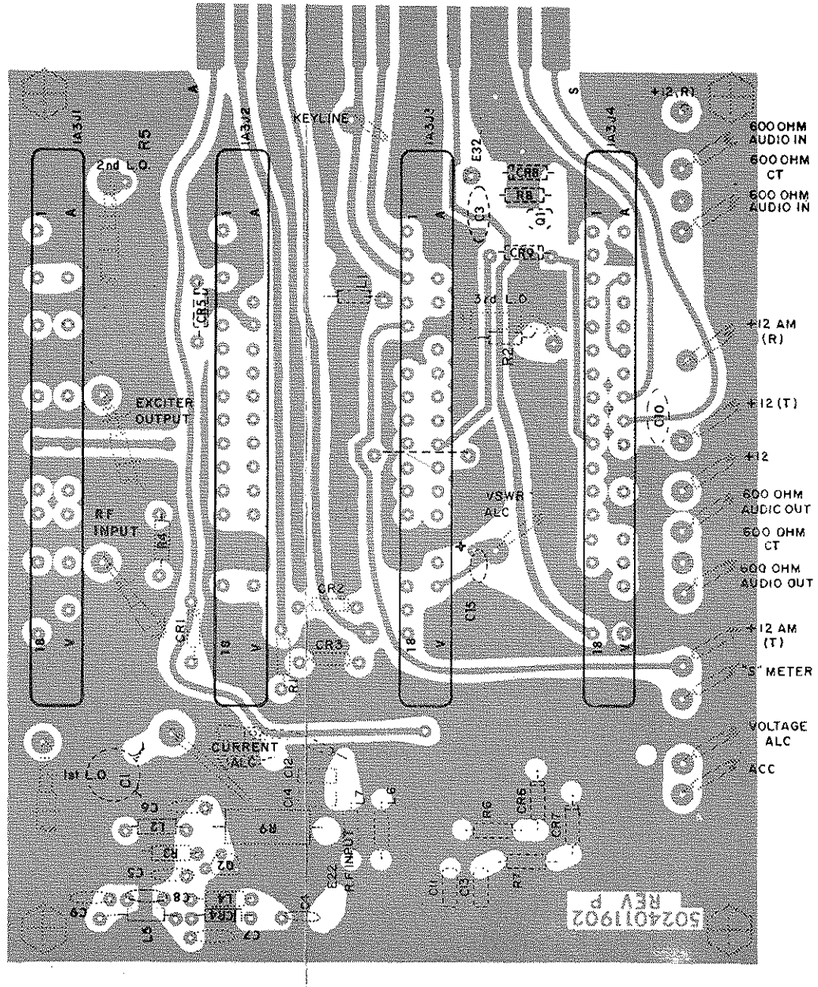
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NOTES, UNLESS OTHERWISE SPECIFIED
1. ALL DECIMAL CAPACITORS IN UF, ALL OTHERS IN PF
   ALL RESISTORS IN OHMS
   ALL DIODES ARE IN4454
2. PREFIX ALL DESIGNATORS WITH "1A3A3"
3. ◯ DESIGNATES RECIEVE VOLTAGE
   □ DESIGNATES TRANSMIT VOLTAGE
   ⬡ DESIGNATES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

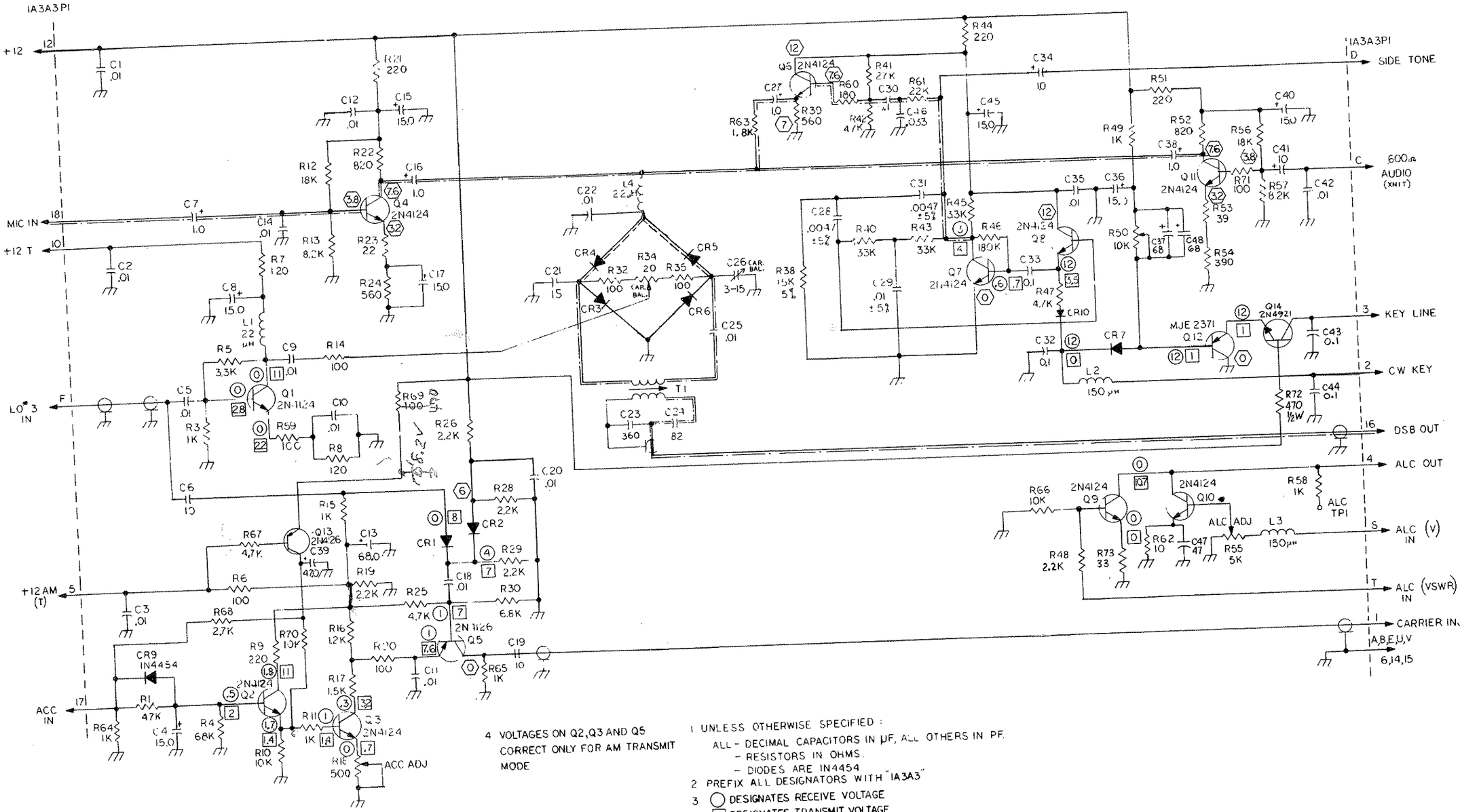
Figure 5.21 Sideband Generator (1A3A3)





PARTS LIST, 1A3A5

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mica, 2700 PF, 2%, 500 V	28124
C2	Capacitor, Ceramic, 0.001 UF, 250 V	28626
C3		
C4	Capacitor, Monolythic, 0.1 UF, 50 V	28161
C5	CR5 Diode, 1N4454	40527
C6	Capacitor, Monolythic, 0.1 UF, 50 V	28161
C7	Capacitor, Mica, 51 PF, 500 V	28135
C8	Capacitor, Mica, 18 PF, 500 V	28133
C9	Capacitor, Mica, 51 PF, 500 V	28135
C10	Capacitor, Monolythic, 0.1 UF, 50 V	28161
CR1	Diode, Signal, 1N4454	40527
CR2	Diode, Signal, 1N4454	40527
CR3	Diode, Signal, 1N4454	40527
CR4	Diode, PIN	40557
L1	Inductor, 220 UH, 10%	65050
L2	Inductor, 220 UH, 10%	65050
L3	Inductor, 220 UH, 10%	65050
L4	Inductor, 220 UH, 10%	65050
L5	Inductor, 0.15 UH, 10%	64862
P1	Connector, RF, Rt. Angle	75370
P2	Connector, RF, Rt. Angle	75370
P3	Connector, RF, JCM	75372
P4	Connector, RF, JCM	75372
R1	Resistor, Carbon, 100 ohm, 10%, 1/4W	17118
R2	Resistor, Carbon, 56 ohm, 10%, 1/4W	17429
R3	Resistor, Carbon, 2.2K, 10%, 1/4W	17807
R4	Resistor, Carbon, 1K, 10%, 1/4W	17156
R5	RESISTOR 56 OHM, 10% 1/4W	17429
X1A3J1	Connector, Edge, P.C., 18 pin	75361
X1A3J2	Connector, Edge, P.C., 18 Pin	75361
X1A3J3	Connector, Edge, P.C., 18 Pin	75361
X1A3J4	Connector, Edge, P.C., 18 Pin	75361
CR8	Diode, IN4454	0405270003
CR9	Diode, IN4004	0405180004
C3	Capacitor, 0.01UF 100V	0273210009
Q1	Transistor, NPN, 2N4124	0448010003
R6	Resistor, 100K, 10%, 1/4W	0170390004
R32	Potentiometer, 1K, 1/2W	1004680007



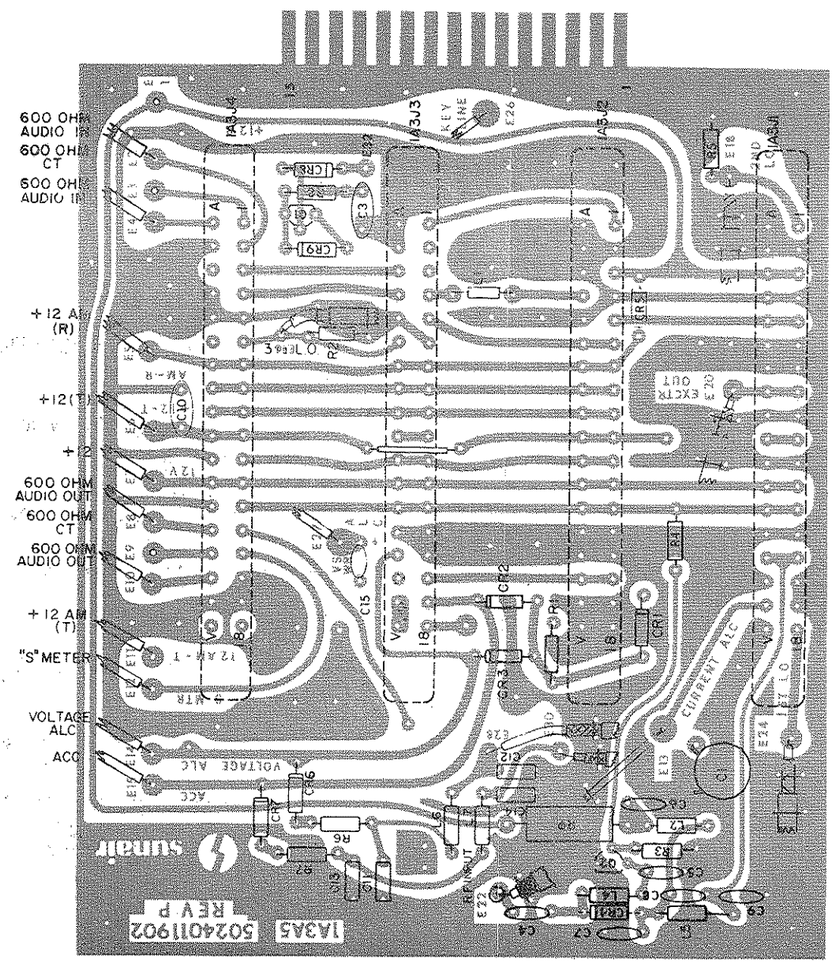
4 VOLTAGES ON Q2,Q3 AND Q5 CORRECT ONLY FOR AM TRANSMIT MODE

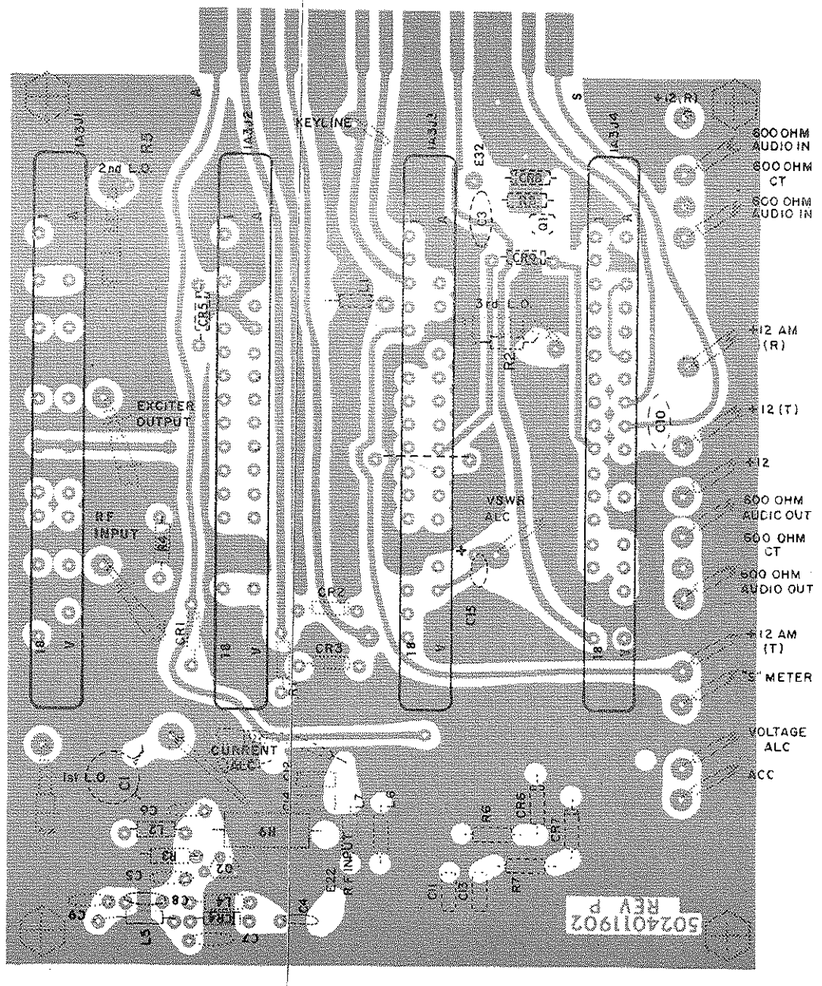
1 UNLESS OTHERWISE SPECIFIED :
ALL - DECIMAL CAPACITORS IN μF, ALL OTHERS IN PF.
- RESISTORS IN OHMS.
- DIODES ARE IN4454

2 PREFIX ALL DESIGNATORS WITH "1A3A3"

3 ◯ DESIGNATES RECEIVE VOLTAGE
□ DESIGNATES TRANSMIT VOLTAGE
⬡ DESIGNATES RCV & XMIT VOTAGE

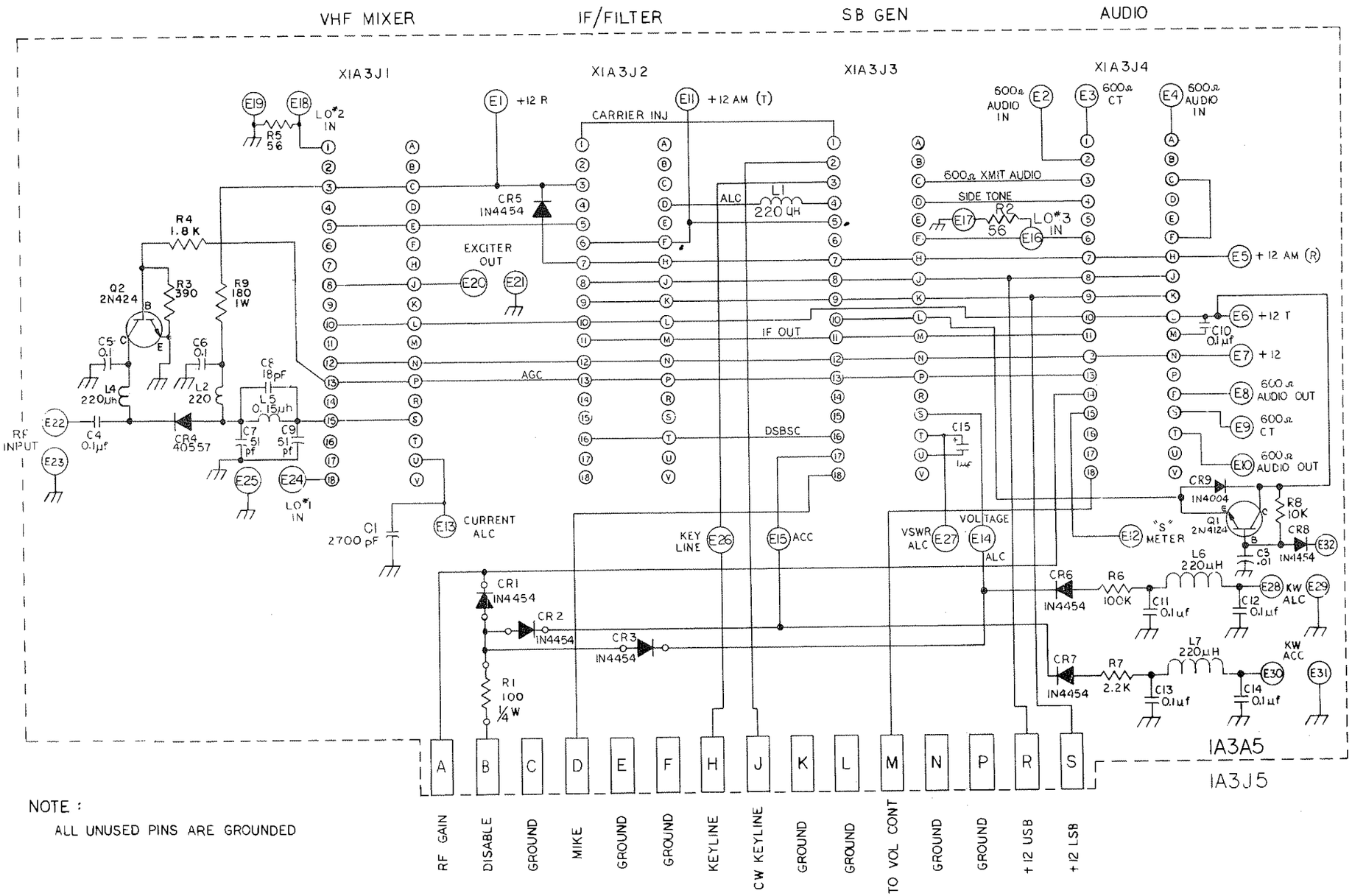
Figure 5.22 Sideband Generator (1A3A3) Schematic





