NAVELEX 0967-LP-970-9010 VOLUME I

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

RADIO RECEIVER R-1051/URR

Each transmittal of this document outside of the Department of Defense must have approval of the issuing service.

This publication supersedes Navships 0967-970-9010
4 February 1964

Published by direction of Commander, Naval Electronic Systems Command.

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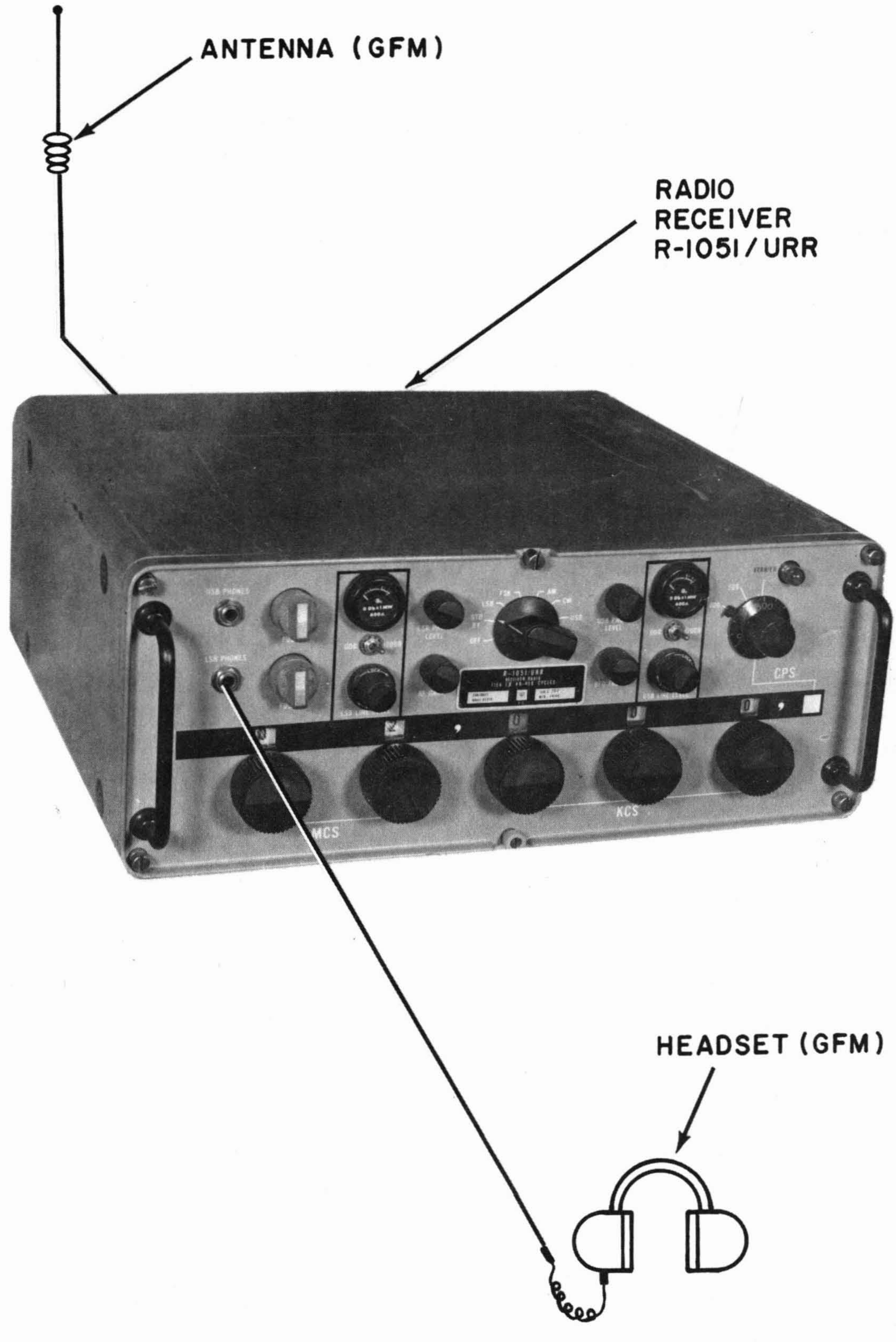


Figure 1-1. Radio Receiver R-1051/URR

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

1-2. This Technical Manual is in effect upon receipt. It supersedes NAVSHIPS 0967-970-9010 for the radio receiver R-1051/URR. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications. Volume I of this Technical Manual covers installation, troubleshooting procedures, maintenance procedures, and a parts list for Radio Receiver R-1051/URR (hereafter also referred to as the receiver or R-1051/URR). Operating procedures for the R-1051/URR are contained in Volume II of this Technical Manual, NAVELEX 0967-LP-970-9020.

1-3. GENERAL DESCRIPTION.

1-4. The R-1051/URR is a digitally tuned superheterodyne receiver capable of receiving lower sideband (LSB), upper sideband (USB), independent sideband (ISB), frequency shift keyed (FSK), amplitude modulated (AM), and continuous wave (CW) transmissions in the 2.0- to 30.0-MHz frequency range. The ISB mode of operation allows two different types of intelligence to be received simultaneously, one on the LSB channel and one on the USB channel. FSK reception is obtained by using suitable ancillary equipment, such as Teletype Converter-Comparator AN/URA-17 or AN/URA-8. The R-1051/URR may also receive tone-modulated continuous wave (MCW), compatible amplitude modulated (compatible AM), and facsimile (FAX) transmissions, through the use of suitable ancillary equipment.

1-5. The R-1051/URR may be operated in conjunction with a transmitter in systems such as Radio Set AN/WRC-1. In this application, either simplex or duplex operation is possible. The R-1051/URR may also be used as a separate, self-contained receiver requiring only a headset, antenna, and a nominal 115-vac primary power source for full operation. The functional relationship of the R-1051/URR to accessory equipment is illustrated in figure 1-1. The R-1051/URR is intended for ship and shore installations. For either type of installation, the R-1051/URR may be mounted in a standard 19-inch rack, or may be mounted to the supplied shock mount.

1-6. REFERENCE DESIGNATIONS.

1-7. Reference designations of the electronic assemblies and subassemblies of the R-1051/URR are listed in table 1-1. See figure 1-2 for location of electronic assemblies and subassemblies in the R-1051/URR.

1-8. FUNCTION.

1-9. The function of the R-1051/URR is to extract the intelligence from any USB, LSB, ISB, CW, or AM transmission in the 2.0- to 30.0-MHz frequency range. The R-1051/URR is also capable of receiving MCW, compatible AM, FAX, and FSK signals, using suitable ancillary equipment.

1-10. PHYSICAL CHARACTERISTICS.

1-11. The R-1051/URR is housed in an aluminum case. The chassis is mounted on roller-type slides (one on each side), and is secured to the case by six-captive screws through the front panel. When fully extended from the case, the chassis may be tilted up on the slides to a 90-degree angle to expose the bottom for servicing. All operating controls and indicators are located on the front panel, and all power and signal input

TABLE 1-1. RADIO RECEIVER R-1051/URR, REFERENCE DESIGNATIONS

ASSEMBLY OR SUBASSEMBLY	REFERENCE DESIGNATION
Case	A1
Filter Box Electronic Assembly	A1A1
Chassis and Front Panel	A2
Receiver Mode Selector Electronic Assembly	A2A1
Receiver IF / Audio Amplifier Electronic Assembly	A2A2 and A2A3
RF Amplifier Electronic Assembly	A2A4
Frequency Standard Electronic Assembly	A2A5
Translator/Synthesizer Electronic Assembly	A2A6
MC Synthesizer Electronic Subassembly	A2A6A1
100 KC Synthesizer Electronic Subassembly	A2A6A2
1 and 10 KC Synthesizer Electronic Subassembly	A2A6A3
500 CPS Synthesizer Electronic Subassembly	A2A6A4
Spectrum Generator Electronic Subassembly	A2A6A5
RF Translator Electronic Subassembly	A2A6A6
Code Generator Electronic Assembly	A2A7
Power Supply Electronic Assembly	A2A8
Antenna Overload Electronic Assembly	A2A9
Light Panel Electronic Assembly	A2A10
CPS Vernier Assembly	A2A11

connections are made on the rear of the case. Handles are secured to the front panel to facilitate withdrawal of the chassis and transporting the unit. The chassis contains the chain-drive mechanism for tuning, the receptacles for the plug-in electronic assemblies, and a power supply.

1-12. ELECTRICAL CHARACTERISTICS.

1-13. The R-1051/URR employs a digital tuning scheme for automatically tuning in 500-Hz steps. Additional vernier tuning provides continuous tuning throughout the frequency range. All circuits (except two RF amplification stages) utilize solid-state devices. These circuits are assembled into plug-in electronic assemblies. The frequency generation circuits, which are referenced to an ultrastable frequency standard, provide a stability of 1 part in 10^8 per day.

1-14. REFERENCE DATA.

1-15. The following performance data provide a summary of the electrical characteristics of the R-1051/URR:

a. Frequency range: 2.0 to 29.9995 MHz in 0.5-kHz increments, or 2.0 to 30.0 MHz

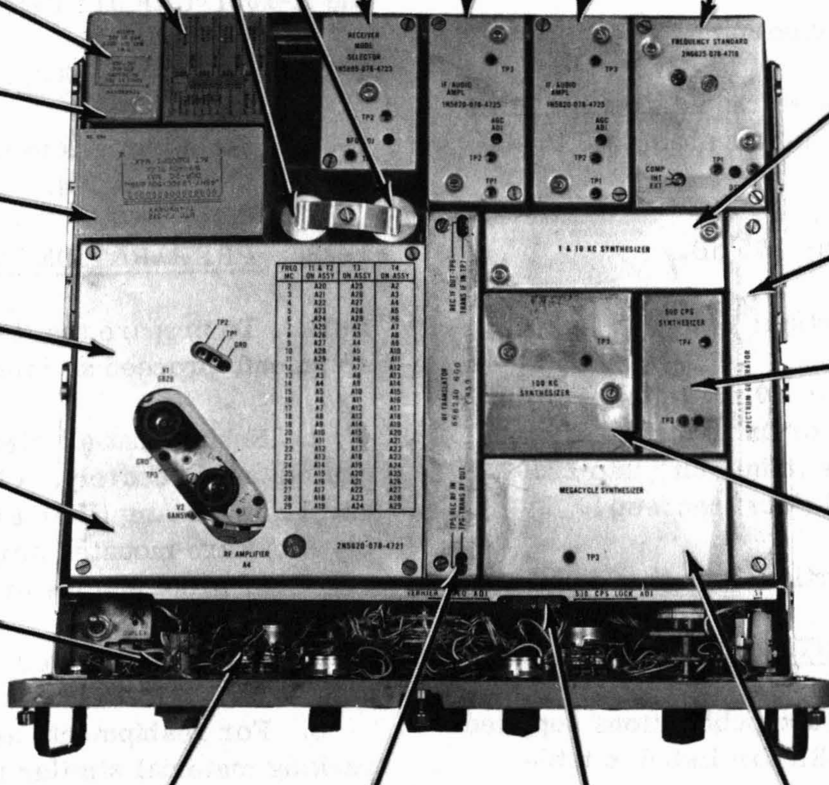


Figure 1-2. Radio Receiver R-1051/URR, Top View, Case Removed

with continuous vernier tuning between 1.0-kHz increments.

b. Receiver type: superheterodyne (triple conversion).

c. Frequency stability: 1 part in 10^8 per day.

d. Frequency accuracy: $\pm$ 0.5 Hz at 5 MHz.

e. Type of frequency control: crystal-controlled synthesizer referenced to a 5-MHz internal or external standard, 0.2 volt minimum input.

f. Modes of operation: LSB: USB: ISB, AM, CW, and FSK.

g. Sensitivity: 1 uv for 10 dB $\frac{S + N}{N}$ in single-sideband(SSB) and FSK modes; 2 uv in CW modes; and 4 uv in AM mode.

h. Receiver IF: first, 20 or 30 MHz; second, 2.85 MHz; third, 500 kHz.

i. Bandwidth: SSB, 3.2 kHz, AM and CW, 7 kHz.

j. Recommended antenna: 50-ohm impedance.

k. Ambient temperature limitations: $0^{o}C$ to $+50^{o}C$.

l. Power consumption: 55 Watts.

m. Primary power requirements: 115 vac $\pm$ 10 per cent, single phase, 48 to 450 Hz.

n. IF rejection: -75 dB.

o. Image rejection: -80 dB.

p. Audio output: 60 mv (minimum) into 600-ohm balanced or unbalanced remote output load; 15 mv (minimum) into 1200-ohm balanced load (local headset).

q. Audio distortion: less than 3 per cent.

1-16. EQUIPMENT SUPPLIED.

1-17. Equipment and publications supplied with the R-1051/URR are listed in table 1-2.

1-18. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

1-19. Accessory and test equipment and publications required but not supplied with the R-1051/URR are listed in table 1-3.

1-20. FIELD CHANGES.

1-21. Field changes to the R-1051/URR are listed in table 1-4.

1-22. PREPARATION FOR RESHIPMENT.

1-23. To prepare the R-1051/URR for reshipment, proceed as follows:

a. Ensure that all electronic assemblies are fastened securely. Check that tubes V1 and V2 in RF Amplifier Electronic Assembly A2A4 are mounted properly, using vibration-proof shields provided.

b. Set Mode Selector switch to OFF.

c. For reshipment, use containers and packing material similar to those originally used to ship the R-1051/URR.

TABLE 1-2 RADIO RECEIVER R-1051/URR, EQUIPMENT SUPPLIED

QTY PER EQPT	NOMENCLATURE		OVERALL DIMENSIONS (IN.)			VOLUME (FT^3)	WEIGHT (LB)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R-1051/URR	7.0	17.38	18.9	1.33	70
1	Shock Mount	MT-3114/UR	4.25	19.71	16.66	0.81	16
1	Kit, Bracket Mounting						
1	Kit, Connector Mating, consisting of:						
2		MS-3106E-10SL-4S(for remote audio lines)					
1		MS-3106R-165-5S (for primary power)					
2		UG-941B/W (for antenna and 5-MHz input)					
1		UG-88/U (for 5-MHz output)					
2	Technical Manual for Radio Receiver R-1051/URR, Vol I	NAVELEX 0967-LP-970-9010					
2	Operator's Manual for Radio Receiver R-1051/URR, Vol II	NAVELEX 0967-LP-970-9020					
1	Maintenance Standards Book for Radio Receiver R-1051/URR	NAVELEX 0967-LP-970-9050					
1	Performance Standards Sheet for Radio Receiver R-1051/URR	NAVELEX 0967-LP-970-9030					

TABLE 1-3. RADIO RECEIVER R-1051/URR, EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQPT	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	Antenna		Reception of RF signals	
1	Cable Set		Interconnection	
1	Headset		General operation	
1	Teletype Converter-Comparator	AN/URA-8 or AN/URA-17 (or equivalent)	FSK operation	
1	Audio Amplifier	AM-4453/U (or equivalent)	Speaker amplifier	
1	Kit, Extender Test Cable	W1 58189 P/N 666243-070	Mates with P1 on Receiver IF / Audio Amplifier Electronic Assembly A2A2 or A2A3	
1	Kit, Extender Test Cable (Cont)	W2 58189 Pin 666243-071	Mates with P1 on Receiver Mode Selector Electronic Assembly A2A1	
		W3 58189 P/N 666243-072	Mates with P2 on Receiver Mode Selector Electronic Assembly A2A1	
1	Resistor	RC42GF510J	Maintenance	51 ohms, 2 Watts
1	Resistor	RC42GF601J	Maintenance	600 ohms, 2 Watts
1	RF Insert Extractor Tool	ITT Cannon P/N CET-C6B	Maintenance	
1	RF Insert Connector, Female	P/N DM 53740-5008	Troubleshooting	
1	RF Insert Connector, Male	P/N DM 53743-5014	Troubleshooting	

TABLE 1-3. RADIO RECEIVER R-1051/URR, EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Cont)

QTY PER EQPT	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	Speaker	LS-474/U (or equivalent)	Audio monitoring	
1	Multimeter	AN/USM-311 (or equivalent)	Troubleshooting and maintenance procedures	Ranges: 0 to 100 vdc, 9 ranges, 20,000 ohms/volt 0 to 250 vac, 3 ranges, 5,000 ohms/volt 0 to 20 megohms, 5 ranges Accuracy: ± 2 per cent
1	RF Volt-meter	CCVO-91DA (or equivalent)	Troubleshooting and maintenance procedures	Input imdedance: 20,000 ohms/volt at 500 kHz
1	RF Volt-meter (Cont)			Ranges 0 to 1 mv 0 to 10 mv 0 to 100 mv 0 to 300 mv 0 to 1000 mv 0 to 3000 mv
1	AC Volt-meter	ME-6( )/U (or equivalent)	Troubleshooting and maintenance prodedures	Frequency: 20 Hz to 5 kHz Input impedance: 100,000 ohms/volt Ranges: 0 to 0.1 volt 0 to 0.3 volt
1	Frequency Counter	AN/USM-207 (or equivalent)	Troubleshooting and maintenance procedures	Frequency range: 1 Hz to 100 MHz Period: 0.0 to 1 MHz Time interval: 1 us to 10^7 s

TABLE 1-3. RADIO RECEIVER R-1051/URR, EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Cont)

QTY PER EQPT	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	RF Signal Generator	CAQI-606A (or equivalent)	Troubleshooting and maintenance procedures	Output impedance: 50 ohms Frequency range: 2 to 30 MHz Output: 0 to 3 volts
1	Frequency Standard	AN/URQ-9( ) (or equivalent)	Troubleshooting and maintenance procedures	Outputs: 100 Hz, 500 kHz, and 5 MHz Stability: 1 part in 10^9 Output: 0.5 volt
1	Transistor Tester	AN/USM-206	Troubleshooting procedures	
1	Voltmeter Hetrodyne	*CDAN 2006	Troubleshooting procedures	
1	Electronic	AN/USM-116( )	Troubleshooting	Voltage range: 0 to 1000 vdc 0 to 300 vac (1000 vac with external multiplier) Current range: 0 to 1000 ma dc Resistance range: 0 to infinite ohms Input impednace: dc volts: 100 megohms ac volts: 15 megohms at 20 Hz, 5 megohms at 300 kHz, 125 kilohms at 500 MHz Frequency range: Up to 700 MHz

*These items are available only at special Module Repair Facilities.

TABLE 1-3. RADIO RECEIVER R-1051/URR, EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Cont)

QTY PER EQPT	NOMENCLATURE NAME	NOMENCLATURE DESIGNATION	REQUIRED USE	EQUIPMENT CHARACTERISTICS
				Accuracy: Voltage and current: 2% (over 300 vac, 4%) Resistance: 3% (over 10 megohms, +1 degree of arc length)
1	Oscillo-scope	AN/USM-281( ) (or equivalent)	Troubleshooting and maintenance procedures	Frequency: dc to 50 MHz Input impedance: X and Y Axis: 1 megohm Input sensitivity: 5 mv/cm
1	*Hetrodyne Voltmeter CDAN 2006	Technical Manual 0969-247-2010		
1	Coaxial T-Connector (BNC)	UG-274A/U	Troubleshooting and maintenance procedures	50 ohms
1	Adapter, BNC to N	UG-201/U	Troubleshooting and maintenance procedures	
1	AN/USM-311 Technical Manual	NAVELEX 0967-LP-131-7010	Troubleshooting and maintenance procedures	
1	CCVO-91DA Technical Manual	NAVSHIPS 0967-231-1010	Troubleshooting and maintenance procedures	
1	ME-6( )/U Technical Manual	NAVSHIPS 0967-091-0010	Troubleshooting and maintenance procedures	

*These items are available only at special Module Repair Facilities.

TABLE 1-3. RADIO RECEIVER R-1051/URR, EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED (Cont)

QTY PER EQPT	NOMENCLATURE		REQUIRED USE	EQUIPMENT CHARACTERISTICS
	NAME	DESIGNATION		
1	AN/USM-116 Technical Manual	NAVSHIPS 93808	Troubleshooting and maintenance procedures	
1	AN/USM-281 Technical Manual	NAVSHIPS 0969-244-3010 and 3020	Troubleshooting and maintenance procedures	
1	CAQI-606-A Technical Manual	NAVSHIPS 0967-107-7010	Troubleshooting and maintenance procedures	
1	AN/URQ-9 Technical Manual	NAVSHIPS 0967-053-7010	Troubleshooting and maintenance procedures	
1	AN/USM-207 Technical Manual	NAVSHIPS 0969-028-4010 and 4020	Troubleshooting and maintenance procedures	
1	AN/USM-206 Technical Manual	NAVSHIPS 0969-002-7020	Troubleshooting and maintenance procedures	

TABLE 1-4. FIELD CHANGES

CHANGE	AUTHORIZATION	APPLICABILITY	IDENTIFICATION
1 R-1051	NS981802	Selected serial numbers (completed)	Improved MT-3114 Shock Isolators
2 R-1051	0967-971-0050	All	AF Amplifier Reliability
3 R-1051	0967-971-0060	All	Reduce Panel Lamp Failures
4 R-1051	0967-971-0080	Selected installations (completed)	Installation of Elapsed Time Meter
5 R-1051	0967-971-0140	All	Antenna Overload
6 R-1051	0967-970-9090	All	AF Amplifier Reliability
7 R-1051	0967-971-0180	All	28 VDC Power Supply/ Transient Protection

SECTION 2

OPERATION

NOTE

This section is bound as Volume II. Refer to Volume II, Operation Instructions for Radio Receiver R-1051/URR, NAVELEX 0967-LP-970-9020, for operation of this equipment

SECTION 3

FUNCTIONAL DESCRIPTION

3-1. GENERAL.

3-2. This section is divided into three parts: overall description, functional block diagram description, and functional circuit descriptions.

3-3. OVERALL DESCRIPTION.

3-4. GENERAL. The R-1051/URR (see figure 3-1) is a triple-conversion superheterodyne receiver, tunable over the high-frequency range from 2 to 30 MHz. Tuning of the R-1051/URR is accomplished digitally by five frequency controls (MCS and KCS) and a switch (CPS), located on the front panel. A display window directly above each MCS and KCS control provides a decimal readout of the frequency to which the control is set. The displayed frequency can be changed in 1-kHz increments. The CPS switch allows the operating frequency to be changed in 500-Hz increments. This tuning provides 56,000 discrete frequencies in which the R-1051/URR is locked to a very accurate frequency standard. Each 1-kHz increment can be continuously tuned through by selecting the V positions of the CPS switch. When using the CPS vernier control, the full accuracy of the frequency standard is sacrificed. The R-1051/URR demodulates and provides audio outputs for the following types of received signals: LSB, USB, ISB, CW, FSK, and AM. Over the frequency range, the input sensitivity for an audio output signal plus noise-to-noise ratio of 10 dB is better than 1 uv for ISB, LSB, FSK and USB; 2 uv for CW and 4 uv for AM.

3-5. POWER SUPPLY. The operating voltages for the R-1051/URR are produced by Power Supply Electronic Assembly A2A8. The 103.5- to 126.5- vac primary power is converted to voltages of +110 vdc RF amplifier tubes plate and screen supply), -30 vdc RF amplifier tubes bias), and +28 vdc (general use). The +28 vdc is also regulated to +20 vdc for use in all semiconductor circuits of the R-1051/URR.

3-6. FREQUENCY GENERATION. An accurate, stable (one part in 10^8 per day) 5-MHz oscillator is used as the frequency standard. By means of divider-multiplier circuits, 500-kHz, 1-MHz, and 10-MHz frequencies are generated. The 500-kHz is used to provide further generation of 100-kHz, 10-kHz, and 1-kHz spectra. The spectra are used to phase-lock injection oscillators (synthesizers) to the accuracy of the frequency standard. Three injection frequencies are produced by a combination of the MC, 100 KC, 1 and 10 KC, and 500 CPS Synthesizer Electronic Subassemblies A2A6A1 through A2A6A4.

3-7. The frequency errors of the synthesizers are cancelled out by means of phase-locked control circuits or additive-and-subtractive mixers, which provide error-free dial readings except in the V position of the CPS switch.

3-8. FUNCTIONAL BLOCK DIAGRAM DESCRIPTION.

3-9. SIGNAL FLOW. (See figure 3-2.)

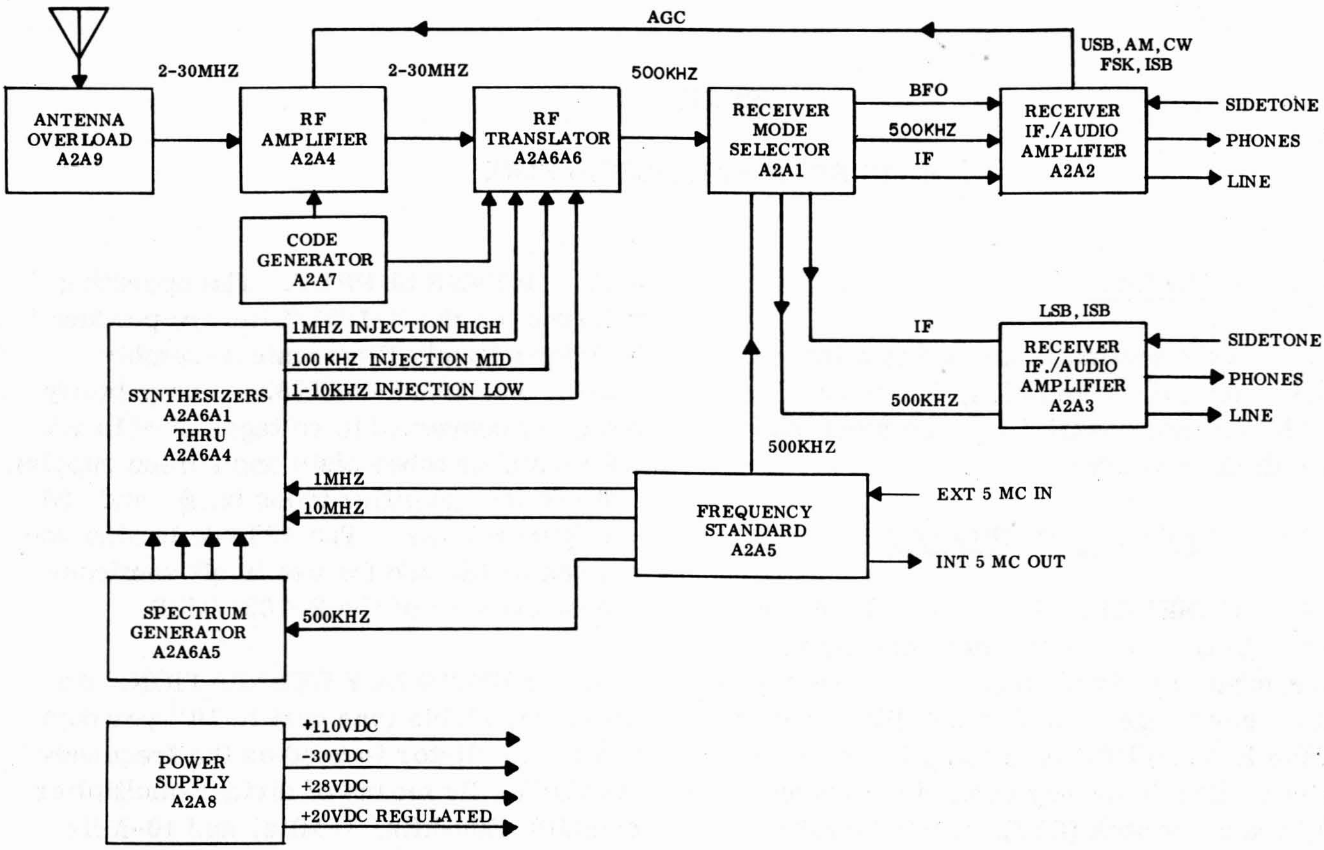


Figure 3-1. Radio Receiver R-1051/URR, Simplified Block Diagram

3-10. Antenna Overload and RF Amplifiers. A received signal from the antenna passes through closed relay contacts in Antenna Overload Electronic Assembly A2A9 to RF Amplifier Electronic Assembly A2A4. Should a signal in excess of 8 volts appear at the receiver input, the antenna overload circuit will open the relay contacts. The excessive voltage is thereby prevented from being applied to the RF amplifier. Within the RF amplifier, the signal passes through a double-tuned input circuit, two RF amplifier stages, a single-tuned interstage circuit, and output circuits. All of the resonant tuned circuits are tuned by the MCS and KCS frequency controls on the front panel. The MCS controls operate Code Generator Electronic Assembly A2A7, which activates a motor-driven turret containing 28 strips. Each strip contains a tuned transformer and a portion of the capacitance required by each of the four tuned circuits. For each MHz increment, a differently tuned transformer and capacitor are switched into place. The remaining tuned circuit capacitance is mechanically switched into the four tuned circuits by the 100 KCS and 10 KCS controls on the front panel. These capacitors are located on circular boards stacked in the center of the turret. The tuned circuits provide the frequency selectivity required to prevent undesired off-channel signals from distorting the desired signal by cross-modulating or overloading the RF amplifier stages. The gain of the RF amplifier stages ensures that the weak-signal sensitivity of the R-1051/URR is maintained. The gain of both RF amplifier stages is controlled by the application of

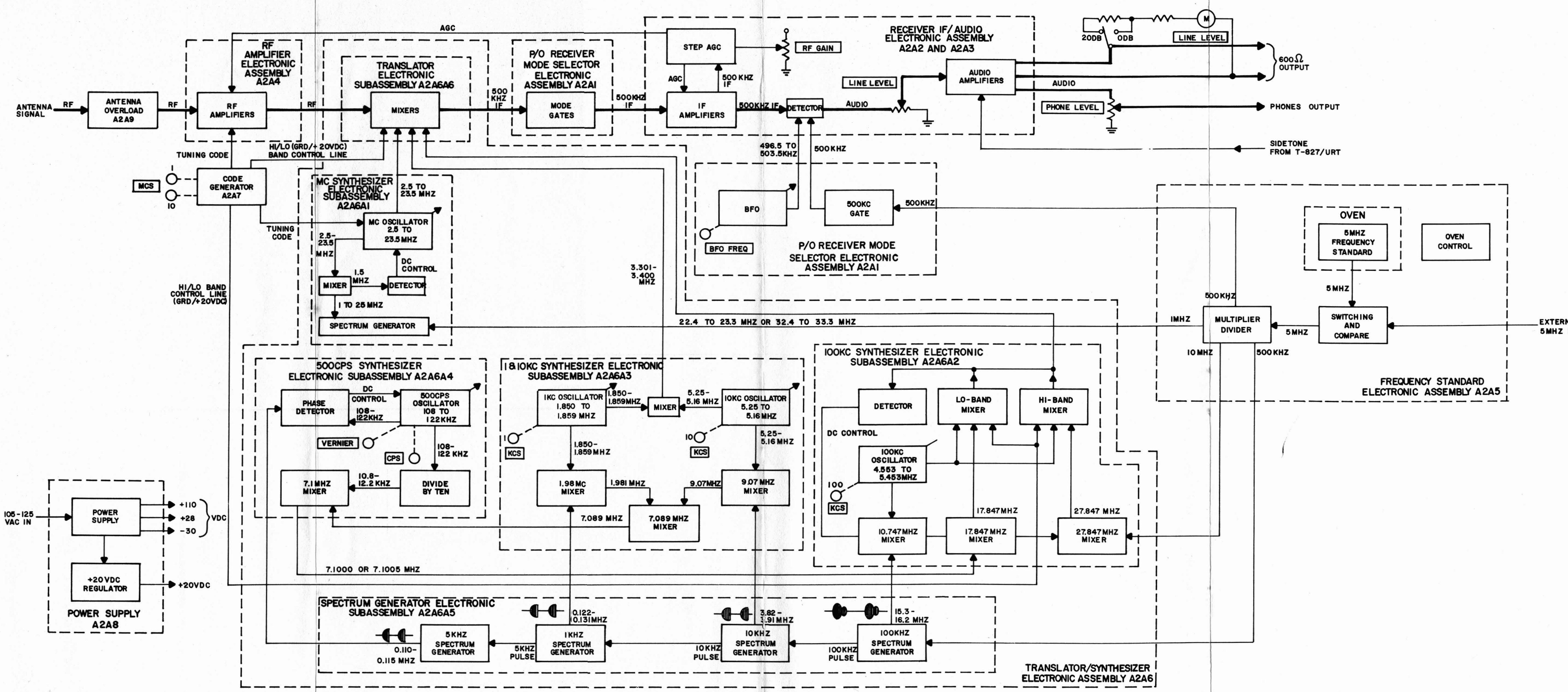


Figure 3-2. Radio Receiver R-1051/URR, Functional Block Diagram

an automatic gain control (AGC) voltage from the step AGC circuit.

3-11. Translator (Mixers). Output from the RF amplifiers is applied to the mixers, which form a part of RF Translator Electronic Subassembly A2A6A6, located in Translator/Synthesizer Electronic Assembly A2A6. The mixers consist of three transistor mixer stages, with interstage coupling provided by selective filters. The first mixer receives injection frequencies from MC Synthesizer Electronic Subassembly A2A6A1. The injection frequency is determined by the MHz band selected by the MCS controls on the front panel. The desired output frequency from the first mixer always falls within two frequency bands, either 19.5 to 20.5 MHz (lo band) or 29.5 to 30.5 MHz (hi band). The hi or lo band also is determined by MCS control settings.

3-12. The output from the first mixer is gated through the appropriate 20- or 30-MHz filter. This signal is mixed in the second mixer stage with the injection frequencies supplied from 100 KC Synthesizer Electronic Subassembly A2A6A2. The desired frequency band from the second mixer is 2.8 to 2.9 MHz. This signal is coupled through a 2.85-MHz filter to the third mixer. The injection frequencies for the third mixer are supplied from 1 and 10 KC Synthesizer Electronic Subassembly A2A6A3. The output from the third mixer is a 500-kHz IF signal.

3-13. Signal flow from the antenna input through the output of the third mixer is the same for any selected mode of operation.

3-14. Mode Selector. The 500-kHz IF output from the third mixer is applied to gates in the Receiver Mode Selector Electronic Assembly A2A1. Three parallel paths are presented to the signal. The path that passes through the LSB mechanical filter (also used in ISB) is not gated, since it has an independent output from the mode selector. Because the outputs from the USB mechanical filter (also used in FSK and ISB) and the AM mechanical filter (also used in CW) are paralleled for a common output, the input paths to these two filters must be gated so that only one path is open at any given time. Application of the correct gating potentials is determined by the mode of operation selected at the front panel.

3-15. IF Amplifiers. Output from the LSB filter is applied to the IF amplifiers in Receiver IF/Audio Amplifier Electronic Assembly A2A3. Common output from the USB and AM filters also is applied to the IF amplifiers in Receiver IF/Audio Electronic Assembly A2A2. Operating dc voltage is applied to the proper electronic assembly (A2A2 or A2A3) according to the mode of operation selected at the front panel. In the ISB mode of operation, a dc operating voltage is applied to both IF amplifiers. AGC voltage from the step AGC circuit controls the overall gain of the IF amplifiers by varying the attenuation of the input and the gain of the second IF amplifier stage. The input to the step AGC circuit is derived from the output from the second IF amplifier stage.

3-16. Detectors and Beat Frequency Oscillator. Output from the IF amplifiers is applied to the detector circuits, consisting of a product detector and an AM detector. Depending on the mode of operation selected at the front panel, either the balanced product detector or the AM detector is powered by dc operating voltage. The product detector demodulates the USB, LSB, FSK, and ISB signals. In these modes of operating, a 500-kHz injection, originating at a multiplier-divider in Frequency Standard Electronic Assembly A2A5, is applied to the product detector for carrier reinsertion. This 500-kHz injection passes through the 500-kHz gate in Receiver Mode Selector Electronic Assembly A2A1 with little attenuation in these modes of operation. In AM and CW modes, this gate presents a high attenuation, since no carrier reinsertion is required by the AM detector. In the CW mode of operation, the beat frequency oscillator (BFO) assembly in Receiver Mode Selector Electronic Assembly A2A1 is turned on and a variable 500-kHz output is applied to the input of the AM detector in assembly A2A2. The output frequency from the BFO circuit is controlled by the BFO FREQ control on the front panel.

3-17. Audio Amplifiers. Audio derived from the detector circuits in assembly A2A2 is applied to the USB LINE LEVEL control on the front panel, which controls the audio level prior to application to the audio amplifiers. The LSB LINE LEVEL control sets the audio level from the product detector in assembly A2A3. Each Receiver IF/Audio Amplifier Electronic Assembly A2A2 or A2A3 has two outputs. One is a 600-ohm remote output, which is applied to a connector at the rear of the case; the second is to the USB or LSB PHONES jacks on the front panel. The phone output passes through a USB or LSB PHONE LEVEL control on the front panel, which adjusts the phone signal amplitude without altering the level of the remote output. Each remote output is monitored at the front panel by a USB or LSB LINE LEVEL meter, which has two scale ranges controlled by a USB or LSB LINE LEVEL switch on the front panel.

3-18. Step AGC. The step AGC circuit, which forms a part of the Receiver IF/Audio Amplifier Electronic Assemblies A2A2 and A2A3, controls the gain of the RF amplifiers and IF amplifiers according to the received RF signal strength. Output from the IF amplifiers is applied to the step AGC circuits, where it is converted to a dc voltage that applied to the RF and IF amplifiers. The gain of the RF and IF amplifiers may be manually controlled by applying a dc voltage on the AGC lines with the RF GAIN control. This manual action overrides the normal AGC voltages.

3-19. FREQUENCY STANDARDIZATION. The Frequency Standard Electronic Assembly A2A5 produces an accurate, stable, 5-MHz reference frequency upon which all frequencies used in the R-1051/URR are based. The circuit is housed in an oven assembly maintained at a nearly constant temperature of 85 °C by the oven-control circuit. The accurate output from the 5-MHz frequency standard is applied to a switching and compare circuit. An external 5-MHz frequency standard may also be applied to this circuit. The switching and compare circuit routes the internal or external 5-MHz signal to the multiplier-divider circuits or to the compare circuit. The compare circuit compares the internal 5-MHz frequency with the external 5-MHz frequency for an indication of the accuracy of the internal frequency standard. The 5-MHz output from the switching and compare circuit is applied to the multiplier-divider circuit, where it is converted to frequencies of 500 kHz, 1 MHz, and 10 MHz. These three outputs are used in the mixing processes required to produce the injection frequencies used in the RF conversion process. The 500-kHz output is also applied to the 500-kHz gate circuit for insertion into the product detector for demodulation. The 5-MHz frequency standard, oven-control, multiplier-divider, and switching and compare circuits make up Frequency Standard Electronic Assembly A2A5.

3-20. FREQUENCY GENERATION. Injection frequencies used in the first frequency conversion in the mixers of RF Translator Electronic Subassembly A2A6A6 are generated with MC Synthesizer Electronic Subassembly A2A6A1. This circuit consists of a phase-locked, crystal-controlled 1-MHz oscillator that is automatically tuned to produce one of 17 frequencies between 2.5 and 23.5 MHz. The oscillator output is applied to the high-frequency mixer. The output frequency depends on the setting of the front-panel MCS controls.

3-21. Injection frequencies used in the second frequency conversion in the mixers of the RF translator are generated within 100 KC Synthesizer Electronic Subassembly A2A6A2. This circuit consists of a crystal-controlled 100-kHz oscillator, the output of which may be any one of 10 frequencies spaced at 100-kHz intervals between 4.553 and 5.453 MHz. The output frequency is determined by the setting of the front-panel 100 KCS control. If a lo-band injection frequency is required, the 17.847-MHz output from the 17.847-MHz mixer is additively mixed in the lo-band mixer with the output from the 100-kHz oscillator (4.553 to 5.453 MHz, in 100-kHz steps) to provide a frequency in the 22.4- to 23.3-MHz range. If a hi-band injection frequency is required the 27.847-MHz output from the 27.847-MHz mixer is additively mixed in the hi-band mixer with the output from the 100-kHz oscillator (4.553 to 5.453 MHz in 100-kHz steps) to provide a frequency in the 32.4- to 33.3-MHz range. In either case the resultant frequency is applied to the mid-frequency mixer.

3-22. Injection frequencies used in the third frequency conversion in the mixers circuit are generated within 1 and 10 KC Synthesizer Electronic Subassembly A2A6A3. This circuit consists of two crystal oscillators, each of which has 10 possible output frequencies. The output from the 1-kHz oscillator (1.859 to 1.859 MHz in 1-kHz steps) is determined by the setting of the front-panel 1 KCS control, and the output from the 10-kHz oscillator (5.25 to 5.16 MHz in 10-kHz steps) is determined by the setting of the front-panel 10 KCS control. The outputs from the two oscillators are subtractively mixed to provide one of 100 possible output frequencies spaced at 1-kHz intervals between 3.301 and 3.400 MHz. The output is applied to the low-frequency mixer, resulting in a 500-kHz output.

3-23. ERROR CANCELLATION. A combination of error-canceling loops and phase-locked loops is used in the frequency synthesizer circuits of the R-1051/URR to ensure that the injection frequencies applied to the mixers are correct. These loops are described in the following paragraphs.

3-24. MC Synthesizer Electronic Subassembly A2A6A1 employs a phase-locked loop to ensure the accuracy of the MHz injection frequencies. The 1-MHz output from multiplier-divider A1 in Frequency Standard Electronic Assembly A2A5 is applied to spectrum generator A3 in the MC synthesizer to produce a spectrum of frequencies spaced at 1-MHz intervals between 1 and 25 MHz. The output from spectrum generator A2A6A1A3 and the output from MHz oscillator A2A6A1A1 are mixed. Any error in output from MHz oscillator is detected and an error voltage is produced. This error signal is applied to the MHz oscillator to lock it to the correct frequency. The accuracy of the oscillator output is the same as that of the 5-MHz frequency standard.

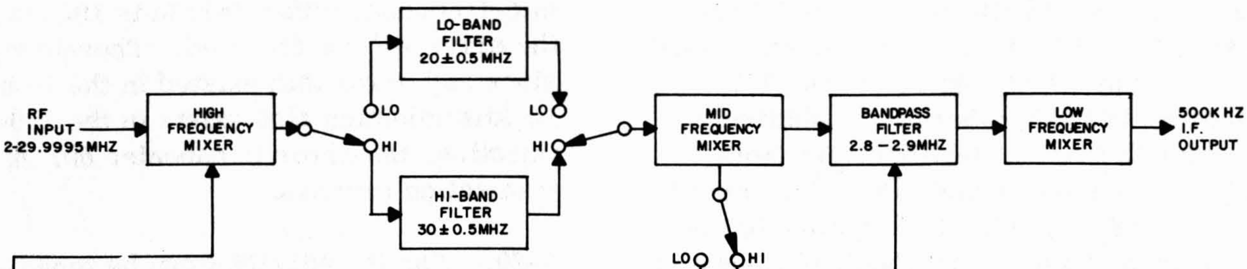
3-25. In addition, 100 KC Synthesizer Electronic Subassembly A2A6A2 employs an error-canceling loop to ensure the accuracy of the 100-kHz injection frequencies. The 500-kHz output from multiplier-divider A2A5A1 is applied to 100-kHz spectrum generator A2A6A5A1 to produce a spectrum of frequencies spaced at 100-kHz intervals between 15.3 and 16.2 MHz. The output from 100-kHz oscillator A2A6A2A1 (4.553 to 5.453 MHz in 100-kHz steps) is applied to

10.747-MHz mixer A2A6A2A2, where it is mixed with that spectrum point of the 100-kHz spectrum which will result in an output of 10.747 MHz. The 10.747-MHz signal is additively mixed with the 7.1-MHz output from 7.1-MHz mixer A2A6A4A3 to produce the 17.847-MHz signal, which is used in one of two mixing processes. It is mixed with the output of the 100-kHz oscillator to cancel any oscillator frequency error and produce the lo-band injection frequencies, or it is mixed with the 10-kHz output from multiplier-divider A2A5A1. This latter mixing produces a 27.847-MHz signal, which is mixed with the output of the 100-kHz oscillator to cancel any oscillator frequency error and produce the hi-band injection frequencies.

3-26. The hi or lo band injection frequencies is determined by the voltage level on the hi-/l0-band control line from Code Generator Electronic Assembly A2A7. If an error was present in the output of the 100-kHz oscillator, it would be canceled in this mixing scheme. This is accomplished as follows. Assume that the output from 100-kHz oscillator should be 4.553 MHz, but is 200 Hz high (4.5532 MHz), and that the desired frequency output is 22.4 MHz (in the lo band). The subtractive mixing of the oscillator output with which ever 100-kHz spectrum point will produce an output as close as possible to 10.747 MHz results in a 10.7468-MHz output (15.3 MHz - 4.5532 MHz = 10.7468 MHz). This signal is then additively mixed with the 7.1-MHz signal, producing a 17.8468-MHz output. The 17.8468-MHz signal is then additively mixed with the output of the 100-kHz oscillator (17.8468 MHz + 4.5532 MHz = 22.4 MHz), resulting in the desired 22.4-MHz output. Assume that the output from 100-kHz oscillator should be 4.953 MHz but is 300 Hz low (4.9527 MHz), and that the desired frequency output should be 32.8 MHz (in the hi band). Subtractively mixing the 100-kHz spectrum point (15.7 MHz) with the 4.9527-MHz signal results in an output of 10.7473 MHz. This signal is then mixed with the 7.1-MHz signal, resulting in a frequency of 17.8473 MHz. The 17.8473-MHz signal is further mixed with the 10-MHz signal to obtain a frequency of 27.8473 MHz, which is additively mixed with the 4.9527-MHz output from the 100-kHz oscillator to obtain the required 32.8-MHz output. Therefore, any error existing in the output from the 100-kHz oscillator will be canceled, resulting in the exact 100-kHz injection frequency required.

3-27. Any error existing in 1- and 10-kHz oscillators A2A6A3A2 and A2A6A3A1 is canceled in the following manner. The 100-kHz pulses from 100-kHz spectrum generator A2A6A5A1 are applied to 10-kHz spectrum generator A2A6A5A2, producing an output from 3.82 to 3.91 MHz in 10-kHz increments. In addition, the 10-kHz spectrum generator produces 10-kHz pulses which are applied to 1-kHz spectrum generator A2A6A5A3 to produce a spectrum of frequencies spaced at 1-kHz intervals between 0.122 and 0.131 MHz. The output from 10-kHz oscillator A2A6A3A1 (5.25 to 5.16 MHz in 10-kHz steps) is additively mixed with whichever spectrum point of the 10-kHz spectrum will result in a frequency of 9.07 MHz. The output from 1-kHz oscillator A2A6A3A2 (1.850 to 1.859 MHz in 1-kHz steps) is additively mixed with whichever spectrum point of the 1-kHz spectrum will result in a frequency of 1.981 MHz. The 1.981- and 9.07-MHz signals are then subtractively mixed, producing the 7.089-MHz signal, which contains the error of both oscillators.

3-28. The 1 kHz spectrum generator also produces 5 kHz pulses, which are applied to the 5 kHz spectrum generator to produce an output consisting of two spectrum points, 110 kHz and 115 kHz. These spectrum



MCS	LO	HI	100 KCS	100 kHz OSC	LO 000 CPS	LO 500 CPS	LO VERNIER*	HI 000 CPS	HI 500 CPS	HI VERNIER*	10 KCS	10 kHz OCS	1 AND 10 kHz 1NJ.	1 KCS	1 kHz OSC
2	17.5		0	4.553	22.4000	22.4005	22.3998 to 22.4012	32.4000	32.4005	32.3998 to 32.4012	0	5.25	3.400 to 3.391	0	1.850
3	16.5		1	4.653	22.5000	22.5005	22.4998 to 22.5012	32.5000	32.5005	32.4998 to 32.5012	1	5.24	3.390 to 3.381	1	1.851
4	15.5		2	4.753	22.6000	22.6005	22.5998 to 22.6012	32.6000	32.6005	32.5998 to 32.6012	2	5.23	3.380 to 3.371	2	1.852
5	14.5		3	4.853	22.7000	22.7005	22.6998 to 22.7012	32.7000	32.7005	32.6998 to 32.7012	3	5.22	3.370 to 3.361	3	1.853
6		23.5	4	4.953	22.8000	22.8005	22.7998 to 22.8012	32.8000	32.8005	32.7998 to 32.8012	4	5.21	3.360 to 3.351	4	1.854
7	12.5		5	5.053	22.9000	22.9005	22.8998 to 22.9012	32.9000	32.9005	32.8998 to 32.9012	5	5.20	3.350 to 3.341	5	1.855
8	11.5		6	5.153	23.0000	23.0005	22.9998 to 23.0012	33.0000	33.0005	32.9998 to 33.0012	6	5.19	3.340 to 3.331	6	1.856
9		20.5	7	5.253	23.1000	23.1005	23.0998 to 23.1012	33.1000	33.1005	33.0998 to 33.1012	7	5.18	3.330 to 3.321	7	1.857
10		19.5	8	5.353	23.2000	23.2005	23.1998 to 23.2012	33.2000	33.2005	33.1998 to 33.2012	8	5.17	3.320 to 3.311	8	1.858
11	8.5		9	5.453	23.3000	23.3005	23.2998 to 23.3012	33.3000	33.3005	33.2998 to 33.3012	9	5.16	3.310 to 3.301	9	1.859
12	7.5														
13		16.5													
14	5.5														
15	4.5														
16	3.5														
17		12.5													
18		11.5													
19		10.5													
20		9.5													
21		8.5													
22	2.5														
23	3.5														
24		5.5													
25		4.5													
26		3.5													
27	7.5														
28	9.5														

*NOTES:

1. ALL FREQUENCIES ARE GIVEN IN MHz UNLESS OTHERWISE SPECIFIED
2. 100-KC INJECTION FREQUENCIES MAY BE DISPLACED TO COMPENSATE FOR ERRORS IN OSCILLATOR FREQUENCY.

Figure 3-3. RF Translator A2A6A6, Frequency Translator, Functional Block Diagram

points are used to lock the output frequency of the 500 Hz phase-locked oscillator to 110 Hz or 115 Hz when desired. With the front panel CPS switch in the 000 position, the output from the phase-locked oscillator is 110 Hz and is locked to that exact frequency by the 110 Hz spectrum point applied to the phase detector. This 110-kHz signal is divided by 10 and applied to the 7.1-MHz mixer A2A6A4A3, where it is additively mixed with the 7.089-MHz output from 7.089-MHz mixer A2A6A3A4. The resulting 7.1-MHz signal is then applied to the error loop of 100 KC Synthesizer Electronic Subassembly A2A6A2. Therefore, if an error exists in the 1- or 10-kHz oscillators A2A6A3A2 or A2A6A3A1, the same error will exist in the 100-kHz injection frequencies. This error is then canceled in the mid- and low-frequency mixers of RF Translator Electronic Subassembly A2A6A6 (figure 3-3) in the following manner. Assume that the output from the 10-kHz oscillator should be 5.25 MHz but is actually 5.2502 MHz. Also, assume that the output from 1-kHz oscillator should be 1.852 MHz but is actually 1.8521 MHz. Subtractively mixing these two frequencies results in an injection frequency to the low-frequency mixer of 3.3981 MHz, rather than the desired 3.3980 MHz. Therefore, a 100-Hz error exists in the injection signal. The additive mixing of the 5.2502-MHz signal and the 10-kHz spectrum point (3.82 MHz) results in a frequency of 9.0702 MHz. The additive mixing of the 1.8521-MHz signal and the 1-kHz spectrum point (0.129 MHz) results in a frequency of 1.9811 MHz. Subtractively mixing the 9.0702- and the 1.9811-MHz signals results in a frequency of 7.0891 MHz. The 7.0891-MHz signal is mixed with the 11-kHz signal from divide-by-ten circuit A2A6A4A1, resulting in a frequency of 7.1001 MHz, which is mixed with the 10.747-MHz signal to produce a frequency of 17.8471 MHz. If the output from the 100-kHz oscillator is assumed to be 4.553 MHz, then the 100-kHz injection frequency would be 22.4001 MHz. The 100-kHz injection is then also 100 Hz high. Therefore, when the 1- and 10-kHz injection frequency of 3.3981 MHz (which is 100 Hz high) is subtractively mixed in the low-frequency mixer with the output from the mid-frequency mixer (which is 100 Hz high), the error will be canceled. Therefore, since any error that existed in the 1- and 10-kHz injection also exists in the 100-kHz injection, the error is cancelec during the translation process.

3-29. The R-1051/URR can be tuned to 0.5- kHz increments using the 000 and the 500 positions of the CPS switch as well as any frequency in between, using the VERNIER position of the CPS switch and the VERNIER control, both located on the front panel. When the CPS switch is in the 000 position, the phase-locked oscillator output in the 500 Hz oscillator circuit is locked to 110 kHz. Therefore, when the 11.0-kHz signal (after division by ten) is mixed with the 7.089-MHz error frequency of 7.1000 MHz is obtained. When the CPS switch is in the 500 position, the output from the phase-locked oscillator is locked to 115 kHz. Therefore, when the 11.5 kHz (after division by ten) is mixed with the 7.089 MHz error frequency, a frequency of 7.1005 MHz is obtained. Therefore, the 100-kHz injection frequency will be 500 Hz greater. Thus, the output from the mid-frequency mixer may be varied in 500 Hz increments. When the CPS switch is in the vernier position, the output from the phase-locked oscillator can be varied between 108 and 122 kHz. As a result, the 7.1000 MHz error frequency can be varied between 7.0998 and 7.1012 MHz. Thus, the output from the mid-frequency may be varied continuously between any two 1-kHz increments.

3-30. The RF signal from the antenna is converted to the 500-kHz intermediate frequency as follows. Assume that the frequency controls on the front panel are set for a frequency of 13,492,500 Hz (see figure 3-3). The 1-MHz injection corresponding to the selected MCS digits (13) is 16.5 MHz (in the hi band). The level-controlled 16.5 MHz is additively mixed in the high-frequency mixer of A2A6A6 with 13,492,500 Hz, producing 29,992,500 Hz which is filtered and applied to the mid-frequency mixer of A2A6A6. Since the MCS digits (13) are in the hi band and the CPS switch is in the 500 position, the 100-kHz injection frequency corresponding to the 100 KCS digit (4) will be 32.8005 MHz, as shown in figure 3-3. The mid-frequency mixer of A2A6A6 subtractively mixes the 29,992,500-Hz and the 32.8005-MHz signals, thereby producing a frequency of 2,808,000 Hz, which is filtered and applied to the low-frequency mixer of A2A6A6. The 1-and 10-kHz injection is that frequency of 10-kHz oscillator A2A6A3A1 corresponding to the 10 KCS digit (9) minus that frequency of 1-kHz oscillator A2A6A3A2 corresponding to the 1 KCS digit (2). As shown in figure 3-3, this results in an injection frequency of 3.308 MHz (5.16 MHz minus 1.852 MHz). The 3.308 MHz is subtractively mixed with the 2,808,000 Hz, producing the 500-kHz intermediate frequency. Similarly, any frequency between 2 and 30 MHz may be translated into the 500-kHz intermediate frequency.

3-31. FUNCTIONAL CIRCUIT DESCRIPTIONS.

3-32. ANTENNA OVERLOAD ELECTRONIC ASSEMBLY A2A9. Antenna Overload Electronic Assembly A2A9 is a part of the receiver main frame, and protects the receiver from high-level input signals which could cause damage to the input circuit of RF Amplifier Electronic Assembly A2A4. Protection is afforded against signals of 100 volts rms open circuit in series with 50 ohms. It contains a relay which will normally deenergize and connect a resistance in series with the antenna input circuitry when the input RF reaches 6 to 8 volts rms. This resistance will also be connected whenever the MHz frequency is being changed.

3-33. Two circuit boards compose the antenna overload assembly. Circuit board A2A9A2 provides surface area for mounting zener diode clamp circuit A2A9A2CR3, CR4, CR5, and CR6, and also furnishes cover and component layout for circuit board A2A9A1 This circuit board contains signal-sampling attenuator A2A9A1R1 and R2, diode rectifier CR1, two-stage amplifier Q1 and Q2, and relay K1. (See figure 3-4.)

3-34. RF Protection Function. The RF signal from the antenna is applied to the normally open contact of relay A2A9A1K1. The pole of this relay is connected to the input transformer of the RF amplifier. When the receiver is turned off or place in standby, the input to the RF amplifier is isolated from the antenna by resistor R10. When power is applied to the receiver and no excessive signal (RF in excess of 6 to 8 volts) is present at the antenna input terminals, transistor Q1 is biased off as a result of the action of resistors R5 and R6. This causes the collector of Q1 and the base of Q2 to rise in potential, saturating Q2 and causing K1 to operate. This shorts out resistor R10, completing the signal path from the antenna to the RF amplifier input. At the same time, the antenna input voltage is coupled by capacitor C1 to an attenuator consisting of resistors R1 and R2. Capacitors C2 and C3 compensate for circuit-distributed compensate for circuit-distributed capacitances to maintain substantially constant attenuation throughout the range from 2 to 30 MHz. The attenuated signal is rectified by diode CR1, filtered by capacitor C1, and applied to the base of Ql through resistor R3.

3-35. When the input signal amplitude

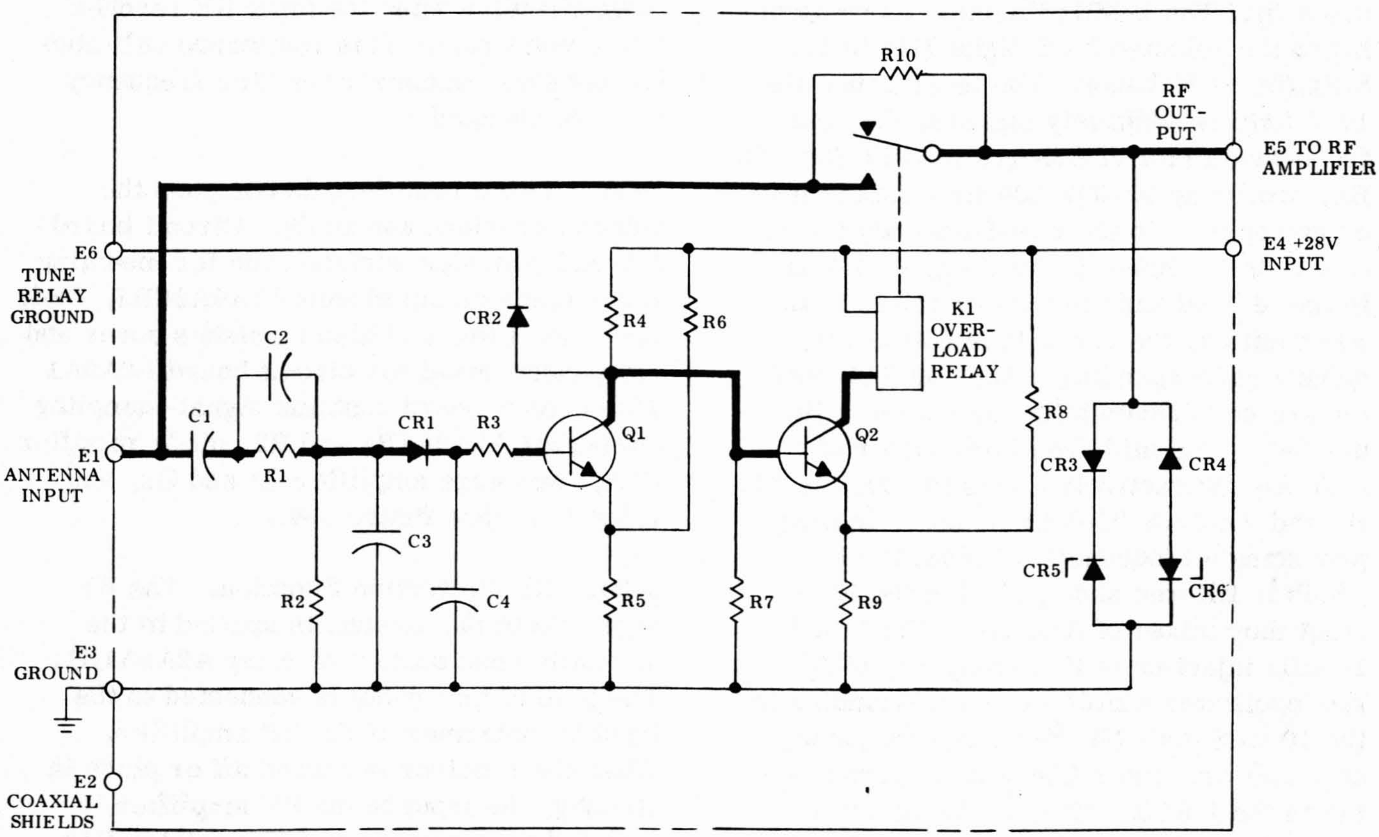


Figure 3-4. Antenna Overload Assembly A2A9, Simplified Schematic Diagram

rises above 6 to 8 volts rms, Q1 becomes forward-biased and conducts, causing the Q1 collector and Q2 base voltage to fall. When Q2 base voltage drops below the emitter bias established by R8 and R9, Q2 ceases to conduct, and relay K1 releases. This reduces the signal applied to the receiver input to a safe level, due to the attenuation produced by the "L" pad, consisting of R10 and the receiver input impedance. During the time between the application an overload signal and the operation of relay K1, diodes A2A9A2CR3, CR4, CR5, and CR6 function to limit the peak voltage applied to the receiver front end to a value substantially determined by the breakdown voltage of diodes CR5 and CR6. Diodes CR3 and CR4 are low-capacitance units which function to prevent the large junction capacitance of CR5 and CR6 from loading the receiver input.

3-36. Tuning Cycle Protection Function. Terminal A2A9A1E6 is used to operate relay K1 during the tuning cycle for MHz tuning changes. This action attenuates broadband noise generated by the turret drive motor and the MHz synthesizer motor. During the tuning cycle produced by a change in the MHz tuning selectors, a circuit ground is applied to terminal E6, causing CR2 to conduct. This causes Q2 base voltage to fall below the emitter voltage, and Q2 ceases to conduct, producing the same action as an overload signal at the receiver Antenna input terminals. When the tuning cycle is complete, the potential at E6 rises to +28 volts, which causes CR2 to be reverse-biased, and circuit operation returns to normal.

3-37. RF AMPLIFIER ELECTRONIC ASSEMBLY A2A4. RF Amplfier Electronic Assembly A2A4 is a depot-repairable assembly. Its functional circuit description is contained in Repair Book for AN/WRC-1 and R-1051/URR, 2N Modules.

3-38. TRANSLATOR/SYNTHESIZER ELECTRONIC ASSEMBLY A2A6. Translator/Synthesizer Electronic Assembly A2A6 is a depot-repairable assembly. Its functional circuit description is contained in Repair Book for AN/WRC-1 and R-1051/URR, 2N Modules.

3-39. RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2A1. Receiver Mode Selector Electronic Assembly A2A1 consists of an LSB mode gate and filter, a USB mode gate and filter, an AM mode gate and filter, a 500-kHz gate, and the bear frequency oscillator (BFO) and amplifier. These circuits are discussed separately in the following paragraphs.

3-40. LSB Mode Gate and Filter. The LSB mode gate and filter (figure 3-5) consists of LSB filter A2A1FL3 and a portion of Mode Gates Subassembly A2A1A1. Its function is to filter the 500-kHz LSB IF signal from the low-frequency mixer in RF Translator Electronic Subassembly A2A6A6 and apply it to the gain-controlled IF amplifier A2A3A2 . The LSB filter circuit is used only during the LSB and ISB modes of operation. The following paragraphs describe the operation of this circuit for each of the indicated modes of operation.

3-41. In LSB operation, the 500-kHz IF signal is coupled by capacitor A2A1A1C1 to

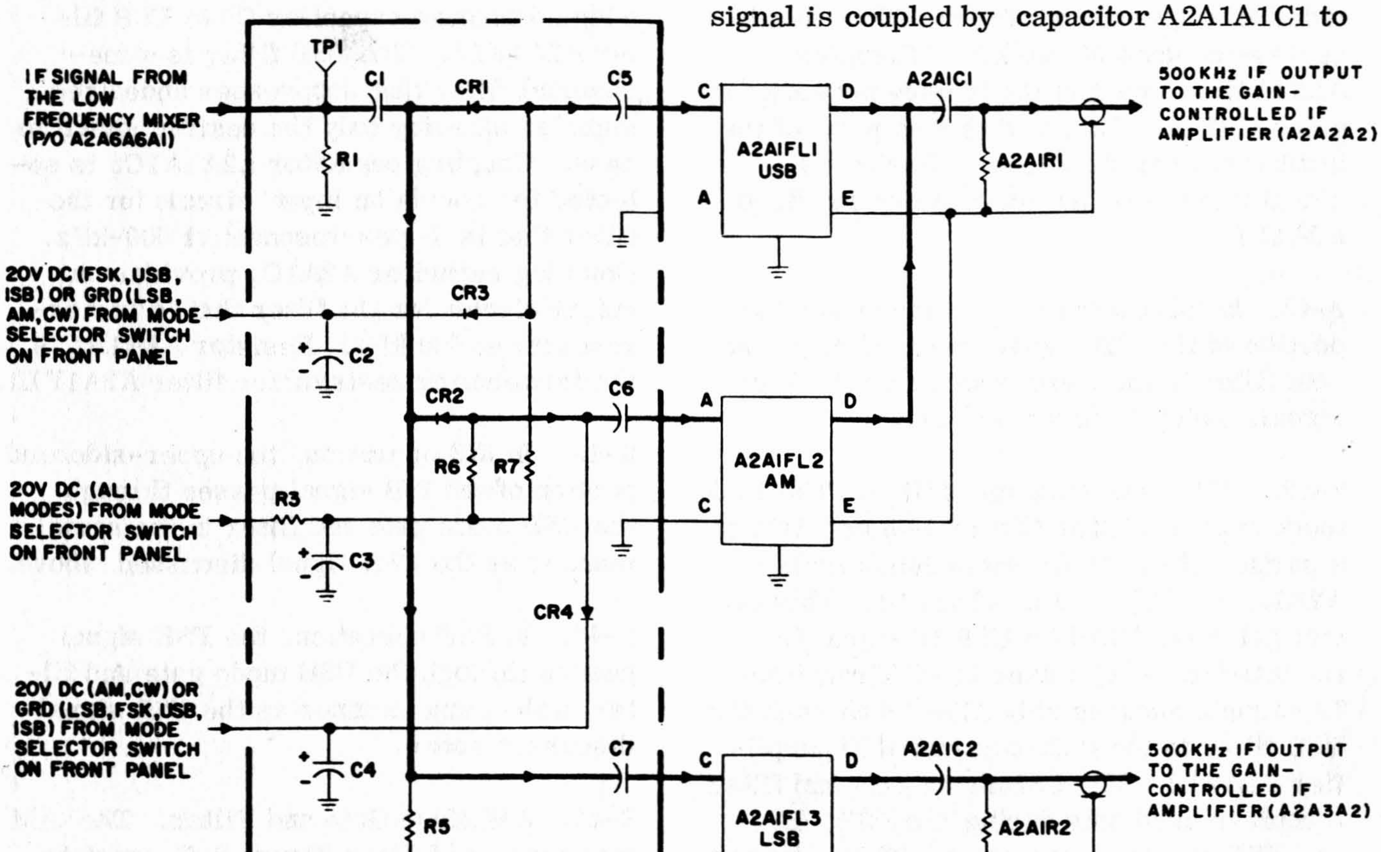


Figure 3-5. Modes Gates and Filters, Simplified Schematic Diagram

the cathodes of gating diodes CR1 and CR1 and to coupling capacitor C7. In the LSB mode, 20 vdc is applied through resistors R3 and R7 to the anodes of diodes CR1 and CR3, and through resistors R3 and R6 to the anodes of diodes CR2 and CR4. A ground is applied to the cathodes of diodes CR3 and CR4, producing forward bias, and effectively placing the ground on the anode of diodes CR1, CR2, CR3, and CR4. Therefore, any portion of the IF signal passing through diodes CR1 and CR2 will be shorted to ground. The IF signal is coupled through capacitor C7 to LSB filter A2A1FL3. The LSB filter is a mechanical filter which suppresses undesired signals, allowing only the desired LSB signal to pass. Coupling capacitor A2A1A1C7 is selected to provide an input to the filter that is series-resonant at 500-kHz. Coupling capacitor A2A1C2 provides an output circuit for the filter that is series-resonant at 500 kHz. Resistor A2A1A1R5 is part of the biasing network for gates CR1 and CR2, and is also part of the input circuit to the filters. Resistors A2A1R2 is the output termination for filter A2A1FL3.

3-42. In ISB operation, the lower sideband portion of the ISB signal passes through the LSB filter in the same manner as the LSB signal, which is described above.

3-43. USB Mode Gate and Filter. The USB mode gate and filter (figure 3-5) consists of a portion of the Mode Gates Subassembly A2A1A1 and USB filter A2A1FL1. This circuit gates the 500-kHz USB IF signal from the low-frequency mixer in RF Translator Electronic Subassembly A2A6A6 through the USB filter to the gain-controlled IF amplifier A2A2A2. The USB mode gate and filter circuit is used only during the USB, ISB, and FSK modes of operation. The following paragraphs describe the operation of this circuit for each of the indicated modes of operation.

3-44. In USB operation, the 500-kHz IF signal applied to the mode gates is coupled by capacitor A2A1A1C1 to the cathodes of gating diodes CR1 and CR2. In the USB, ISB, and FSK modes, gating diode CR1 if forward-biased by 20 vdc applied through resistors R3 and R7 to its anode, and by ground applied through resistor R5 to its cathode. The 20 vdc is also applied through reistors R3 and R6 to the anodes of diodes CR2 and CR4. A ground is applied to the cathode of diode CR4, producing forward-bias and effectively placing the ground on the anodes of diodes CR2 and CR4. Diode CR2 is reverse-biased due to the ground on its anode and approximately 7.3 Vdc on its cathode. The IF signal will pass through forward-biased diode CR1 and be rejected by reverse-biased diode CR2. The IF signal is then coupled through capacitor C5 to USB filter A2A1FL1. The USB filter is a mechanical filter that suppresses undesired signals, allowing only the desired signal to pass. Coupling capacitor A2A1A1C5 is selected to provide an input circuit for the filter that is series-resonant at 500-kHz. Coupling capacitor A2A1C1 provides an output circuit for the filter that is series-resonant at 500 kHz. Resistor A2A1R1 is the terminating resistor for filter A2A1FL1.

3-45. In ISB operation, the upper-sideband portion of the ISB signal passes through the USB mode gate and filter in the same manner as the USB signal discussed above.

3-46. In FSK operation, the FSK signal passes through the USB mode gate and filter in the same manner as the USB signal discussed above.

3-47. AM Mode Gate and Filter. The AM mode gate and filter (figure 3-5) consists of AM filter A2A1FL2 and a portion of the Mode Gates Subassembly A2A1A1. This circuit gates the 500-kHz AM IF signal from the low-frequency mixer in RF Translator Electronic Subassembly A2A6A6 through the AM filter to gain-controlled IF, amplifier A2A2A2. The AM mode gate and filter circuit is used only during the AM and CW modes of operation. The following paragraphs describe the operation of this circuit for either of the indication modes of operation.

3-48. The 500-kHz IF signal applied to the mode gates is coupled by capacitor A2A1A1-C1 to the cathode of gating diodes CR1 and CR CR2. In the AM and CW modes, gating diode CR2 is forward-biased by 20 vdc applied through resistor R3 and R6 to its anode, and by ground applied through resistor R5 to its cathode. The 20 vdc is also applied through resistors R3 and R7 to the anodes of diodes CR1 and CR3. A ground is applied to the cathode of diode CR3, producing forward bias and effectively placing the ground on the anodes of diodes CR1 and CR3. Diode CR2 is reverse-biased by the ground on its anode and approximately 7.3 vdc on its cathode. The IF signal will pass through forward-biased diode CR2 and be rejected by reverse-biased diode CR1. The IF signal is then coupled through capacitor C6 to AM filter A2A1FL1. The AM filter is a mechanical filter which suppresses the undesired signals, allowing only the desired signal to pass. Coupling capacitor A2A1A1C6 is selected to provide an input circuit for the filter that is series-resonant at 500 kHz. Coupling capacitor A2A1C1 provides an output circuit for the filter that is series-resonant at 500 kHz.

3-49. 500 kHz Gate. The 500 kHz Gate Subassembly A2A1A2 (figure 3-6) gates the 500-kHz IF signal from the 1-MHz divide-by-two circuit in Frequency Standard Electronic Assembly A2A5 to the product detector circuit in Receiver IF/Audio Amplifier Electronic Assemblies A2A2 and A2A3. The 500-kHz gate circuit is used only during the LSB, FSK, USB, or ISB modes of operation.

3-50. In LSB, FSK, USB, and ISB operation, the 500-kHz local carrier signal from the 1-MHz divide-by-two circuit is coupled by capacitor A2A1A2C1 to the anode of gating diode CR1. To explain the bias developement for gate CR1, assume that gate CR1 is removed from the circuit. In the LS LSB, FSK, USB, and ISB modes, 20 vdc is applied to voltage divider R1, R5, R6 and voltage divider R2, R3, R4. This produces a voltage of approximately 18.8 vdc at the junction of resistors R3 and R4, and approximately 6.7 vdc at the junction of resistors R5 and R6. Replacing the diode would result in forward-biasing. Since the gate is forward-biased, the 500-kHz IF signal is allowed to pass and is coupled by capacitor C4 to the product detector to be used in demodulating.

3-51. In the AM and CW modes, gating

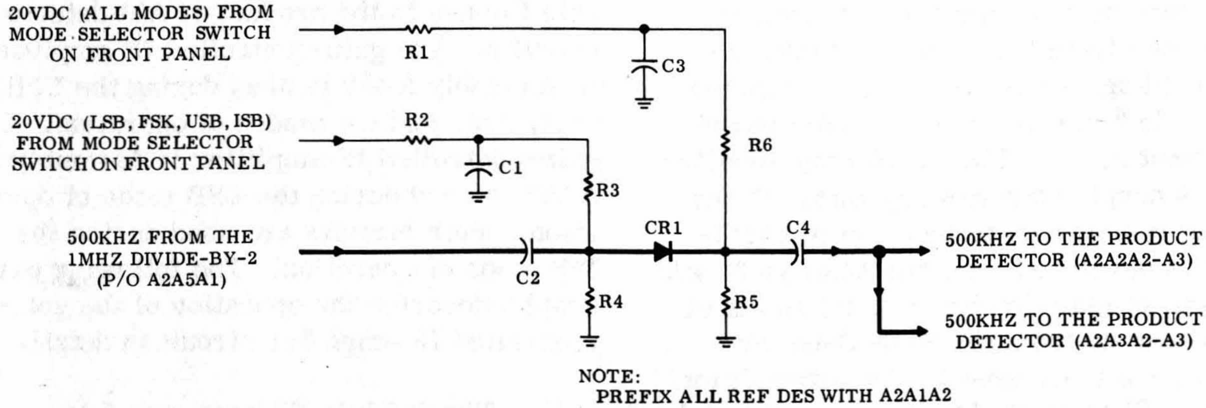


Figure 3-6. 500-kHz Gate, Simplified Schematic Diagram

diode CR1 is reverse-biased by removing the 20 vdc from voltage divider R2, R3, R4, thereby preventing the 500 kHz from being passed.

3-52. BFO and Amplifier. BFO and Amplifier Subassembly A2A1A3 (figure 3-7) consists principally of modified Colpitts oscillator Q1 and amplifier Q2. These circuits generate and amplify a signal betwen 496.5 and 503.5 kHz and apply it to the product detector in Receiver IF/Audio Amplifier Electronic Assembly A2A2. The BFO and amplifier circuit is used only for CW operation. The following paragraphs describe the operation of this circuit in detail.

3-53. The frequency of the BFO is determined by the setting of the BFO FREQ control on the front panel. The output voltage of this control can be varied between 0.2 a and 20 vdc. This voltage is applied across voltage-variable capacitor A2A1A3CR1, producing a capacitance dependent upon the magnitude of the voltage. The output frequency of oscillator Q1 is determined by the tuned circuit consisting of voltage-variable capacitor CR1, inductor L1, and capacitors C2, C3, C4, C5, and C6. Emitter-to-base feedback sustains oscillations in transistor Q1. The negative temperature coefficient characteristic of capacitor C3 compensates for variations in the operating parameters of transistor Q1 that result from ambient temperature changes.

3-54. Operating voltage for oscillator Q1 is developed from the positive 20 vdc applied to voltage divider R3, R4 and emitter resistor R5 from the Mode Selector switch on the front panel. The output from oscillator Q1 is coupled through capacitor C7 and isolating resistor R6 to the base of amplifier Q2 is developed from the positive 20 vdc applied to voltage divider R7, R8 and emitter resistor R9 from the Mode Selector switch on the front panel. The output from amplifier Q2 is applied to limiters CR2 and CR3, where the signal is limited to approximately 150 mv, and is applied to the tuned circuit consisting of capacitor C9 and inductor T1. The signal from the tuned circuit passes through isolating resistor R10 to the product detector circuit in Receiver IF/Audio Amplifier Electronic Assembly A2A2.

3-55. RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLIES A2A2 AND A2A3. The identical IF/Audio Amplifier Assemblies A2A2 and A2A3 consist of three subassemblies: Gain-Controlled IF/Audio Amplifier Subassembly A2, Step AGC and Audio Amplifier Subassembly A1, and Product/AM Detectors Subassembly A3 (all reference designations in this and the following paragraphs are understood to be prefixed by either A2A2 and A2A3). Functionally, however, the assembly may be conveniently divided into five circuits for discussion purposes. These circuits are a gain-controlled IF amplifier, a product detector, an AM detector, an audio amplifier, and a step AGC circuit. These circuits are discussed separately in following paragraphs.

3-56. Gain-Controlled IF Amplifier. The gain-controlled IF amplifier (figure 3-8) consists of four stages of IF amplification (A2Q1, Q4, Q5, and A6), the gain of which is controlled by variable attenuators Q2 and Q3. These circuits amplify the 500 kHz IF signal from Receiver Mode Selector Ele Electronic Assembly A2A1 to a level suitable for use in the product or AM detector circuits. The gain-controlled IF amplifier in assembly A2A2 is used during the USB, FSK, AM, and Cw modes of operation. The gain-controlled IF amplifier in assembly A2A3 A2A3 is used during the LSB mode of operation. Both circuits are used during the ISB mode of operation. The following paragraphs describe the operation of the gain-controlled IF amplifier circuit in detail.