PARTS LIST, 1A3A5

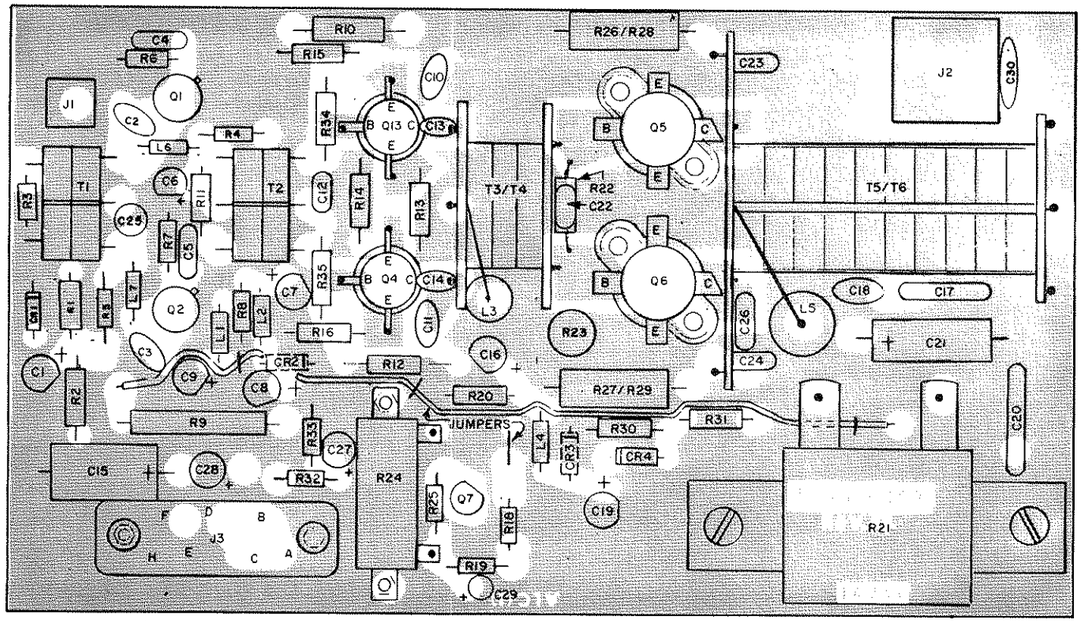
REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mica, 2700 PF, 2%, 500 V	28124
C2	Capacitor, Ceramic, 0.001 UF, 250 V	28626
C3		
C4	Capacitor, Monolythic, 0.1 UF, 50 V	28161
C5	CR5 Diode, 1N4454	40527
C6	Capacitor, Monolythic, 0.1 UF, 50 V	28161
C7	Capacitor, Mica, 51 PF, 500 V	28135
C8	Capacitor, Mica, 18 PF, 500 V	28133
C9	Capacitor, Mica, 51 PF, 500 V	28135
C10	Capacitor, Monolythic, 0.1 UF, 50 V	28161
CR1	Diode, Signal, 1N4454	40527
CR2	Diode, Signal, 1N4454	40527
CR3	Diode, Signal, 1N4454	40527
CR4	Diode, PIN	40557
L1	Inductor, 220 UH, 10%	65050
L2	Inductor, 220 UH, 10%	65050
L3	Inductor, 220 UH, 10%	65050
L4	Inductor, 220 UH, 10%	65050
L5	Inductor, 0.15 UH, 10%	64862
P1	Connector, RF, Rt. Angle	75370
P2	Connector, RF, Rt. Angle	75370
P3	Connector, RF, JCM	75372
P4	Connector, RF, JCM	75372
R1	Resistor, Carbon, 100 ohm, 10%, 1/4W	17118
R2	Resistor, Carbon, 56 ohm, 10%, 1/4W	17429
R3	Resistor, Carbon, 2.2K, 10%, 1/4W	17807
R4	Resistor, Carbon, 1K, 10%, 1/4W	17156
R5	RESISTOR 56 OHM, 10% 1/4W	17429
X1A3J1	Connector, Edge, P.C., 18 pin	75361
X1A3J2	Connector, Edge, P.C., 18 Pin	75361
X1A3J3	Connector, Edge, P.C., 18 Pin	75361
X1A3J4	Connector, Edge, P.C., 18 Pin	75361
CR8	Diode, IN4454	0405270003
CR9	Diode, IN4004	0405180004
C3	Capacitor, 0.01UF 100V	0273210009
Q1	Transistor, NPN, 2N4124	0448010003
R6	Resistor, 100K, 10%, 1/4W	0170390004
R32	Potentiometer, 1K, 1/2W	1004680007

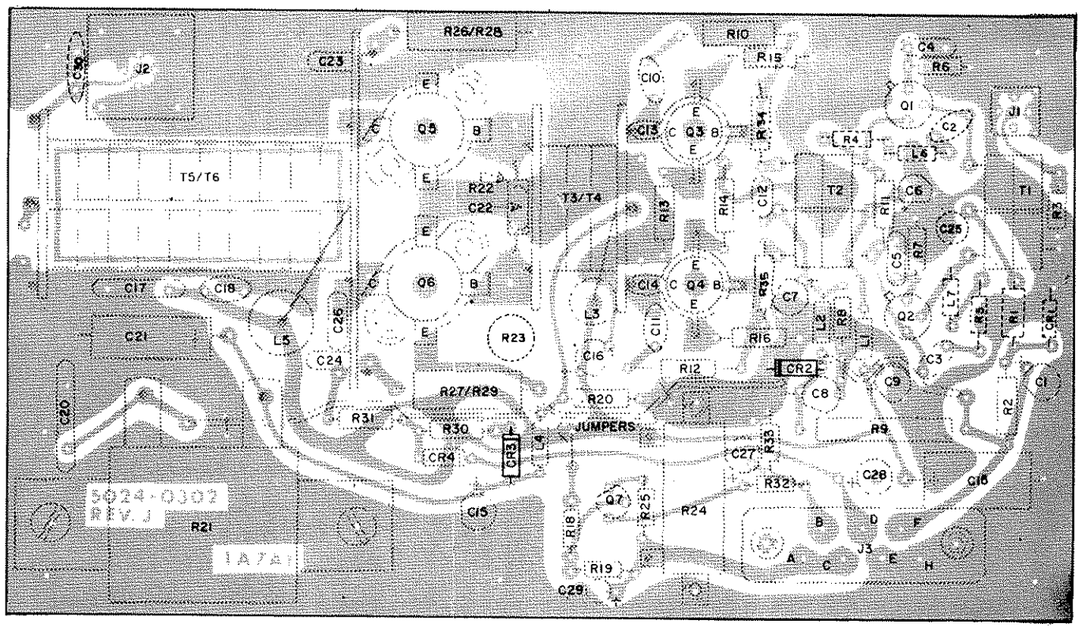


NOTE :

ALL UNUSED PINS ARE GROUNDED

Figure 5.23 Receiver/Exciter Mother Board (1A3A5) Schematic





PARTS LIST, 1A7A1

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C2	Capacitor, Monolithic, .01 UF, 50 V	28173
C3	Capacitor, Monolithic, .01 UF, 50 V	28173
C4	Capacitor, Disc Ceramic, .0022 UF, 200 V	27278
C5	Capacitor, Disc Ceramic, .0022 UF, 200 V	27278
C6	Capacitor, Tantalum, 1 UF, 50 V	28091
C7	Capacitor, Tantalum, 1 UF, 50 V	28091
C8	Capacitor, Tantalum, 1 UF, 50 V	28091
C9	Capacitor, Tantalum, 1 UF, 50 V	28091
C10	Capacitor, Monolithic, .01 UF, 50 V	28173
C11	Capacitor, Monolithic, .01 UF, 50 V	28173
C12	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C13	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C14	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C15	Capacitor, Tantalum, 47 UF, 50 V	24575
C16	Capacitor, Tantalum, 1 UF, 50 V	28091
C17	Capacitor, Disc Ceramic, .01 UF, 250 V	28095
C18	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C19	Capacitor, Tantalum, 1 UF, 50 V	28091
C21	Capacitor, Electrolytic, 125 UF, 3 V	26602
C23	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C24	Capacitor, Monolithic, 0.1 UF, 50 V	28161
C25	Capacitor, Tantalum, 47 UF, 20 V	28170
C26	Capacitor, Disc Ceramic, .001 UF, 250 V	28626
C27	Capacitor, Tantalum, .22 UF, 20 V	28351
C28	Capacitor, Tantalum, 47 UF, 20 V	28170
C29	Capacitor, Tantalum, 1 UF, 50 V	28091
C30	Capacitor, Mica, 51 PF, 2%	28135
C31	Capacitor, Mica, 18 PF, 5%	26030
CR1	Diode, 1N4004	40518
CR2	Diode, 1N4004	40518
CR3	Diode, 1N4004	40518
CR4	Diode, 1N4454	40527
J1	Connector, RF JCM	75360
J2	Connector, RF BNC	75349
J3	Connector, 7 Pin	75359
L1	Inductor, 22 UH, 5%	65000
L2	Inductor, 6.8 UH, 5%	65921
L3	Inductor, RF Choke, Driver	5024-0306-00
L4	Inductor, 2.7 UH, 10%	65218
L5	Inductor, RF Choke, Amplifier	5024-0307-00
L6	Inductor, 2.7 UH, 10%	65218
L7	Inductor, 2.7 UH, 10%	65218
Q1	Transistor, 2N3866	44814

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
Q2	Transistor, 2N3866	44814
Q3	Transistor, PT6619	44815
Q4	Transistor, PT6619	44815
Q5	Transistor, RF Power	44817
Q6	Transistor, RF Power	44817
Q7	Transistor, 2N4249	44678
R1	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R2	Resistor, Carbon, 1 K, 10%, 1/2 W	16748
R3	Resistor, Carbon, 82 ohm, 10%, 1/4 W	18461
R4	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R5	Resistor, Carbon, 330 ohm, 10%, 1/4 W	17091
R6	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R7	Resistor, Carbon, 10 ohm, 10%, 1/4 W	17716
R8	Resistor, Carbon, 22 ohm, 10%, 1/4 W	19685
R9	Resistor, Wirewound, 300 ohm, 10%, 5 W	16114
R10	Resistor, Carbon, 820 ohm, 10%, 1/2 W	17560
R11	Resistor, Carbon, 1 K, 10%, 1/2 W	16748
R12	Resistor, Carbon, 820 ohm, 10%, 1/2 W	17560
R13	Resistor, Carbon, 1 ohm, 5%, 1/2 W	19477
R14	Resistor, Carbon, 1 ohm, 5%, 1/2 W	19477
R15	Resistor, Carbon, 1 ohm, 5%, 1/2 W	19477
R16	Resistor, Carbon, 1 ohm, 5%, 1/2 W	19477
R17	Not Used	
R18	Resistor, Carbon, 1 K, 10%, 1/2 W	16748
R19	Resistor, Carbon, 3.3 K 10%, 1/2 W	18409
R20	Resistor, Carbon, 3.3 ohm 5%, 1/2 W	18605
R21	Resistor, Wirewound, 50 ohm, 10%, 30 W	19324
R22	Resistor, Carbon, 39 ohm, 10%, 1/2 W	16592
R23	Potentiometer, Wirewound, 10 ohm 5%, 1/2 W	34638
R24	Resistor, Wirewound, 0.1 ohm, 10%, 15 W	19316
R25	Resistor, Carbon, 470 ohm, 10%, 1/4 W	17261
R26	Resistor, Carbon, 10 ohm, 10%, 2 W	16384
R27	Resistor, Carbon, 10 ohm, 10%, 2 W	16384
R28	Resistor, Carbon, 10 ohm, 10%, 2 W	16384
R29	Resistor, Carbon, 10 ohm, 10%, 2 W	16384
R30	Resistor, Carbon, 150 ohm, 10%, 1/4 W	17273
R31	Resistor, Carbon, 5.1 K, 10%, 1/2 W	18370
R32	Resistor, Carbon, 470 ohm, 10%, 1/4 W	17261
R33	Resistor, Carbon, 2.7 K, 10%, 1/4 W	18667
R34	Resistor, Carbon, 2.2 ohm, 5%, 1/2 W	17869
R35	Resistor, Carbon, 2.2 ohm, 5%, 1/2 W	17869
T1	Transformer, Input	5024-0304-00
T2	Transformer, Interstage	5024-0305-00
T3	Transformer Assembly, Driver	5024-0308-01
T4	Transformer Assembly, Driver	5024-0308-01
T5	Transformer Assembly, Output	5024-0311-01
T6	Transformer Assembly, Output	5024-0311-01
Miscellaneous Mechanical Parts		
	Heat Sink, Machined	5024-0314-00

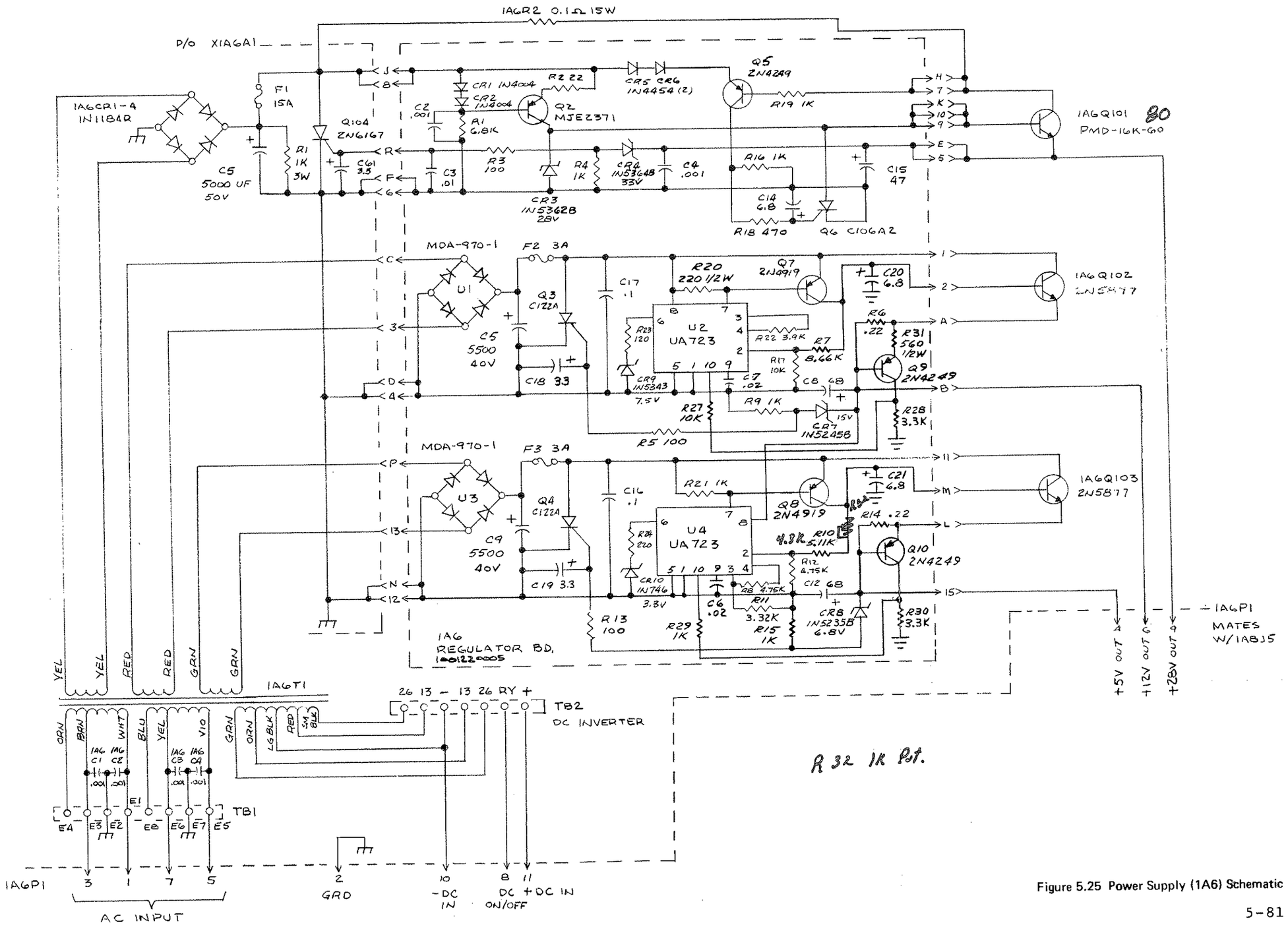
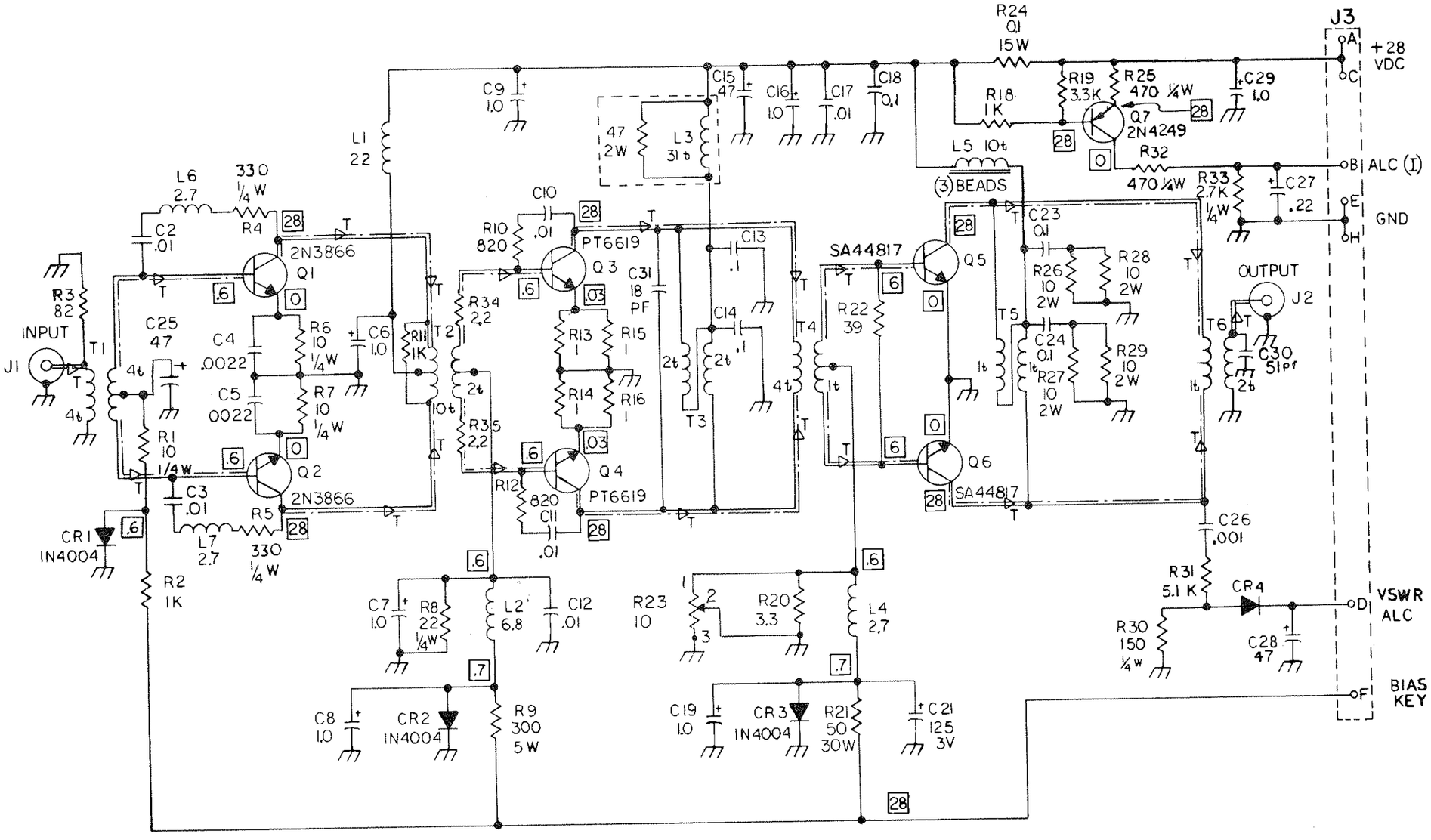


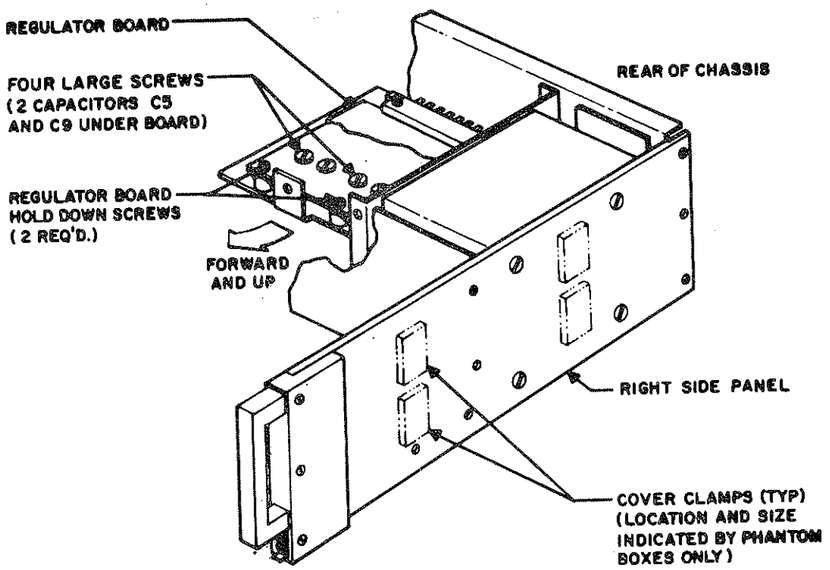
Figure 5.25 Power Supply (1A6) Schematic

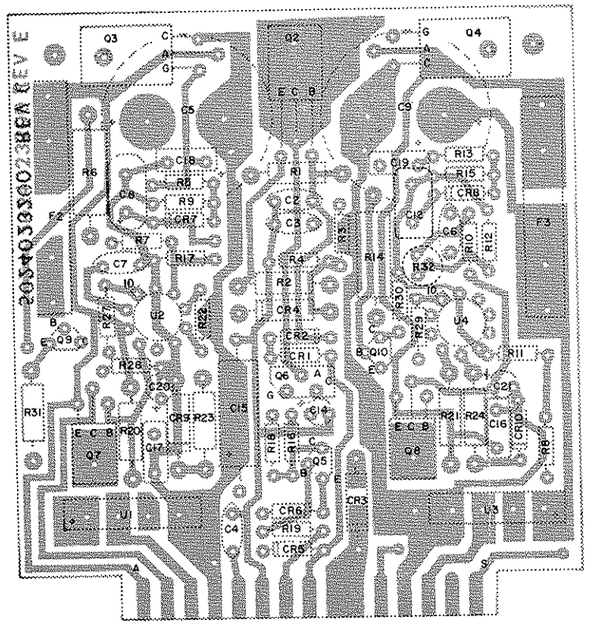


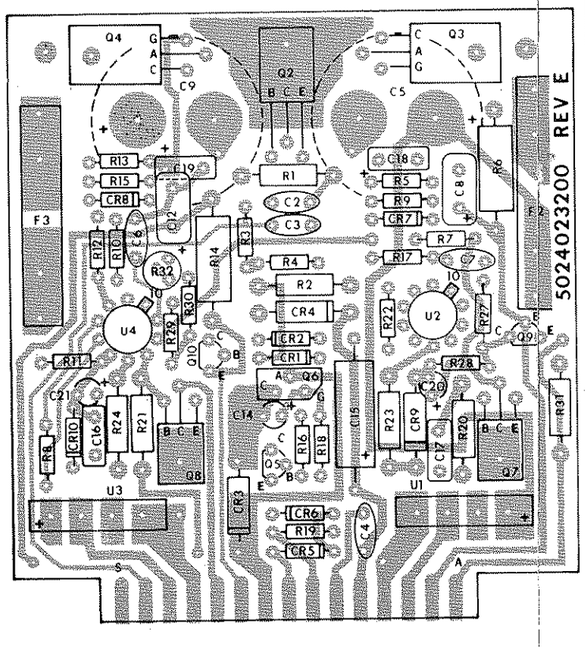
UNLESS OTHERWISE SPECIFIED:

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

Figure 5.24 RF Power Amplifier (1A7A1) Schematic





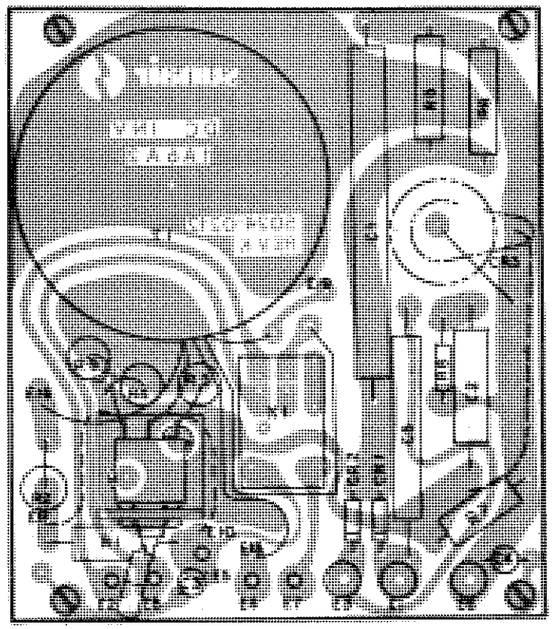


1A61 Chassis Assy

PCB, REGULATOR (1A6A1)

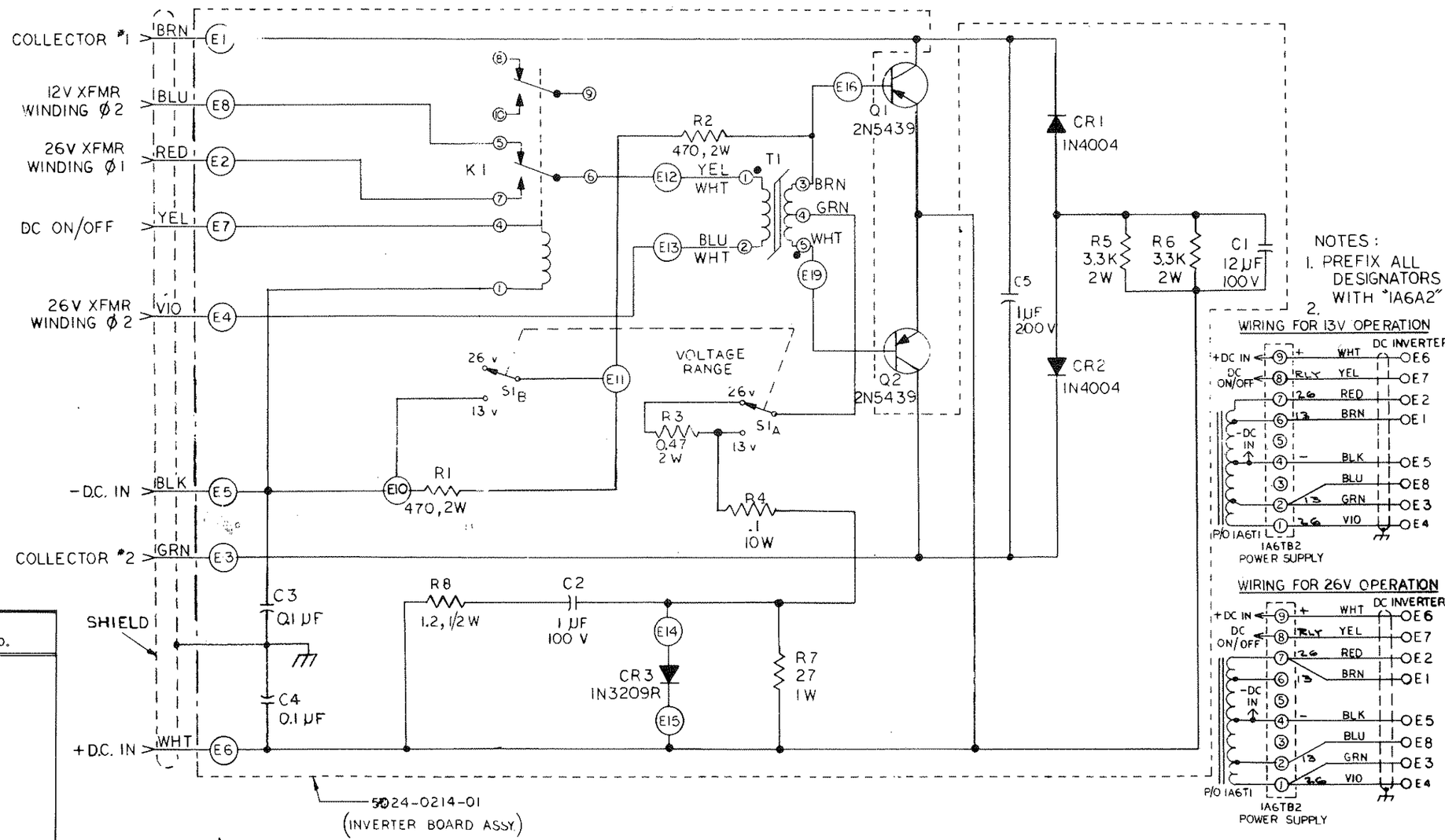
REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C15	Capacitor, 47 UF, 50V, CL65B	0245750002
C6,7	Capacitor, 0.02 UF, 25V, Y5U	0269130004
C16,17	Capacitor, 0.1 UF, 50V, X7R, 20%	0281610002
C3	Capacitor, 0.01 UF, 25V, X5S	0281620008
C18,19	Capacitor, 3.3 UF, 35V, 196D	0281680001
C8,12	Capacitor, 68 UF, 25V, T368	0282150005
C2,4	Capacitor, 0.001 UF, 250V, X5R, 10%	0286260000
C14,20,21	Capacitor, 6.8 UF, 20V, T368	0296780006
CR10	Diode, Zener, 1N746	0402320000
CR1,2	Diode, Rectifier, 1N4004	0405180004
CR8	Diode, Zener, 1N5235B	0405200005
CR7	Diode, Zener, 1N5245B	0405210001
CR3	Diode, Zener	0405220006
CR4	Diode, Zener, 1N5364B	0405230001
CR5,6	Diode, Signal, Silver, 1N4454	0405270003
CR9	Diode, Zener, 1N5343B	1003060005
F2,3	Fuse, AGC, 3 Amp, 250V	1002550009
Q7,8	Transistor, PNP, Si., 2N4919	0445370009
Q5,9,10	Transistor, PNP, Si., 2N4249	0446780006
Q3,4	Diode, SCR, C122A	0446920002
Q6	Diode, SCR, C106A2	0447070002
Q2	Transistor, PNP, Silver, T1P-32A	0448200007
R1	Resistor, 6.8K, 10%, 1/2W	0162290004
R21	Resistor, 1K, 10%, 1/2W	0167480006
R27	Resistor, 10K, 10%, 1/4W	0170410005
R28,30	Resistor, 3.3K, 10%, 1/4W	0170890007
R3,5,13	Resistor, 100, 5%, 1/4W	0171180003
R4,9,15,16, 19,29	Resistor, 1K, 10%, 1/4W	0171560001
R20,24	Resistor, 220, 10%, 1/2W	0172850002
R22	Resistor, 3.9K, 10%, 1/4W	0178830003
R18	Resistor, 470, 5%, 1/4W	0184110009
R31	Resistor, 560, 10%, 1/2W	0185900003
R23	Resistor, 120, 10%, 1/2W	0186430001
R2	Resistor, 22, 10%, 1/2W	0186930003
R6,14	Resistor, 0.22, 5%, 2W	0193620006
R11	Resistor, 3320, 1%, 1/8W	1003050000
R8,12	Resistor, 4750, 1%, 1/8W	1003050018
R17	Resistor, 10K, 1%, 1/8W	1003050026
R7	Resistor, 8.66K, 1%, 1/8W	1003120008
R10	Resistor, 5.11K, 1%, 1/8W 4.3k 5%	1003120016 100509045
U1,3	Diode, Bridge, MDA970-1	0405260008
U2,4	IC, Linear, VA723	0448190001
	Regulator Board Assembly, GSB-900R	1001220005
R32	POTENTIOMETER, 1K, 1/2W	1004680007

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Disc Ceramic, .001 UF, 1 KV	28935
C2	Capacitor, Disc Ceramic, .001 UF, 1 KV	28935
C3	Capacitor, Disc Ceramic, .001 UF, 1 KV	28935
C4	Capacitor, Disc Ceramic, .001 UF, 1 KV	28935
C5	Capacitor, Electrolytic, 5000 UF, 50 V	28214
C6	Capacitor, Tantalum, 3.3 UF, 35 V	28168
CR1	Diode, 1N1184R	40559
CR2	Diode, 1N1184R	40559
CR3	Diode, 1N1184R	40559
CR4	Diode, 1N1184R	40559
F1	Fuse, 15 Amp, 3 AG	84874
J1	Connector, 15 Pin, Double	75378
P1	Connector, 11 Pin	75332
Q101	Transistor, Power	44821
Q102	Transistor, 2N6055	44818
Q103	Transistor, 2N6055	44818
Q104	SCR, 2N6167	40545
R1	Resistor, Wirewound, 1 K, 10%, 3 W,	16279
R2	Resistor, Wirewound, 0.1 ohm, 10%, 15 W	19336
T1	Transformer, Power	5024-0203-00
	Miscellaneous Mechanical Parts	
TB2	Terminal Strip	50803
	Socket, Transistor, TO-3	76619
	Support, Rubber	5024-0220-00
C18	Capacitor, Disc Ceramic, .1 UF, 12 V	27010
C19	Capacitor, Disc Ceramic, .1 UF, 12 V	27010