3-57. The 500 kHz IF input signal is coupled to the base of amplifier A2Q1 by

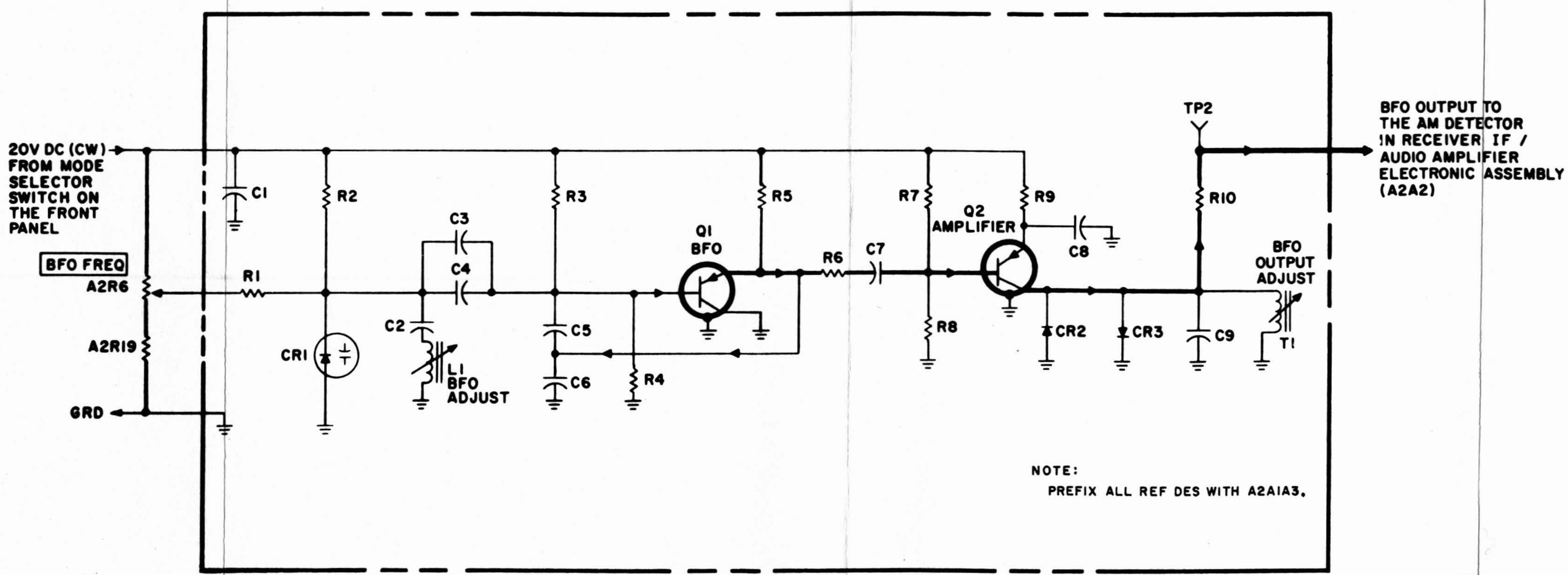


Figure 3-7. BFO and Amplifier, Simplified Schematic Diagram

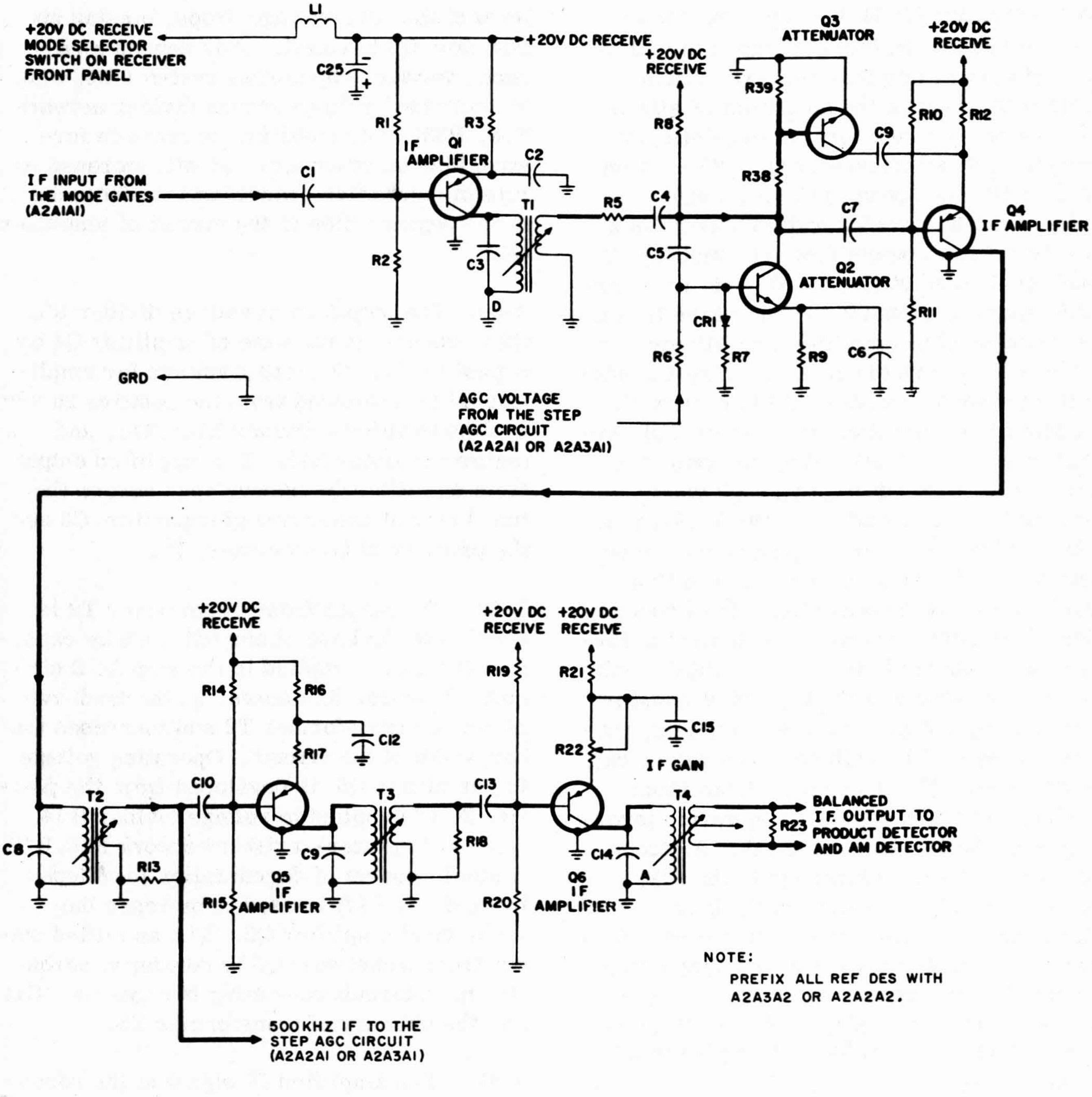


Figure 3-8. Gain-Controlled IF Amplifier, Simplified Schematic Diagram

capacitor C1. Operating voltages for amplifier Q1 are developed from the positive 20 vdc applied to voltage divider R1, R2, and emitter resistor R3. The amplified output from amplifier Q1 is developed across the tuned circuit, consisting of capacitor C3 and the primary of transformer T1. Transformer T1 couples the amplified IF signal to a voltage-divider network consisting of resistor R5 and attenuator Q2. The action of the AGC voltage upon the combined circuits of attenuators Q2 and Q3 results in a nearly constant output from IF amplifier Q4. AGC-controlled attenuator Q2 acts as a variable shunt resistance to control the IF signal input level to amplifier Q4. Attenuator Q3 acts as a variable resistor in series with emitter-bypass capacitor C9 to control the amount of degeneration in the circuit of amplifier Q4. The AGC voltage is applied to the base of attenuator Q2 through voltage divider R6, CR1, and R7. Diode CR1 is a silicon diode used for temperature compensation. An increase in temperature that would normally increase the rate of conduction of attenuator Q2 will also lower the forward resistance of diode CR1. This results in a lower voltage at the base of attenuator Q2, thereby compensating for the temperature change. The collector-emitter circuit of attenuator Q2 acts as a variable shunt resistor with a resistance that varies inversely with the IF signal strength. A strong IF signal causes an increase in the AGC voltage, which is applied to the base of attenuator Q2. This results in a larger forward bias on attenautor Q2, causing a higher rate of conduction. This causes a reduction in the level of the 500-kHz IF signal that is coupled to the base of amplifier Q4 by capacitor C7.

3-58. The voltage dropped across resistor R8 varies with the rate of conduction of attenuator Q2. Therefore, increased conduction increases the voltage drop and decreases the voltage across voltage divider R38, R39. This results in a reduced forward bias, a reduced rate of conduction, and an increased collector-emitter resistance for attenautor Q3. These actions increase the degeneration in the circuit of amplifier Q4. When the IF signal disappears, the level of the AGC voltage drops, biasing attenuator Q2 to cutoff. This causes a reduced voltage drop across resistor R8, and an increased voltage across divider network R38, R39. The resulting increase in forward bias on attenuator Q3 will increase its rate of conduction, resulting in a decrease in the degeneration in the circuit of amplifier Q4.

3-59. The output from voltage divider R5, Q2 is coupled to the base of amplifier Q4 by capacitor C7. Operating voltage for amplifier Q4 is developed from the positive 20 vdc applied to voltage divider R10, R11, and emitter resistor R12. The amplified output from amplifier Q4 is developed across the tuned circuit consisting of capacitor C8 and the primary of transformer T2.

3-60. The output from transformer T2 is coupled to the base of amplifier Q5 by capacitor C10 and is applied to the step AGC circuit. Resistor R13 serves as the load resistor for transformer T2 and increases the bandwidth of the circuit. Operating voltage for amplifier Q5 is developed from the positive 20 vdc applied to voltage divider R14, R15, and emitter-resistor network R16, R17.. A small amount of degeneration (developed by resistor R17) is used to increase the stability of amplifier Q5. The amplified output from transistor Q5 is developed across the tuned circuit consisting of capacitor C11 and the primary of transformer T3.

3-61. The amplified IF signal at the secondary of transformer T3 is coupled to the base of Q6 by capacitor C13. Resistor R18 serves as the load resistor of transformer T3 and increases the bandwidth of the circuit. Operating voltage for Q6 is developed from the positive 20 vdc applied to voltage divider R19, R20 and emitter resistors R21 and R22. Amplifier Q6 is the last stage of amplification in the gain-controlled IF amplifier. The gain amplifier Q6 is controlled by the amount of degenerative feedback developed by potentiometer R22. The output from amplifier Q6 is developed across the tuned circuit consisting of capacitor C14 and the primary of transformer T4. The center-tapped secondary of transformer T4 develops a balanced output across load resistor R23. Transformer T4 couples the IF output to the product and AM detector circuits.

3-62. Product Detector. The product detector (figure 3-9) contains transistor stages A3Q1 and A3Q2 connected in a balanced mixer configuration. This circuit extracts intelligence from the USB, LSB, ISB, or FSK 500-kHz IF signals supplied by the gain-controlled amplifier. It utilizes a 500-kHz injection signal from the Receiver Mode Selector Electronics Assembly A2A1. The product detector in assembly A2A2 is used during the USB and FSK modes of operation. The product detector is assembly A2A3 is used during the LSB mode of operation. Both product detectors are used during the ISB mode of operation, but neither is used during the AM or CW modes of operation. The following paragraphs describe the operation of the product detector circuits in detail.

3-63. The base operating voltage for transistors A3Q1 and A3Q2 (developed by voltage divider A2R24, A2R25 from the positive 20 vdc applied to it from relay A2K3 on the main frame) is applied through the secondary of transformer A2T4. Resistor A2R23 is the load resistor for transformer A2T4. The emitter operating voltage is applied to transistors A3Q1 and A3Q2 through bias resistors A3R2 and A3R4 from the Mode Selector switch on the front panel. (The emitter operating voltage for the product detector in assembly A2A2 is present only during the USB, FSK, and ISB modes of operation. The emitter operating voltage for the product detector in A2A3 is present only during the LSB and ISB modes of operation.) Because of the center tap (ac ground) on the secondary of transformer A2T4, the 500-kHz IF signals coupled to the bases of the product-detector transistors are of equal magnitude, but 180 degrees out of phase with each other.

3-64. A 500-kHz injection signal is coupled to the emitters of transistors A3Q1 and A3Q2 by capacitors A3C1 and A3C4, respectively. Resistors A3R1 and A3R3 provide isolation between the emitters of transistors A3Q1 and A3Q2. The 500-kHz injection and 500-kHz IF signals are mixed in two stages, resulting in an output consisting of the sum of the two signals, the difference of the two signals, and the two individual signals. Capacitors A3C2 and A3C3 bypass the sum of the two signals to ground. Since the circuit is balanced, the outputs from transistors A3Q1 and A3Q2 that are developed across transformer A3T1 are 180 degrees out of phase with each other. This results in cancelling of the 500-kHz carrier and 500-kHz IF signals. Transformer A3T1 has an audio frequency response that will attenuate (into the noise region) any of the RF signals not previously cancelled. The difference of the two signals is the desired intelligence, and it is developed across the primary of transformer A3T1. The detected intelligence is coupled to the LINE LEVEL control on the front panel by transformer A3T1.

3-65. AM Detector. The AM detector (figure 3-10) contains IF amplifier A3Q3, diode detector A3CR2, and audio amplifier A1Q9. These circuits extract the intelligence from the 500-kHz IF signals from the gain-controlled IF amplifier in

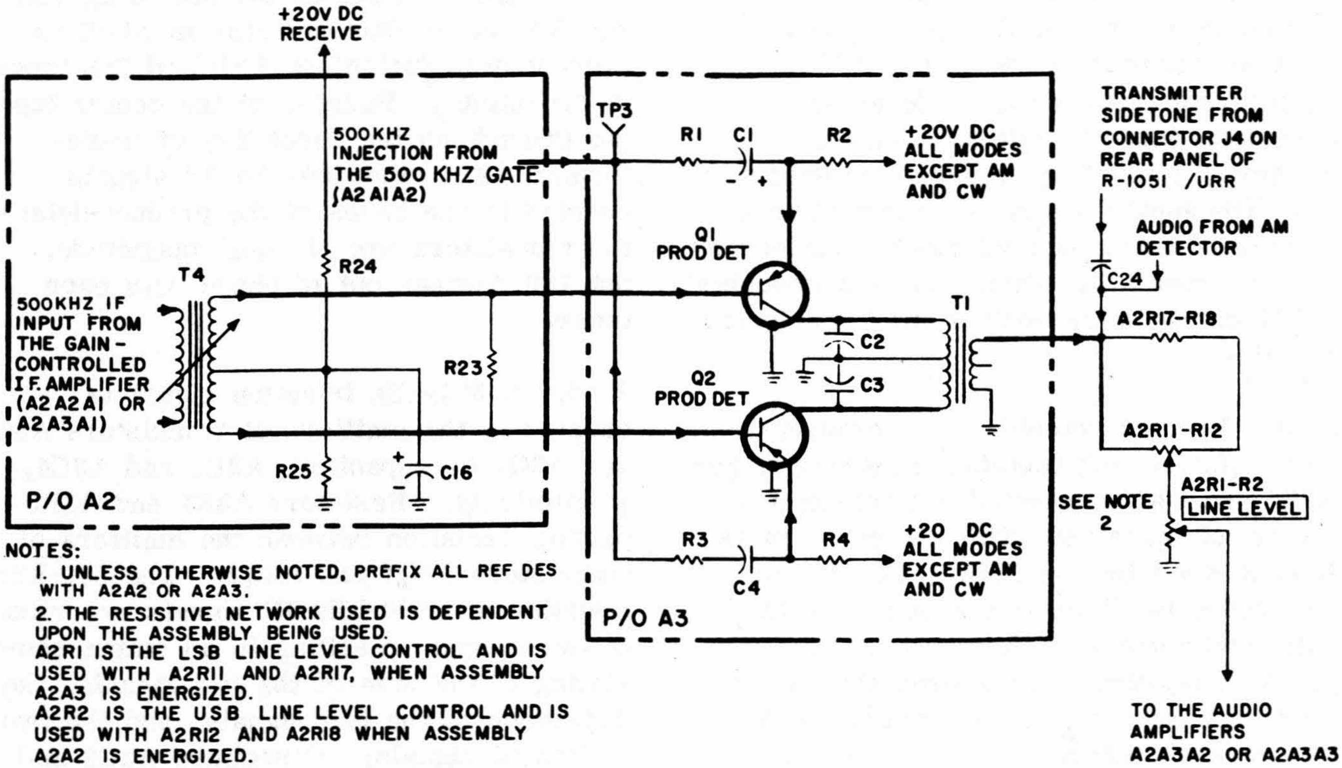


Figure 3-9. Product Detector, Simplified Schematic Diagram

the CW and AM modes of operation, utilizing a BFO signal from the Receiver Mode Selector Electronic Assembly A2A1. The AM detector circuit in A2A2 is not used in any mode of operation. The following paragraphs describe the operation of the AM detector circuit in detail.

3-66. The 500-kHz IF signal is coupled to the base of transistor A3Q3 by transformer A2T4. The base operating voltage for transistor A3Q3 is developed by voltage divider A2R24, A2R25 from the 20 vdc applied through the secondary of transformer A2T4. The emitter operating voltage for amplifier A3Q3 is the 20 vdc applied through diode A3CR1 and resistor A3R5 from the Mode Selector switch on the front panel. Diode A2CR1 prevents any incidental base currents in amplifier A3Q3 from affecting the operating voltage for the product detector when operating in any mode other than AM or CW. The amplified output from amplifier A2Q3 is developed across the tuned circuit consisting of capacitor A3C6 and inductor A3L1. In the CW mode of operation, the BFO input signal is mixed with the 500-kHz IF signal in the tuned circuit. The output from the tuned circuit is detected by diode A3CR2. Capacitor A3C7 bypasses any RF passed by diode A3CR2 to ground. This ensures that the ac voltages developed across A3R6 will be the voice signals extracted from the AM signal or the audio difference between the 500-kHz IF and the BFO frequency during the CW mode of operation.

3-67. The audio signals developed across resistor A3R6 are coupled to the base of

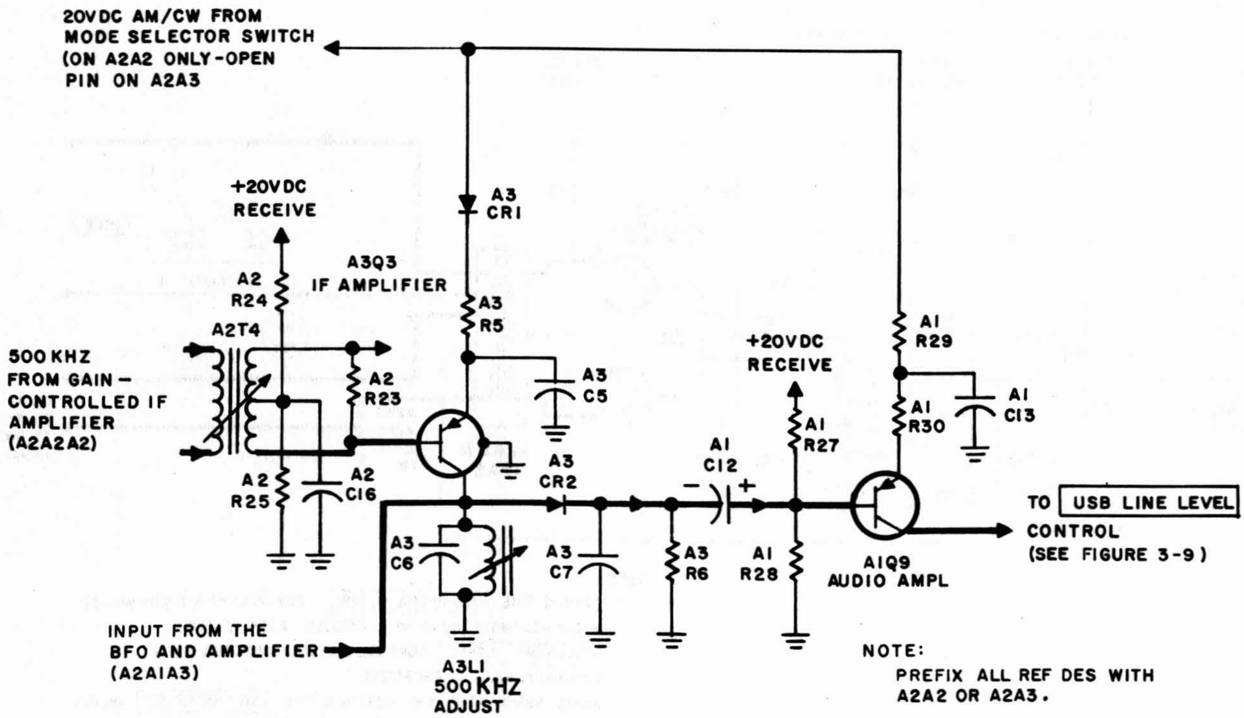
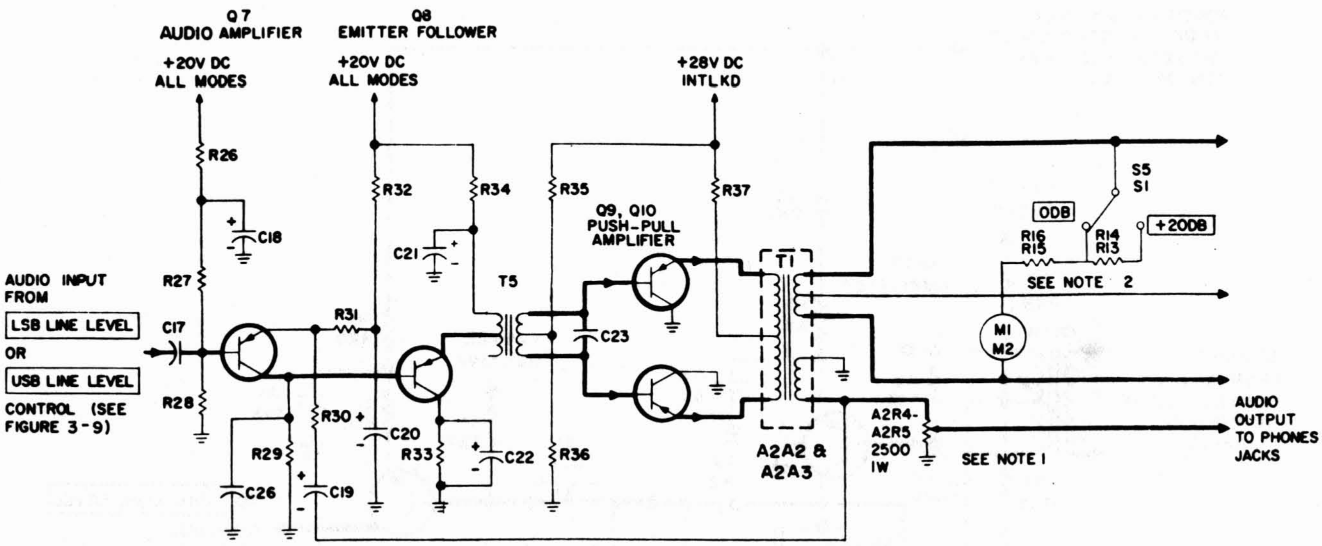


Figure 3-10. AM Detector, Simplified Schematic Diagram

amplifier A1Q9 by capacitor A1C12. The base operating voltage for amplifier A1Q9 is developed by voltage divider A1R27, A1R28 from the positive 20 vdc applied to it from the transmit/receiver relay on the main frame. The emitter operation voltage is applied through emitter resistors A1R29 and A1R30 from the 20 vdc present at the Mode Selector switch on the front panel. Degeneration (developed by resistor A1R30) controls the gain and improves the distortion characteristics of amplifier A1Q9. The amplied output of amplifier A1Q9 is applied to the USB LINE LEVEL control on the front panel (see figure 3-11).

3-68. Audio Amplifier. The audio amplifier (figure 3-11) consists of audio amplifier Q7, emitter follower Q8, and push-pull amplifier Q9, Q10. These circuits amplify the audio signals from the USB or LSB LINE LEVEL control to a level suitable for driving the headset and the remote audio output accessories. The audio amplifier portion of assembly A2A2 is used during the USB, FSK, AM, and CW modes of operation. The audio amplifier portion of assembly A2A3 is used during the LSB mode of operation. Both audio amplifiers are used during the ISB mode of operation. The audio amplifier circuits are energized during transmit operation to allow the operator to monitor the respective sidetones. The following paragraphs describe the operation of the audio amplifier circuit in detail.

3-69. The audio signals present at the USB or LSB LINE LEVEL control are coupled to



NOTES:

1. A2R5 IS THE USB PHONE LEVEL CONTROL AND IS CONNECTED WHEN ASSEMBLY A2A2 IS ENERGIZED. A2R4 IS THE LSB PHONE LEVEL CONTROL AND IS CONNECTED WHEN ASSEMBLY A2A3 IS ENERGIZED.
2. A2R13, A2R15, A2M1, AND A2S1 ARE THE LSB LINE LEVEL METER AND SWITCH CIRCUITS. A2R14, A2R16, A2M2, AND A2S5 ARE THE USB LINE LEVEL METER AND SWITCH CIRCUITS.
3. [ ] INDICATES EQUIPMENT MARKING.
4. PREFIX ALL REF DES WITH A2A3A2 OR A2A2A2

Figure 3-11. Audio Amplifier, Simplified Schematic Diagram

the base of audio amplifier A2Q7 by capacitor C17. (The audio signals are applied from either the product detector, AM detector, or an input connector on the rear of the R-1051/URR.) The operating voltage for amplifier Q7 is developed by voltage divider R26, R27, R28 and emitter resistors R31 and R32 from the positive 20 vdc applied to them from the Mode Selector switch on the front panel. Capacitor C18 and resistor R26 perform a decoupling function to prevent any fluctuations in line voltage from affecting the operation of amplifier Q7. Capacitor C20 is an emitter-bypass capacitor. Negative feedback is produced by coupling the output from transformer T6 back to the emitter of amplifier Q7 through capacitor C19. Resistors R30 and R31 form a voltage divider for providing the desired amount of feedback to the emitter of amplifier Q7. The RC network consisting of capacitor C26 and resistor R29 provides high-frequency suppression to maintain the frequency response of the circuit within the required limitations.

3-70. The amplified audio output from amplifier Q7 is developed across resistor R29 and is applied directly to the base of emitter follower Q8. Operating voltage for emitter follower Q8 is developed by emitter resistor R34 from the positive 20 vdc from the Mode Selector switch on the front panel. Emitter follower Q8 provides the necessary isolation and impedance matching between amplifier Q7 and the push-pull amplifier Q9, Q10. Resistor R33 is the collector resistor, which is bypassed by capacitor C22. The output from emitter follower Q8 is developed across the primary of transformer T5.

3-71. Transformer T5 couples the output from emitter follow Q8 to the bases of push-pull amplifiers Q9 and Q10. The base operating voltage for the push-pull amplifier is developed by voltage divider R35, R36 from the positive 28 vdc from the tune relay located on the main frame. This operating voltage is applied through the secondary of transformer T5. Emitter operating voltage for the push-pull amplifier is the positive 28 vdc from the tune relay on the main frame, which is applied through resistor R37 and the primary of the IF/audio amplifier assembly main transformer T1. The 28 vdc is interlocked through the tune relay to enable the audio output to be shut off when the R-1051/URR is being tuned. This prevents spurious feedback from affecting the tuning. The amplified output from push-pull amplifier Q9, Q10 is developed across the primary of the IF/audio amplifier assembly main transformer T1 which couples the audio signals to the USB or LSB PHONES jacks on the front panel for monitoring with the headset, and to an interconnection box for driving a remote speaker when the R-1051/URR is used as part of a system. The USB or LSB LINE LEVEL meter is connected across the remote audio output. This meter provides an indication of the level of audio on the remote output lines. The USB or LSB LINE LEVEL switches select the meter range to be used.

3-72. Step AGC. The step AGC circuit (figure 3-12) consists of IF amplifiers A1Q7 and Q8, time detector CR5, hang detector CR4, coincidence detector Q6, switch Q5, emitter follower Q4, and dc amplifiers Q1, Q2, and Q3. These circuits produce the automatic gain control (AGC) voltages, which are used in the gain-controlled IF amplifier circuits and the RF amplifier circuit. The step AGC portion of assembly A2A2 is used during the USB, AM, FSK, and CW modes of operation. The step AGC portion of assembly A2A3 is used during the LSB mode of operation. Both step AGC circuits are used during the ISB mode of operation. The following paragraphs describe the operation of the step AGC circuit in detail.

3-73. The 500-kHz IF output from the gain-controlled IF amplifier is coupled to the base of IF amplifier A1Q8 by capacitor C4 in the step AGC. The operating voltage for IF amplifier Q8 is developed by voltage divider R23, R26 and emitter resistor R22 from the positive 20 vdc applied to them from the Mode Selector switch on the front panel. The amplified output from IF amplifier Q8 is developed across the tuned circuit consisting of capacitor C10 and the primary of transformer T2. Resistors R24 and R25 function together to increase the bandwidth of the amplifier circuit. The gain of IF amplifier Q8 is controlled by potentiometer R25. Capacitor C11 is the emitter-bypass capacitor.

3-74. The output from transformer T2 is coupled to the base of IF amplifier Q7 by capacitor C9. Resistor R21 serves as the load for transformer T2. The operating voltage for IF amplifier Q7 is developed by voltage divider R20, R21 and emitter resistor R18 from the 20 vdc applied from the Mode Selector switch on the front panel. The amplified output from IF amplifier Q7 is developed across the tuned circuit consisting of capacitor C8 and the primary of transformer T1. Capacitor C7 is the emitter-bypass capacitor.

3-75. Two outputs, identical in frequency and polarity but differing in amplitude by 20 per cent, are taken from transformer T1. The smaller of the two outputs (designated by E) is applied to hang detector CR4, where it is rectified and used to charge capacitor C3. The resistive network consisting of resistors R16, R15 and thermistor RT1 compensates for variations in the input that result from temperature changes to hang detector CR4. The charge on Capacitor C3 is the emitter bias for coincidence detector Q6. The larger of the two outputs (designated 1.2E) is applied to time detector CR5, where it is rectified and used to charge capacitor C5. The dc voltage at capacitor C5 is the base bias for coincidence detector Q6.

3-76. When a signal is present, coincidence detector Q6 is back-biased, due to the voltage (1.2E) on the base and the voltage (E) on the emitter. When the antenna signal is removed, capacitor C5 discharges through resistor R19, and capacitor C3 discharges through the high input impedance of emitter follower Q4. After a discharge time of approximately 600-ms duration, the voltages on capacitor C5 and capacitor C3 are equal, thereby forward-biasing coincidence detector Q6, and causing it to conduct. Capacitors C3 and C5 then discharge very rapidly to ground through the small emitter-to-collector resistance of coincidence detector Q6. If, during this process, new signal information is received, the step AGC circuit will immediately reset itself on the new information, as described above.

3-77. Due to the continuous nature of an FSK signal, a shorter hang time for the AGC voltage is desired. This is accomplished by reducing the RC time constant in the time detector circuit. In the FSK mode of operation, positive 20 vdc is applied to voltage divider R13, R14 from the Mode Selector switch on the front panel. Since the emitter of switch Q5 is at ground potential, the voltage applied to the base by voltage divider R13, R14 forward-biases switch Q5, causing it to conduct. This terminates resistor R17 at ground through the small collector-to-emitter resistance of switch Q5. Therefore, the discharge path for capacitor C5 is now through the parallel combination of resistors R17 and R19. Since the values of resistors R17 and R19 are identical, the discharge time for capacitor C5 is one-half on that given for the other modes of operation.

3-78. The strength of the input signal determines the level to which capacitor C3 charges and, thereby, determines the base bias on emitter follower Q4. The hang time, of the hang-detector and time-detector circuits are of sufficient duration so that the charge across capacitor C3 remains relatively constant during the reception of intermittent voice signals. The collector voltage for emitter follower Q4 is applied directly from the Mode Selector switch on the front panel. The RF GAIN control is normally set at a maximum sensitivity position (ground). Therefore, when a signal is present, the charge on capacitor C3 will forward-bias emitter follower Q4, causing it to conduct. This results in a voltage across resistor R12, which is the base bias for dc amplifier Q3. The collector voltage for dc amplifier Q3 is developed across resistor R11 from the positive 20 vdc applied to it from the Mode Selector switch on the front panel. Since the emitter of dc amplifier Q3 is essentially at ground (through resistor R9), an output from emitter follower Q4 will forward-bias dc amplifier Q3, causing it to conduct. The resulting voltage developed across emitter resistor R9 is applied to the gain-controlled IF amplifiers as the required AGC voltage. Resistor R9 and capacitor C2 constitute an RC network to filter any leakage (500-kHz IF signal from the AGC voltage.

3-79. With no signal output, the collector of dc amplifier Q3 is biased at 20 vdc. This same voltage is the base bias for dc amplifier Q2. Voltage divider R7, R8 develops a bias of approximately 17.1 vdc on the anode

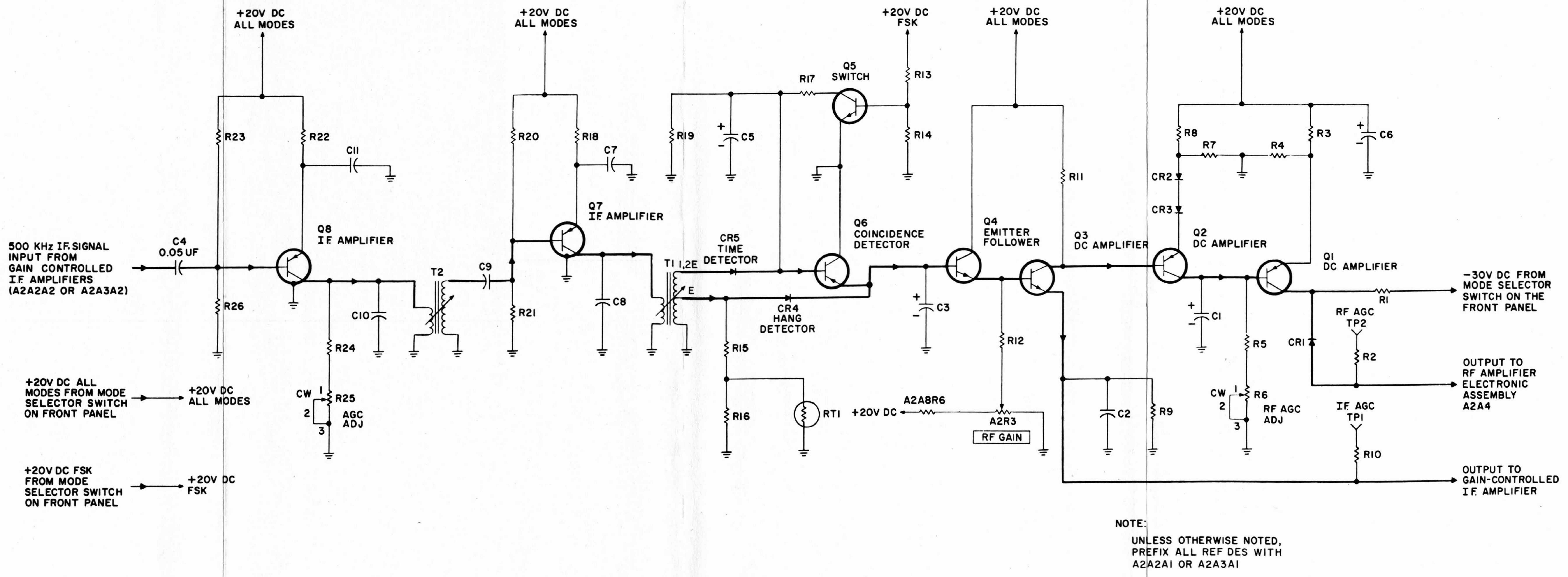


Figure 3-12. Step AGC, Simplified Schematic Diagram

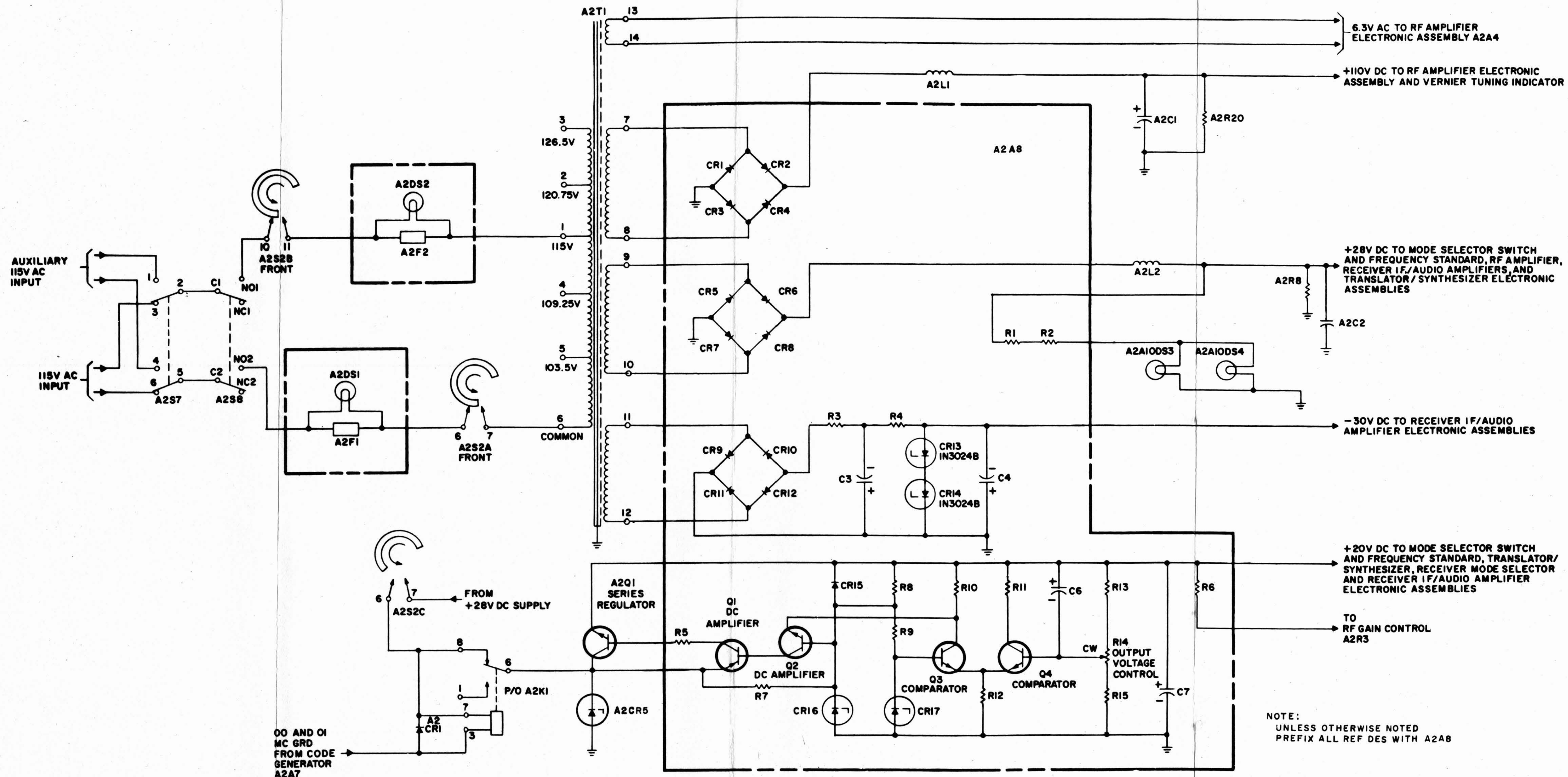


Figure 3-13. Power Supply, Simplified Schematic Diagram

of diode CR2 from the positive 20 vdc applied to it from the Mode Selector switch on the front panel. The signal strength determines the rate of conduction of dc amplifier Q3 and the resulting voltage drop across resistor R11. Therefore, with an increase in signal strength, the voltage drop across resistor R11 will increase, and the base bias on dc amplifier Q2 will decrease. If diodes CR2 and CR3 were not in the emitter circuit of dc amplifier Q2, the signal strength would have to be of such magnitude as to cause a 3-volt drop across resistor R11 before dc amplifier Q2 would become forward-biased and conduct. Since the IF and RF AGC voltages are both taken from the output from dc amplifier Q3, both circuits could have the same AGC threshold. Since the RF circuits of a receiver determine its sensitivity to weak-signal reception, and the application on an AGC voltage to these circuits tends to decrease this weak-signal capability, it is desirable to delay the application of AGC to the RF amplifier circuits until the received signal strength has reached a sufficient signal-to-noise ratio. Therefore, diodes CR2 and CR3 are placed in the emitter circuit of dc amplifier Q2. Together, these diodes drop the emitter voltage of the dc amplifier an additional 0.8 vdc. Therefore, the signal strength must be of sufficient magnitude to cause an additional 0.8-volt drop across resistor R11 before dc amplifier Q2 becomes forward-biased and conducts. Thus, the AGC threshold for the RF amplifier circuits is at a higher signal input level than that of the IF amplifier circuit. The RF GAIN control is used to desensitize the RF and IF amplifier circuits during strong signal receptions. When the RF GAIN control is varied, a dc voltage between 0 and 5 volts is applied to the base of dc amplifier Q2 through resistor R12, thus forcing dc amplifier Q2 to conduct even in the absence of IF signals. The conduction thus caused will be of sufficient magnitude to override the normal IF and RF AGC thresholds, resulting in no delay in the application of the two AGC voltages.

3-80. When dc amplifier Q2 conducts, the output voltage is developed across resistors R5 and R6. This voltage serves as the base bias for dc amplifier Q1 and may be varied by AGC ADJ potentiometer R6. Capacitor C1 attenuates any 500-kHz IF signal leakage. The operating voltage for dc amplifier Q1 is developed by voltage divider R3, R4 from the positive 20 vdc applied to it from the Mode Selector switch on the front panel. With no AGC voltage, the base of dc amplifier Q1 will be at ground potential, forward-biased, unless the RF GAIN control has been adjusted. This saturates dc amplifier Q1, resulting in zero or slightly positive voltage at the collector. Diode CR1 prevents any positive levels from being applied to the RF amplifier circuits. The voltage on the collector of dc amplifier Q1 is the AGC voltage for the RF amplifier circuits. As the signal strength increases, the output from dc amplifier Q2 increases, decreasing the forward-biasing of dc amplifier Q1. The collector of dc amplifier Q1 goes more negative as the signal strength increases. When the signal strength is of sufficient magnitude to cut off dc amplifier Q1, the -30 vdc will be the AGC voltage applied to the RF amplifier circuit. If the RF GAIN control is set to some position other than for maximum sensitivity, the conduction of dc amplifier Q1 will no longer be dependent only on the signal strength.

3-81. FREQUENCY STANDARD ELECTRONIC ASSEMBLY A2A5. Frequency Standard Electronic Assembly A2A5 is a depot-repairable assembly.

3-82. POWER SUPPLY ELECTRONIC ASSEMBLY A2A8. Power Supply Electronic Assembly A2A8 (figure 3-13) consists of the +110-vdc supply, the +28-vdc supply, the -30-vdc supply, and the regulated +20-vdc supply. These circuits supply operating power to all the circuits of the R-1051/URR. The following paragraphs describe the operation of the power supply in detail.

3-83. All power is derived from the nominal 115-vac line, which is applied through switches A2S7, A2S8, and A2S2 and fuses A2F1 and A2F2 to the primary power transformer A2T1. Indicator lamps A2DS1 and A2DS2 will light if fuses A2F1 and A2F2 open. The primary of transformer A2T1 is tapped, so that, in locations where line voltages differ slightly from the normal 115 vac on a reasonably permanent basis, one can compensate for the difference by reconnecting to a new tap.

3-84. The 6.3 vac from terminals 13 and 14 of the secondary of transformer A2T1 supplies power to the filaments of RF amplifiers V1 and V2 in RF Amplifier Electronic Assembly A2A4. The output from terminals 7 and 8 of transformer A2T1 is applied to a bridge rectifier consisting of diodes A2A8CR1 through CR4; the output of the bridge is applied to a choke input filter consisting of choke A2L1 and capacitor A2C1. The output of the choke input filter, +110 vdc, is used to supply plate and screen voltage to RF amplifiers V1 and V2 in RF Amplifier Electronic Assembly A2A4, and to light the vernier tuning indicator on the front panel. Resistor A2R20 is a bleeder load for the +110-vdc supply. The output from terminals 9 and 10 of transformer A2T1 is applied to a bridge rectifier consisting of diodes A2A8CR5 through CR8; the output of the bridge is applied to a choke input filter consisting of choke A2L2 and capacitor A2C2. The output of the choke input filter, +28 vdc, is used in the RF Amplifier, Frequency Standard, Receiver IF/Audio Amplifier, and Translator/Synthesizer Electronic Assemblies A2A4, A2A5, A2A2 and A2A3, and A2A6. A2CR5 reduces transits on the +28 vdc line.

3-85. The regulated +20-vdc supply is derived from the +28-volt supply. Resistor A2R8 is the bleeder load for the +28-vdc supply. When primary power is supplied, lamps A2A10DS3 and A2A10DS4 light, illuminating the frequency display windows above the MCS and KCS controls on the front panel. Resistors A2A8R1 and R2 are series-dropping resistors. The output from terminals 11 and 12 of transformer A2T1 is applied to a bridge rectifier consisting of diodes A2A8CR9 through CR12; the output of the bridge is applied to a filter network consisting of resistor R3 and capacitor C3. The output from this network is applied to resistor R4 and zener diodes CR13 and CR14. Since the zener voltage of each diode is 15 vdc, the output from this network is regulated -30 vdc. Capacitor C4 is used to provide additional filtering. The -30 vdc is used in the step AGC circuit of Receiver IF/Audio Amplifier Electronic Assembly A2A2 and A2A3.

3-86. The regulated +20-vdc supply consists of series regulator A2Q1, dc amplifiers Q1 and Q2, comparators Q3 and Q4, 12-vdc zener diode CR16, and 4.7-vdc Zener diode CR17. This circuit provides a constant +20 vdc regardless of the load. The input voltage of +28 vdc is applied to the collector of series regulator A2Q1, through contacts 7 and 6 of section C (front) of the Mode Selector switch in any position other than OFF or STD BY, and contacts 8 and 6 of relay A2K1. If the MCS controls are set in their 00 or 01 positions, a ground is applied to relay A2K1, causing it to energize. This cuts off the input to the +20-vdc supply unless the operating frequency is 2.0 to 30.0 MHz. The collector-to-emitter resistance is directly proportional to the amount of base-to-emitter current. The output voltage, +20 vdc in this case, is selected by adjusting output voltage control A2A8R14, which determines the bias voltage on comparator Q4. The bias voltage determines the amount of emitter current flow, thereby determining the voltage across emitter resistor R12. Since the bias voltage on the base of comparator Q3 is held constant by zener diode CR17, the collector current flow will be determined by the emitter voltage. The emitter of comparator Q3 is connected to the emitter of comparator Q4; therefore, collector current of comparator Q3 will be controlled by the bias voltage on comparator Q4. Since the base voltage of dc amplifier Q2 is held constant by zener diode CR16, the collector current flow is controlled by the collector voltage on comparator Q3. The collector current of dc amplifier Q1 is controlled by the collector current of dc amplifier Q2. The collector current through resistor R5 determines the bias voltage on the base of series regulator A2Q1, which, in turn, determines the emitter-to-collector resistance.

3-87. In order to understand the operation of the regulated +20-vdc supply more thoroughly, assume that some of the load on the +20-vdc supply has been removed. This condition causes the base-bias voltage of comparator A2A8Q4 to increase, thereby increasing the voltage across resistor R12. This increase causes a decrease in the base-to-emitter voltage to comparator Q3, thereby causing an increase in collector voltage. Since the emitter of the dc amplifier is connected to the collector of comparator Q3, and the base voltage is held constant by zener diode CR16, the increase in collector voltage in comparator Q3 causes the collector current to decrease in dc amplifier Q2. Since the collector of dc amplifier Q2 is connected to the base of dc amplifier Q1, the decrease in collector current in dc amplifier Q2 causes a decrease in collector current in dc amplifier Q1. Since the collector of dc amplifier Q1 is connected to the base of series regulator A2Q1 through resistor A2A8R5, a decrease in collector current in dc amplifier Q1 causes the collector-to-emitter resistance to increase, thereby causing the output voltage to return to +20 vdc. Resistor R5 acts as a parasitic suppressor. Diode CR15 protects the circuit if the +20-vdc line is accidentally grounded. Normally, diode CR15 is back-biased by the +20 vdc on its anode and +12 vdc on its cathode. If the +20-vdc line becomes grounded, the diode will be forward-biased, dropping the base of dc amplifier Q2 to ground potential and preventing damaging current flow in dc amplifiers Q1 and Q2.

3-88. MHz DIGITAL TUNING CIRCUITS. The MHz tuning circuits (figure 3-14) consist of Code Generator Electronic Assembly A2A7; switch S1, motor B1, and relay K1 in RF Amplifier Electronic Assembly A2A4; and switch S1, motor B1, and relay K1 in 1 MC Synthesizer Electronic Subassembly A2A6A1. The code generator consists of switches A2A7S3 and S4, which form three parallel, open-seeking, tuning circuits, each employing a five-wire coding scheme. Two of these tuning circuits generate a tuning code for positioning the turret assembly in the RF amplifier and the crystal switch in the 1 MC Synthesizer. The third tuning circuit is not used in tuning the R-1051/URR. The following paragraphs describe the tuning circuits for the R-1051/URR in detail.

3-89. Switches A2A7S3 and S4 are controlled by the 10 MCS and 1 MCS controls on the front panel. These two switches are analogously represented (figure 3-14) by sections A, B, C, D, and E; sections A and C form two 28-position masters, and sections B and D form two 28-position images. For the schematic diagram of these switches, see figure 5-13. Section A establishes the tuning code for turret motor switch A2A4S1 in the rf amplifier, and section C establishes the tuning code for crystal motor switch A2A6A1S1 in the MC synthesizer. The tuning code generated by section A is one of

28 series of opens and grounds; each series represents one of the 28 tuning positions of turret switch A2A4S1 (refer to table 3-1). Although section C is also a 28-position switch, the tuning code it generates is one of 17 series of opens and grounds; each series represents one of the 17 positions of crystal switch A2A6A1S1 (refer to table 3-1).

3-90. Section A (master) applies the coded information to turret motor switch A2A4S1-A (master). This establishes a ground path through the common contact of S1-A to pin 7 of turret motor relay K1; since position 28 vdc is applied to pin 3, the ground causes relay K1 to energize. When turret motor relay K1 energizes, turret motor B1 is energized by application of positive 28 vdc through contacts 5 and 2 of turret motor relay K1. When energized, turret motor B1 rotates turret motor switch S1 until the complement of the code on section A (master) is reflected by turret motor switch S1-A (master). Whenever the codes on the two masters are complementary, the ground path to turret motor relay K1 is broken, causing it to deenergize. Similarly, section C generates a code to energize crystal motor A2A6AB1, and to rotate crystal motor switch S1 to the position established by the 1 and 10 MCS controls on the front panel.

3-91. The two image switch sections in code generator A2A7S3 and S4 (sections B and D), turret motor switch section A2A4S1-B, and crystal motor switch section A2A6A1S1-B, always have the complementary code of their respective masters. This ensures that the ground, or grounds, will be applied to the masters whenever a new code is selected. This is accomplished by the cut of the wafer, which is the exact mirror image of the respective master. All contacts appearing as opens at the master appear as grounds at the image, and vice versa.

3-92. In figure 3-14, code generator switch sections A and B are positioned to represent the code 10100 (x2.xxx MHz). If the MCS controls on the front panel were set at x3.xxx MHz, sections A and B would be rotated one position counterclockwise, creating the new code 01000 (refer to table 3-1). A ground path would be established to pin 7 of turret motor relay A2A4K1 through code line 2 and turret motor switch S1-A. This energizes turret motor relay K1 which in turn energizes turret motor B1. This dynamically brakes turret motor B1. If the MCS controls on the front panel were set to 22.xxx MHz rather than x2.xxx MHz, the code generated by section A would have been 10000. As shown in figure 3-14, there is no ground path directly between the two masters. This time the ground path would be through code line 1 to turret motor switch S1-B (image), code line 3 to section B (image), and code line 2 to turret motor switch S1-A (master). Therefore, the ground path to turret motor relay K1 is e established using the images. In a like manner, any code can be traced, and the tuning of turret motor switch S1 will be accomplished for any code shown in table 3-1. Similary, the codes shown in table 3-1 can energize crystal motor B1 and tune crystal motor switch S1 to the position established by the MCS controls on the front panel.

3-93. Section E of the code generator switches generates the hi-/lo-nand control-line codes. The wiper of section E remains open until it is placed in an MCS position that has a tab. At this time, ground is applied to hi-lo-filter relay A2K2, causing it to energize. When relay A2K2 is energized, ground is placed on the hi-/lo-band control line. When hi-/lo-filter relay A2K2 is deenergized, positive 20 vdc is applied to the hi-/lo-band control line.

3-94. kHz DIGITAL TUNING SYSTEM. The kHz digital tuning system (figures 5-17

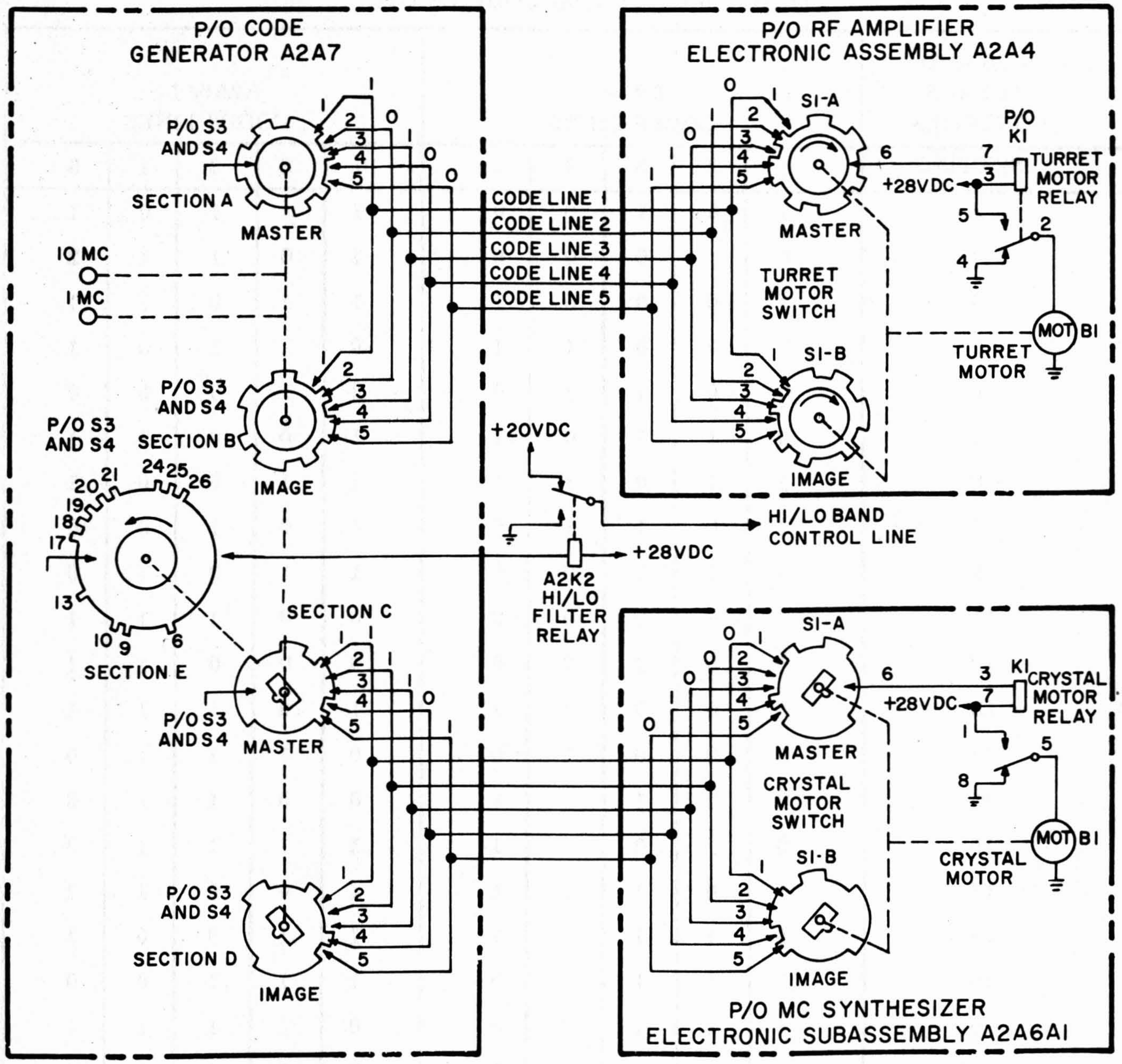


Figure 3-14. MHz Digital Tuning, Simplified Schematic Diagram

through 5-19) consists of mechanical positioning of the 100-, 10-, and 1-kHz oscillator circuits. Each of three front-panel KCS controls has a digital dial, chain-drive mechanism, couplings, and detents for positive positioning of tuning shafts in RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronics Assembly A2A6. The 1 KCS control selects and centers the desired digit in the viewing window as it positions the 1-kHz index wheel on the 1 and 10 KC Synthesizer Electronic Subassembly A2A6A3 fully in its detent. The 1 KCS

TABLE 3-1. TUNING CODE CHART

MCS AND 100 KCS CONTROLS	A2A4 CODES LINES					A2A6A1 CODES LINES				
SETTING	1	2	3	4	5	1	2	3	4	5
2	1	0	1	0	0	1	1	1	0	1
3	0	1	0	0	0	1	0	1	1	2
4	1	0	0	0	1	1	1	0	1	1
5	0	0	0	1	1	0	1	1	0	1
6	0	0	1	1	0	0	1	0	0	0
7	0	1	1	0	1	1	0	0	1	1
8	1	1	0	1	1	1	1	0	0	1
9	1	0	1	1	0	1	0	1	0	0
10	0	1	1	0	0	1	1	0	1	0
11	1	1	0	0	0	0	0	1	1	1
12	1	0	0	0	0	0	0	0	1	1
13	0	0	0	0	1	1	0	1	1	1
14	0	0	0	1	0	0	1	1	1	0
15	0	0	1	0	1	0	0	1	1	0
16	0	1	0	1	1	1	1	1	1	0
17	1	0	1	1	1	1	0	0	1	1
18	0	1	1	1	1	1	1	0	0	1
19	1	1	1	1	0	1	1	1	0	0
20	1	1	1	0	0	0	1	1	1	1
21	1	1	0	0	1	0	0	1	1	1
22	1	0	0	1	0	0	0	0	0	1
23	0	0	1	0	0	1	1	1	1	0
24	0	1	0	0	1	0	1	1	1	0
25	1	0	0	1	1	0	0	1	1	0
26	0	0	1	1	1	1	1	1	1	0
27	0	1	1	1	0	0	0	0	1	1
28	1	1	1	0	1	0	0	1	1	1
29	1	1	0	1	0	0	1	1	1	1

control positions the 10-kHz indexed coupler wheel on RF amplifier to the exact same position. Coupler wheels in the RF amplifier are not detented.

3-95. The 100-kHz positioning system functions the same as the 10-kHz positioning system. The detent spring arms on the dual sprocket assembly are positioned to give fully seated detents as the same position in which the translator/synthesizer index wheel is fully seated. The hub clamps allow positioning of each chassis coupler slot without disrupting the chain mechanism and system. The hub clamp also allows coarse adjustment of the index wheel. The hex-head screw adjustment allows alignment between the two associated couplers, i.e., the RF amplifier and the translator/synthesizer.

3-96. RELAY AND CONTROL SWITCHING. The control switching circuits (figure 5-1) consist of switches A2S2, S7, and S9 and relays K1 through K3. These circuits which form a part of main frame, energize and key the applicable circuits according to the selected mode operation. The following paragraphs describe the control switching circuits in detail.

3-97. Primary power for the R-1051/URR is received via pins R and S of connector A1A1J4 or pins A and C of connector A1A1J3, depending upon whether the R-1051/URR is operated independently or in an AN/URC-1 system. For independent operation, AUX/NORM power switch A2S7 is set to the AUX position to connect 115 vac from A1A1J3-A and C to interlock switch A2S8. For system operation, AUX/NORM power switch A2S7 is set to the NORM position to connect 115 vac from A1A1J4-R and S to interlock switch A2S8.

3-98. From interlock switch A2S8, one side of the 115-vac line (A1A1J4-S) passes through fuse A2F1 to contact 6 of the front part of section A of Mode Selector switch A2S2, which is an open circuit in the OFF position. The other side of the 115-vac line (A1A1J4-R) comes from interlock switch A2S8 and goes directly to contact 10 of the front part of section B of Mode Selector switch A2S2, which also is an open circuit in the OFF position. In the STD BY position of Mode Selector switch A2S2, one side of the 115-vac line is switched directly to terminal 6 of power transformer A2T1. The other side of the 115-vac line is switched through section B of switch A2S2 and fuse A2F2 to terminal 1 of power transformer A2T1. Therefore, the power input circuit of the R-1051/URR is completed, and transformer A2T1 and the 6.3-vac, 100-vdc, -30-vdc, and 28-vdc power supplies are energized. The 28 vdc is routed to Frequency Standard Electronic Assembly A2A5, where the 5-MHz oscillator and its associated oven-control circuits are energized. The 110-vdc and -30-vdc power supplies are not used in the STD BY position of Mode Selector switch A2S2.

3-99. In any on position of Mode Selector switch A2S2 (e.g., USB, CW), 28 vdc from Power Supply Electronic Assembly A2A8 is routed through contacts 7 and 6 of the front part of section C of switch A2S2. This 28 vdc is applied to RF Amplifier Electronic Assembly A2A4, 1 MC Synthesizer Electronic Subassembly A2A6A1, and contact 6 of SIMPLEX/DUPLEX switch A2S9. It is also applied to contact 8 and coil contact 7 of tune relay A2K1 and coil contact 7 of hi-/lo-filter relay A2K2. For operation of hi-/lo-filter relay A2K2, see paragraph 3-93. When tune relay A2K1 is deenergized, the 28 vdc on contact 8 is routed through contact 6 to contacts 4 and 6 on the rear part of section D of switch A2S2, and also to the regulated 20-vdc supply, providing energizing voltage (see paragraph 3-86). The 20 vdc from power supply A2A8 is routed through contacts 2 and 4 of transmit/receive relay A2K3 to pin 4 of connector A2J17 and pin 6 of connector A2J16 on Receiver Mode Selector Electronic Assembly A2A1. Tune relay A2K1 is energized by a ground applied to coil contact 3 from pin 7 of connector A2J8 on Code Generator Electronic Assembly A2A7, whenever the MCS controls are tuned to 00 or 01, or whenever the R-1051/URR is being tuned.

3-100. Provisions are made on pins J and K of connector A1A1J4 on the rear panel of the R-1051/URR to receive 28 vdc and a ground keyline, respectively, from Radio Transmitter T-827/URT, when used with the AN/WRC-1. When SIMPLEX/DUPLEX switch A2S9 is in the SIMPLEX position, the 28 vdc will be routed through contacts 4 and 5 to coil contact 7 of transmit/receive relay A2K3. When the T-827/URT is energized, a ground is routed through contacts 1 and 2 of switch A2S9 and contacts 4 and 2 of tune relay A2K1 to coil contact 3 of transmit/receive relay A2K3, thereby energizing it. When transmit/receive relay A2K3 is energized, the 110-vdc path through contacts 6 and 8 of A2K3 is broken and the 20-vdc path through contacts 2 and 4 of relay A2K3 is broken. When SIMPLEX/DUPLEX switch A2S9 is in the DUPLEX position, transmit/receive relay A2K3 is energized during tuning by 28 vdc routed through contacts 6 and 5 of switch A2S9 to coil contact 7 of relay A2K3 and by a ground routed through contacts 5 and 2 of tune relay A2K1 to coil contact 3 of relay A2K3.

SECTION 4

TROUBLESHOOTING

4-1. INTRODUCTION.

4-2. OVERALL FAULT ISOLATION AND REPAIR. When the R-1051/URR is suspected of having an operational malfunction the technician must verify there is a malfunction, isolate and perform repairs, make final adjustments, and perform the overall test to ensure receiver meets all operational requirements. Figure 4-1 provides a logical sequence of performing these steps to return the equipment to an operational condition. Study figure 4-1 to aid in understanding of the overall fault isolation and repair method used. Read paragraph 4-7 on maintenance procedure, evaluate all systems and use figure 4-1 for guidance in fault isolation of malfunction, repair, making adjustments and overall receiver performance test.

4-3. TROUBLESHOOTING INDEX. Table 4-1 breaks down the R-1051/URR into assemblies for separate troubleshooting and identifies text and illustrations necessary to troubleshoot and evaluate the performance of each assembly.

4-4. TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING. Test equipment and accessories required to perform the troubleshooting procedures described in this section are identified in table 4-2.

4-5. WARNING AND CAUTION. Observe the following warning and caution at all times when troubleshooting this equipment:

WARNING

115 volts ac is present on the rear side of the front panel at all times except when the power switch external to the equipment is off or the power cables are removed from connectors A1A1J3 and A1A1J4 at the rear of the receiver case.

CAUTION

Fault isolation by indiscriminate substitution of assemblies should not be practiced as a troubleshooting technique. This method may result in damage to the mainframe chassis, excessive voltage applied to a newly installed assembly, and alignment-adjustment problems. If an urgency arises to justify substituting operational assemblies as a means of rapid fault isolation, the following precautions should be taken:

a. Insure the Manufacturer's Part Number or the National Stock Number(NSN) of the assembly to be installed is the correct replacement for use in the R-1051/URR.

b. Perform step 2 of table 4-3 to insure that the 20 vdc supply is between 19.5 and 20.5 volts.

c. After exchange, perform paragraph 5-57 and 5-80 to insure receiver is completely operational.

d. If malfunction is still present, install original assembly and proceed with the fault isolation and repair procedure in accordance with figure 4-1.

4-6. MAINTENANCE TURN-ON PROCEDURE.

4-7. GENERAL. Table 4-3 is to be used as an aid in troubleshooting after an operational check has confirmed the existence of a receiver malfunction. The procedure is not intended to be used as an operational check, but as an aid in obtaining a sufficient number of symptoms to isolate a malfunction. When a symptom is observed that tends to indicate the area of malfunction, continue with the procedure and make brief notes of all other observed symptoms, which should be classified under a heading of noise or signal for various modes and frequencies of operation until the malfunction area is obvious. Upon completion of the maintenance turn-on procedure, see figure 4-2, which is keyed to include known failure data and the most likely causes in the usual operating environments. If the faulty assembly is obvious at this point in troubleshooting, use the appropriate assembly troubleshooting procedure in paragraphs 4-58 through 4-103 to isolate the fault within the assembly. If the faulty assembly is not obvious, complete the overall receiver performance test in paragraph 5-80.

4-8. REFERENCE NOTES. The maintenance turn-on procedure should be performed only after the technician has verified the existence of a malfunction. Perform the known-station receiver check in paragraph 5-82 to confirm the existence of a malfunction. If the only problem appears to be poor reception or off-frequency signals, the complete overall receiver performance test in paragraph 5-80 should be performed prior to the maintenance turnon procedure. Ensure that the associated antenna, phones, remote speakers, patch panel, and other external equipment are not the cause of the indicated receiver malfunction. Continue with step 1 of table 4-3.

4-9. If 115 vac input is present, continue with maintenance turn-on procedure through step 3. If the 28-volt measurement in step 3 is normal, refer to paragraph 5-27 for replacement of panel lamps. If 115 vac is not present, refer to paragraph 4-35.

4-10. A reading above 22 volts indicates 20-volt series regulator A2Q1 or power supply A2A8 (printed circuit board 20-volt regulation circuitry) may be partially or completely shorted to the 28-vdc source. Refer to paragraph 4-32.

4-11. Most installations will have an 5 MHz input cable from Frequency Standard AN/URQ-10 or AM-2123/A amplifier connected directly to EXT 5MC IN connector A1J25 on the rear of the receiver case. The amplitude of the external 5MHz input should not exceed 2 volts to insure proper operation of the compare lamp circuitry with all types A2A5 assemblies. If no system is available, an operational equipment having a similar 5-MHz frequency standard may be used by placing that equipment's frequency standard switch in the compare

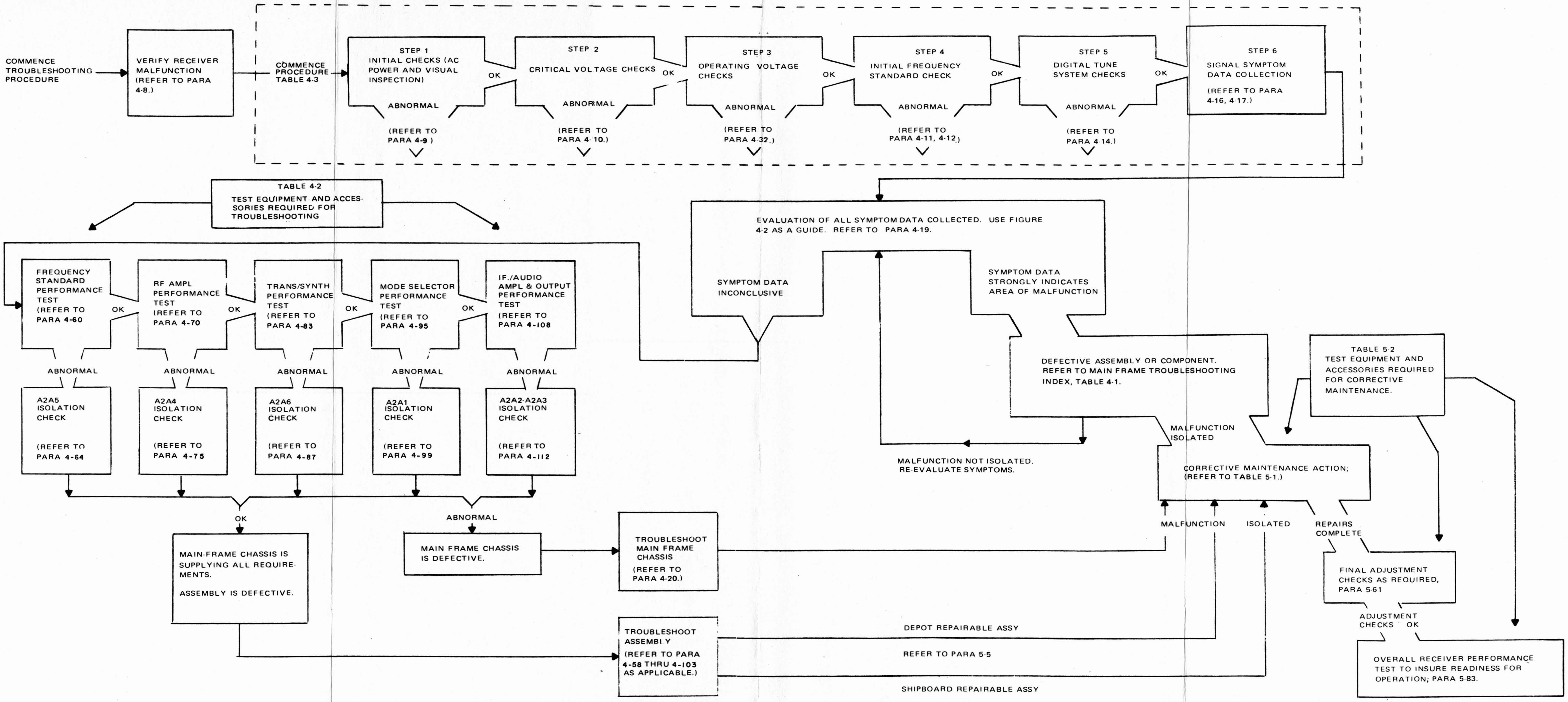


Figure 4-1. Radio Receiver R-1051/URR, Overall Fault Isolation and Repair Diagram

TABLE 4-1. TROUBLESHOOTING INDEX

ASSEMBLY	TROUBLE-SHOOTING PARAGRAPH	TEST POINT LOCATION DIAGRAM FIGURE	PERFORMANCE TEST PARAGRAPH	ISOLATION CHECKS PARAGRAPH	SERVICING BLOCK DIA-GRAM FIG
Chassis and Front Panel A2 (Main Frame)	4-20	4-3 thru 4-5	-	4-23 thru 4-55	4-22
Receiver Mode Selector Electronic Assembly A2A1**	4-91	5-20	4-95	4-99	4-23
Receiver IF Audio Amplifier Electronic Assembly A2A2 or A2A3**	4-103	5-20	4-108	4-112	4-24, 25
RF Amplifier Electronic Assembly A2A4**	4-68	5-20	4-70	4-75	4-26
Frequency Standard Electronic Assembly A2A5**	4-58	5-20	4-60	4-64	4-27
Translator/Synthesizer Electronic Assembly A2A6** and A2A11	4-79	5-20	4-83	4-87	4-28 thru 4-33
Code Generator Electronic Assembly A2A7	4-24	4-13, 4-14	4-14, 4-24	4-24 thru 4-31	-
Power Supply Electronic Assembly A2A8	4-32	4-3, 5-25	Table 4-3 Step 3	4-32 thru 4-45	4-22
Antenna Overload Electronic Assembly A2A9	4-46	5-27	4-70	4-75	4-22
Light Panel Electronic Assembly A2A10	4-49	5-19	-	-	-

* Indicates test or check is incidental to or implied by proper performance of rf amplifier or translator/synthesizer

** Depot-repairable assemblies.

TABLE 4-2. TEST EQUIPMENT AND ACCESSORIES REQUIRED FOR TROUBLESHOOTING

CATEGORY	RECOMMENDED	ALTERNATE
Frequency Standard	AN/URQ-9	AN/URQ-10
Frequency Counter	AN/USM-207	CAQI-5245-L
RF Signal Generator	CAQI-606-A	SG-582/U
RF Voltmeter	CCVO-91DA	CCVA-91H CCVO-91CA
Electronic Multimeter	AN/USM-116( )	CAQI-410B
Multimeter	AN/USM-311	AN/PSM-4( )
AC Voltmeter	ME-6( )/U	CBFM-300
Transistor Tester	AN/USM-206	TS-1100A/U
Oscilloscope	AN/USM-281( )	AN/USM-140( )
Headphones	General Purpose	
Adapter, BNC to N	UG-201/U	
*RF Insert Connector, Female	P/N DM 53740-5008	
*RF Insert Connector, Male	P/N DM 53743-5014	

CAUTION

*Remove locking clip ring prior to using for troubleshooting.

position and connecting a 50-ohm coaxial jumper cable from the INT 5MC OUT connector on the operational equipment to the EXT 5MC IN connector A1J25 on the defective R-1051/URR. If this is not feasible, obtain a frequency counter and check for 5 MHz at INT 5MC OUT connector A1J24, with switch in compare position. The frequency need be only within 10 Hz for initial troubleshooting. Do not adjust the frequency of the frequency standard. When the COMP/INT/EXT switch S1 on top of Frequency Standard Electronic Assembly A2A5 is in the EXT position, only the internal 5-MHz oscillator circuit is not used. The multiplier and divider circuits must still be operational. Refer to paragraph 4-59 for information on various type frequency standard switch positions. If noise is heard in the R-1051/URR output in some modes, and indicator A2A5A1DS1 flickers at some visible rate, the frequency standard is operating but not necessarily at 5 MHz $\pm$0.5 Hz, as required for proper operation. The various types of frequency standard A2A5 used in the R-1051/URR will provide different symptoms on indicator A2A5A1DS1 when operation is normal. Some types light brightly when the switch is in the COMP position without an external 5-MHz input to A1J25. Other frequency standard indicators are barely visible without an external input. Although inconclusive by itself, a low noise level heard at the LSB or USB PHONES jack provides some assurance that the frequency standard, mode selector, and IF/audio amplifier (LSB or USB) are probably passing signals. This indication is true only if the gain adjustments in the IF/audio amplifier are set approximately correct. With the frequency standard removed, low noise will normally be present at the R-1051/URR output in the AM or CW mode, unless there is a malfunction in the mode selector or the IF/audio amplifier. Multiple malfunctions will be greatly reduced (cutting troubleshooting and repair time) if the frequency standard is not adjusted unless the R-1051/URR has been in standby or operate for a minimum of 24 hours. Momentary loss of power during warmup will present no problem. Flickering of indicator A2A5A1DS1 at some visible rate does not cause loss of signals, and flickering should be present after 10 minutes of power turnon. Usually, the R-1051/URR will operate satisfactorily after a 10-minute warmup, except in multiplex operation. For best results, set the R-1051/URR on standby or in an operate mode when not in use. Where the AM-2123/U amplifier and/or AN/URQ-10 frequency distribution system is installed, set the frequency standard switch A2A5S1 to EXT for normal use. Set the switch to COMP only to check and adjust the frequency standard's internal oscillator periodically, to ensure availability (in INT position) if the external distribution system fails. Refer to final adjustments in paragraph 5-57 for adjustment of the frequency standard. If the frequency standard is replaced, do not adjust the frequency for several days to avoid false symptoms of malfunction and the necessity of readjustment after warmup. Continue with step 4 of table 4-3.

4-12. If a beatnote was heard in step 4e and could be zeroed, the frequency standard is producing 500 kHz, and some noise should be present in the R-1051/URR output. If the beatnote could not be zeroed by the BFO FREQ control, the 500-kHz output of the frequency standard may be defective. Additional data are provided in paragraph 4-13.

4-13. If step 4 conditions are normal and initial conclusions are that the frequency standard appears to be performing adequately, continue to step 5 of table 4-3. If the frequency standard is strongly suspected as being defective (by an indication such as indicator A2A5A1DS1 not flickering at some visual rate), refer to frequency standard troubleshooting in paragraph 4-58.

4-14. Step 5 provides a checkout procedure to determine if the digital motor drive system is functioning mechanically to set up all frequencies correctly. Perform step 5 without altering the procedure. Even when the tune system appears completely operational, step 5 should be performed to observe each mode of operation, noise levels at various frequencies, signals in certain modes and at certain frequencies, and other data. The technician is then provided with all of the symptoms available to aid him in the isolation of the malfunction. Take notes of symptoms observed during step 5 for evaluation after completion of step 6. As soon as any type of indication is obtained, vary all controls which should have an effect on receiver output in that mode. Determine if controls and associated circuits are operational to aid step 6 evaluation. Continue with step 5 of table 4-3.

4-15. If all indications of the digital tuning system are normal, proceed to step 6 of table 4-3. If only several MHz digits were faulty (no noise or improper rotation) and this problem is not the prime malfunction in the receiver, continue to step 6, but check out and repair the tuning problem after the prime malfunction has been located and repaired. If a major malfunction is indicated, refer to paragraph 4-51 for kHz digital tuning system troubleshooting or to paragraph 4-55 for MHz digital tuning system troubleshooting. If noise is abnormally low at certain frequencies only, ensure the kHz and MHz digital tuning systems are operational, then perform RF amplifier and translator/synthesizer performance tests in paragraph 4-70 and 4-83.

4-16. Step 6 should be performed only after completion of steps 1 through 5, or if the following conditions exist:

a. Technician has confirmed there is a malfunction.

b. The ac power distribution circuits appear normal.

c. A visual inspection of equipment has resulted in no apparent problems.

d. The dc power supply voltages are present and measure correct values.

e. The frequency standard indicator A2A5A1DS1 has indicated some visible change in intensity when compared to an external 5-MHz standard, or a frequency counter has indicated 5 MHz ±10 Hz is present.

f. The digital tuning system appears to be operational.

Most symptoms will be affecting signal flow. Step 6 provides various signal/noise/mode/frequency checks which will aid in isolating many malfunctions. The degree of assistance provided by step 6 depends on the technician's ability to evaluate all symptoms. Many malfunctions are possible with only one or two symptoms. Obtaining all symptoms present will aid in pin pointing the area of malfunction. Perform the checks in step 6 and make notes of symptoms. Step 6 is to be used only as an aid in obtaining symptoms. After completion, see the fault isolation guide, figure 4-2, to evaluate the notes taken in steps 5 and 6. Read paragraph 4-7, and then continue with step 6 of table 4-3.