PARTS LIST, 1A6A2

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mylar, 12 UF, 100 V	28202
C2	Capacitor, Mylar, 1 UF, 100 V	27230
C3	Capacitor, Ceramic, .1 UF, 50 V	28161
C4	Capacitor, Ceramic, .1 UF, 50 V	28161
C5	Capacitor, Mylar, 1 UF, 200 V	24525
CR1	Diode, 1N4004	40518
CR2	Diode, 1N4004	40518
CR3	Diode, 1N3209R	40519
K1	Relay, DPDT 5A, 12 V	66468
Q1	Transistor, 2N5439	44832
Q2	Transistor, 2N5439	44832
R1	Resistor, Carbon, 470 ohm, 10%, 2 W	16358
R2	Resistor, Carbon, 470 ohm, 10%, 2 W	16358
R3	Resistor, Wirewound, .47 ohm, 2 W	19735
R4	Resistor, Wirewound, .1 ohm, 10W	19749
R5	Resistor, Carbon, 3.3K, 10%, 2 W	19722
R6	Resistor, Carbon, 3.3K, 10%, 2 W	19722
R7	Resistor, Carbon, 27 ohm, 10%, 1 W	19715
R8	Resistor, Carbon, 1.2 ohm, 10%, 1/2 W	18849
R9		
S1	Switch, Toggle, DPDT, Lever Lock	34637
T1	Transformer, Saturable	5024-0215-00



EFFECTIVITY:
SERIAL NUMBER 650

Figure 5.26 D.C. Inverter (1A6A2) Schematic

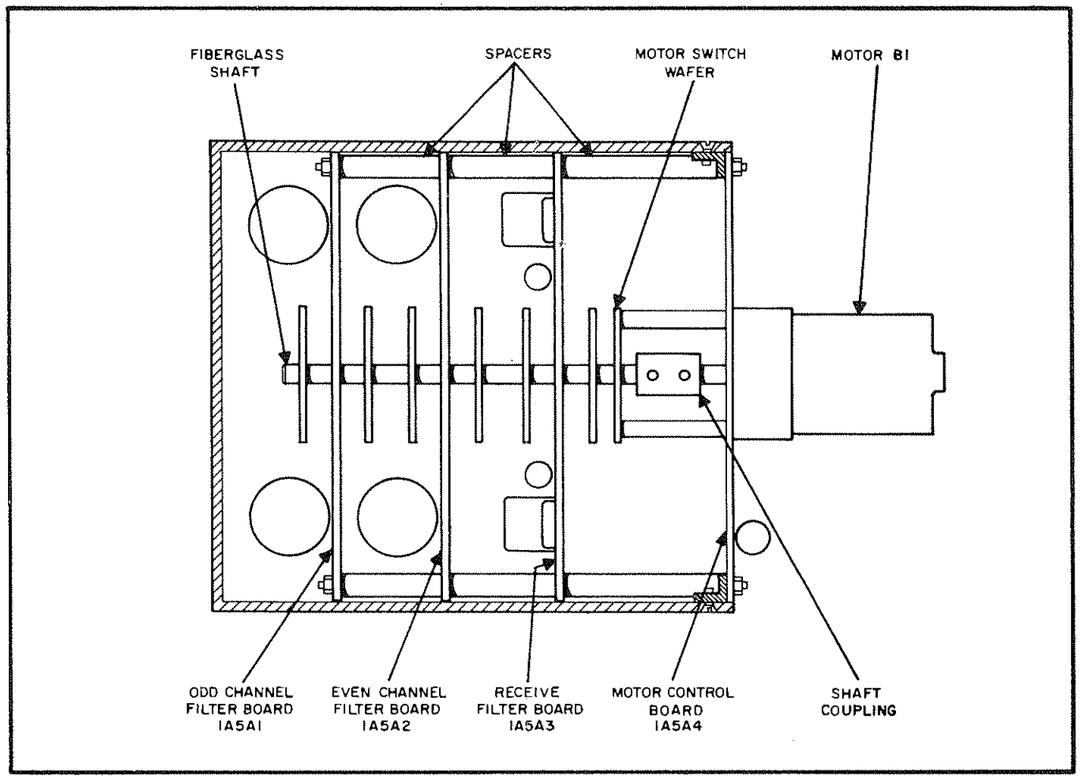
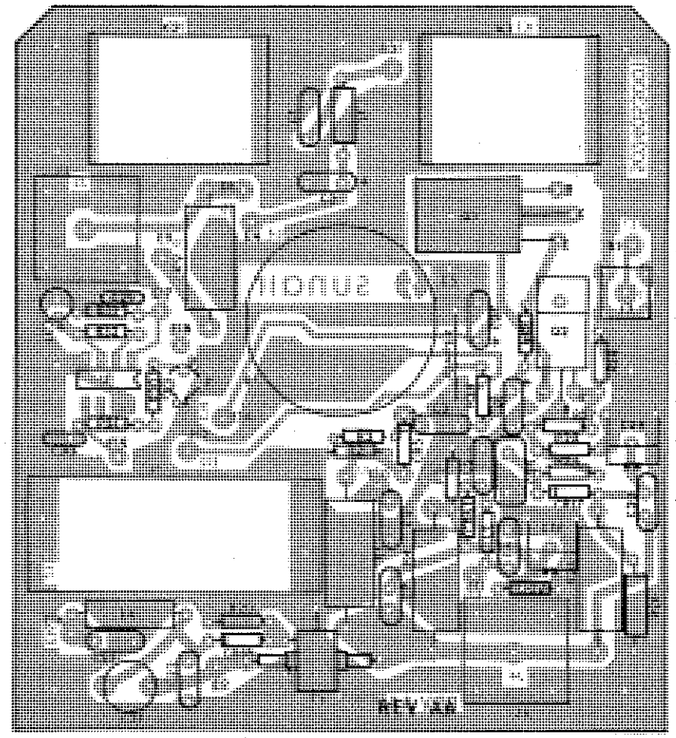


Figure 5.27 Filter Module Assembly

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, 0.01 UF, 50 V, X7R, 20%	0281610002
C24	Capacitor, 2.5-20 PF	1005140031
C25	Capacitor, 150 PF, 500 V, DM15, 5%	0274980002
C26	Not used	
C27	Capacitor, 3.3 UF, 35 V, 196D	0281680001
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	0183180003
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	

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
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	0182890007
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
	Socket, Relay, 4PDT Contacts	0767000005
	Retainer, Relay Socket	0767500008
	Switch, Wafer, Motor Control	5024053109



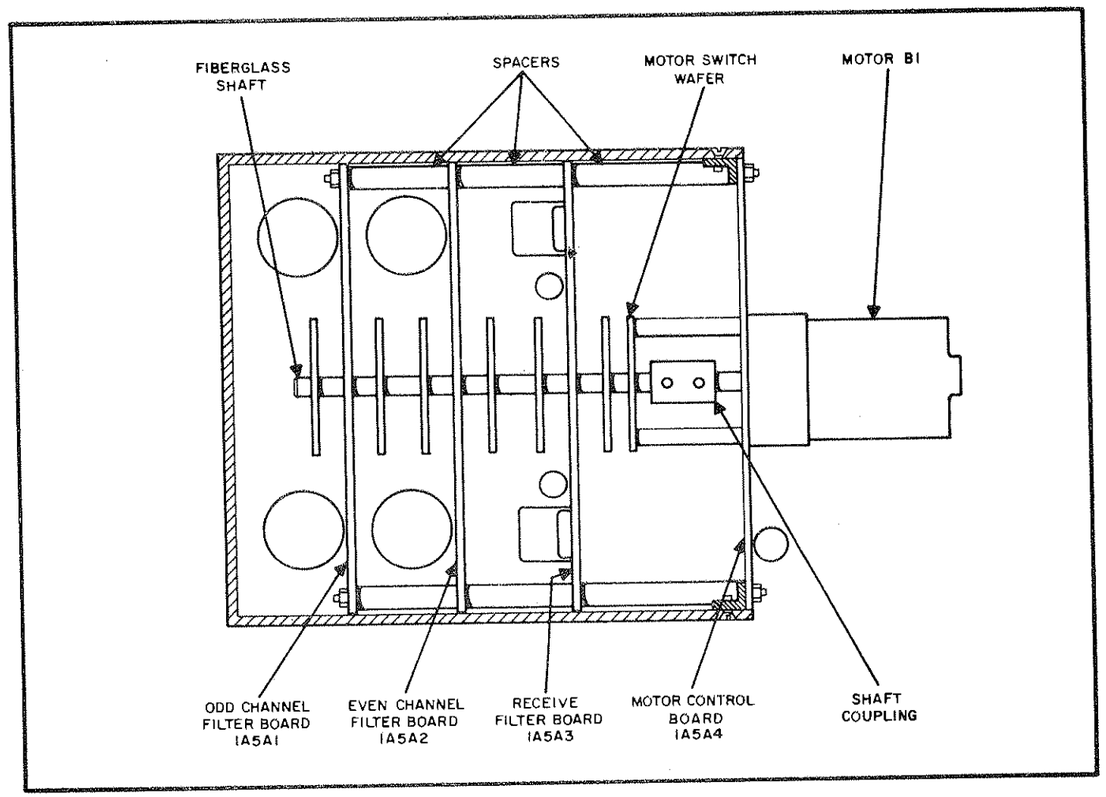


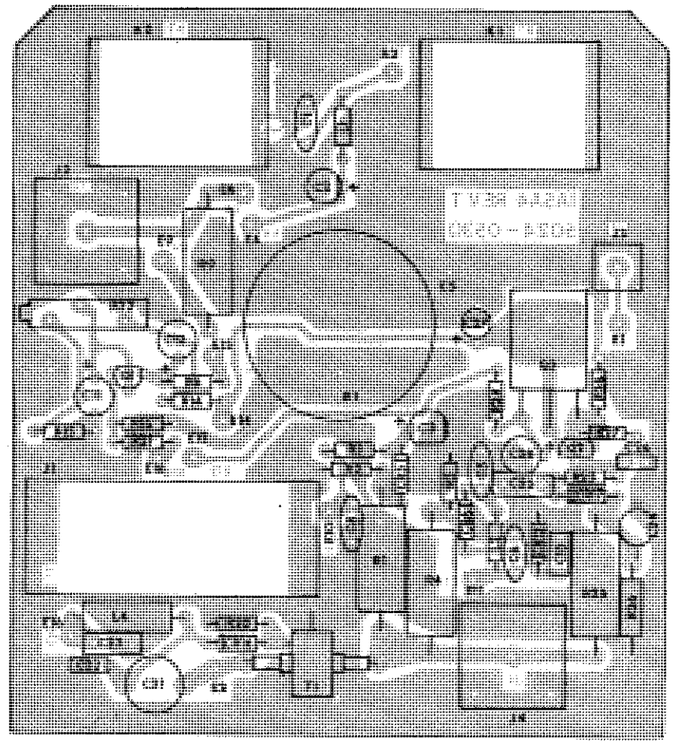
Figure 5.27 Filter Module Assembly

OBSOLETE

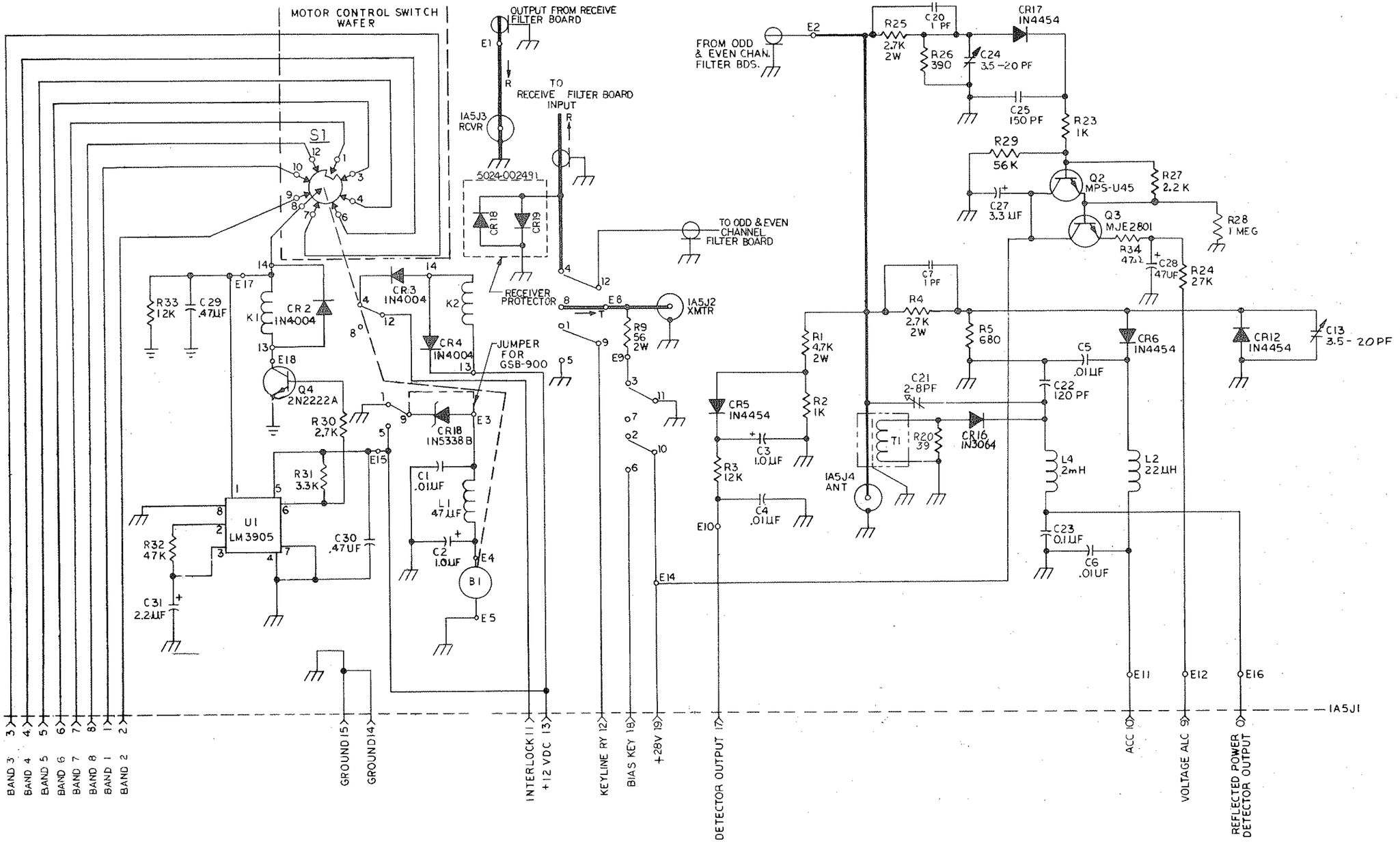
PARTS LIST, 1A5A4

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
B1	Motor, 12 VDC, 566 RPM	5024-0535
C1	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C2	Capacitor, Tantalum, 1 UF, 50 V	28091
C3	Capacitor, Tantalum, 1 UF, 50 V	28091
C4	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C5	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C6	Capacitor, Disc Ceramic, .01 UF, 25 V	28162
C7	Capacitor, Disc Ceramic, .001 UF, 250V	28626
C8	Capacitor, Electrolytic, 10 UF, 150 V	24549
C9	Capacitor, Disc Ceramic, .001 UF, 250V	28626
C10	Not Used	
C11	Capacitor, Tantalum, 47 UF, 20V	28170
C12	Capacitor, not used	
C13	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C14	Capicitor, Dipped Mica 10 pf, 5%, 300V	25983
C15	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C16	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C17	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C18	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C19	Capacitor, Dipped Mica 10 pf, 5%, 300V	25983
C20	Capacitor, Tantalum, 47 UF, 20V	28170
C21	Capacitor, Variable, 2-8pf	26822
C22	Capacitor, Mica 120pf, 5%, 300V	28088
C23	Capacitor, Monolithic, 0.1UF, 20%, 50V	28161
CR1	Diode, 1N4004	40518
CR2	Diode, 1N4004	40518
CR3	Not Used	
CR4	Diode, 1N4004	40518
CR5	Diode, 1N4454	40527
CR6	Diode, 1N4454	40527
CR7	Diode, 1N4454	40527
CR8	Diode, 1N4454	40527
CR9	Diode, 1N4454	40527
CR10	Diode, 1N4454	40527
CR11	Not Used	
CR12	Diode, 1N4454	40527
CR13	Diode, 1N4454	40527
CR14	Diode, 1N4454	40527
CR15	Diode, 1N4454	40527
CR16	Diode, IN4454	40527

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
J1	Connector, 20 Pin	75347
J2	Connector, RF, BNC	75349
J3	Connector, RF, JCM	75360
J4	Connector, RF, BNC	75349
K1	Relay, 12VDC, 4 PDT	66664
K2	Relay, 12VDC, 4 PDT	66664
L1	Inductor, 47 UH 5%	65268
L2	Inductor, 22 UH 5%	65000
L3	Inductor, 22 UH 5%	65000
L4	Inductor, 2 MH	65359
R1	Resistor, Carbon, 4.7K, 10%, 2 W	16413
R2	Resistor, Carbon, 1 K, 10%, 1/4 W	17156
R3	Resistor, Carbon, 12K, 10%, 1/4 W	18318
R4	Resistor, Carbon, 2.7K 10%, 2W	19594
R5	Resistor, Carbon, 680 ohm, 10%, 1/4 W	17663
R6	Resistor, Carbon, 2.7K 10%, 1/4W	18667
R7	Resistor, Carbon, 39 ohm, 10%, 1/4 W	18289
R8	Resistor, Carbon, 330K, 10%, 1/4 W	17467
R9	Resistor, Carbon, 56 ohm, 10%, 1/4 W	19721
R10	Resistor, Carbon, 100K, 10%, 1/4 W	17039
R11	Resistor, Carbon, 100K, 10%, 1/4 W	17039
R12	Resistor, Carbon, 100K, 10%, 1/4 W	17039
R13	Resistor, Carbon, 100K, 10%, 1/4 W	17039
R14	Resistor, Carbon, 3K, 5%, 1/4 W	19718
R15	Resistor, Carbon, 2.2K, 10%, 1/4 W	17807
R16	Resistor, Carbon, 2.2K, 10%, 1/4 W	17807
R17	Resistor, not used	
R18	Resistor, Carbon, 100K, 10%, 1/4 W	17039
R19	Resistor, Carbon, 100K, 10%, 1/4 W	10739
R20	Resistor, Carbon, 39ohm, 10%	18289
S1	Switch, Rotary, Motor Control	5024-0531
T1	Transformer, Current	5024-0556
Q1	Transistor, 2N4126	44802
Mechanical Parts		
	Insulated Shaft, 4 in.	33253-1
	Coupling Shaft, 4 in.	84071



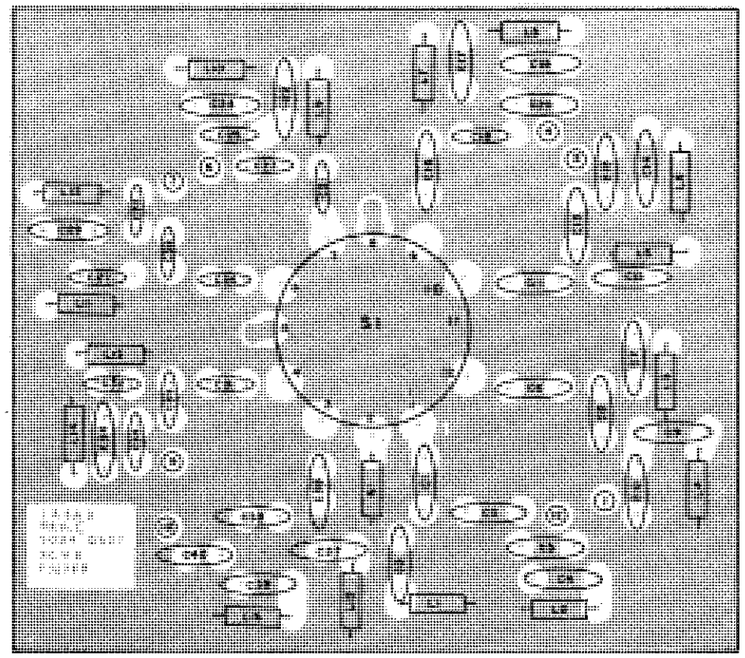
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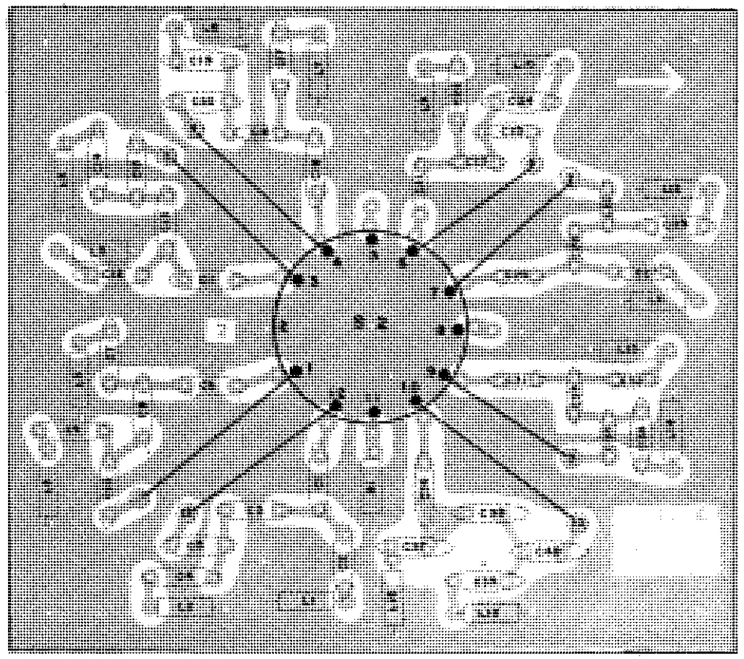


NOTES:

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

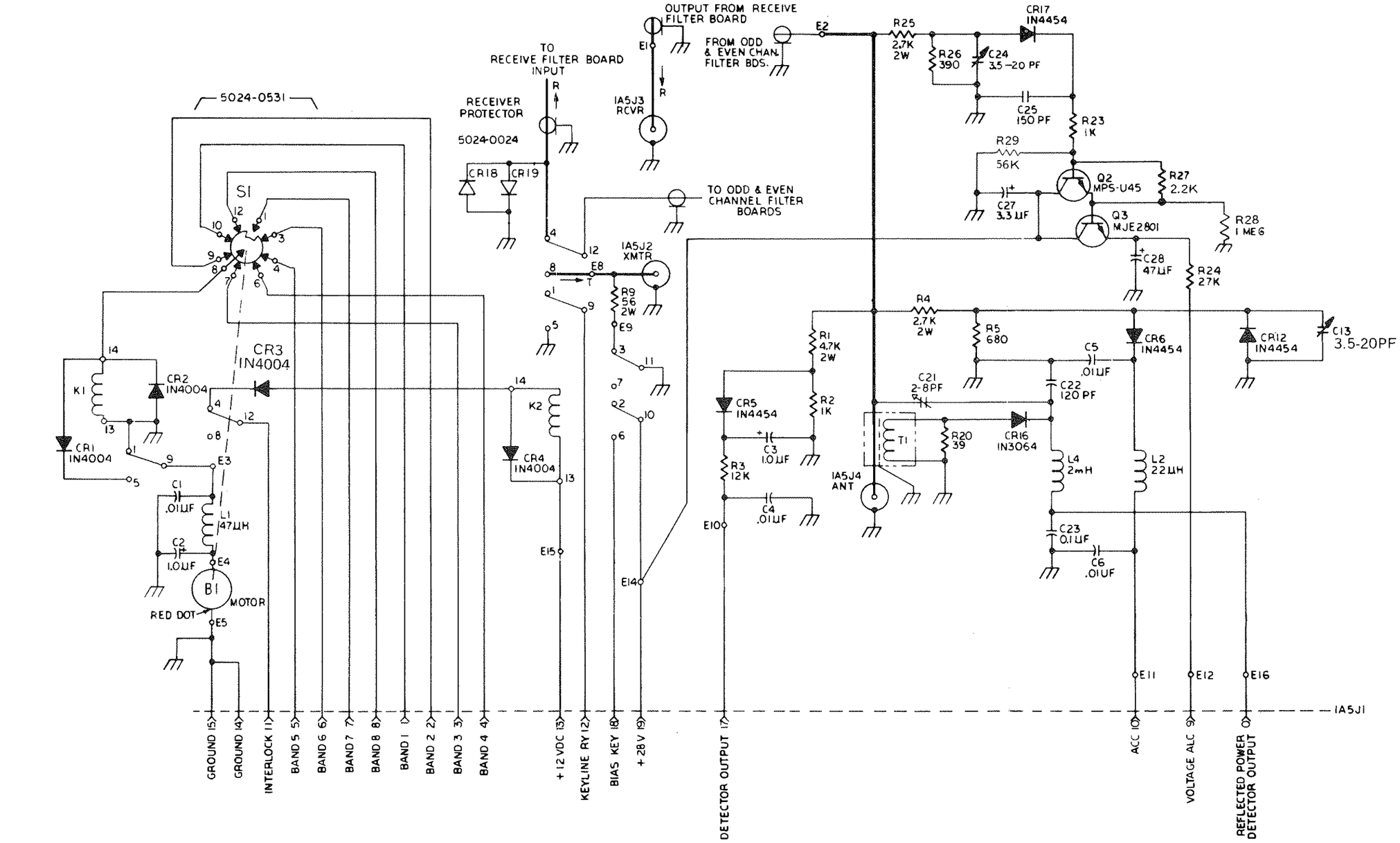
Figure 5.28 Motor Control Board (1A5A4) Schematic





PARTS LIST, 1A5A3

REF. SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mica, 2700 PF 2%, 500 V	28124
C2	Capacitor, Mica, 4700 PF 2%, 500 V	28139
C3	Capacitor, Mica, 1300 PF 2%, 500 V	28138
C4	Capacitor, Mica, 1100 PF 2%, 500 V	28137
C5	Capacitor, Mica, 2200 PF 2%, 500 V	28136
C6	Capacitor, Mica, 2200 PF 2%, 500 V	28136
C7	Capacitor, Mica, 3300 PF 2%, 500 V	28125
C8	Capacitor, Mica, 1100 PF 2%, 500 V	28100
C9	Capacitor, Mica, 9100 PF 2%, 500 V	28096
C10	Capacitor, Mica, 1600 PF 2%, 500 V	28122
C11	Capacitor, Mica, 1500 PF 2%, 500 V	28127
C12	Capacitor, Mica, 2200 PF 2%, 500 V	28136
C13	Capacitor, Mica, 750 PF 2%, 500 V	28099
C14	Capacitor, Mica, 5600 PF 2%, 500 V	28126
C15	Capacitor, Mica, 1100 PF 2%, 500 V	28100
C16	Capacitor, Mica, 1100 PF 2%, 500 V	28100
C17	Capacitor, Mica, 1800 PF 2%, 500 V	28130
C18	Capacitor, Mica, 560 PF 2%, 500 V	28106
C19	Capacitor, Mica, 4700 PF 2%, 500 V	28139
C20	Capacitor, Mica, 820 PF 2%, 500 V	28128
C21	Capacitor, Mica, 750 PF 2%, 500 V	28099
C22	Capacitor, Mica, 1200 PF 2%, 500 V	28103
C23	Capacitor, Mica, 360 PF 2%, 500 V	28116
C24	Capacitor, Mica, 3000 PF 2%, 500 V	28132
C25	Capacitor, Mica, 560 PF 2%, 500 V	28106
C26	Capacitor, Mica, 510 PF 2%, 500 V	28123
C27	Capacitor, Mica, 750 PF 2%, 500 V	28099
C28	Capacitor, Mica, 220 PF 2%, 500 V	28142
C29	Capacitor, Mica, 2000 PF 2%, 500 V	28141
C30	Capacitor, Mica, 390 PF 2%, 500 V	28104
C31	Capacitor, Mica, 360 PF 2%, 500 V	28116
C32	Capacitor, Mica, 470 PF 2%, 500 V	28144
C33	Capacitor, Mica, 160 PF 2%, 500 V	28134
C34	Capacitor, Mica, 1500 PF 2%, 500 V	28127
C35	Capacitor, Mica, 270 PF 2%, 500 V	28097
C36	Capacitor, Mica, 220 PF 2%, 500 V	28142
C37	Capacitor, Mica, 330 PF 2%, 500 V	28107
C38	Capacitor, Mica, 110 PF 2%, 500 V	28146
C39	Capacitor, Mica, 910 PF 2%, 500 V	28145
C40	Capacitor, Mica, 160 PF 2%, 500 V	28134
L1	Inductor, 5.6 UH 5%	65036
L2	Inductor, 4.7 UH 5%	65191
L3	Inductor, 4.7 UH 5%	65191
L4	Inductor, 3.9 UH 5%	65048
L5	Inductor, 3.3 UH 5%	65892
L6	Inductor, 2.7 UH 5%	65218
L7	Inductor, 2.2 UH 5%	64989
L8	Inductor, 1.8 UH 5%	65244
L9	Inductor, 1.5 UH 5%	64927
L10	Inductor, 1.2 UH 5%	64991
L11	Inductor, 1.0 UH 5%	64915
L12	Inductor, 0.82 UH, 5%	65232
L13	Inductor, 0.82 UH 5%	65232
L14	Inductor, 0.56 UH 5%	64953
L15	Inductor, 0.47 UH 5%	64941
L16	Inductor, 0.39 UH 5%	64977
R1	Resistor, Carbon, 10 ohm 10%, 1/2 W	18538
S1	Switch, Receive Filter, Top	5024-0528-00
S2	Switch, Receive Filter, Bottom	5024-0534-00



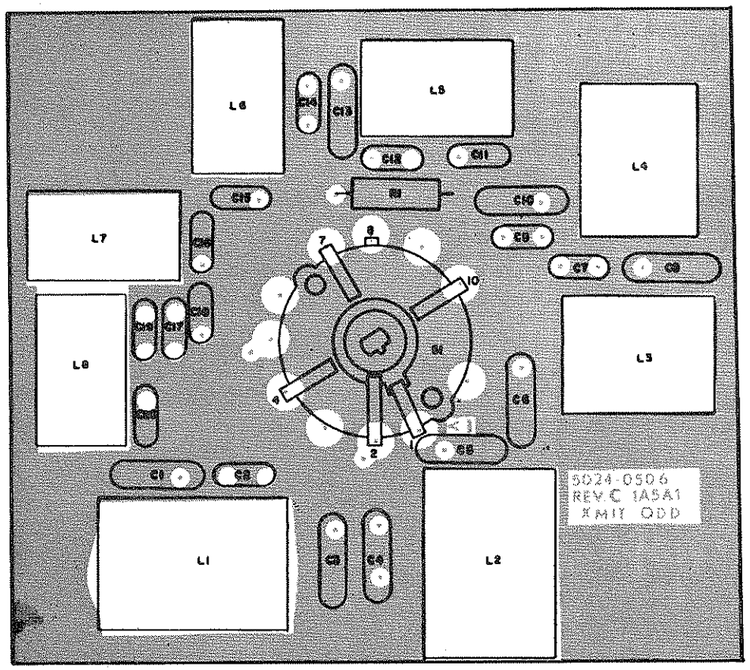
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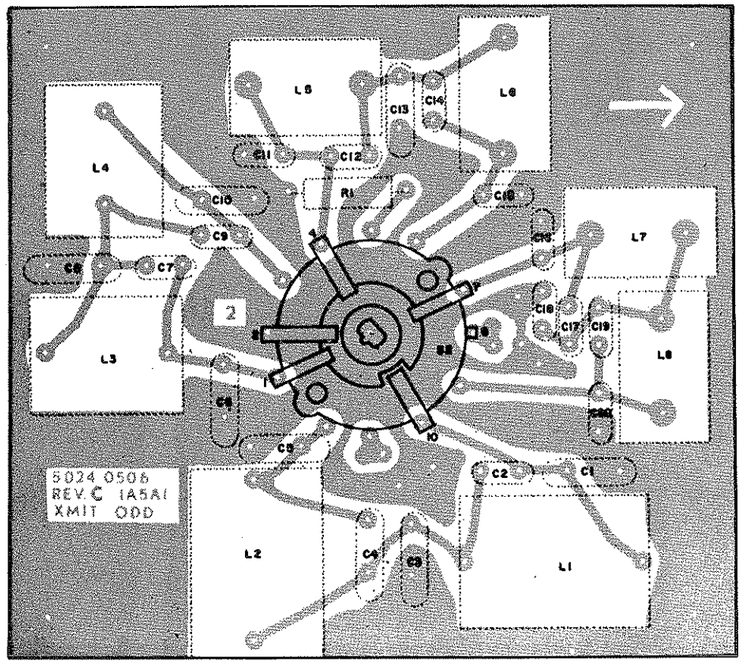
1.) UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE 1/4 WATT
PREFIX ALL ITEMS WITH 1A5A4