4-17. Comments on noise levels in table 4-3 are for initial symptom recognition only. Noise symptoms are a very useful aid in troubleshooting. If noise is amplified and passed through the selective filters in the signal-flow path, signals will probably also pass. To define noise levels correctly, measurements are required. However, for initial observations to obtain data in isolating malfunctions, noise is broadly define as:

a. No noticeable noise is that amount of noise an operator would have difficulty hearing at the output with controls at maximum. In an operational R-1051/URR, it is the noise present in the output when the mode selector has been removed, and would measure approximately 0.001 to 0.01 volt at the LSB or USB PHONES jack.

b. Low noise is that amount of noise which, although detected in the output, an operator would recognize as less than the amount present in the output of an operational receiver. It is that amount of noise present in output when the translator/synthesizer has been removed, and would measure approximately 0.01 to 0.1 volt at the LSB or USB PHONES jack.

c. Normal noise is that amount of noise present from an operational receiver, and would measure approximately 0.1 to 5 volts at the LSB or USB PHONES jack.

d. All R-1051/URR receivers having the original-type translator/synthesizer assembly (58189 p/n 666230-027 or A09496-001) have spurious internally generated signals present at the output of the translator/synthesizer when the receiver is set to 22.500 MHz. This spurious signal will be heard in the receiver output when the frequency is set to approximately 22.5003 to 22.504 MHz in the LSB mode or 22.496 to 22.4997 MHz in other modes of operation. Since this spurious signal is synthesized, its accuracy is equal to that of the frequency standard. Although spurious and basically undesirable, the signal should not be over-looked as a very helpful aid in troubleshooting. Use this spurious signal for evaluation only when its presence indicates certain circuits, assemblies, or signal flow paths are functional. If the spurious signal (tone in output) is not present, no conclusions should be made as to the area of the malfunction. The reason for this is that later versions of the translator/synthesizer (which is interchangeable in this equipment) may be installed, and the spurious signal may not be present. If the spurious signal is not heard, use noise levels to determine initially if the translator/synthesizer is operational, and follow up troubleshooting with the performance test described in paragraph 4-83.

4-18. Determine whether a beatnote is present in output of the R-1051/URR. Most mode selectors will have this beatnote present. (A factory change decreased the feedthrough in later models of the R-1051( )/URR.) Regardless of beatnote, low noise will be present if the mode selector, the USB IF/audio amplifier, and the USB output circuits are functioning. If a beatnote is heard, it should pass through a zero beat if 500 kHz from the frequency standard is present and near the correct frequency.

4-19. Evaluate symptom data collected during steps 4 through 6 of table 4-3. If results strongly indicate a malfunction in a specific assembly or area of the main frame chassis, refer to applicable paragraph 4-4 through 4-115 for troubleshooting. If symptom data are inconclusive, see figure 4-1 for guidance. Keep the following points in mind during evaluation:

a. The received signal at the antenna has the same signal-flow path for all modes of receiver operation (LSB, FSK, AM, CW, USB, and ISB) until the signal is diverted at the mode selector filters. Therefore, if normal signals are obtained in one mode while other modes are inoperative, the defect is not likely to be in antenna overload circuit, RF amplifier, or translator/ synthesizer.

b. Frequency selection takes place in the RF amplifier and the translator/synthesizer, and is affected by the MHz digital tuning system, the kHz digital tuning system, and the relay control circuits. Consistent dial inaccuracies can be caused by either of the digital tuning systems, or by the translator/synthesizer.

c. Frequency instability malfunctions usually are caused by the frequency standard, translator/synthesizer, or the 500 Hz lock and vernier control.

d. No noticeable noise in the output usually indicates the frequency standard or IF/audio amplifier has a malfunction, if all dc voltages measured in step 3 of table 4-3 are normal. Low noise in the output usually indicates a translator/synthesizer problem, but this conclusion should be confirmed by other symptoms.

CAUTION

Never interchange a 500-CPS translator/synthesizer with a 100-CPS translator/synthesizer, or vice-versa, in any Receiver. The receiver will not operate, and components of the translator/synthesizer and main frame chassis may be damaged. Consult current instructions on interchangeability of the various types of translator/synthesizer. Only 500 Hz assemblies are to be installed in the R-1051/URR Receiver.

TABLE 4-3. MAINTENANCE TURNON PROCEDURE

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
1	Initial Checks:		
	a. Read paragraphs 4-5 through 4-8		
	b. Loosen the six-captive screws on the front panel, and withdraw the receiver from case.		
	c. Set the MCS controls to 03. Defeat the interlock switch. Rotate the Mode Selector switch to the STD BY position.	Panel dial lamps light. Fuse indicators do not light. RF amplifier tube filaments light.	4-9 4-22 4-69
	d. Set Mode Selector switch to LSB.	Motors may or may not rotate.	
	e. Set MCS controls to 02.	RF amplifier turret and translator/synthesizer motors rotate and come to a stop in several seconds.	4-23
	f. Set Mode Selector switch to OFF, release interlock, and turn main power switch OFF.		

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
1 (Cont)	g. Visually check for indications of defects: (1) Look for loose or improperly seated modules, module captive screws not secured, mechanically defective front-panel controls, etc.		
	(2) Rotate 10 and 100 KCS knobs in both directions.	Rotor plates (just visible between the two RF amplifier vacuum tubes) respond to control-knob rotation.	
	(3) Tilt chassis 90 degrees to aid visual inspection.	No overheated components, broken leads or parts, failure of detents, or slippage of gears or chain drive.	
	h. Inspect each and every insert. (Always inspect these RF inserts after installing an assembly.)	Insert is completely engaged into connector shell. (These inserts are pushed partially loose when installing modules, and often do not cause a malfunction until vibrated loose later.)	
	i. If the translator/synthesizer has been removed since the receiver was last operational, set the KCS controls to 555. Remove translator/synthesizer.	Couplings on module are at 555 and slots in the mating couplings are pointed straight forward on chassis.	4-53
	j. Replace translator/synthesizer, rotate each KCS control from 5 to 9 to 0 to 6. Secure captive screws on assembly. (Always use this method.)	All couplings are engaged.	4-53

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
2	Critical Voltage Checks:		
	a. Locate standoff terminal A2E11 (see figure 4-3). Set Mode Selector switch to LSB and MCS controls at 02, apply power to receiver, and defeat interlock switch.		
	b. Using a 20,000-ohm/volt meter(AN/USM-311 or equivalent), initially set meter scale to read at least 30 vdc. Measure from A2E11 to ground. All assemblies should be installed while making measurement.	Meter should read not more than 22 vdc. Do not attempt any adjustment of voltages at this time. If voltage is below values given, proceed with this procedure.	4-10
3	Operating Voltage Checks:		
	a. Measure following voltages between terminal indicated and ground. See figure 4-3 for terminal location.		
	(1) E12 - Mode Selector switch at STD BY and each operational mode position.	25.5 to 31.5 vdc (readings in STD BY may be slightly higher)	4-39
	(2) E15 - Mode Selector switch at each operational mode position.	25.5 to 31.5 vdc	4-40
	E16 - Mode Selector switch at each operational mode	25.5 to 31.5 vdc with MCS controls at 02 through 29; 0 volts with MCS controls at 00 or 01; 0 volts during tune cycle (while motors are rotating)	4-23

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
3 (Cont)	(3) E17 - Mode Selector switch at STD BY and each operational mode position.	103 to 130 vdc, 103 to 120 vdc (slow decay of meter reading when mode selector switch is rotated to OFF).	4-45
	(4) A8E10-Mode Selector switch at STD BY and each operational mode position. (negative reading-reverse meter polarity or leads)	-28 to -33 vdc. (slow decay of meter reading when mode selector switch rotated to OFF).	4-44
	(5) E11 - Mode Selector switch at each operational mode position and frequency above 01 MHz (positive polarity)	20 ±0.5 vdc	4-41
	(6) E18-Mode Selector switch at each operational mode position and frequency above 01 MHz.	20 ±0.5 vdc	4-41
	b. Ensure all normal indications are present in steps 1, 2, and 3 before continuing with procedure.		
4	<u>Initial Frequency Standard Checks:</u>		
	a. Set Mode Selector switch to CW Place COMP/INT/EXT switch on top of Frequency Standard Electronic Assembly A2A5 to COMP position. Set MCS controls above 01 MHz Connect external 5-MHz Connect external 5-MHz ship's frequency standard to EXT 5MC IN connector A1J25 on rear of R-1051/URR case. NOTE: Read paragraph 4-11.	Indicator DS1 on frequency standard changes intensity at some visible rate. Several minutes may be required to notice a change. Allow 10 minutes if receiver was just turned on. Do not change the frequency adjustment at this time.	4-58

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATOR	IF FAULTY, REFER TO PARAGRAPH
4 (Cont)	b. Set frequency standard switch to EXT position.	Check receiver to observe if it now operates normally.	
	c. Set frequency standard switch to INT position.	Check receiver to observe if it now operates normally.	
	d. Monitor receiver output with RF GAIN, PHONE LEVEL, and LINE LEVEL controls turned maximum clockwise.	Noise is present in receiver output in various modes.	
	e. Momentarily jumper TP8 on RF Translator Electronic Subassembly A2A6A6 to ground.	Notice in CW mode if beatnote is present and can be zeroed by BFO FREQ control. Refer to paragraph 4-12.	
	f. Evaluate symptoms. Refer to paragraph 4-13.		
5	Digital Tune Checks:		
	a. Read paragraph 4-14.		
	b. Connect 2- to 30-MHz antenna to the receiver. Connect headphones or speaker to USB PHONES jack (change as required by mode selected throughout procedure). Set LINE LEVEL meter switches to +20DB. Adjust LINE LEVEL, PHONE LEVEL, and RF GAIN controls maximum clockwise. Set CPS switch to 000. Set Mode Selector switch to AM. Set receiver frequency to 02.000 MHz.	RF amplifier MC window indicates the same frequency as the MCS controls on the front panel, and all numbers are centered in windows on front panel.	4-55

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY REFER TO PARAGRAPH
5 (Cont)	c. Apply slight pressure to each KCS control in each direction to lift the setting slightly out of detent.	Noise level (if present) does not increase.	4-51
	d. Rotate MCS controls in 1-MHz steps through 15.000 MHz. Repeat step 5c at any frequency having a noticeably lower noise-level output than other frequencies set up. Listen to receiver output at each setting.	RF amplifier turret rotates and stops at correct position each time. A second motor (in the translator/ synthesizer) should also drive and stop each time. Take notes on symptoms for use after step 6.	4-55
	e. Set Mode Selector switch to CW. Set frequency to 16.333 MHz Repeat step 5d through 29.333 MHz.	Same as step 5d.	4-55
	f. Set Mode Selector switch to USB and frequency to 28.666 MHz. Set CPS switch to 500. Repeat step 5d through 15.666 MHz.	Same as step 5d.	4-55
	g. Set Mode Selector switch to LSB. Set frequency to 14.999 MHz. Repeat step 5d through 6.999 MHz.	Same as step 5d.	4-55
	h. Set Mode Selector switch to ISB. Set frequency to 5.000 MHz. Set CPS switch to V with CPS vernier control set in the center of range. Repeat step 5d through 02.000 MHz.	Same as step 5d.	4-55
	i. Change frequency to 01 and 00 MHz.	Motors do not rotate and receiver has no output.	4-23

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP		ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
5 (Cont)	j.	Evaluate digital tune drive system. Refer to paragraph 4-15.	Retain notes on noise/ signal symptoms for use in step 6.	
6		<u>Signal Symptom Data Collection:</u>		
	a.	Read paragraph 4-16. If signals were heard at any frequency in step 5, return controls to that condition.	Ascertain whether all modes or only certain modes operate normally. Observe whether all level controls, CPS switch, and CPS vernier control operate normally.	
		If signals are present at one or more frequencies, rotate each KCS control from 0 to 9.	Note if noise level decreases noticeably only at certain digit settings.	
	b.	Read paragraph 4-17. If no signals are present but noise is present, momentarily short TP4, then TP3 (both on the RF amplifier) to ground.	Note if a static condi- will pass through receiver to output at present frequency.	
		Set receiver frequency to 6.777 MHz. Repeat step b, except momentarily short TP8, then TP5 (both on the translator/synthesizer) to ground.	Note if there is a very noticeable decrease in the noise level output when TP8 is grounded and a lesser decrease in noise output when TP5 is grounded. This indicates the translator/ synthesizer, mode selector, and IF/audio amplifier (in use) have a signal-flow path at present hi-band frequency.	

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
6 (Cont)	c. Set receiver frequency to 22.499 MHz, CPS switch to 0, and Mode Selector switch to USB. Remove the RF amplifier.	Note whether receiver output has a clear tone (tone should be precisely 1 kHz). If a tone is not present, observe output to detect if there is noticeable noise present, and then perform step 6d.	
	If tone is present, vary LINE LEVEL and RF GAIN controls, CPS switch, CPS vernier control, and 1 KCS control. Set Mode Selector switch alternately to FSK, ISB, and CW positions. Vary BFO FREQ control.	Observe normal operation of receiver as though receiving a signal carrier at 22.5000 MHz.	
	d. Set receiver frequency to 22.501 MHz with Mode Selector switch in LSB.	Observe normal operation of receiver as though receiving a signal carrier at 22.500 MHz. Note if a clear stable tone was present at 22.999 or 22.501 MHz, but not at both frequencies.	
	e. If a tone was not present at 22.499 or 22.501 MHz, but noise was present, momentarily short TP8, then TP5 (both on the translator/synthesizer) to ground.	Note if there is a very noticeable decrease in the noise-level output when TP8 is grounded, and a lesser decrease in noise output when TP5 is grounded. This indicates the translator/synthesizer, mode selector, and IF/audio amplifier (in use) have a signal-flow path at lo-band frequency.	

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP	ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
6 (Cont)	NOTE Prior to condemning any depot-repairable assembly as defective, complete the performance test and isolation check for that assembly. This is necessary to ensure that the trouble is not in the chassis or elsewhere.		
	f. If a tone was heard at USB and LSB but was varying in pitch, set the CPS switch to V, then to both CPS positions.	Observe if frequency is stable in all three positions of the CPS switch.	
	g. If no tone was heard at USB or LSB, note noise levels present, then remove translator/synthesizer.	Note noise level output in USB and LSB with translator/synthesizer remove.	
	Set Mode Selector switch to CW and vary BFO FREQ control while listening to USB output.	Note if a beatnote is present in output. Note if a low noise level is present in output. Read paragraph 4-18.	
	h. Set Mode Selector switch to OFF. Reinstall translator/synthesizer.		
	Reinstall RF amplifier.	Observe if initial noise level is present and if it increases in amplitude as RF amplifier tube filaments heat up.	

TABLE 4-3. MAINTENANCE TURNON PROCEDURE (Cont)

STEP		ACTION OR CONDITION	NORMAL INDICATION	IF FAULTY, REFER TO PARAGRAPH
6 (Cont)	i.	Momentarily short TP4 and TP3 on RF amplifier to ground.	Observe if a static condition passes through receiver to output.	
	j.	Perform any additional checks which will provide symptoms for evaluation.	Evaluate symptoms. Read paragraph 4-19.	

4-20. MAIN FRAME CHASSIS TROUBLESHOOTING.

4-21. GENERAL. Paragraphs 4-22 through 4-57 cover troubleshooting of the main frame chassis, assemblies, case, and filter box. To aid in troubleshooting, wiring data are provided for the chassis, case, and filter box in tables 5-4, 5-5, and 5-6. For troubleshooting and repair within the Mode Selector switch, refer to paragraphs 4-50 and 5-32. The following figures are also helpful when troubleshooting the main frame chassis:

a. Figure 4-3. Main Frame Chassis, "E" Terminal and Test Point Location Diagram.

b. Figure 4-4. Main Frame Connector Pin Location Diagram, Top View.

c. Figure 4-5. Front-Panel Components, Terminal and Switch Contact Markings.

d. Figure 4-6. Mode Selector Switch A2S2, Contact Arrangement.

4-22. AC POWER AND DC VOLTAGE DISTRIBUTION. Diagrams of ac power and dc voltage distribution in the R-1051/URR are given in figures 4-8 through 4-11. The relay control diagram in figure 4-12 and the receiver overall schematic diagram in figure 5-1 are also helpful in troubleshooting. Procedures for troubleshooting the ac power and dc supply circuits are given in paragraph 4-32.

4-23. RELAY AND CONTROL CIRCUITS. Refer to figure 4-12 when troubleshooting relay and control circuits in the receiver. Remember that all relays shown on schematics are in the deenergized condition. A brief comment on tune relay A2K1 may be helpful. The tune relay is energized when a ground is present at A2K1-3(A2E16). This point may be grounded by having the MCS controls at either 00 or 01 MHz. A ground will then be provided by the code generator to A2J8-7(A2A7-P7). A ground will also be present at A2K1-3 when motors in the RF amplifier or translator/synthesizer are rotating, and will appear at A2J10-6 or A2J12-6, respectively. To have a ground appear at either or both of these points, the motor relay in the respective assembly must be energized. The motor relays are energized when a ground code is received on the five-wire code lines from the code generator. This will occur when the MCS controls are rotated above 01 MHz. The motor relays also energize the motors, which continue to rotate until repositioning of the turrets removes the ground. When the detents are adjusted correctly, the ground will be removed only when the turrets have been repositioned to the same setting as the MCS control knobs. Whenever a ground appears at A2E16, it also is present at A2A9A1-E6, which deenergizes antenna overload protection relay A2A9A1K1.

4-24. CODE GENERATOR ELECTRONIC ASSEMBLY A2A7. Troubleshooting information for code generator A2A7 is provided in the following paragraphs.

4-25. General. The code generator is not supported by piece parts for repair. The R-1051/URR is normally supplied with a four-deck pcb assembly (see figure 4-13). A five-deck pcb assembly is supplied and required in Transmitter T-827/URT. The receiver will operate normally with either type of assembly.

4-26. When the code generator is suspected of being defective, refer to MHz digital tuning system, paragraph 4-55, for additional data on troubleshooting.

4-27. The code generator is associated with four different circuits in the receiver: tune relay A2K1 ground, hi-lo filter relay A2K2 ground, rf amplifier A2A4 five-wire ground codes for positioning turret, and translator/synthesizer A2A6 five-wire ground codes for positioning turret. A malfunction in several of these circuits at the same time strongly indicates theMHz detents are not adjusted correctly. Refer to paragraph 4-55. To ensure proper performance of the tune relay and hi-/lo-filter relay ground circuits within the code generator, perform the procedure in paragraph 4-28. To check out the turret positioning circuits of the code generator, perform the procedure in paragraph 4-29 for A2A4 or paragraph 4-30 for A2A6.

4-28. Tune Relay A2K1 and Hi-Low Filter A2K2 Ground Circuit Check.

a. Turn Mode Selector switch on receiver to OFF. Connect Multimeter AN/USM-311 (Rx1 scale) between A2A7A5E3 (see figure 4-13) and ground. Ensure this point is grounded. Remove meter leads. Set Mode Selector switch to any operational mode, and set MCS controls to 02 with A2A4 and A2A6 assemblies installed. Ensure approximately 28 vdc is present at A2E16 (see figure 4-3), A2A7A5E1, and A2A7A2E10 (see figures 4-13 and 4-14). If these readings are not present, remove A2A7P1 from A2J8 and obtain these readings at A2J8 prior to continuing procedure.

b. The tune relay ground circuitry is located on pcb A2A7A5. Set multimeter to measure 30 vdc. Connect meter leads from A2E16 (A2A7A5E1) to ground. Observe approximately 28 vdc at all MCS control settings from 02 through 29 MHz. Observe 0 volt at 00 and 01 MHz.

c. The hi-/lo-filter relay ground circuitry is located on pcb A2A7A2. Connect multimeter leads from A2A7A2E19 (J8-6) to ground. Observe meter reads approximately 28 vdc at following MCS settings while 0 volt at all other MCS settings: 2, 3, 4, 5, 7, 8, 11, 12, 14, 15, 16, 22, 23, 27, 28, and 29.

4-29. Five-Wire Code Lines to RF Amplifier. To ensure that the code generator is providing the correct codes on the five-wire code lines to the RF amplifier, proceed as follows:

a. Set Mode Selector switch to OFF and MCS controls to 02. Pull R-1051/URR out of case and remove RF amplifier and translator/synthesizer. Refer to table 4-4. The RF amplifier uses terminals 1 through 5 on A2J10 (A2A4P1) as turret control-line terminals from A2J8 (A2A7P1), terminals 1 through 5.

b. Set multimeter at Rx1 scale and con-

TABLE 4-4. CODE GENERATOR ELECTRONIC ASSEMBLY A2A7, RESISTANCE CHECKS

MCS CONTROL SETTINGS	A2J10 (A4P1) TERMINALS					A2J12 (A6P1) TERMINALS				
	1	2	3	4	5	1	2	3	4	5
02	S	O	S	O	O	S	S	S	O	S
03	O	S	O	O	O	S	O	S	S	S
04	S	O	O	O	S	S	S	O	S	S
05	O	O	O	S	S	O	S	S	O	S
06	O	O	S	S	O	O	S	O	O	O
07	O	S	S	O	S	S	O	O	S	S
08	S	S	O	S	S	S	S	O	O	S
09	S	O	S	S	O	S	O	S	O	O
10	O	S	S	O	O	S	S	O	S	O
11	S	S	O	O	O	O	O	S	S	S
12	S	O	O	O	O	O	O	O	S	S
13	O	O	O	O	S	S	O	S	S	S
14	O	O	O	S	O	O	S	S	S	O
15	O	O	S	O	S	O	O	S	S	O
16	O	S	O	S	S	S	S	S	S	O
17	S	O	S	S	S	S	O	O	S	S
18	O	S	S	S	S	S	S	O	O	S
19	S	S	S	S	O	S	S	S	O	O
20	S	S	S	O	O	O	S	S	S	S
21	S	S	O	O	S	O	O	S	S	S
22	S	O	O	S	O	O	O	O	O	S
23	O	O	S	O	O	S	S	S	S	O
24	O	S	O	O	S	O	S	S	S	O
25	S	O	O	S	S	O	O	S	S	O
26	O	O	S	S	S	S	S	S	S	O
27	O	S	S	S	O	O	O	O	S	S
28	S	S	S	O	S	O	O	S	S	S
29	S	S	O	S	O	O	S	S	S	S

S - Shorted (less than 15 ohms)

O - Open (high resistance)

nect test leads between ground and terminal 1 of A2J10 (see figure 4-4). Rotate MCS controls from 02 through 29 and observe normal indications as listed in table 4-4.

c. Repeat step b for terminals 2 through 5.

d. Remove meter ground lead and connect it to A2A7A1E7 (see figure 4-13). Repeat steps b and c, observing that all readings are reversed (O is now shorted, and S is open). Both sets of conditions are necessary to ensure proper operation.

4-30. Five-Wire Code Lines to Translator/Synthesizer. To ensure that the code generator is providing the correct codes on the five-wire code lines to the translator/synthesizer, proceed as follows:

a. Set Mode Selector switch to OFF and MCS controls to 02. Pull R-1051/URR out of case and remove RF amplifier and translator/synthesizer. Refer to table 4-4. The translator/synthesizer uses terminals from A2J8 (A2A7P1), terminals 21 through 25.

b. Set multimeter at Rx1 scale and connect test leads between ground and terminal 1 of A2J12 (see figure 4-4). Rotate MCS controls from 02 through 29 and observe normal indications as listed in table 4-4.

c. Repeat step b for terminals 2 through 5.

d. Remove meter ground lead and connect it to A2A7A2E18 (see figure 4-13). Repeat steps b and c observing that all readings are reversed (O is now shorted, and S is open). Both sets of conditions are necessary to ensure proper operation.

4-31. Summary. Normal indications in paragraphs 4-28 through 4-30 indicate the code generator and MHz detents are functional. The RF amplifier performance test and translator/synthesizer performance test in paragraphs 4-70 and 4-83, respectively, will indicate if the MHz digital tuning system is functional in these assemblies. The removal and replacement procedure for the code generator is provided in paragraph 5-22. The code generator wiring list is given in table 4-5. See figure 5-13 for wiring of four-deck code generator.

4-32. POWER SUPPLY ELECTRONIC ASSEMBLY A2A8. Troubleshooting for the ac and dc power circuits of the R-1051/URR is covered below.

4-33. General. Only the technician may determine which checks are applicable to his situation. These troubleshooting notes are initial guidelines to assist in the isolation of malfunctioning components. Voltage measurements should be taken wherever possible when troubleshooting. The only time resistance readings are likely to be necessary is when fuses are blowing, or when visual signs of overheating are observed. Resistance readings are provided and should be used only where the results can be evaluated effectively. Multimeters provide various scales and sensitivities (ohms/volt). They also vary as to internal battery polarity connections to the two test leads. The R-1051/URR uses many semiconductors that will provide readings depending on the meter scale and test lead polarity. The readings taken below use a 20,000 ohm/volt meter on the Rx100 scale. Wherever lead reversal results in a second reading, both are listed. Prior to taking resistance measurements, all assemblies should be removed and the ac power input connector at A1A1J3 or J4 removed from the rear of the R-1051/URR case.

4-34. When troubleshooting by resistance measurements with the Mode Selector switch in the OFF or STD BY position, misleading

TABLE 4-5. CODE GENERATOR ELECTRONIC ASSEMBLY A2A7, WIRING LIST

WIRE NO.***	COLOR	FROM	TO	WIRE NO.***	COLOR	FROM	TO
1	BARE	A1E1	A2E12	*30	BARE	A3E9	A4E5
2	BARE	A1E2	A2E13	*31	BARE	A3E10	A4E6
3	BARE	A1E3	A2E14	*32	BARE	A3E12	A4E7
4	BARE	A1E4	A2E15	33	BARE	A4E7	A5E5
5	BARE	A1E5	A2E16	34	WHT-BLK-BRN	P1-1	A1E10
6	BARE	A1E6	A2E17	35	WHT-BLK-RED	P1-2	A1E11
*7	BARE	A2E1	A3E1	36	WHT-BLK-ORN	P1-3	A1E8
*8	BARE	A2E2	A3E2	37	WHT-BLK-YEL	P1-4	A1E9
*9	BARE	A2E3	A3E3	38	WHT-BLK-GRN	P1-5	A2E22
*10	BARE	A2E4	A3E4	39	WHT-BLK-BLU	P1-6	A2E19
*11	BARE	A2E5	A3E5	40	WHT-BLK-VIO	P1-7	A5E1
*12	BARE	A2E6	A3E6	41	WHT-BLK-GRY	P1-8	A5E2
*13	BARE	A2E7	A3E6	42	WHT-BRN-RED	P1-9	A5E3
*14	BARE	A2E8	A3E8	*43	WHT-BRN-ORN	P1-10	A3E14
*15	BARE	A2E9	A3E9	44	WHT-BRN-YEL	P1-11	A5E4
*16	BARE	A2E10	A3E10	*45	WHT-BRN-GRN	P1-12	A3E15
*17	BARE	A2E11	A3E11	*46	WHT-BRN-BLU	P1-13	A3E17
*18	BARE	A2E12	A3E12	*47	WHT-BRN-VIO	P1-14	A3E16
**19	BARE	A2E5	A4E1	*48	WHT-BRN-GRY	P1-15	A3E19
**20	BARE	A2E6	A4E2	*49	WHT-RED-ORN	P1-16	A3E18
**21	BARE	A2E7	A4E3	50	WHT-RED-YEL	P1-17	A2E21
**22	BARE	A2E8	A4E4	*51	WHT-RED-GRN	P1-18	A3E13
**23	BARE	A2E9	A4E5	52	WHT-RED-BLU	P1-19	A1E7
**24	BARE	A2E10	A4E6	53	WHT-RED-VIO	P1-20	A2E18
**25	BARE	A2E12	A4E7	54	WHT-RED-GRY	P1-21	A2E20
*26	BARE	A3E5	A4E1	55	WHT-ORN-YEL	P1-22	A4E9
*27	BARE	A3E6	A4E2	56	WHT-ORN-GRN	P1-23	A4E8
*28	BARE	A3E7	A4E3	57	WHT-ORN-BLU	P1-24	A4E11
*29	BARE	A3E8	A4E4	58	WHT-ORN-VIO	P1-25	A4E10

* Applies when five-deck assembly is used. A3 terminals listed do not exist in four-deck assy.

** Applies when four-deck assembly is used. Refer to paragraph 4-25 and figure 4-13.

*** Wire type AWG #22 for all wiring.

readings may be encountered, such as 20-vdc output at A2E11 shorted to ground. To prevent these misleading symptoms, remove the ac input by disconnecting the power input connector at A1A1J3 or J4 on rear of case. After this is done, set the Mode Selector switch and other controls, as specified, to required position to make resistance measurements.

4-35. AC Power Input Circuits. When no ac input is apparent, ensure that AUX/NORM PWR switch A2S7 is in the correct position. See figure 4-8. The AUX position (115 vac to A1A1J3) is for connecting the R-1051/URR for independent operation (not having or requiring AN/WRC-1 equipment to be energized). Remove one fuse on front panel, replace fuse cap, and note that fuse indicator lights. Repeat with second fuse after replacing first fuse; then replace the second fuse. Ensure that fuses are slow-blow 3/4 amp, MIL type F02B250V3-4AS. Ensure power is disconnected at A1A1J3 and A1A1J4 prior to troubleshooting with an ohmmeter. The resistance of the A2T1 primary circuit from A2XF1-2 to A2XF2-2 (see figure 4-5) is approximately 7 ohms in STD BY or any operational mode (Rx1 scale).

4-36. Fuses Blown in Standby Mode. This malfunction is mostly likely to occur in the 28-vdc supply, although it could also occur in the -30-vdc, 110-vdc, or ac supply circuits. Set the MCS controls above 01, the CPS switch to 000, and all other controls maximum clockwise. Remove frequency standard A2A5 and note if new fuse blows in STD BY mode. If fuse blows, remove receiver ac input power. Set ohmmeter to Rx100 scale. Set Mode Selector switch to STD BY and check for the following approximate readings. See figure 4-3.

a. A2E12 to grd - 90 ohms, regardless of lead polarity.

b. A2E17 to grd - 13 kilohms or 2500 ohms, depending on lead polarity.

c. A2A8E10 to grd - above 1500 ohms or open, depending on lead polarity.

Measure resistance from A2XF1-2 to A2XF2-2, observing reading is approximately 7 ohms. (This reading is dependent on which terminals of A2T2 primary winding are connected.) Troubleshoot circuits to isolate the defective component.

4-37. Fuses Blown in Operate Modes Only, All Assemblies Installed. Set MCS controls above 01 and CPS switch to V. Remove A2A1, A2A2, A2A3, A2A5, and A2A6 assemblies. Install new fuse and place Mode Selector switch to each operational mode, allowing time for fuse to blow. If fuse does not blow, replace assemblies in the following sequence, A2A6, A2A5, A2A4, A2A3, A2A2, and A2A1, with Mode Selector switch at ISB, and observe when fuse blows. If fuse opened when A2A6 was replaced, remove A2A6, remove ac power input to receiver, and measure resistance at the following location with Mode Selector switch at ISB. Set meter to Rx100 scale and measure above 800 ohms or above 25 kilohms, depending on lead polarity, from A2A11A1E7 to ground. Refer to figure 4-15 for location.

4-38. Fuses Blown in Operate Modes Only, Assemblies A2A1 Through A2A6 Removed. Remove ac input power from rear of receiver case. Set Mode Selector switch to ISB, CPS switch to 000, MCS controls above 01, and all other controls maximum clockwise. Observe following approximate resistance measurements to ground, using a 20,000 ohm/voltmeter on Rx100 scale.

a. A2E18 to grd - 1000 ohms, regardless of lead polarity.

b. A2E15 to grd - 90 ohms, regardless of lead polarity.

c. A2E17 to grd - above 2500 ohms or 13 kilohms, depending on lead polarity.

d. A2A8E10 to grd - open or above 1500 ohms, depending on lead polarity.

Evaluate the readings and troubleshoot the defective circuit.

4-39. DC Power Circuits. When 28 vdc and 110 vdc are slightly high or low in operational modes, check ac line input voltage to ensure the normal operating voltage is present; then check that correct primary tap on transformer A2T2 is in use (see figure 4-8). Move primary tap as necessary to provide in-tolerance readings from the 28- and 110-vdc supplies. Before changing the primary tap, ensure that the ac line voltage is at the same value that will be available under normal operating conditions. If the tap is changed, check the 20-vdc supply adjustment as described in paragraph 5-59.

4-40. When 28 vdc is not present at A2E12 in STD BY or at A2A15 in operational modes, determine if 28 vdc is present at A2A8E3. Remove protective cover from A2A8 pcb, and inspect for signs of overheating. See figures 4-9 and 5-1, and troubleshoot the 28-vdc circuits.

4-41. When 20 vdc is not present at A2E11 in operational modes, the symptom can be misleading. A protective circuit on the A2A8 pcb will cut A2Q1 series regulator off if the 20-vdc load is shorted (2 to 3 ohms or less). This will result in 0 volt at A2E11. Also, a resistance reading, with power to the R-1051/URR removed and the Mode Selector switch in OFF or STD BY, will cause a misleading ground to be indicated on the 20-vdc line. If 28 vdc is normal at A2E11, connect a voltmeter between A2E37 (or A2E11) and ground. Remove assemblies A2A1 through A2A6 while observing meter. If 20 vdc is shorted to ground in any of the assemblies, the meter will read 20 vdc when the defective assembly is removed. If 20 vdc is not present with all assemblies removed, see figures 4-10, 5-1, and 5-37 to troubleshoot the 20-vdc circuits.

4-42. When 20 vdc is not present at A2E18, in operational modes, but is present at A2E11 (refer to table 4-3, step 3), troubleshoot A2K3 contacts using figures 4-10, 4-12, and 5-1.

4-43. When 20-vdc supply measures above 22 vdc at A2E11 and is not caused by misadjustment of A2A8R14, trouble may be suspected in series regulator A2Q1 or the A2A8 pcb. The collector of A2Q1 is insulated above ground by an insulated bushing and a mica disc. Measure voltage from collector to ground (25.5 to 31.5 vdc), base to ground (20.6 vdc), and emitter to ground (20 vdc). If voltage on base or emitter is excessive, or if voltage on the base is not slightly higher than the emitter voltage, troubleshoot A2Q1 and the 20-vdc regulator circuit on the A2A8 pcb. See figures 5-1 and 5-27.

4-44. When -30 vdc is not present at A2A8E10, ensure that the correct terminal is being measured. The pcb cover terminal board marking is misleading. The correct terminal is the 7th terminal up from the bottom terminal. See figures 5-27, 4-11 and 5-1; remove the A2A2 and A2A3 assemblies; and troubleshoot the main frame chassis.

4-45. When 110 vdc is not present at A2E17, determine if voltage is present at A2A8E7. Remove RF amplifier A2A4 and set CPS switch in 000 position. Note if 110 vdc is not present in the operational modes. Normally, trouble will be at the A2A8 pcb, relay contacts A2K3-6-8, A2S6-8-9 pcb. See figures 4-11 and 5-1, and troubleshoot the 110-vdc circuits.

4-46. ANTENNA OVERLOAD ELECTRONIC ASSEMBLY A2A9. Troubleshooting information for antenna overload A2A9 is provided in the following paragraphs.

4-47. General. The antenna overload circuit supplies a signal path from the antenna input to RF amplifier when in operational modes. The signal path is opened when an RF signal of approximately 7 volts or higher is present on the antenna. Also, the antenna overload circuit opens the signal path when 28 volts is not present at the A2E16 terminal (during a tuning cycle). This manual incorporates Field Change 5 R-1051/URR for increased protection of the RF input circuit.

4-48. Troubleshooting Data. Poor sensitivity of the R-1051/URR at all frequencies can be caused by contacts of relay A2A9A1K1 being open. Momentary jumpering of 2-watt, 5.1-kilohm resistor A2A9A1R10 will confirm this condition. A defect on pcb A2A9A1 that prevents the relay from energizing in the operational modes will also result in poor sensitivity. Measure resistance across A2A9A1R10 for 5100 ohms, with the R-1051/URR in OFF and STD BY mode. Set Mode Selector switch to LSB and note that the meter reads 0 ohm. See figure 5-1 for a schematic diagram of the antenna overload assembly, and for voltage measurements on transistors when troubleshooting.

4-49. LIGHT PANEL ELECTRONIC ASSEMBLY A2A10. Repeated failures of the front-panel dial lamps in the R-1051/URR has been reduced by increasing the value of resistor A2A8R2 to 100 ohms, 1 watt. See figure 5-1. Refer to paragraph 5-28 for dial lamp replacement procedures.

4-50. MODE SELECTOR SWITCH A2S2. The Mode Selector switch assembly is difficult to troubleshoot completely because of inaccessibility. Replacement of the entire assembly requires time and caution at every step of disassembly and replacement. See figures 4-8 through 4-11 and figure 5-1, to isolate trouble up to the switch assembly. Ensure that all readings taken with an ohmmeter are performed after removing the ac input power to the R-1051/URR, releasing interlock switch A2S8, and setting the Mode Selector switch to the required position. Do not be misled by readings such as the 20-vdc line grounded, and one side of the power transformer primary grounded, when the Mode Selector switch is at OFF. See figures 4-16 through 4-21 to isolate a malfunction within the switch assembly, and refer to paragraph 5-32 for repair or replacement data.

4-51. kHz DIGITAL TUNING SYSTEM. The following data pertain to the 1-, 10-, and 100-kHz chain-drive mechanism. For troubleshooting data on the 1- and 10-MHz frequency controls, refer to paragraph 4-55.

4-52. General. Prior to proceeding with troubleshooting of the chain-drive mechanism, a short review of the following points may be helpful:

a. Correct alignment of the 1-kHz mechanism requires that the 1-kHz coupler on the bottom of the translator/synthesizer be fully in its detent at the same time as the 1 KCS digit is centered in its window and the 1 KCS control is in its detent.

b. Correct alignment of the 10-kHz mechanism requires that the 10-kHz indexed coupler wheel on the translator/synthesizer be fully in its detent at the same time as the 10-kHz indexed coupler wheel on the bottom of RF amplifier is positioned exactly at the same digit, and with that digit centered in the front-panel window. The above conditions must exist for all digits, 0 through 9. If the dual sprocket detent is fully seated without all of the above conditions existing, various symptoms of malfunction will result.

c. Correct alignment of the 100-kHz mechanism requires the same conditions as for the 10-kHz mechanism.

4-53. Coarse Mechanical Alignment.

a. Pull R-1051/URR chassis out of case.

b. Set Mode Selector switch to OFF.

c. Set MCS and KCS controls for 11111 kHz.

d. Remove RF amplifier from chassis.

e. Remove translator/synthesizer from chassis.

f. Observe that coupling disks on the bottom of both assemblies are set at 1, and that the digit 1 appears centered in KCS windows. Rotate MCS and KCS controls on main frame chassis to 00000. The three mechanical coupling keyways for the translator/synthesizer should be pointed toward, and perpendicular to, the rear of chassis. Refer to step k below if any coupling keyway is incorrectly oriented.

g. Rotate MCS and KCS controls to 00660. The two coupling keyways for the RF amplifier should now be pointed toward, and perpendicular to, the rear of the chassic. Refer to step k below if any keyway is incorrectly oriented.

h. Rotate MCS and KCS controls to 29999 and observe that the correct digits appear in center of windows. Refer to step k if correct digits are not centered in windows.

i. Ensure that spring washer under each coupling disk on main frame has not been flattened to such an extent as to prevent engagement of coupler when assemblies are installed. Also note that each index wheel on the bottom of the translator/synthesizer is the same height. If one of these wheels has been pushed toward the center of the assembly, it will not engage with the chassis coupler.

j. Rotate MCS and KCS controls to 11111 and install both assemblies in the chassis. Rotate KCS controls through 0 to 9 to 0 ensure that the coupling disks are engaged, then secure assemblies with captive screws. If a KCS digital tuning malfunction is still suspected or evident, perform all the remaining steps for both coarse and fine mechanical alignment.

k. When any coupling keyway is in the wrong position, either the chain has been aligned improperly (if removed), the digital dial has loosened and slipped, or the hub clamp associated with the misaligned coupler has slipped. Since the 1 KCS control has only one coupling and detents are non-adjustable, no problem should be encountered in alignment. The hub clamp on the chassis can be loosened and the coupling positioned to mate with the translator/synthesizer's indexed coupling wheel while in its detent, and while the digit is set to the same number as the dial.

l. When the 10 and 100 KCS controls are set to 0, the RF amplifier coupling keyways should be pointed midway between the 10 and 100 KCS controls on front panel.

4-54. Fine Mechanical Alignment. If slight pressure in either direction on the 10 KCS or 100 KCS controls will result in proper operation, and adjustment of the detent spring will not restore the equipment to normal operation, perform the following steps:

a. Remove RF amplifier from chassis.

b. Remove dust cover from the assembly and reinstall in the equipment.

c. Set frequency controls to 00000.

d. Obtain a 5- to 8-inch long, 1/8-inch diameter, straight guide rod with rounded points at both ends. Ensure that the rod is not larger than 1/8 inch in diameter.

e. Ensure RF amplifier couplings are engaged by observing rotation of rotor plates, located between and behind vacuum tubes, as the 10 and 100 KCS controls are turned.

f. Return controls to 0 and gently insert rod into alignment hole located to the right of finger-stock on top of RF amplifier. Do not use force. The rod should insert into the RF amplifier at least 3-3/4 inches. If slight movement of the 10 or 100 KCS control is required to align holes, an improperly set dual sprocket coupling on the main frame chassis indicated. Remember, however, that if the associated dual sprocket index wheel detent is reset, the associated detent in the translator/synthesizer will be moved out of detent, also. Only the coupling should be moved by loosening the hub clamp. Refer to paragraph 5-13 for complete alignment of the system.

4-55. MHz DIGITAL TUNING SYSTEM. Troubleshooting information for the MHz digital tuning system is provided in the following paragraphs.

4-56. General. The MHz digital tuning system includes the MCS controls, dials, and detents; the code generator, the RF amplifier digital system, and the translator/synthesizer digital system. A suspected malfunction in the MHz digital tuning system must be further isolated to one of these areas. An assembly may be suspected when only the detents are out of adjustment. Paragraph 4-23 provides data associated with the MHz digital tuning system. Since the code generator is not supported for piece-part replacement, do not disassemble it until the malfunction is known to be in the code generator.

4-57. Troubleshooting Data. If proper operation results when slight turn pressure is applied to either or both MCS controls, refer to mechanical adjustment of the MHz detents in paragraph 5-19. If motors in assemblies A2A4 and A2A6 do not energized when the MCS controls are rotated above 01 MHz, refer to paragraphs 4-75 and 4-87 to ensure that 28 vdc is available to these assemblies. If a malfunction is still present, refer to the code generator troubleshooting procedures in paragraph 4-24.

4-58. <u>FREQUENCY STANDARD ELECTRONIC ASSEMBLY A2A5 TROUBLESHOOTING.</u>

4-59. GENERAL. Frequency Standard Electronic Assembly A2A5 is a depot-repairable assembly. Refer to paragraph 5-7 for additional data. Upon determining that the assembly will not meet the performance test requirements in paragraph 4-60, and that the isolation check in paragraph 4-64 has confirmed that 20 and 28 vdc are present, the frequency standard should be replaced. Adjustment of the frequency standard is provided for in paragraph 5-60. There are various type Frequency Standard (A2A5) Modules which may be installed or obtained as replacement spares. This manual provides documentation for the original module provided with the equipment. Later versions have the internal and compare positions as one position to be used during test or for operation when no external 5 MHz is available. The center position (external normal) should be utilized for operation whenever an external 5 MHz is available. The EXT (oven standby) position should not be utilized except for prewarm-up, prior to performing test, removal of external 5 MHz reference source for calibration, or when immediate backup support is of primary concern. When the ship's frequency standard distribution system is utilized, the R-1051/URR internal frequency standard should still be checked periodically to ensure its availability in case of failure of the ship's distribution system. The COMP/INT/EXT switch on top of frequency standard should be in the EXT position when the ship's distribution system is in use.

The COMP position is to be used when comparing internal frequency standard with the ship's frequency standard (AN/URQ-9 or 10), or when the internal frequency standard is required as a source of 5 MHz for the operation of another receiver. When the R-1051/URR is in operation using only internal frequency standard, the COMP/INT/EXT switch should be in the INT position. Additional troubleshooting data provided in table 4-3, step 4 and paragraph 4-11.

4-60. FREQUENCY STANDARD PERFORMANCE TEST. Test information for the Frequency Standard is provided in the following paragraphs.

4-61. Test Equipment. A frequency counter and an RF voltmeter are required for this test. Refer to table 4-2.

4-62. Preliminary Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Mode Selector switch at USB.

c. MCS and KCS controls at 02010 kHz.

d. Connect frequency counter to INT 5 MC OUT connector A1J24 at rear of R-1051/URR.

e. Set COMP/INT/EXT switch on top of frequency standard to COMP. See figure 5-20.

4-63. Procedure.

a. Observe indication on the frequency counter for five display cycles. If this indication is other than 5 MHz ± 0.5 Hz, refer to paragraph 5-60. If the frequency is within tolerance, connect the RF voltmeter probe (without 50-ohm adapter) to INT 5 MC OUT connector A1J24 on rear panel. Normal indication is 450 mV minimum. If indication is abnormal, refer to paragraph 4-64, isolation check.

b. Set COMP/INT/EXT switch to INT.

c. Remove translator/synthesizer assembly A2A6 from chassis. Connect frequency counter to terminal A3 of connector A2J12 (A6P1). Normal indication is abnormal, refer to paragraph 4-64, isolation check. Disconnect frequency counter and connect RF voltmeter (without 50-ohm adapter) to the same terminal. Normal indication is 150 mV minimum. If indication is abnormal, refer to paragraph 4-64, isolation check.

d. Connect RF voltmeter (without 50-ohm adapter) to terminal A2(1 MHz) of connector A2J12. Normal indication is 300 mV minimum. If indication is abnormal, refer to paragraph 4-64.

e. Connect RF voltmeter probe (with 50-ohm adapter) to terminal A1 (10 MHz) of connector A2J21. Normal indication is 20 mV minimum. If indication is abnormal, refer to paragraph 4-64.

f. Replace translator/synthesizer in chassis.

4-64. FREQUENCY STANDARD ISOLATION CHECK. An isolation check for the frequency standard is provided in the following paragraphs.

4-65. Test Equipment. Multimeter AN/USM-311 or alternate is required for this test. Refer to table 4-2.

4-66. Preliminary Conditions and Control Setting.

a. R-1051/URR pulled out of case.

b. Mode Selector switch at OFF.

c. MCS and KCS controls at 02010 kHz.

d. Remove frequency standard assembly A2A5.

e. Set Mode Selector switch to USB.

4-67. Procedure.

a. Connect multimeter between terminal 3 of connector A2J9 (A2A5P1) and ground. Normal indication is 28 $\pm$ 4 vdc.

b. Connect multimeter between terminal 1 of connector A2J9 (A2A5P1) and ground. Normal indication is 20 $\pm$0.5 vdc.

c. If indications in a and b are normal but paragraph 4-63 does not provide adequate results, the assembly is defective. Refer to paragraph 5-7. If indications in a or b are abnormal, refer to voltage distribution diagrams, figures 4-9 and 4-10, and troubleshoot the power-supply circuits.

4-68. <u>RF AMPLIFIER ELECTRONIC ASSEMBLY A2A4 TROUBLESHOOTING.</u>

4-69. GENERAL. RF Amplifier Electronic Assembly A2A4 is a depot-repairable assembly. Refer to paragraph 5-7 for additional data. Upon determining that the RF amplifier does not meet the requirements of the performance test in paragraph 4-70, ensure that the two vacuum tubes in the RF amplifier are not defective. The isolation check in paragraph 4-75 should then be performed to ensure that all input requirements to the assembly are normal prior to referring to paragraph 5-40. Mechanical synchronization of the 100 and 10 KCS frequency controls, which affect the proper operation of the RF amplifier, is covered in paragraph 4-51. The 1 and 10 MCS frequency controls, which affect the digital motor drive in setting up the correct position of the RF amplifier turret, are covered in paragraph 4-55.

4-70. RF AMPLIFIER PERFORMANCE TEST. Test information for the RF amplifier is provided in the following paragraphs.

4-71. Test Equipment. An RF signal generator and an RF voltmeter are required for this test. Refer to table 4-2.

4-72. Preliminary Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Mode Selector switch at USB.

c. MCS and KCS controls at 02.010 MHz.

d. RF GAIN control fully clockwise.

e. CPS switch at 000.

4-73. Procedure.

a. Connect the RF signal generator RF OUT connector to R-1051/URR ANT 50 OHM connector A1J23 on the receiver rear panel. Remove mode selector assembly A2A1. Set

RF signal generator to R-1051/URR frequency and to CW, with a 1000-mV output. Connect rf voltmeter (without 50-ohm adapter) to TP4 on RF amplifier. Tune signal generator for maximum indication on the RF voltmeter. Normal indication is greater than 31.6 mv.

b. Without changing frequency, connect RF voltmeter to TP5 on translator/synthesizer assembly A2A6. Normal indication is greater than 31.6 mv.

c. Connect RF voltmeter to TP4 and check for indication greater than 31.6 mv for all frequencies listed as follows:

2.010 MHz	12.010 MHz	21.010 MHz
3.101	13.010	22.010
4.222	14.010	23.010
5.333	15.010	24.010
6.444	16.010	25.010
7.555	17.010	26.010
8.666	18.010	27.010
9.777	19.010	28.010
10.898	20.010	29.010
11.989		

4-74. Summary of Performance Test. If indications at TP5 are abnormal, check cable from A2J11A1 to A2J14A1. If RF amplifier performance test results are normal but the R-1051/URR is not functional, proceed to translator/synthesizer troubleshooting in paragraph 4-79. If one or several frequencies in paragraph 4-78c resulted in marginal readings, note results of performing the translator/synthesizer performance test to determine if A2A4 should be replaced. If only the kHz digital tuning system is defective, refer to paragraph 4-51. If only the MHz digital tuning system is defective, refer to paragraph 4-55. If results of performance test and referenced paragraphs indicate malfunction of the RF amplifier, refer to paragraph 4-75 prior to replacement.

4-75. RF AMPLIFIER ISOLATION CHECK. An isolation check for the RF amplifier is provided in the following paragraphs.

4-76. Test Equipment. Multimeter AN/USM-311 or alternate, a signal generator, and an RF voltmeter are required for this test. Refer to table 4-2.

4-77. Preliminary Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Mode Selector switch at STD BY.

c. MCS and KCS controls at 2.010 MHz.

d. RF GAIN control fully clockwise.

4-78. Procedure.

a. Observe that vacuum tube filaments are lit. Ensure RF amplifier turret has revolved to proper position as indicated by window and chart on top of assembly.

b. Remove RF amplifier. Connect multimeter between terminal 12 of A2J11 (A2A4P2) and ground. Refer to figure 4-4. Set Mode Selector switch to USB. Normal indication is 103 vdc minimum. If indication is abnormal, troubleshoot main frame chassis.

c. Connect multimeter between terminal 7 of A2J10 (A2A4P1) and ground. Normal indication is from 24 to 32 vdc. If indication is abnormal, troubleshoot main frame chassis.

NOTE

If indication was normal in step a. of paragraph 4-73, step d. below is unnecessary.

d. Connect RF signal generator as required in paragraph 4-73a, remove RF amplifier, and set output of RF signal generator for 40 mv. Connect RF voltmeter to A2J11A3. RF voltmeter should indicate approximately the same as signal generator output (40 mv) if signal path from antenna connector to RF amplifier is normal. If abnormal, troubleshoot the main frame chassis. If all indications are normal and paragraph 4-73 does not provide required results, refer to paragraph 5-43.

4-79. TRANSLATOR/SYNTHESIZER ELECTRONIC ASSEMBLY A2A6 TROUBLESHOOTING.

4-80. GENERAL. Translator/Synthesizer Electronic Subassembly A2A6 is a depot-repairable assembly. Refer to paragraph 5-7 for additional data. Upon determining that the assembly does not meet the requirements of the translator/synthesizer performance test in paragraph 4-83, the isolation check in paragraph 4-87 should be performed to ensure all input requirements of the assembly are normal prior to referring to paragraph 5-45 for replacement.

4-81. Various types of translator/synthesizers are installed in the R-1051/URR and similar family equipments. Refer to current instructions prior to using any similar assembly.

CAUTION

Follow current instructions regarding interchangeability carefully to prevent damage to the assembly, the chassis, or both. Never interchange a translator/synthesizer of the 100-Hz type into the R-1051/URR, or a 500-Hz assembly into the R-1051B/URR receiver.

4-82. When marginal readings are obtained in the performance test, remove the RF amplifier and turn the REC GAIN ADJ (on side of RF translator subassembly A2A6A6) not more than 1/8-turn clockwise. Repeat performance test at frequencies which are marginal. Do not increase the REC GAIN ADJ more than necessary to have all marginal frequencies indicate the minimum required 100 mv.

4-83. TRANSLATOR/SYNTHESIZER A2A6 PERFORMANCE TEST. Test information for the translator/synthesizer is provided in the following paragraphs.

4-84. Test Equipment. An RF signal generator and an RF voltmeter are required for this test. Refer to table 4-2.

4-85. Operating Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Mode Selector switch at USB.

c. MCS and KCS controls at 2.010 MHz.

d. RF GAIN control fully clockwise.

e. CPS switch at 000.

4-86. Procedure.

a. Remove receiver mode selector assembly A2A1. Connect RF signal generator RF OUT connector to R-1051/URR ANT 50 OHM connector A1J23 at rear of case. Set RF signal generator at CW with 1000 mv output at 2.010 MHz. Connect RF voltmeter (without 50-ohm adapter) to TP8 on RF translator subassembly. Tune RF signal generator for a maximum indication of RF voltmeter. Normal indication is 100 mv minimum. If indication is either normal or abnormal, proceed with step b.

b. Repeat step a. at all frequencies listed below. All indications should be 100 mv, minimum.

2.010 MHz	12.010 MHz	21.010 MHz
3.101	13.010	22.010
4.222	14.010	23.010
5.333	15.010	24.010
6.444	16.010	25.010
7.555	17.010	26.010
8.666	18.010	27.010
9.777	19.010	28.010
10.898	20.010	29.010
11.989		

c. If only several frequencies are slightly below 100 mv, refer to paragraph 4-82. If malfunction of the translator is indicated, refer to the isolation check in paragraph 4-87. If indications are normal, reinstall receiver mode selector assembly.

4-87. TRANSLATOR/SYNTHESIZER ISOLATION CHECK. An isolation check for the translator/synthesizer is provided in the following paragraphs.

4-88. Test Equipment. Multimeter AN/USM-311 or alternate is required for this test. Refer to table 4-2.

4-89. Operating Conditions and Control Settings.

a. R-1051/URR chassis pulled out of case.

b. Mode Selector switch at OFF.

c. MCS and KCS controls at 02010 kHz.

d. CPS switch at 000.

e. RF GAIN control fully clockwise.

4-90. Procedure.

a. Remove translator/synthesizer from chassis. Rotate Mode Selector switch to the USB position. Connect multimeter between the terminals listed below and ground, and observe that the voltages are within tolerance as specified. See figure 4-4 for location of terminals.

TERMINAL	VOLTAGE
A2J12-7	28 ±4.0 vdc
A2J12-18	20 ±0.5 vdc
A2J12-6	28 ±4.0 vdc (0 vdc when MCS control has been turned and RF amplifier turret is turning)
A2J12-10	20 ±0.5 vdc
A2J12-20	20 ±0.5 vdc when MCS controls are set at 2, 3, 4, 5, 7, 8, 11, 12, 14, 15, 16, 22, 23, 27, 28 and 29; 0 volt when MCS controls are set at 6, 9, 10, 13, 17, 18, 19, 20, 21, 24, 25, and 26.

b. Return MCS controls to 02.

c. Set Mode Selector switch to OFF and remove ac power connector from rear of case. Using Rx1 scale of multimeter, perform the continuity checks listed in table 4-6.

d. Install translator/synthesizer and connect ac power connector at rear of receiver case. Set Mode Selector switch to USB. Measure dc voltage between following terminals of A2A11 and ground, using the multimeter. See figure 4-15 for terminal locations.

TERMINALS	VOLTAGE
A2A11-E1	15 vdc ±1 volt in 000/500 Hz positions
A2A11-E7	1 to 13 vdc in vernier position and varies with vernier control.

TERMINALS	VOLTAGE
A2A11-E4	4.2 vdc $\pm$ 0.5 v in 000-500 Hz position
A2A11-E5	2.0 vdc $\pm$0.5 v in 000-500 Hz position

e. If indications are all normal and paragraph 4-85 did not provide required results, replace translator/synthesizer as described in paragraph 5-44. If indications are abnormal, troubleshoot the main frame chassis. It should be noted the 15 vdc at A2A11-E1 is supplied from the translator/synthesizer J12-12.

4-91. RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2A1 TROUBLESHOOTING.

4-92. GENERAL. Mode selector assembly A2A1 is a depot repairable assembly. The performance test (paragraph 4-95) and isolation check (paragraph 4-99) prior to replacement of A2A1 assembly.

4-93. The mode selector has a low failure rate and will seldom fail to the extent of preventing reception of signals in all modes. When certain modes of reception are malfunctioning, fault isolation will usually result in locating a defective IF/audio amplifier (A2A2 or A2A3) or frequency standard (2A5). Temporary exchange of IF/audio amplifiers A2A2 and A2A3 may expedite fault isolation of these assemblies. Slow flickering of lamp DS5 on the frequency standard usually indicates presence of 500 kHz to the mode selector.

4-94. Before assuming that the mode selector requires troubleshooting, complete the performance test in paragraph 4-95. Test cables required for troubleshooting and repair of this assembly are GD/E58189 P/N 666243-071 for A2A1P1, and GD/E58189 P/N 666243-072 for A2A1P2.

4-95. MODE SELECTOR PERFORMANCE TEST. Test information for the mode selector is provided in the following paragraphs.

4-96. Test Equipment. An RF signal generator, and RF voltmeter, and a frequency counter are required for this test. Refer to table 4-2.

4-97. Operating Conditions and Control Settings.

a. R-1051/URR in full operation and chassis pulled out of case.

b. Mode Selector switch at OFF.

c. RF GAIN control fully clockwise.

d. CPS switch at 000.

e. Remove IF/audio amplifiers A2A2 and A2A3 from chassis.

f. With 50-ohm coaxial cable RG-58C/U, connect RF OUT connector on RF signal generator to ANT 50 OHM connector A1J23 at rear panel of receiver.

g. Set Mode Selector switch to CW.

h. Set RF signal generator at 2010 kHz in CW with 100-mv output.

i. Connect RF voltmeter (without 50-ohm adapter) to TP1 on top of mode selector. See figure 5-20.

4-98. Procedure.

a. Adjust frequency and output level of RF signal generator for peak signal of 100 mv on RF voltmeter. Connect RF voltmeter to terminal A3 of jack A2J18 (A2A2P1). (See figure 4-4). Normal indication is more than 4 mv when Mode Selector switch is in CW or AM position. (Disregard indications in other modes.) If indication is abnormal, proceed to step b. to

TABLE 4-6. TRANSLATOR/SYNTHESIZER ELECTRONIC ASSEMBLY A2A6, RESISTANCE CHECKS

MULTIMETER LEADS BETWEEN	CPS SWITCH AT	NORMAL INDICATION
J12-19 & J12-21	V (VERNIER)	SHORT
J12-19 & GROUND	000-500	SHORT
J12-14 & A11-E4	500	SHORT
J12-14 & A11-E5	000	SHORT
J12-14 & A11-E7	V (VERNIER)	SHORT
J12-12 & A11-E1	000-500	SHORT
J12-12 & A2R7-1	(CW VERNIER CONTROL TERMINAL)	SHORT

aid in isolating fault.

b. Set Mode Selector switch to USB. Adjust frequency of RF signal generator for peak signal on RF voltmeter. Normal indication is more than 4 mv when Mode Selector switch is set to USB or ISB position. If indication is abnormal, proceed to step c. to aid in isolating fault.

c. Set Mode Selector switch to LSB. Connect RF voltmeter to terminal A3 of jack A2J19 (A2A3P1). Adjust frequency of RF signal generator for peak signal on RF voltmeter. Normal indication is more than 4 mv when Mode Selector switch is at LSB position. If indication is abnormal, proceed to step d. to aid in isolating fault.

d. Connect RF signal generator to terminal A2 on jack A2J18 (A2A2P1). Verify that RF voltmeter indicates more than 100 mv in the LSB, USB, ISB, and FSK positions of the Mode Selector switch, and 0 mv in the AM and CW positions of the Mode Selector switch. If indication is abnormal, proceed to steps e. and f. to aid in osolating fault.

e. Reinstall IF/audio amplifiers A2A2 and A2A3 in R-1051/URR. Disconnect RF signal generator from ANT 50 OHM connector A1J23.

f. Set Mode Selector switch to CW and rotate RF GAIN control fully counterclockwise. Connect frequency counter to TP2 on top of mode selector. Rotate BFO FREQ control fully clockwise. Verify that counter indicates 503 kHz minimum. If indication is abnormal, refer to the BFO frequency adjustment procedure in paragraph 5-72.

g. If steps a. through f. produce normal indications, complete the performance check in paragraph 4-108 for IF/audio amplifiers A2A2 and A2A3. If abnormal indications are obtained, proceed to the isolation check in paragraph 4-99.

4-99. MODE SELECTOR ISOLATION CHECK. An isolation check for the mode selector is provided in the following paragraphs.

4-100. Test Equipment. Multimeter AN/

TABLE 4-7. RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2A1, VOLTAGE CHECKS

CONNECTOR TERMINAL	OPERATIONAL MODE						IF INDICATION IS ABNORMAL*
	LSB	FSK	AM	CW	USB	ISB	
A2J16-1	-	20V	-	-	20V	20V	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.
A2J16-2	-	-	20V	20V	-	-	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.
A2J16-6	20V	20V	20V	20V	20V	20V	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.
A2J17-1	-	-	-	0.2 to 20V**	-	-	Troubleshoot A2R6 and A2R19.
A2J17-2	-	-	-	20V	-	-	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.
A2J17-4	20V	20V	20V	20V	20V	20V	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.
A2J17-5	20V	20V	-	-	20V	20V	Troubleshoot A2K3, A2FL1, and Power Supply Electronic Assembly A2A8.

*See figure 5-1.
**Varies with setting of BFO FREQ control.

USM-311 or alternate is required for this test. Refer to table 4-2.

4-101. Operating Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Mode Selector switch at OFF.

c. MCS and KCS controls at 02010 kHz.

d. Remove mode selector from R-1051/URR.

e. Connect multimeter between one of the connector terminals listed in table 4-7 and ground.

4-102. Procedure. Rotate Mode Selector switch to each of the operational modes for which a voltage is indicated. The measured voltage in each position should be within 0.5 volt of the listed value. Repeat this procedure for each of the connector terminals in table 4-7. If all indications are normal and procedures of paragraph 4-94 have produced abnormal indications, replace the assembly as directed by current instructions.

4-103. RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLY A2A2 AND A2A3 TROUBLESHOOTING.

4-104. GENERAL. IF/Audio Amplifiers A2A2 and A2A3 are depot repairable assemblies.

4-105. The USB IF/audio amplifier (A2A2) and the LSB IF/audio amplifier (A2A3) are identical, and are interchangeable provided the AGC performance test in paragraph 5-76 is made and AGC circuits are adjusted as necessary.

4-106. Two versions of this assembly are currently in use in the R-1051/URR receivers. To determine which schematic diagram, figure 5-3 or 5-4, to use, note transistor A2A2A2QQ9. Early versions used a 2N1183A transistor and later versions use a 2N1131 transistor.

4-107. Before assuming that the IF/audio amplifier PSM, complete the performance test in paragraph 4-108. The test cable required for AGC alignment of this assembly is GD/E58189 P/N 666243-070 for A2A2P1. See figure 5-3 for the schematic diagram. After a malfunction has been isolated, refer to the repair and adjustment procedures in paragraph 5-52.

4-108. IF/AUDIO AMPLIFIER AND PERFORMANCE TEST. Test information for the IF/audio amplifier is provided in the following paragraphs.

4-109. Test Equipment. An RF signal generator and an ac voltmeter are required for this test. Refer to table 4-2.

4-110. Operating Conditions and Control Settings.

a. R-1051/URR in full operation, chassis pulled out of case.

b. Set Mode Selector switch to USB.

c. Set MCS and KCS controls to 02.010 MHz.

d. Rotate the RF GAIN control fully clockwise.

e. Set CPS switch to 000.

f. Set USB LINE LEVEL switch to +20 dB.

g. Rotate the USB LINE LEVEL control to midrange.

h. Connect the RF signal generator to ANT 50 OHM connector A1J23 on the rear of the receiver.

i. Connect ac voltmeter to AUDIO OUT 600 OHM USB connector A1A1J5 on rear of the receiver.

j. Set RF signal generator to 2.010 MHz, CW, with 1-mv output.

4-111. Procedure.

a. Adjust RF signal generator frequency for peak on ac voltmeter. Rotate USB LINE LEVEL control fully clockwise. The ac voltmeter should indicate 6 to 11 vac.

b. Set Mode Selector switch to AM.

Set RF signal generator to 1000 Hz at 30 percent modulation. Adjust RF signal generator frequency for a peak on the ac voltmeter. The ac voltmeter should read 6 to 11 vac.

c. Set USB LINE LEVEL switch to the +20 dB position and set ac voltmeter to 0DB scale. Adjust USB LINE LEVEL control until +15 dB is indicated on the ac voltmeter. The USB LINE LEVEL meter should read -5 ±2 dB. Adjust USB LINE LEVEL control for 0 dB indication on the ac voltmeter. Set USB LINE LEVEL to the 0DB position and observe USB LINE LEVEL meter reads 0 ±2 dB. Disconnect ac voltmeter and reconnect audio cable to A1A1J5 on rear of receiver.

d. Connect ac voltmeter to AUDIO OUT 600 OHM LSB connector A1A1J6 on rear of the receiver. Set Mode Selector switch to LSB and set the signal generator to CW. Adjust signal generator frequency for a peak reading on the ac voltmeter. Rotate LSB LINE LEVEL control fully clockwise. The ac voltmeter should read 6 to 11 vac.

e. Repeat procedure c. above, substituting LSB for USB. Upon completion, disconnect the ac voltmeter and reconnect audio cable to A1A1J6 on rear of receiver.

f. If indications are abnormal, complete the AGC and IF gain loop adjustment in paragraph 5-76. If the adjustment procedure does not correct the malfunction, perform the isolation check in paragraph 4-112.

4-112. IF/AUDIO AMPLIFIER ISOLATION CHECK. An isolation check for the IF/audio amplifier is provided in the following paragraphs.

4-113. Test Equipment. Multimeter AN/USM-311 or alternate is required for this test. Refer to table 4-2.

4-114. Operating Conditions and Control Settings.

a. Receiver in full operation, chassis pulled out of case.

b. Set Mode Selector switch to OFF.

c. Set MCS and KCS controls to 02.010 MHz.

d. Remove USB (left) IF/audio amplifier A2A2.

4-115. Procedure.

a. Connect multimeter between one of the connector terminals listed in table 4-8 and ground. See figure 4-4 for connector and pin locations.

b. Rotate Mode Selector switch to each of the operational modes for which a voltage is listed, observing that voltage are within limits listed in the table.

c. Repeat steps a. and b. until voltage has been checked at each connector terminal in table 4-8.

d. Reinstall IF/audio amplifier A2A2 and remove IF/audio amplifier A2A3.

e. Connect multimeter between one of the connector terminals listed in table 4-9 and ground.

f. Rotate Mode Selector switch to each of the operational modes for which a voltage is listed, observing that voltages are within limits listed in the table.

g. Repeat steps e. and f. until voltage has been checked at each connector terminal in table 4-9.

h. If any readings in steps b. through g. are abnormal, troubleshoot the main frame chassis in accordance with paragraph 4-20. If readings are normal, refer to the overall receiver performance test in paragraph 5-80.

4-116. SERVICING BLOCK DIAGRAMS.

4-117. Figures 4-22 through 4-33 provide servicing block diagrams for assemblies A2A1 through A2A5 and subassemblies A2A6A1 through A2A6A6. The figures are in order by reference designations of the assemblies.

TABLE 4-8. RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLY A2A2, USB VOLTAGE CHECKS

CONNECTOR TERMINAL	OPERATIONAL MODE						LIMITS
	LSB	FSK	AM	CW	USB	ISB	
A2J18-1 (A2P1)	-	28V	28V	28V	28V	28V	±4V
7	-	20V	20V	20V	20V	20V	±0.5V
11	-	20V	20V	20V	20V	20V	±0.5V
15	-	20V	-	-	-	-	±0.5V
17	-	-	20V	20V	-	-	±0.5V
18	-	20V	-	-	20V	20V	±0.5V
19	-	-30V	-30V	-30V	-30V	-30V	±1.5V
21*	0 to 5V	0 to 5V	0 to 5V	0 to 5V	0 to 5V	0 to 5V	±0.5V
22*	0 to 30V	-	-	-	-	0 to -30V	±1.5V

*Varies with RF GAIN control. Fully clockwise is 0 volt.

TABLE 4-9. RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLY A2A3, LSB VOLTAGE CHECKS

CONNECTOR TERMINAL	OPERATIONAL MODE						LIMITS
	LSB	FSK	AM	CW	USB	ISB	
A2J19-1 (A3P1)	28V	-	-	-	-	28V	±4V
7	20V	-	-	-	-	20V	±0.5V
11	20V	-	-	-	-	20V	±0.5V
15	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-
18	20V	-	-	-	-	20V	±0.5V
19	-30V	-	-	-	-	-30V	±1.5V
21*	0 to 5V	0 to 5V	0 to 5V	0 to 5V	0 to 5V	0 to 5V	±0.5V
22*	-	0 to -30V	0 to -30V	0 to -30V	0 to -30V	0 to -30V	±1.5V

*Varies with RF GAIN control. Fully clockwise is 0 volt.

MALFUNCTION * REFER TO NOTES 1 THROUGH 4	SYMPTOMS: NO SIGNALS NO NOTICE-ABLE NOISE* AT OUTPUT				NO SIGNALS LOW NOISE* AT OUTPUT				NO SIGNALS NORMAL NOISE* AT OUTPUT				WEAK SIGNALS PRESENT AT OUTPUT				FREQUENCY OFF BUT STBL		FREQUENCY UN-STBL	
	ALL MODES	CERTAIN MODES	ALL FREQUENCIES	CERTAIN FREQUENCIES	ALL MODES	CERTAIN MODES	ALL FREQUENCIES	CERTAIN FREQUENCIES	ALL MODES	CERTAIN MODES	ALL FREQUENCIES	CERTAIN FREQUENCIES	ALL MODES	CERTAIN MODES	ALL FREQUENCIES	CERTAIN FREQUENCIES	ALL FREQUENCIES	CERTAIN FREQUENCIES	ALL FREQUENCIES	CERTAIN FREQUENCIES
1. INTERNAL FREQUENCY STANDARD A2A5 INT/COMP/EXT SWITCH SET AT INT (OR TO COMP WITH INPUT FROM EXT FREQUENCY STANDARD)	X		X		X		X	X									X		X	
2. EXTERNAL FREQUENCY STANDARD (AN/URQ-9, -10) (A2A5 INT/COMP/EXT SWITCH SET TO EXT POSITION)	X		X														X			
3. LSB IF./AUDIO AMPLIFIER A2A3 OR OUTPUT CIRCUITS		X	X			X	X			X	X			X	X					
4. USB IF./AUDIO AMPLIFIER A2A2 OR OUTPUT CIRCUITS		X	X			X	X			X	X			X	X					
5. MODE SELECTOR A2A1		X	X			X	X			X	X			X	X					
6. TRANSLATOR/SYNTHESIZER A2A6					X		X	X	X		X	X	X		X	X	X	X	X	X
7. RF AMPLIFIER A2A4									X		X	X	X		X	X				
8. ANTENNA OVERLOAD PCB A2A9									X		X		X		X					
9. ANTENNA INPUT CIRCUITS (ANTENNA TO A2A9 ASSEMBLY)									X		X		X		X	X				
10. 4-VDC POWER SUPPLY AND VERNIER CONTROL A2A11					X		X	X									X	X	X	X
11. KCS DIGITAL TUNE SYSTEM					X		X	X	X		X	X	X		X	X	X	X		
12. MCS DIGITAL TUNE SYSTEM					X		X	X	X		X	X								

NOTES:
1. PRIOR TO USING THIS GUIDE, INSURE THAT CORRECT VOLTAGES ARE BEING SUPPLIED BY THE POWER SUPPLY. (REFER TO TABLE 4-3.)
2. THIS GUIDE IS TO BE USED ONLY AS AN AID IN INITIAL FAULT ISOLATION OF A MALFUNCTION. CONCLUSIVE RESULTS SHOULD THEN BE OBTAINED BY THE PERFORMANCE TESTS AND ISOLATION CHECKS IN SECTION 4.
3. REFER TO PARAGRAPH 4-17 FOR DEFINITION OF NOISE LEVELS.
4. AN X INDICATES THAT THE SYMPTOM IN THE COLUMN HEADING IS LIKELY TO BE CAUSED BY A MALFUNCTION IN THE ASSEMBLY INDICATED AT LEFT.

Figure 4-2. Fault Isolation Guide

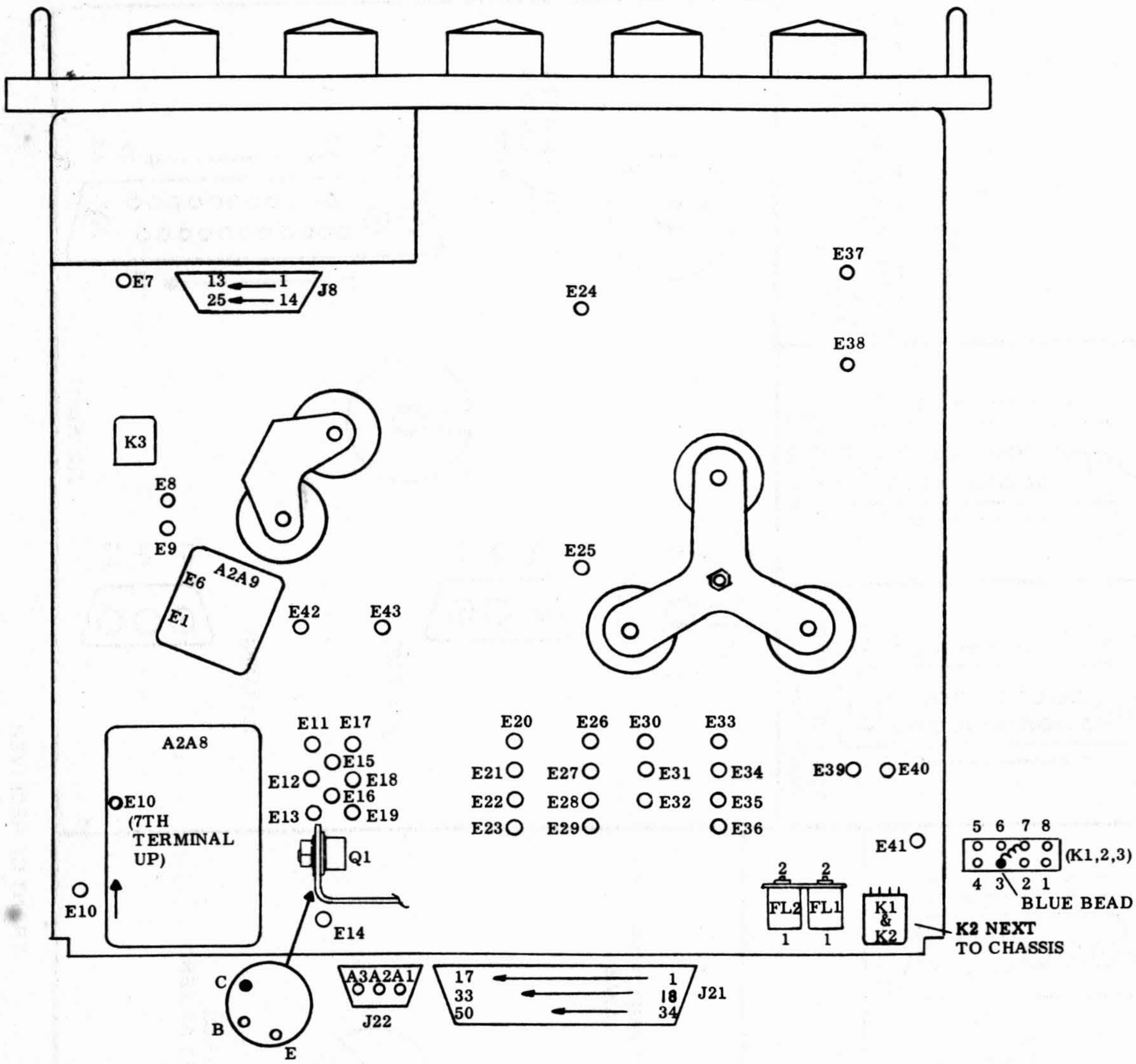


Figure 4-3. Main Frame Chassis "E" Terminal and Test Point Location Diagram

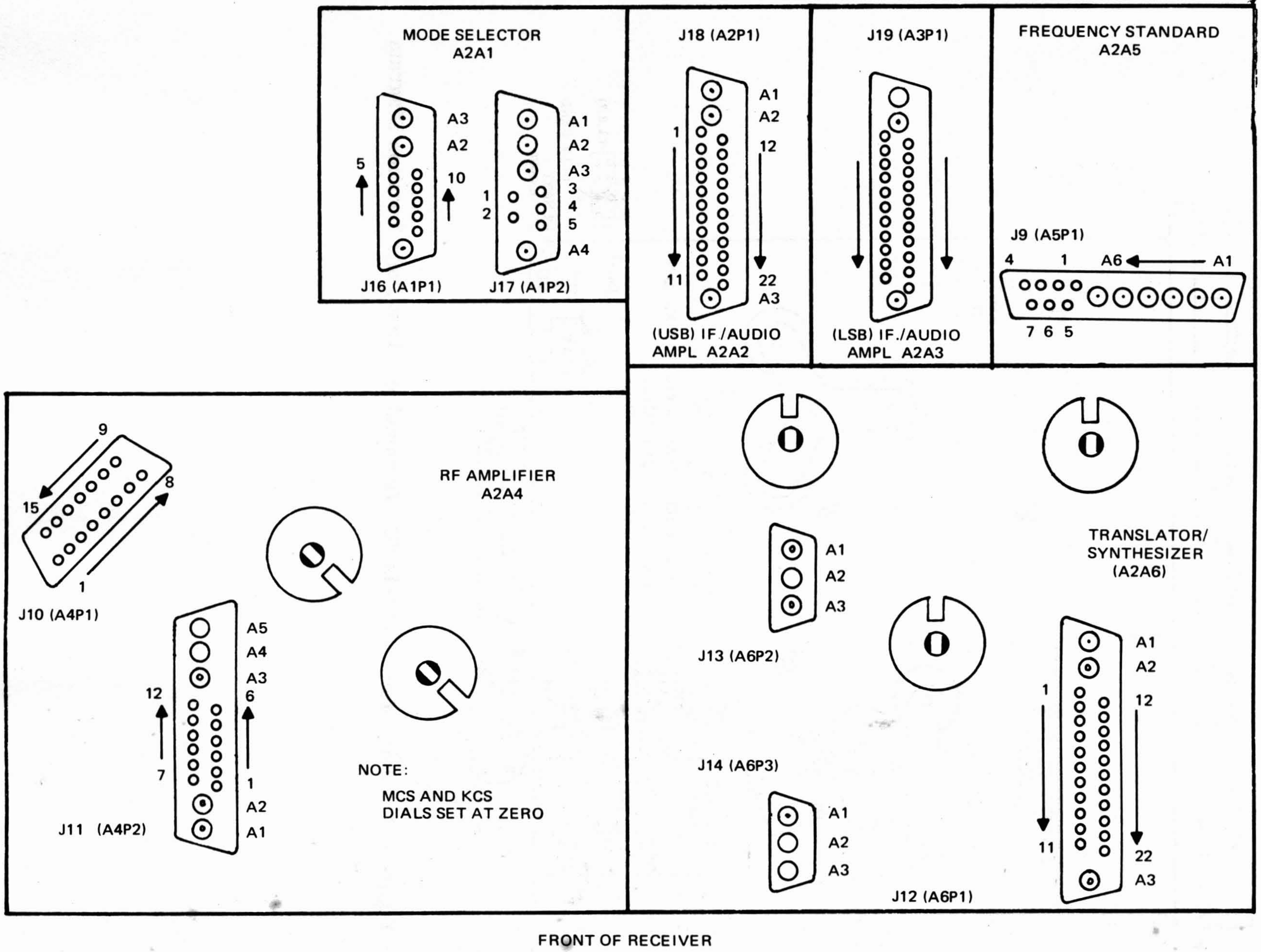


Figure 4-4. Main Frame Chassis, Top View, Connector Pin Location Diagram

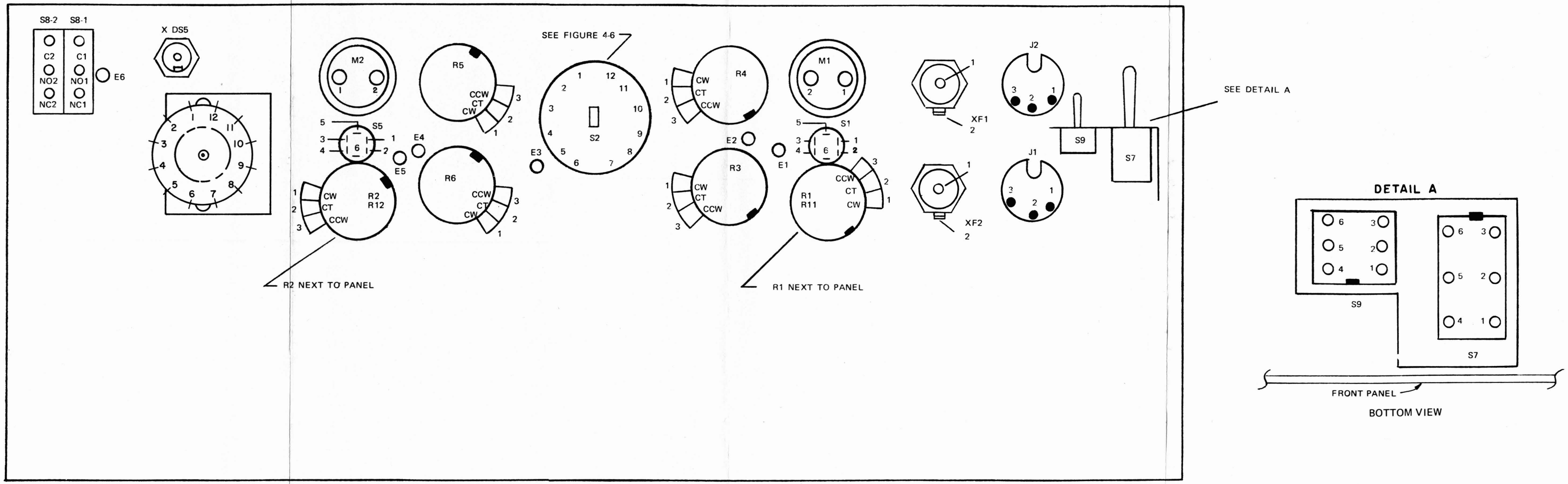
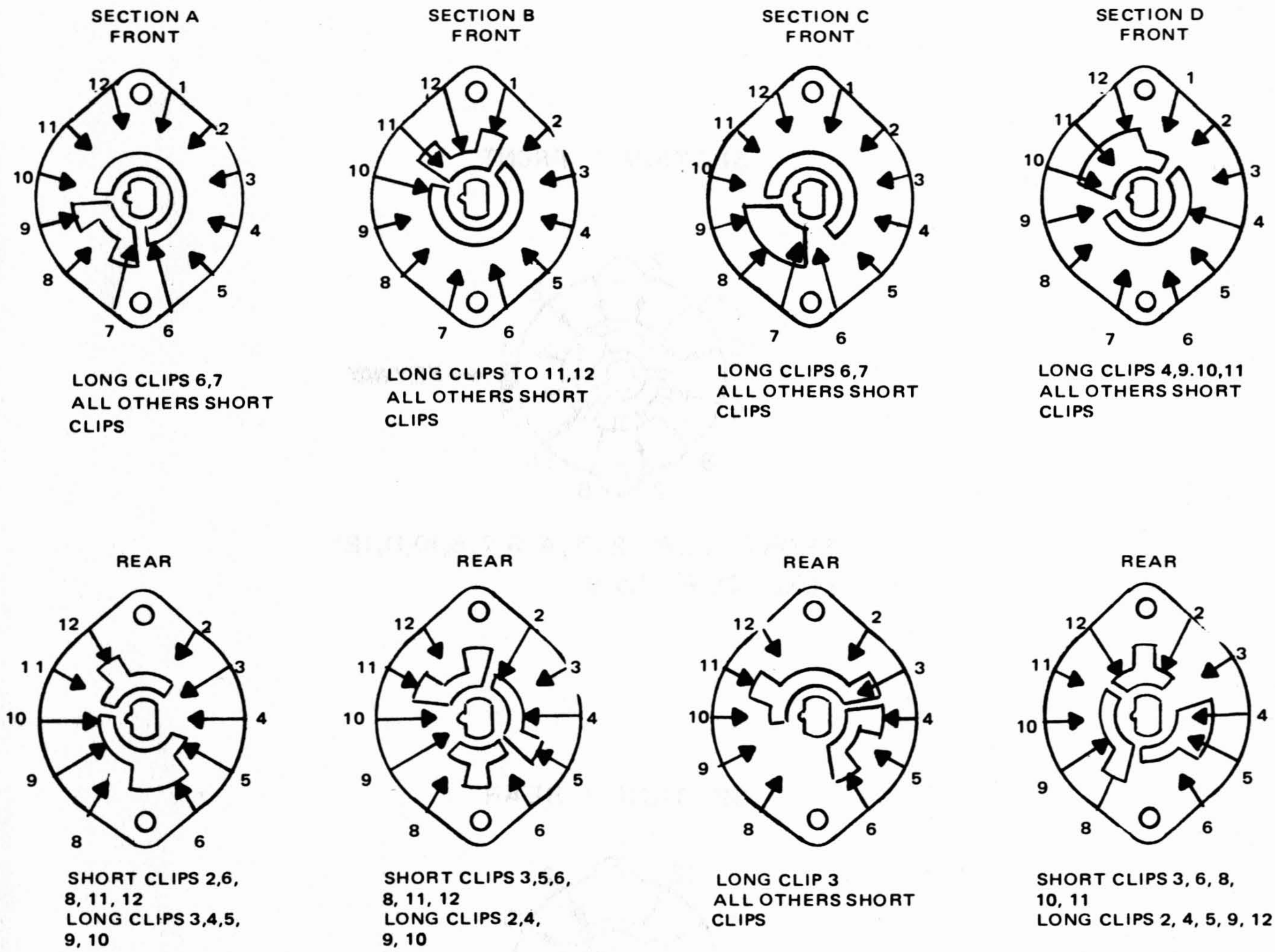
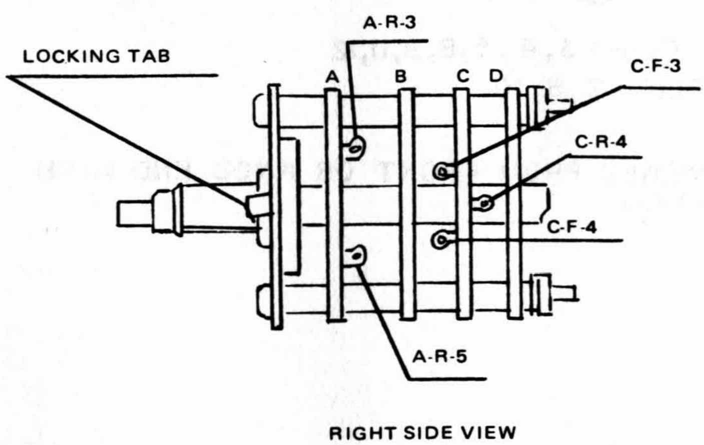


Figure 4-5. Front-Panel Components, Terminal, and Switch Contact Marking Diagram



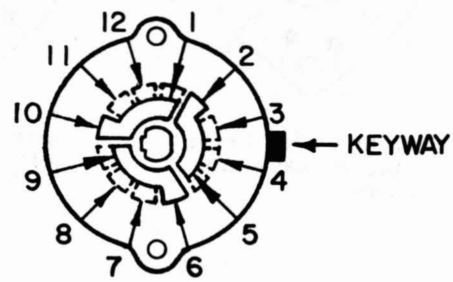
NOTES:
1. PREFIX ALL REF DES WITH A2S2.
2. SWITCH SECTIONS VIEWED FROM FRONT OR KNOB END WITH ROTOR SHAFT IN EXTREME CCW (OFF) POSITION
3. EACH SWITCH SECTION HAS A DOT AT TERMINAL 2 (REAR) FOR ALIGNMENT DURING ASSEMBLY.



RIGHT SIDE VIEW

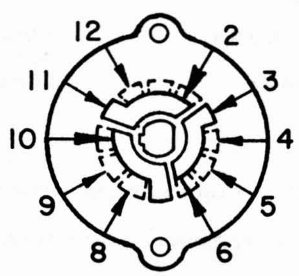
Figure 4-6. Mode Selector Switch A2S2, Contact Arrangement Diagram

SECTION I FRONT



SHORT CLIP: 2,3,4,6,7,8,10,11,12
LONG CLIP: 1,5,9

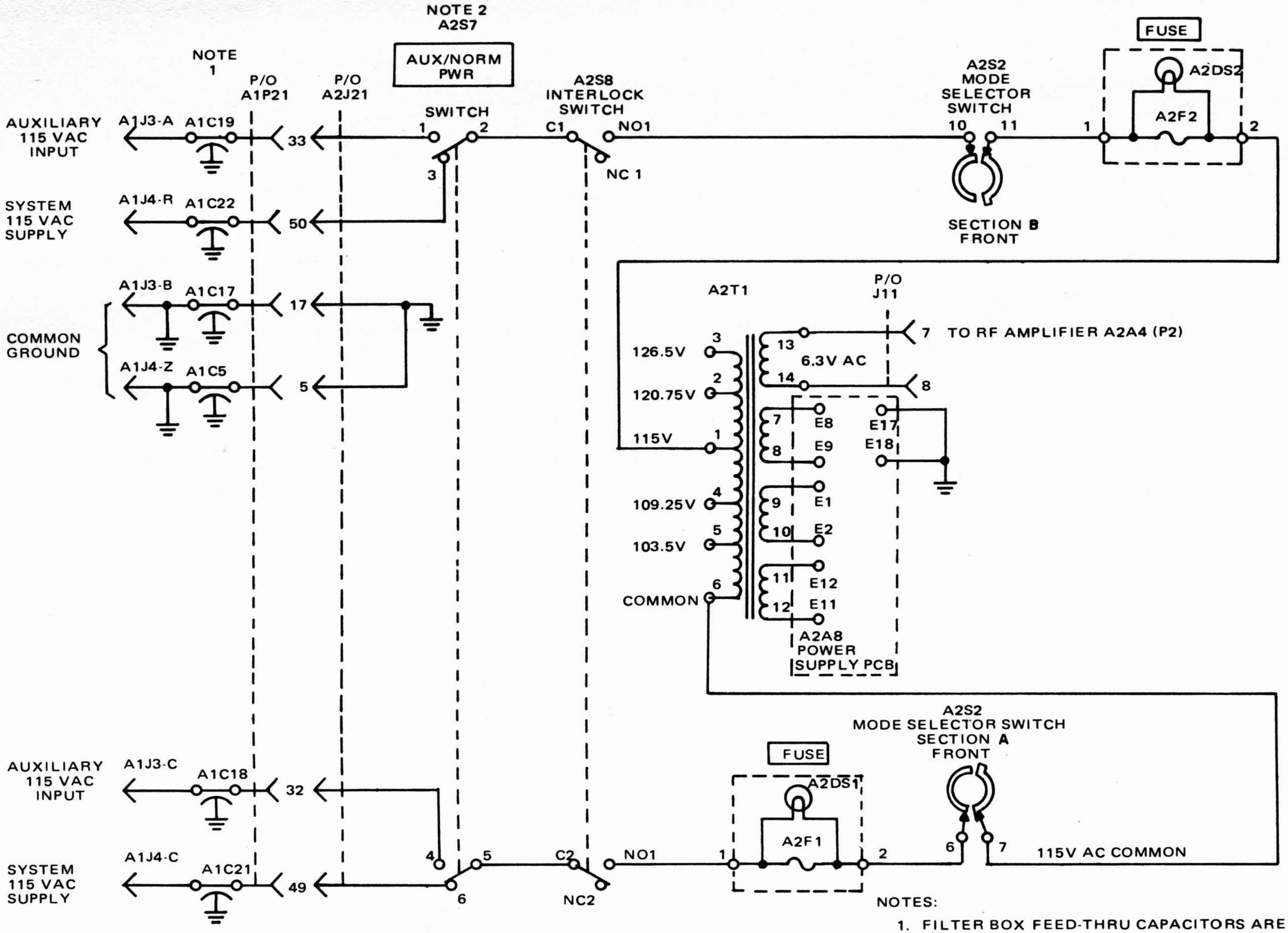
SECTION I REAR



SHORT CLIP: 3,4,5,8,9,11,12
LONG CLIP: 2,6,10

FRONT AND REAR OF SECTION VIEWED FROM FRONT OR KNOB END WITH SWITCH IN EXTREME CCW POSITION.

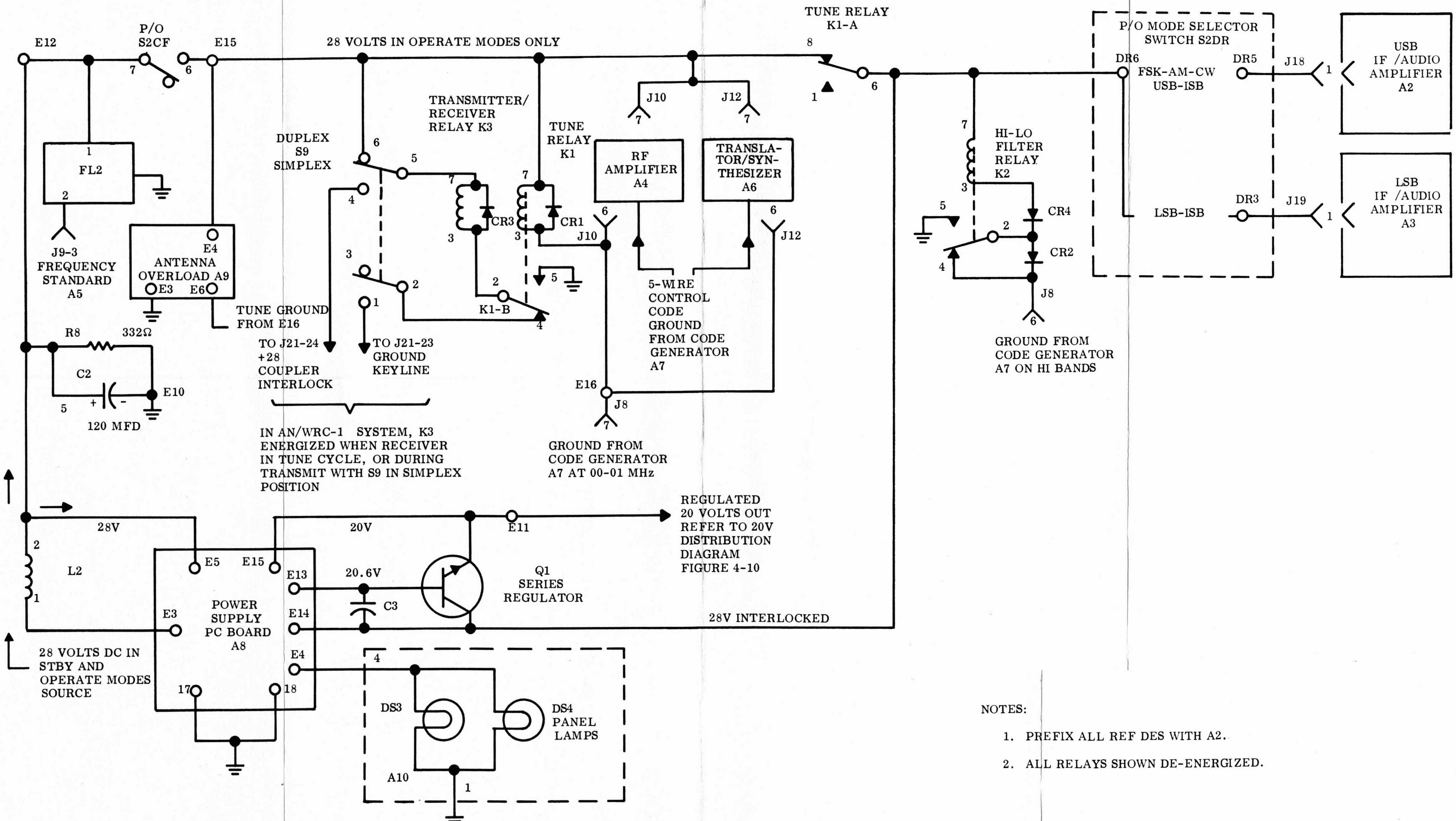
Figure 4-7. CPS Switch Assembly A2S6, Contact Arrangement Diagram



NOTES:

1. FILTER BOX FEED-THRU CAPACITORS ARE 0.001 MICROFARADS
2. A2S7: NORM - 115VAC SUPPLY FROM AN/WRC-1B SYSTEM
   AUX - 115VAC SUPPLY INDEPENDENT OF AN/WRC-1B SYSTEM

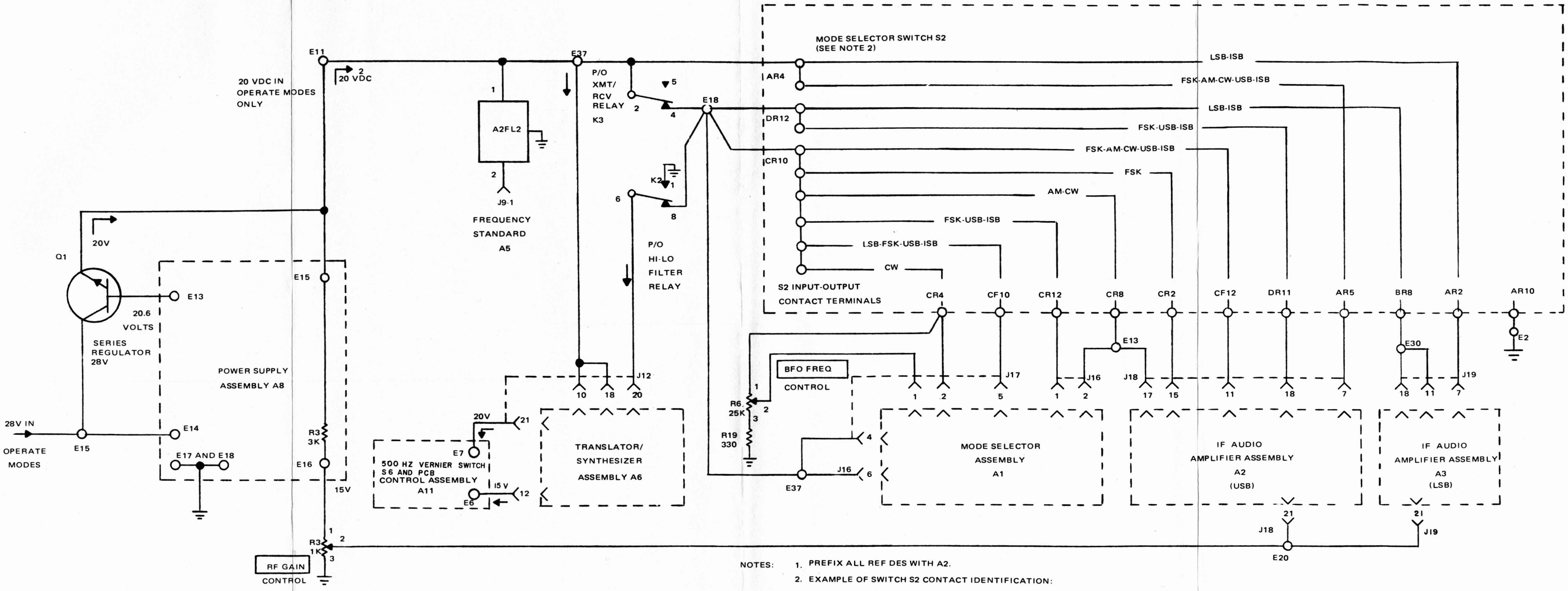
Figure 4-8. AC Power Distribution Diagram



NOTES:

1. PREFIX ALL REF DES WITH A2.
2. ALL RELAYS SHOWN DE-ENERGIZED.

Figure 4-9. 28-VDC Distribution Diagram

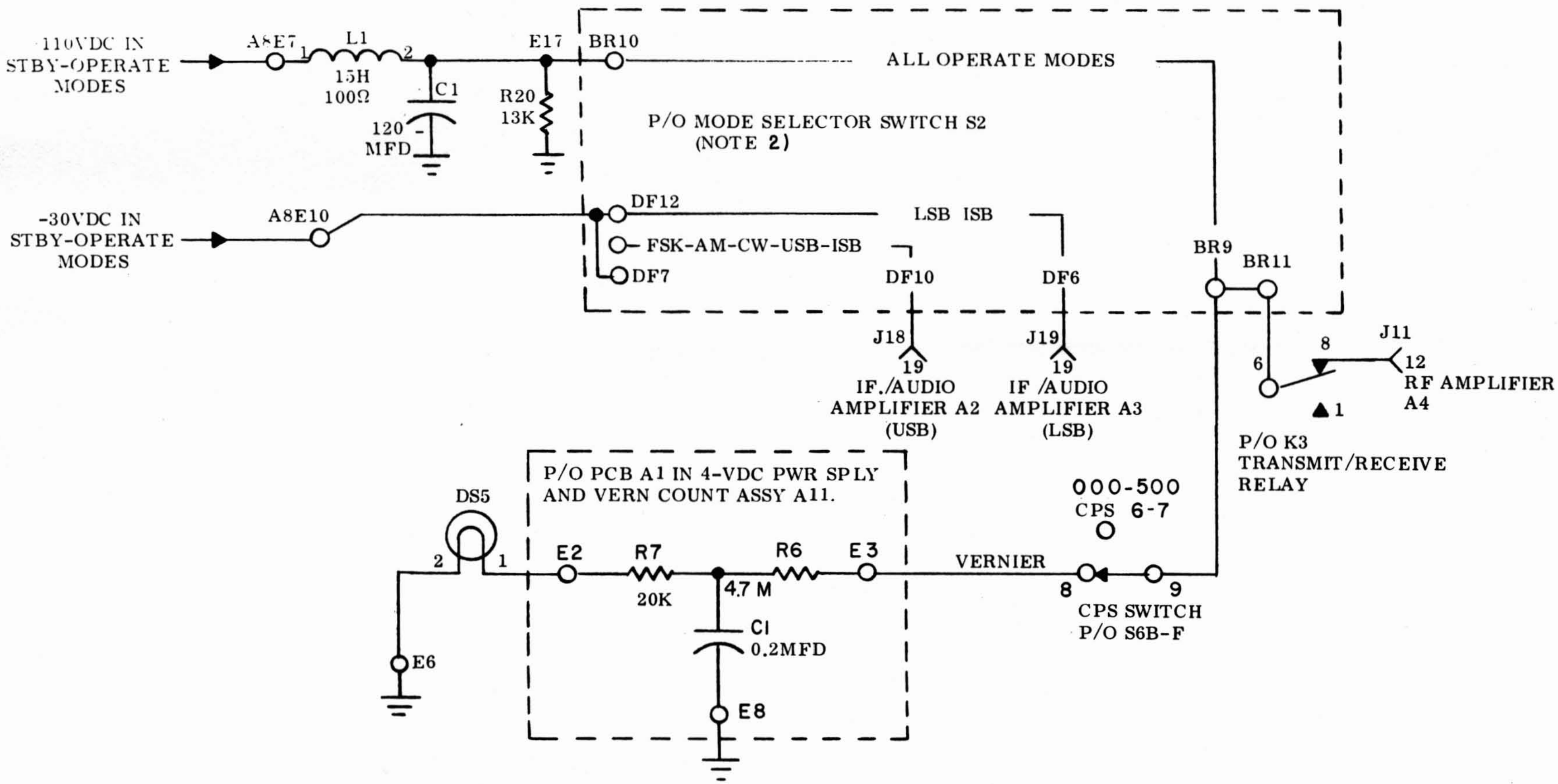


NOTES:

1. PREFIX ALL REF DES WITH A2.
2. EXAMPLE OF SWITCH S2 CONTACT IDENTIFICATION:

   AR4 IS SECTION A, REAR SIDE, CONTACT 4 OF S2.
   REFER TO FIGURE 4-6 FOR NUMBERING OF S2, SWITCH CONTACTS.
   REFER TO FIGURE 4-16 THROUGH 4-21 FOR INTERNAL SWITCHING, JUMPERS, AND TROUBLESHOOTING OF S2.

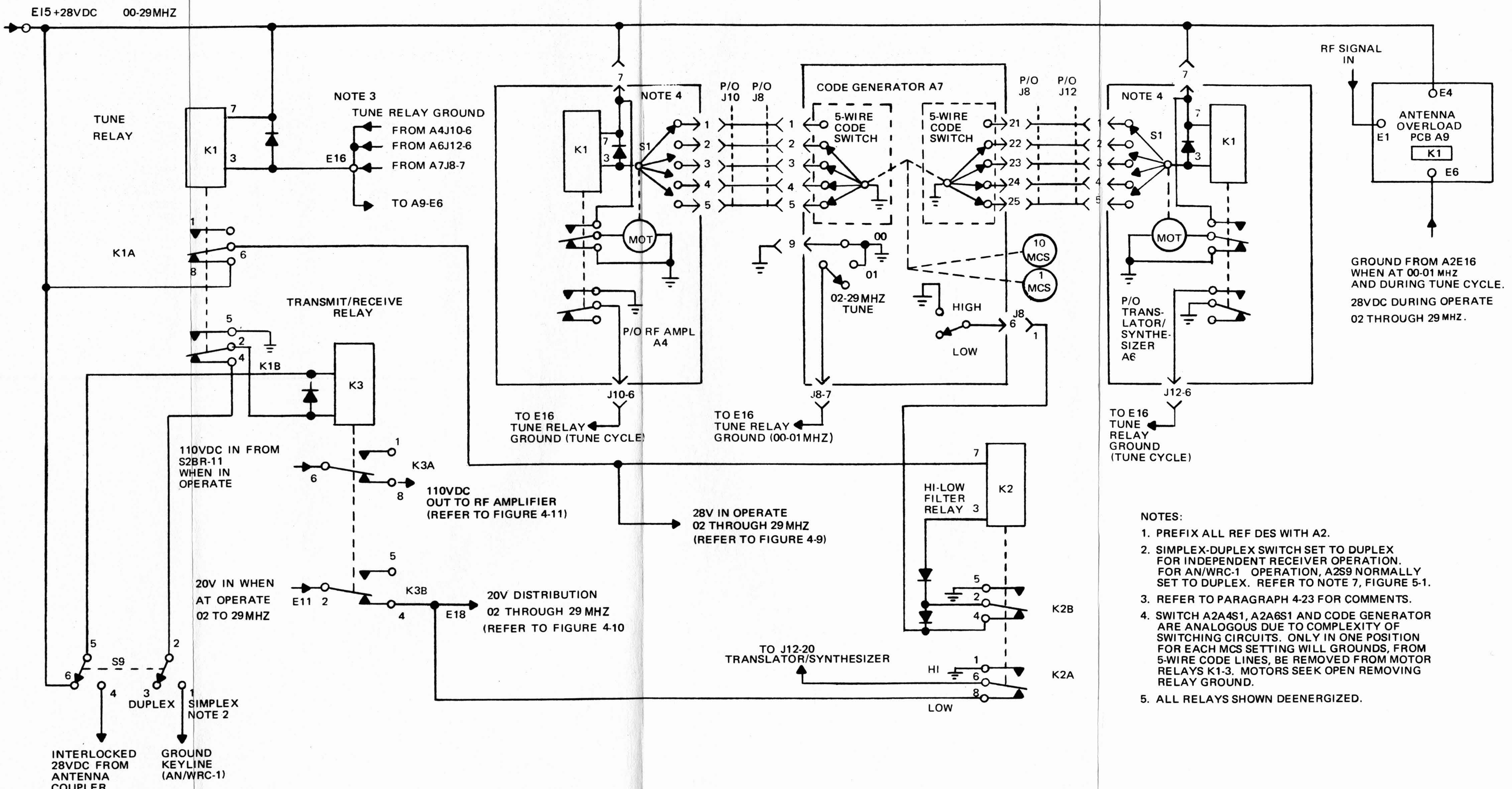
Figure 4-10. 20-VDC Distribution Diagram



NOTES:

1. PREFIX ALL REF DES WITH A2.
2. FOR TROUBLESHOOTING MODE SELECTOR SWITCH, REFER TO PARA 4-50.

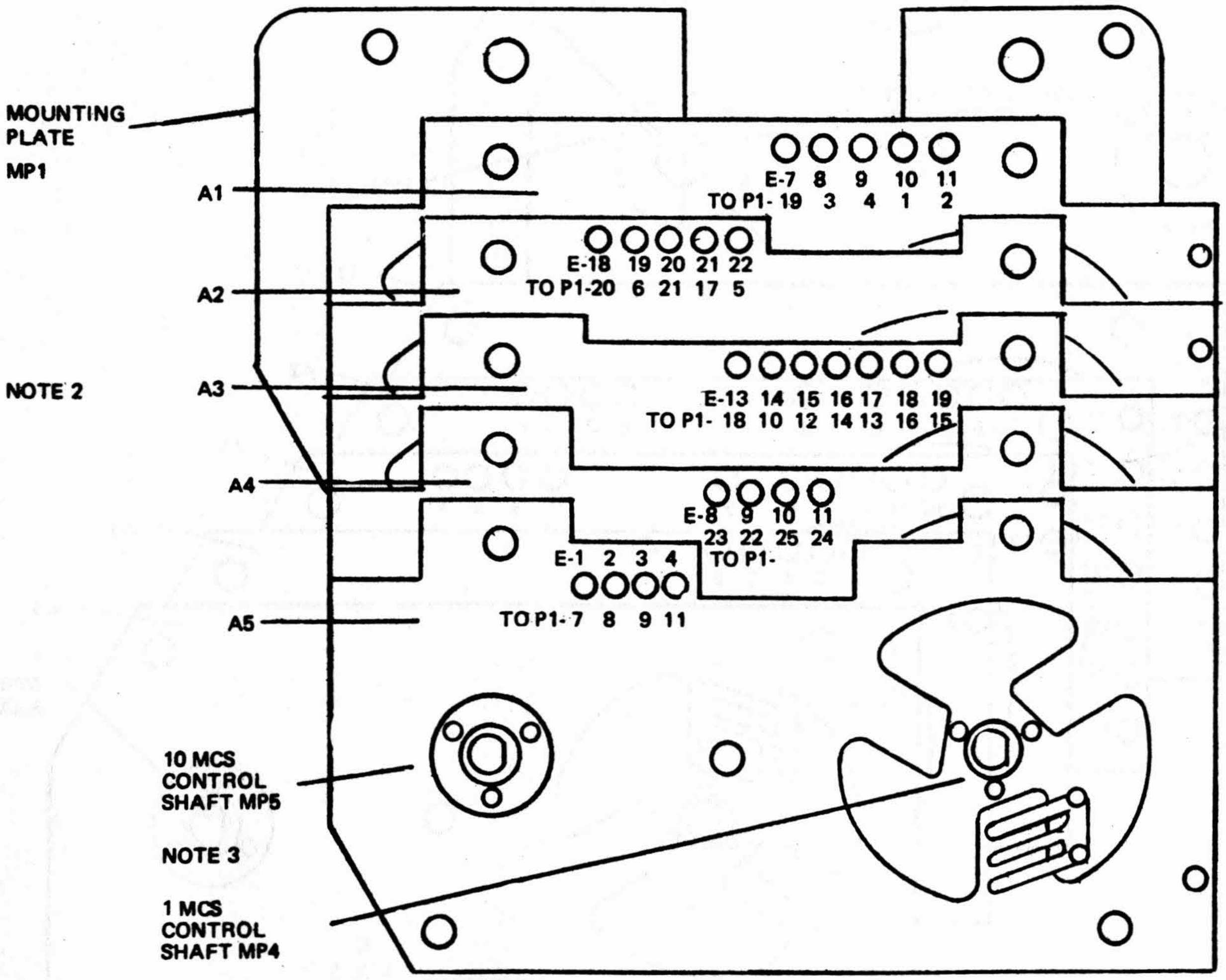
Figure 4-11. 30- and 110-VDC Distribution Diagram



NOTES:

1. PREFIX ALL REF DES WITH A2.
2. SIMPLEX-DUPLEX SWITCH SET TO DUPLEX FOR INDEPENDENT RECEIVER OPERATION. FOR AN/WRC-1 OPERATION, A2S9 NORMALLY SET TO DUPLEX. REFER TO NOTE 7, FIGURE 5-1.
3. REFER TO PARAGRAPH 4-23 FOR COMMENTS.
4. SWITCH A2A4S1, A2A6S1 AND CODE GENERATOR ARE ANALOGOUS DUE TO COMPLEXITY OF SWITCHING CIRCUITS. ONLY IN ONE POSITION FOR EACH MCS SETTING WILL GROUNDS, FROM 5-WIRE CODE LINES, BE REMOVED FROM MOTOR RELAYS K1-3. MOTORS SEEK OPEN REMOVING RELAY GROUND.
5. ALL RELAYS SHOWN DEENERGIZED.

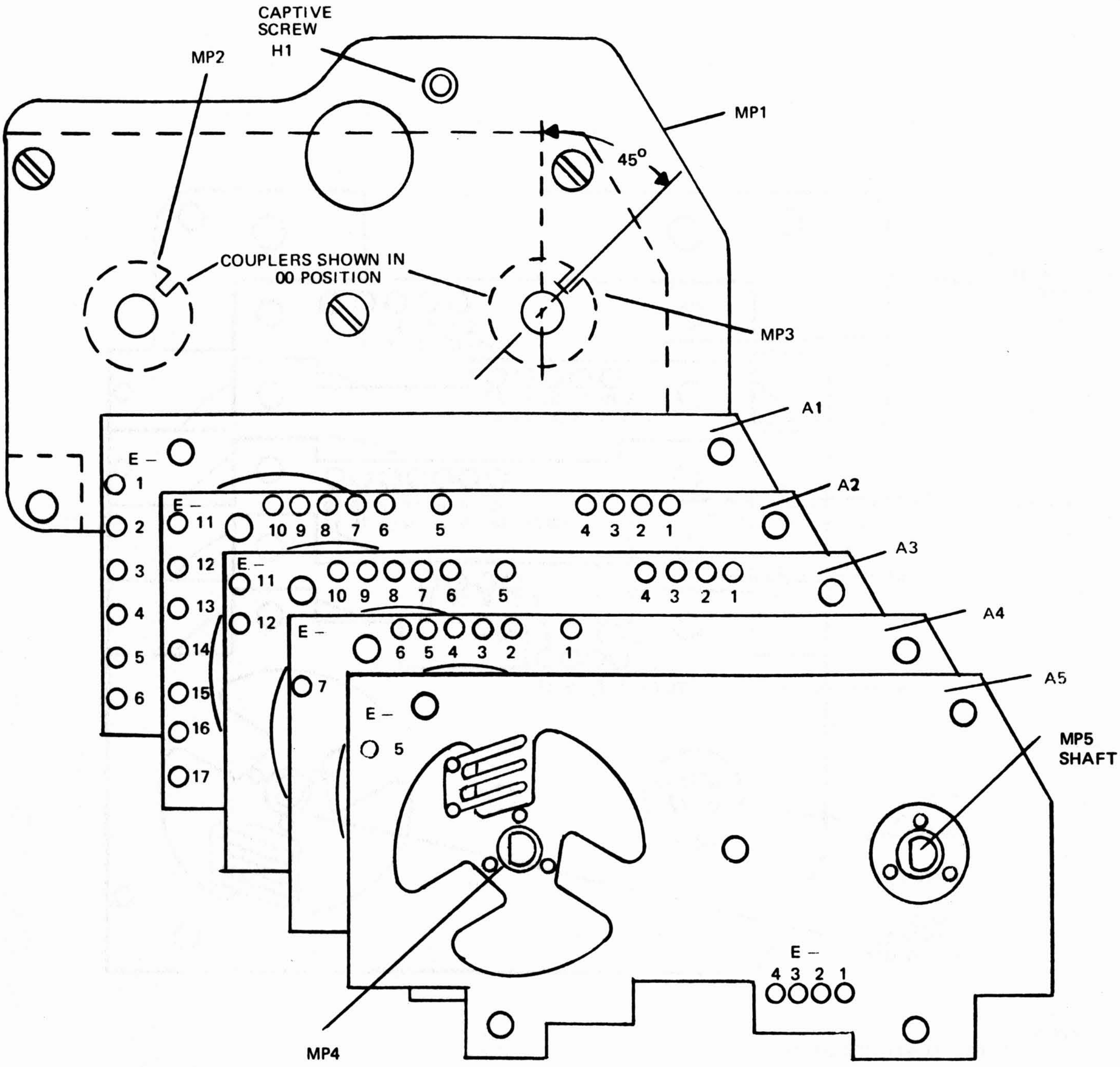
Figure 4-12. Relay Control Diagram



NOTES:

1. PREFIX ALL REF DES WITH A2A7
2. REFERENCE DIAGRAM IS FOR A FIVE-DECK PCB CODE GENERATOR, WHICH MAY BE USED IN RECEIVER OR EXCITER, HOWEVER, CENTER PCB (A3) IS NOT UTILIZED IN RECEIVER. IN MOST RECEIVERS, ONLY A1, A2, A4 AND A5 WILL BE PRESENT. REFER TO TABLE 4-5 FOR WIRING.
3. SHAFTS OF 1 MCS AND 10 MCS CONTROLS SHOWN IN ZERO POSITION. AS VIEWED, ROTATION IS CCW BY 30 DEGREE DETENTS. 10MCS CONTROL HAS THREE POSITIONS AND 1 MCS CONTROL HAS TEN POSITIONS BETWEEN END STOPS.

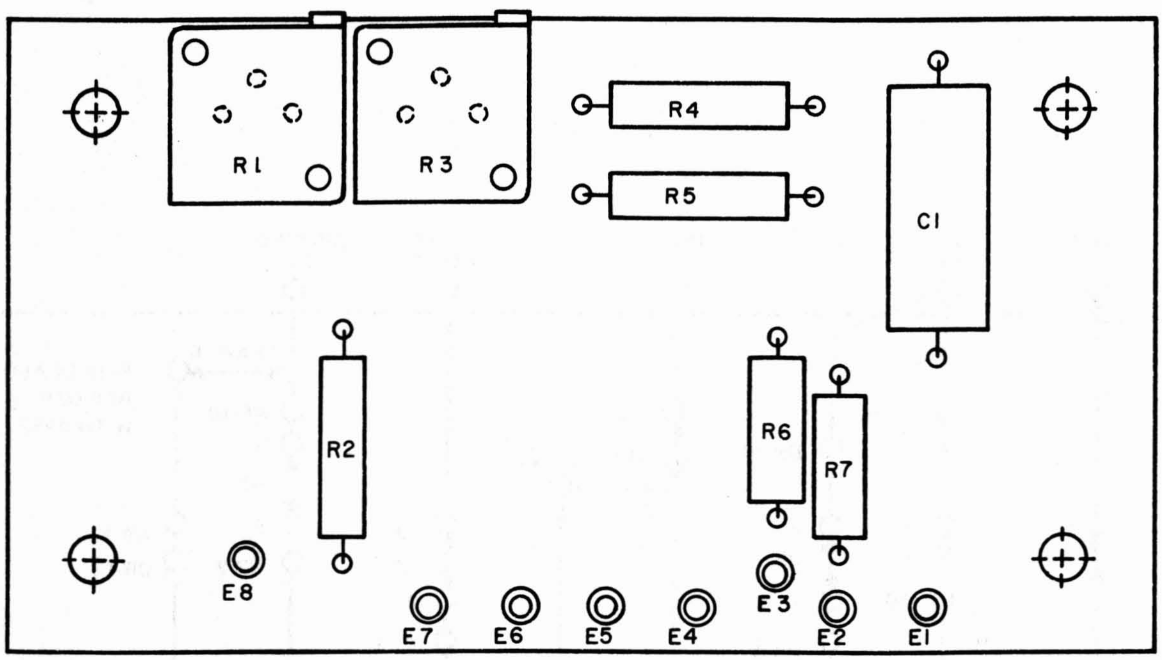
Figure 4-13. Code Generator Assembly, Test Point Location Diagram (Bottom-Rear View)



NOTES:

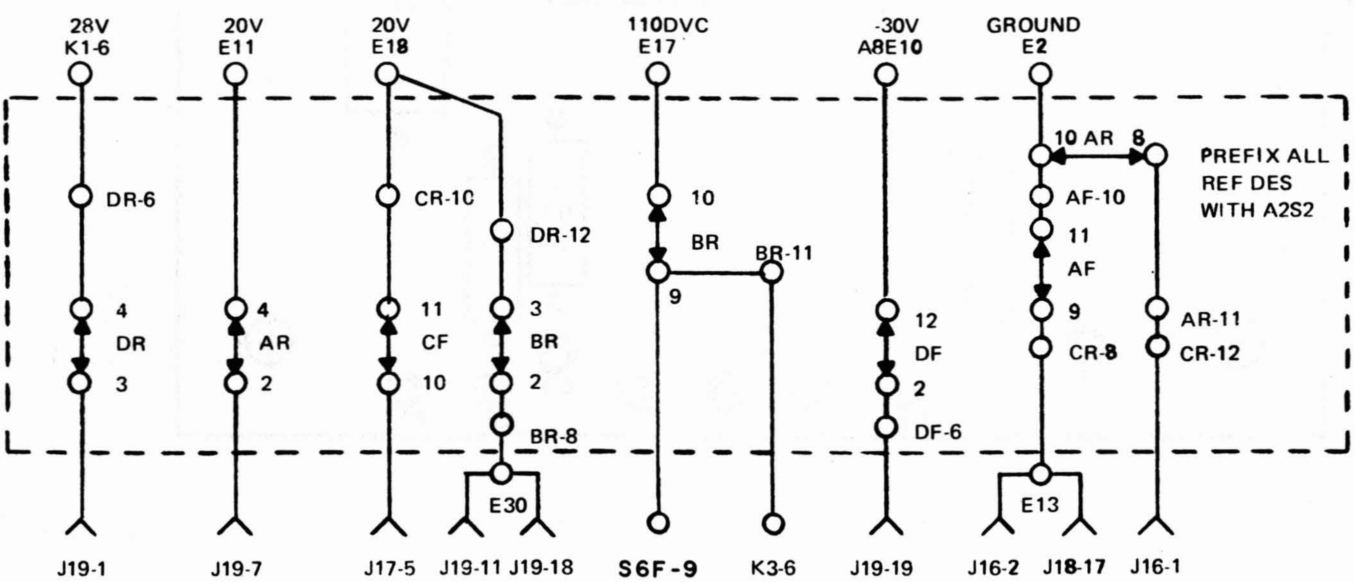
1. PREFIX ALL REF DES WITH A2A7
2. REFERENCE DIAGRAM IS FOR A FIVE-DECK PCB CODE GENERATOR, WHICH MAY BE USED IN RECEIVER OR EXCITER, HOWEVER, CENTER PCB (A3) IS NOT UTILIZED IN RECEIVER. IN MOST RECEIVERS, ONLY A1, A2, A4 AND A5 WILL BE PRESENT. REFER TO TABLE 4-5 FOR WIRING.
3. SHAFTS OF 1 MCS AND 10 MCS CONTROLS SHOWN IN ZERO POSITION. AS VIEWED, ROTATION IS CCW BY 30 DEGREE DETENTS. 10MCS CONTROL HAS THREE POSITIONS AND 1 MCS CONTROL HAS TEN POSITIONS BETWEEN END STOPS.

Figure 4-14. Code Generator Assembly A2A7, Test Point Location Diagram (Top-Rear View)



E 8	GRD	E 5	000 LOCK CONTROL
E 6	VERNIER CONTROL	E 4	500 LOCK CONTROL
E 7	VERNIER CONTROL ARM	E 3	VERNIER CONTROL LAMP 110V DC
		E 2	VERNIER INDICATOR
		E 1	15V VERNIER CONTROL

Figure 4-15. Receiver 500 CPS Control Component Location



NOTE: IN TWO-LETTER IDENT, FIRST LETTER IS SW SECT., SECOND LETTER IS FRONT (F) OR REAR (R).

Figure 4-16. LSB Position of Mode Selector Switch A2S2

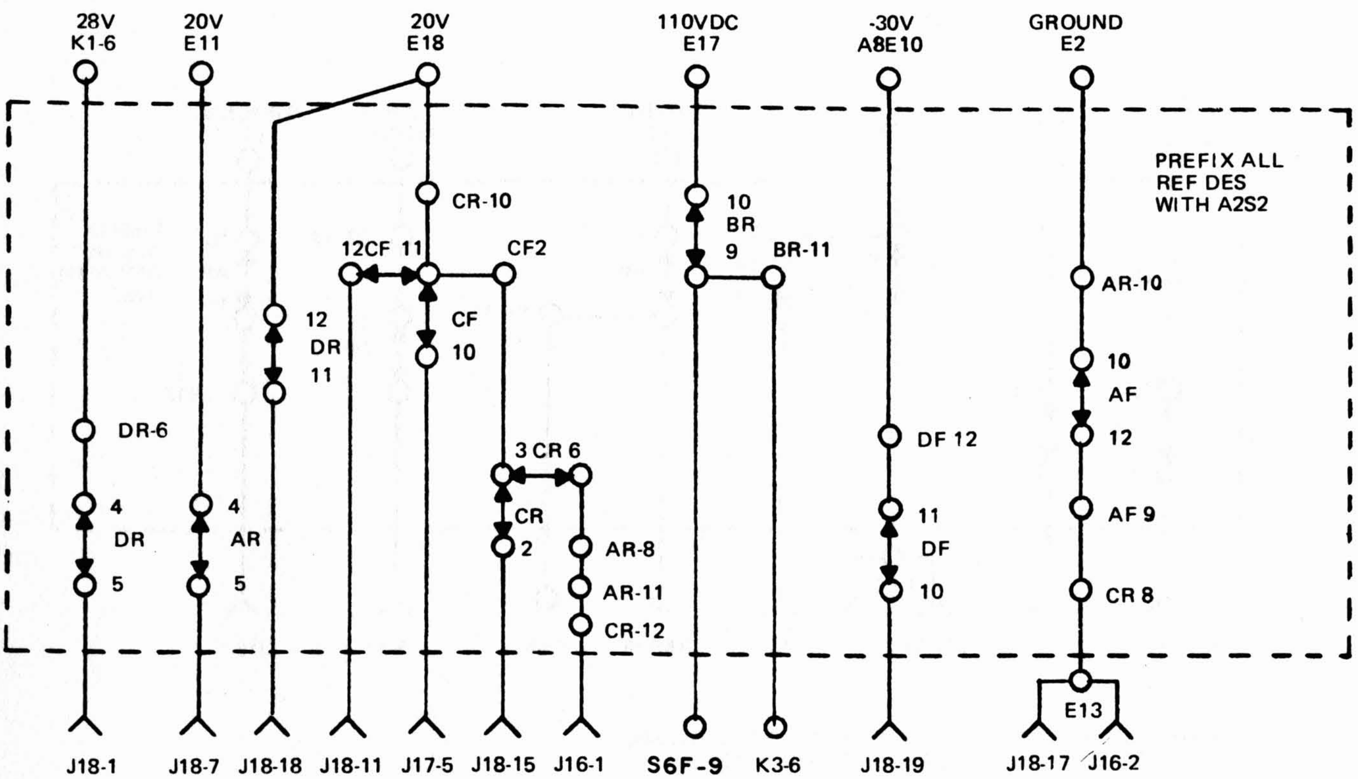


Figure 4-17. FSK Position of Mode Selector Switch A2S2

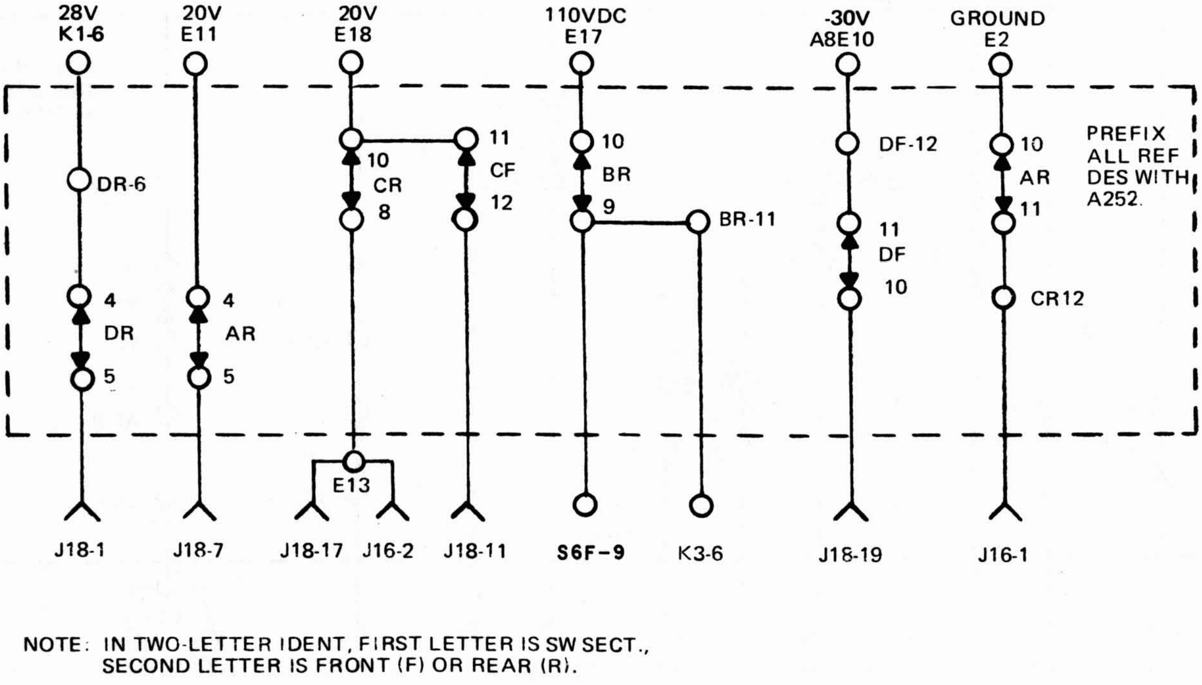
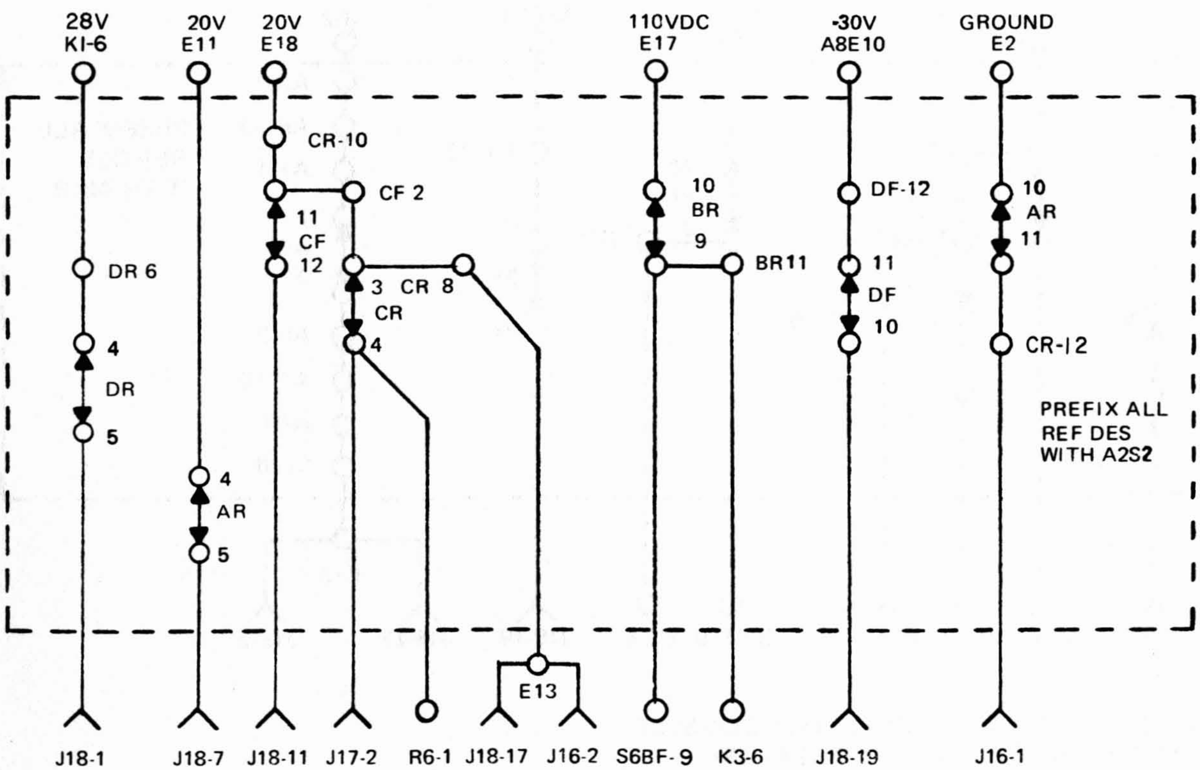
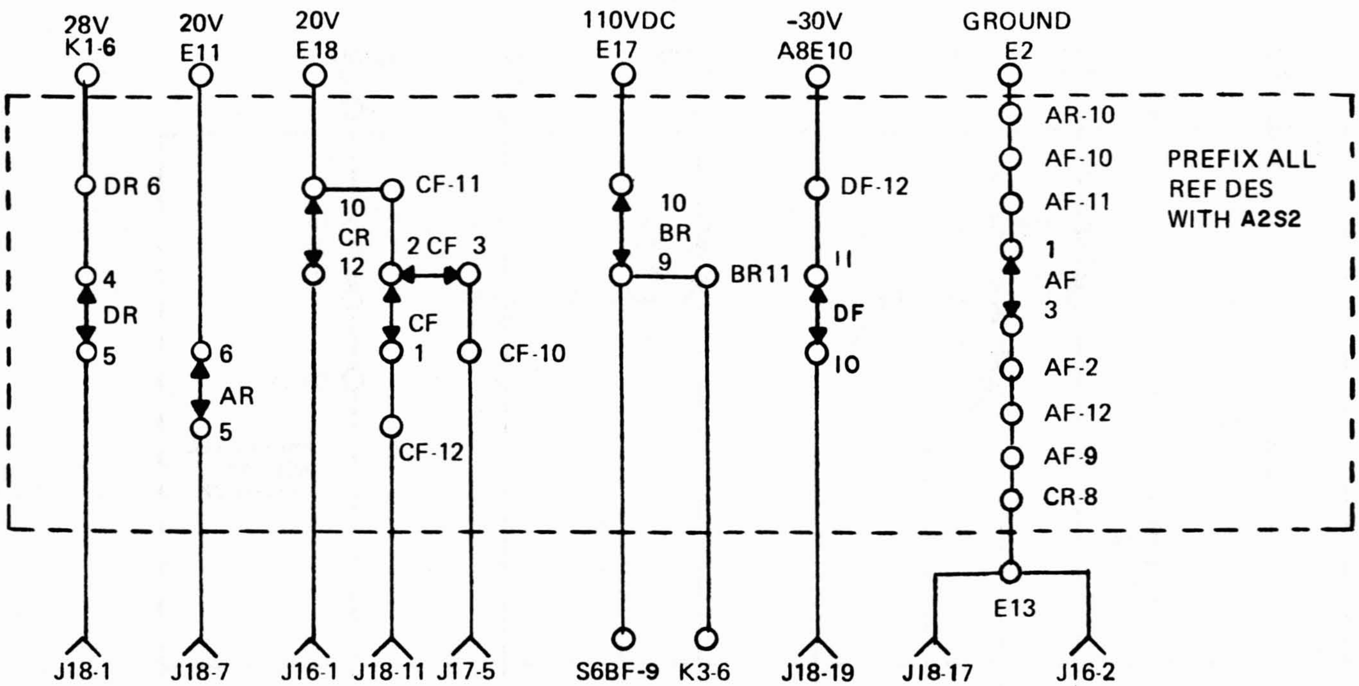


Figure 4-18. AM Position of Mode Selector Switch A2S2



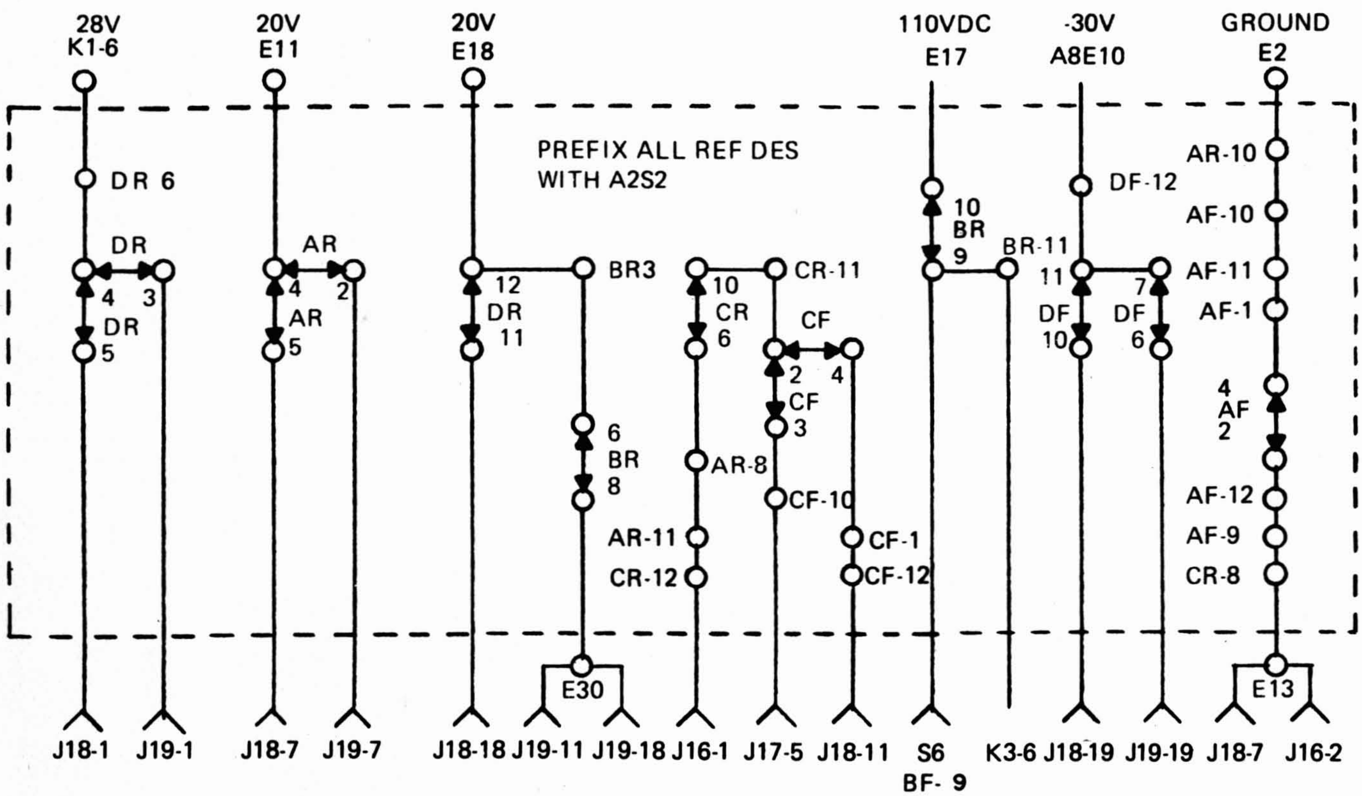
NOTE: IN TWO-LETTER IDENT, FIRST LETTER IS SW SECT., SECOND LETTER IS FRONT (F) OR REAR (R).

Figure 4-19. CW Position of Mode Selector A2S2



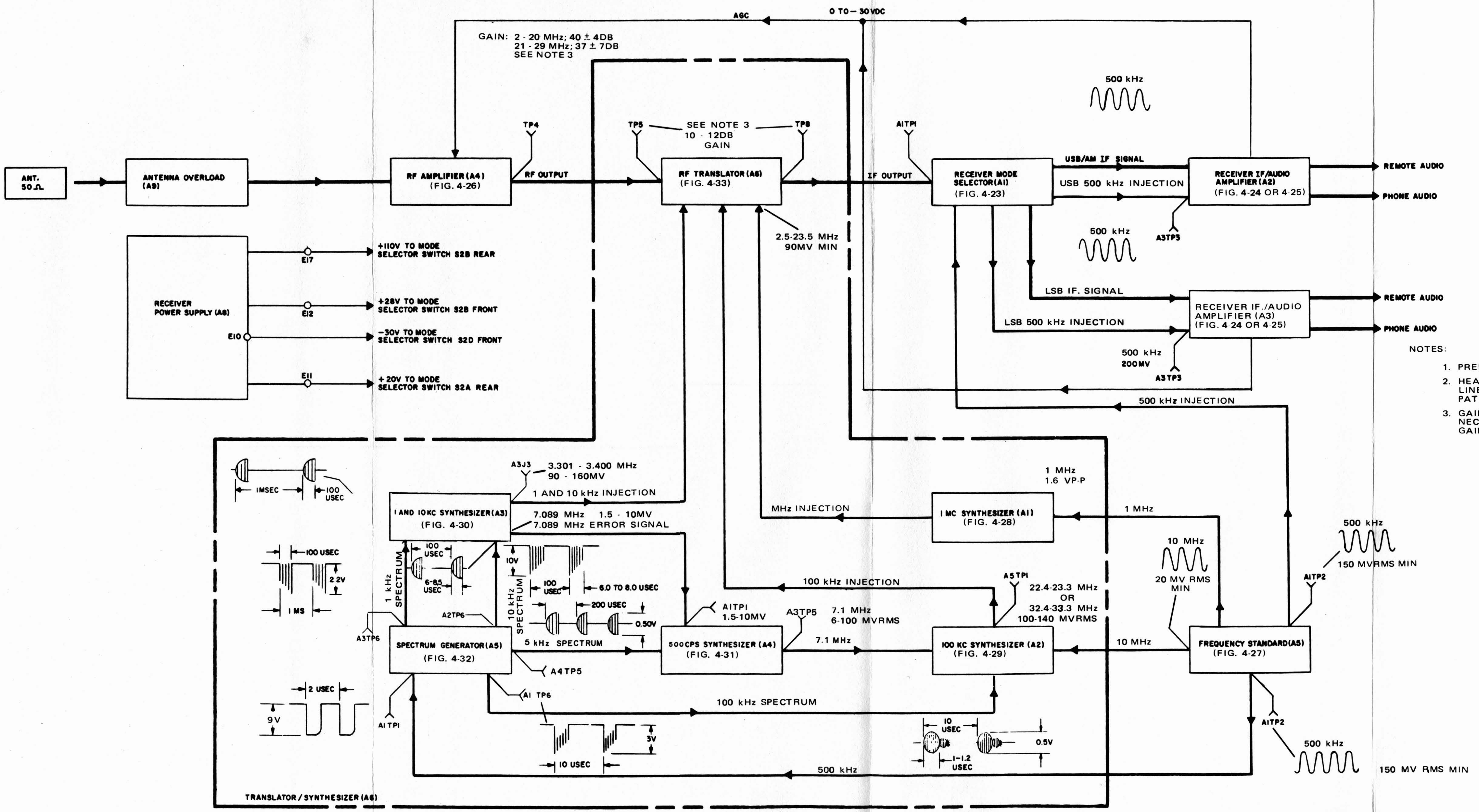
NOTE: IN TWO-LETTER IDENT, FIRST LETTER IS SW SECT., SECOND LETTER IS FRONT (F) OR REAR (R).

Figure 4-20. USB Position of Mode Selector Switch A2S2



NOTE: IN TWO-LETTER IDENT., FIRST LETTER IS SW SECT., SECOND LETTER IS FRONT (F) OR REAR (R).

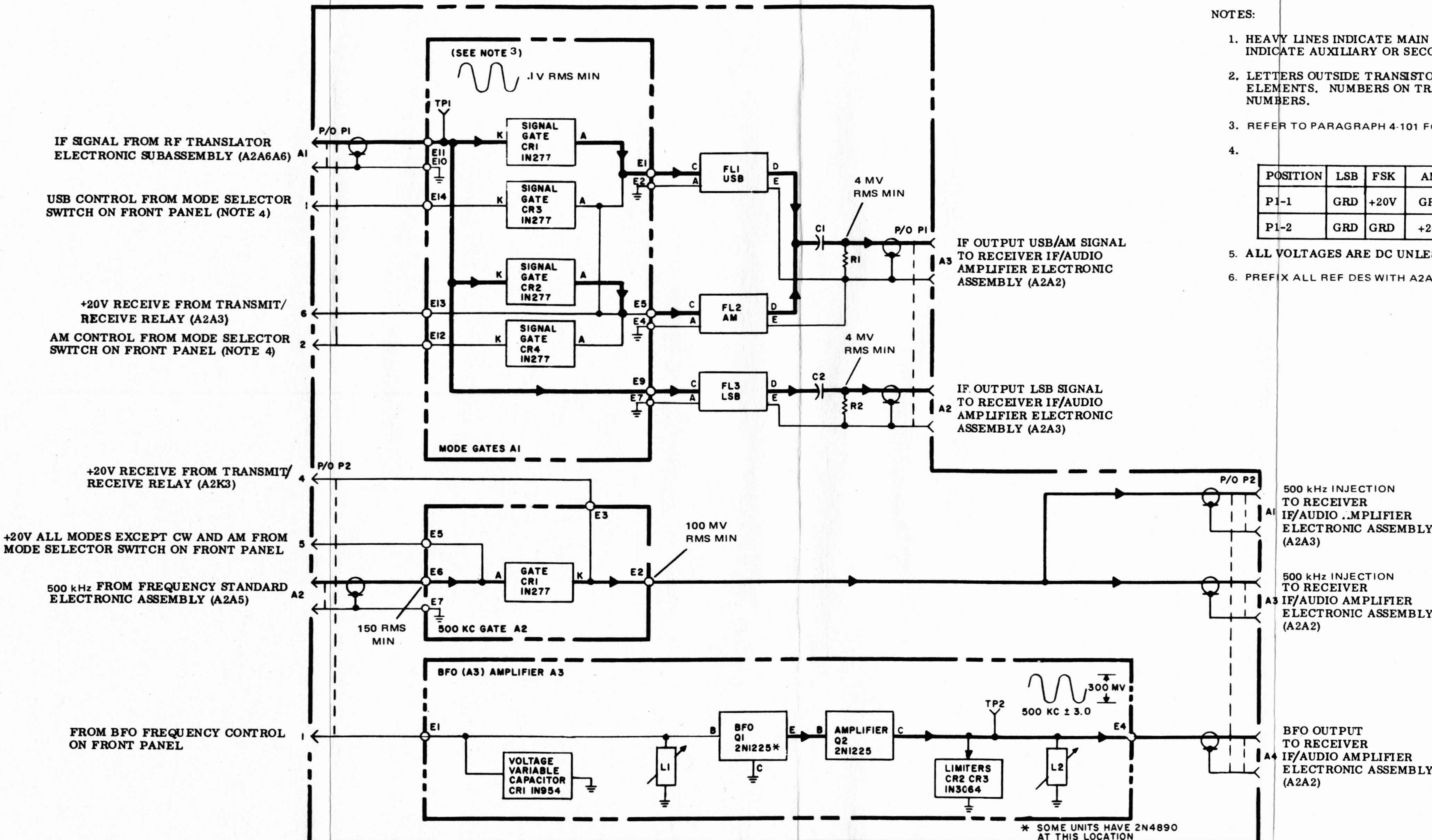
Figure 4-21. ISB Position of Mode Selector Switch A2S2



NOTES:

1. PREFIX ALL REF DES WITH A2.
2. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
3. GAIN MEASURED EASIER WITH AGC VOLTAGE DISCONNECTED (REMOVE RECEIVER MODE SELECTOR (A1)). GAIN EXPRESSED AS DB ABOVE PREVIOUS STAGE.

Figure 4-22. Radio Receiver R-1051/URR, Overall Servicing Diagram



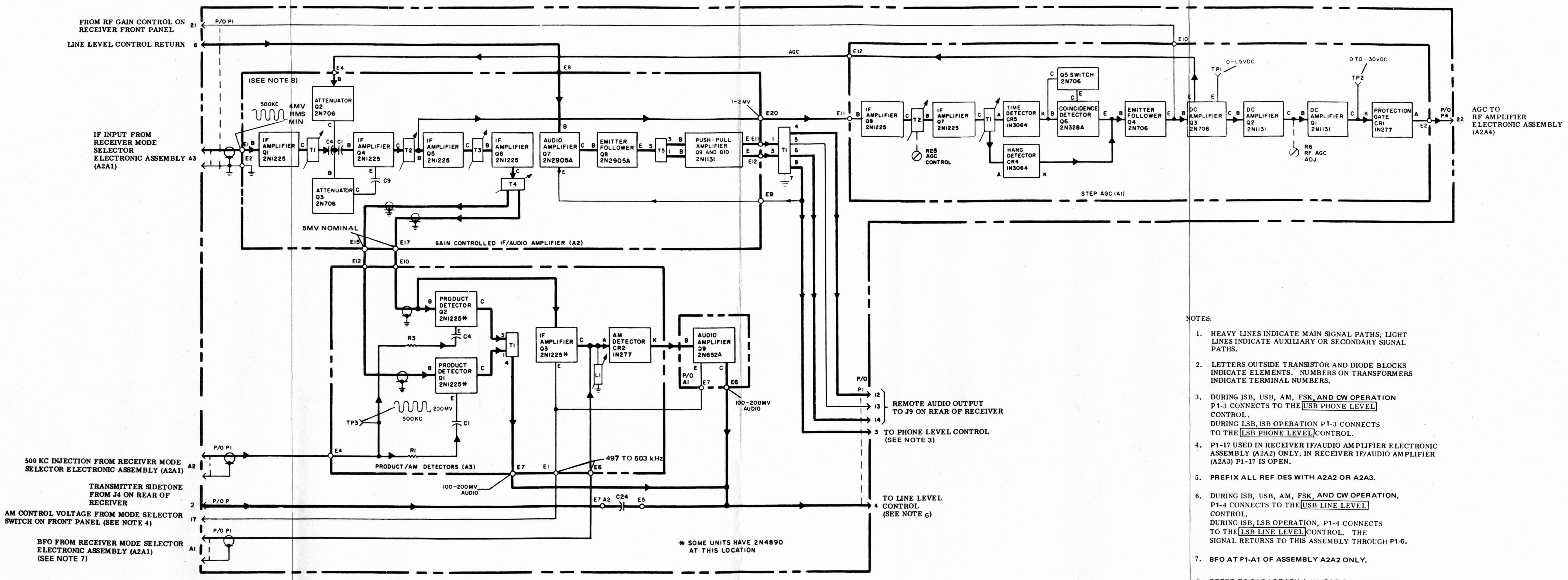
NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS. NUMBERS ON TRANSFORMERS INDICATE TERMINAL NUMBERS.
3. REFER TO PARAGRAPH 4-101 FOR SIGNAL LEVELS.
4.

POSITION	LSB	FSK	AM	CW	USB	ISB
P1-1	GRD	+20V	GRD	GRD	+20V	+20V
P1-2	GRD	GRD	+20V	+20V	GRD	GRD

5. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
6. PREFIX ALL REF DES WITH A2A1.

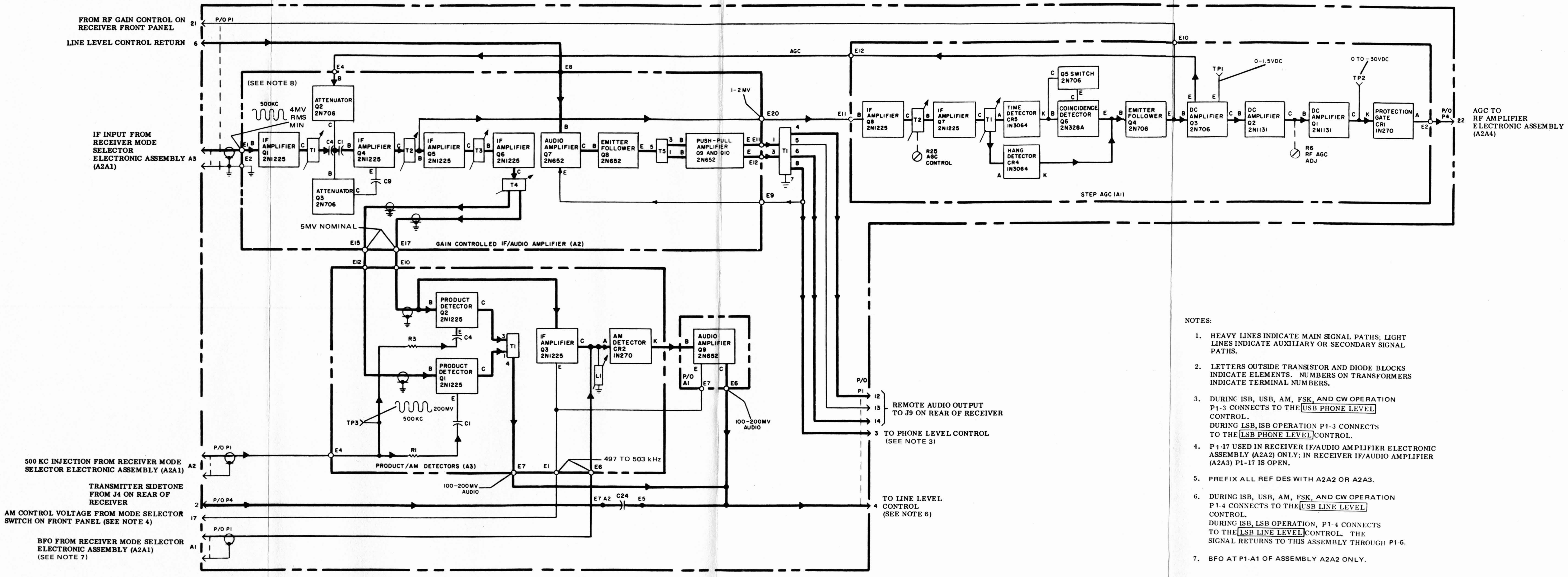
Figure 4-23. Receiver Mode Selector Assembly A2A1, Servicing Diagram Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS. NUMBERS ON TRANSFORMERS INDICATE TERMINAL NUMBERS.
3. DURING ISB, USB, AM, FSK, AND CW OPERATION P1-3 CONNECTS TO THE USB PHONE LEVEL CONTROL. DURING LSB, ISB OPERATION P1-3 CONNECTS TO THE LSB PHONE LEVEL CONTROL.
4. P1-17 USED IN RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLY (A2A2) ONLY; IN RECEIVER IF/AUDIO AMPLIFIER (A2A3) P1-17 IS OPEN.
5. PREFIX ALL REF DES WITH A2A2 OR A2A3.
6. DURING ISB, USB, AM, FSK, AND CW OPERATION, P1-4 CONNECTS TO THE USB LINE LEVEL CONTROL. DURING ISB, LSB OPERATION, P1-4 CONNECTS TO THE LSB LINE LEVEL CONTROL. THE SIGNAL RETURNS TO THIS ASSEMBLY THROUGH P1-6.
7. BFO AT P1-A1 OF ASSEMBLY A2A2 ONLY.
8. REFER TO PARAGRAPH 4-111 FOR SIGNAL LEVELS.

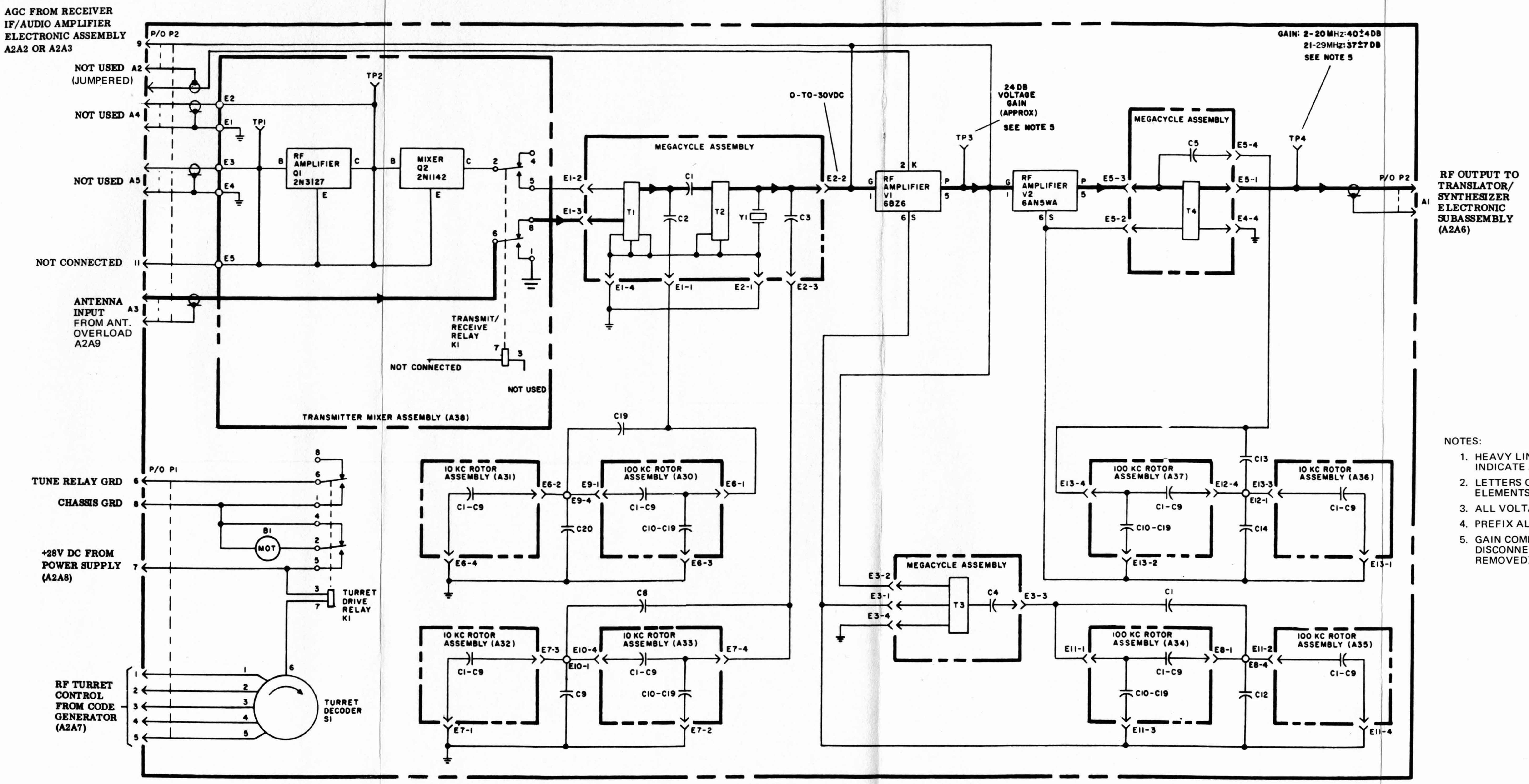
Figure 4-24. Receiver IF/Audio Amplifier Assemblies A2A2 and A2A3, Servicing Block Diagram (Late Model Version)



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS. NUMBERS ON TRANSFORMERS INDICATE TERMINAL NUMBERS.
3. DURING ISB, USB, AM, FSK, AND CW OPERATION P1-3 CONNECTS TO THE USB PHONE LEVEL CONTROL. DURING LSB, ISB OPERATION P1-3 CONNECTS TO THE LSB PHONE LEVEL CONTROL.
4. P1-17 USED IN RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLY (A2A2) ONLY; IN RECEIVER IF/AUDIO AMPLIFIER (A2A3) P1-17 IS OPEN.
5. PREFIX ALL REF DES WITH A2A2 OR A2A3.
6. DURING ISB, USB, AM, FSK, AND CW OPERATION P1-4 CONNECTS TO THE USB LINE LEVEL CONTROL. DURING ISB, LSB OPERATION, P1-4 CONNECTS TO THE LSB LINE LEVEL CONTROL. THE SIGNAL RETURNS TO THIS ASSEMBLY THROUGH P1-6.
7. BFO AT P1-A1 OF ASSEMBLY A2A2 ONLY.
8. REFER TO PARAGRAPH 4-111 FOR SIGNAL LEVELS.