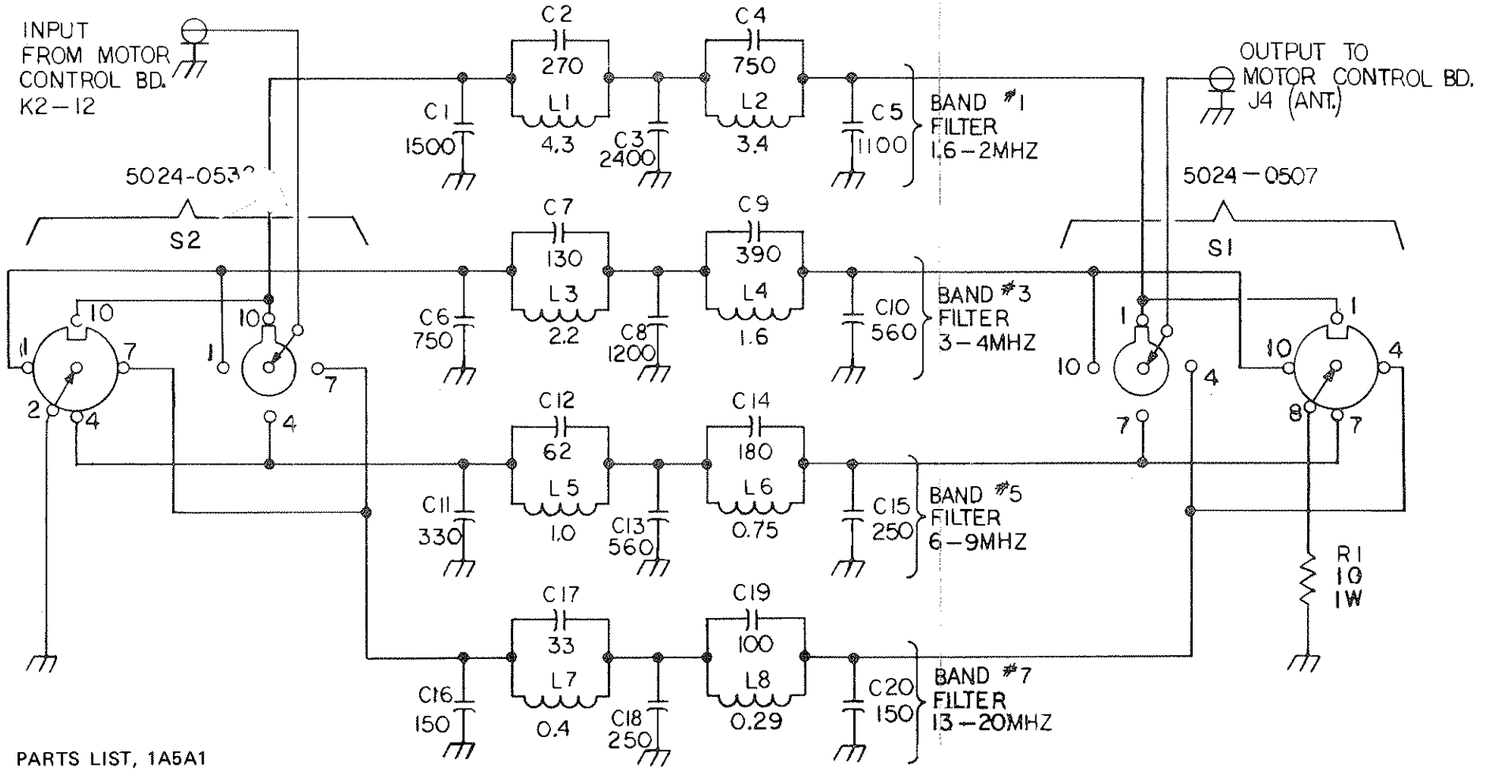
Applies to P.C. Board
Revision T

Figure 5.28 Motor Control Board (1A5A4) Schematic

OBSOLETE







PARTS LIST, 1A5A1

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1	Capacitor, Mica, 1500 PF, ±2%, 500 V	28127
C2	Capacitor, Mica, 270 PF, ±2%, 500 V	28097
C3	Capacitor, Mica, 2400 PF, ±2%, 500 V	28098
C4	Capactior, Mica, 750 PF, ±2%, 500 V	28099
C5	Capacitor, Mica, 1100 PF, ±2%, 500 v	28100
C6	Capacitor, Mica, 750 PF, ±2%, 500 V	28099
C7	Capacitor, Mica, 130 PF, ±2%, 500 V	28101
C8	Capacitor, Mica, 1200 PF, ±2%, 500 V	28103
C9	Capacitor, Mica, 390 PF, ±2%, 500 V	28104
C10	Capacitor, Mica, 560 PF, ±2%, 500 V	28106
C11	Capacitor, Mica, 330 PF, ±2%, 500 V	28107
C12	Capacitor, Mica, 62 PF, ±2%, 500 V	28108
C13	Capacitor, Mica, 560 PF, ±2%, 500 V	28106
C14	Capacitor, Mica, 180 PF, ±2%, 500 V	28109
C15	Capacitor, Mica, 250 PF, ±2%, 500 V	28110
C16	Capacitor, Mica, 150 PF, ±2%, 500 V	28120
C17	Capacitor, Mica, 33 PF, ±2%, 500 V	28102
C18	Capacitor, Mica, 250 PF, ±2%, 500 V	28110
C19	Capacitor, Mica, 100 PF, ±2%, 500 V	28119
C20	Capacitor, Mica, 150 PF, ±2%, 500 V	28120
L1	Inductor, 4.3 UH, ±5%	5024-0508
L2	Inductor, 3.4 UH, ±5%	5024-0509
L3	Inductor, 2.2 UH, ±5%	5024-0510
L4	Inductor, 1.6 UH, ±5%	5024-0511
L5	Inductor, 1.0 UH, ±5%	5024-0512
L6	Inductor, 0.75 UH, ±5%	5024-0513
L7	Inductor, 0.4 UH, ±5%	5024-0514
L8	Inductor, 0.29 UH, ±5%	5024-0515
R1	Resistor, Carbon, 10 ohm, ±10%, 1 W	19609
S1	Switch, Odd Channel, Top	5024-0507
S2	Switch, Odd Channel, Bottom	5024-0532

NOTES:

UNLESS OTHERWISE SPECIFIED,

CAPACITORS ARE IN PF

INDUCTORS ARE IN μH

PREFIX ALL DESIGNATORS WITH "1A5A1."

Figure 5.31 Odd Channel Filter (1A5A1) Schematic

100047002 D

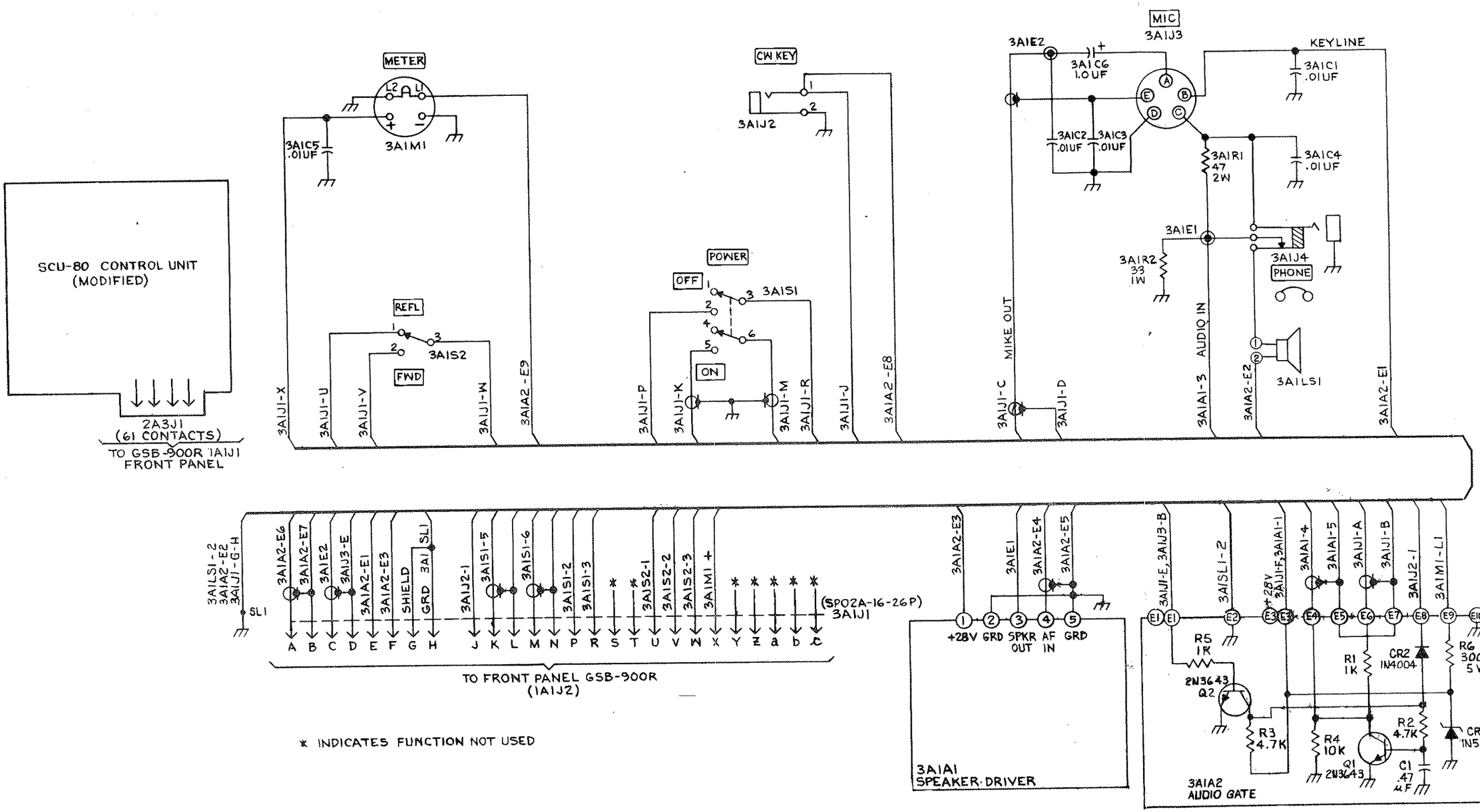
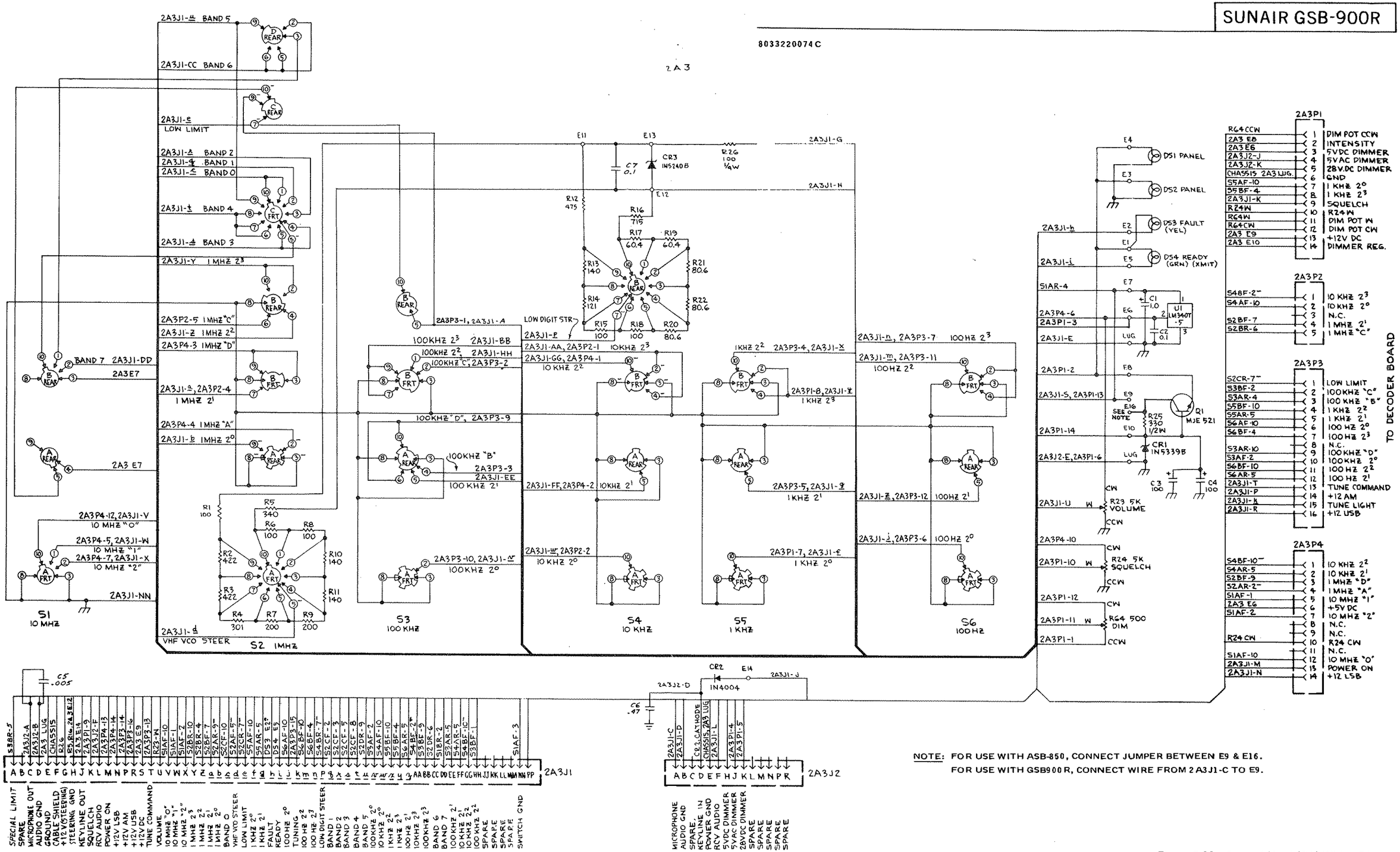


Figure 5.32 GRC-955, Remote Control Unit Schematic

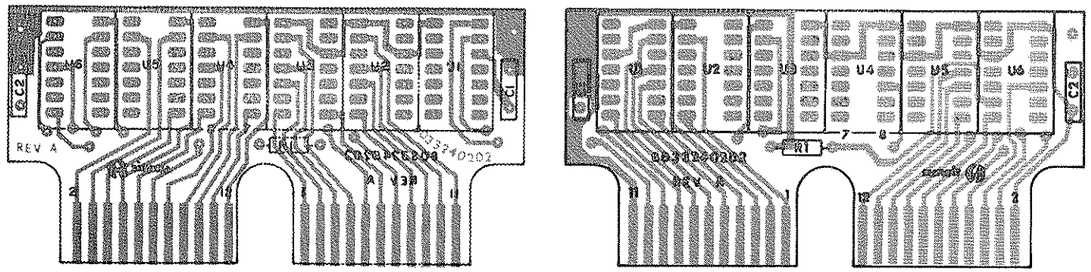
CONTROL HEAD (2A) 8033210095

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C2	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C1	Capacitor, 1 UF, 35 V, 196D	0281660000
C3,C4	Capacitor, 100 UF, 20 V	0282230009
	Knob, .05 D, BLK, WHT DOT	0346420008
C5	Capacitor, 0.005 UF, 100 V, Z5V	0273330004
C7	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
C6	Capacitor, 0.47 UF, 50 V, X5V, 20%	0283370009
CR3	Diode, Zener, 1N5240B	0403850002
CR2	Diode, Rectifier, 1N4004	0405180004
CR1	Diode, Zener, 1N5339B	0405530005
DS1,2	Lamp, Wire Term. T-1, Clear	0842300007
DS3	Lamp, Wire Term. T-1, Yellow	0842310002
DS4	Lamp, Wire Term. T-1, Green	0842320008
J1	Connector, Power, 61 Pin Round	0754520005
	Pin, Connector, Female	0754790002
J2	Connector, Power, 14 Pin Rect.	0754930009
P3	Connector, Strip, 16 Pin Fem.	8033225106
P1,4	Connector, Strip, 14 Pin Fem.	8033225203
P2	Connector, Strip, 5 Pin Fem.	8033225408
Q1	Transistor, NPN, Si., MJE521	0448610001
R25	Resistor, 330, 10%, 1/2 W	0173380000
R64	Potentiometer, 500 Ohm, 1/2 W, 10%, 1 Turn	1000080013
R23,24	Potentiometer, 5 K, 20%, 1/2 W, w/Std. Hdw.	0346710006
R26	Resistor, 100, 5%, 1/4 W	0171180003
R2,3	Resistor, 422, 1%, 1/8 W	0194030008
R4	Resistor, 301, 1%, 1/8 W	0194150003
R7,9	Resistor, 200, 1%, 1/8 W	0194270009
R10,11,13	Resistor, 140, 1%, 1/8 W	0194390004
R1,6,8,15, 18	Resistor, 100, 1%, 1/8 W	0194890007
R5	Resistor, 340, 1%, 1/8 W	0194910008
R16	Resistor, 715, 1%, 1/8 W	0195060008
R17,19	Resistor, 60.4, 1%, 1/8 W	0195180003
R20,21,22	Resistor, 80.6, 1%, 1/8 W	0195200004
R14	Resistor, 121, 1%, 1/8 W	0195320000
R12	Resistor, 475, 1%, 1/8 W	0196610001
S1,2	Switch, Dual, Concentric	8033220201
S3,4	Switch, Dual, Concentric	8033220406
S5,6	Switch, Dual, Concentric	8033220601
U1	IC, Linear, LM340T5	0448600005



NOTE: FOR USE WITH ASB-850, CONNECT JUMPER BETWEEN E9 & E16.
FOR USE WITH GSB900R, CONNECT WIRE FROM 2A3J1-C TO E9.