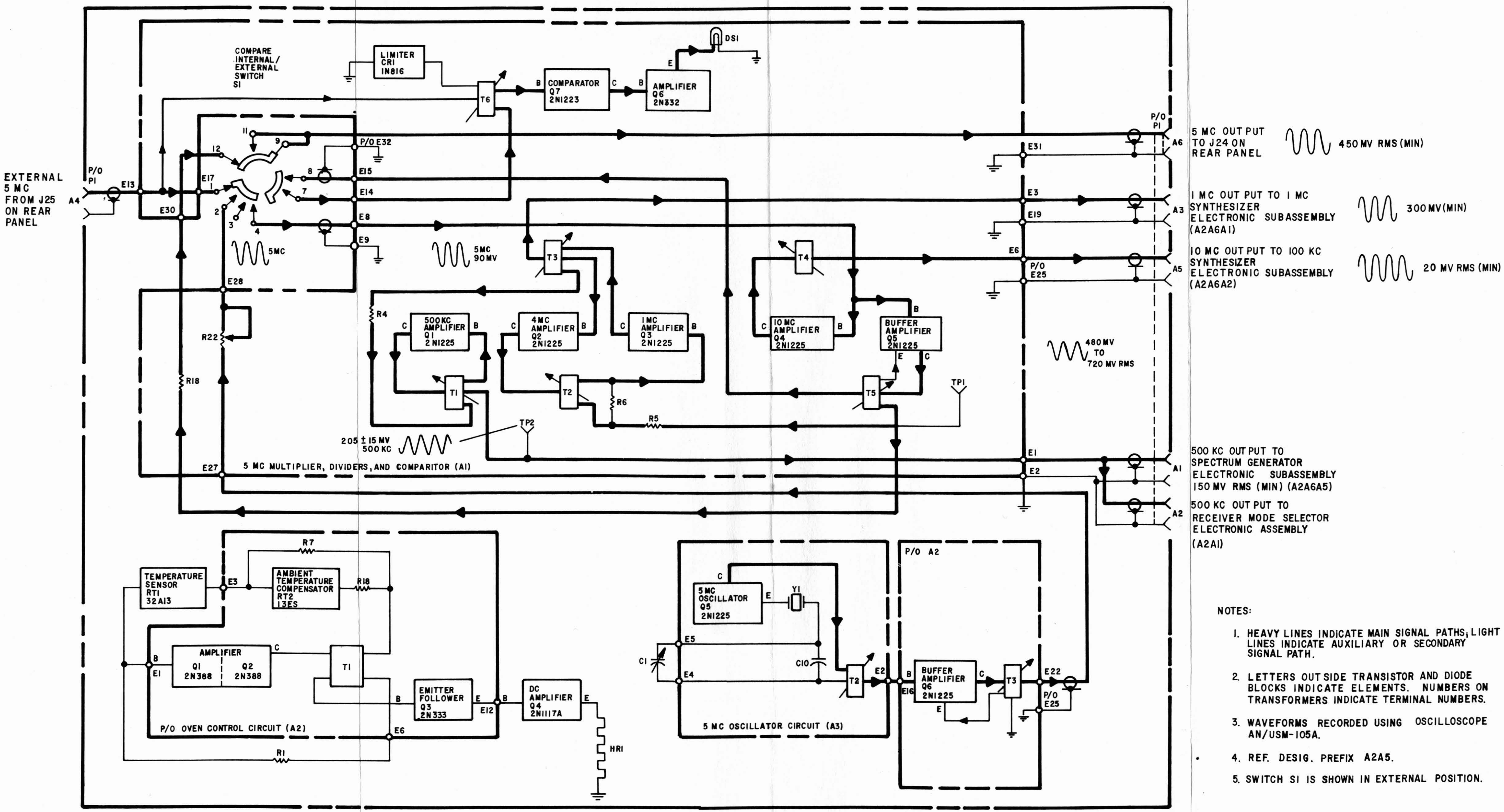
Figure 4-25. Receiver IF/Audio Amplifier Assemblies A2A2 and A2A3, Servicing Block Diagram (Early Model Version)



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND TUBE BLOCKS INDICATE ELEMENTS.
3. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
4. PREFIX ALL REF DES WITH A2A4.
5. GAIN COMPARED TO INPUT VOLTAGE WITH AGC VOLTAGE DISCONNECTED (MODE SELECTOR ELECTRONIC ASSEMBLY REMOVED). REFER TO PARAGRAPH 4-73.

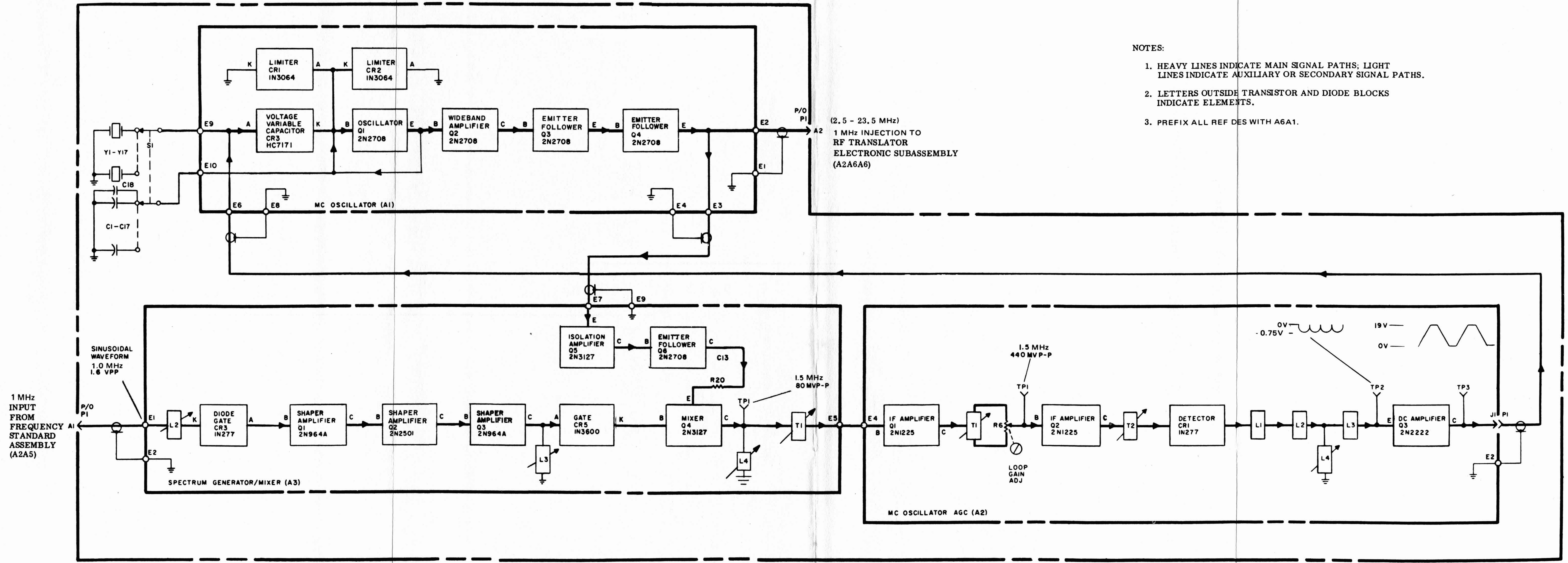
Figure 4-26. RF Amplifier Assembly A2A4, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATH.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS. NUMBERS ON TRANSFORMERS INDICATE TERMINAL NUMBERS.
3. WAVEFORMS RECORDED USING OSCILLOSCOPE AN/USM-105A.
4. REF. DESIG. PREFIX A2A5.
5. SWITCH S1 IS SHOWN IN EXTERNAL POSITION.

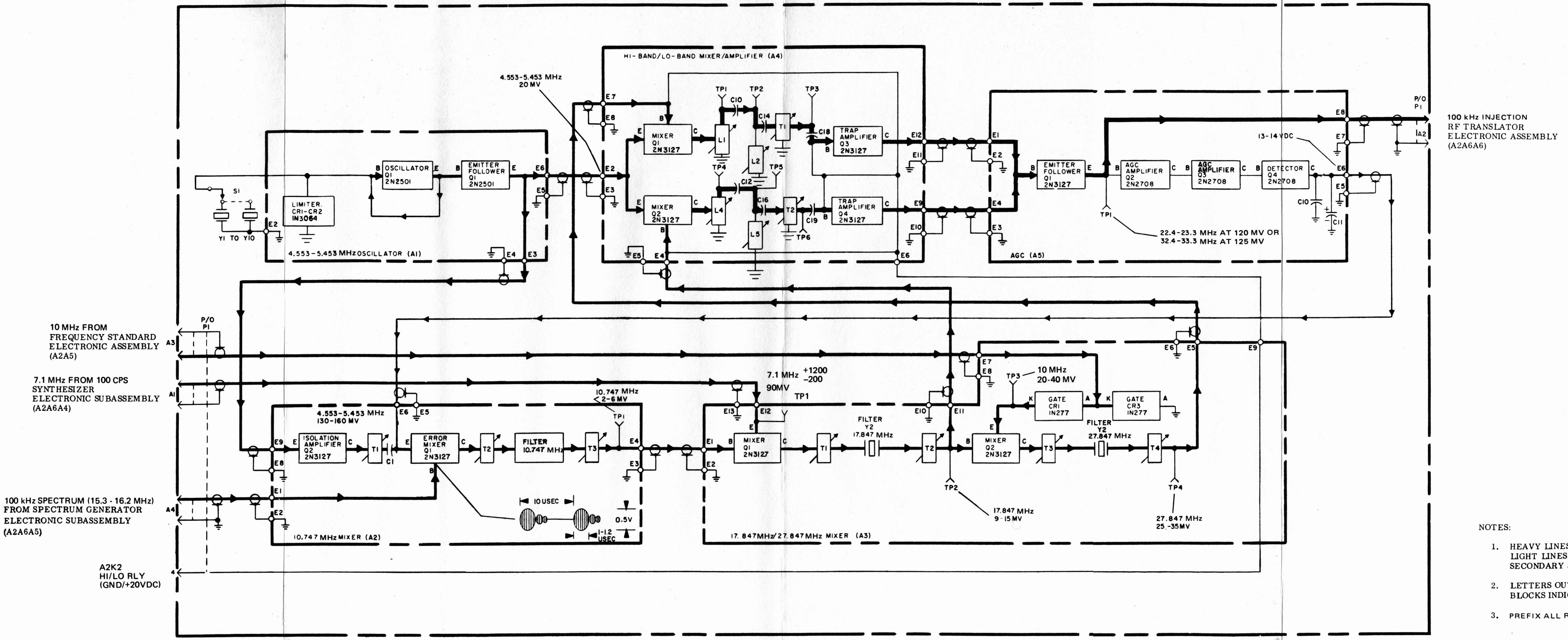
Figure 4-27. Frequency Standard Assembly A2A5, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS.
3. PREFIX ALL REF DES WITH A6A1.

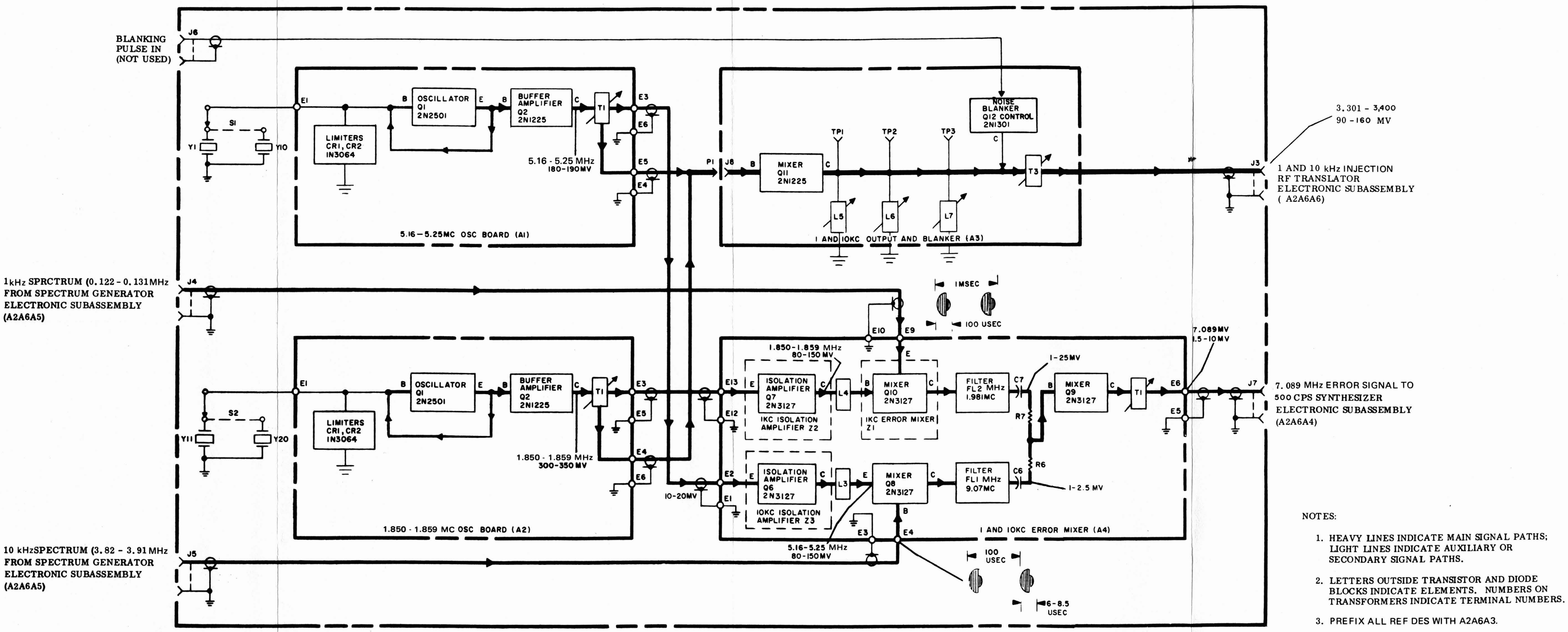
Figure 4-28. MC Synthesizer Subassembly A2A6A1, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS.
3. PREFIX ALL REF DES WITH A2A6A2.

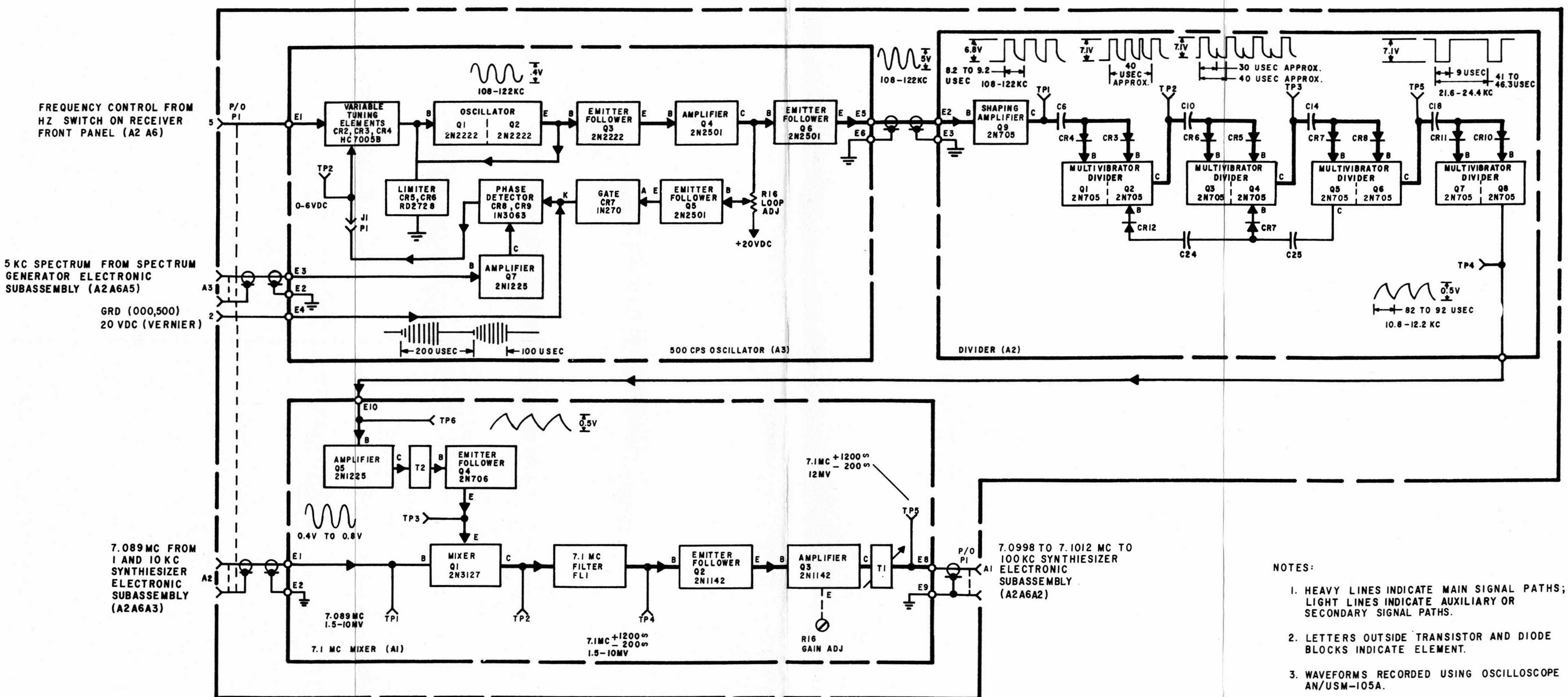
Figure 4-29. 100 KC Synthesizer Subassembly A2A6A2, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS. NUMBERS ON TRANSFORMERS INDICATE TERMINAL NUMBERS.
3. PREFIX ALL REF DES WITH A2A6A3.

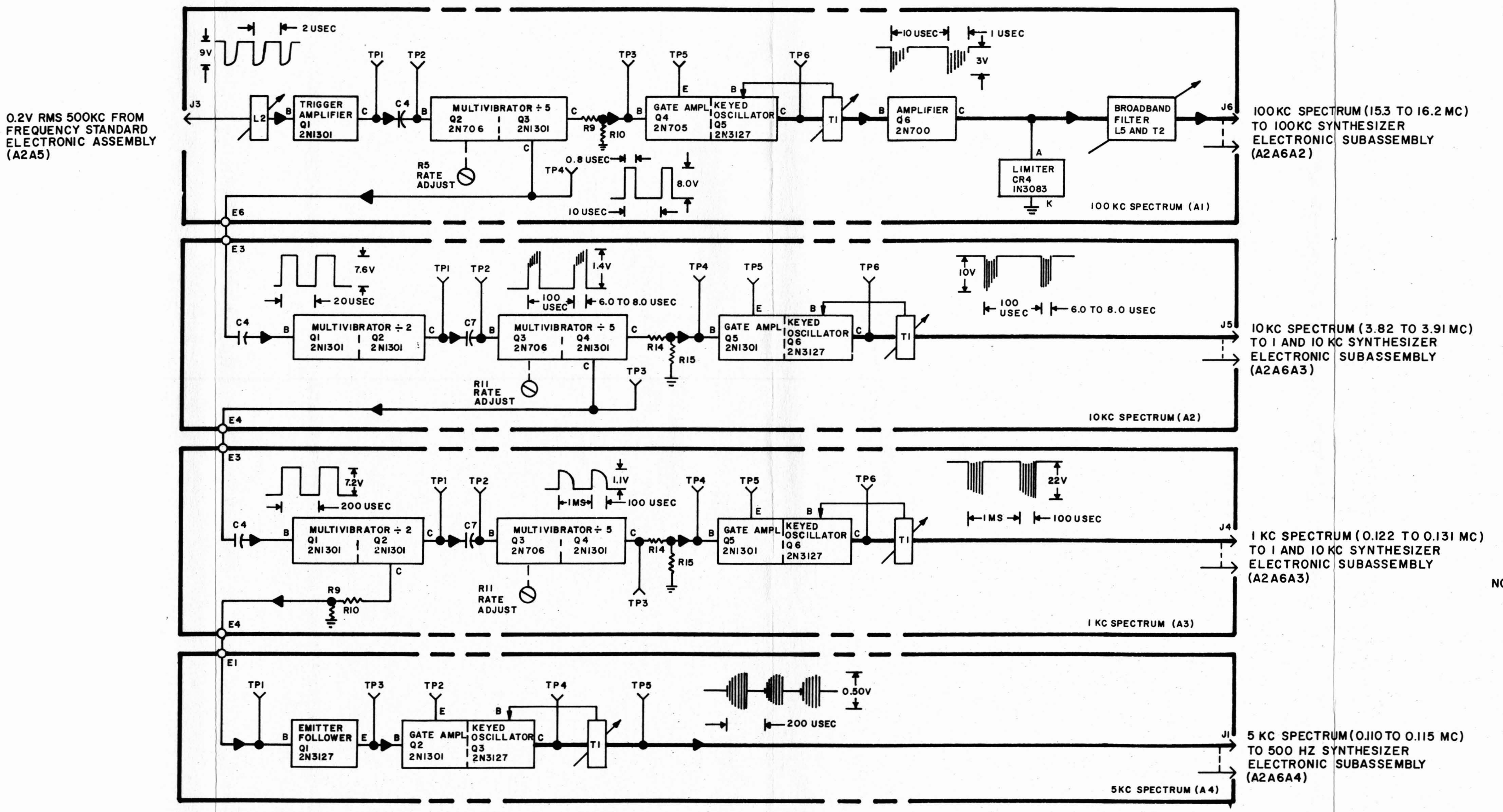
Figure 4-30. 1 and 10 KC Synthesizer Subassembly A2A6A3, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENT.
3. WAVEFORMS RECORDED USING OSCILLOSCOPE AN/USM-105A.
4. REF. DESIG. PREFIX A2A6A4.

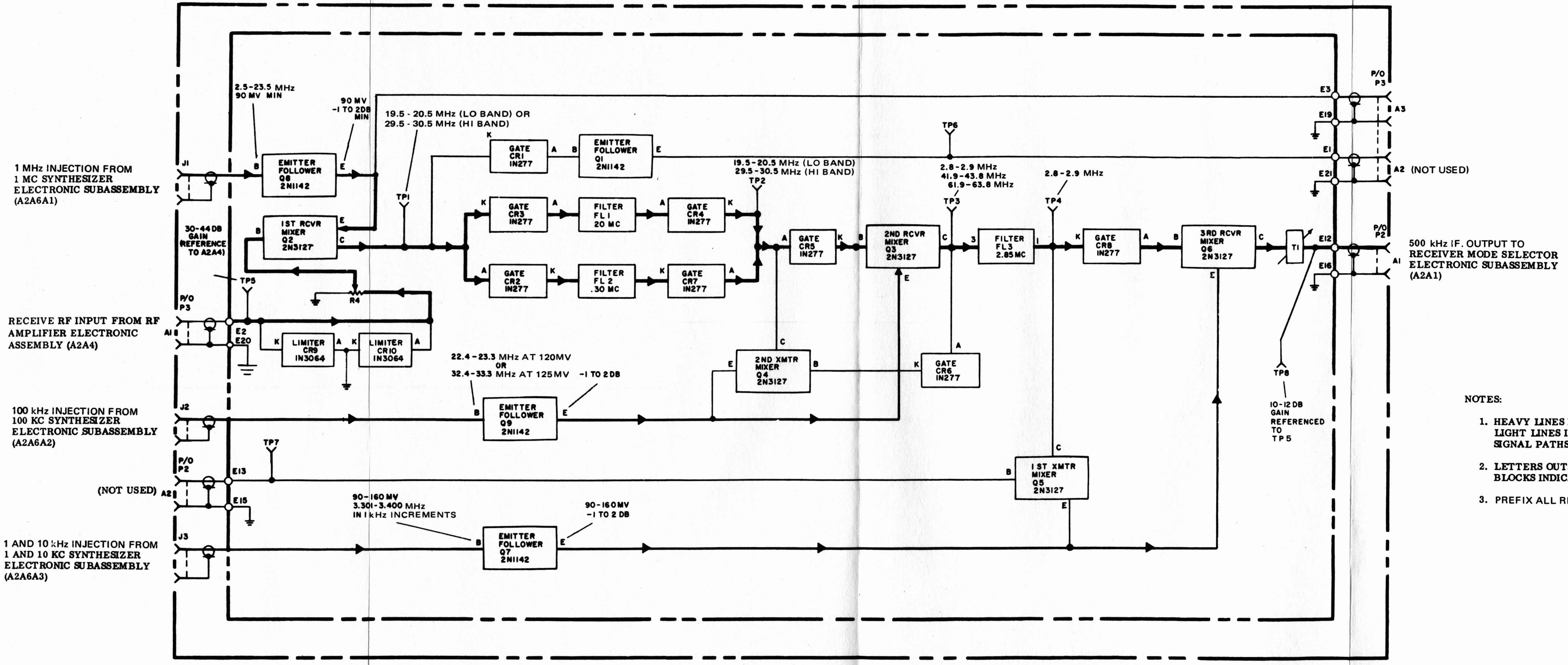
Figure 4-31. 500 CPS Synthesizer Subassembly A2A6A4, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXLIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS.
3. WAVEFORMS RECORDED USING OSCILLOSCOPE AN/USM-105A.
4. REF. DESIG. PREFIX A6A5

Figure 4-32. Spectrum Generator Subassembly A2A6A5, Servicing Block Diagram



NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL PATHS; LIGHT LINES INDICATE AUXILIARY OR SECONDARY SIGNAL PATHS.
2. LETTERS OUTSIDE TRANSISTOR AND DIODE BLOCKS INDICATE ELEMENTS.
3. PREFIX ALL REF DES WITH A2A6A6.

Figure 4-33. RF Translator Subassembly A2A6A6, Servicing Block Diagram

SECTION 5

MAINTENANCE

5-1. INTRODUCTION.

5-2. GENERAL. This Section provides repair, alignment, and adjustment procedures to enable maintenance personnel to correct deficiencies found as a result of troubleshooting Radio Receiver R-1051/URR. Also, final adjustment and an overall receiver performance test (to ensure that the receiver is fully operational) are included.

5-3. CORRECTIVE MAINTENANCE INDEX. An index to corrective maintenance data for each assembly in the R-1051/URR is provided in table 5-1.

5-4. TEST EQUIPMENT AND ACCESSORIES REQUIRED. Table 5-2 lists the test equipment, connectors, special tools, and other accessories necessary to accomplish corrective maintenance on the R-1051/URR.

5-5. REPAIRABILITY OF ELECTRONIC ASSEMBLIES.

5-6. GENERAL. Certain assemblies are not repairable except at repair depots. The primary reasons for this are:

a. Special test fixtures are required.

b. Special test equipments are required.

c. Certain interchangeable assemblies within the family of similar equipments require completely different piece-part support.

5-7. RF Amplifier Electronic Assembly A2A4, Frequency Standard Electronic Assembly A2A5, and Translator/Synthesizer Electronic Assembly A2A6 are not shipboard-repairable assemblies. Normally, the only maintenance to be performed outside of the repair depot on these assemblies is:

a. Replacement of electron tubes A2A4 V1 and V2 in the RF amplifier. Refer to paragraph 5-42.

b. Alignment check of chassis with RF amplifier positioned as directed in paragraph 5-18.g.

c. Certain gain adjustments made in conjunction with the translator/synthesizer performance test in paragraph 4-89.

d. Frequency adjustment of the frequency standard. Refer to paragraph 5-64.

e. AGC and IF gain loop adjustment. Refer to paragraph 5-77.

5-8. To determine if other assemblies in the R-1051/URR are shipboard-or depot-repairable, refer to current instructions and the SM&R code on the Allowance Parts List (APL).

5-9. Defective electronic assemblies are mandatory turn-in depot-level-repairable items. Ensure defective assemblies are adequately packaged to prevent damage during shipment. When possible, use the carton in which the replacement assembly was received.

TABLE 5-1. CORRECTIVE MAINTENANCE INDEX

ASSEMBLY	REPAIR PARA	PART LOCATION FIGURE NO.	FINAL ADJUST-MENT PARA	SCHEMATIC FIGURE NO.	PERFORMANCE TEST PARA
A2 MAIN FRAME	5-11	5-18 thru 5-22	5-57	5-1	5-82
A2A1 MODE SELECTOR	5-46	5-20,	5-72	5-2	5-93
A2A2 AND A2A3 IF/AUDIO AMPLIFIER	5-52	5-20	5-76	5-3 and 5-4	5-89, 5-94
A2A4 RF AMPLIFIER	5-40	5-20	--	5-5	5-93
A2A5 FREQUENCY STANDARD	5-38	5-20	5-63	5-6	5-97
A2A6 TRANSLATOR/ SYNTHESIZER	5-44	5-20	--	5-7 thru 5-12	5-93
A2A7 CODE GENERATOR	5-22	5-22, 5-25	--	5-13	5-93
A2A8 POWER SUPPLY	5-25	5-22, 5-26	5-59	5-1	5-85
A2A9 ANTENNA OVERLOAD	5-26	5-22, 5-27	--	5-14	5-93
A2A10 LIGHT PANEL	5-27	5-19	--	5-1	--
A2A11 000-500 Hz LOCK & VERNIER ASSY.	5-31	5-20, 5-28	5-68	5-1	5-97

TABLE 5-2. TEST EQUIPMENT AND ACCESSORIES REQUIRED FOR CORRECTIVE MAINTENANCE

CATEGORY	RECOMMENDED	ALTERNATE
Frequency Standard	AN/URQ-10	AN/URQ-9
Frequency Counter	AN/USM-207	CAQI-5245-L
RF Signal Generator	CAQI-606A	SG-582/U
RF Voltmeter	CCVO-91DA	CCVO-91H CCVO-91CA
Electronic Multimeter	AN/USM-116( )	CAQI-410B
Multimeter	AN/USM-311	AN/PSM-4( )
AC Voltmeter	ME-6( )/U	CBFM-300
Headphones		
Resistor, 600 ohm, 2 Watt	RC42GF601J	
Resistor, 51 ohm, 2 Watt	RC42GF510J	
Adapter, BNC to N	UG-201/U	
Coaxial T-Connector (BNC)	UG-274A/U	
RF Insert Extractor Tool	ITT Cannon P/N CET-C6B	
Extender Test Cable (A2A2-P1)	P/N 666243-070	
Extender Test Cable (A2A1-P1)	P/N 666243-071	
Extender Test Cable (A2A1-P2)	P/N 666243-072	

5-10. The assembly performance tests provided in Section 4, Troubleshooting, are to be used only when there is a known defect in the receiver or the overall receiver performance test in paragraph 5-80 is unsatisfactory. No assembly should be considered defective when the overall receiver performance test is met, or if there is no operational indication of a malfunction.

5-11. MAIN FRAME CHASSIS A2 AND CASE A1, MAINTENANCE PROCEDURES.

5-12. GENERAL. Paragraphs 5-11 through 5-38 cover corrective maintenance data for all assemblies in the main frame chassis and case except mode selector A2A1, IF audio amplifiers A2A2 and A2A3, RF amplifier A2A4, frequency standard A2A5, and translator/synthesizer A2A6. The main frame chassis and case includes the KCS and MCS digital tuning systems, Code Generator Electronic Assembly A2A7, Light Panel Electronic Assembly A2A10, 000-500 Hz Lock and Vernier Control Electronic

Assembly A2A11, Mode Selector switch A2S2, and Filter Box Electronic Assembly A1A1.

5-13. KCS DIGITAL TUNING SYSTEM, REPAIR AND ADJUSTMENT.

5-14. Removal Procedure. This paragraph provides instructions for removing the drive chains and for removing and disassembling the sprocket assemblies on the bottom of the R-1051/URR chassis. Removal of these components can be accomplished with the chassis in place on the slide mechanisms. To remove the drive chains and sprocket assemblies, proceed as follows, using figure 5-19 as a guide:

a. Turn off power to R-1051/URR. Loosen front-panel screws and slide chassis out of case.

b. Remove RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6 from the chassis.

c. Tilt chassis up 90 degrees to expose bottom. Loosen three chain-tension idler gears and slide gears away from chains. Locate keeper clip on each drive chain. Carefully remove keeper clips and unthread chains.

d. Remove four nuts securing dual and triple sprocket assemblies to chassis, and lift sprocket assemblies from chassis.

e. To disassemble sprocket assemblies, remove two retaining rings located inside assembly housing and secured around shaft. Loosen coupler hub-clamp set screw and punch out shaft from end opposite coupler. Separate sprocket assembly parts as they clear the shaft.

5-15. Repair Procedure. To repair a defective sprocket assembly, proceed as follows:

a. Wipe all disassembled parts with dry, lint-free cloth, and inspect the parts for damage.

b. Replace worn parts. Replace metal springs if they no longer provide proper tension between associated parts. Replace both coupler and shaft if shaft is scored. Replace detent springs if bent so that too much or too little tension results. Replace hub clamp if it is evident during equipment operation that proper clamping action is not being maintained.

5-16. Reassembly Procedure. To reassemble the sprocket assemblies, and to reinstall the sprocket assemblies and drive chains onto bottom of chassis after repair, proceed as follows:

a. Reassemble sprocket assemblies, using new retaining rings in place of those that were removed. Do not tighten hub-clamp set screws.

b. Secure sprocket assemblies in their respective positions on chassis with four appropriate nuts.

c. Thread drive chains onto gears. Fasten ends of each chain together with keeper clip.

5-17. Drive-Chain Adjustment Procedure. After reassembly, the chain-drive mechanism must be adjusted to ensure proper relationship between the front-panel KCS controls, the couplers, and their respective detent spring positions in the sprocket assemblies. Loosen the five hub clamps on the dual and triple sprocket assemblies if entire system is being aligned. Loosen both 10 KCS coupler hub clamps for 10-kHz alignment. Loosen both 100 KCS coupler hub clamps for 100-kHz alignment. Loosen the 1 KCS coupler hub clamp for 1-kHz alignment. To obtain proper positioning of the front-panel KCS controls with respect to the fully seated position of the detent spring, adjust the position of the drive chain as follows:

a. Reinstall RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6. Ensure that all couplers are engaged properly.

b. For each KCS control, take slack out of associated drive chain by holding associated chain-tension idler gear against chain. If digit is centered in window, tighten chain-tension idler gear in that position and proceed to step d.

c. If digit is not centered in window, release chain-tension idler gear and slide gear away from chain. Lift drive chain away from gears and shift entire chain to position where front panel KCS control and digit above control remain fairly stationary when chain is tightened. Repeat this procedure as necessary. When drive chain is positioned properly, tighten chain-tension idler gear securely against chain.

d. The dual sprocket assembly MP15 (figure 5-19) provides means of making finer adjustment for 100 KCS and 10 KCS controls. Rotate 100 KCS and 10 KCS controls and observe detent action of dual sprocket assembly. Proper detent action is displayed by relatively smooth rotation of controls with full-seating detent action. If necessary, remove spacer under detent spring to increase spring tension, or add spacer to reduce spring tension. If digit is still not fully centered in window when detent spring is fully seated, loosen two hex-head screws on wheel index engaged with detent spring. Wheel index provides seating position for detent spring. Press firmly on detent spring above roller. Do not allow wheel index to rotate. Rotate front-panel KCS control until digit is exactly centered in window as desired. Release front-panel control and detent spring. If digit moves from center of window, repeat until digit is centered exactly in window; then tighten hex-head screws on wheel index.

5-18. Coupler Adjustment Procedure. Once the drive chains have been adjusted to provide optimum detent positioning, the sprocket assembly couplers, which are operated by the KCS controls, must be adjusted for proper electromechanical alignment between the electronic assemblies and the chain-drive mechanism. To adjust the couplers, proceed as follows:

a. Remove RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6 from chassis.

b. Set 100 KCS and 10 KCS controls to 1. Insert screwdriver in coupler adjustments in dual sprocket assembly (figure 5-19), and rotate couplers so that slot in each coupler points toward, and is perpendicular to, the front panel.

c. Tighten hub-clamp set screws on dual sprocket assembly.

d. Set 100 KCS, 10 KCS, and 1 KCS controls to 0. Insert screwdriver in respective coupler adjustments in triple sprocket assembly MP14 (see figure 5-19), and rotate couplers so that each coupler slot points towards, and is perpendicular to, the rear panel.

e. Tighten hub-clamp set screws on triple sprocket assembly.

f. Set KCS controls to 1. Reinstall RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6.

g. Check fine adjustment by performing procedure in paragraph 4-54. If adjustment is needed, loosen associated hub coupler on dual sprocket assembly and move the coupler to allow fully insertion of rod. Tighten hub clamp. Restore R-1051/URR to normal operating condition.

5-19. MCS DIGITAL TUNING SYSTEM, MECHANICAL ADJUSTMENT. The adjustment of the MCS digital tuning system provides adequate detent pressure and switch contact positioning of the two MCS controls.

5-20. To adjust detent pressure on either of the MCS controls, loosen the two screws mounting the block. Adjust the angle of the block for required detent pressure, and tighten the two nuts. If necessary, add or remove spring spacers.

5-21. To adjust the positioning of the detent, set the MCS control to 0 and tighten the detent spring, ensuring the digit stays in the center of the window. Turn Mode Selector switch A2S2 to an operational mode and set MCS controls to 02 through 29, ensuring the RF amplifier turret rotates to the same frequency. If any frequency does not set up properly, apply slight pressure on each MCS control in each direction, to note if correct frequency setup is obtained. If correct setup is obtained, loosen that detent spring and readjust the spring position to correct condition. The flat portion of the two MCS control shafts should be vertical (as shown in figure 4-13) when the MCS controls are at 00. If proper operation cannot be obtained, troubleshoot the code generator as described in paragraph 4-24.

5-22. CODE GENERATOR ELECTRONIC ASSEMBLY A2A7, REPAIR AND REPLACEMENT. Adjust data on spring detents for the 1 and 10 MCS knobs on the front panel are provided in paragraph 5-19. The code generator furnished with the R-1051/URR is a four-deck printed circuit board (pcb) assembly, and cannot be used in Radio Transmitter T-827/URT. The code generator furnished with the T-827/URT is a five-deck pcb assembly, which may be used in either equipment. When a five-deck assembly is used in the receiver, center pcb (A3) is not utilized.

5-23. Removal/Replacement Procedure.

a. Remove power to the R-1051/URR and rotate Mode Selector switch A2S2 to OFF. Set MCS controls to 11.

b. Remove RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6 from the chassis.

c. On each side of chassis, remove the two screws which secure vertical support and shield plate MP69 (see figure 5-22), and move the plate slightly away from front panel and chassis. Do not remove cable clamps from plate for any part of this procedure. From bottom of chassis, remove nuts that secure plug A2A7P1 to receptable A2J8, and separate these connectors. Remove two screws that secure code generator to chassis.

d. From top of chassis, remove partially hidden captive screw A2A7H1, which also secures the code generator to the chassis, carefully pulling and holding shield plate MP69 away from front panel. See figures 5-18 and 5-22.

e. Set couplers (on assembly to be installed) to approximately mate with key pins on MCS detent wheel. Install spare Code Generator Electronic Assembly A2A7 into mounting position, and rock MCS controls until both couplers are mated. Reassemble by reversing removal sequence.

5-24. Repair Procedure.

a. Code Generator Electronic Assembly A2A7 is not supported by piece parts. If the assembly cannot be repaired without replacement of parts, except for the connector, the assembly should be replaced.

b. This assembly can usually be repaired, as most malfunctions are open spring-finger contacts. Usually, all that is required is slight pressure added to one spring-finger contact on a switch rotor, when the defective contact can be isolated by troubleshooting. After adjusting pressure, check to ensure each finger of rotor contact makes contact at the same angle of rotation (imaginary line drawn through center of shaft and two or three fingers of contact). When reassembling, ensure all spacers and washers are replaced. Refer to paragraph 4-24 and perform required checks to ensure code generator is operational.

5-25. POWER SUPPLY ELECTRONIC ASSEMBLY A2A8, REPAIR AND REPLACEMENT. Power Supply Electronic Assembly A2A8 is shipboard-repairable. See figure 5-1 for its schematic diagram, and figure 5-24 for parts location. If the power supply pcb is badly carbonized after a failure, replace the pcb. Certain other versions of this pcb may be substituted when necessary. Different bridge diodes and other semiconductors are used in various versions of the power supply pcb, but all will operate normally when interchanged. Power supply A2A8 assemblies for the T-827/URT have no -30-vdc supply, and cannot be used in the R-1051/URR.

5-26. ANTENNA OVERLOAD ELECTRONIC ASSEMBLY A2A9, REPAIR AND REPLACEMENT. Antenna Overload Electronic Assembly A2A9 is shipboard-repairable. See figure 5-14 for a schematic diagram of the antenna overload assembly. Parts location is shown in figure 5-25. When troubleshooting through relay contacts note that the etching of the contact arrangement on the relay is a bottom view (not a through-relay view). This manual provides the schematic diagram parts location diagram and parts listing for A2A9 assemblies a reflecting field change to R-1051/URR.

5-27. LIGHT PANEL ELECTRONIC ASSEMBLY A2A10, REPAIR AND REPLACEMENT. The two front-panel lamps are mounted on a light bar strip. The lamp bulbs are of the screw-base type, and are not readily accessible without some disassembly. When one lamp burns out, it should be replaced as soon as possible to prevent burning out the other lamp due to the high internal resistance of the lamps.

5-28. Procedure for replacement of lamp A2A10DS4, located between the 1 KCS and 10 KCS controls (see figure 5-22), is as follows:

a. Remove power to the R-1051/URR.

b. Slide receiver chassis out of case.

c. Set the frequency controls to 15.555 MHz.

d. Loosen the four captive hold-down screws and lift out Translator/Synthesizer Electronic Assembly A2A6. (Suggestion: lift the screws and turn about one-half turn into the captive nut. Then use the screws for handles to lift the A2A6 assembly.)

e. Replace defective panel lamp, ensuring new lamp is tight in socket.

f. Reinstall Translator/Synthesizer Electronic Assembly A2A6.

5-29. The procedure for replacement of lamp A2A10DS3, located between the 1 MCS and 10 MCS controls (see figure 5-22), is as follows:

a. Remove power to the R-1051/URR.

b. Slide receiver chassis out of case

c. Set the frequency controls to 15.555 MHz.

d. Loosen the four captive hold-down screws and lift out RF Amplifier Electronic Assembly A2A4.

e. Remove the two screws from the bottom of Code Generator Electronic Assembly A2A7.

f. Loosen the screw (A2A7H1) on top of the code generator mounting plate. This screw is located about 1 inch directly below fuseholder A2XF2.

g. Remove the two nuts securing code generator plug A2P8, and remove plug from jack.

h. Remove the code generator.

i. Replace defective panel lamp, ensuring new lamp is tight in socket.

j. Reinstall the code generator, mounting plug, and RF amplifier.

5-30. After replacing either lamp, restore power to the R-1051/URR, and verify that both lamps are operating properly.

5-31. <u>500 CYCLE AND VERNIER CONTROL ELECTRONIC ASSEMBLY A2A11, REPAIR AND REPLACEMENT.</u>

a. Figure 5-22 assembly location.

b. Figure 5-26, printed circuit board A2A11 component and terminal location diagram.

5-32. MODE SELECTOR SWITCH A2S2, REPAIR AND REPLACEMENT. Replacement of Mode Selector switch A2S2 is time-consuming, and may cause many added problems if not performed with the correct tools, using great care. Although the following data are provided to replace the entire switch, in many cases it may be possible to repair the switch or to replace only one section of the switch. See figures 4-6 and 4-16 through 4-21. By troubleshooting, determine the exact segment and clips that are causing the malfunction. Be sure to note and remember contact arrangement on the rear sections.

5-33. Removal and Repair Procedure.

a. Remove the ac power cables at the rear of the receiver case.

b. Remove RF Amplifier Electronic Assembly A2A4 and Translator/Synthesizer Electronic Assembly A2A6.

c. Remove the four screws attaching vertical support and shield plate MP69 (see figure 5-17), and push the plate slightly forward to allow removal of the cable clamps on the bottom of the plate. Remove the clamps and any other components attached to the plate. Remove the vertical support and shield plate.

d. Remove the Mode Selector switch A2S2 from the front panel. Examine the switch to ensure no leads are broken. Usually, the only problem will be an open contact. If the switch is not damaged or burned, replacement of the entire switch assembly may not be necessary.

e. With good lighting, a magnifying glass, small tweezers, and an ohmmeter, physically locate the defective segment. If necessary to obtain more space, disassemble the switch. Be sure to account for all spacers and fiber washers.

f. Carefully move all four wafers off the shaft. Note that sections A and C have interconnections, and sections C and D have interconnections. Tag and remove any short leads preventing removal.

g. Separate the sections and locate the exact point of malfunction. Determine if the switch is repairable. If only one switch is defective, ensure the replacement switch section is identical mechanically as well as electrically, and that the replacement section is positioned correctly (see figure 4-6).

h. When the entire switch is to be replaced, refer to table 5-3.

5-34. Reassembly Procedure. Connect jumper wires to new switch, but do not solder contacts indicated by an asterisk in table 5-3 until external leads are connected to these points. Complete the wiring of section A through section D. After completion of wiring, make continuity checks in all positions, using referenced data to ensure correct wiring. Reassembly hardware, replace assemblies, and make voltage measurements to ensure repair of switch.

5-35. MAIN FRAME CHASSIS, WIRING DATA. Table 5-4 lists complete wiring data for main frame chassis A2 of the R-1051/URR. Bear the following information in mind when using this wiring list:

a. Terminal identification for components not marked appears on figures 4-3 through 4-7, and 4-13 through 4-15.

b. The color code of the wires cannot be used for wire tracing in every case. If the color in the equipment is not as specified for a certain lead, verify the connection by continuity checks.

c. The wire item number information is provided to aid identification. The parts list in table 6-2 provides a complete description of wiring items. A description of each wire is given below:

ITEM NO.	DESCRIPTION
9	Cable, coax, no. 28 AWG, double shield
8	Wire, shield, no. 20 AWG, twisted pair
7	Wire, shielded, no. 20 AWG
3	Wire, bare, no. 24 AWG
5	Wire, electrical, no. 24 AWG
6	Wire, electrical, no. 22 AWG

5-36. RECEIVER CASE, WIRING DATA. Table 5-5 list complete wiring data for receiver case A1 of the R-1051/URR. The wire item numbers and descriptions are given below:

ITEM NO.	DESCRIPTION
17	Cable, coax, no. 28 AWG, double shield
18	Wire, shield, no. 20 AWG, twisted pair
16-19	Wire, electrical, no. 20 AWG Braid, #12

5-37. FILTER BOX ELECTRONIC ASSEMBLY A1A1, WIRING DATA. Wiring data for Filter Box Electronic Assembly A1A1 are listed in table 5-6.

5-38. FREQUENCY STANDARD ELECTRONIC ASSEMBLY A2A5, MAINTENANCE PROCEDURES.

TABLE 5-3. MODE SELECTOR SWITCH A2S2, WIRING LIST

JUMPERS		EXTERNAL LEADS	
FROM	TO	FROM	TO
S2A-F4	S2A-F1	S2A-F6	XF1-2
S2A-F1	S2A-F11	S2A-F7	A2T1-6
S2A-F11	S2A-F10	S2A-R2	J19-7
S2A-F10	S2A-R10*	S2A-R4	E11
S2A-F3	S2A-F2	S2A-R5	J18-7
S2A-F2	S2A-F12	S2A-R10	E2
S2A-F12	S2A-F9	S2B-F1	J21-7
S2A-F9	S2C-R8*	S2B-F1	R4ct
S2A-R6	S2A-R4	S2B-F4	J21-25
S2A-R6	S2A-R4	S2B-F5	R5ct
S2C-R6	S2A-R8	S2B-F7	J21-13
S2A-R8	S2A-R11	S2B-F8	J21-10
S2A-R11	S2C-R12*	S2B-F10	S8N01
S2B-F2	S2B-F3	S2B-F11	XF2-1
S2B-F3	S2B-F6	S2B-R8	E30
S2B-F6	S2B-F7*	S2B-R9	S6-F9
S2B-F4*	S2B-F5*	S2B-R10	E17
S2B-R2	S2B-R8*	S2B-R11	K3-6
S2C-R3	S2C-F2	S2C-F6	E15
S2C-F2	S2C-F11	S2C-F7	E12
S2C-F11	S2C-R10*	S2C-F10	J17-5
S2B-R6	S2B-R3	S2C-F12	J18-11
S2B-R3	S2D-R12*	S2C-R2	J18-15
S2B-R11*	S2B-R9*	S2C-R4	R6-1
S2C-F4	S2C-F1	S2C-R4	J17-2
S2C-F1	S2C-F12*	S2C-R8	E13
S2C-F3	S2C-F10*	S2C-R10	E18
S2D-F2	S2D-F6*	S2C-R12	J16-1
S2D-F7	S2D-F11	S2D-F6	J19-19
S2D-F11	S2D-F12*	S2D-F10	J18-19
S2D-R4	S2D-R6*	S2D-F12	A8E10
		S2D-R3	J19-1
		S2D-R5	J18-1
		S2D-R6	K1-6
		S2D-R11	J18-18
		S2D-R12	E18

*External lead connected at this contact.

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
1	3	BARE	S2A-F4	S2A-F1	
2	3	BARE	S2A-F1	S2A-F11	
3	3	BARE	S2A-F11	S2A-F10	
4	3	BARE	S2A-F10	S2A-R10	
5	5	WHT-BLK-BRN	S2A-R10	E2	
6	3	BARE	S2A-F3	S2A-F2	
7	3	BARE	S2A-F2	S2A-F12	
8	3	BARE	S2A-12F	S2A-F9	
9	3	BARE	S2A-F12	S2A-F9	
10	5	WHT-BLK-RED	S2C-R8	E13	
11	7	20 SHLD 101	S2A-F6	XF1-2	
12	7	20 SHLD 102	S2A-F7	T1-6	
13	6	WHITE	SHLD OF 101	SHLD OF 102	At S2
14	5	WHT-BLK-ORN	S2A-R2	J19-7	
15	3	BARE	S2A-R6	S2A-R4	
16	5	WHT-BLK-YEL	S2A-R4	E11	
17	5	WHT-BLK-GRN	S2A-R5	J18-7	
18	3	BARE	S2C-R6	S2A-R8	
19	3	BARE	S2A-R8	S2A-R11	
20	3	BARE	S2A-R11	S2C-R12	
21	5	WHT-BLK-BLU	S2C-R12	J16-1	
22	9	COAX 1	S2B-F1	J21-7	
23	9	COAX 2	S2B-F1	R4-2	
24	6	WHITE	SHLD OF 1	SHLD OF 2	At S2
25	3	BARE	S2B-F2	S2B-F3	
26	3	BARE	S2B-F3	S2B-F6	
27	3	BARE	S2B-F6	S2B-F7	
28	9	COAX 3	S2B-F7	J21-13	
29	3	BARE	S2B-F4	S2B-F5	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
30	9	COAX 4	S2B-F4	J21-25	
31	9	COAX 5	S2B-F5	R5-2	
32	6	WHITE	SHLD OF 3	SHLD OF 4	At S2
33	6	WHITE	SHLD OF 4	SHLD OF 5	At S2
34	9	COAX 6	S2B-F8	J21-10	
35	7	20 SHLD 103	S2B-F10	S8-NO 1	
36	7	20 SHLD 104	S2B-F11	XF2-1	
37	6	WHITE	SHLD OF 103	SHLD OF 104	At S2
38	3	BARE	S2B-R2	S2B-R8	
39	5	WHT-BLK-VIO	S2B-R8	E30	
40	3	BARE	S2C-R3	S2C-F2	
41	3	BARE	S2C-F2	S2C-F11	
42	3	BARE	S2C-F11	S2C-R10	
43	5	WHT-BLK-GRY	S2C-R10	E18	
44	3	BARE	S2B-R6	S2B-R3	
45	3	BARE	S2B-R3	S2D-R12	
46	5	WHT-BRN-RED	S2D-R12	E18	
47	3	BARE	S2B-R11	S2B-R9	
48	5	WHT-BLK-ORN	S2B-R9	S6-F9	
49	5	WHT-BRN-YEL	S2B-R11	K3-6	
50	5	WHT-BRN-GRN	S2B-R10	E17	
51	3	BARE	S2C-F4	S2C-F1	
52	3	BARE	S2C-F1	S2C-F12	
53	5	WHT-BRN-BLU	S2C-F12	J18-11	
54	3	BARE	S2C-F3	S2C-F10	
55	5	WHT-BRN-VIO	S2C-F10	J17-5	
56	5	WHT-BRN-GRY	S2C-F6	E15	
57	5	WHT-RED-ORN	S2C-F7	E12	
58	5	WHT-RED-YEL	S2C-R2	J18-15	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
59	5	WHT-RED-GRN	S2C-R4	J17-2	
60	5	WHT-RED-BLU	S2C-R4	R6-1	
61	3	BARE	S2D-F2	S2D-F6	
62	5	WHT-RED-VIO	S2D-F6	J19-19	
63	3	BARE	S2D-F7	S2D-F11	
64	3	BARE	S2D-F11	S2D-F12	
65	5	WHT-RED-GRY	S2D-F12	A8-10	
66	5	WHT-ORN-YEL	S2D-F10	J18-19	
67	5	WHT-ORN-GRN	S2D-R3	J19-1	
68	3	BARE	S2D-R4	S2D-R6	
69	5	WHT-ORN-BLU	S2D-R6	K1-6	
70	|	WHT-ORN-VIO	S2D-R5	J18-1	
71	|	WHT-ORN-GRY	S2D-R11	J18-18	
72	|	WHT-RED-BRN	J1-1	J2-1	
73	5	WHT-BRN-RED			
74	9	COAX 7	J1-3	R4-2	
75	9	COAX 8	J2-3	R5-2	
76	6	WHITE	SHLD OF 7	SHLD OF 8	At J1 and J2
77	6	WHITE	SHLD OF 7	SHLD OF 2	At R4 see wire no. 23
78	6	WHITE	SHLD OF 2	E2	At R4
79	6	WHITE	SHLD OF 8	SHLD OF 5	At R5 see wire no. 31
80	6	WHITE	SHLD OF 5	R5-3	At R5
81	6	R10	J1-1	J1-2	
82	6	R9	J2-1	J2-2	
83	7	20 SHLD 105	XF1-1	S8-NO 2	
84	6	WHITE	SHLD OF 105	SHLD OF 101	At XF1 see wire no. 11
85	6	WHITE	SHLD OF 105	SHLD OF 103	At S8 see wire no. 35

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
86	6	WHITE	E6	SHLD OF 103	At S8
87	7	20 SHLD 106	XF2-2	T1-1	
88	6	WHITE	SHLD OF 106	SHLD OF 104	At XF2 see wire no. 36
89	6	WHITE	SHLD OF 106	SHLD OF 102	At T1 see wire no. 12
90	6	WHITE	SHLD OF 102	E19	At T1
91		R15	M1-1	E1	
92		R13	E1	S1-2	
93	3	BARE	E1	S1-4	
94	9	COAX 9	S1-6	E36	
95	6	WHITE	SHLD OF 9	E35	At E36
96	9	COAX 10	M1-2	E33	
97	6	WHITE	SHLD OF 10	E35	At E33
98		R16	M2-1	E5	
99		R14	E5	S5-2	
100	3	BARE	E5	S5-4	
101	9	COAX 11	S5-6	E26	
102	6	WHITE	SHLD OF 11	E27	At E26
103	9	COAX 12	M2-2	E23	
104	6	WHITE	SHLD OF 12	E21	At E23
105	5	WHT-BLK-ORN	A10-4	A8-4	
106	5	WHT-BRN-ORN	A10-1	R2-3	Direct
107	5	WHT-BLK-YEL	R1-1	R11-2	Direct
108	9	COAX 13	R1-2	J19-6	
109	9	COAX 14	R11-3	J19-4	
110	6	WHITE	SHLD OF 13	SHLD OF 14	At R1 and R11
111	6	WHITE	SHLD OF 14	R1-3	At R11 and R1
112	5	WHT-BLK-GRN	R1-3	E2	Direct
113		R17	R11-1	R11-3	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
114	5	WHT-BLK-YEL	R2-1	R12-2	
115	9	COAX 15	R2-2	J18-6	
116	9	COAX 16	R12-3	J18-4	
117	6	WHITE	SHLD OF 15	SHLD OF 16	At R2 and R12
118	6	WHITE	SHLD OF 16	R2-3	At R12 and R2
119	5	WHT-BRN-ORN	R2-3	E4	
120		R18	R12-1	R12-3	
121	5	WHT-BLK-VIO	R3-1	R4-3	
122	5	WHT-BLK-GRY	R3-1	E2	
123	5	WHT-BRN-RED	R3-2	E20	
124	5	WHT-YEL-GRN	R3-3	A8-16	
125	9	COAX 17	R4-1	J19-3	
126	6	WHITE	SHLD OF 17	R4-3	At R4
127	9	COAX 18	R5-1	J18-3	
128	6	WHITE	SHLD OF 18	E4	
129	5	WHT-RED-ORN	R5-3	E3	
130	5	WHT-YEL-BLU	R6-2	J17-1	
131		R19	R6-3	E3	
132	5	WHT-YEL-BLU	J12-19		
133	│	WHT-YEL-GRN	S6-F4	A11-7	
134	│	WHT-YEL-VIO	S6-F5	J12-14	
135	│	WHT-YEL-GRY	S6-F12	J12-21	
136	│	WHT-YEL-GRY	S6-F10	S6-F11	
137	│	WHT-GRN-BLU	S6-F11	E6	
138	│	WHT-GRN-VIO	DS5-2	S2D-F7	
139	│	WHT-BRN-BLU	S6-R5	R7-CW	
140	│	WHT-BRN-VIO	S6-R6	J12-12	
141	│	WHT-BRN-GRY	A11-4	S6-F3	
142	5	WHT-RED-ORN	A11-5	S6-F2	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
143	5	WHT-RED-YEL	A11-2	DS5-1	
144		WHT-RED-GRN	A11-3	S6-F8	
145		WHT-RED-BLU	A11-7	R7-SL	
146		WHT-BRN-VIO	A11-6	R7-CCW	
147	5	WHT-ORN-GRY	A11-8	E4	
148	8	WHT TP1	S8-C1	S7-2	
149		BLK TP1	S8-C2	S7-5	
150	6	WHITE	SHLD OF TP1	E6	At S8
151	8	BLK TP2	S7-1	J21-33	
152		WHT TP2	S7-4	J21-32	
153	8	BLK TP3	S7-3	J21-50	
154		WHT TP3	S7-6	J21-49	
155	6	WHITE	SHLD OF TP1	SHLD OF TP2 S7 END	
156	6	WHITE	SHLD OF TP2	SHLD OF TP3 S7 END	
157	5	WHT-ORN-YEL	S9-1	J21-23	
158	5	WHT-ORN-GRN	S9-2	K1-4	
159	5	WHT-ORN-BLU	S9-4	J21-24	
160	5	WHT-ORN-VIO	S9-5	K3-7	
161		WHT-ORN-GRY	S9-6	K1-7	
162		WHT-BLK-BRN	J8-1	J10-1	
163		WHT-BLK-RED	J8-2	J10-2	
164		WHT-BLK-ORN	J8-3	J10-3	
165		WHT-BLK-YEL	J8-4	J10-4	
166		WHT-BLK-GRN	J8-5	J10-5	
167		WHT-BRN-VIO	J8-6	K2-4	
168		WHT-RED-YEL	J8-7	E16	
169		WHT-RED-GRN	J8-9	E7	
170	5	WHT-BRN-RED	J8-21	J12-1	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
171	5	WHT-BRN-ORN	J8-22	J12-2	
172		WHT-BRN-YEL	J8-23	J12-3	
173		WHT-BRN-GRN	J8-24	J12-4	
174		WHT-BRN-BLU	J8-25	J12-5	
175		WHT-BLK-RED	J9-1	FL1-2	
176		WHT-RED-ORN	J9-2	E39	
177		WHT-BLK-YEL	J9-3	FL2-2	
178		WHT-BLK-GRN	FL1-1	E11	
179		WHT-BLK-BLU	FL2-1	E12	
180		WHT-ORN-YEL	J10-6	E16	
181		WHT-ORN-GRN	J20-7	E15	
182		WHT-ORN-BLU	J10-8	E9	
183	5	WHT-ORN-BLU	J11-1	E9	
184	8	BLK TP4	J11-7	T1-13	
185		WHT-TP4	J11-8	T1-14	
186	6	WHITE	SHLD OF TP4	E9	
187	6	WHITE	SHLD OF TP4	E9	
188	5	WHT-ORN-GRN	J11-9	E29	
189	5	WHT-BRN-GRN	J11-12	K3-8	
190	5	WHT-BLK-VIO	K3-2	E11	
191	5	WHT-BLK-BRN	K3-3	K1-2	
192		CR3	K3-3	K3-7	Cathode to K3-7
193	5	WHT-BLK-ORN	K3-4	E18	
194		WHT-BRN-YEL	A9-E1	E12	
195		WHT-BRN-VIO	A9-E2	E9	
196		WHT-BRN-VIO	XC1-1	E42	
197		WHT-BRN-BLU	XC1-5	E43	
198	5	WHT-BRN-BLU	E43	E17	
199		R20	E42	E43	
200	5	WHT-ORN-BLU	J12-6	E16	

TABLE-5.4 MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
201	5	WHT-ORN-VIO	J12-7	E-15	
202		WHT-YEL-GRN	J12-8	E28	
203		WHT-ORN-GRY	J12-10	E37	
204		WHT-YEL-GRN	J12-16	E38	
205		WHT-ORN-GRY	J12-18	E37	
206		WHT-ORN-GRN	E37	E11	
207		WHT-BRN-GRY	J12-20	K2-6	
208	5	WHT-RED-GRN	K1-3	E16	
209		CR1	K1-3	K1-7	Cathode to K1-7
210	3	BARE	K1-7	K1-8	
211		WHT-RED-BLU	K1-8	E15	
212		WHT-BLK-RED	K1-5	E41	
213		WHT-BLK-ORN	K1-6	Q1-C	
214					
215	3	BARE	K2-7	K1-6	
216	5	WHT RED-GRY	K2-8	E18	
217		CR2	K2-2	K2-4	Cathode to K2-4
218	5	WHT-BLK-BRN	J16-2	E13	
219		WHT-GRN-VIO	J16-6	E18	
220		WHT-BLU-GRY	J16-7	E19	
221		WHT-BLU-YEL	J17-3	E21	
222		WHT-GRN-GRY	J17-4	E18	
223		WHT-BLK-BRN	J18-2	J21-6	
224	5	WHT-BLK-RED	J18-9	E27	
225	5	WHT-BLK-ORN	J18-12	E26	
226	5	WHT-BLK-YEL	J18-13	E22	
227		WHT-BLK-BLU	J18-14	E23	
228		WHT-BRN-VIO	J18-17	E13	
229		WHT-BLK-VIO	J18-20	E28	
230	5	WHT-BLK-GRY	J18-21	E20	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
231	5	WHT-BRN-ORN	J18-22	E29	
232	6	WHITE	SLD OF 18	SHLD OF 16	AT J18 see wire nos. 116, 127
233	6	WHITE	SHLD OF 16	SHLD OF 15	At J18 see wire no. 115
234	6	WHITE	SHLD OF 15	E21	At J18
235	5	WHT-BRN-YEL	J19-2	J21-8	
236		WHT-BRN-GRN	J19-91	E31	
237		WHT-BRN-BLU	J19-11	E30	
238		WHT-BRN-VIO	J19-12	E36	
239		WHT-BRN-GRY	J19-13	E34	
240		WHT-RED-ORN	J19-14	E33	
241		WHT-RED-YEL	J19-18	E30	
242		WHT-RED-GRN	J19-20	E31	
243		WHT-RED-BLU	J19-21	E20	
244	5	WHT-YEL-GRN	J19-22	E29	
245	6	WHITE	SHLD OF 17	SHLD OF 14	At J19 see wire nos. 125, 109
246	6	WHITE	SHLD OF 14	SHLD OF 13	At J19 see wire no. 108
247	6	WHITE	AHLS OD 18	E31	At J19
248	5	WHT-BLU-GRY	J21-5	E28	
249	5	WHT-YEL-BLU	J21-11	E36	
250	5	WHT-YEL-VIO	J21-12	E33	
251	5	WHT-YEL-GRY	J21-14	E28	
252	5	WHT-GRN-BLU	J21-17	E28	
253	5	WHT-GRN-VIO	J21-18	E26	
254	5	WHT-GRN-GRY	J21-19	E23	
255	5	WHT-BLU-VIO	J21-38	W18	
256	6	WHITE	SHLD OF 1	E32	At J21 see wire no. 22

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
257	6	WHITE	SHLD OF 6	E32	At J21 see wire no. 34
258	6	WHITE	SHLD OF 3	E32	At J2 1 see wire no. 28
259	6	WHITE	SHLD OF 4	E32	At J21 see wire no. 30
260	6	WHITE	SHLD OF TP 2	Lug on J21	At J21 see wire nos. 151, 152
261	6	WHITE	SHLD OF TP3	Lug on J21	At J21 see wire nos. 153, 154
262	5	WHT-BLK-VIO	Q1-E	A8-15	
263		WHT-YEL-GRN	Q1-E	E11	
264		WHT-BLK-GRN	Q1-B	A8-13	
265		WHT-BLK-BLU	Q1-C	A8-14	
266		WHT-BLK-YEL	L1-1	A8-7	
267		WHT-YEL-BLU	L1-2	E17	
268		WHT-BLK-BRN	L2-1	A8-3	
269		WHT-BLK-RED	L2-2	A8-5	
270		WHT-RED-ORN	L2-2	R8-1	
271		WHT-YEL-VIO	R8-1	E12	
272		WHT-RED-YEL	R8-2	E10	
273		WHT-BLK-GRY	E10	A8-17	
274		WHT-BRN-RED	T1-7	A8-8	
275		WHT-BRN-ORN	T1-8	A8-9	
276		WHT-BRN-YEL	T1-9	A8-1	
277		WHT-BRN-GRY	T1-10	A8-2	
278		WHT-BRN-BLU	T1-11	A8-12	
279	5	WHT-BRN-VIO	T1-12	A8-11	
280	16	BRAID	A8-18	E14	
281	9	COAX 19	J9-A1	J12-A3	
282	6	WHITE	SHLD OF 19	E40	At J9
283	6	WHITE	SHLD OF 19	E38	At J12

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
284	9	COAX 20	J9-A1	J17-A2	
285	6	WHITE	SHLD OF 20	E40	At J9
286	9	COAX 21	J9-A3	J12-A2	
287	6	WHITE	SHLD OF 21	E40	At J9
288	6	WHITE	SHLD OF 21	E38	At J12
289	9	COAX 22	J9-A4	J22-A2	
290	6	WHITE	SHLD OF 22	E39	At J9
291					
292	9	COAX 23	J9-A5	J12-A1	
293	6	WHITE	SHLD OF 23	E39	At J9
294	6	WHITE	SHLD OF 23	E38	At J12
295	9	COAX 24	J9-A6	J22-A1	
296	6	WHITE	SHLD OF 24	E39	At J9
297	6	WHITE	SHLD OF 24	Lug at J21	At J21
298	9	COAX 25	J11-A1	J14-A1	
299	6	WHITE	SHLD OF 25	E24	At J14
300	9	COAX 26	J11-A3	A9-E5	
301	6	WHITE	SHLD OF 26	E8	At J11
302	6	WHITE	SHLD OF 26	A9-E4	At J9
303	9	COAX 27	SHLD OF 27	E25	At J13
304	6	WHITE	SHLD OF 27	E25	At J13
305	9	COAX 28	J16-A2	J19-A3	
306	6	WHITE	SHLD OF 28	E31	At J19
307	9	COAX 29	J16-A3	J18-A3	At J18
308	6	WHITE	SHLD OF 29	E21	At J18
309	9	COAX 30	J17-A1	J19-A2	
310	6	WHITE	SHLD OF 30	E32	At J19
311	9	COAX 31	J17-A3	J18-A2	
312	6	WHITE	SHLD OF 31	E21	At J18
313	9	COAX 31	J17-A4	J18-A1	

TABLE 5-4. MAIN FRAME CHASSIS A2, WIRING LIST (Cont)

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO	REMARKS
314	6	WHITE	SHLD OF 32	E21	At J18
315	9	COAX 33	J22-A3:	A9-E3	
316	6	WHITE	SHLD OF 33	A9-E4	
317	3	BARE	J11-A1 Center Pin	J11-A2 Out-side Sleeve	
318	5	WHT-BRN-VIO	XC2-1	E42	
319	5	WHT-BLU-VIO	XC2-5	L2-2	
320	3	CR4	K2-3	K2-2	Cathode to K2-2
321	3	BARE	K2-5	K2-1	Sleeve
322	5	WHT-BLK-RED	A11-1	S6-R4	
323		BARE	S6-R4	S6-R3	
324		BARE	J13-A3	J13-A3	Shorting
325		C3	A2Q1-C	A2Q1-B	Sleeve

TABLE 5-5. RECEIVER CASE A1, WIRING LIST

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO
1	19	WHT-BLK-BRN	C1	P21-1
2		WHT-BLK-RED	C2	P21-2
3		WHT-BLK-ORN	C3	P21-3
4		WHT-BLK-YEL	C4	P21-4
5		WHT-BLK-GRN	C5	P21-5
6		WHT-BLK-BLU	C6	P21-6
7		WHT-BLK-VIO	C7	P21-7
8		WHT-BLK-GRY	C8	P21-8
9		WHT-BRN-RED	C9	P21-9
10	19	WHT-BRN-ORN	C10	P21-10
11	18	BLACK TP 1	C11	P21-11
12		WHITE TP1	C12	P21-12
13	19	WHT-RED-ORN	C13	P21-13
14	18	BLACT TP2	C15	P21-18
15		WHITE TP2	C16	P21-19
16	19	WHT-BRN-YEL	C17	P21-17
17	18	WHITE TP3	C18	P21-32
18		BLACK TP3	C19	P21-33
19	18	WHITE TP4	C21	P21-49
20		BLACK TP4	C22	P21-50
21	19	WHT-BRN-GRN	C23	P21-23
22	29	WHT-BRN-BLU	C24	P21-24
23	19	WHT-BRN-VIO	C25	P21-25
24	19	WHT-BRN-GRY	C26	P21-26
25	17	COAX 1	J24	P22-A1
26	17	COAX 2	J23	P22-A3
27	17	COAX 3	J25	P22-A2
28	19	WHITE	SH OF TP1	SH OF TP2
29	19	WHITE	SH OF TP2	C14
30	19	WHITE	SH OF TP3	SH OF TP4

TABLE 5-5. RECEIVER CASE A1, WIRING LIST

WIRE NO.	WIRE ITEM NO.	COLOR	FROM	TO
31	19	WHITE	SH OF TP4	C20
32	19	WHITE	SH OF TP2	SH OF TP1
33	19	WHITE	SH OF TP1	P21-14
34	19	WHITE	SH OF TP3	SH OF TP4
35	19	WHITE	SH OF TP4	P21-48
36	16	BRAID	SH OF A2	Lug on P22

TABLE 5-6. FILTER BOX ELECTRONIC ASSEMBLY A1A1, WIRING LIST

WIRE NO.	COLOR	FROM	TO	WIRE NO.	COLOR	FROM	TO
1	WHT-BLK-BRN	J4-E	C1	17	WHT-RED-YEL	J4-h	C14
2	WHT-BLK-RED	J4-D	C2	18	WHT-RED-GRN	J4-d	C15
3	WHT-BLK-ORN	J4-B	C3	19	WHT-RED-BL	C15	J5-A
4	WHT-BLK-YEL	J4-C	C4	20	WHT-RED-VIO	J4-e	C16
5	WHT-BLK-GRN	J4-Z	C5	21	WHT-RED-GRY	C16	J5-B
6	WHT-BLK-BLU	C5	E1	22	WHT-ORN-YEL	J3-B	C17
7	WHT-BLK-VIO	J4-Y	C6	23	WHT-ORN-GRN	C17	E1
8	WHT-BLK-GRY	J4-a	C7	24	WHT-ORN-BL	J3-C	C18
9	WHT-BRN-RED	J4-X	C8	25	WHT-ORN-VIO	J3-A	C19
10	WHT-BRN-ORN	J4-A	C9	26	WHT-ORN-GRY	J4-1	C20
11	WHT-BRN-YEL	J4-W	C10	27	WHT-YEL-GRN	J4-S	C21
12	WHT-BRN-GRN	J4-m	C11	28	WHT-YEL-BL	J4-R	C22
13	WHT-BRN-BLU	C11	J6-A	29	WHT-YEL-VIO	J4-K	C23
14	WHT-BRN-VIO	J4-n	C12	30	WHT-YEL-GRY	J4-J	C24
15	WHT-BRN-GRY	C12	J6-B	31	WHT-GRN-BL	J4-b	C25
16	WHT-RED-ORN	J4-H	C13	32	WHT-GRN-VIO	J4-F	C26

NOTES:
1. All wire is no. 20 AWG.
2. Wire Nos. 12 and 14, 18 and 20, 24 and 25, and 27 and 28 are twisted to form pairs.

5-39. Frequency Standard Electronic Assembly A2A5 is not repairable aboard ship (refer to paragraph 5-5). To replace Frequency Standard Electronic Assembly A2A5, loosen the two corner captive screws on top of the assembly and lift it from the chassis. Install the spare frequency standard into the chassis and tighten the captive screws. Check bottom of chassis to ensure all RF inserts are fully seated in connector. Verify proper R-1051/URR operation by performing the overall receiver performance test given in paragraph 5-81.

5-40. <u>RF AMPLIFIER ELECTRONIC ASSEMBLY A2A4, MAINTENANCE PROCEDURES.</u>

5-41. GENERAL. RF Amplifier Electronic Assembly A2A4 may be repaired aboard ship only to the extent of replacing defective electron tubes V1 and V2. Otherwise, the RF amplifier is replaced with a spare assembly aboard ship (refer to paragraph 5-5). The following paragraphs provide instructions for replacement of electron tubes, and for replacement of RF Amplifier Electronic Assembly A2A4 as a unit.

5-42. ELECTRON TUBE REPLACEMENT PROCEDURE. To replace a defective electron tube, proceed as follows:

a. Turn off power to R-1051/URR.

b. Loosen front-panel screws and slide chassis from case.

c. Withdraw tube shield by bail handle, replace defective tube, and reinstall shield.

d. Slide chassis into case and tighten front-panel screws.

e. Apply power and verify that R-1051/URR operates satisfactorily by performing the overall receiver performance test given in paragraph 5-80.

5-43. RF AMPLIFIER REPLACEMENT PROCEDURE. To replace a defective RF amplifier assembly, proceed as follows:

a. Turn off power to R-1051/URR.

b. Set KCS controls to 111.

c. Loosen four captive screws at corners of RF amplifier, and lift the assembly from the chassis.

d. Check that slots in chassis couplers point toward, and are perpendicular to, the front panel. If slots are not properly aligned, refer to paragraph 5-18.

e. Set couplers on bottom of spare RF amplifier at position 1, and place spare RF amplifier assembly into chassis, applying small amount of finger pressure.

f. Rotate 100 KCS and 10 KCS controls to 0, then to 2, and then to 1, while observing digital tuning rotor assemblies on the turret assembly located inside the RF amplifier. This is done by looking through tube access slot in top of the dust cover. As the 100 KCS control is rotated, the top two wafers (with vertical posts) should rotate. As the 10 KCS control is rotated, the lower rotor (with printed circuit visible) should rotate.

g. When couplers are fully engaged, tighten four captive screws at corners of RF amplifier.

h. Apply power and verify that R-1051/URR operates satisfactorily by performing the overall receiver performance test given in paragraph 5-80.

5-44. <u>TRANSLATOR/SYNTHESIZER ELECTRONIC ASSEMBLY A2A6, MAINTENANCE PROCEDURES.</u>

5-45. Translator/Synthesizer Electronic Assembly A2A6 may be replaced with a spare assembly aboard ship (refer to paragraph 5-5). To replace a defective translator/synthesizer, proceed as follows:

a. Turn off power to R-1051/URR.

b. Loosen four fastening screws at corners of the translator/synthesizer.

c. Rotate KCS controls to 11, and carefully lift out the translator/synthesizer assembly. Rotate KCS controls to 000.

d. Check that slots in couplers point toward, and are perpendicular to, rear chassis panel. If slots are not properly aligned, refer to paragraph 4-51.

e. Rotate KCS controls to 111. Carefully place new translator/synthesizer assembly into chassis.

f. Apply slight finger pressure on top of translator/synthesizer assembly, and rotate KCS controls. When couplers are fully engaged, tighten four fastening screws in corners of the translator/synthesizer.

g. Apply power and verify that R-1051/URR operates satisfactorily by performing the overall receiver performance test given in paragraph 5-80.

5-46. RECEIVER MODE SELECTOR ELECTRONIC ASSEMBLY A2A1, MAINTENANCE PROCEDURES.

5-47. GENERAL. The following paragraphs provide instructions for removal, and adjustment of Receiver Mode Selector Electronic Assembly A2A1.

5-48. REMOVAL PROCEDURE. To remove the mode selector assembly, loosen the two corner captive screws on top of the assembly and lift it from the chassis. Remove the dust-cover screw and lift the dust cover.

5-49. REASSEMBLY PROCEDURE. Reinstall the assembly into the chassis, and tighten the two corner captive screws.

5-50. ADJUSTMENT PROCEDURE. The only adjustment performed on mode selector is adjustment of the BFO frequency (refer to paragraph 5-72).

5-51. TEST PROCEDURE. After repair is complete, ensure receiver is operational by completing the overall receiver performance test given in paragraph 5-80.

5-52. RECEIVER IF/AUDIO AMPLIFIER ELECTRONIC ASSEMBLIES A2A2 AND A2A3, MAINTENANCE PROCEDURES.

5-53. GENERAL. The following paragraphs provide instructions for removal, and adjustment of IF/Audio Amplifier Electronic Assemblies A2A2 and A2A3. Refer to paragraph 5-5 for repairability of this assembly.

5-54. REMOVAL PROCEDURE. IF/audio amplifiers A2A2 and A2A3 are located side by side at the rear of the chassis (see figure 5-23). They operate identically and are interchangeable. To remove either the A2A2 or A2A3 assembly, loosen the two corner captive screws on top of the assembly and lift it from the chassis. Remove the two dust-cover screws, and lift the dust cover from the assembly.

5-55. REASSEMBLY PROCEDURE. Reinstall the assembly into chassis, and tighten the two corner captive screws.

5-56. ADJUST PROCEDURE. If electrical components were replaced in the IF/audio amplifier, necessitating the tuning of any or all of the variable transformers, adjust the IF/audio amplifier.

5-57. FINAL ADJUSTMENT PROCEDURES.

5-58. GENERAL. The final adjustment procedures in this paragraph should be performed when referred to by other procedures, when an assembly containing adjustable components is replaced, and when scheduled by a planned maintenance system. Frequency Standard Electronic Assembly A2A5 must be checked (with very slight adjustment necessary) at least monthly.

5-59. 20-VOLT REGULATOR CIRCUIT ADJUSTMENT. Power Supply Electronic Assembly A2A8 provides a regulated 20-vdc output which must be adjusted if the voltage varies more than ±0.5 volt from 20 vdc.

5-60. Test Equipment. This adjustment uses Multimeter AN/USM-311 or alternate (refer to table 5-2).

5-61. Preliminary Conditions and Control Settings.

a. Set the Mode Selector switch A2S2 to STD BY.

b. Loosen front-panel screws and slide chassis from case.

c. Defeat chassis interlock switch A2S8.

d. Tilt chassis up 90 degrees to expose bottom.

e. Set multimeter to read 50 volts full scale.

f. Connect positive lead of multimeter to solder terminal E11 or E37 on bottom of chassis (see figure 4-3).

g. Connect negative lead of multimeter to chassis.

5-62. Adjustment Procedure. To adjust the 20-volt regulator circuit, proceed as follows:

a. Set Mode Selector switch A2S2 to AM.

b. Set MCS controls for 02 MHz.

c. Adjust output voltage control A2A8R14 (see figure 5-22) for an indication of 20 ±0.1 vdc on multimeter. If reading is above 22 volts or adjustment does not have enough range, refer to paragraph 4-40.

d. Set Mode Selector switch A2S2 to OFF. Tilt chassis back to horizontal. Slide chassis into case and tighten front-panel screws.

5-63. 5-MHz OSCILLATOR CIRCUIT ADJUSTMENT. The 5-MHz oscillator circuit in Frequency Standard Electronic Assembly A2A5 must be adjusted properly to ensure accurate development of frequencies in the R-1051/URR. However, the adjustment must not be made until it has been determined that the 5-MHz output frequency is in error. Unnecessary adjustment cause poor equipment operation that requires difficult and time-consuming maintenance procedures.

5-64. Test Equipment. An external frequency standard is required to perform this adjustment (refer to table 5-2).

5-65. Preliminary Conditions and Control Settings.

a. Set the Mode Selector switch A2S2 to STD BY. Allow at least a 3-day warmup period before proceeding with the adjustment. If immediate adjustment is necessary, proceed but recheck oscillator adjustment after required warmup period.

b. Connect 5 MC OUTPUT jack on external frequency standard to EXT 5 MC IN jack A1J25 at rear of R-1051/URR.

c. Loosen front-panel screws on R-1051/URR and slide chassis from case.

d. Defeat chassis interlock switch A2S8.

5-66. Adjustment Procedure. To adjust the 5-MHz oscillator circuit, proceed as follows:

a. Using a small screwdriver, rotate COMP/INT/EXT switch A2A5S1 on top of the frequency standard to COMP.

b. Set Mode Selector switch A2S2 to AM and observe comparator lamp A2A5DS1 on top of frequency standard. Lamp will flicker at rate equal to error frequency. Measure from time lamp is just visibly increasing in brilliance, until again just visibly increasing in brilliance. Make adjustment only if time measured is less than 20 seconds. If lamp does not flicker, refer to table 4-3, step 4.

CAUTION

Less than one-quarter turn of FREQ ADJ capacitor A2A5C1 will correct for most drift. Do not force the adjustment.

NOTE

Some type frequency standards require removal of cover.

c. Adjust FREQ ADJ capacitor A2A5C1 on frequency standard until lamp A2A5DS1 changes brilliance as slowly possible (see figure 5-23).

d. Wait 5 minutes and repeat steps b. and c. until time measured is in excess of 20 seconds.

e. Rotate A2A5S1 switch to required position for operation (refer to paragraph 4-59).

f. Slide chassis into case and tighten front-panel screws.

g. Disconnect the external frequency standard.

5-67. 500 CPS FREQUENCY LOCK ADJUSTMENT.

a. Connect INT 5 MC OUT jack (J24) to ANT jack (J23) at rear of receiver. Rotate COMP-INT-EXT switch on top of Frequency Standard (A2A5) assembly to COMP. Set Mode Selector switch to LSB, CPS switch to 000, RF GAIN control fully clockwise, MCS and KCS controls to 5.001 MHz, LSB LINE LEVEL switch to 20 db, and LSB PHONES LEVEL control fully clockwise.

b. Set AN/PSM-4( ) Multimeter Selector switch to 10 volt DC scale and connect test leads between TP2 and ground on 500 CPS Synthesizer. This test point is located near the center of A2A6 Translator/Synthesizer Assembly.

c. Adjust 500 CPS Lock Adjust (A2A11R3-located near front, top, top, right side of receiver) as follows: Turn 500 CPS ADJ fully counterclockwise and note multimeter reading is between 2 and 3 volts. (The multimeter will read between 2 and 3 volts at both ends of rotation but is the wrong final setting). Turn potentiometer clockwise until multimeter reading decreases sharply and then raises to 2.5 volts. Rotate CPS switch back and forth between 000 and 500 adjusting potentiometer for approximately equal DC levels between the limits of 2.1 and 3.1 volts. Perform paragraph 5-97 to observe locking action at 000 and 500 CPS on counter.

5-68. VERNIER FREQUENCY ADJUSTMENT.

5-69. Test Equipment. The vernier frequency adjustment requires a frequency counter (refer to table 5-2).

5-70. Preliminary Conditions and Control Settings.

a. Set A2A5 switch S1 on Frequency Standard Electronic Assembly A2A5 to COMP.

b. Set Mode Selector switch A2S2 to LSB, CPS switch to 000, RF GAIN control fully clockwise, MCS and KCS controls at 5.001 MHz, and LSB LINE LEVEL and LSB PHONE LEVEL controls fully clockwise.

c. Connect INT 5 MC OUT jack A1J24 to ANT 50 OHM jack A1J23 at rear of the R-1051/URR.

d. Set LSB LINE LEVEL switch to +20 DB.

e. Adjust LSB LINE LEVEL control for -10 dB on LSB LINE LEVEL meter.

f. Connect frequency counter to LSB PHONES jack.

5-71. Adjustment Procedure. To adjust the vernier frequency, proceed as follows:

a. Frequency counter should read 1000 Hz.

b. Set CPS switch at V position, and rotate the CPS vernier control fully counterclockwise.

c. Adjust potentiometer A2A11R1 (see figure 5-20) for not more than 980-Hz indication on the frequency counter.

d. Rotate CPS vernier control fully clockwise and observe frequency counter for indication of not less than 2020 Hz.

e. Repeat steps b. through d. as necessary until both frequencies are within limits.

5-72. BFO FREQUENCY ADJUSTMENT. The BFO circuit in Receiver Mode Selector Electronic Assembly A2A1 is adjustable to produce a frequency between 497 and 503 kHz, depending upon the setting of the BFO FREQ control on the front panel.

5-73. Test Equipment. A frequency counter (table 5-2) is recommended to perform this adjustment accurately. However, satisfactory results may be obtained by connecting headphones to the USB PHONES jack and centering the BFO FREQ control without the use of the frequency counter.

5-74. Preliminary Conditions and Control Settings.

a. Set the Mode Selector switch A2S2 to CW, MCS and KCS controls for 5.000 MHz, and CPS switch to 000.

b. Loosen front-panel screws and slide chassis from case.

c. Rotate A2A5 switch S1 on Frequency Standard Electronic Assembly A2A5 to COMP.

d. Defeat chassis interlock switch A2S8.

e. Connect INT 5 MC OUT jack A1J24 to ANT 50 OHM jack A1J23, using BNC-to-N adapter UG-201/U (table 5-2).

f. Connect input of frequency counter to USB PHONES jack.

5-75. Adjustment Procedure. To adjust the BFO frequency, proceed as follows:

a. Rotate BFO FREQ control fully counterclockwise and note frequency indicated by counter. If no reading is obtained on counter, increase USB PHONE LEVEL and USB LINE LEVEL adjustments until a stable reading is obtained.

b. Rotate BFO FREQ control fully clockwise and note frequency indicated by frequency counter. Adjust BFO ADJ inductor A2A1A3L1 (see figure 5-18) so that counter reads 3 kHz minimum when BFO FREQ control is at extreme counterclockwise and clockwise positions.

c. Set Mode Selector switch A2S2 to OFF. Disconnect counter from USB PHONES jack. Remove test connections from A1J23 and A1J24 and connect antenna to ANT 50 OHM jack A1J23.

5-76. AGC AND IF GAIN LOOP ADJUSTMENT. The AGC and IF gain loops in Receiver IF/Audio Amplifier Electronic Assemblies A2A2 and A2A3 are adjusted as indicated in the following paragraphs.

5-77. Test Equipment. Adjustment of the AGC and IF gain loops requires use of an RF signal generator (refer to table 5-2).

5-78. Preliminary Conditions and Control Settings.

a. Set the Mode Selector switch A2S2 to USB.

b. Set MCS and KCS controls to 26.510 MHz.

c. Set RF GAIN control fully clockwise.

d. Set CPS switch to 000, USB LINE LEVEL meter switch to +20 DB, and USB LINE LEVEL control fully clockwise.

e. Connect RF signal generator to ANT 50-OHM jack A1J23 on rear of receiver.

f. Connect extender test cable A2A2-P1 (see table 5-2) between IF/audio amplifier A2A2 (left assembly) and the chassis connector, and remove dust cover from the assembly.

g. Defeat interlock switch A2S8.

5-79. Adjustment Procedure.

a. Initially adjust RF AGC adjust potentiometer A2A2A1R6 20 turns clockwise, IF gain adjust potentiometer A2A2A2R22 20 turns clockwise and then 5 turns counterclockwise, and AGC adjust potentiometer A2A2A1R25 20 turns counterclockwise.

b. Set signal generator to CW with 1-uv output. Tune signal generator for a peak on USB LINE LEVEL meter. Turn USB LINE LEVEL control fully counterclockwise and set USB LINE LEVEL meter switch to 0 DB. Adjust USB LINE LEVEL control to -5 dB on the meter.

c. Increase signal generator output to 5 uv. Adjust A2A2A1R25 clockwise until USB LINE LEVEL meter reads 0 dB. Set USB LINE LEVEL meter switch to +20 DB position and USB LINE LEVEL control fully clockwise. Set signal generator output to 1000 uv. Adjust A2A2A2R22 for 0 dB on USB LINE LEVEL meter. Reduce signal generator output to 1 uv, turn USB LINE LEVEL control fully counterclockwise, and set USB LINE LEVEL meter switch to 0 DB position. Adjust USB LINE LEVEL control to -5 dB on the meter. Increase signal generator output to 5 uv and readjust A2A2A1R25 for 0 dB on USB LINE LEVEL meter.

d. Increase signal generator output to 0.1 volt and adjust A2A2A1R6 counterclockwise until USB LINE LEVEL meter reads +1.5 dB (momentary downscale deflection of meter must be observed while adjusting R6). Decrease signal generator output to 1000 uv and set USB LINE LEVEL switch to +20 DB position. Turn USB LINE LEVEL control fully clockwise. USB LINE LEVEL must indicate between -2 and +3 dB. If indication is incorrect, repeat steps a. through d. of this procedure.

e. Repeat the procedure in paragraphs 5-78 and 5-79 for IF/audio amplifier A2A3 (right assembly), substituting LSB for USB and assembly A2A3 for A2A2 throughout the procedure.

f. Perform the overall receiver performance test given in paragraph 5-80 to verify proper operation of the R-1051/URR.

5-80. OVERALL RECEIVER PERFORMANCE TEST.

5-81. GENERAL. The overall receiver performance test should be performed when scheduled; whenever an assembly is exchanged by installing a new or used assembly; after any repair has been performed or adjustment made that could affect overall receiver performance; and when a receiver is suspected of being in a poor operational condition (poor sensitivity, off frequency, etc.).

5-82. KNOWN-STATION RECEIVER CHECK

5-83. Preliminary Conditions and Control Settings.

a. Set Mode Selector switch A2S2 to CW.

b. Rotate RF GAIN control fully clockwise.

c. Set CPS switch to 000.

d. Set USB LINE LEVEL switch to +20 DB.

e. Rotate USB LINE LEVEL control fully counterclockwise.

5-84. Checkout Procedure.

a. Tune receiver to WWV or WWVH at 5, 10, or 15 MHz. Plug headset into USB PHONES jack. Adjust USB LINE LEVEL control and USB PHONE LEVEL control for comfortable signal level.

b. Verify that signal is received and signal tone varies when BFO FREQ control is varied.

c. Set Mode Selector switch to USB. Tune receiver 1 kHz lower, and check that signal is heard in headset. Set Mode Selector switch to ISB and ensure signal is present.

d. Set Mode Selector switch to LSB. Tune receiver 1 kHz higher than WWV carrier, plug headset into LSB PHONES jack, and set LSB LINE LEVEL control and LSB PHONE LEVEL control for comfortable signal level. Check that signal is heard in headset.

e. Rotate CPS switch to V and check that signal tone varies as CPS vernier control is rotated. Set Mode Selector switch to ISB and ensure signal is present.

f. Set Mode Selector switch to AM. Plug headset into USB PHONES jack. Tune receiver to a known AM station, such as Armed Forces frequency at 15.330 MHz.

Check that signal is heard in headset.

g. Set Mode Selector switch to FSK. Check that signal is heard in headset. If teletype system is available, refer to R-1051/URR Operation Instructions, NAVELEX 0967-LP-970-9020. Set up equipments as required by receiver and associated manuals to a known FSK frequency, and ensure proper operation.

5-85. DC POWER SUPPLY VOLTAGE CHECK.

5-86. Test Equipment. Multimeter AN/USM-311 or alternate (refer to table 5-2) is required for this test.

5-87. Preliminary Conditions and Control Settings.

a. Receiver in full operation, chassis pulled out of case.

b. Set Mode Selector switch A2S2 to AM.

c. Set MCS controls to 02.

d. Rotate RF GAIN control fully clockwise.

e. Defeat interlock switch A2S8.

5-88. Checkout Procedure.

a. Tilt receiver chassis up 90 degrees to expose bottom. Set multimeter to 100-vdc scale. In lower left-hand corner to the right of pcb A2A8 (see figure 4-3), locate test points E11, E12, and E17 (see figure 4-3). Voltage at E11 should be 19.5 to 20.5 vdc. If adjustment is necessary, refer to paragraph 5-59.

b. Voltage at E12 should be 25 to 31 vdc.

c. Set multimeter to 250-vdc scale. Voltage at E17 should be 103 to 117 vdc.

d. Along left side of pcb A2A8 is a row of terminals. Count 7 terminals up from bottom to locate the -30-volt terminal, E10. Set multimeter switch for negative reading. Voltage at this terminal should be -28.5 to -31.5 vdc.

NOTE

If voltage in steps b. and c. are out of limits, check the ac line voltage and the setting of the primary winding tap on transformer A2T1 (see figure 4-8).

5-89. AGC PERFORMANCE TEST.

5-90. Test Equipment. This test requires use of an RF signal generator (refer to table 5-2).

5-91. Preliminary Conditions and Control Settings.

a. Set Mode Selector switch A2S2 to USB.

b. Set MCS and KCS controls to 02.010 MHz.

c. Rotate RF GAIN control fully clockwise.

d. Set CPS switch to 000.

e. Rotate USB and LSB LINE LEVEL controls fully clockwise.

f. Set USB and LSB LINE LEVEL switches to +20 DB position.

g. Disconnect audio cables from A1A1J5 and A1A1J6 (rear of receiver).

5-92. Test Procedure.

a. Connect RF signal generator to ANT 50 OHM connector A1J23 at rear of receiver. Set signal generator to receiver frequency, CW mode, with 1-uv output. Tune signal generator for a peak reading on USB LINE LEVEL meter, which should indicate -12 dB minimum with USB LINE LEVEL switch in +20 DB position. If peak is obtained but is not within the requirement, perform the AGC and IF gain loop adjustment described in paragraph 5-76.

b. Set Mode Selector switch to LSB and repeat step a. above, substituting LSB for USB.

c. Set Mode Selector switch to USB. Peak the signal generator to the receiver frequency. Turn USB LINE LEVEL control fully clockwise, and set USB LINE LEVEL meter switch to 0 DB position. Slowly increase USB LINE LEVEL control clockwise until -5 dB is indicated on USB LINE LEVEL meter. Increase signal generator output to 5 uv and note that USB LINE LEVEL meter reads between -5 and +1 dB.

d. Increase signal generator output to 0.1 volt and peak signal generator frequency on USB LINE LEVEL meter, which should indicate not more than 3 dB above previously noted 5-uv reading. If these limits are not obtained, perform AGC and IF gain loop adjustment described in paragraph 5-79.

e. Set Mode Selector switch to LSB and repeat steps c. and d. substituting LSB for USB. Reconnect cables to A1A1J5 and A1A1J6.

5-93. <u>RECEIVER SENSITIVITY TEST.</u>

5-94. Test Equipment. Performance of this test requires an RF signal generator (refer to table 5-2).

5-95. Preliminary Conditions and Control Settings.

a. Set Mode Selector switch A2S2 to USB.

b. Set MCS and KCS controls to 02.010 MHz.

c. Rotate RF GAIN control fully clockwise.

d. Set CPS switch to 000.

e. Set USB LINE LEVEL switch to 0 DB position.

f. Rotate USB LINE LEVEL control fully counterclockwise.

g. Set LSB LINE LEVEL switch to 0 DB position.

h. Rotate LSB LINE LEVEL control fully counterclockwise.

5-96. Test Procedure.

a. Connect RF signal generator to ANT 50 OHM connector A1J23 at rear of receiver. Set modulation selector switch on signal generator to CW mode, and set generator for 1-uv output.

b. Set RF signal generator frequency approximately 150 kHz away from receiver frequency. Adjust USB LINE LEVEL control for -10 dB noise reference level as read on USB LINE LEVEL meter. Less than -10 dB (toward -20 dB) with USB LINE LEVEL control control maximum is acceptable, provided correct dB reading is obtained in the remainder of these steps. Adjust signal generator frequency and output attenuator for a peak on-scale indication. Adjust signal generator attenuator for 0 dB on USB LINE LEVEL meter. Sideband sensitivity reading (signal generator attenuator setting) should be not more than 1 uv.

c. Set Mode Selector switch to LSB. Repeat step b. above, substituting LSB LINE LEVEL control and meter for USB LINE LEVEL control and meter.

d. Turn Mode Selector switch to sideband (USB or LSB) having the poorest sensitivity (larger numerical reading) of step b. or c.

e. Set RF signal generator frequency approximately 150 kHz away from receiver frequency and set signal generator attenuator for 1-uv output. Adjust LSB or USB LINE control for -10 dB of noise on associated LINE LEVEL meter. Tune signal generator slowly through receiver frequency and observe that LSB or USB LINE LEVEL meter deflects above 0 dB with the associated meter switch in the 0 dB position. Test all frequencies (in MHz) listed below:

2.010	16.010
3.101	17.010
4.222	18.010
5.333	19.010
6.444	20.010
7.555	21.010
8.666	22.010
9.777	23.010
10.898	24.010
11.989	25.010
12.010	26.010
13.010	27.010
15.010	29.010

NOTE

It is important to test all frequencies in table to ensure that receiver is operational at all selected combinations of digits.

f. Set the Mode Selector switch to USB and adjust BFO FREQ control to midrange position. Adjust the USB LINE LEVEL control for -10 dB of noise on USB LINE LEVEL meter. Set Mode Selector switch to CW and adjust RF GAIN control for -10 dB of noise on the USB LINE LEVEL meter. Tune the signal generator to receiver frequency (2.010 MHz) for a peak, and adjust signal generator output attenuator for 0 dB on the USB LINE LEVEL meter. CW sensitivity reading on signal generator should be not more than 2 uv.

g. Set the Mode Selector switch to AM and the USB LINE LEVEL switch to 0 DB. Set RF GAIN control fully clockwise. With the signal generator modulator selector switch at the 1000-Hz, 30-percent modulation position, adjust signal generator frequency and output attenuator for a peak reading of 0 dB on USB LINE LEVEL meter with USB LINE LEVEL switch at 0 DB. With the signal generator modulation selector switch in the CW position, adjust USB LINE LEVEL control for -10 dB on USB LINE LEVEL meter with USB LINE LEVEL switch at 0 DB. AM sensitivity reading on signal generator should be not more than 4 uv.

5-97. <u>FREQUENCY, LOCKING ACTION, AND VERNIER TEST.</u>

5-98. Test Equipment. An external frequency standard and a frequency counter are required for the performance of this test (refer to table 5-2).

5-99. Preliminary Conditions and Control Settings.

a. Receiver in full operation, chassis pulled out of case.

b. Set Mode Selector switch A2S2 to USB.

c. Set MCS and KCS controls for 04.996 MHz.

d. Rotate RF GAIN control fully clockwise.

e. Set CPS switch to 500.

f. Set USB and LSB LINE LEVEL switches to +20 DB position.

g. Rotate USB and LSB LINE LEVEL controls fully counterclockwise.

h. Rotate USB and LSB PHONE LEVEL controls fully clockwise.

5-100. Test Procedure.

a. Connect external frequency standard 5-MHz output to EXT 5 MC IN jack A1J25 on receiver. On top of Frequency Standard Electronic Assembly A2A5, rotate A2A5 switch S1 to COMP. Observe that comparator indicator lamp DS1 fades out and lights not more than once in 20 seconds. Measure time from instant when lamp visibly increases in brilliance to next instant when lamp visibly increases in brilliance. If the lamp flickers rapidly, or stays lit without varying intensity for longer than 4 minutes, refer to table 4-3, step 4, and to paragraphs 4-58 through 4-57. Disconnect the external frequency standard from receiver EXT 5 MC IN jack A1J25.

b. Connect INT 5 MC OUT jack A1J24 to ANT 50 OHM jack A1J23. Connect frequency counter to USB PHONES jack and adjust USB LINE LEVEL control so that signal level on USB LINE LEVEL meter reads -10 dB. Frequency counter should read 3500 Hz. Change receiver frequency to 4997.5, 4998.5, and 4999.5 kHz, and note that frequency counter reads 2500, 1500, and 500 Hz, respectively.

c. Set Mode Selector Switch to LSB. Set receiver frequency to 5003.500 kHz. Connect frequency counter to LSB PHONES jack and set LSB LINE LEVEL control so that signal level on LSB LINE LEVEL meter reads -10 dB. Frequency counter should read 3500 Hz. Change receiver frequency to 5002.5, 5001.5, and 5000.5 kHz, and observe that frequency counter reads 2500, 1500, and 500 Hz, respectively. Change receiver frequency to 5001.000 kHz, and observe that counter reads 1000 Hz. Rotate CPS switch from 000 to 500, observing that counter increases by 500-Hz to 1500 Hz.

d. Set CPS switch to V and rotate CPS vernier control fully counterclockwise. Frequency counter indication should be not more than 980 Hz. Rotate CPS vernier control fully clockwise. Counter indication should be above 2020 Hz. If these readings are not with tolerance, refer to paragraph 5-68.

NOTE

The CPS vernier dial is not calibrated, and is an arbitrary scale only. Vernier operation must permit selection of any frequency within the 1-kHz slot selected by the KCS controls.

e. Set CPS switch to 000 and note counter reading is 1000 Hz. Rotate MCS controls from 02 through 29 MHz, observing 1000 Hz on counter at each MHz step. Remove counter from LSB PHONES jack.

f. Set MCS and KCS controls to 5.000 MHz. Set Mode Selector switch to CW. Connect phones to USB PHONES jack. Vary BFO FREQ control from one extreme to the other, observing a zero-beat note near midrange of control. If zero beat is not near midrange, set control to midrange and adjust BFO ADJ on top of Mode Selector Electronic Assembly A2A1 for zero beat.

g. Rotate A2A5S1 switch on Frequency Standard Electronic Assembly A2A5 to INT or EXT as required for normal operation (refer to paragraph 4-58). Remove test cable from connectors A1J23 and A1J24 on rear of receiver, and reconnect antenna cable to A1J23.

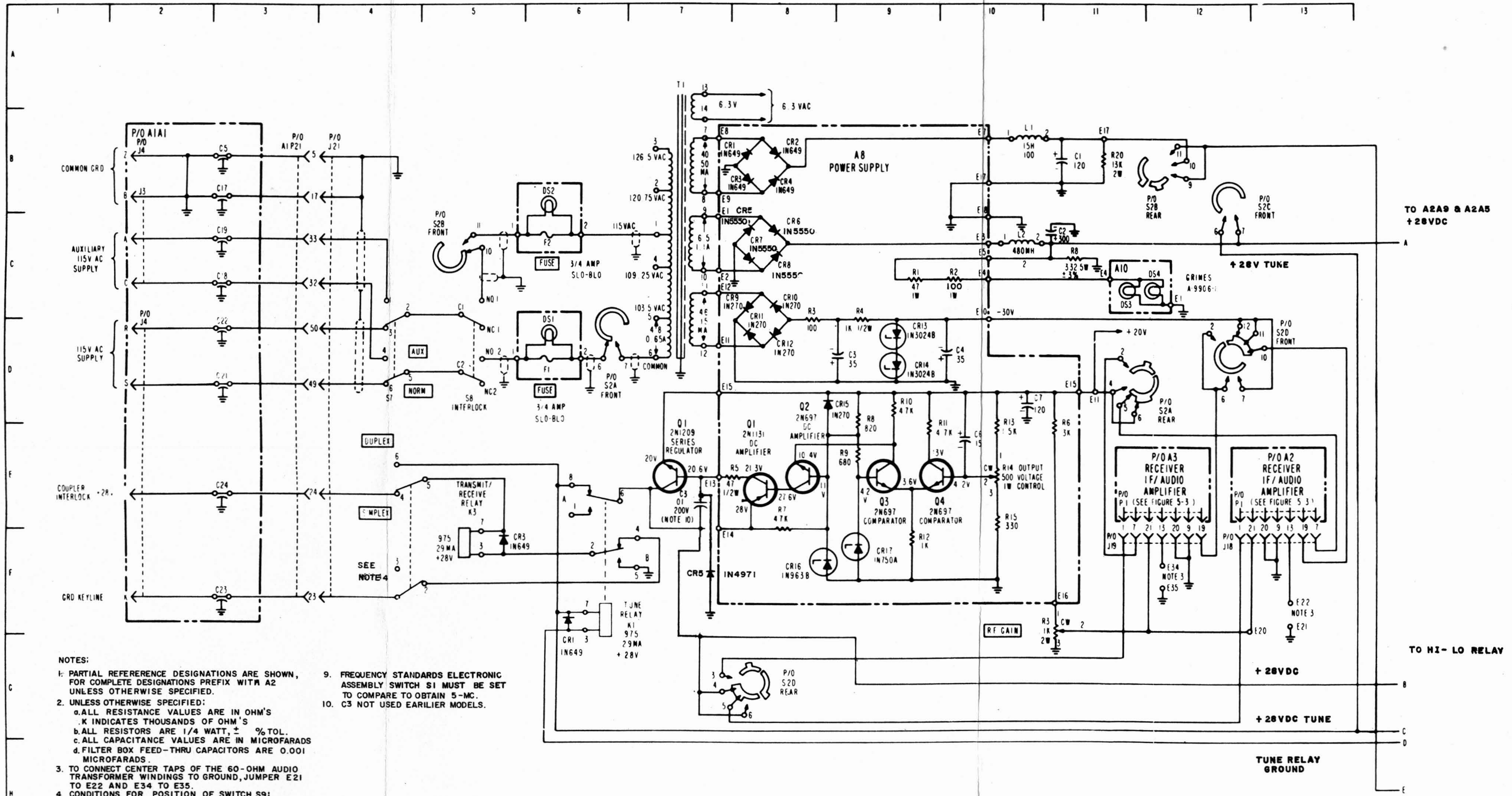
5-101. RECEIVER SCHEMATIC DIAGRAMS.

5-102. The Radio Receiver R-1051/URR chassis and main frame schematic diagram is figure 5-1.

5-103. All other schematic diagrams are supplied in figures 5-2 through 5-14 in order by reference designation sequence.

5-104. RECEIVER PARTS LOCATION DIAGRAMS.

5-105. Main frame chassis and case parts location diagrams are given in Figures 5-15 through 5-23. Figures 5-24 through 5-26 provide parts location diagrams for assemblies and subassemblies. To locate a specific part, refer to Section 6. Locate the part by reference designation and refer to the figure location column. All parts not in an assembly should appear in figures 5-15 through 5-23 or in figures 5-24 through 5-26.



NOTES:

1. PARTIAL REFERERENCE DESIGNATIONS ARE SHOWN, FOR COMPLETE DESIGNATIONS PREFIX WITH A2 UNLESS OTHERWISE SPECIFIED.
2. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTANCE VALUES ARE IN OHM'S .K INDICATES THOUSANDS OF OHM'S
   b. ALL RESISTORS ARE 1/4 WATT, ± % TOL.
   c. ALL CAPACITANCE VALUES ARE IN MICROFARADS
   d. FILTER BOX FEED-THRU CAPACITORS ARE 0.001 MICROFARADS.
3. TO CONNECT CENTER TAPS OF THE 60-OHM AUDIO TRANSFORMER WINDINGS TO GROUND, JUMPER E21 TO E22 AND E34 TO E35.
4. CONDITIONS FOR POSITION OF SWITCH S9:
   a. AN/WRC-1 SIMPLEX-RECEIVER KEYS OFF WHILE TRANSMITTER KEYS ON.
   b. AN/WRC-1 DUPLEX-RECEIVER REMAINS ON WHILE TRANSMITTER KEYS ON AND OFF.
   c. R1051/URR BY ITSELF-SWITCH S9 IN DUPLEX POSITION ONLY.
5. NUMBERS ADJACENT TO WINDINGS AND COILS INDICATE DC RESISTANCE (VALUES LESS THAN ONE OHM ARE NOT SHOWN).
6. UNLESS OTHERWISE INDICATED ALL VOLTAGES ARE DC TAKEN WITH MULTIMETER AN/PSM-4.
7. FOR CONNECTOR SPARE PINS REFER TO TABLE 5-1.
8. [box] INDICATES EQUIPMENT OPERATIONS MARKINGS FRONT PANEL CONTROL
9. FREQUENCY STANDARDS ELECTRONIC ASSEMBLY SWITCH S1 MUST BE SET TO COMPARE TO OBTAIN 5-MC.
10. C3 NOT USED EARILIER MODELS.

WHEN MAKING RESISTANCE CHECK AT SEMI CONDUCTOR DEVICES, USE ONLY THE HIGHER SCALES OF THE MULTIMETER SO AS TO AVOID UNINTENTIONAL DAMAGE TO THE SEMI-CONDUCTOR DEVICE DUE TO THE METERS INTERNAL VOLTAGE.

Figure 5-1. Radio Receiver R-1051/URR, Chassis and Main Frame, Schematic Diagram (Sheet 1 of 2)

PARTS LOCATION INDEX

REF. DESIG.	LOC.
A1J23	14B
A1J24	34I
A1J25	14H
A1P21	3B, 3C, 3D,
	3E, 3F, 16A,
	16I, 36A, 36B,
	36C, 36D, 36E,
	36F
A1P22	15B, 15H, 34I
A1A1C5	3B
A1A1C6	16I
A1A1C7	36E
A1A1C8	16I
A1A1C10	16A
A1A1C11	36F
A1A1C12	36F
A1A1C13	36D
A1A1C15	36A
A1A1C16	36B
A1A1C17	3B
A1A1C18	3C
A1A1C19	3C
A1A1C21	3D
A1A1C22	3D
A1A1C23	3F
A1A1C24	3E
A1A1C25	36C
A1A1J3	2C, 2B
A1A1J4	2B, 2D,
	2E, 2F,
	14A, 14I,
	37A, 37B.
	37C, 37D,
	37E. 37F
A1A1J5	37B
A1A1J6	37F
C1	11B
C2	11C
C3	7E
CR1	6E
CR2	18D
CR3	5F
CR4	18E
CR5	7F
DS1	6D
DS2	6B
DS5	24H
P1	6C

REF. DESIG.	LOC.
FL1	20H
FL2	18H
J1	34E
J2	34D
J8	19E, 19F,
	20E, 21E
J9	20G, 21F,
	22G
J10	22B, 23B
J11	22A, 24A,
	24B, 23B
J12	23F, 24C,
	24D, 25B,
	27G, 28G,
	29C, 29D
J13	25B, 29A
J14	25A, 29B
J16	29A, 30C,
	31C, 31A,
	31B
J17	29C, 30C,.
	31C
J18	12F, 13F,
	32A, 32B,
	33C, 34A,
	34B, 34C
J19	11F, 12F,
	32F, 33G,
	34E, 34F
J21	4B, 4C,
	4D, 4E,
	4F, 17I,
	17A, 36A,
	36B, 36C,
	36D, 36E,
	36F
J22	16B, 16H,
	34I
K1	6E
K2	19D
K2A	24H
K3	5F
K3A	23H
K3B	22H
L1	10B
L2	10C

REF. DESIG.	LOC.
M1	35G
M2	35B
Q1	7E
R1	32F
R2	32C
R3	11F
R4	35E
R5	34B
R6	30E
R7	25H
R8	11C
R9	34D
R10	34E
R11	32G
R12	32C
R13	34G
R15	35G
R16	35B
R17	32G
R18	32C
R19	30F
R20	11B
S1	34G
S2A (Front)	6D, 33D
S2A (Rear)	11D, 32E
S2B (Front)	5C, 34C,
	35C
S2B (Rear)	31G
S2C (Front)	12B, 32D
S2C (Rear)	31E
S2D (Front)	12D
S2D (Rear)	8G, 31D
S5	34B
S6 (Front)	27H
S6 (Rear)	30H
S7	4D
S8	5D
S9	4E, 4F
T1	7A, 7B,
	7C, 7D
A1P1	30A. 30C,
	31A, 31B.
	31C
A1P2	30C. 31C
A2P1	12E, 13E.
	32A, 32B,
	33B, 34A,
	34B

REF. DESIG.	LOC.
A3P1	11E, 12E,
	32F, 33G,
	34E, 34F
A4P1	22A, 23B
A4P2	24A, 24B
	22A, 23A,
A5P1	20G, 21G, 22G
A6A1P1	25C, 26C
A6A2P1	27D, 27E,
	28D, 28E
A6A3J1	26E
A6A3J3	26E
A6A3J4	26E
A6A3J5	26E
A6A3J6	27E
A6A3J7	26E
A6A4P1	27F, 28F
A6A5J1	25F
A6A5J2	24F
A6A5J3	24F
A6A5J4	25E
A6A5J5	25E
A6A5J6	24E
A6A6J1	26B
A6A6J2	27B
A6A6J3	26B
A6A6J4	28B
A6A6J5	28B
A6A6J6	27B
A6A6J7	26B
A6C1	28C
A6C2	27C
A6J4	25C, 25D,
	26C, 26D
A6J5	27F, 28F
A6J6	27D, 27E,
	28D, 28E
A6P1	24C, 24D,
	24F, 25B,
	27G, 28C,
	28D, 28G
A6P2	25B, 28A,
	28E
A6P3	25A, 28B
A6P7	27B
A6P8	28B

REF. DESIG.	LOC.
A6P9	28B
A6P10	26B
A6P11	26B
A6P12	27B
A6P13	26B
A6P14	26F
A6P15	26F
A6P16	27E
A6P17	26E
A6P18	26E
A6P19	26E
A6P21	24F
A6P22	25F
A6P23	25E
A6P24	25E
A6P25	25E
A6P26	24F
A7P8	19E, 20E,
	21E
A7S3	21E
A7S4	21E
A8C3	9D
A8C4	10D
A8C6	10E
A8C7	10D
A8CR1	8B
A8CR2	8B
A8CR3	8B
A8CR4	8B
A8CR5	8C
A8CR6	8C
A8CR7	8C
A8CR8	8C
A8CR9	8C
A9CR10	8C
A8CR11	8D
A8CR12	8D
A8CR13	9D
A8CR14	9D
A8CR15	8D
A8CR16	8F
A8CR17	9F
A8Q1	8E
A8Q2	8E
A8Q3	9E
A8Q4	9E

REF. DESIG.	LOC.
A8R1	9C
A8R2	10C
A8R3	8D
A8R4	9D
A8R5	8E
A8R6	11E
A8R7	8E
A8R8	9D
A8R9	9E
A8R10	9D
A8R11	9D
A8R12	9F
A8R13	10E
A8R14	10E
A8R15	10E
A9C1	18B
A9C2	18B
A9C3	18C
A9C4	19B
A9C5	20B
A9CR1	19B
A9K1	20B
A9Q1	20B
A9R1	18B
A9R2	19B
A9R3	19B
A9R4	20B
A9R5	20B
A10DS3	11C
A10DS4	12C
A11C1	25H
A11R1	25H
A11R2	26H
A11R3	25G
A11R4	26H
A11R5	26G
A11R6	26H
A11R7	25H

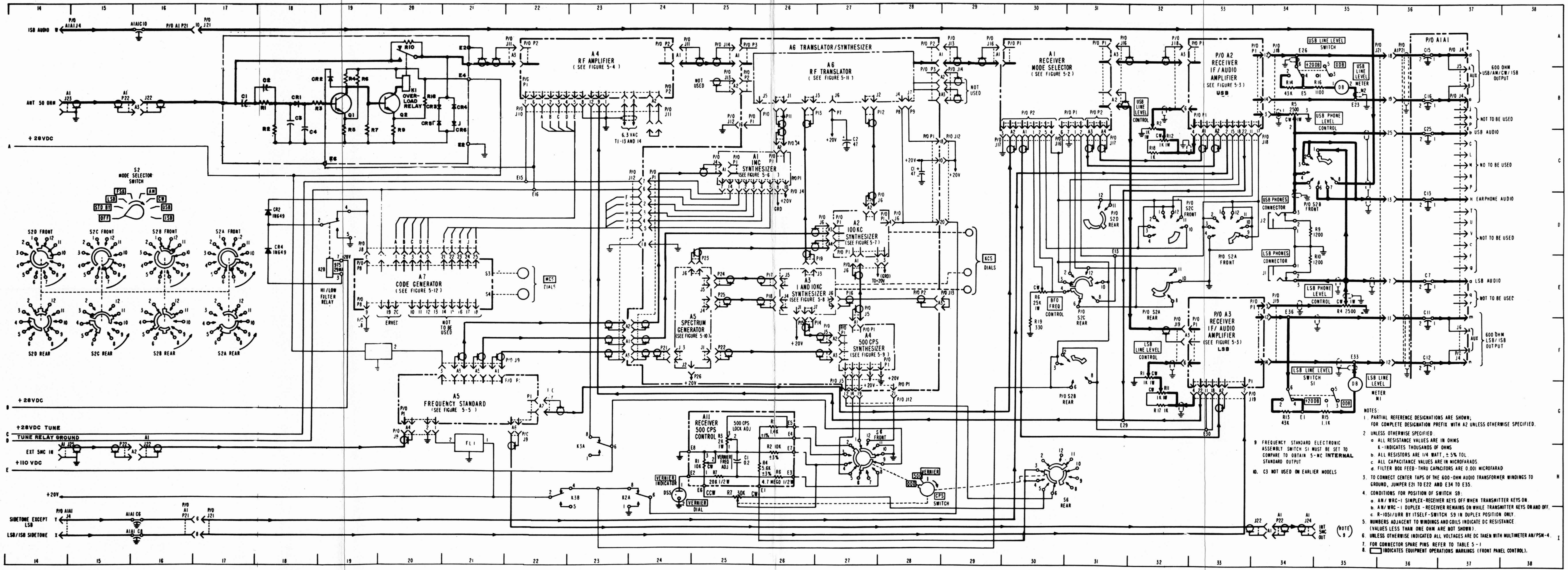
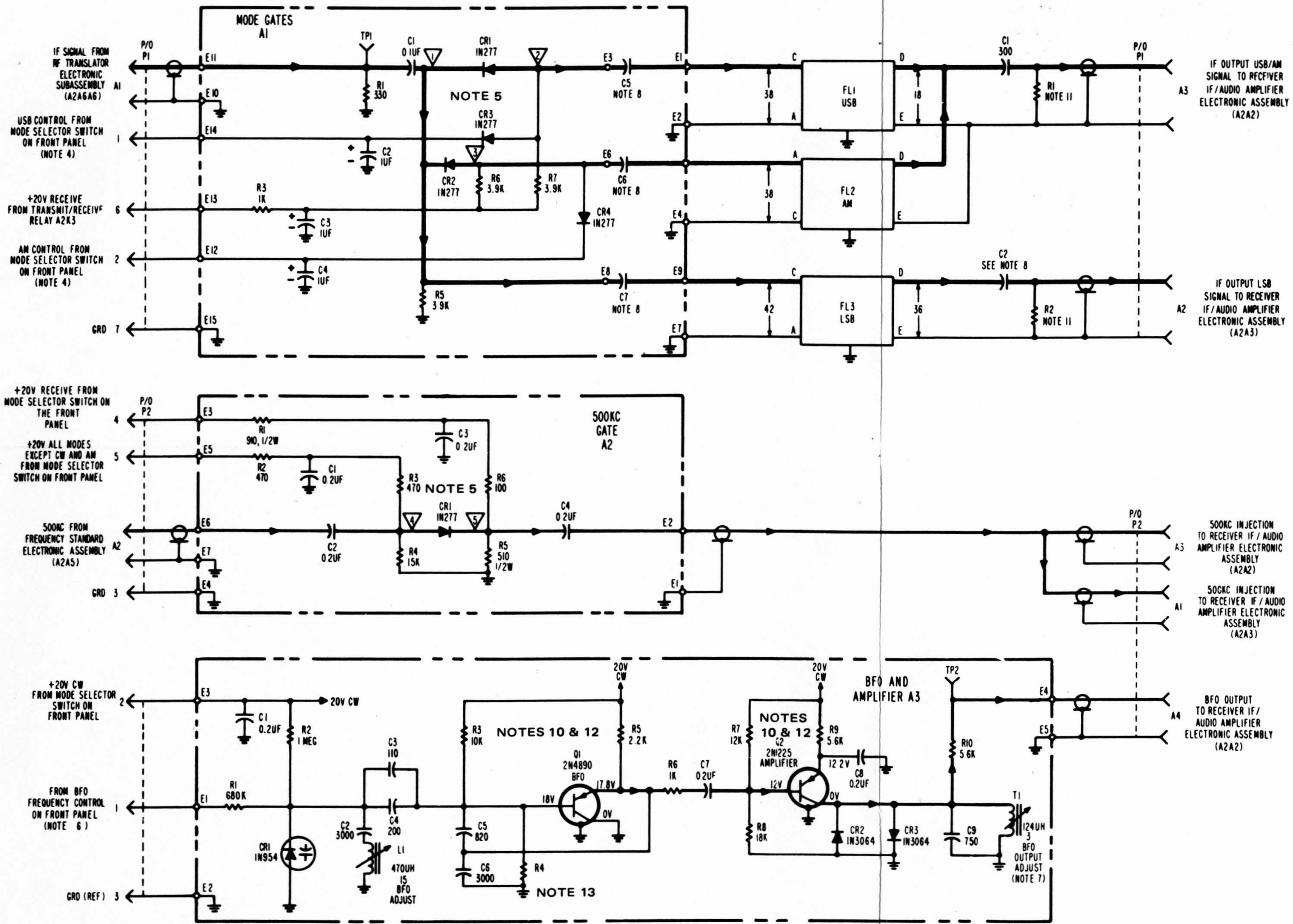


Figure 5-1. Radio Receiver R-1051/URR, Chassis and Main Frame, Schematic Diagram (Sheet 2 of 2)



NOTES:

1. PREFIX ALL REF DES WITH A2A1.
2. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTANCE VALUES ARE IN OHMS K-INDICATES THOUSANDS OF OHMS
   b. ALL RESISTORS ARE 1/4 WATT ±5% TOLERANCE
   c. ALL CAPACITANCE VALUES ARE IN PICOFARADS, UF INDICATES MICROFARADS.
3. NUMBERS ADJACENT TO WINDINGS, COILS, AND TEST POINTS INDICATE DC RESISTANCE (VALUES LESS THAN ONE OHM ARE NOT SHOWN)
4.

MODE	LSB	FSK	AM	CW	USB	ISB
P1-1	GRD	+20V	GRD	GRD	+20V	+20V
P1-2	GRD	GRD	+20V	+20V	GRD	GRD

5.

MODE	▽1	▽2	▽3	▽4	▽5
LSB	0 22V	0 33V	0.33V	10V	10V
FSK	7.3V	7 4V	0 33V	10V	10V
AM	7 3V	0 33V	7 4V	0 04V	6.5V
CW	7 3	0.33V	7.4V	0.04V	6 5V
USB	7.3V	7 4V	0.33V	10V	10V
ISB	7 3V	7.4V	0 33V	10V	10V

6. 0 2 TO 20V PRESENT DEPENDING ON BFO FREQUENCY CONTROL POSITION.
7, A3T1 IS ADJUSTED AND SEALED AT AT THE FACTORY.
8. CAPACITANCE TO BE SELECTED AT ASSEMBLY
9. UNLESS OTHERWISE INDICATED ALL VOLTAGES ARE DC TAKEN WITH ELECTRONIC MULTIMETER AN/USM-116
10. VOLTAGE READINGS ON A3Q1 AND A3Q2 ARE FOR CW MODE ONLY
11. RESISTANCE TO BE SELECTED AT ASSEMBLY (100—1000 OHM).
12. SOME UNITS HAVE 2N1225 AT THIS LOCATION.
13. RESISTANCE TO BE SELECTED AT ASSEMBLY (10-82K).

Figure 5-2. Receiver Mode Selector Assembly A2A1, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN
P1	2A,2B,2C,	A1R11	12F	A2C18	14B	A2R23	12C
	2D,2F,2G,	A1R12	11G	A2C19	15C	A2R24	13B
	2H,2I,23B,	A1R13	10E	A2C20	16C	A2R25	13C
	23C,23D	A1R14	10F	A2C21	17B	A2R26	14B
T1	19B	A1R15	9G	A2C22	17C	A2R27	14B
A1C1	13G	A1R16	9G	A2C23	17C	A2R28	14C
A1C2	12G	A1R17	9E	A2C24	18D	A2R29	15C
A1C3	11G	A1R18	7E	A2C25	4B	A2R30	15C
A1C4	8E	A1R19	8E	A2C26	15C	A2R31	16B
A1C5	9E	A1R20	7E	A2CR1	6C	A2R32	16B
A1C6	3E	A1R21	7F	A2L1	4A	A2R33	16C
A1C7	8F	A1R22	5E	A2Q1	4B	A2R34	17B
A1C8	8G	A1R23	4F	A2Q2	6C	A2R35	17B
A1C9	7F	A1R24	5G	A2Q3	7B	A2R36	17C
A1C10	6G	A1R25	5G	A2Q4	7C	A2R37	19B
A1C11	5F	A1R26	4G	A2Q5	9C	A2R38	6B
A1C12	21F	A1R27	21F	A2Q6	11C	A2T1	5C
A1C13	22F	A1R28	21G	A2Q7	15C	A2T2	8C
A1CR1	14G	A1R29	22F	A2Q8	16C	A2T3	10C
A1CR2	13F	A1R30	22F	A2Q9	18B	A2T4	12C
A1CR3	13F	A1RT1	9G	A2Q10	18C	A2T5	17B
A1CR4	10G	A1T1	8F	A2R1	4B	A3C1	17E
A1CR5	9F	A1T2	6F	A2R2	4C	A3C2	17F
A1Q1	14F	A1TP1	12E	A2R3	5B	A3C3	17F
A1Q2	13F	A1TP2	14G	A2R5	5B	A3C4	17G
A1Q3	12F	A2C1	3B	A2R6	6C	A3C5	19F
A1Q4	11F	A2C2	5B	A2R7	6C	A3C6	20G
A1Q5	10E	A2C3	5C	A2R8	6B	A3C7	20G
A1Q6	10F	A2C4	6B	A2R9	7C	A3CR1	19E
A1Q7	7F	A2C5	6C	A2R10	7B	A3CR2	20F
A1Q8	5F	A2C6	7C	A2R11	7C	A3L1	19G
A1Q9	22F	A2C7	7C	A2R12	8B	A3Q1	17F
A1R1	14F	A2C8	8C	A2R13	8C	A3Q2	17F
A1R2	14G	A2C9	7B	A2R14	9B	A3Q3	19F
A1R3	14E	A2C10	9C	A2R15	9C	A3R1	17E
A1R4	14F	A2C11	10C	A2R16	9B	A3R2	17E
A1R5	13G	A2C12	10B	A2R17	9B	A3R3	17G
A1R6	13G	A2C13	11C	A2R18	10C	A3R4	17G
A1R7	13F	A2C14	11C	A2R19	11B	A3R5	19F
A1R8	13E	A2C15	12B	A2R20	11C	A3R6	20F
A1R9	12G	A2C16	13C	A2R21	11B	A3T1	18F
A1R10	12E	A2C17	14C	A2R22	11B	A3TP3	16E

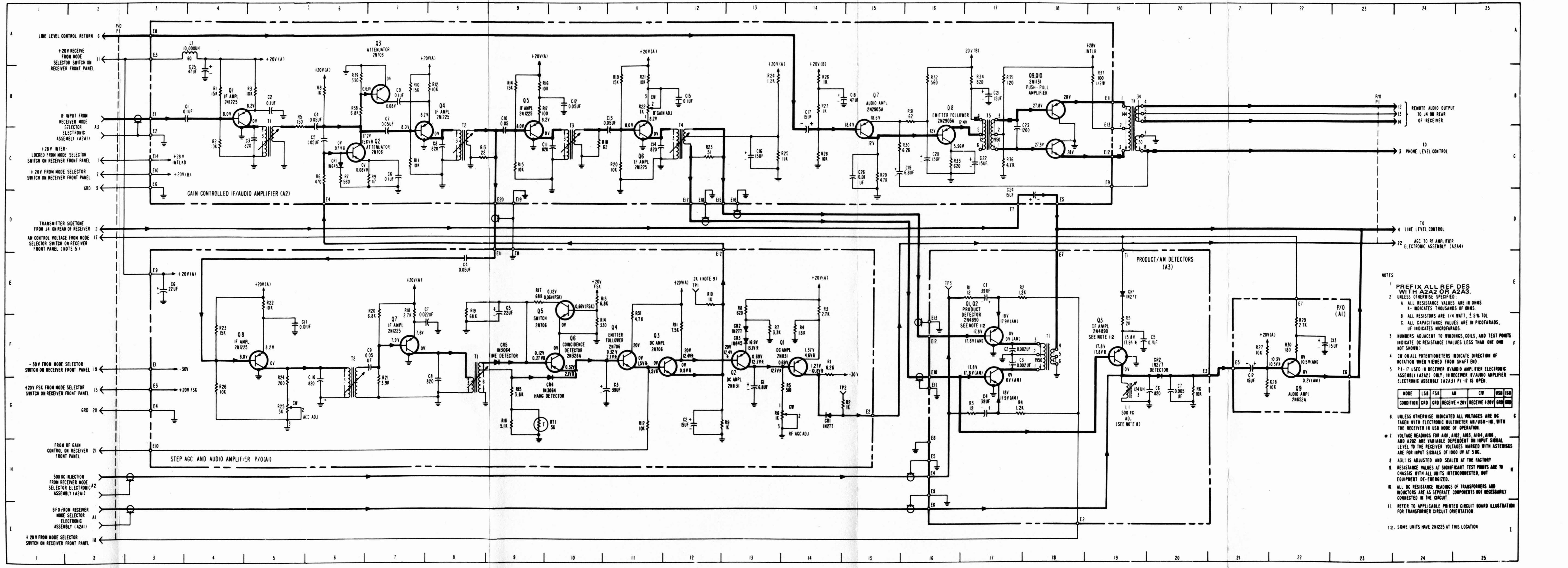


Figure 5-3. Receiver IF/Audio Amplifier Assembly A2A2/A2A3, Schematic Diagram (Late Version)

PARTS LOCATION INDEX

REF DES	LCTN
P1	2A,2B,2C, 2D,2F,2G, 2H,2I,23B, 23C,23D
T1	19B
A1C1	13G
A1C2	12G
A1C3	11G
A1C4	8E
A1C5	9E
A1C6	3E
A1C7	8F
A1C8	8G
A1C9	7F
A1C10	6G
A1C11	5F
A1C12	21F
A1C13	22F
A1CR1	14G
A1CR2	13F
A1CR3	13F
A1CR4	10G
A1CR5	9F
A1Q1	14F
A1Q2	13F
A1Q3	12F
A1Q4	11F
A1Q5	10E
A1Q6	10F
A1Q7	7F
A1Q8	5F
A1Q9	22F
A1R1	14F
A1R2	14G
A1R3	14E
A1R4	14F
A1R5	13G
A1R6	13G
A1R7	13F
A1R8	13E
A1R9	12G
A1R10	12E
A1R11	12F

REF DES	LCTN
A1R12	11G
A1R13	10E
A1R14	10F
A1R15	9G
A1R16	9G
A1R17	9E
A1R18	7E
A1R19	8E
A1R20	7E
A1R21	7F
A1R22	5E
A1R23	4F
A1R24	5G
A1R25	5G
A1R26	4G
A1R27	21F
A1R28	21G
A1R29	22F
A1R30	22F
A1R31	11F
A1RT1	9G
A1T1	8F
A1T2	6F
A1TP1	12E
A1TP2	14G
A2C1	3B
A2C2	5B
A2C3	5C
A2C4	6B
A2C5	6C
A2C6	7C
A2C7	7C
A2C8	8C
A2C9	7B
A2C10	9C
A2C11	10C
A2C12	10B
A2C13	11C
A2C14	11C
A2C15	12B
A2C16	13C
A2C17	14C
A2C18	14B

REF DES	LCTN
A2C19	15C
A2C20	16C
A2C21	17B
A2C22	17C
A2C23	17C
A2C24	18D
A2C25	4B
A2C26	15C
A2CR1	6C
A2L1	4A
A2Q1	4B
A2Q2	6C
A2Q3	7B
A2Q4	7C
A2Q5	9C
A2Q6	11C
A2Q7	15C
A2Q8	16C
A2Q9	18B
A2Q10	18C
A2R1	4B
A2R2	4C
A2R3	5B
A2R5	5B
A2R6	6C
A2R7	6C
A2R8	6B
A2R9	7C
A2R10	7B
A2R11	7C
A2R12	8B
A2R13	8C
A2R14	9B
A2R15	9C
A2R16	9B
A2R17	9B
A2R18	10C
A2R19	11B
A2R20	11C
A2R21	11B
A2R22	11B
A2R23	12C

REF DES	LCTN
A2R24	13B
A2R25	13C
A2R26	14B
A2R27	14B
A2R28	14C
A2R29	15C
A2R30	15C
A2R31	16B
A2R32	16B
A2R33	16C
A2R34	17B
A2R35	17B
A2R36	17C
A2R37	19B
A2R38	6B
A2R39	6B
A2T1	5C
A2T2	8C
A2T3	10C
A2T4	12C
A2T5	17B
A3C1	17E
A3C2	17F
A3C3	17F
A3C4	17G
A3C5	19F
A3C6	20G
A3C7	20G
A3CR1	19E
A3CR2	20F
A3L1	19G
A3Q1	17F
A3Q2	17F
A3Q3	19F
A3R1	17E
A3R2	17E
A3R3	17G
A3R4	17G
A3R5	19F
A3R6	20F
A3T1	18F
A3TP3	16E

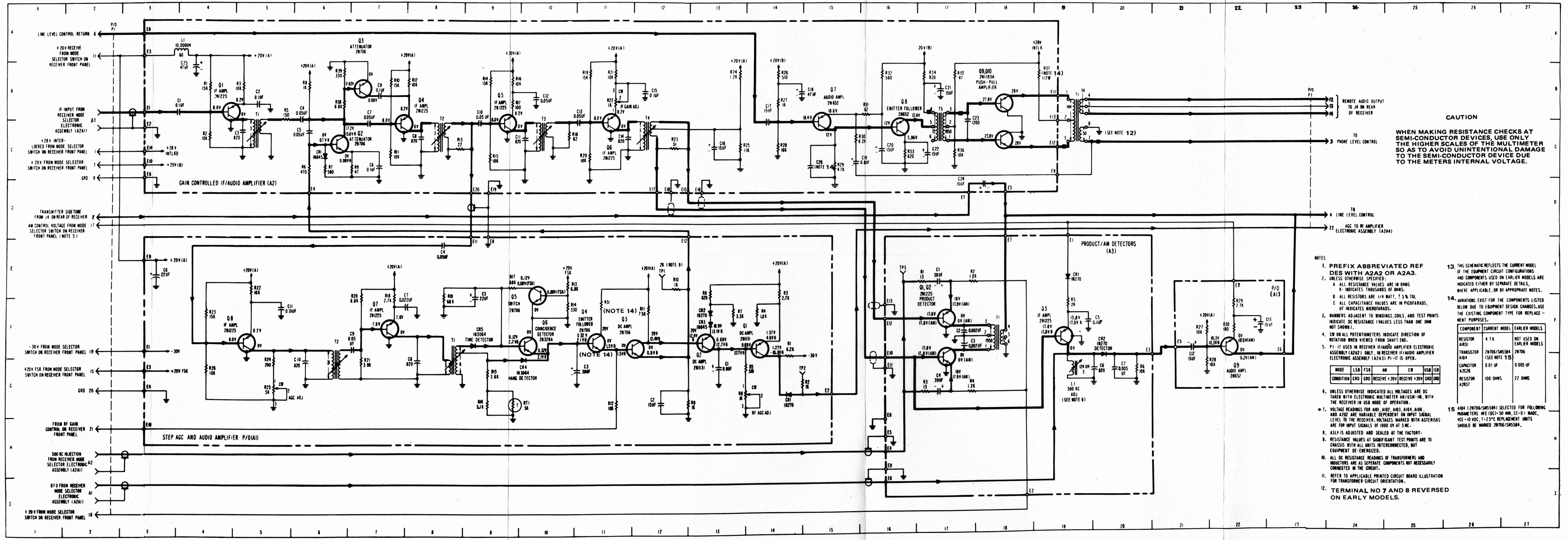
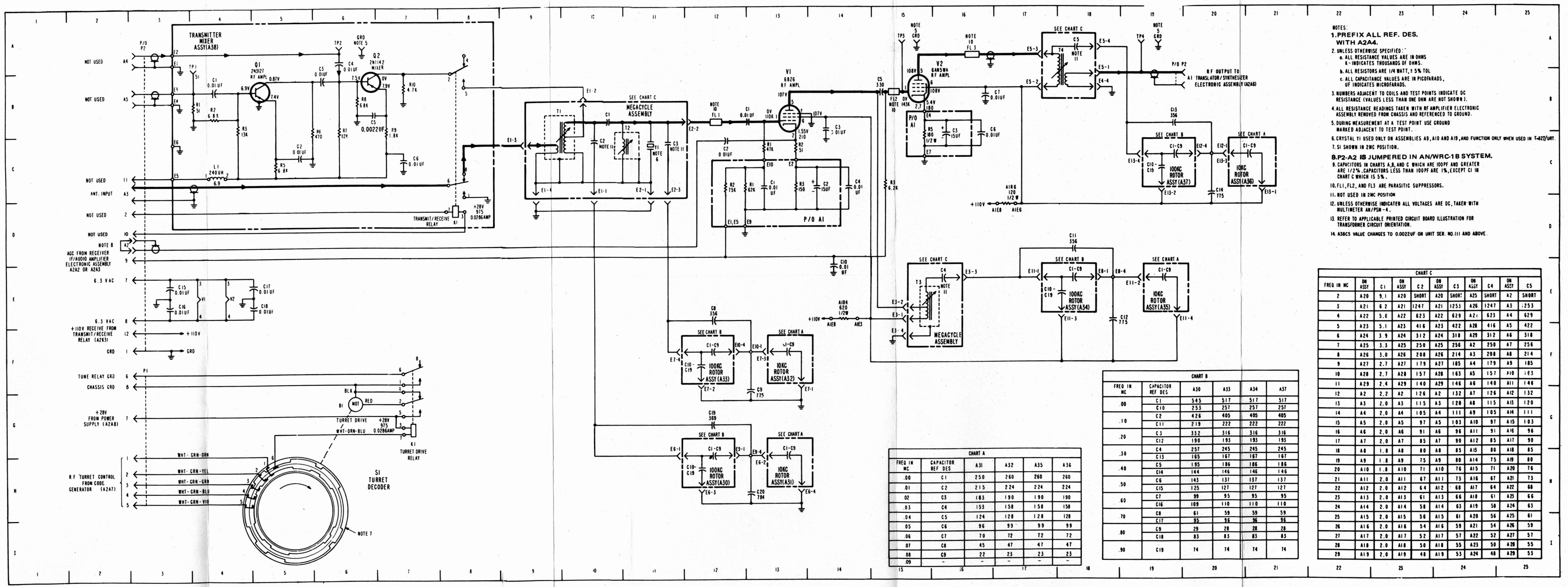


Figure 5-4. Receiver IF/Audio Amplifier Assembly A2A2/A2A3, Schematic Diagram (Early Version)

PARTS LOCATION INDEX

REF DES	LCTN
B1	6G
C1	12B
C2	12C
C3	14B
C4	14C
C5	15B
C6	16C
C7	16B
C8	12E
C9	13F
C10	14E
C11	18D
C12	18E
C13	19B
C14	20C
C15	3E
C16	3E
C17	5E
C18	5E
C19	12G
C20	12H
FL1	12B
FL2	15B
FL3	16A
K1	7G
P1	3F,3G,3H
P2	3A,3B,3C 3D,3E,3F 19B
R1	13C
R2	13C
R3	15C
S1	5H
TP4	19A
V1	4E,13B
V2	4E,15B
A1C1	13C
A1C2	14C
A1C3	16B
A1R1	12C
A1R2	12C
A1R3	13C
A1R4	14E
A1R5	15B
A1R6	16D
A2C1 thru A29C1	10B
A2C2 thru A29C3	10C
A2C3 thru A29C3	11C
A2C4 thru A29C4	16D
A2C5 thru A29C5	18A
A2T1 thru A29T1	9B
A2T2 thru A29T2	11B
A2T3 thru A29T3	15E
A2T4 thru A29T4	17A
A9Y1	11C
A10Y1	11C
A19Y1	11C
A30C1 thru A30C9	12H
A30C10 thru A30C19	12H
A31C1 thru A31C9	13H
A32C1 thru A32C9	13F
A33C1 thru A33C9	12F
A33C10 thru A33C19	12F
A34C1 thru A34C9	18E
A34C10 thru A34C19	18E
A35C1 thru A35C9	19E
A36C1 thru A36C9	20C
A37C1 thru A37C9	19C
A37C10 thru A37C19	19C
A38C1	4B
A38C2	5C
A38C3	6B
A38C4	6A
A38C5	6B
A38C6	7C
A38K1	8D
A38L1	4C
A38Q1	5B
A38Q2	6B
A38R1	4B
A38R2	4B
A38R3	4B
A38R5	5C
A38R6	5B
A38R7	6B
A38R8	6B
A38R9	7B
A38R10	7B
A38TP1	4A
A38TP2	6A



NOTES:

1. PREFIX ALL REF. DES. WITH A2A4.
2. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTANCE VALUES ARE IN OHMS K-INDICATES THOUSANDS OF OHMS.
   b. ALL RESISTORS ARE 1/4 WATT, ± 5% TOL
   c. ALL CAPACITANCE VALUES ARE IN PICOFARADS, UF INDICATES MICROFARADS.
3. NUMBERS ADJACENT TO COILS AND TEST POINTS INDICATE DC RESISTANCE (VALUES LESS THAN ONE OHM ARE NOT SHOWN).
4. ALL RESISTANCE READINGS TAKEN WITH RF AMPLIFIER ELECTRONIC ASSEMBLY REMOVED FROM CHASSIS AND REFERENCED TO GROUND.
5. DURING MEASUREMENT AT A TEST POINT USE GROUND MARKED ADJACENT TO TEST POINT.
6. CRYSTAL Y1 USED ONLY ON ASSEMBLIES A9, A10 AND A19, AND FUNCTION ONLY WHEN USED IN T-827/URT.
7. S1 SHOWN IN 2MC POSITION.
8. P2-A2 IS JUMPERED IN AN/WRC-1B SYSTEM.
9. CAPACITORS IN CHARTS A,B, AND C WHICH ARE 100PF AND GREATER ARE 1/2%. CAPACITORS LESS THAN 100PF ARE 1%, EXCEPT C1 IN CHART C WHICH IS 5%.
10. FL1, FL2, AND FL3 ARE PARASITIC SUPPRESSORS.
11. NOT USED IN 2MC POSITION
12. UNLESS OTHERWISE INDICATED ALL VOLTAGES ARE DC, TAKEN WITH MULTIMETER AN/PSM-4.
13. REFER TO APPLICABLE PRINTED CIRCUIT BOARD ILLUSTRATION FOR TRANSFORMER CIRCUIT ORIENTATION.
14. A38C5 VALUE CHANGES TO 0.0022UF ON UNIT SER. NO.111 AND ABOVE.

CHART A

FREQ IN MC	CAPACITOR REF DES	A31	A32	A35	A36
.00	C1	250	260	260	260
.01	C2	215	224	224	224
.02	C3	183	190	190	190
.03	C4	153	158	158	158
.04	C5	124	128	128	128
.05	C6	96	99	99	99
.06	C7	70	72	72	72
.07	C8	45	47	47	47
.08	C9	22	23	23	23
.09	–	–	–	–	–

CHART B

FREQ IN MC	CAPACITOR REF DES	A30	A33	A34	A37
.00	C1	545	517	517	517
	C10	253	257	257	257
.10	C2	426	405	405	405
	C11	219	222	222	222
.20	C3	332	316	316	316
	C12	190	193	193	193
.30	C4	257	245	245	245
	C13	165	167	167	167
.40	C5	195	186	186	186
	C14	144	146	146	146
.50	C6	143	137	137	137
	C15	125	127	127	127
.60	C7	99	95	95	95
	C16	109	110	110	110
.70	C8	61	59	59	59
	C17	95	96	96	96
.80	C9	29	28	28	28
	C18	83	83	83	83
.90	C19	74	74	74	74

CHART C

FREQ IN MC	ON ASSY	C1	ON ASSY	C2	ON ASSY	C3	ON ASSY	C4	ON ASSY	C5
2	A20	9.1	A20	SHORT	A20	SHORT	A25	SHORT	A2	SHORT
3	A21	6.2	A21	1247	A21	1253	A26	1247	A3	1253
4	A22	5.6	A22	623	A22	629	A27	623	A4	629
5	A23	5.1	A23	416	A23	422	A28	416	A5	422
6	A24	3.9	A24	312	A24	318	A29	312	A6	318
7	A25	3.3	A25	250	A25	256	A2	250	A7	256
8	A26	3.0	A26	208	A26	214	A3	208	A8	214
9	A27	2.7	A27	179	A27	185	A4	179	A9	185
10	A28	2.7	A28	157	A28	163	A5	157	A10	163
11	A29	2.4	A29	140	A29	146	A6	140	A11	146
12	A2	2.2	A2	126	A2	132	A7	126	A12	132
13	A3	2.0	A3	115	A3	120	A8	115	A13	120
14	A4	2.0	A4	105	A4	111	A9	105	A14	111
15	A5	2.0	A5	97	A5	103	A10	97	A15	103
16	A6	2.0	A6	91	A6	96	A11	91	A16	96
17	A7	2.0	A7	85	A7	90	A12	85	A17	90
18	A8	1.8	A8	80	A8	85	A13	80	A18	85
19	A9	1.8	A9	75	A9	80	A14	75	A19	80
20	A10	1.8	A10	71	A10	76	A15	71	A20	76
21	A11	2.0	A11	67	A11	73	A16	67	A21	73
22	A12	2.0	A12	64	A12	68	A17	64	A22	68
23	A13	2.0	A13	61	A13	66	A18	61	A23	66
24	A14	2.0	A14	58	A14	63	A19	58	A24	63
25	A15	2.0	A15	56	A15	61	A20	56	A25	61
26	A16	2.0	A16	54	A16	59	A21	54	A26	59
27	A17	2.0	A17	52	A17	57	A22	52	A27	57
28	A18	2.0	A18	50	A18	55	A23	50	A28	55
29	A19	2.0	A19	48	A19	53	A24	48	A29	53

Figure 5-5. RF Amplifier Assembly A2A4, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN
A1	4A	A1R24	5C	A2C42	12H	A2R24	14C	A4	8E
A1C1	2B	A1Y1	3B	A2C44T	10B	A2R25	13D	A4C1	8D
A1C2	3B	A2	14I	A2CR1	12H	A2R26	13A	A4C2	9E
A1C3	3B	A2C1	8C	A2CR2	11F	A2R27	14B	A4CR1	9D
A1C4	4B	A2C2	7C	A2DS1	13H	A2R28	14D	A4R1	8E
A1C5	4B	A2C3	8B	A2J1	1H, 2F, 17B	A2R29	15A	A4Q1	8E
A1C6	5B	A2C4	8D	A2J2	7E	A2R30T	15D		
A1C7	6A	A2C5	8B	A2L1	9B	A2R31T	16B		
A1C8T	2B	A2C6	8B	A2L2	13B	A2R32	5G		
A1C9	6B	A2C7	10B	A2L3	7G	A2R33	6F		
A1C10	4C	A2C8	10B	A2L4	11G	A2R34	5G		
A1C11T	3B	A2C9	10B	A2Q1	8C	A2R36	6G		
A1C12	2D	A2C10	10C	A2Q2	9B	A2R37	6H		
A1CR1	6A	A2C11	11B	A2Q3	11C	A2R38	6H		
A1CR2	5C	A2C12	11B	A2Q4	13C	A2R39	7F		
A1Q1	4B	A2C13	11B	A2Q5	15C	A2R40	8G		
A1Q2	5B	A2C14	12C	A2Q6	5G	A2R41	8H		
A1Q3	6B	A2C15	12B	A2Q7	7H	A2R42	8F		
A1Q4	3E	A2C16	14B	A2Q8	8G	A2R43	8H		
A1Q5	4E	A2C17	14C	A2Q9	11G	A2R44T	9G		
A1Q6	4C	A2C18	10B	A2Q10	12G	A2R46	10H		
A1Q7	5D	A2C19	10B	A2Q11	13G	A2R47	10G		
A1R1	2B	A2C20	14A	A2R1	7C	A2R48	11F		
A1R2	4B	A2C21	15B	A2R2	8C	A2R49	11H		
A1R3	4A	A2C22	15B	A2R3	8B	A2R51	12G		
A1R4	4A	A2C23	5G	A2R4	8B	A2R52	12H		
A1R5	4B	A2C24	5G	A2R5	9B	A2R53	12G		
A1R6	5B	A2C25	5G	A2R6	9C	A2P54	12H		
A1R7	5A	A2C26	5H	A2R7	6A	A2R55	13G		
A1R8	6A	A2C27	6H	A2R8	9A	A2R56	13H		
A1R9	2A	A2C28	6H	A2R9	8D	A2P57	13F		
A1R10T	3C	A2C29	7G	A2R10	9C	A2R58	14F		
A1R11	4C	A2C30	7H	A2R11	9D	A2R60	7G		
A1R12	6B	A2C31	8G	A2R12	9B	A2R61	9H		
A1R13	2D	A2C32	8H	A2R13	10C	A2R62	5H		
A1R14	3D	A2C33	8G	A2R14	11B	A2S1	3G		
A1R15	3E	A2C34	8G	A2R15	11D	A2T1	12B		
A1R16	3E	A2C35	6G	A2R16	11A	A2T2	15B		
A1R17	3C	A2C36	10G	A2R17	11D	A2T3	9G		
A1R18	4C	A2C37	10G	A2R18T	12B	A3	5D		
A1R19	4E	A2C38	11G	A2R19	12C	A3J2	2E, 5E		
A1R20	4E	A2C39	11G	A2R20	13B	A3Q1	6E		
A1R21	5E	A2C40	11H	A2R21	13D	A3R1	6D		
A1R22	4C	A2C41	11H	A2R22	13B	A3R2	2E		
A1R23T	4D	A2C42	13H	A2R23	13C				

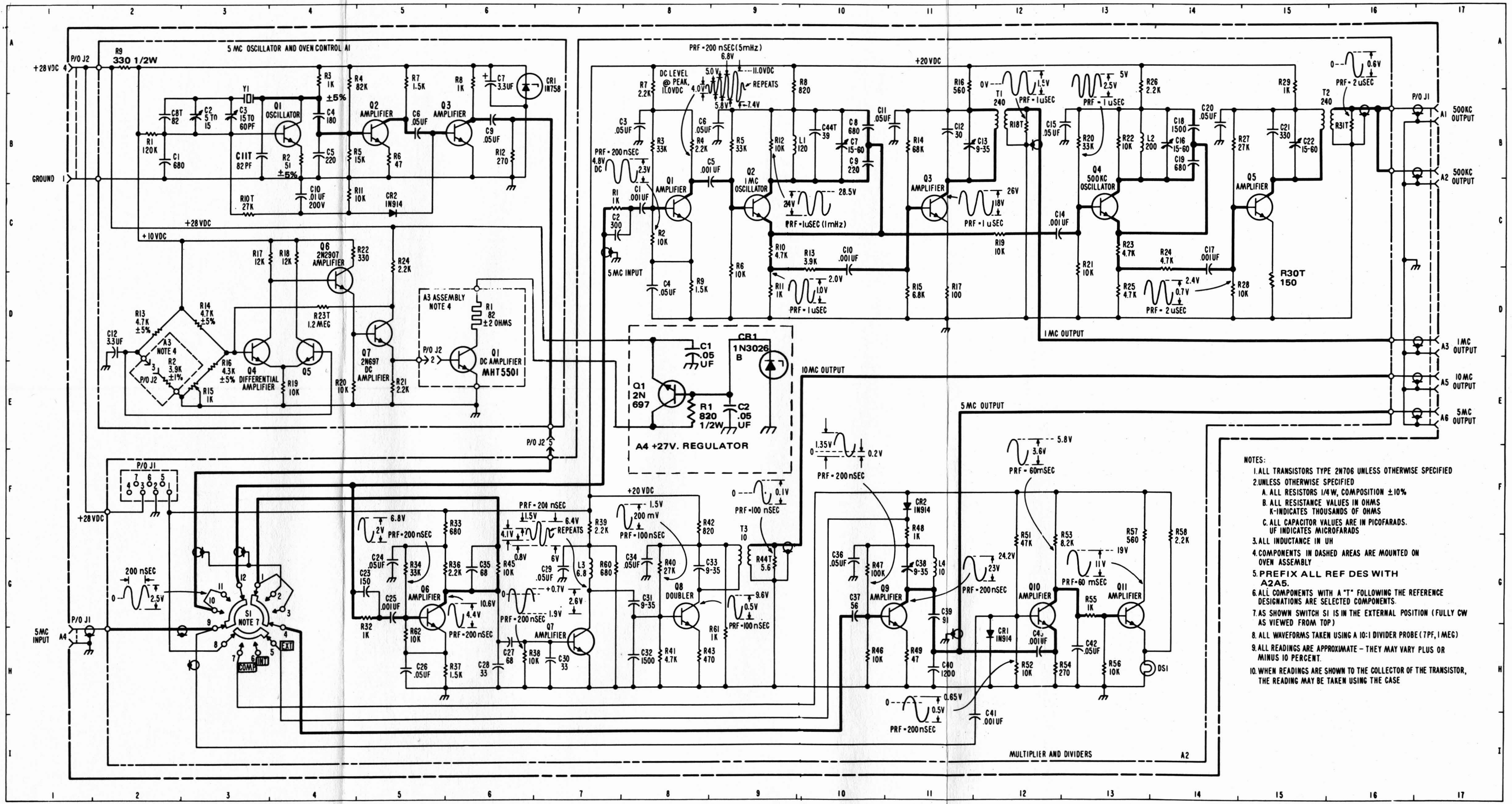


Figure 5-6. Frequency Standard Assembly A2A5, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN
B1	3F
C1 thru C17	4C
C1	4G
CR1	4F
K1	3E, 3D
L1	4G
L2	15E
P1	2D, 2E 4G, 12C
S1	3E, 4C, 4E
Y1 thru Y17	4C
A1C18	11B
A1C19	5B
A1C20	6B
A1C21	7C
A1C23	7B
A1C24	8C
A1C25	11B
A1C26	9C
A1C27	10B
A1C28	11C
A1CR1	6A
A1CR2	6A
A1CR3	5C
A1L1	11A
A1L2	8B
A1L3	9C
A1Q1	8C
A1Q2	9C
A1Q3	10C
A1Q4	11C
A1R1	5D
A1R2	5B
A1R3	5A
A1R4	6B
A1R5	7A
A1R6	7B

REF DES	LCTN
A1R7	8B
A1R8	7B
A1R9	8C
A1R10	9C
A1R11	9B
A1R12	10B
A1R13	9C
A1R14	9C
A1R15	10C
A1R16	11C
A1R17	11C
A1R18	12C
A1RT1	6B
A2C1	15G
A2C2	16F
A2C3	16G
A2C4	16F
A2C5	19G
A2C6	19G
A2C7	21G
A2C8	21G
A2C9	21H
A2C10	21F
A2C11	22H
A2C12	18G
A2C13	20G
A2C14	15F
A2CR1	20G
A2J1	23G
A2J2	22F
A2L1	20G
A2L2	21G
A2L3	21G
A2L4	21H
A2P1	23G
A2P2	22F
A2Q1	16G
A2Q2	19G
A2Q3	22G
A2R1	16F
A2R2	16G
A2R3	16F
A2R4	16F

REF DES	LCTN
A2R5	16G
A2R6	17G
A2R7	18G
A2R8	18G
A2R9	19F
A2R10	19G
A2R11	19G
A2R12	20G
A2R13	21G
A2R14	22G
A2R15	22F
A2R16	22G
A2R17	22G
A2R18	22H
A2R19	22H
A2R20	22H
A2R21	23G
A2R22	15F
A2RT1	22H
A2T1	17G
A2T2	19G
A2TP1	18G
A2TP2	21G
A2TP3	23F
A3C1	6F
A3C2	6G
A3C3	5G
A3C4	7G
A3C5	7G
A3C6	8H
A3C7	8G
A3C8	8G
A3C9	10H
A3C10	10G
A3C11	5F
A3C12	12G
A3C13	12G
A3C14	11G
A3C15	13G
A3C16	13G
A3C17	14G
A3C18	10F
A3C19	11G

REF DES	LCTN
A3C20	11F
A3CR1	5F
A3CR2	7G
A3CR3	6G
A3CR4	9G
A3CR5	10H
A3L1	5F
A3L2	5G
A3L3	9H
A3L4	13G
A3Q1	7G
A3Q2	8G
A3Q3	9G
A3Q4	13G
A3Q5	10F
A3Q6	11G
A3R1	5F
A3R2	6F
A3R3	7F
A3R4	7G
A3R5	6G
A3R6	7G
A3R7	7G
A3R8	8H
A3R9	8F
A3R10	8G
A3R11	8G
A3R12	9F
A3R13	9F
A3R14	9G
A3R15	9G
A3R16	9G
A3R17	10H
A3R18	11G
A3R19	12G
A3R20	12G
A3R21	11H
A3R22	10H
A3R23	11G
A3R24	11G
A3R25	12G
A3R26	10F
A3R27	10F