Figure 5.33 Control Head (2A) Wiring Diagram

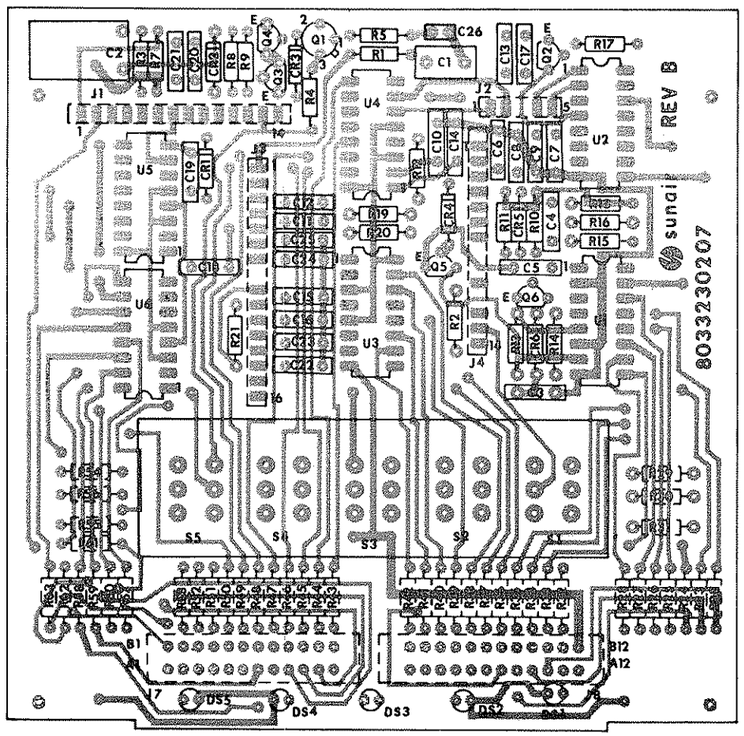


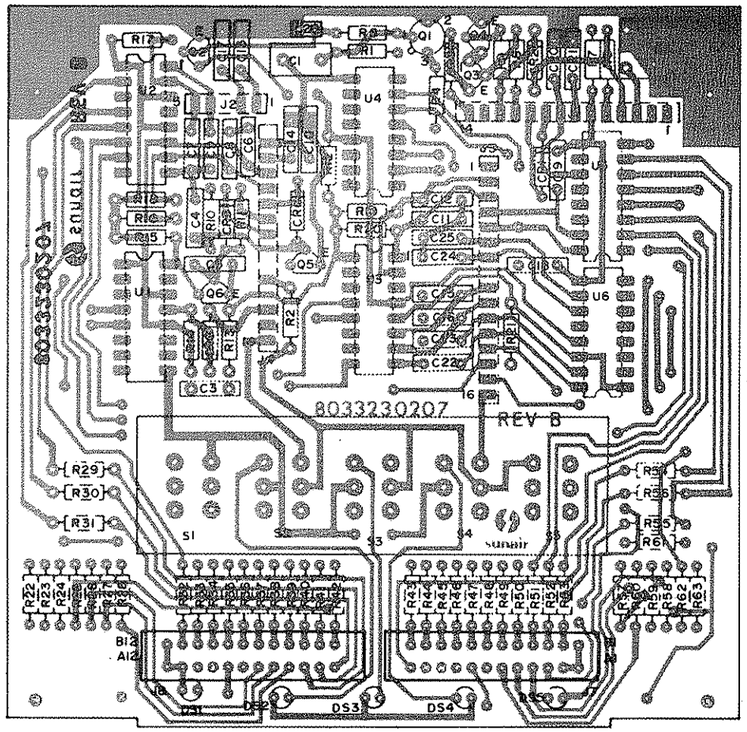
DISPLAY ASSY. (2A2) 8033240091

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1,2	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
R1	Resistor, 120, 10%, 1/4 W	0186550006
U1-6	Display LED 7 Segment	1001260015

DECODER ASSY. (2A1) 8033230098

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C3-26	Capacitor, 0.01 UF, 50 V, W5R, 20%	0281730008
C2	Capacitor, 100 UF, 20 V	0282230009
C1	Capacitor, 68 UF, 15 V, T368	0296540005
CR2	Diode, Rectifier, 1N4004	0405180004
CR1	Diode, Signal, Sil., 1N4454	0405270003
CR3-6	Diode, Signal, Germ., 1N270	0405510004
DS1-5	Lamp, Wire Term. T-1, Clear	0842330003
J1	Connector, PC, 16 Pin Male	8033235101
J4	Connector, PC, 14 Pin Male	8033235209
J3	Connector, PC, 14 Pin Male	8033235306
J2	Connector, PC, 5 Pin Male	8033235403
J7,8	Connector, PC, 12 Pin Female	0754760006
Q2,4-6	Transistor, NPN, Si., 2N4124	0448010003
Q1	Transistor, UJT, 2N2646	0448340003
Q3	Transistor, PNP, Si., MPS-A63	0448650002
R1,8	Resistor, 10 K, 10%, 1/4 W	0170410005
R4,10,11	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R7	Resistor, 120 5%, 1/4 W	0186550006
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R5	Resistor, 120 K, 10%, 1/4 W	0175100004
R3,4	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R2	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R12-21	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R22-63	Resistor, 120, 10%, 1/4 W	0186550006
S1-5	Switch, Multiple Pushbutton	8033231009
U1-6	IC, Digital	0448560003





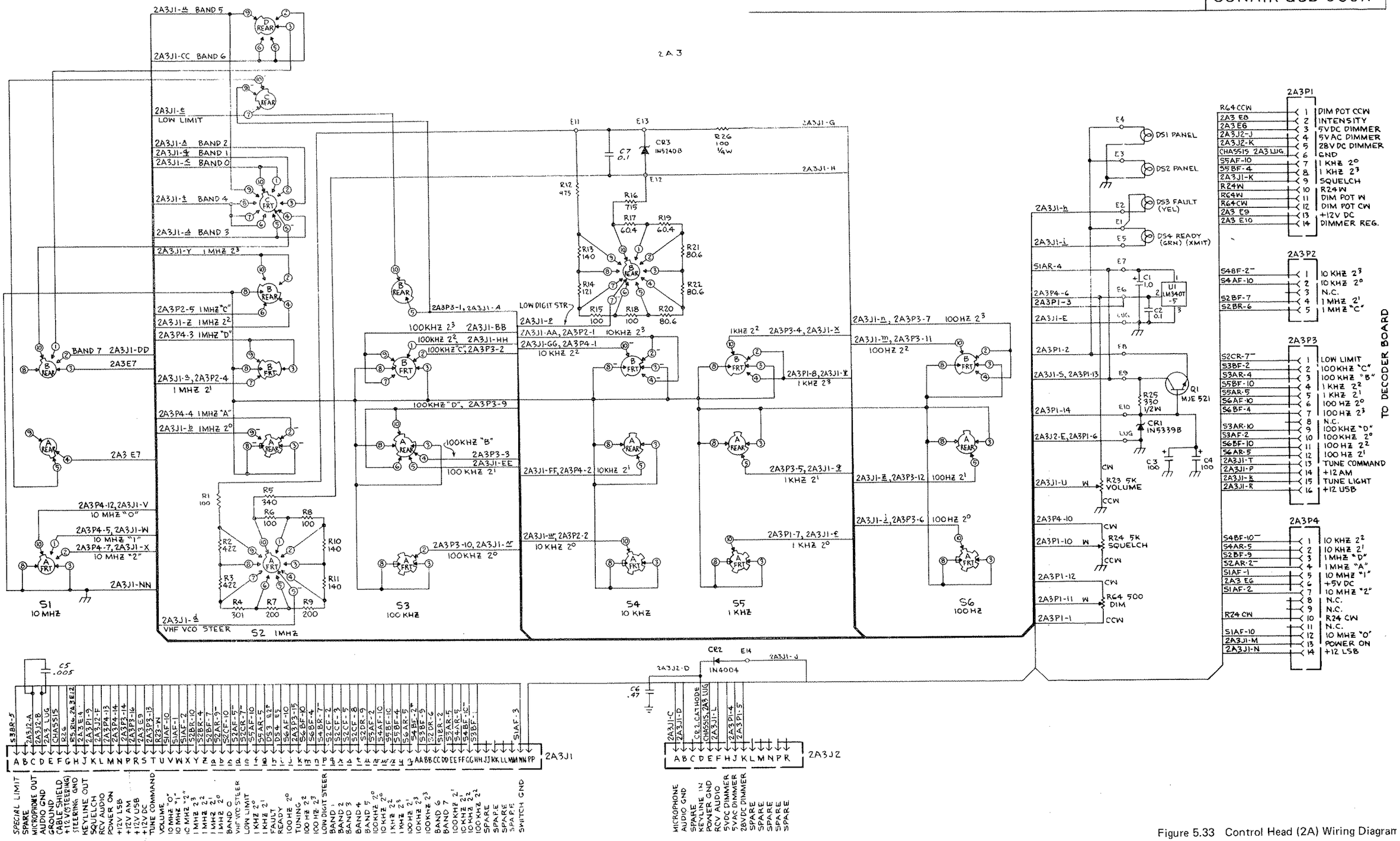
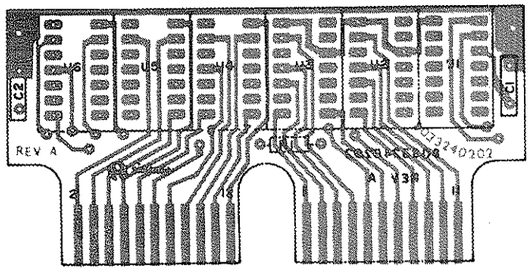
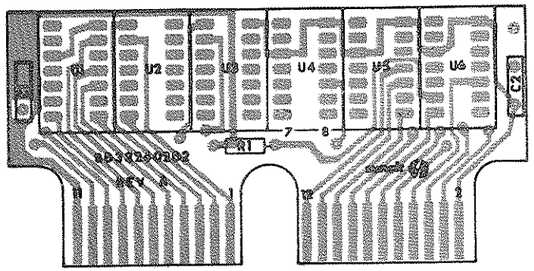


Figure 5.33 Control Head (2A) Wiring Diagram

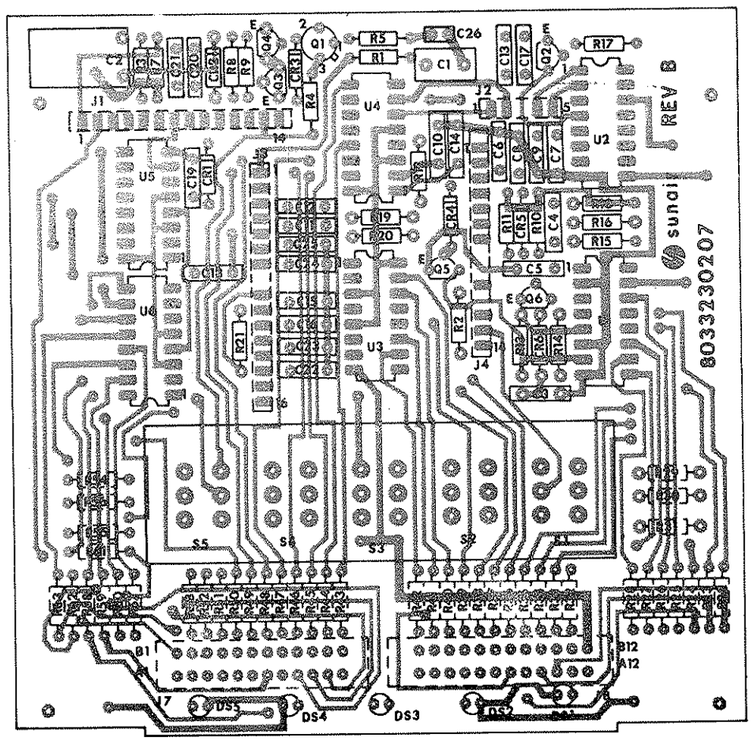
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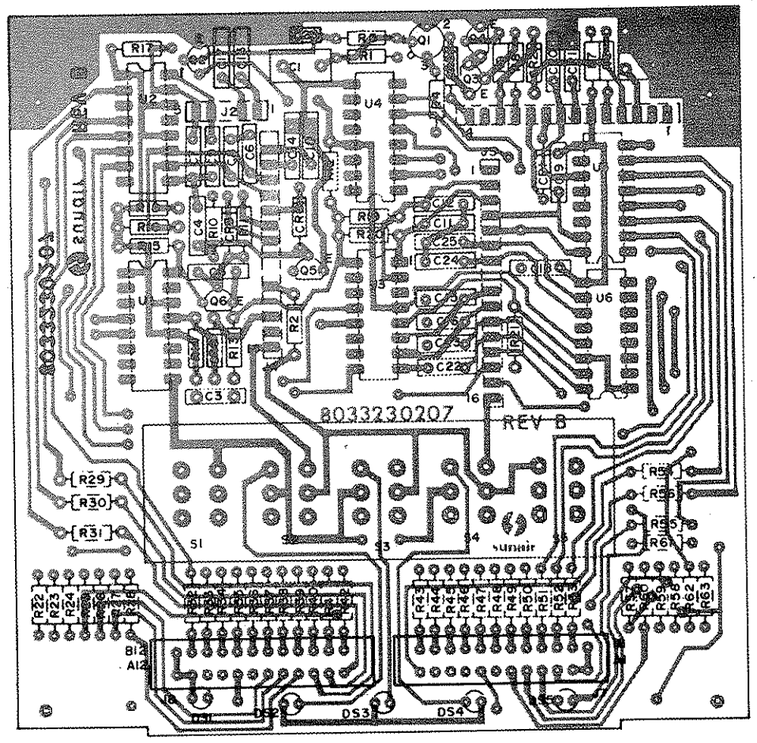
DISPLAY ASSY. (2A2) 8033240091

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C1,2	Capacitor, 0.1 UF, 50 V, X7R, 20%	0281610002
R1	Resistor, 120, 10%, 1/4 W	0186550006
U1-6	Display LED 7 Segment	1001260015



DECODER ASSY. (2A1) 8033230096

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
C3-26	Capacitor, 0.01 UF, 50 V, WSR, 20%	0281730008
C2	Capacitor, 100 UF, 20 V	0282230009
C1	Capacitor, 68 UF, 15 V, T368	0296540005
CR2	Diode, Rectifier, 1N4004	0405180004
CR1	Diode, Signal, Sil., 1N4454	0405270003
CR3-6	Diode, Signal, Germ., 1N270	0405510004
DS1-5	Lamp, Wire Term. T-1, Clear	0842330003
J1	Connector, PC, 16 Pin Male	8033235101
J4	Connector, PC, 14 Pin Male	8033235209
J3	Connector, PC, 14 Pin Male	8033235306
J2	Connector, PC, 5 Pin Male	8033235403
J7,8	Connector, PC, 12 Pin Female	0754760006
Q2,4-6	Transistor, NPN, Si., 2N4124	0448010003
Q1	Transistor, UJT, 2N2646	0448340003
Q3	Transistor, PNP, Si., MPS-A63	0448650002
R1,8	Resistor, 10 K, 10%, 1/4 W	0170410005
R4,10,11	Resistor, 4.7 K, 5%, 1/4 W	0170770001
R7	Resistor, 120 5%, 1/4 W	0186550006
R9	Resistor, 1 K, 10%, 1/4 W	0171560001
R5	Resistor, 120 K, 10%, 1/4 W	0175100004
R3,4	Resistor, 2.2 K, 5%, 1/4 W	0178070009
R2	Resistor, 8.2 K, 10%, 1/4 W	0181620006
R12-21	Resistor, 5.6 K, 10%, 1/4 W	0183060008
R22-63	Resistor, 120, 10%, 1/4 W	0186550006
S1-5	Switch, Multiple Pushbutton	8033231009
U1-6	IC, Digital	0448560003



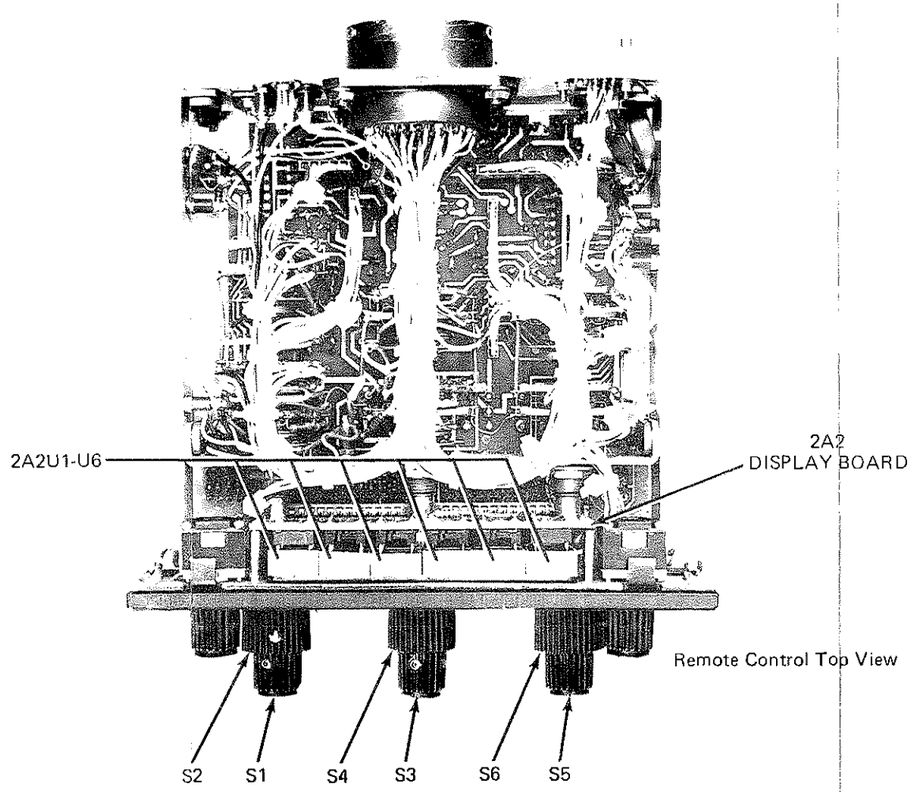
2A1

2A2

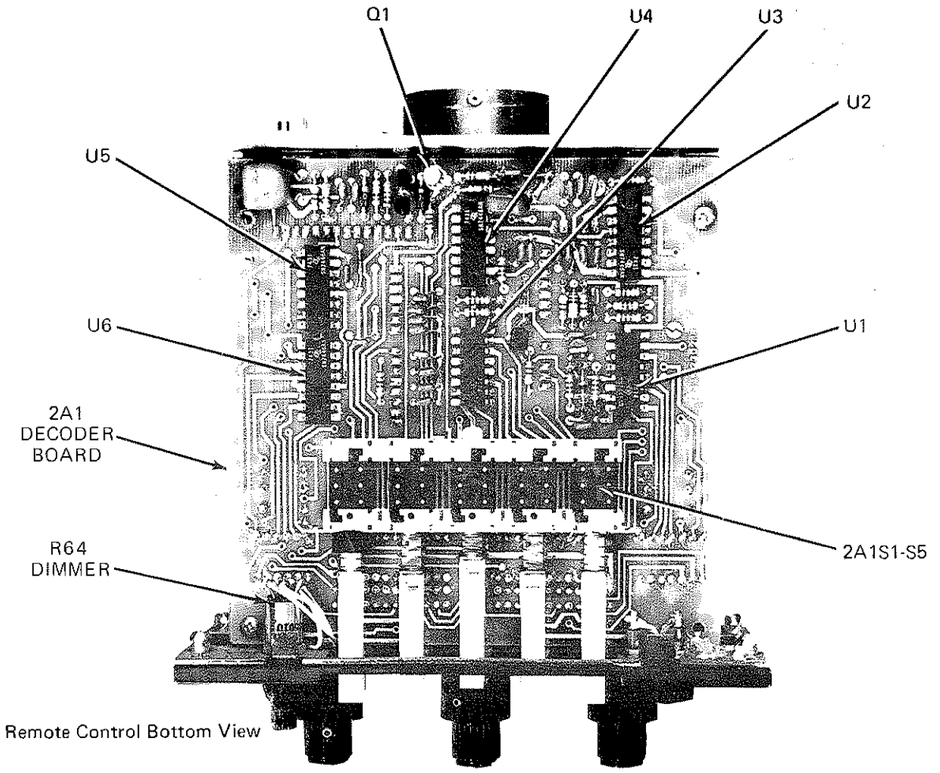
DIM POT CCW
INTENSITY
5VDC DIMMER
5VAC DIMMER
28VDC DIMMER
GROUND
1 KHZ 2°
1 KHZ 2³
SQUELCH
R24W
DIM POT W
DIM POT CW
+12V DC
DIMMER REG
10 KHZ 2³
10 KHZ 2°
NO PIN
1 MHZ 2¹
1 MHZ "C"
LOW LIMIT
100 KHZ "C"
100 KHZ "B"
1 KHZ 2²
1 KHZ 2¹
100 HZ 2°
100 HZ 2³
NO PIN
100 KHZ "D"
100 KHZ 2°
100 HZ 2²
100 HZ 2¹
TUNE COMMAND
+12 AM
TUNE LIGHT
+12 USB
10 KHZ 2²
10 KHZ 2¹
1 MHZ "D"
1 MHZ "A"
10 MHZ "1"
+5 V DC
10 MHZ "2"
NO PIN
NO PIN
R24 CW
NO PIN
10 MHZ "0"
POWER ON
+12 LSB