REF DES	LCTN
A3R28	10G
A3R29	10G
A3R30	10F
A3R31	11F
A3R32	14G
A3R33	5G
A3T1	13G
A3TP1	13F

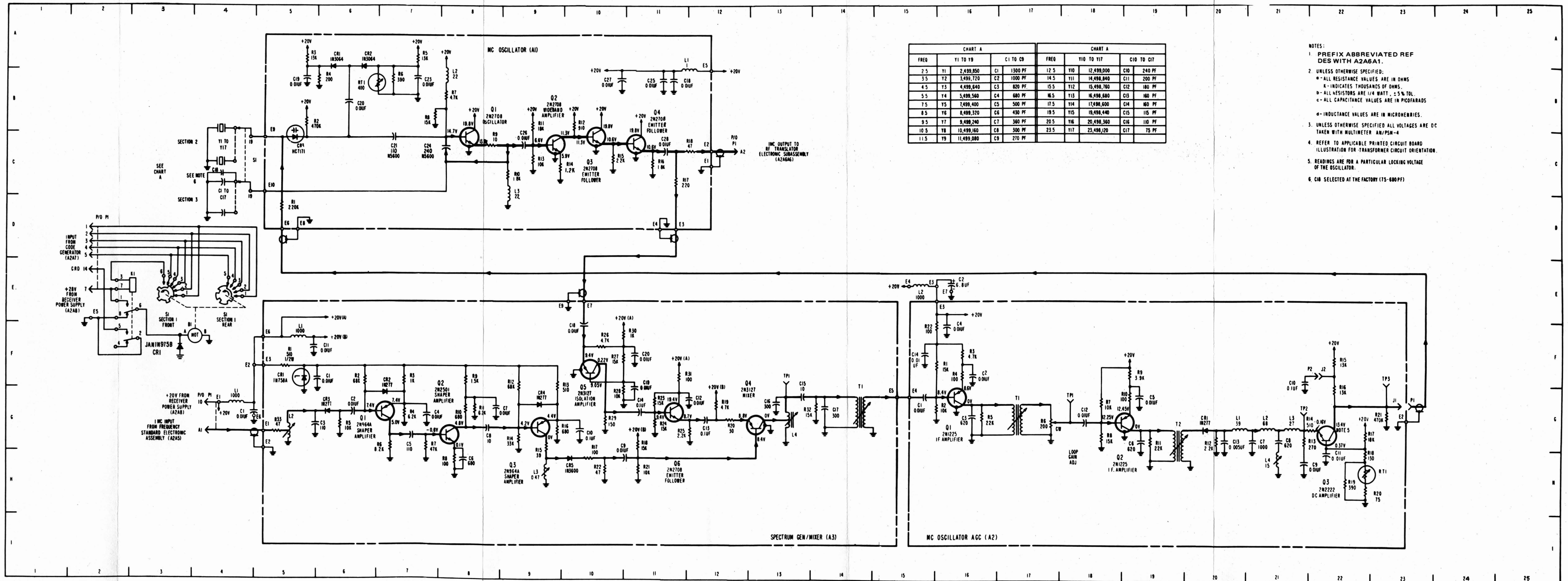


Figure 5-7. MC Synthesizer Subassembly A2A6A1, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN
P1	2E, 2F,	A2R9	5G	A3Y1	14G	A4R16	14D
	2H, 2I,	A2T1	6G	A3Y2	20F	A4R17	14C
	22B	A2T2	8G	A4C1	9B	A4R18	14E
S1	2C	A2T3	9G	A4C2	9D	A4R19	13E
Y1 thru Y10	2C	A2TP1	9G	A4C3	9A	A4R20	10C
A1C1	3C	A3C1	11H	A4C4	9B	A4R21	15B
A1C2	3D	A3C2	21I	A4C5	10C	A4R22	15D
A1C3	4C	A3C3	20I	A4C6	9D	A4T1	12B
A1C4	5C	A3C4	11H	A4C7	10B	A4T2	13D
A1C5	5C	A3C5	12G	A4C8	10C	A4TP1	10B
A1C6	5C	A3C6	12H	A4C9	10D	A4TP2	11B
A1C7	6C	A3C7	13H	A4C10	11B	A4TP3	13B
A1C8	4D	A3C8	14H	A4C11	11B	A4TP4	11D
A1C9	7C	A3C9	14H	A4C12	11D	A4TP5	12D
A1C10	8C	A3C10	16G	A4C13	11D	A4TP6	13D
A1CR1	3C	A3C11	17H	A4C14	12B	A5C1	17B
A1CR2	4C	A3C12	17H	A4C15	12B	A5C2	17D
A1Q1	5C	A3C13	17G	A4C16	12D	A5C3	21C
A1Q2	7C	A3C14	18H	A4C17	12D	A5C4	18C
A1R1	4C	A3C15	18G	A4C18	13B	A5C5	18B
A1R2	4C	A3C16	19H	A4C19	13D	A5C6	19D
A1R3	4C	A3C17	20G	A4C20	14B	A5C7	19C
A1R4	4C	A3C18	19G	A4C21	14E	A5C8	20C
A1R5	5C	A3C19	20G	A4C22	9B	A5C9	20D
A1R6	6C	A3C20	20G	A4C23	14C	A5C10	21C
A1R7	5B	A3CR1	18H	A4C24	14D	A5C11	21C
A1R8	6C	A3CR2	18H	A4C25	14C	A5CR1	20D
A1R9	6B	A3CR3	19H	A4C26	15E	A5L1	21B
A1R10	6C	A3Q1	12H	A4C27	14C	A5L2	19C
A1R11	7C	A3Q2	16G	A4L1	11B	A5L3	20C
A1R12	3D	A3R1	11H	A4L2	11B	A5Q1	17D
A1R13	8C	A3R2	12H	A4L3	15B	A5Q2	18C
A1R14	7C	A3R3	11H	A4L4	11D	A5Q3	19C
A1RT1	3C	A3R4	12H	A4L5	12D	A5Q4	20C
A2C1	6G	A3R5	15H	A4L6	15D	A5R1	17D
A2C2	6H	A3R6	16G	A4Q1	10B	A5R2	17C
A2C3	5G	A3R7	16H	A4Q2	10D	A5R3	17C
A2C4	7H	A3R8	16H	A4Q3	14B	A5R4	18C
A2C5	7G	A3R9	17H	A4Q4	14D	A5R5	18D
A2C6	4G	A3R10	18G	A4R1	9B	A5R6	19C
A2C7	4G	A3R11	18H	A4R2	10C	A5R7	19D
A2C8	9G	A3R12	18H	A4R3	9A	A5R8	19D
A2C9	8G	A3R13	19H	A4R4	10B	A5R9	19C
A2FL1	8G	A3R14	19G	A4R5	10D	A5R10	19D
A2Q1	7H	A3R15	21G	A4R6	10B	A5R11	20C
A2Q2	5G	A3R16	12G	A4R7	10D	A5R12	19D
A2R1	7H	A3T1	13H	A4R8	10D	A5R13	19D
A2R2	7H	A3T2	15H	A4R9	12D	A5R14	19D
A2R3	7H	A3T3	19G	A4R10	13B	A5R15	20C
A2R4	5G	A3T4	21G	A4R11	13C	A5R16	21C
A2R5	4G	A3TP1	12G	A4R12	13D	A5R17	20D
A2R6	4G	A3TP2	15G	A4R13	14B	A5TP1	18D
A2R7	4G	A3TP3	17G	A4R14	14B		
A2R8	6F	A3TP4	21F	A4R15	14D		

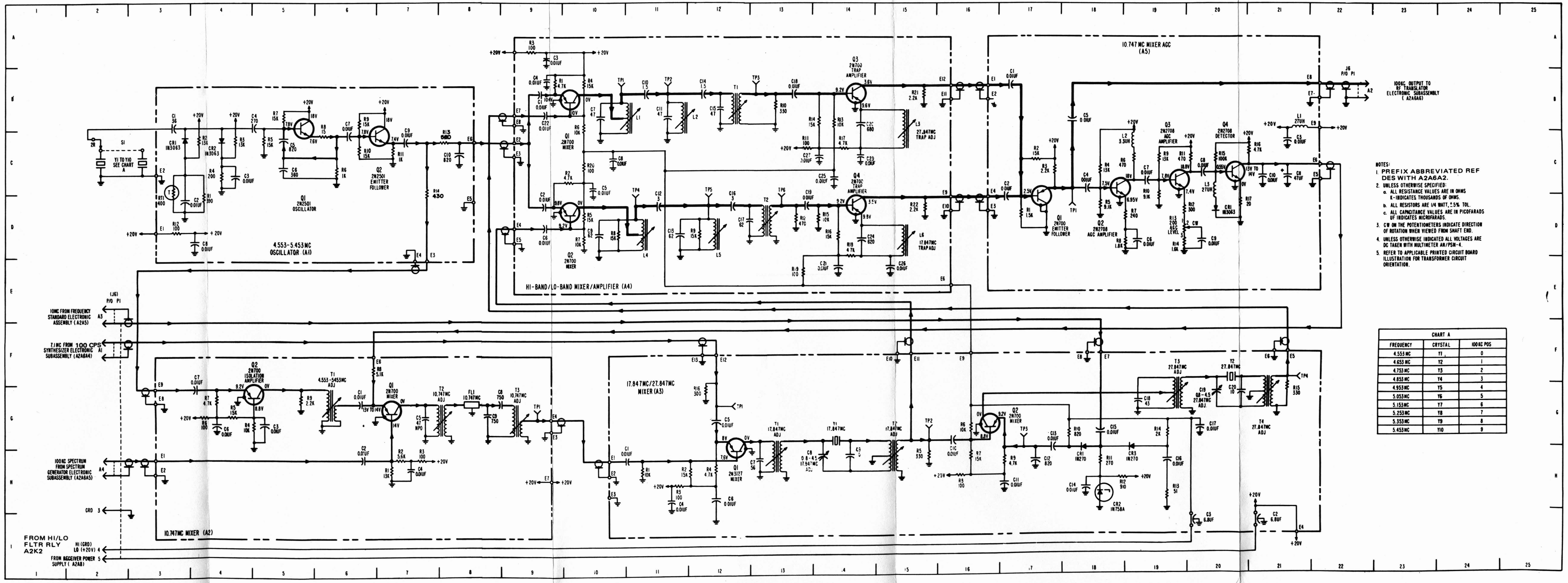


Figure 5-8. 100 KC Synthesizer Subassembly A2A6A2, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN	REF DES	LCTN
C25	3E	A1R8	6B	A2R16	8G	A4C7	17G	A4Z3C27	14F
C26	3E	A1R9	7B	A2RT1	4H	A4C8	15G	A4Z3C28	15F
J1	3D	A1R10	7B	A2T1	8G	A4C9	14G	A4Z3Q6	15F
J3	15C	A1R11	4D	A3C46	10B	A4C10	19G	A4Z3R22	16F
J4	3E	A1R12	5D	A3C47	10C	A4C11	18F	A4Z3R23	15F
J5	3I	A1R13	5D	A3C48	10C	A4C12	19G	A4Z3R24	15F
J6	3A	A1R14	7A	A3C49	11C	A4C13	12G	A4Z3R25	15F
J7	21G	A1R15	8C	A3C50	12C	A4FL1	18H		
P1	9C	A1R16	8C	A3C51	12C	A4FL2	15G		
P2	9A	A1RT1	4D	A3C52	13C	A4L3	17F		
S1	2B	A1T1	8C	A3C53	13A	A4L4	12G		
S2	2G	A2C1	4G	A3C54	13C	A4Q8	17H		
Y1	2C,	A2C2	4G	A3C55	10C	A4Q9	19G		
thru	3C	A2C3	5G	A3C56	11C	A4R1	17I		
Y10		A2C4	5G	A3CR7	13C	A4R2	16H		
Y11	2G,	A2C5	4H	A3J8	9C	A4R3	16H		
thru	3G	A2C6	6G	A3J9	9A	A4R4	16H		
Y20		A2C7	4F	A3J10	9D	A4R5	17H		
A1C1	4B	A2C8	5H	A3L5	11C	A4R6	19H		
A1C2	4B	A2C9	7F	A3L6	12C	A4R7	18G		
A1C3	5C	A2C10	7G	A3L7	12C	A4R8	18G		
A1C4	5C	A2CR1	4H	A3Q11	10C	A4R9	18F		
A1C5	4D	A2CR2	5H	A3Q12	13B	A4R10	19F		
A1C6	6B	A2Q1	5G	A3R47	10B	A4R11	19F		
A1C7	4B	A2Q2	6G	A3R48	10B	A4R12	12F		
A1C8	5D	A2R1	4G	A3R49	13B	A4T1	20G		
A1C9	7B	A2R2	5F	A3R50	12B	A4Z1C43	13G		
A1C10	7C	A2R3	4H	A3R51	13D	A4Z1C44	13F		
A1C11	8C	A2R4	6G	A3R52	10C	A4Z1Q10	13G		
A1CR1	4C	A2R5	7G	A3R54	10C	A4Z1R41	13G		
A1CR2	5C	A2R6	6G	A3T3	14C	A4Z1R42	13G		
A1Q1	5B	A2R7	5G	A3TP1	10C	A4Z1R43	13F		
A1Q2	6B	A2R8	6F	A3TP2	11C	A4Z1R44	13G		
A1R1	4B	A2R9	7F	A3TP3	12C	A4Z2C29	11H		
A1R2	5B	A2R10	7F	A4C1	16G	A4Z2C30	10G		
A1R3	4D	A2R11	4H	A4C2	17I	A4Z2Q7	10G		
A1R4	6C	A2R12	5H	A4C3	16I	A4Z2R26	11G		
A1R5	7C	A2R13	5H	A4C4	17H	A4Z2R27	10H		
A1R6	6C	A2R14	7F	A4C5	19H	A4Z2R28	10G		
A1R7	5B	A2R15	8G	A4C6	19H	A4Z2R29	11G		

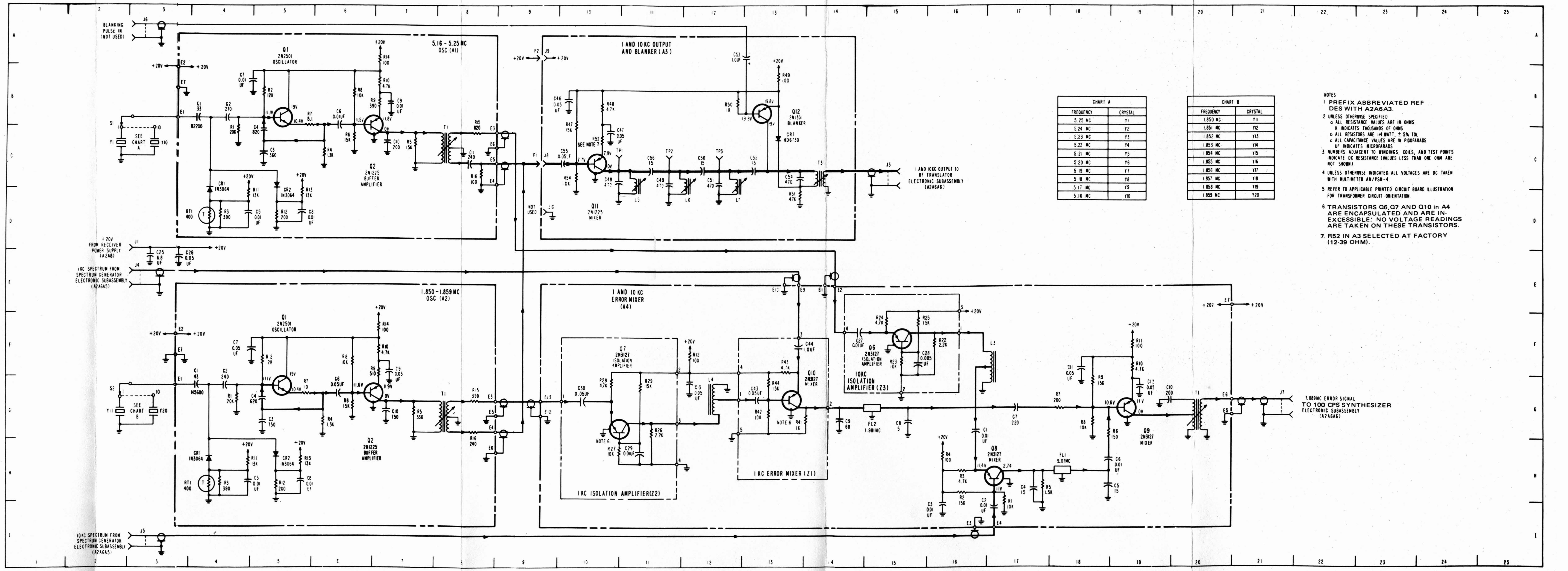


Figure 5-9. 1 and 10 KC Synthesizer Subassembly A2A6A3, Schematic Diagram

PARTS LOCATION INDEX

REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC
P1	3B, 3E,	A1R14	11G	A2C25	20C	A2R23	19D	A3R26	11C
	3H, 13B,	A1R15	11H	A2CR1	14D	A2R24	20D	A3R27	11D
	14F, 14G,	A1R16	12G	A2CR2	14B	A2R25	21C	A3R28	11D
	14H	A1R17	7H	A2CR3	17D	A2R26	21C	A3R29	12D
A1C1	12F	A1R18	6G	A2CR4	16D	A2R27	21D	A3R30	12D
A1C2	4H	A1R19	6G	A2CR5	19D	A2R28	21D	A3R31	11E
A1C3	9G	A1R20	6G	A2CR6	19D	A2R29	22C	A3RT1	6D
A1C4	7H	A1R21	5F	A2CR7	19C	A2R30	21C	A3T1	11D, 11E
A1C5	9H	A1R22	5H	A2CR8	21D	A2R31	22D	A3TP2	4C
A1C6	9H	A1R23	5G	A2CR9	21D	A2R32	22D		
A1C7	10H	A1R24	5G	A2CR10	24D	A2R33	23C		
A1C8	10G	A1R25	4G	A2CR11	23D	A2R34	23C		
A1C9	11G	A1R26	4H	A2CR12	17C	A2R35	23D		
A1C10	11H	A1T1	12H	A2L1	13D	A2R37	24C		
A1C11	12H	A1T2	6G	A2Q1	16D	A2R38	24C		
A1C12	12G	A1TP1	4H	A2Q2	17D	A2R39	24D		
A1C13	12G	A1TP2	9H	A2Q3	18D	A2R40	24D		
A1C14	7G	A1TP3	7G	A2Q4	18D	A2R41	23E		
A1C15	6G	A1TP4	9H	A2Q5	21D	A2TP1	15C		
A1C16	6G	A1TP5	12H	A2Q6	22D	A2TP2	17D		
A1C17	5G	A1TP6	4G	A2Q7	23D	A2TP3	20D		
A1C18	5G	A2C1	14D	A2Q8	24D	A2TP4	23E		
A1C19	4G	A2C2	14D	A2Q9	14C	A2TP5	22D		
A1C20	4G	A2C3	13C	A2R1	14D	A3C1	4B		
A1FL1	9H	A2C4	14C	A2R2	14C	A3R5	8B		
A1L1	12F	A2C5	15C	A2R3	14B	A3R6	7B		
A1L2	12G	A2C6	15C	A2R4	15B	A3R7	6D		
A1Q1	8H	A2C7	16B	A2R5	15C	A3R8	6D		
A1Q2	10H	A2C8	16D	A2R6	15C	A3R9	7D		
A1Q3	11H	A2C9	17D	A2R7	16B	A3R10	7D		
A1Q4	6G	A2C10	18D	A2R8	16C	A3R11	4C		
A1Q5	5G	A2C11	18C	A2R9	16C	A3R12	4B		
A1R1	4H	A2C12	18D	A2R10	16D	A3R13	9C		
A1R2	8H	A2C13	19D	A2R11	16D	A3R14	9C		
A1R3	8G	A2C14	20D	A2R12	17B	A3R15	9C		
A1R4	7G	A2C15	22C	A2R13	17C	A3R16	10B		
A1R5	8G	A2C16	21D	A2R14	17D	A3R17	10C		
A1R6	9H	A2C17	22D	A2R15	17D	A3R18	10D		
A1R7	10H	A2C18	22D	A2R16	18C	A3R19	11B		
A1R8	10H	A2C19	24C	A2R17	19C	A3R20	11B		
A1R9	10H	A2C20	23D	A2R18	18D	A3R21	10E		
A1R10	11G	A2C21	24D	A2R19	18D	A3R22	10D		
A1R11	11H	A2C22	24E	A2R20	18C	A3R23	10E		
A1R12	11G	A2C23	23E	A2R21	19C	A3R24	9D		
A1R13	11G	A2C24	18B	A2R22	19C	A3R25	9D		

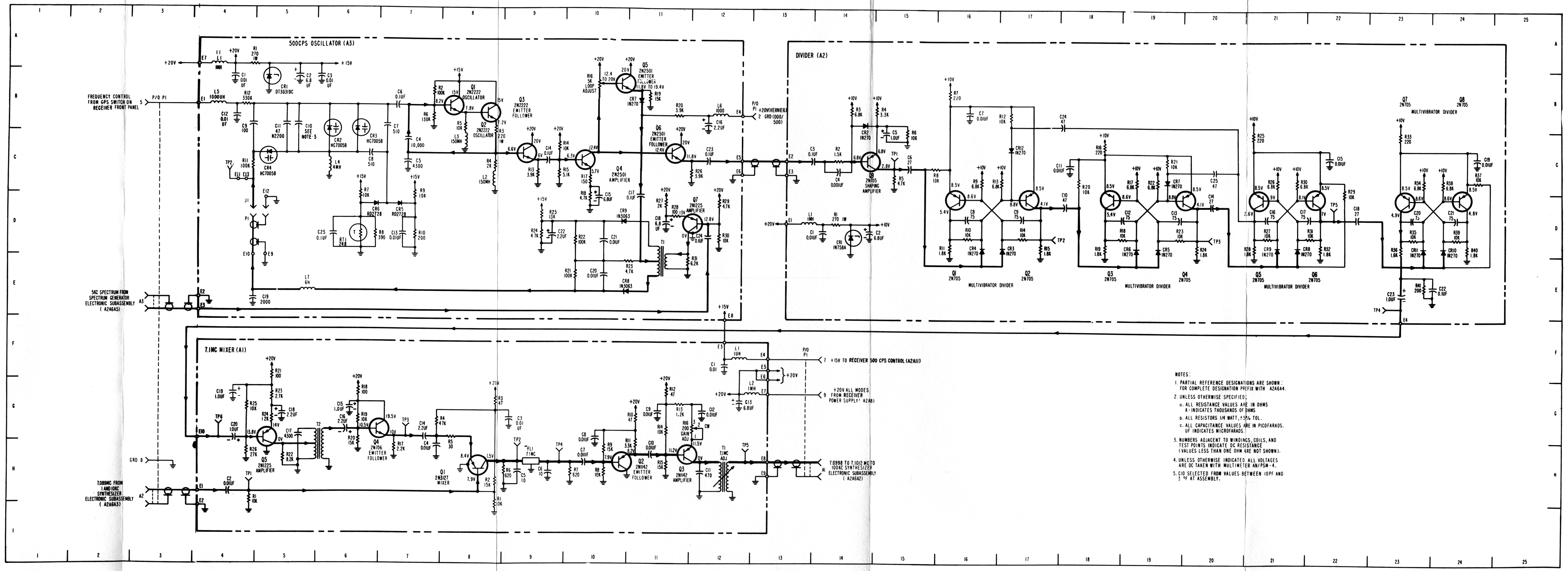


Figure 5-10. 500 CPS Synthesizer Subassembly A2A6A4, Schematic Diagram

REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC	REF DESIG	LOC
						A3C7	13E		
A1C1	3D	A1R12	7G	A2Q2	8B	A3C8	14E	A3R22	16D
A1C2	4D	A1R13	7H	A2Q3	11B	A3C9	15F	A3R23	18D
A1C3	4E	A1R14	7H	A2Q4	10B	A3C10	14D	A3R24	17D
A1C4	5E	A1R15	8G	A2Q5	12B	A3C11	15F	A3R25	17F
A1C5	6E	A1R16	8H	A2Q6	13B	A3C12	16E	A3R26	18D
A1C6	7F	A1R17	9G	A2R1	7A	A3C13	17D	A3R27	19E
A1C7	7H	A1R18	9G	A2R2	7A	A3C14	17E	A3T1	18E
A1C8	6D	A1R19	9G	A2R3	8A	A3C15	11D	A3TP1	13E
A1C9	8G	A1R20	9H	A2R4	8B	A3C16	18E	A3TP2	14E
A1C10	8H	A1R21	9G	A2R5	7C	A3C17	18F	A3TP3	14E
A1C11	8H	A1R22	11I	A2R6	7B	A3CR1	11D	A3TP4	16F
A1C12	8H	A1R23	10G	A2R7	8A	A3CR2	12F	A3TP5	16D
A1C13	9H	A1R24	10I	A2R8	8B	A3CR3	13F	A3TP6	17E
A1C14	9H	A1R25	11I	A2R9	9B	A3CR4	15F	A4C1	14G
A1C15	9H	A1T1	8H	A2R11	10A	A3CR5	14E	A4C2	14H
A1C16	9I	A1T2	12H	A2R12	10B	A3J4	10D, 19E	A4C3	15H
A1C17	11I	A1TP1	5E	A2R13	10B	A3L1	11D	A4C4	17G
A1C18	11H	A1TP2	6E	A2R14	10C	A3L2	18E	A4C5	17G
A1C19	12I	A1TP3	7G	A2R15	10C	A3Q1	12E	A4C6	18H
A1CR1	4D	A1TP4	7F	A2R16	10A	A3Q2	13E	A4C7	17H
A1CR2	5D	A1TP5	7H	A2R18	10C	A3Q3	15E	A4J1	19H
A1CR3	5D	A1TP6	8G	A2R19	11B	A3Q4	14E	A4L1	14G
A1CR4	9H	A2C1	6A	A2R20	11C	A3Q5	16E	A4Q1	15H
A1J3	3E	A2C2	7A	A2R21	12B	A3Q6	17E	A4Q2	16H
A1J6	13I	A2C3	8B	A2R22	12A	A3R1	11D	A4Q3	18G
A1L1	3D	A2C4	8C	A2R23	13A	A3R2	12D	A4R1	14H
A1L2	4E	A2C5	8B	A2R24	13A	A3R3	12D	A4R2	14H
A1L5	10h	A2C6	9A	A2R25	12C	A3R4	12E	A4R3	16G
A1Q1	5E	A2C7	9B	A2R26	14A	A3R5	12F	A4R4	15H
A1Q2	7E	A2C8	10B	A2R27	14B	A3R6	12E	A4R5	16H
A1Q3	6E	A2C9	11C	A2R28	14B	A3R7	13D	A4R6	15G
A1Q4	7H	A2C10	9A	A2R29	14B	A3R8	13E	A4R7	16G
A1Q5	8G	A2C11	10C	A2T1	13B	A3R9	13F	A4R8	16G
A1Q6	9H	A2C12	12B	A2TP1	9B	A3R10	13F	A4R9	17H
A1R1	3D	A2C13	13A	A2TP2	9B	A3R11	15D	A4R10	18G
A1R2	4D	A2C14	13B	A2TP3	9B	A3R12	15E	A4R11	18G
A1R3	5E	A2C15	12B	A2TP4	11C	A3R13	14F	A4R12	18G
A1R4	7D	A2C16	14B	A2TP5	11A	A3R14	14F	A4R13	19H
A1R5	7D	A2CR1	7A	A2TP6	12B	A3R15	14F	A4T1	18H
A1R6	6D	A2CR2	8C	A3C1	12D	A3R16	14E	A4TP1	14G
A1R7	6E	A2CR3	8C	A3C2	12D	A3R17	15E	A4TP2	16G
A1R8	7F	A2CR4	9A	A3C3	12F	A3R18	15F	A4TP3	16G
A1R9	6G	A2J5	15B	A3C4	11F	A3R19	16E	A4TP4	17G
A1R1(	6H	A2L1	6A	A3C5	13E	A3R20	16F	A4TP5	19H
A1R11	7G	A2Q1	7B	A3C6	13D	A3R21	16E		

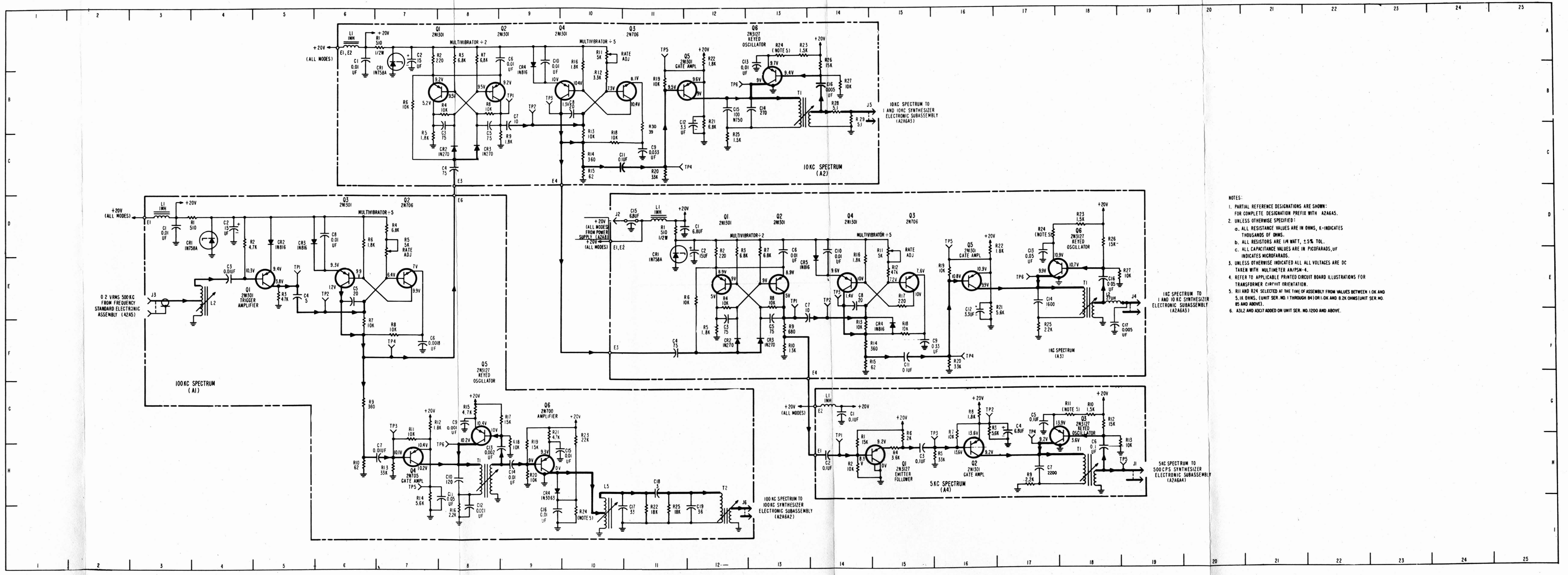


Figure 5-11. Spectrum Generator Subassembly A2A6A5, Schematic Diagram

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN	REF DES	LCTN
P2	2B, 2E	A1CR3	16B	A1R15	11E
P3	19B, 19F,	A1CR4	13B	A1R16	12E
	19H	A1CR5	11C	A1R17	10G
A1C1	18B	A1CR6	9B	A1R18	10E
A1C2	17C	A1CR7	13C	A1R19	10E
A1C3	17B	A1CR8	6C	A1R20	11D
A1C4	14F	A1CR9	18E	A1R21	11D
A1C5	17F	A1CR10	17E	A1R22	11E
A1C6	8E	A1CR11	16H	A1R23	5G
A1C7	16G	A1FL1	14B	A1R24	5H
A1C8	15G	A1FL2	14C	A1R25	4G
A1C9	14B	A1FL3	7B	A1R26	5G
A1C10	14C	A1J1	3F	A1R27	16H
A1C11	13B	A1J2	3G	A1R28	6E
A1C12	13C	A1J3	3G	A1R29	5E
A1C13	18D	J1J4	18D	A1R30	5E
A1C14	11B	A1J5	18B	A1R31	5D
A1C15	10B	A1J6	18H	A1R32	5D
A1C16	5D	A1J7	3C	A1R33	5C
A1C17	9D	A1L1	18D	A1R34	5C
A1C18	10E	A1L2	16E	A1R35	4B
A1C19	11D	A1L3	10C	A1R36	5B
A1C20	11F	A1L4	8C	A1R37	6A
A1C21	4F	A1L5	7C	A1R38	6B
A1C22	11E	A1L6	3C	A1R39	6B
A1C23	10G	A1L7	18B	A1R40	9B
A1C24	12D	A1L8	18H	A1R41	10C
A1C25	12E	A1L9	11E	A1R42	10B
A1C26	5G	A1Q1	17B	A1R43	11B
A1C27	5G	A1Q2	16E	A1R44	12A
A1C28	6D	A1Q3	11E	A1R45	12B
A1C29	6E	A1Q4	12B	A1R46	12B
A1C30	6E	A1Q5	5B	A1R47	13C
A1C31	5E	A1Q6	5E	A1R48	14C
A1C32	4E	A1Q7	5G	A1R49	14C
A1C33	17H	A1Q8	8F	A1R50	13C
A1C34	17H	A1Q9	12F	A1R51	11D
A1C35	17H	A1R1	18B	A1R52	18F
A1C36	17H	A1R2	17B	A1R53	10G
A1C37	18B	A1R3	17C	A1R54	10E
A1C38	4D	A1R4	17F	A1R55	3F
A1C39	10C	A1R5	17F	A1R56	4H
A1C40	5B	A1R6	14E	A1T1	4E
A1C41	5B	A1R7	15E	A1TP1	16B
A1C42	17D	A1R8	15E	A1TP2	12B
A1C43	17D	A1R9	15F	A1TP3	9B
A1C45	10B	A1R10	7E	A1TP4	6B
A1C46	3D	A1R11	7E	A1TP5	18E
A1CR1	17B	A1R12	8E	A1TP6	18B
A1CR2	16C	A1R13	4F	A1TP7	4B
		A1R14	11D	A1TP8	3E

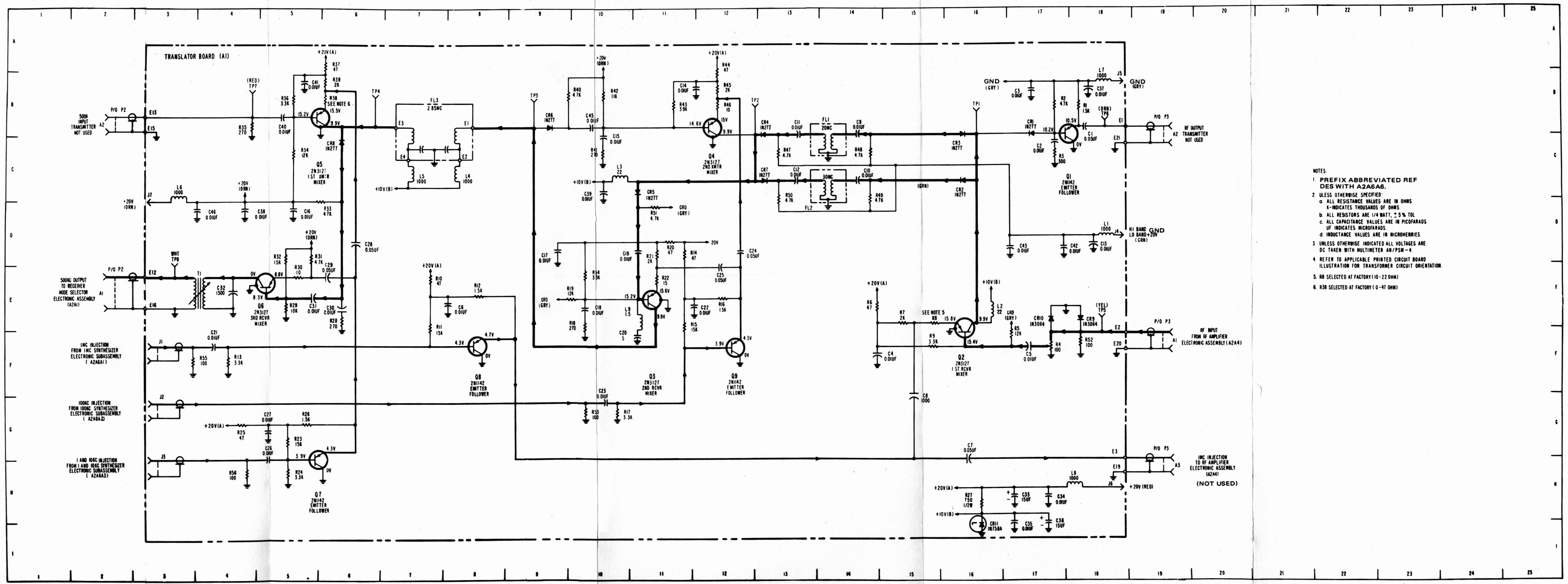
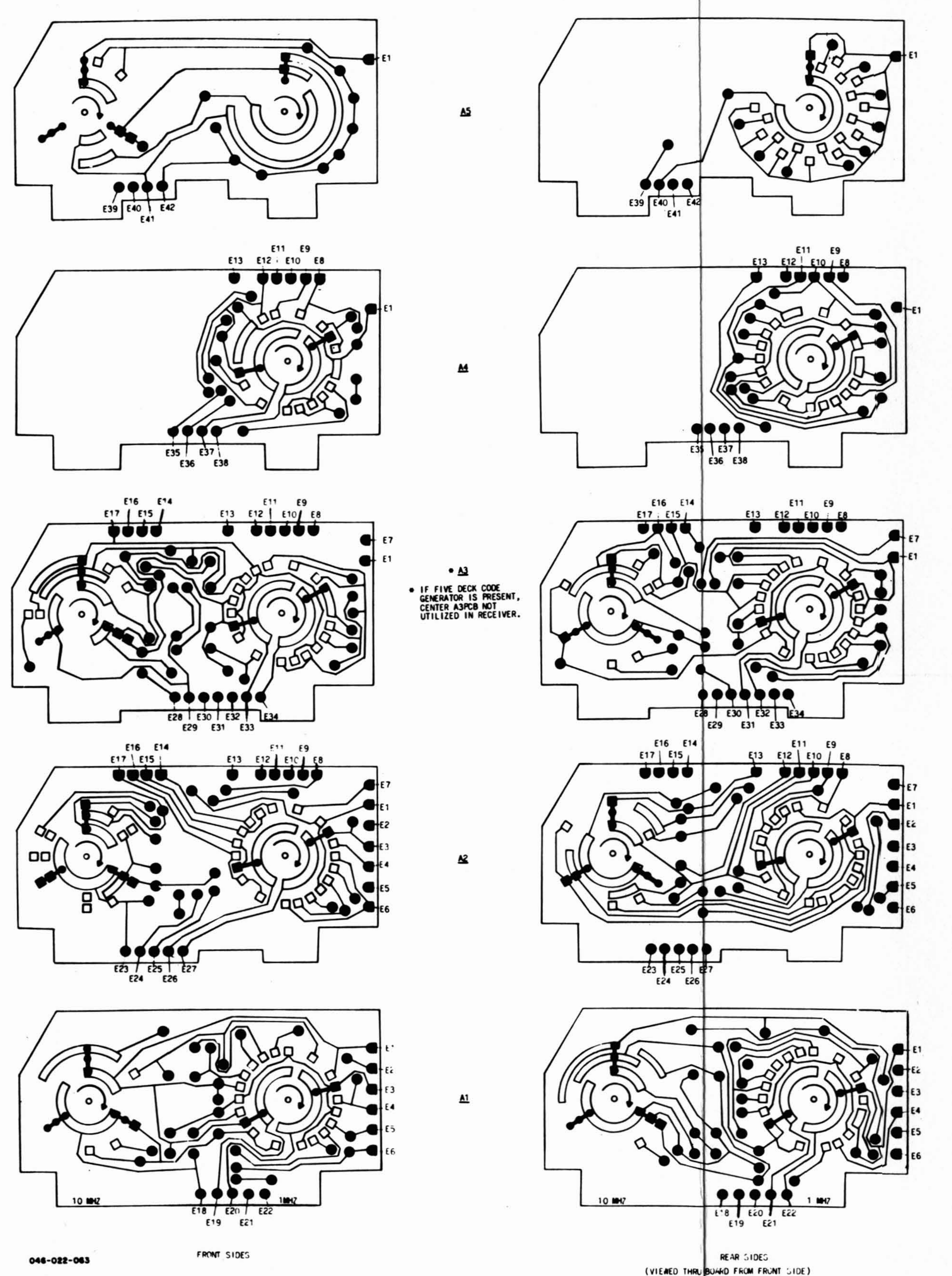


Figure 5-12. RF Translator Subassembly A2A6A6, Schematic Diagram



ACTUAL SCHEMATIC DATA

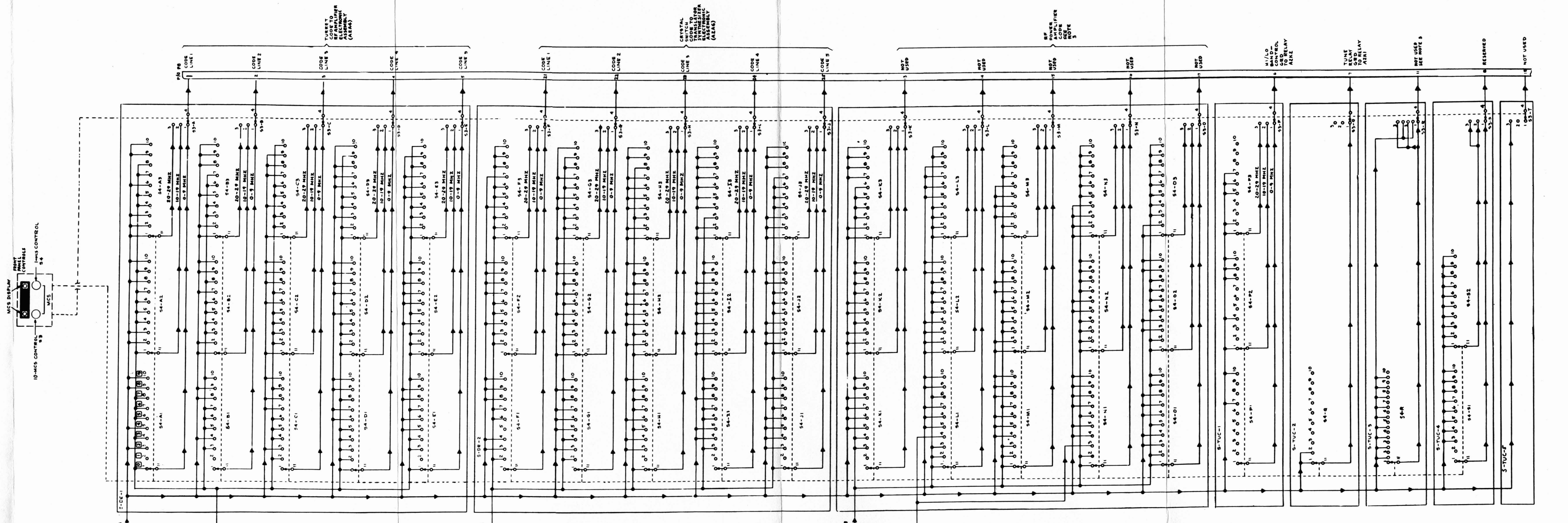
INTER-BOARD AND PLUG P1 WIRING DATA

FROM	TO	FUNCTION
E21A	P1-1	R.F. AMPLIFIER CODE
E22A	P1-2	
E19A	P1-3	
E20A	P1-4	
E27B	P1-5	
E25B	P1-21	1 MHZ SYNTHESIZER CODE
E36D	P1-22	
E35D	P1-23	
E38D	P1-24	
E37D	P1-25	
E32C	P1-13	TA AMPLIFIER CODE
E31C	P1-14	
E34C	P1-15	
E33C	P1-16	
E26B	P1-17	
E24B	P1-6	HI/LO CONTROL
E39E	P1-7	TUNE RELAY GRD.
E29C	P1-10	100 KC IMAGE CONTROL
E30C	P1-12	
E42E	T1-11	GRD. PULSE
E41E	P1-9	GROUND

E1 OF BOARDS A,B,C,D, AND E ARE CONNECTED TOGETHER
E2 OF BOARDS A AND B ARE CONNECTED TOGETHER
E3 OF BOARDS A AND B ARE CONNECTED TOGETHER
E4 OF BOARDS A AND B ARE CONNECTED TOGETHER
E5 OF BOARDS A AND B ARE CONNECTED TOGETHER
E6 OF BOARDS A AND B ARE CONNECTED TOGETHER
E7 OF BOARDS B AND C ARE CONNECTED TOGETHER
E8 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E9 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E10 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E11 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E12 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E13 OF BOARDS B, C AND D ARE CONNECTED TOGETHER
E14 OF BOARDS B AND C ARE CONNECTED TOGETHER
E15 OF BOARDS B AND C ARE CONNECTED TOGETHER
E16 OF BOARDS B AND C ARE CONNECTED TOGETHER
E17 OF BOARDS B AND C ARE CONNECTED TOGETHER

NOTES:

1. SOLID CIRCLES INDICATE FRONT AND REAR OF PC BOARD ARE CONNECTED TOGETHER AT THAT POINT.
2. SWITCH WIPERS SHOWN IN 00 MHZ POSITION.
3. BOARD A IS LOCATED CLOSEST TO FRONT PANEL.
4. P1 CONNECTS TO A2J8.
5. MHZ TUNING SHAFTS THROUGH LEFT- AND RIGHT-HAND SWITCH ROTORS MOVE ALL 1 MHZ OR 10 MHZ ROTOR WIPERS IN UNISON.
6. REFER TO TABLE 4-5 FOR ADDITIONAL WIRING DATA.

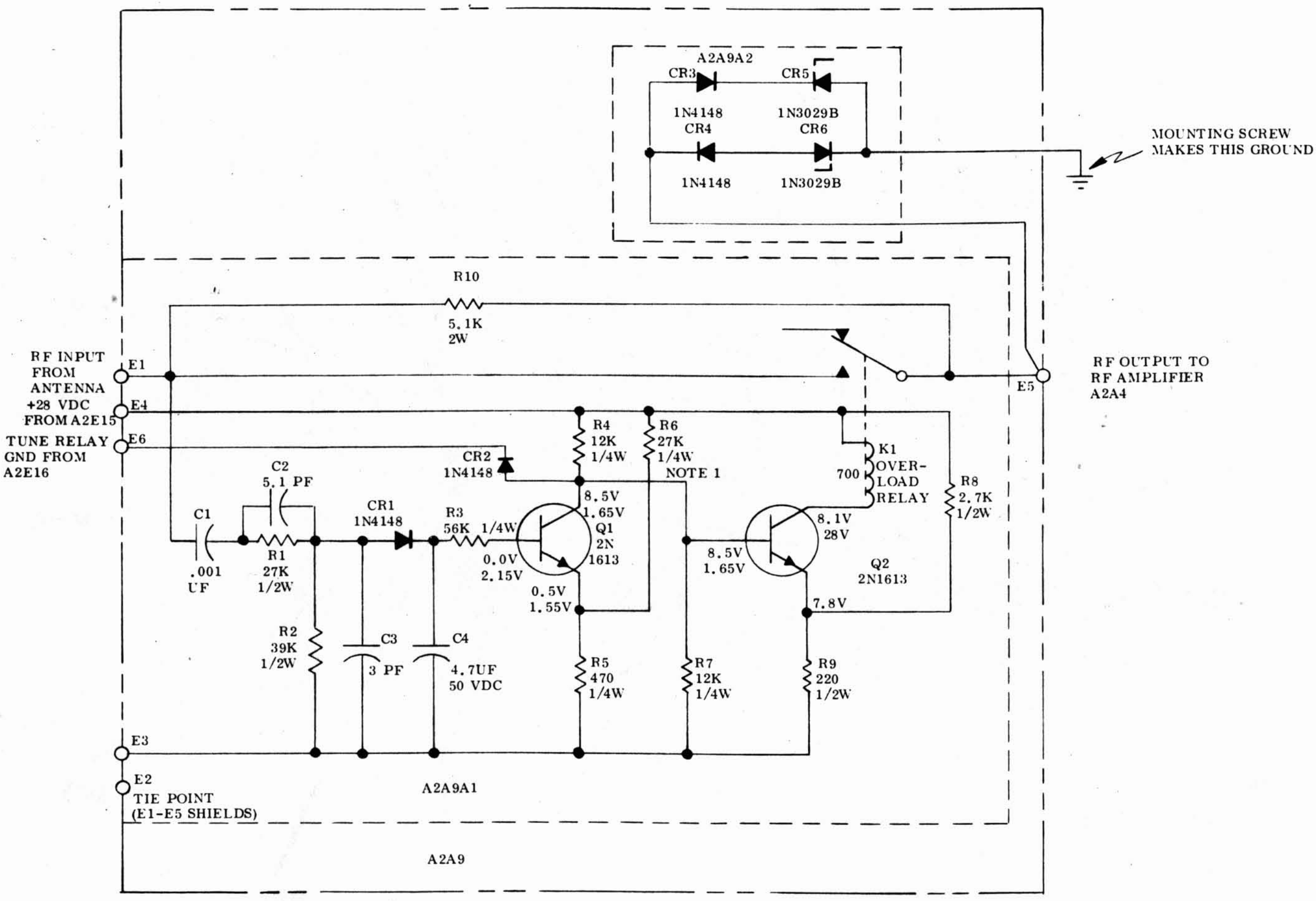


NOTES:

1. DISABLE IN POSITION 00 AND 01 MC.
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH A2A7.
3. NOT USED AND/OR NOT PRESENT ON SOME SETS.
4. SWITCHES S3 AND S4 ARE SHOWN AT THE 00 MCS POSITION.

EQUIVALENT SCHEMATIC DATA

Figure 5-13. Code Generator Assembly A2A7, Schematic Diagram



NOTES:
TRANSISTOR VOLTAGE MEASUREMENTS TAKEN WITH AN/USM-116( ) TO CHASSIS GROUND WITH NO SIGNAL INPUT, WITH 10V RMS INPUT AND K1 TRIPPED.

Figure 5-14. Antenna Overload Assembly A2A9, Schematic

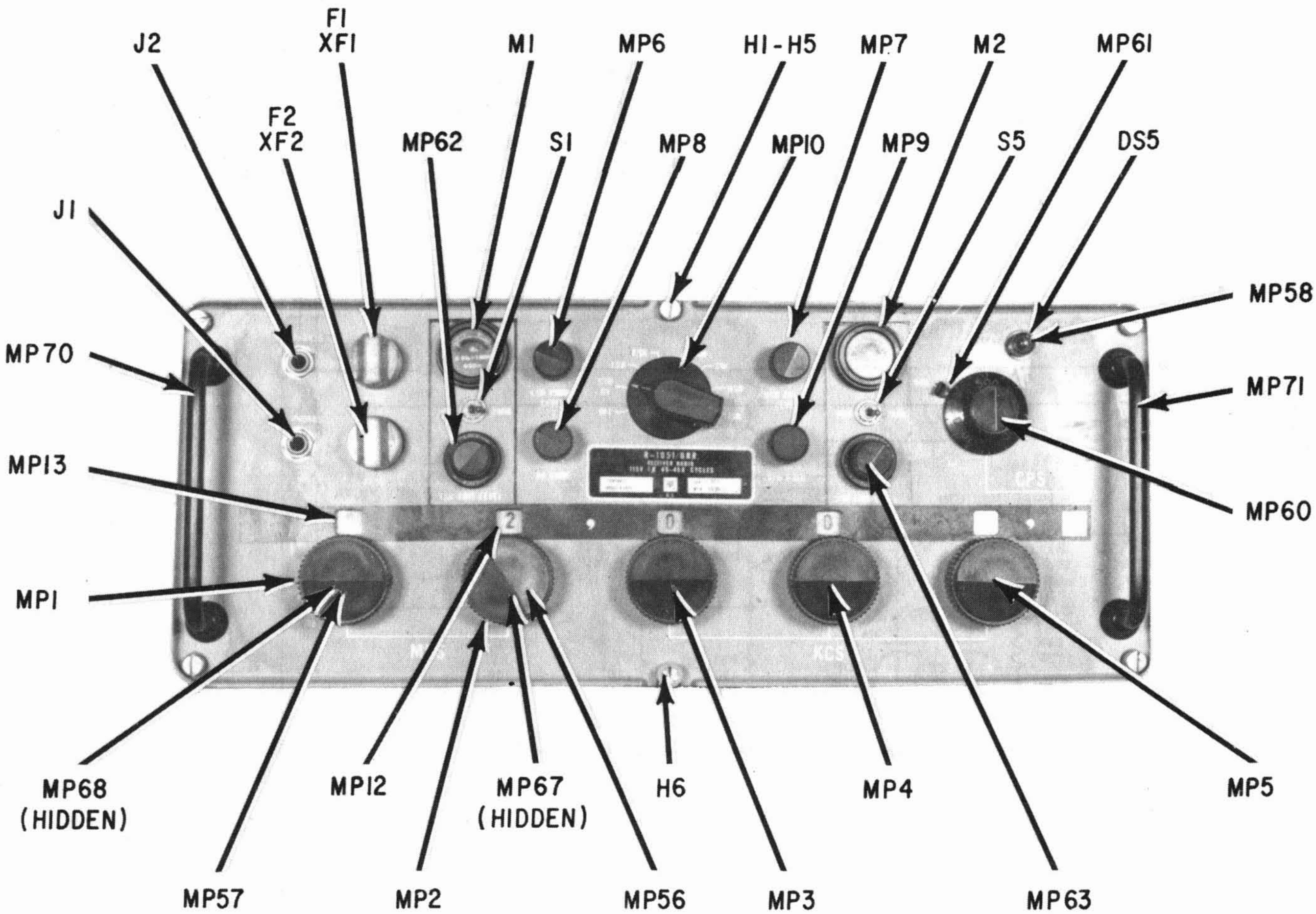


Figure 5-15. R-1051 Front Panel Assembly Front View, Component Location

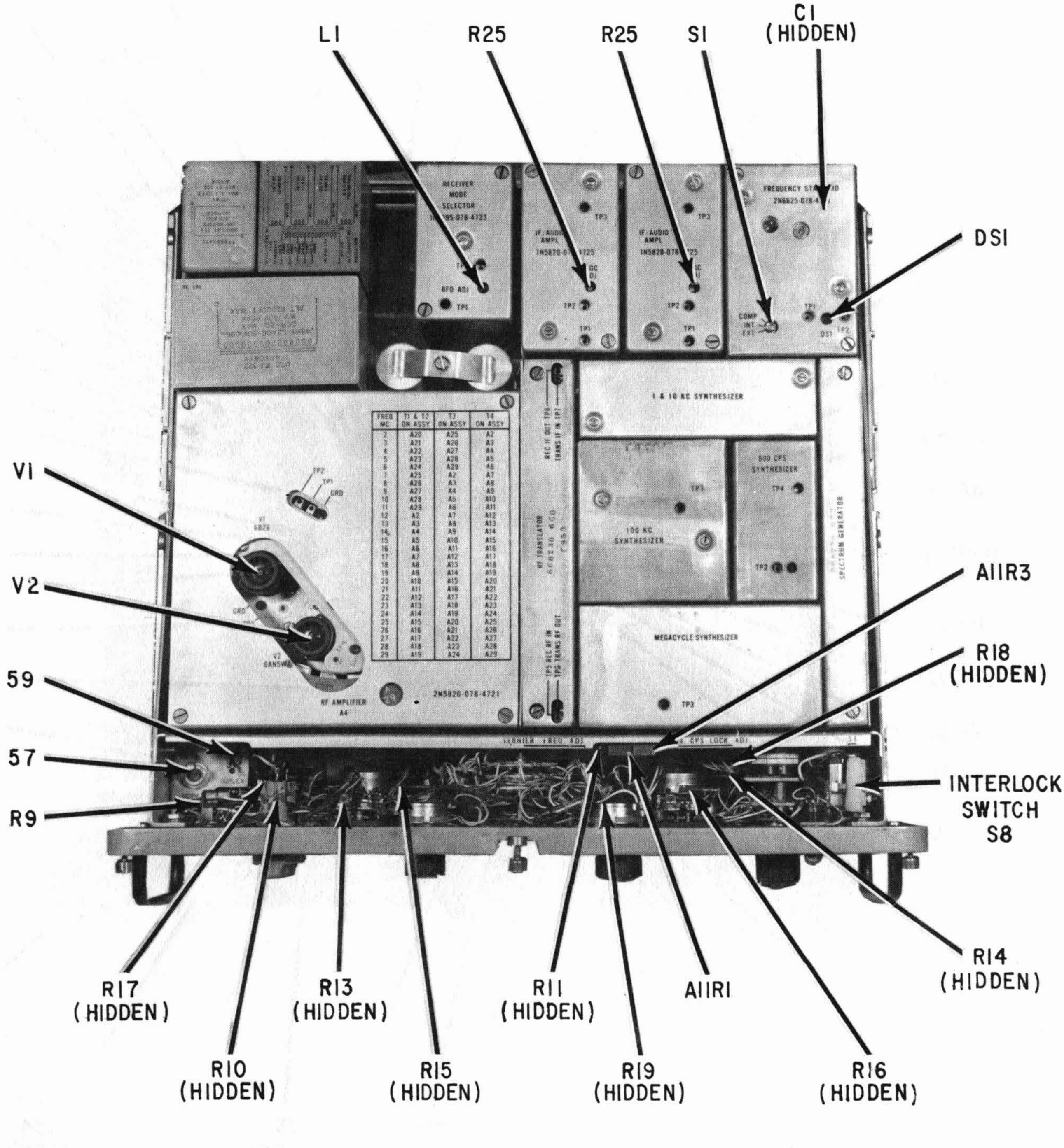


Figure 5-16. Radio Receiver R-1051/URR, Top View, Case Removed, Component and Test Location

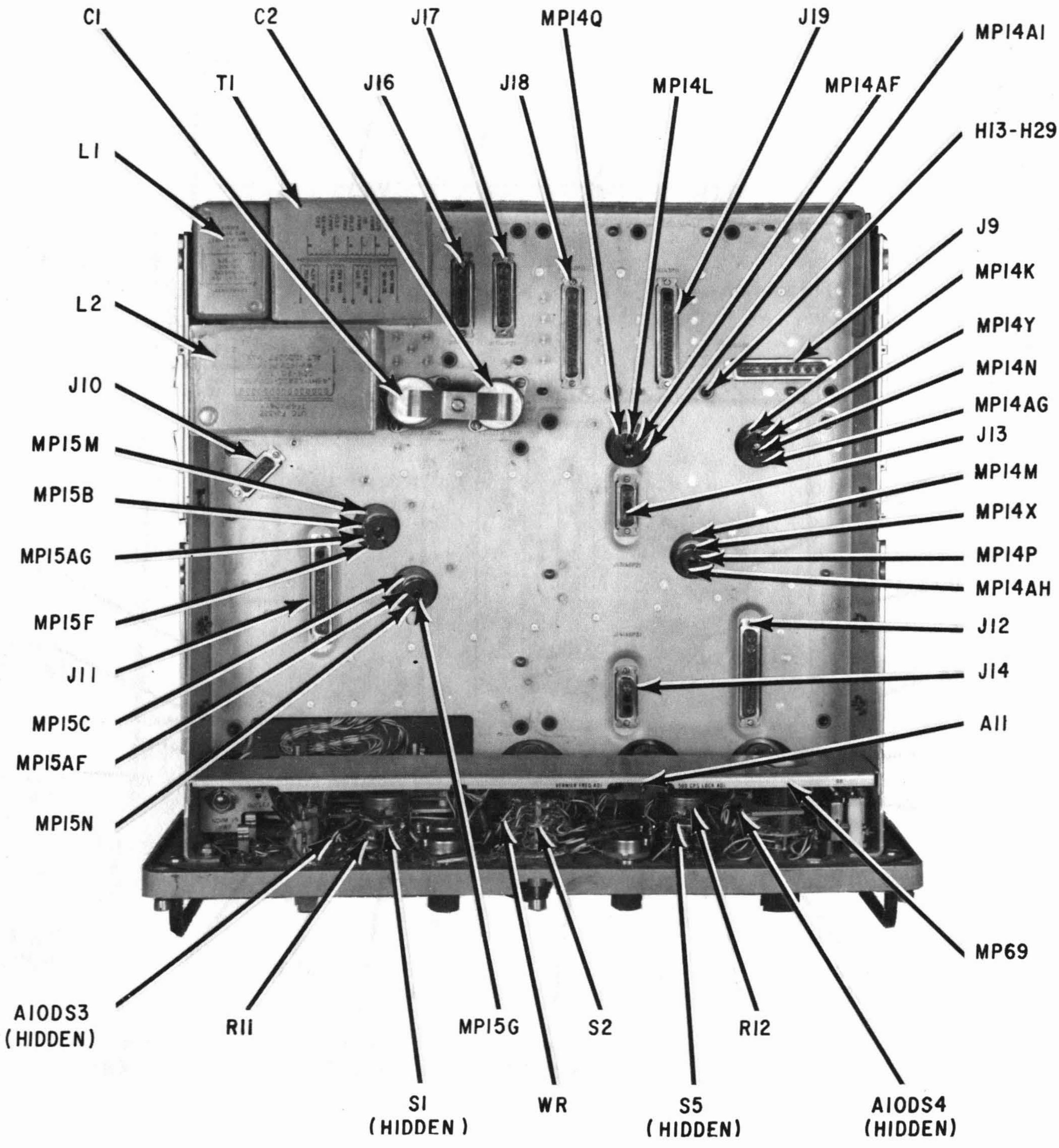


Figure 5-17. R-1051/URR Chassis Main Frame, Top View, Assemblies Removed, Component Location

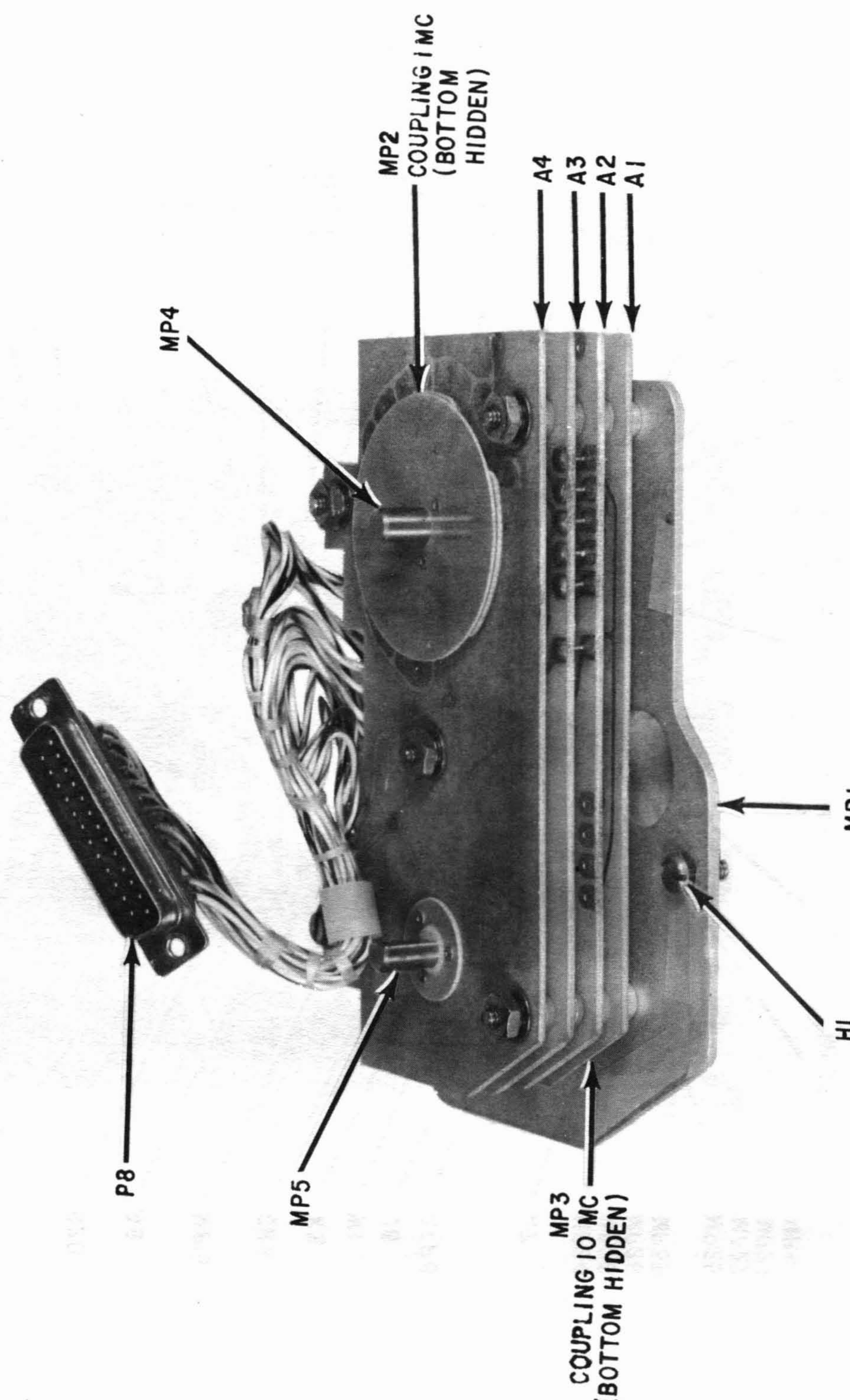


Figure 5-18. Code Generator Assembly A2A7, Component Location

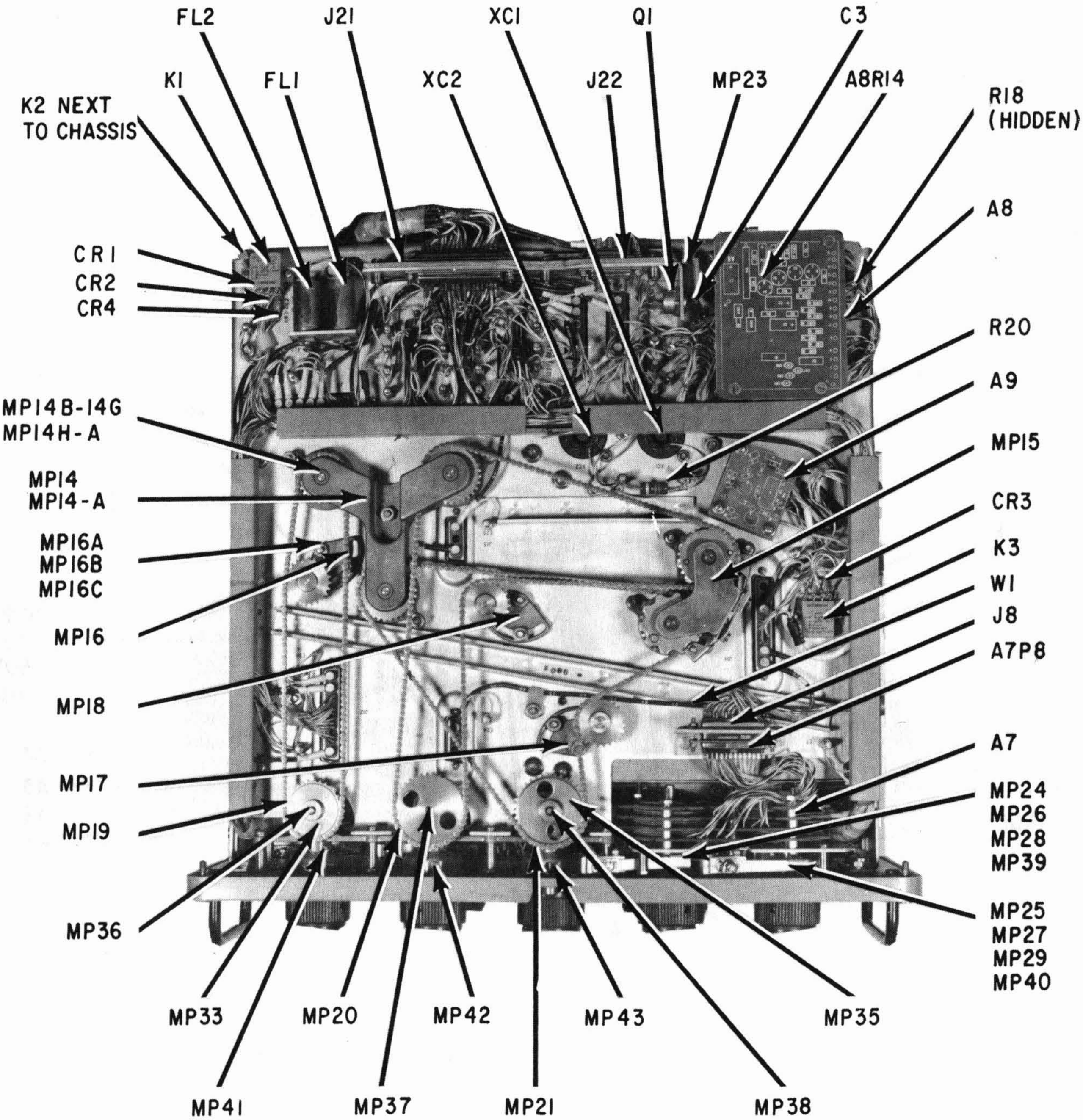


Figure 5-19. R-1051/URR Chassis Main Frame, Bottom View, Component Location (Sheet 1 of 2)

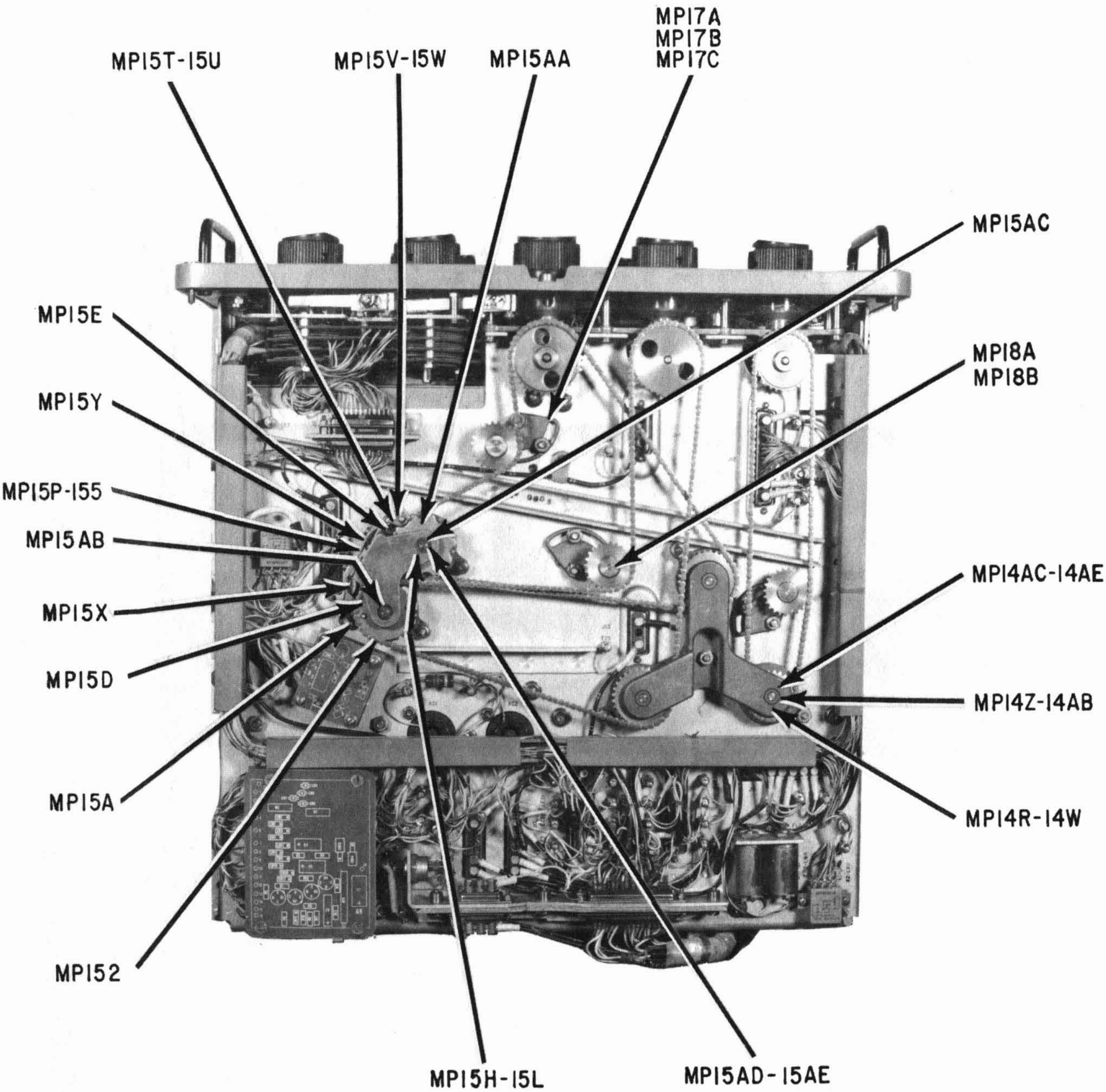


Figure 5-19. R-1051/URR Chassis Main Frame, Bottom View, Component Location (Sheet 2 of 2)

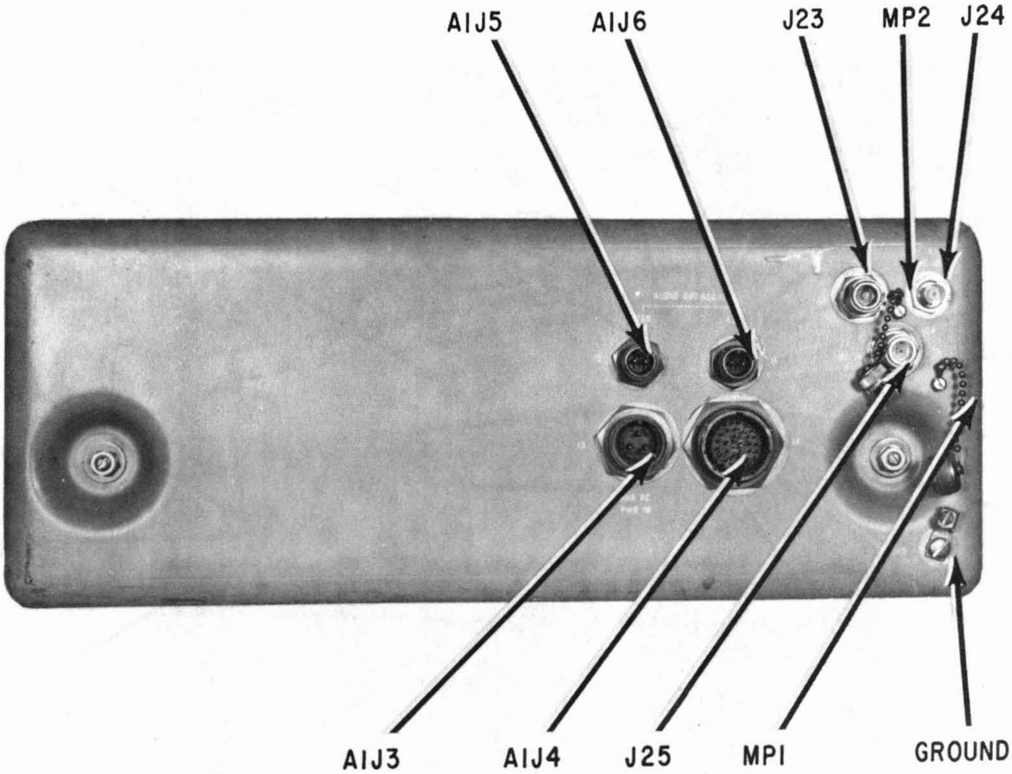


Figure 5-20. Radio Receiver R-1051/URR, Case, Rear View

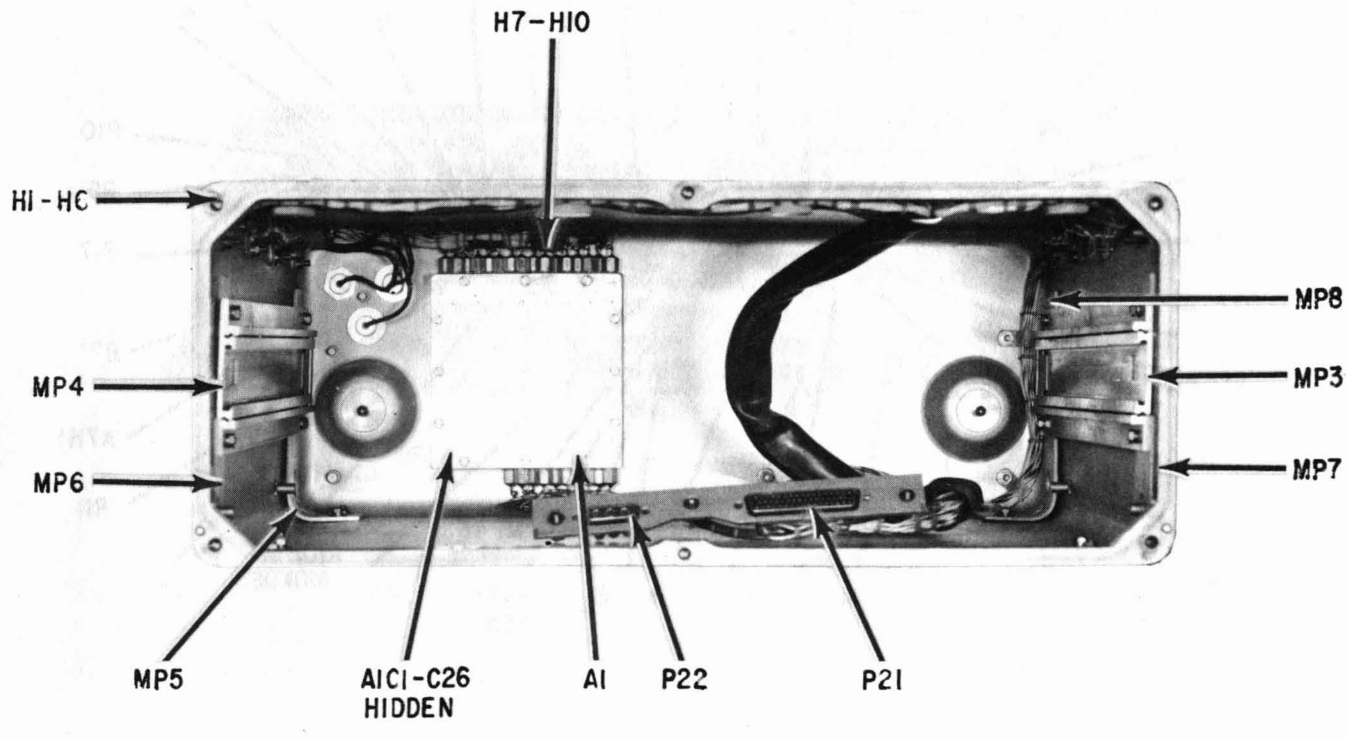


Figure 5-21. Radio Receiver R-1051/URR, Case, Inside View

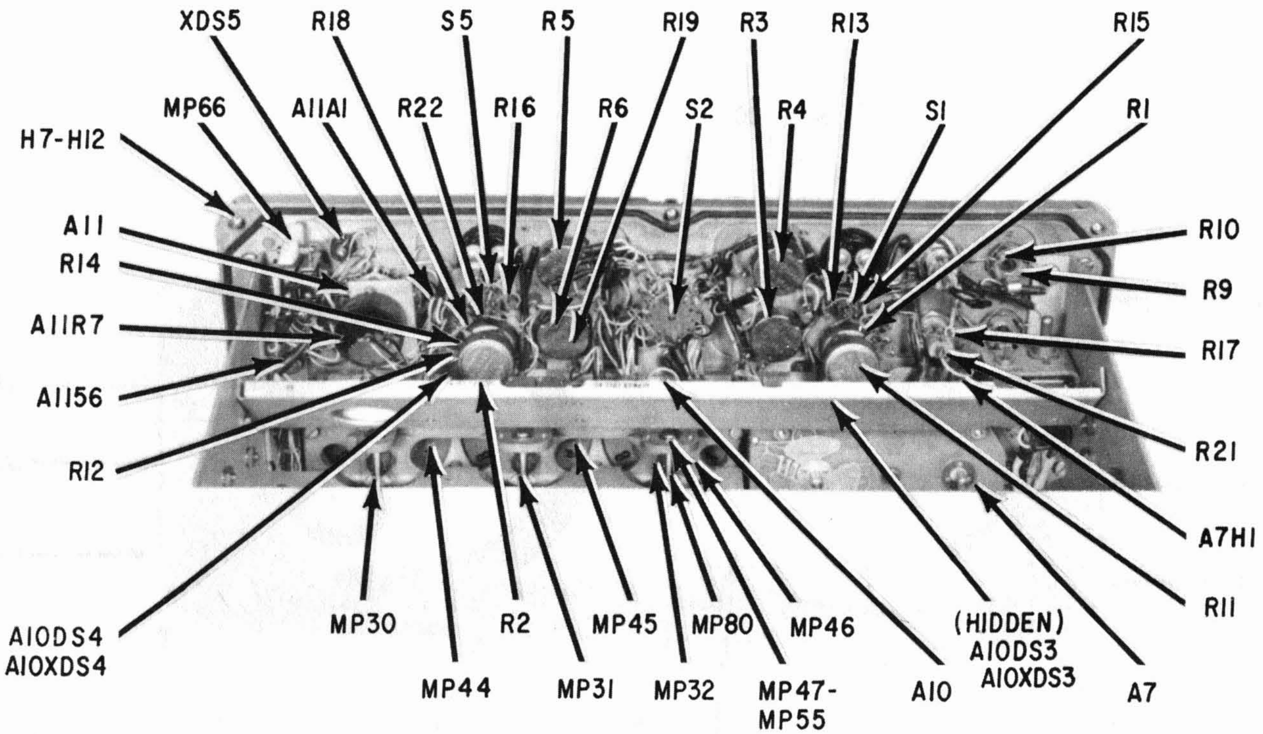


Figure 5-22. R-1051/URR Front Panel Assembly, Rear View, Component Location

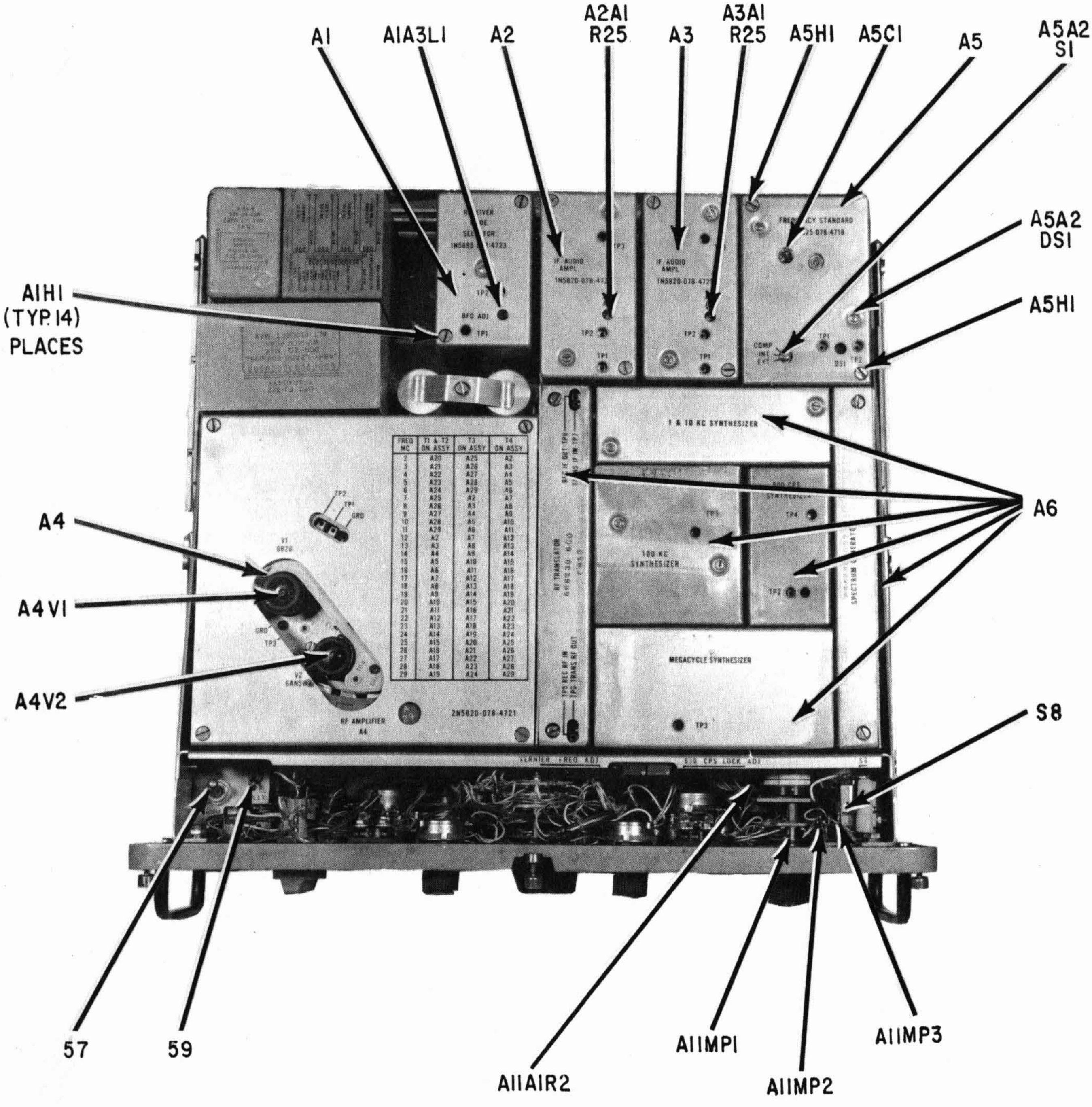


Figure 5-23. R-1051/URR Chassis Main Frame, Top View, Subassembly Location

PARTS LOCATION INDEX

REF DES	LCTN	REF DES	LCTN
C3	5D	E9	5F
C4	4D	E10	5F
C6	7C	E11	5F
C7	6B	E12	6F
CR1	4E	E13	6F
CR2	4E	E14	6F
CR3	4E	E15	7F
CR4	4E	E16	7F
CR5	2D	E17	2F
CR6	2D	Q1	6E
CR7	2D	Q2	6D
CR8	3D	Q3	6D
CR9	5E	Q4	6C
CR10	5E	R1	3C
CR11	5E	R2	3E
CR12	5E	R3	5D
CR13	4B	R4	5C
CR14	5B	R5	6F
CR15	7D	R6	8E
CR16	5E	R7	6E
CR17	6E	R8	7D
E1	2F	R9	7D
E2	2F	R10	7D
E3	3F	R11	7C
E4	3F	R12	6D
E5	3F	R13	7C
E7	4F	R14	7B
E8	4F	R15	6C