NOTE:
R22 THRU R63 = 120 OHMS

Figure 5.34 Decoder (2A1) and Display (2A2) Boards



Remote Control Top View



Remote Control Bottom View

THIS IS NOT THE
GRC-955 REMOTE CONTROL UNIT

Figure 5.35 GRC-955 Remote Control, Top and Bottom View

FIELD MODULE KIT – GSB-900R

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	CPLR Interface Board Assembly	1000410005
	Audio Processing Board Assembly	1000450007
	Packaging Kit, PC Boards	1002600006
GSB-900	PC Board Spares Kit	5024905792
SCU-80	PCB, Decoder Assembly	8033230096
SCU-80	PCB, Display Assembly	8033240091

DEPOT SPARES KIT – GSB-900R

REF SYMBOL	DESCRIPTION	SUNAIR PART NO.
	Capacitor, 0.01UF, 25V, X5S	0281620008
	Switch, Toggle, DPST	0346430003
	Potentiometer, 5K, 20%, 1/2W, W/STD HDW	0346710006
	Diode, Rectifier, 1N4004	0405180004
	Diode, Bridge, MDA970-1	0405260008
	Diode, Signal, Sil., 1N4454	0405270003
	Diode, Hot Carrier, MBD102	0405280009
	Diode, SCR, 2N6167	0405450001
	Diode, Signal, Germ., 1N270	0405510004
	Diode, Zener, 1N5339B	0405530005
	Diode, LED, 7 Segment, S0827650	0405600003
	Transistor, N-CH, FET, 2N4303	0443930007
	IC, Linear, CA3020	0444600001
	Transistor, NPN, Si., 2N5179	0445130008
	Transistor, PNP, Si., 2N4249	0446780006
	Diode, SCR, C122A	0446920002
	Diode, SCR, C106A2	0447070002
	IC, Linear, CA3086	0447950002
	Transistor, N-CH, FET, MFE120	0448000008
	Transistor, NPN, Si., 2N4124	0448010003
	Transistor, PNP, Si., 2N4126	0448020009
	Transistor, N-CH, FET, MFE122	0448030004
	IC, Linear, CA3053	0448060001
	IC, Digital, SN7400N	0448070006
	IC, Digital, N8280A	0448080001
	IC, Digital, SN74H72N	0448090007
	IC, Digital, MC4044P	0448100002
	IC, Digital, SN7430N	0448110008
	IC, Digital, SN7472N	0448120003
	Transistor, NPN, Si., 2N3866	0448140004
	Transistor, NPN, Si., PT6619	0448150000
	Transistor, NPN, Si.	0448170001
	Transistor, NPN, Si., 2N6055	0448180006
	IC, Linear, VA723	0448190001
	Transistor, PNP, Sil., TIP-32A	0448200007
	Transistor, NPN, Si.	0448210002
	IC, Digital, MC2023P	0448220008
	IC, Digital, SN7401N	0448230003
	IC, Digital, SN7476N	0448240009
	IC, Digital, 74LS196N	0448250004
	IC, Linear, 207C4SC	0448260000
	Transistor, UJT, 2N2646	0448340003
	Transistor, PNP, Si., 2N2907A	0448390001
	IC, Digital, SN7446A	0448560003
	Transistor, NPN, Si., 2N2222A	0448580004
	IC, Linear, LM340T5	0448600005
	Transistor, PNP, Si., MPS-A63	0448650002
	IC, Linear, MC3340P	0448850001
	Relay, 4PDT, 12V, Sensitive	0666640009
	Lamp, Wire Term, T-1, Clear	0842300007
	Lamp, Wire Term, T-1, Yellow	0842310002
	Lamp, Wire Term, T-1, Green	0842320008
	Lamp, Wire Term, T-1, Clear	0842330003
	Fuse, AGC, 10 Amp, 32V	0848860004
	Fuse, AGC, 5 Amp, 32V	0848980000
	Fuse, AGC, 2 Amp, 250V	0878020004
	Motor, 12VDC, 96.7/1 Gear/Red.	5024053508
	Switch, Dual, Concentric	8033220201
	Switch, Dual, Concentric	8033220406
	Switch, Dual, Concentric	8033220601

SECTION 6
ACCESSORIES

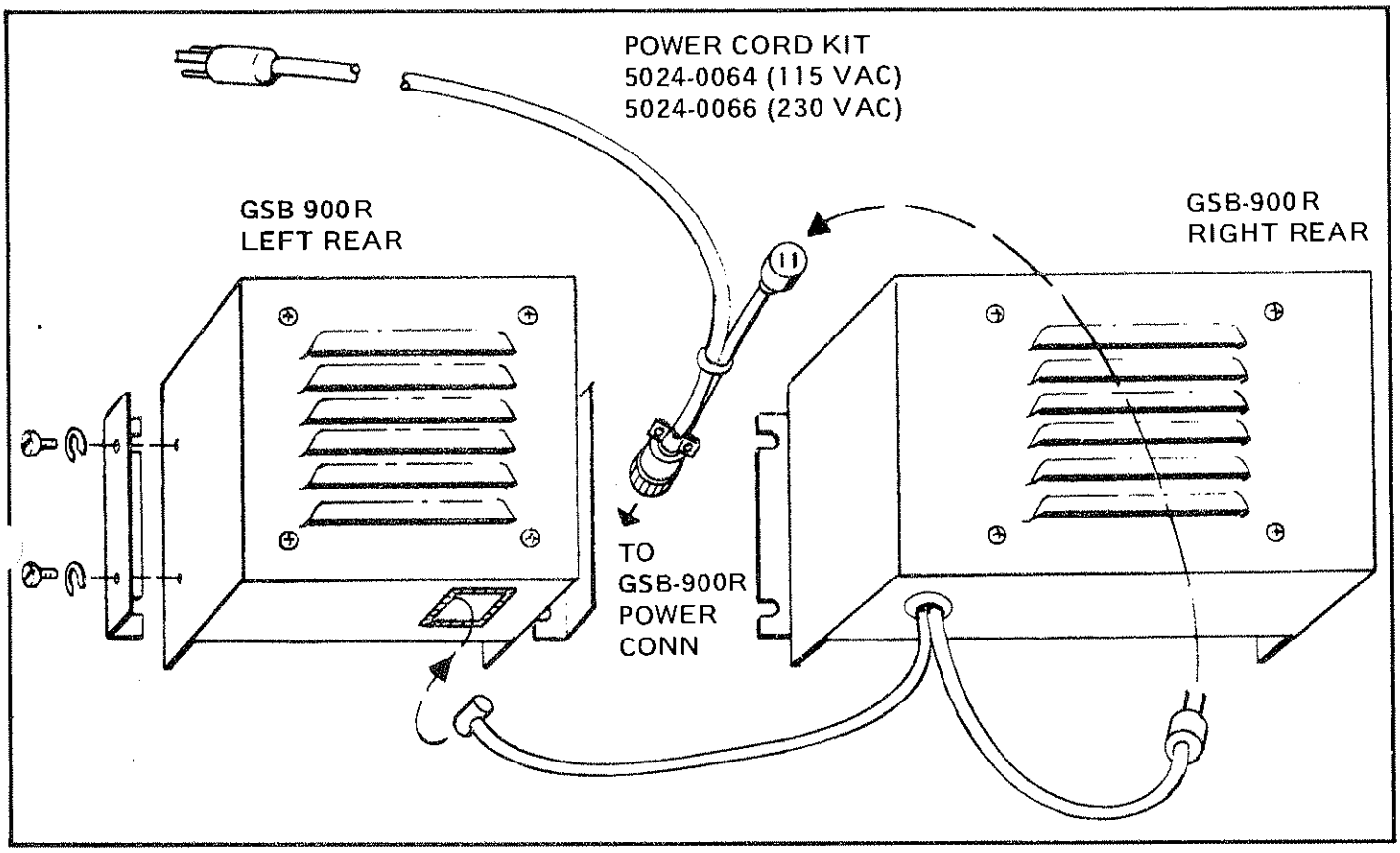


Figure 6.1 Blower Kit Installation Instructions

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 GSB-900R POWER CONNECTOR. BLOWERS WILL BE ENERGIZED WHENEVER GSB-900R POWER SWITCH IS TURNED ON.

ADDENDUMS

Information contained in this section supplements the information contained in the manual. References to this section may be indicated where necessary in the manual.

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R Second Edition

ADDENDUM 1
11-7-78

REFERENCE: Translator PC Assembly

ECN: 5024-750

PURPOSE: To center tuning slug in the associated inductor.

MANUAL REFERENCE: Page 5-59, Schematic, Translator (1A4A3)

TEXT: Change capacitor values per the table below.

Designation	Old Value(PF)	Old PN	New Value(pf)	New PN
C20	18	0260300004	27	0260660001
C23	33	0260780006	39	0276060008
C46	18	0260300004	24	0293790001
C53	7	0292400004	12	0260280003
C55	5	0261190008	10	0259830003
C67	18	0260300004	33	0260780006
C80	12	0260280003	15	0259950009

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R, 2nd Ed.

ADDENDUM 2
Date 11-30-78

REFERENCE: Front panel wiring diagram.

ECN: 8050-031

PURPOSE: To enable the 600 OHM transmit audio gain to be adjusted without affecting the microphone gain.

MANUAL REFERENCE: Page 5-45, figure 5.8, transceiver front panel (1A1) wiring.
Page 5-46, figure 5.9, main frame wiring.

TEXT: Page 5-45.

1. Delete connection from 1A3A5-E6 to 1A1P6-17.
2. Delete connection from 1A1P6-16 to 1A1P6-17.
3. Change destination of coax at 1A1P6-3 from 1A3A5-E2 to 1A1P2-D.

Page 5-46.

1. Delete coax connected to 1A3-E2-E4 from 1A1P6-3 callout.



SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R SECOND EDITION

ADDENDUM 3
DATE: 1/11/79

REFERENCE:	Motor Control Board Assembly
ECN:	5024-764
PURPOSE:	Improve performance of ALC and ACC Detector at high frequencies.
EFFECTIVITY:	All "Motor Control Boards"that require changes specified in this addendum have been modified at the factory.
MANUAL REFERENCE:	Page 5-87, Figure 5.28, "Schematic, Motor Control Board (1A5A4)
TEXT:	Page 5-87

1. Add the following 2pf Capacitors (PN 0250710008)

   a. C7, in parallel with R4
   b. C20, in parallel with R25

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R SECOND EDITION

ADDENDUM 4
DATE: 1/11/79

REFERENCE:	Audio Processing Board (1A1A2)
ECN:	8050-027
PURPOSE:	Reduce Audio bleed thru when the Radio is squelched.
EFFECTIVITY:	S/N 187
MANUAL REFERENCE:	Page 5-51, Figure 5.11, "Schematic, Audio Processing Board.
TEXT:	Page 5-51

1. Revise Schematic as follows:

   a. Change Resistor R 19 from 10K (PN 0170410005) to 1K (PN 0171560001).

   b. Change Resistor R 29 from 100K (PN 0170390004) to 6.8K (PN 0192190008)

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R SECOND EDITION

ADDENDUM 5
DATE: 1/11/79

REFERENCE:	Speaker Driver Board
ECN:	5024-754
PURPOSE:	Reduce RFI on Speaker Driver Audio Input
MANUAL REFERENCE:	Page 5-73, Figure 5.21, Speaker Driver Schematic
TEXT:	Page 5-73

1. Revise Schematic as follows:

   a. Add Capacitor C6, .01uf (PN 0281620008) between E4 and E2.

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900 R SECOND EDITION

ADDENDUM 6
DATE: 1/29/79

REFERENCE: FRONT PANEL ASSEMBLY, CHASSIS ASSEMBLY

ECN: 8050-035

PURPOSE: To remove AC Line Voltage from Control Cables after the Power Switch is turned on.

MANUAL REFERENCE: Page 4-26, Figure 4.6, "Input Power Control Circuit".
Page 5-45, Figure 5.8, "Transceiver Front Panel (1A1) Wiring.
Page 5-46-47, Figure 5.9, "Main Frame Wiring"

TEXT: Page 4-26.

1. Revise Input Power Control Circuit as follows:

   a. Delete line from "Junction of 1A1K1 and and 1A1CR2 Anode" to 1A1P5-17".
   b. Add Connection from "1A1CR2 Anode" to ground.
   c. Move Anode of 1A1CR5 from "1A1E4" to 1A1S1-3.

Page 5-45

1. Revise "Transceiver Front Panel Wiring Diagram" as follows:

   a. Delete line from "1A1P5-17" to "1A1K1-A".
   b. Add a ground connection to "1A1K1-A".
   c. Move Anode of 1A1CR5 from "1A1K1-E4" to "1A1S1-3".
   d. Move Coax Center Conductor from "1A1P6-3" to "1A1P6-D".
   e. Move Shield of coax in item d from ground to 1A1P6-A.
   f. Add Resistor 1A1R4, 10K ¼W (PN0170410005) between 1A1P6 Pins 3 and D.
   g. Add Resistor 1A1R3, 560 Ohm ¼W(PN 018320004) between 1A1P6 Pins A and D.

Page 5-46-47

1. Revise Main Frame Wiring Diagram as follows

   a. Delete Line from 1A8J7-17 to Junction of CR5 Anode and R2.

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R SECOND EDITION

ADDENDUM: 7
DATE: 1/29/79

REFERENCE:	AUDIO PROCESSING BOARD
ECN:	8050-034
PURPOSE:	Improve Audio Compression, Reduce Radio transmit distortion
MANUAL REFERENCE:	Page 5-51, Figure 5.11, "Audio Processing Board (1A1A2) Schematic"
TEXT:	Page 5-51

1. Revise Schematic as follows:

   a. Change Resistor R 29 from 6.8K (PN 0192190008) to 56K (PN 0171440005)

SUNAIR ELECTRONICS, INC.
MANUAL: GSB-900R SECOND EDITION

ADDENDUM 8
DATE: 3/9/79

REFERENCE:	Translator PC Assembly
ECN:	5024-774
PURPOSE:	Improve performance of 81.25MHz Band Pass Filter and Second LO Output.
MANUAL REFERENCE:	Page 5-59, Figure 5.14, "Schematic, Translator Assembly"
TEXT:	Revise Translator Assembly Schematic as follows:

1. Change Capacitor C67 from 33pf (PN 28686) to 18pf (PN 0260300004)

2. Change Capacitor C20 from 27pf (PN 26066) to 18pf (PN 020300004)

SUNAIR ELECTRONICS, INC. ADDENDUM 10
MANUAL: GSB-900R Second Edition DATE: 6/14/79

REFERENCE: Front Panel Wiring Diagram

ECN: 8050-042

PURPOSE: To correct diagram errors

MANUAL REFERENCE: Page 5-45, Figure 5.8
Transceiver Front Panel Wiring

TEXT: Revise wiring diagram as follows:

a. Change wire destination for 1A1P6-1 from "1A1P7-T" to "1A1P7-C"

b. Delete heading plus the three wires and E points shown under heading "to 1A3A5 Rcvr/Exciter Mother Board".

NOTE - These corrections are on the diagram only. The radio is wired correctly.

SUNAIR ELECTRONICS, INC.
MANUAL: GCU-1935 Second Edition

ADDENDUM 11
DATE: 7/3/79

REFERENCE: Timer PC Assembly

ECN: 6029-088

PURPOSE: To prevent the backturns shorting relay from engaging at frequencies above 20MHZ.

MANUAL REFERENCE: Main Schematic Diagram
Page 5-13, Figure 5-6

TEXT: Revise main schematic diagram as follows:

1. Add Capacitor C9 .47uf (PN0283370009) between Q1 Base and Ground.

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