NOTES:

1. PREFIX ALL REF DES WITH A2A8.
2. △1 CR13, CR14, CR16, CR17 ALL ZENER DIODES.

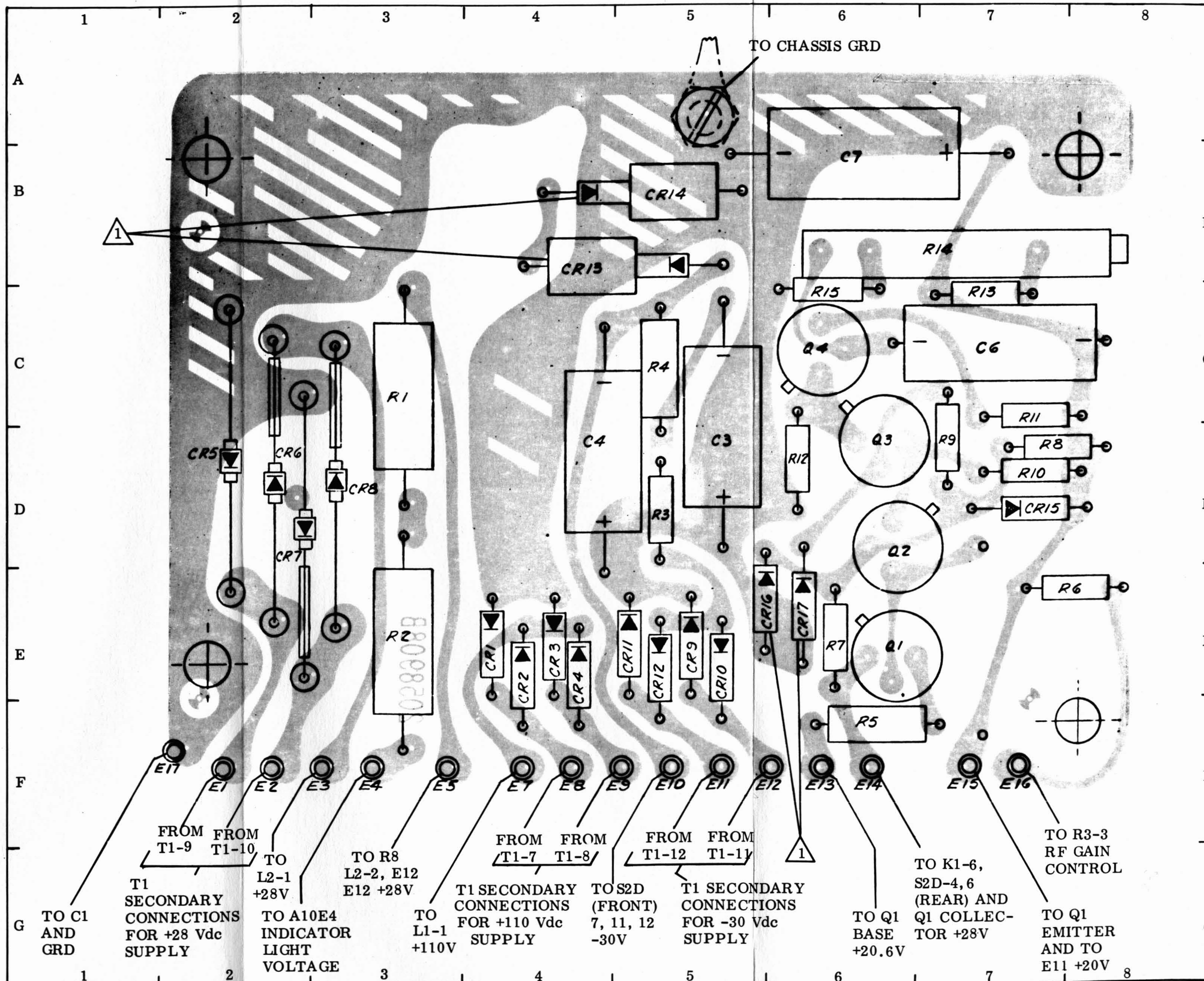
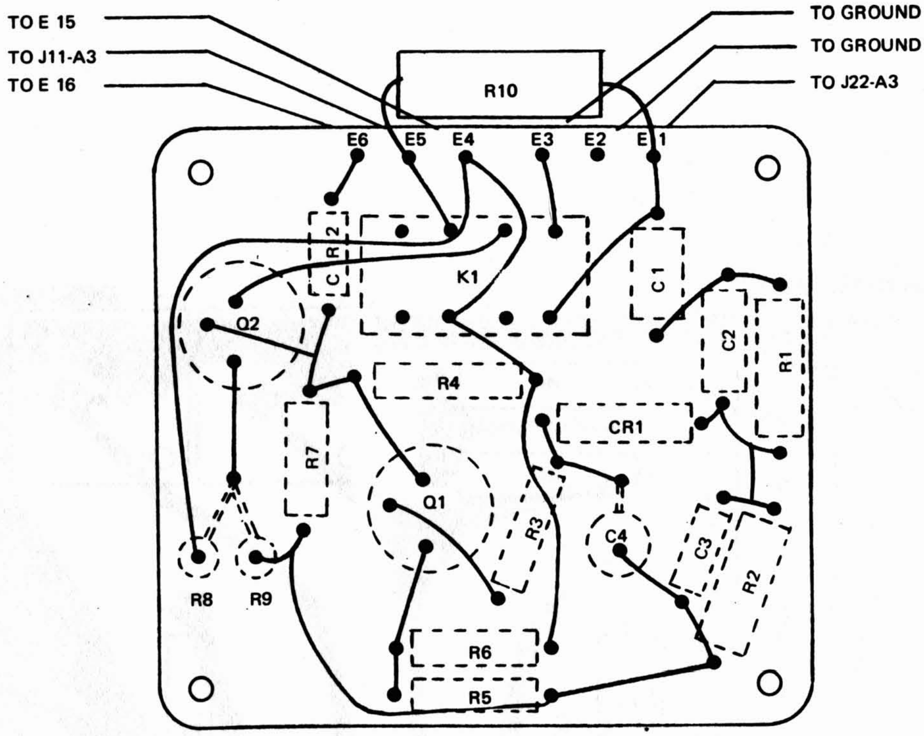
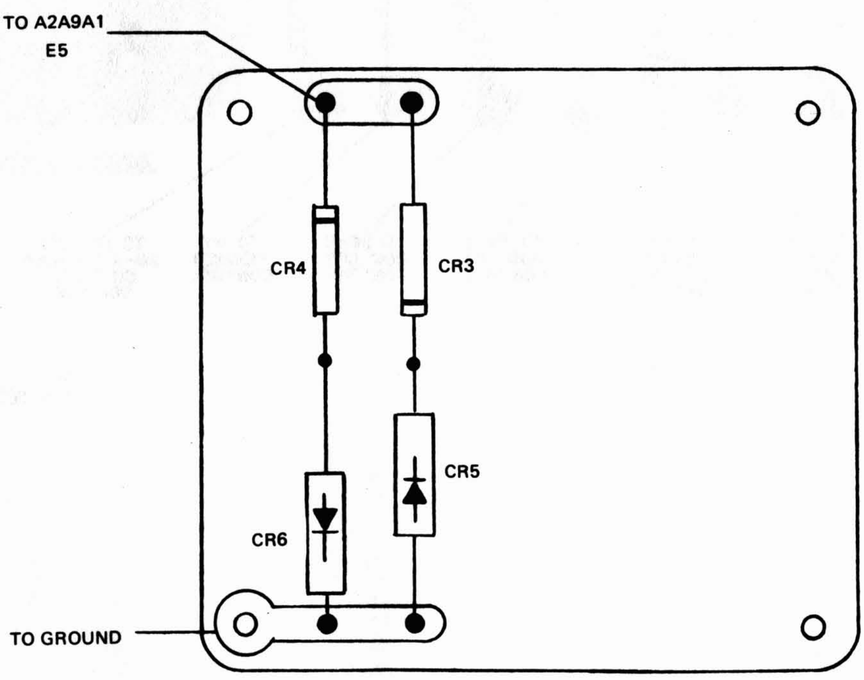


Figure 5-24. Receiver Power Supply, Component Location

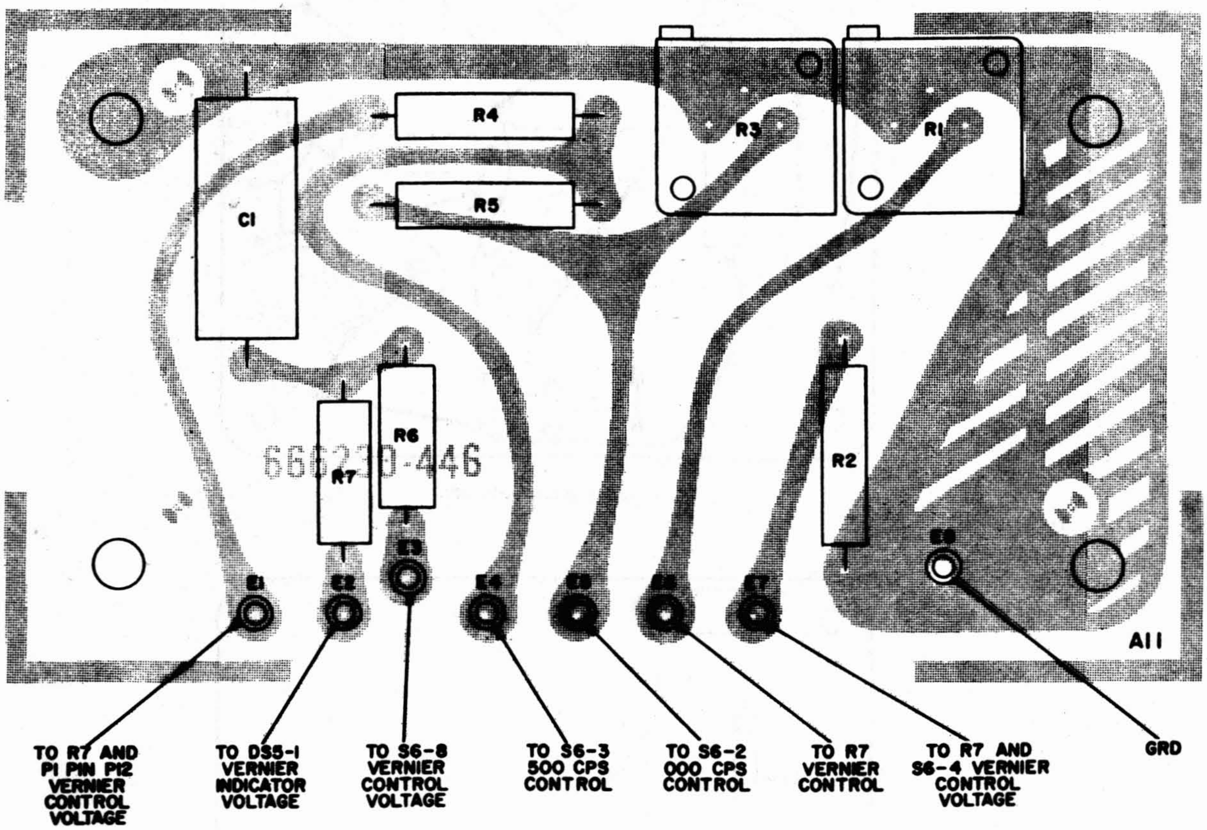


A2A9A1 (FOIL SIDE UP)



A2A9A2 (FOIL SIDE UP)

5-25. Antenna Overload Assembly, A2A9 Component and Test Location



NOTE:
REF. DESIG. PREFIX A2.

Figure 5-26. Receiver 500 CPS Control (Foil Side Up), Component Location

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

6-2. REFERENCE DESIGNATIONS. The unit numbering method of assigning reference designations has been used to identify units, assemblies, subassemblies, and parts. This method has been expanded as much as necessary to adequately cover the various degrees of subdivision of the equipment. Examples of this unit numbering method and typical expansions of the same are illustrated by the following:

Example 1:

1 R 1

Unit No. | Class of Item | Item No. within class

Read as: First (1) resistor (R) of first unit (1).

Example 2:

4 A1 R1

Unit No. | Subassembly designation | Class and No. of item

Read as: First (1) resistor (R) of first (1) subassembly (A) of fourth (4) unit.

Example 3:

3 A1 A2 R1

Unit No. | Subassembly designation | Subassembly designation | Class and No. of item

Read as: First (1) resistor (R) of second (2) subassembly (A) of first (1) subassembly (A) of third (3) unit.

6-3. REFERENCE DESIGNATION PREFIX. Partial reference designations are used on the equipment and illustrations. The partial reference designations consist of the class letter(s) and the identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on illustration notes.

6-4. LIST OF UNITS AND ASSEMBLIES.

6-5. Table 6-1 is a listing of assemblies within Radio Receiver R-1051/URR. The receiver is designated unit 1 when it is part of Radio Set AN/WRC-1. Consequently, each reference designation in this section is preceded by the number 1.

6-6. MAINTENANCE PART LIST.

6-7. Table 6-2 lists all assemblies and required parts. The assemblies are listed in numerical sequence. Maintenance parts for each assembly are listed alphabetically-numerically by class of part following the unit designation. Thus the parts for each assembly are grouped together. Table 6-2 provides the following information: (1) the complete reference designation each unit, assembly, subassembly, or part, (2) reference to explanatory notes in paragraph 6-13, (3) noun name and brief description, and (4) identification of the illustration which pictorially locates the part.

6-8. Printed circuit boards, assembly boards modules, etc., are listed first as individual items in the maintenance parts list. In addition, at the completion of a parts listing for each assembly the individual circuit board, assembly board, module, etc. is then broken down by components into separate parts listing. When there is a redundancy of such electronic assemblies, reference is made to the parts breakdown previously listed.

6-9. LIST OF MANUFACTURERS.

6-10. Table 6-3 lists the manufacturer of parts used in the equipment. The table includes the manufacturer's code used in table 6-2 to identify the manufacturers.

6-11. STOCK NUMBER IDENTIFICATION.

6-12. Allowance Parts List (APL) include National Stock Numbers and Source Maintenance and Recoverability Codes. Therefore, reference should be made to the APL prepared for the equipment for stock numbering information.

6-13. NOTES.

6-14. Parts variation within each article are identified by a Letter Symbol in the Notes Column of table 6-2. The absence of a Letter Symbol in the Notes Column indicates that the part is used on all articles covered by this manual.

TABLE 6-1. LIST OF ASSEMBLIES

UNIT AND ASSEMBLY NO.	QTY	NAME	IDENTIFYING FIGURE	PARTS PAGE
1	1	Radio Receiver	1-1	6-3
1A1	1	Case	5-20, 5-21	6-3
1A1A1	1	Filter box	5-21, 5-23	6-4
1A2	1	Main frame	5-19	6-4 — 6-12
1A2A1	1	Mode selector	5-23	6-12
1A2A2	1	IF/audio amplifier	5-23	6-12
1A2A3	1	IF/audio amplifier	5-23	6-12
1A2A4	1	RF amplifier	5-23	6-12
1A2A5	1	Frequency standard	5-23	6-13
1A2A6	1	Translator/synthesizer	5-23	6-13
1A2A7	1	Code generator	5-22	6-13
1A2A8	1	Power supply	5-19, 5-24	6-14
1A2A9	1	Antenna overload	5-25	6-15
1A2A10	1	Panel lamp assembly	5-22	6-16
1A2A11	1	500 CPS Vernier assembly	5-26	6-17

TABLE 6-2. MAINTENANCE PARTS LIST

RECEIVER, RADIO R-1051/URR

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1		RECEIVER, RADIO R-1051/URR: Mfr 58189, pn 66230-003 or A09499-001	1-1

CASE ASSEMBLY RECEIVER

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1		CASE ASSEMBLY RECEIVER: Mfr 58189, pn 666230-006 or 06845 pn 4030679-0501	5-20
1A1H1-H6		INSERT: Mfr 83324, pn 540725-131.	5-21
1A1H7-H10		POST, CABLE: 0.750 in. w across flats x 0.40 in. lg, nylon per MIL-P-17091, mfr 58189, pn 666231-373.	5-21
1A1J1-J22		Not used	
1A1J23		CONNECTOR, RECEPTACLE, ELECTRICAL: 1.1563 in. lg, 0.6875 in. dia, mfr 91146, pn NJBFO.	5-20
1A1J24		CONNECTOR, RECEPTACLE, ELECTRICAL: 1.1563 in. lg, 0.6875 in. dia, mfr 71468, pn BNCJB7FO.	5-20
1A1J25		Same as A1J23.	5-20
1A1MP1		CAP, RECEPTACLE - for J24: Type CW123A/U.	5-20
1A1MP2		CAP, RECEPTACLE - for J25: Type MX913/U.	5-20
1A1MP3		SLIDE, RIGHT HAND (complete - includes case and chassis assembly): Mfr 05236 or 83508, 06845, dwg 4030800-0702.	5-21
1A1MP4		SLIDE, LEFT HAND (complete - includes case and chassis assembly): Mfr 05236 or 83508, 06845, dwg 4030800-0701.	5-21
1A1MP5-MP8		BRACKET, SLIDE: Mfr 06845, pn 4030961-0501.	5-21
1A1P1-P20		Not used	
1A1P21		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.635 in. w x 0.605 in. h, 0.633 in. thk steel shell, gold contacts, mfr 91146, pn DDMF50S.	5-21
1A1P22		CONNECTOR, RECEPTACLE, ELECTRICAL: 1.541 in. w x 0.494 in. h, 0.390 in. thk steel shell, copper alloy contacts, mfr 91146, pn DAMF3W3S.	5-21
1A1P22A1-A3		CONNECTOR PLUG, ELECTRICAL: Coaxial, rt angle, mfr 91146, pn DM53743-5054	5-21

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

FILTER BOX ASSEMBLY

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1A1		FILTER BOX ASSEMBLY: 58189, pn 666230-733	5-21
1A1A1C1-C26		CAPACITOR, FIXED CERAMIC: MIL type CK70AW102M.	5-21
1A1A1J1-J2		Not used	
1A1A1J3		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.375 in. lg, x 1.375 in. w x 1.093 in. h; 3 contacts, mfr 77820, pn 71-741-16S5P.	5-20
1A1A1J4		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.316 in. x 1.812 in. dia, 39 contacts, mfr 77820, pn PT07A20-39P.	5-20
1A1A1J5-J6		CONNECTOR, PLUG, ELECTRICAL: Mfr 77820, pn 71-741-10SL4P.	5-20

CHASSIS, RECEIVER

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2		CHASSIS, RECEIVER: Mfr 58189, pn 666230-007 or A09497-001.	5-17
1A2C1		CAPACITOR, FIXED: MIL type CE51C121J.	5-17
1A2C2		CAPACITOR, FIXED: MIL type CE51C301G.	5-17
1A2C3		CAPACITOR, FIXED: 0.170 in. x 0.240 in. x 0.625 in. lg, 0.1 uF ±20%, 200 vdc, mfr 02777, 06845, dwg 4030795-0703.	5-19
1A2CR1-CR4		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N649.	5-19
1A2CR5		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N4971	
1A2DS1-DS4		Not used Not used	
1A2DS5		LAMP, GLOW: -90 vdc max./starting, 1.0 mA, 09375 in. lg, 0.290 in. dia, mfr 08806, pn NE2J.	5-15
1A2E1		TERMINAL, STANDOFF: 0.250 in. dia x 0.719 in. lg, mfr 81312, pn 766.	4-5
1A2E2		TERMINAL, GND: 0.25 in. dia, 0.66 in. lg, mfr 71279, pn 2381-1-05.	4-5
1A2E3		TERMINAL, STANDOFF: 0.25 in. dia, 0.60 in. lg, mfr 71279, pn 2380-1.	4-5
1A2E4		Same as 1A2E3	4-5
1A2E5		Same as 1A2E1	4-5
1A2E6		Same as 1A2E2	4-3
1A2E7-E8		Same as 1A2E3	4-3
1A2E9		Same as 1A2E2	4-3
1A2E10		Same as 1A2E3	4-3

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2E11-E13		Same as 1A2E1	4-3
1A2E14		Same as 1A2E3	
1A2E15-E18		Same as 1A2E1	
1A2E19		Same as 1A2E2	
1A2E20		Same as 1A2E1	
1A2E21		Same as 1A2E2	
1A2E22-E23		Same as 1A2E1	
1A2E24-E25		Same as 1A2E3	
1A2E26		Same as 1A2E1	
1A2E27-E28		Same as 1A2E2	
1A2E29-E30		Same as 1A2E1	
1A2E31-E32		Same as 1A2E2	
1A2E33-E34		Same as 1A2E1	
1A2E35		Same as 1A2E2	
1A2E36-E37		Same as 1A2E1	
1A2E38-E40		Same as 1A2E2	
1A2E41		Same as 1A2E3	
1A2E42		Same as 1A2E2	
1A2E43		Same as 1A2E1	4-3
1A2F1-F2		FUSE: 3/4 amp, slow blow, MIL type F02B250V3-4AS.	5-15
1A2FL1-FL2		FILTER, RADIO FREQUENCY: 0.844 in. lg, 0.670 in. dia, 0.3A, 2.7 ohms, 300 vdc, mfr 56289, pn 1JX97.	5-19
1A2H1-H5		SCREW, CAPTIVE: Mfr 58189, pn 666164-260	5-15
1A2H6		SCREW, CAPTIVE: Mfr 13809, 58189, pn 666231-671.	5-15
1A2H7-H12		NUT, CAPTIVE: Mfr 13809, pn 666164-259.	5-22
1A2H13-H29		NUT, SELF LOCKING: Mfr 86455, pn LAC032-2.	5-17
1A2J1-J2		JACK, TIP: MIL spec JJ089.	5-15
1A2J3-J7		Not used	
1A2J8		CONNECTOR, RECEPTACLE, ELECTRICAL: 1.583 in. x 0.494 in. x 0.426 in., mfr 91146, pn DBMF25S.	5-19
1A2J9		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.729 in. lg, 0.494 in. w, 13 contacts, mfr 91146, pn DCMF13W6S.	5-17
1A2J9A1-A6		CONNECTOR, PLUG, ELECTRICAL: Coaxial rt angle, mfr 91146, pn DM53743-5054	4-4
1A2J10		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.541 in. lg, 0.494 in. w, 0.429 in., 15 contacts, mfr 91146, pn DAMF 15S2.	5-17
1A2J11		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.789 in. lg, 0.494 in. w, 17 contacts, mfr 91146, pn DCMF17W5S.	5-17

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2J11A1-A3		Same as 1A2J9A1	4-4
1A2J12		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.729 in. lg, 0.494 in. w, 25 contacts, mfr 91146, pn DCMF25W3S.	5-17
1A2J12A1-A3		Same as 1A2J9A1	4-4
1A2J13		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.422 in. lg, 0.494 in. w, 1.541 in. dia, 3 contacts, mfr 91146, pn DAMF3W3S.	5-17
1A2J13A1		Same as 1A2J9A1	4-4
1A2J13A2		Not used	
1A2J13A3		Same as 1A2J9A1	4-4
1A2J14		Same as 1A2J13	5-17
1A2J14A1-A2		Not used	
1A2J14A3		Same as 1A2J9A1	4-4
1A2J15		Not used	
1A2J16		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.088 in. lg, 0.494 in. w, 13 contacts, mfr 91146, pn DBMF13W3S2.	5-17
1A2J16A1-A3		Same as 1A2J9A1	4-4
1A2J17		CONNECTOR, RECEPTACLE, ELECTRICAL: 2.088 in. lg, 0.494 in. w, 9 contacts, mfr 91146, pn DBMF9W4S2.	5-17
1A2J17A1-A4		Same as 1A2J9A1	4-4
1A2J18-J19		Same as 1A2J12	5-17
1A2J18A1-A3		Same as 1A2J9A1	4-4
1A2J19A1-A3		Same as 1A2J9A14-4.	
1A2J20		Not used	
1A2J21		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.426 in. x 0.605 in. x 2.635 in. dia, mfr 91146, pn DDM50P.	5-19
1A2J22		CONNECTOR, RECEPTACLE, ELECTRICAL: 0.541 in. lg, 0.494 in. w, 3 contacts, mfr 91146, pn DAM3W3P.	5-19
1A2J22A1-A3		CONNECTOR, INSERT, RF: mfr 91146 pn DM53740-5039	4-3

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2K1-K3		RELAY, ARMATURE, ELECTROMAGNETIC: 0.427 in. x 1.085 in. x 1.330 in. dia, 2 form C/DPDT/, 3 amp at 28 vdc, 975 ohms dc ±10% at 25 deg c, 26.5 vdc RTV ±5%, mfr 02289, pn 2B2111.	5-19
1A2L1		INDUCTOR, POWER: 4.500 in. x 2.625 in. x 1.688 in. dia, 2 terminals, 175V working, mfr 70674, pn A14514.	5-17
1A2L2		INDUCTOR, POWER: 1.500 in. x 4.125 in. x 4.375 in. h, 2 terminals, 400 millihenrys, 1.4 amp, 140V working, mfr 93928, pn 16300-1.	5-17
1A2M1-M2		METER: audio level, electrical indicator, power level, 1 in. dia, RD case style 05, 3900 ohms ±2 dB at -10 dB, ±1/2 dB at 0 dB, ±1 dB at +3 dB, mfr 81030, pn 3201-210.	5-15
1A2MP1-MP5		KNOB ASSEMBLY: Mfr 06845, pn 2058802-0501.	5-15
1A2MP6-MP9		KNOB, CONTROL: MIL Spec type MS91528-102B.	5-15
1A2MP10		KNOB: Dial skirted, white line, mfr 49956, pn 70-8WL2G.	5-15
1A2MP11		Not used	
1A2MP12-MP13		DIAL, MC: Mfr 06845, pn 4013395-0501.	5-15
1A2MP14		SPROCKET ASSEMBLY: Triple, complete with all parts, 58189, pn 666162-221	5-19
1A2MP14A		CHASSIS SPIDER: W/o gears and hardware, mfr 58189, pn 666162-134.	5-19
1A2MP14B-14G		BEARING SLEEVE: Mfr 70901, pn 2031154-0001.	5-19
1A2MP14H-14J		SPROCKET DRIVE: Pitch dia 1.411, pitch 0.1475, 30 teeth, mfr 72625, 58189, dwg 666273-099.	5-19
1A2MP14K-14M		DISK, COUPLING: 0.875 in. dia x 0.390 in. cres, mfr 58189, pn 666231-631 or 4030895-0001.	5-17
1A2MP14N-14Q		SPRING WASHER: 0.562 in. dia x 0.001 in. thk, mfr 73682, 58189, dwg 810000-506.	5-17
1A2MP14R-14W		RING, RETAINING: Mfr 96906, pn MS 16333-1819.	5-19
1A2MP14X-14Y		SHAFT, COUPLING: 0.1874 in. dia, 1.062 in. lg cres, mfr 58189, pn 666231-619 or 4030601-0501.	5-17
1A2MP14Z-14AB		RING, RETAINING: 0.472 in. od, 0.382 in. id, 0.025 in. thk, mfr 77339, pn TRC820.	5-19

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2MP14AC-14AE		CLAMP, SPROCKET: 0.344 in. w, 0.484 in. lg, 0.187 in. thk, mfr Metal Screw Products, Inc., pn A09455-001.	5-19
1A2MP14AF		SHAFT, COUPLING: 0.1874 in. dia, 1.328 in. lg, cres mfr 58189, pn 666231-617.	5-17
1A2MP14AG-14AI		PIN DOWEL: 96906 type no. MS16555-606.	5-17
1A2MP15		SPROCKET ASSEMBLY: Dual, with all parts 58189, pn 666162-222.	5-19
1A2MP15A		CHASSIS, SPIDER, STAKED: W/o gears and hardware, mfr 58189, pn 666163-116.	5-19
1A2MP15B-15C		Same as 1A2MP14AF.	5-17
1A2MP15D-15E		SPROCKET, DRIVE: 1.463 in. dia, pitch dia 1.411, teeth 30, mfr 72625, 58189, dwg 666162-066	5-19
1A2MP15F-15G		Same as 1A2MP14N	5-17
1A2MP15H-15L		Same as 1A2MP14B	5-19
1A2MP15M-15N		Same as 1A2MP14K	5-17
1A2MP15P-15S		SPACER: 0.48 in. lg x 0.300 in. w x 0.062 in. thk, brass 1/2 hard, mfr 58189, pn 666163-806.	5-19
1A2MP15T-15U		BEARING ROLLER, NEEDLE: 1.11/32 od, 3/16 in. id, 1/4 in. lg, mfr 60380, pn B34.	5-19
1A2MP15V-15W		PIN, ROLLER: 0.1875 in. dia, 0.400 in. lg, cres mfr 58189, pn 666163-114.	5-19
1A2MP15X-15Y		ARM, SPRING, ANGLED: 2.14 in. x 0.300 in. 0.38 in., mfr 58189, pn 666163-199.	5-19
1A2MP15Z-15AA		WHEEL INDEX: 1.24 in. dia, 10 lobes, cres, mfr 58189, pn 666163-115.	5-19
1A2MP15AB-15AC		SCREW CAP, HEX SOCKET: 4-40 x 0.375 in. lg, mfr 06432, 58189, dwg 2031168-0702.	5-19
1A2MP15AD-15AE		Same as 1A2MP14AC	5-17
1A2MP15AF-15AG		Same as 1A2MP14AG	
1A2MP16		BLOCK ADJUSTABLE IDLER ASSEMBLY LOW, WITH SPROCKET: Mfr 58189, pn 666162-094.	5-19
1A2MP16A		SHAFT, SPROCKET IDLER: 0.1875 in. dia, 0.64 in. lg, cres, 58189, pn 666162-073 or 4030871-0001.	5-19

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2MP16B		SPROCKET, WHEEL: Pitch 0.1475, teeth 24, dia 1.130, mfr 72625, 58189, dwg 666162-092.	5-19
1A2MP16C		Same as 1A2MP15T-15U	5-19
1A2MP17		Same as 1A2MP16	5-19
1A2MP17A		Same as 1A2MP16A	5-19
1A2MP17B		Same as 1A2MP16B	5-19
1A2MP17C		Same as 1A2MP16C	5-19
1A2MP18		BLOCK ADJUSTABLE IDLER ASSEMBLY HIGH, WITH SPROCKET: Mfr 58189, pn 666162-095.	5-19
1A2MP18A		Same as 1A2MP16A	
1A2MP18B		Same as 1A2MP16B	
1A2MP19		CHAIN: 19.7650 in., 0.1475 pitch, 134 pitches with master link, mfr 72625, pn CAV4147CL0019. 7650IN, 58189, dwg 666273-066.	
1A2MP19A		MASTER LINK WITH KEEPER AND CLIP: Mfr 72625, pn CAV4147CL00.	
1A2MP20		CHAIN: 10 KC, 30.9750 in., 0.1475 pitch, 210 pitches with master link, for 10 KC drive, mfr 72625, pn CAV4147CL00-30.9750IN, 58189, dwg 666162-201.	
1A2MP20A		Same as 1A2MP19A	
1A2MP21		CHAIN: 23.8950 in., 0.1475 pitch, 162 pitches with master link for 100 KC drive, mfr 72625, pn CAV4147CL0023. 8950IN, 58189, dwg 666162-202.	
1A2MP21A		Same as 1A2MP19A	5-19
1A2MP22		Not used.	
1A2MP23		MOUNTING KIT: For 1A2Q1, fabricate or procure.	5-19
1A2MP24-MP25		SPRING, DETENT: 58189, pn 666230-191	5-19
1A2MP26-MP27		PIN, BEARING: 0.1562 in. dia, 0.40 in. lg, mfr 58189, pn 666230-187.	5-19
1A2MP28-MP29		BEARING, ROLLER: Mfr 60380, pn B2-1-2-4.	5-19
1A2MP30-MP32		GEAR, MITER (PAIR): Diameteral pitch 64, teeth 32, pitch dia 500, mfr 00141, pn N2-1.	5-22
1A2MP33		SPROCKET, DRIVE: 30 teeth, pitch .1475 dia 1.411, od 1.463, mfr 72625, 06845, dwg 4030778-0701.	5-19
1A2MP34-MP35		SPROCKET, DRIVE: 36 teeth, pitch .1475, dia 1.692, mfr 72625, 58189, dwg 666162-109.	5-19

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2MP36-MP38		SHAFT, SUPPORT BRACKET GEAR, MACHINED: 0.171 in. dia x 2.122 in. lg, mfr 06845, pn 4030873-0001.	5-19
1A2MP39-MP40		SHAFT, MCS, MACHINED: 0.0619 in. dia, 1.76 in. lg, mfr 58189, pn 666231-235.	5-19
1A2MP41		DETENT SHAFT (1 KC): Mfr 76854, pn Type H Base Frame, 06845, dwg 4030604-0701.	5-19
1A2MP42-MP43		SHAFT, FEEDTHRU (10-100 KC): 0.625 in. dia x 2.296 in. lg, mfr 76854, dwg 666163-194.	5-19
1A2MP44-MP46		DIAL AND COLLAR ASSEMBLY (KCS): Mfr 58189 pn 666162-227.	5-22
1A2MP47-MP55		BEARING, BALL, ANNULAR: 0.422 in. OD x 0.1875 in. ID x 0.1406 in. thk, mfr 52676, pn SD1224VAC.	5-22
1A2MP56		PLATE STAKED (1 MHZ-KHZ): Mfr 06845, pn 4013365-0001.	5-15
1A2MP57		PLATE STAKED (10 MHz): Mfr 06845, pn 4013364-0001.	5-15
1A2MP58		LENS, INDICATOR LAMP (P/O X055): Mfr 11237, pn LC13YN.	5-15
1A2MP59		Not used	
1A2MP60		KNOB, VERNIER DIAL: Mfr 23480, pn 4030603-0001.	5-15
1A2MP61		KNOB, 000-500 CPS, VERNIER, Mfr 58189, pn 666230-706	5-15
1A2MP62-MP63		KNOB: Ms91528-1N2B.	5-15
1A2MP64-MP65		KNOB, LOCKING DEVICE: Mfr 49956, pn KL701G.	5-15
1A2MP66		ACTUATOR, INTERLOCK SWITCH, MODIFIED: Mfr 58189, pn 666230-745	5-22
1A2MP67-MP68		BUSHING, SHAFT, PANEL CODE GENERATOR: Mfr 06845, pn 2058974-0001.	5-15
1A2MP69		PLATE, VERTICAL SUPPORT AND SHIELD (for reference only): 15.544 in. lg, 2.40 in. w, 0.58 in. thk, mfr 06845, pn 2058966-0501.	5-17
1A2MP70-MP71		HANDLE, RECEIVER FRONT PANEL: Mfr 58189, pn 540542-019.	5-15
1A2MP72-79		Not used.	
1A2MP80		SPIRAL PIN: 1/16 in. dia. x 1/2 in. lg, MIL type MS39086-104.	5-22

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2Q1		TRANSISTOR: Case style A13, mfr 80131, pn 2N1209.	5-19
1A2R1, R2		RESISTOR, VARIABLE, LINEAR PRECISION: 1000 ohms ±10%, 1.265 in. dia, 1.156 in. thk, include 1A2R11 and 1A2R12 mfr 01121, pn JD1E056S102UA.	5-22
1A2R3		RESISTOR: MIL type RV4SAYSD102A.	
1A2R4, R5		RESISTOR: MIL type RV4SAYSD252C.	
1A2R6		RESISTOR: MIL type RV4SAYSD253C.	5-22
1A2R7		Not used (refer to 1A2A11R7)	
1A2R8		RESISTOR, FIXED WIREWOUND: 1.125 in. lg, x 0.646 in. x 0.317 in., 332 ohms ±3%, 5W, mfr 91637, pn RH5-330HMSPORM3PCT.	5-19
1A2R9, R10		RESISTOR: MIL type RC07GF122J.	5-22
1A2R11, R12		Refer to 1A2R1	5-22
1A2R13, R14		RESISTOR: MIL type RL07S433J.	5-22
1A2R15, R16		RESISTOR: MIL type RL07S112J.	5-22
1A2R17, R18		RESISTOR: MIL type RC07GF102J.	5-22
1A2R19		RESISTOR: MIL type RC07GF331J.	5-22
1A2R20		RESISTOR: MIL type RL42S133J.	5-19
1A2S1		SWITCH, TOGGLE: DPDT, 28 vdc, 120 vac, 0.469 in. dia, 1.281 in. lg, mfr 81640, pn TW2150.	5-22
1A2S2		SWITCH, ROTARY: 4 section, 18p, 8 position, non-shorting 1.350 in. od, 2.633 in. lg, mfr 76854, pn 276779K4.	5-22
1A2S3		Refer to 1A2A7	5-22
1A2S4		Refer to 1A2A7	5-22
1A2S5		Same as 1A2S1	5-22
1A2S6		SWITCH, ROTARY: 1 sect. 6P, 3 pos nonshorting 58189, pn 810000-424	
1A2S7		SWITCH, TOGGLE: MIL type MS35059-41.	5-23
1A2S8		INTERLOCK SWITCH: Mfr 91929, pn 11SM3T.	5-23
1A2S9		SWITCH, TOGGLE: MIL type MS24656-231.	5-23
1A2T1		TRANSFORMER, POWER: 4.500 in. h, 2.750 in. w, 3.438 in. deep, 14 terminals 48-450 cps, 215V max, mfr 91574, pn W5508.	5-17
1A2W1		COAX TYPE NO. 28 (Double Shield - Miniature 50 Ohms): Mfr 06090, Raychem pn 42-508 (used in various assemblies).	5-19
1A2W2		COAX TYPE RG196: (Used in various assemblies).	5-19

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CHASSIS, RECEIVER (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2W3		SHIELDED PAIR TYPE B NO. 20: MIL Type per MIL-W-16878C.	5-17
1A2XC1-XC2		SOCKET, TUBE OCTAL: Mfr 72825, pn 2729-38.	5-19
1A2XDS3-XDS4		Not used (refer to 1A2A10XDS-3).	5-22
1A2XDS5		HOUSING, LAMP INDICATOR: Mfr 72619, type LH74/2, 125 volts, 0.550 in. dia, 1.047 in. lg.	5-22
1A2XF1-XF2		FUSEHOLDER: MIL type FHL17G.	5-15

RECEIVER MODE SELECTOR ASSEMBLY

1A2A1		RECEIVER MODE SELECTOR ASSEMBLY: Mfr 58189, pn 666230-015 or mfr 06845 pn 4030939-0501 NOTE: This assembly is depot repairable. Piece Parts Listing is provided in The Technical Repair Standards Manual.	5-23

RECEIVER, INTERMEDIATE FREQUENCY/AUDIO AMPLIFIER ASSEMBLY

1A2A2		RECEIVER, INTERMEDIATE FREQUENCY/AUDIO AMPLIFIER ASSEMBLY: Mfr 58189, pn 666230-011 or mfr 06845, pn 4030674-0501. NOTE: This assembly is depot repairable. Piece Parts Listing is provided in The Technical Repair Standards Manual.	5-23

IF/AUDIO AMPLIFIER ASSEMBLY

1A2A3		IF/AUDIO AMPLIFIER ASSEMBLY: Mfr 58189, pn 666230-011 or mfr 06845, pn 4030674-0501. NOTE: This assembly is identical to 1A2A2. This assembly is depot repairable. Piece Parts Listing is provided in The Technical Repair Standards Manual.	5-23

RF AMPLIFIER ASSEMBLY

1A2A4		RF AMPLIFIER ASSEMBLY: Mfr 58189, pn A70229-001, mfr 06845 or 58189, pn 666230-029, or mfr 06845, pn 4030677-0501.	5-23

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

RF AMPLIFIER ASSEMBLY (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
		NOTE: This assembly is depot repairable except replacement of vacuum tubes. Piece Parts Listing is provided in The Technical Repair Standards Manual.	
1A2A4V1		TUBE, ELECTRON: MIL type 6BZ6	5-23
1A2A4V2		TUBE, ELECTRON: MIL type 6AN5WA	5-23

FREQUENCY STANDARD ASSEMBLY

1A2A5		FREQUENCY STANDARD ASSEMBLY: Mfr 58189, pn 666230-006, or mfr 58189, pn A70744-001 or mfr 06845, pn 4013399-0701, or 06845 pn 400015-0701. NOTE: This assembly is depot repairable. Piece Parts Listing is provided in The Technical Repair Standards Manual.	5-23

TRANSLATOR/SYNTHESIZER ASSEMBLY

1A2A6		TRANSLATOR/SYNTHESIZER ASSEMBLY: pn 666230-027 or A09496-001 NOTE: This assembly (of six sub-modules) is depot repairable. Piece Parts Listing is provided in The Technical Repair Standards Manual.	5-23

CODE GENERATOR ASSEMBLY

1A2A7		CODE GENERATOR ASSEMBLY (for use in Receivers only): Mfr 58189, pn 666230-794 or 809000-252 or mfr 06845, pn 809000-252 or 06845, pn 4030745-0501. The Code Generator Assembly (for use in Exciter (T-827( )/URT or Receiver R-1051( )/URR) mfr 58189, pn 666230-795 or 809000-253 or 06845, pn 4030746-0501.	5-23
1A2A7A1		PRINTED CIRCUIT BOARD (PCB) 1st (FRONT) SECTION: (For reference only), mfr 06845, pn 4030743-0501.	5-19
1A2A7A2		PCB, 2nd SECTION: (For reference only), mfr 06845, pn 4030937-0501	5-18
1A2A7A3		PCB, 3rd SECTION: (For reference only) Mfr 06845, pn 4030744-0501.	

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

CODE GENERATOR ASSEMBLY (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A7A4		PCB, 4th SECTION: (For reference only) Mfr 06845, pn 4030748-0501.	5-18
1A2A7A5		PCB, 5th SECTION: (For reference only) Mfr 06845, pn 4030740-0501.	5-18
1A2A7H1		SCREW, CAPTIVE: (For reference only) Mfr 58189, pn 666273-015.	5-18
1A2A7MP1		MOUNTING PLATE: (For reference only), 3.800 in. x 3.40 in. x 0.090 in. thk, mfr 58189, pn 666273-014	5-18
1A2A7MP2-MP3		COUPLING DISK 1 AND 10 MHz: (For reference only), 0.750 in. dia x 0.284 in., mfr 58189, pn 666231-236.	
1A2A7MP4-MP5		SHAFT, 1 AND 10 MHz: (For reference only), 0.210 in. dia x 1.76 in. lg mfr 58189, pn 666231-235.	5-18

POWER SUPPLY PRINTED CIRCUIT BOARD

1A2A8		POWER SUPPLY PRINTED CIRCUIT BOARD: With all parts mounted. Mfr 58189, pn 666230-755	5-19
1A2A8C1-C2		Not used	
1A2A8C3-C4		CAPACITOR: MIL type C1640K390MP3.	5-24
1A2A8C5		Not used	
1A2A8C6		CAPACITOR: MIL type CS13BF156K.	5-24
1A2A8C7		CAPACITOR, FIXED, TANTALUM: 0.765 in. lg x 0.375 in. dia, 120 uF, +75 -15%, 40 vdcw, mfr 14433, pn TO314-120MFD7500RM 15%.	5-24
1A2A8CR1-CR4		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N649.	5-24
1A2A8CR5 CR8		SEMICONDUCTOR DEVICE, DIODE: JAN 1N5550	5-24
1A2A8CR9		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N277.	5-24
1A2A8CR13-CR14		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N3024B	5-24
1A2A8CR15		Same as 1A2A8CR9	5-24
1A2A8CR16		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N963B.	5-24
1A2A8CR17		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N750A	5-24
1A2A8Q1		TRANSISTOR: MIL type 2N1131.	5-24
1A2A8Q2-Q4		TRANSISTOR: MIL type 2N697.	5-24
1A2A8R1		RESISTOR, FIXED: 47 ohms 1W MIL type RC32GF470J.	5-24
1A2A8R2		RESISTOR, FIXED: 120 ohms 1W MIL type RC32GF121J.	5-24
1A2A8R3		RESISTOR, FIXED: MIL type RC07GF101J.	5-24
1A2A8R4		RESISTOR, FIXED: MIL type MS35043-87.	5-24

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

POWER SUPPLY PRINTED CIRCUIT BOARD (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A8R5		RESISTOR, FIXED: MIL type MS35043-55.	5-24
1A2A8R6		RESISTOR, FIXED: MIL type RL07S302J.	5-24
1A2A8R7		RESISTOR, FIXED: MIL type RC07GF472J.	5-24
1A2A8R8		RESISTOR, FIXED: MIL type RC07GF821J.	5-24
1A2A8R9		RESISTOR, FIXED: MIL type RC07GF681J.	5-24
1A2A8R10-R11		Same as 1A2A8R7	5-24
1A2A8R12		RESISTOR, FIXED: MIL type RC07GF102J.	5-24
1A2A8R13		RESISTOR, FIXED: MIL type RC07GF152J.	5-24
1A2A8R14		RESISTOR, VARIABLE: 1.250 in. lg, 0.190 in W. dia. 500 ohms ±5%, mfr 80294, pn 224P1-501.	5-24
1A2A8R15		Same as 1A2R19	5-24

ANTENNA OVERLOAD PROTECTION PRINTED CIRCUIT BOARD ASSEMBLY

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A9		ANTENNA OVERLOAD PCB ASSEMBLY: Consists of 1A2A9A1 and 1A2A9A2 with all components mounted, mfr 52512, pn 123450	5-19
1A2A9A1		PRINTED CIRCUIT BOARD: (For reference only)	
1A2A9A1C1		CAPACITOR, FIXED CERAMIC:)0.001 uF, 500 volts dc, MIL-C-11015 type CK61Y102Z	5-25
1A2A9A1C2		CAPACITOR, FIXED GLASS: 5.1 pF, MIL-C-11272 type CY10C5R1C.	
1A2A9A1C3		CAPACITOR, FIXED GLASS: 3.0 pF, MIL-C-11272 type CY10C3ROC.	
1A2A9A1C4		CAPACITOR, TANTALUM ELECTROLYTIC: 4.7 uF, 50 volts dc, type CS13BG475K.	
1A2A9A1CR-CR2		CRYSTAL RECTIFIER: Silicon diode, type JAN 1N4148.	
1A2A9A1K1		RELAY: MIL-R-5757, type M5757/9-003, 26.4 vdc/ 700 ohms, Allied control RY4YY4B3P11.	
1A2A9A1Q1-Q2		TRANSISTOR: Type JAN 2N1613.	
1A2A9A1R1		RESISTOR, FIXED COMPOSITION: 27K ohm, 5%, 1/2W MIL-R-39008A, type RCR20G273JS	
1A2A9A1R2		RESISTOR, FIXED COMPOSITION: 39K ohm, 5%, 1/2W MIL-R-39008A, type RCR20G393JS.	
1A2A9A1R3		RESISTOR, FIXED COMPOSITION: 56K ohm, 5%, 1/4W MIL-R-39008A, type RCR07G563JS.	
1A2A9A1R4		RESISTOR, FIXED COMPOSITION: 12K ohm, 5%, 1/4W MIL-R-39008A, type RCR07G123JS.	5-25

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

PRINTED CIRCUIT BOARD ASSEMBLY (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A9A1R5		RESISTOR, FIXED COMPOSITION: 470 ohm, 5%, 1/4W MIL-R-39008A, type RCR07G471JS.	5-25
1A2A9A1R6		RESISTOR, FIXED COMPOSITION: 27K ohm, 5%, 1/4W MIL-R-39008A, type RCR07G273JS.	
1A2A9A1R7		Same as R4	
1A2A9A1R8		RESISTOR, FIXED COMPOSITION: 2700 ohm, 5%, 1/2W MIL-R-39008A type RCR20G272JS.	
1A2A9A1R9		RESISTOR, FIXED COMPOSITION: 220 ohm, 5%, 1/2W MIL-R-39008A type RCR20G221JS.	
1A2A9A1R10		RESISTOR, FIXED COMPOSITION: 5100 ohm, 5%, 2W MIL-R-39008A type RCR42G512JS.	
1A2A9A2		PLASTIC COVER BOARD: (For reference only) Includes 1A2A9A2CR3 thru CR6.	
1A2A9A2CR1-CR2		Not used	
1A2A9A2CR3-CR4		CRYSTAL RECTIFIER: Silicon diode, type JAN 1N4148.	
1A2A9A2CR5-CR6		ZENER DIODE: Type JAN 1N3029B.	5-25

LIGHT PANEL SUBASSEMBLY

1A2A10		LIGHT PANEL SUBASSEMBLY: pn 58189, pn 666230-235.	5-22
1A2A10DS1-S2		Not used	
1A2A10DS3-S4		LAMP: Mfr 72914, 28 volts, 0.04 amps, type A9906-1.	5-22
1A2A10XDS1-XDS2		Not used	
1A2A10XDS3-XDS4		SOCKET, LAMP: 0.437 in. dia, 0.563 in. lg, mfr 72914 pn A9905-4.	5-22

TABLE 6-2. MAINTENANCE PARTS LIST (Cont)

500 CPS-VERNIER ASSEMBLY

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A11		500 CPS CONTROL, PRINTED CIRCUIT BOARD: W/all components assembled for operation, mfr 58189, pn 666230-443	5-22
1A2A11C1		CAPACITOR, FIXED, METALIZED PAPER DIELECTRIC: 0.2 UF Porm 20 pct, 200 wvdc, mfr 02777, pn T2900-5	
1A2A11R1		RESISTOR, mil type RT22C2P103	
1A2A11R2		RESISTOR, FIXED, WIREWOUND: 10K ohms porm 3 pct, 1w, mfr 91637, pn RS1A103H	
1A2A11R3		RESISTOR: mil type RT22C2P202	
1A2A11R4		RESISTOR, FIXED, WIREWOUND: 5.6K ohms porm 3 pct, 1w, mfr 91637, pn RS1A562H	
1A2A11R5		RESISTOR, FIXED, WIREWOUND: 1.4K ohms porm 1 pct, mfr 91637, pn RS1A142F	
1A2A11R6		RESISTOR: mil type RC20GF475J	
1A2A11R7		RESISTOR: mil type RC20GF203J	5-22

TABLE 6-3. LIST OF MANUFACTURERS

MFR CODE	NAME	ADDRESS
00141	Pic Design Div Benrus Corp.	Ridgefield, CT
01121	Allen-Bradley Co. 1201 South 2nd Street	Milwaukee, WI
02289	HI-G Inc.	Windsor, CT
02777	Hopkins Engineering Co. 12900 Foothill Blvd.	San Fernando, CA 91342
05236	Jonathan Mfg. Co.	Fullerton, CA
06090	Raychem Corp.	300 Constitution Drive Menco Park, CA 94025
06432	All Craft Screw and Hardware Co.	Long Island, NY
06845	Bendix Corporation, The Communication Division	E. Joppard, Baltimore, MD 21204
08806	General Electric Co. Miniature Lamp Dept. Nela Park	Cleveland, OH 44112
11237	CTS Keene Inc.	Paso Robles, CA
13809	Merka Mfg. Co.	29-10 37th Ave. Long Island Cit, NY 11101
14433	ITT Semiconductors-Division of ITT Corp.	3301 Electronics Way, West Palm Beach, FL 33401
23480	Control Knobs, Inc.	Jamaica, NY
49956	Raytheon Co. Microwave and Power Tube Division Adminstration Bldg.	Waltham, MA 02154
52512	Astra Product Co. Inc. of Tampa	4901 Shetland Ave, Tampa, FL 33616
52676	SKF Industries, Inc.	P. O. Box 6731, Front St. and Erie Ave. Philadelphia, PA 19132

TABLE 6-3. LIST OF MANUFACTURERS (Cont)

MFR CODE	NAME	ADDRESS
56289	Sprague Electric Co.	North Adams, MA
58189	General Dynamics-Electronics Division	Rochester, NY
60380	Torrington Co. The 59 Field	Torrington, CT
70674	ADC Products Inc. 6325 Cambridge St.	Minneapolis, MN 55426
70901	Beemer Engineering Co.	Industrial Park Fort Washington, PA 19034
71279	Cambridge Thermionic Corp.	445 Concord Ave. Cambridge, MA 02138
71468	ITT Cannon Electric Inc. 3208 Humbolt St.	Los Angeles, CA 90031
72619	Dialight Corp. 60 Stewart Ave.	Brooklyn, NY 11237
72625	Amsted Industries, Inc. Diamond Chain Co. Division	402 Kentucky Ave. Indianapolis, IN 46225
72825	EBY Hugh H. Inc.	Philadelphia, PA
72914	Grimes Mfg. Co.	515 N. Russell Urbana, OH 43078
73682	Garrett George K. Co.	Philadelphia, PA
76854	Oak Mfg. Co. S. Main	Crystal Lake, IL
77339	National Lock Washer Co.	North Branch, NJ
77820	Bendix Corp. The Scintilla Division	Sidney, NY 13838
80131	Electronic Industries Association	Washington, DC
80294	Bourns Inc. 6135 Magnolia Ave.	Riverside, CA 92506
81030	International Instruments Inc. 88 Marsh Hill Road	Orange, CT 06477

TABLE 6-3. LIST OF MANUFACTURERS (Cont)

MFR CODE	NAME	ADDRESS
81312	Winchester Electronics Division Litton Industries, Inc.	Main St. and Hillside Ave. Oakville, CT 06779
81640	Control Switch Division Controls Co. of America	Folcroft, PA
83324	Rosan, Inc.	2901 W. Coast Highway Newport Beach, CA 92663
83508	Grant Pulley and Hardware	West Nyack, NY
86455	Penn Fibre and Specialty Co. Inc.	2032 E. Westmoreland St. Philadelphia, PA 19134
91146	ITT Cannon Electric Inc. Salem Division	Salem, MA
91574	Caledonia Electronics Division Electro Networks Inc.	Caledonia, NY
91637	Dale Electronics Inc.	Columbus, NE
91929	Honeywell Inc. Micro Switch Division	Chicago and Spring Streets Freeport, AL 61032
93928	Forbes and Wagner	345 Central Ave. Silver Creek, NY 14136
96906	Military Standards Promulgated by Military Departments Under Authority Of Defense Standardization Manual.	

SECTION 7

INSTALLATION

7-1. UNPACKING AND HANDLING.

7-2. Special procedures need not be followed when unpacking Radio Receiver R-1051/URR. Since the R-1051/URR is an accurately calibrated precision equipment, rough handling should be avoided. Handles are provided on the front panel for lifting or carrying the equipment. Extreme caution must be exercised when removing the unit from the packing container to prevent damage to the equipment and connectors.

7-3. POWER REQUIREMENTS.

7-4. The R-1051/URR is designed to operate from a nominal 115-vac, single-phase, 48- to 450-Hz power source.

7-5. SITE SELECTION.

7-6. In selecting a shipboard installation site, adequate consideration must be given to space requirements (figure 7-1). These requirements include space for servicing the slide-mounted equipment when extended from the cases, for shock-mount deflection, and for cable bends. For best results, the antenna should be mounted as high as possible above the ship's superstructure.

7-7. In selecting a shore installation site, similar considerations must be given to the space requirements. The antenna should be mounted high enough to clear any surrounding hills, woods, or building. In addition, the antenna should be located as far as possible from any high-power transmission lines or hospitals to prevent interference.

7-8. INSTALLATION REQUIREMENTS.

7-9. CONSIDERATIONS. The following factors should be considered when determining the proper location for the R-1051/URR:

a. Best operating conditions.

b. Ease of maintenance, adjustment of equipment, and replacement and repair of defective parts.

c. Possibility of interaction between the R-1051/URR and other electronic equipment in the vicinity.

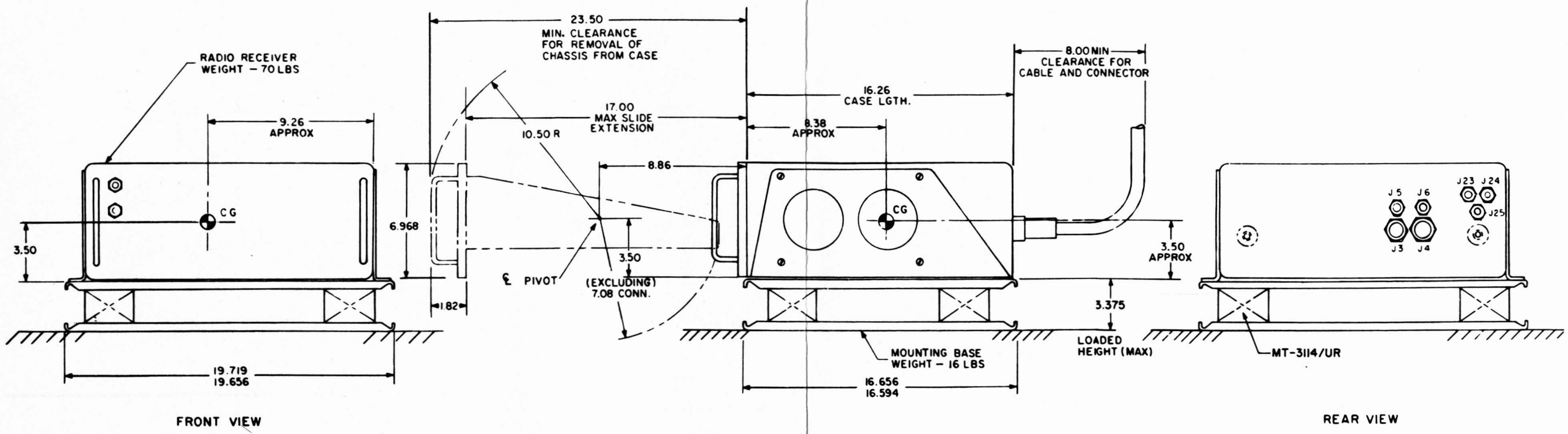
d. Critical and minimum cable length requirements.

e. Adequate heat dissipation.

f. Availability of a good system ground.

7-10. INSTALLATION. The R-1051/URR may be installed independently in any convenient location, using Shock Mount MT-3114/UR aboard ship. The R-1051/URR may be mounted in a standard 19-inch rack by means of adapter plates. For all required installation dimensions, see figure 7-1. Figure 7-2 illustrates the mounting bracket used for rack mounting the R-1051/URR. The completed shock-mounted installation is shown in figure 7-3.

7-11. If the R-1051/URR is to be installed



NOTES:

1. SHOCK MOUNT MT-3114/UR IS USED ONLY WHEN THE R-1051 IS INSTALLED AS AN INDEPENDENT UNIT.
2. REFER TO NAVSHIPS RED2686359 FOR DETAIL INSTALLATION DATA ON THE R-1051B/URR.
3. WHEN THE R-1051B IS MOUNTED IN A CY-4516A/U ELECTRICAL EQUIPMENT CABINET, ORDER MK-979/URR INSTALLATION HARDWARE KIT FROM THE NAVY SUPPLY SYSTEM.

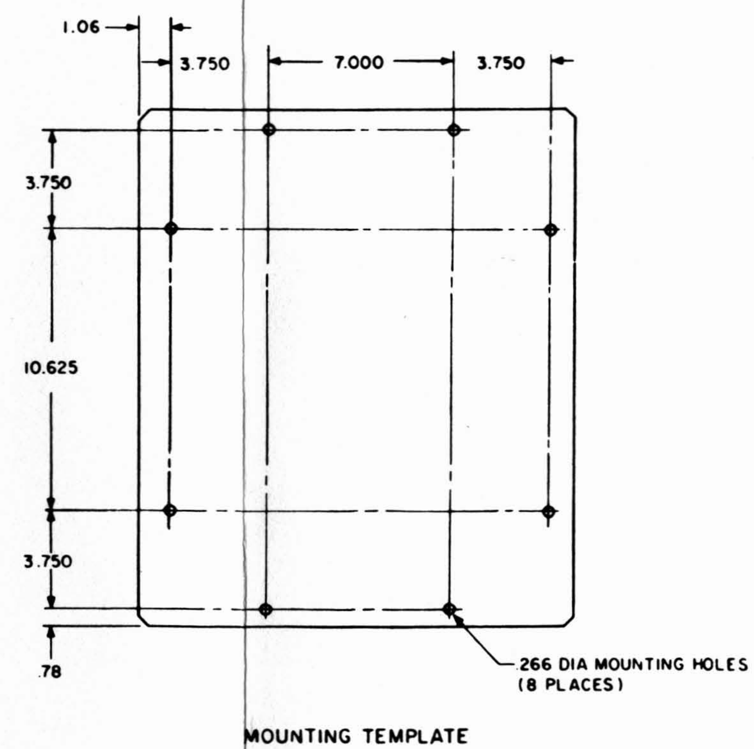
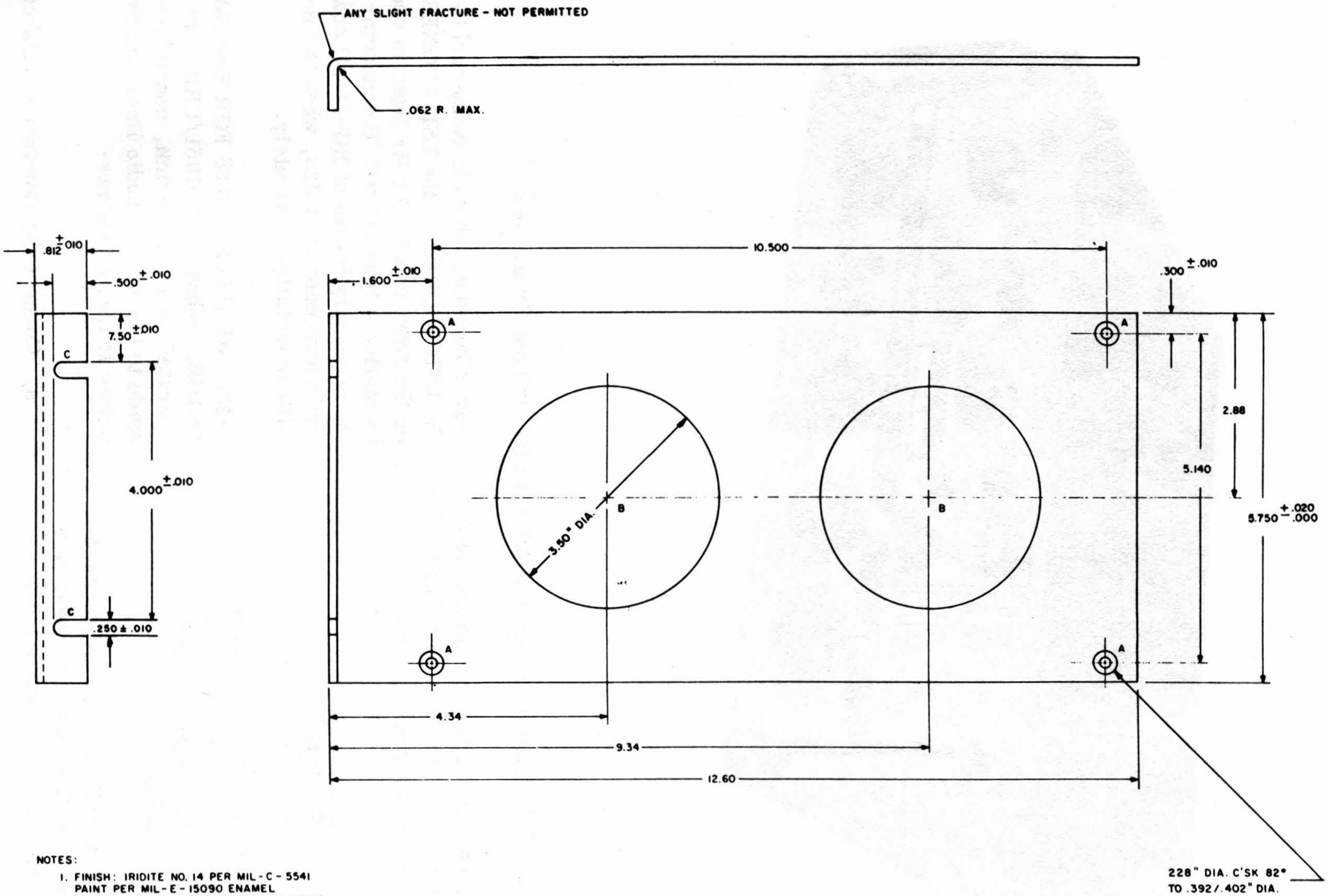


Figure 7-1. Radio Receiver R-1051/URR, Outline and Mounting Dimensions



NOTES:

1. FINISH: IRIDITE NO. 14 PER MIL-C-5541 PAINT PER MIL-E-15090 ENAMEL EQUIPMENT, LIGHT GRAY (FORMULA NO 11)
2. MATERIAL .125" THICK ALUMINUM ALLOY 5052-H32 PER QQ-A-318
3. NOT SUPPLIED. IF REQUIRED, INSTALLATION ACTIVITY MUST FABRICATE

Figure 7-2. Radio Receiver R-1051/URR, Mounting Bracket for Rack Mounting

Figure 7-3. Radio Receiver R-1051/URR, Oblique Front View

as part of a system such as Radio Set AN/WRC-1, refer to Section 7 of NAVELEX 0967-LP-971-0010 for instructions.

WARNING

To avoid injury to personnel, do not overstress mounting bolts, since shock may cause them to shear.

7-12. INTERCONNECTION. All connections are made at the rear of the unit (see figure 7-4) with the exception of the receiver headset, which is connected to either the USB PHONES or the LSB PHONES jack on the front panel. An RF input is obtained by mating a type UG-941/U connector and the necessary length of RG-215/U coaxial cable with connector J23, when the R-1051/URR is installed separately.

7-13. REQUIREMENTS FOR SPECIAL USAGE. When the R-1051/URR is to be operated as a remote unit, connection is made to the remote audio lines and the power source as follows:

a. Connect the receiver switchboard

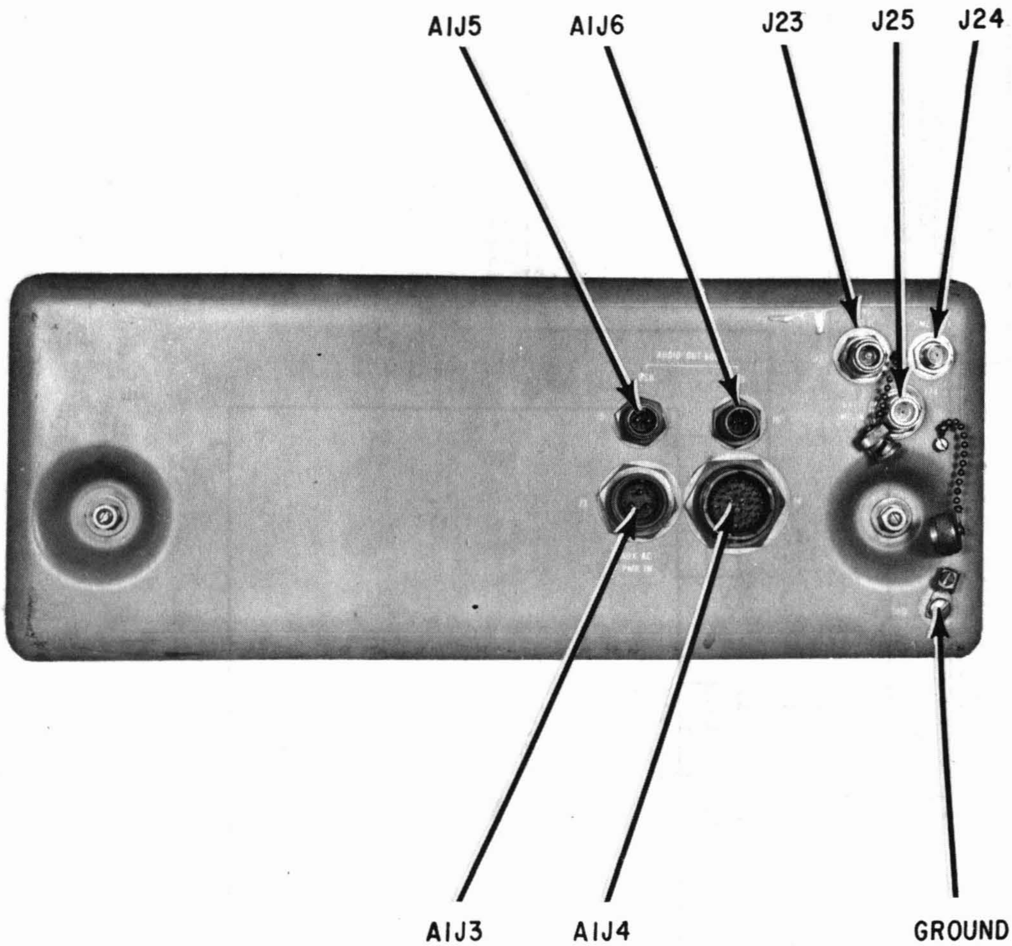


Figure 7-4. Radio Receiver R-1051/URR, Rear View, Connectors

remote audio lines to connectors J5 (USB) and J6 (LSB) on the rear of the R-1051/URR, using type MS-3106J165-5S connectors.

b. Connect the power source to connector J3 (AUX AC PWR IN) on the rear of the R-1051/URR.

c. Loosen front-panel screws and slide the R-1051/URR chassis from the case.

d. Set switch S7 (AUX/NORM) to AUX. This switch is located just behind the front panel on the left.

e. Slide chassis back into case and secure it.

7-14. When the R-1051/URR is to be operated as an independent unit, connect all cables as shown in figure 7-5. When the R-1051/URR is to be operated as part of a system, refer to Section 7 of NAVELEX 0967-LP-971-0010 for instructions.

7-15. If it is required to use an external frequency standard for operation of the

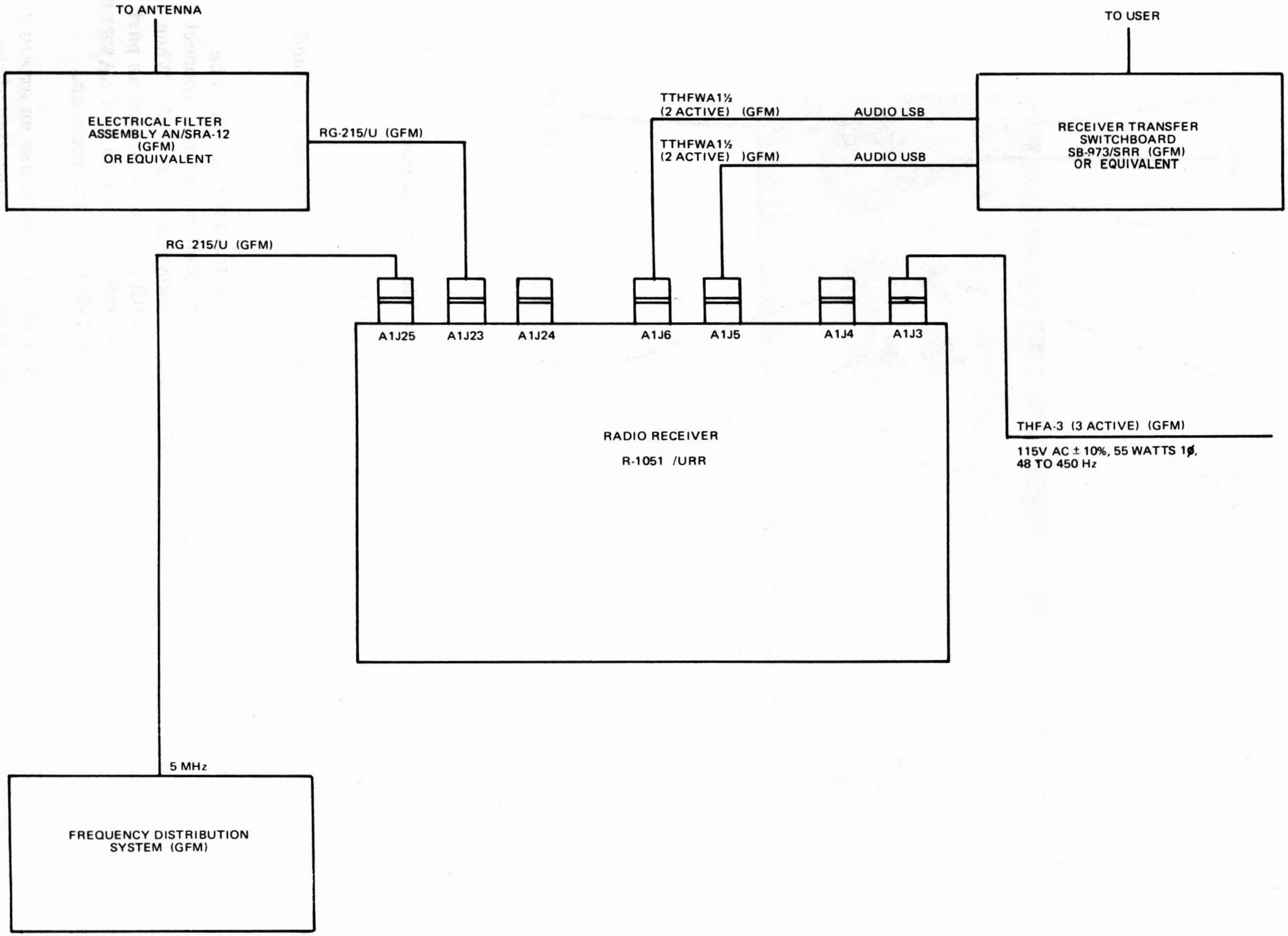


Figure 7-5. Radio Receiver R-1051/URR, Typical Interconnection Diagram

R-1051/URR, proceed as follows:

a. Connect the output from the external frequency standard to connector J25 (EXT 5 MC IN) on the rear of the R-1051/URR.

b. Loosen front-panel screws and slide the R-1051/URR chassis out from the case.

c. Set switch S1 (COMP/INT/EXT) on top of the Frequency Standard Electronic Assembly to EXT. This electronic assembly is located at the right rear of the chassis.

d. Slide the chassis back into the case and secure it.

7-16. If it is required to use the output from the Frequency Standard Electronic Assembly to operate another unit, proceed as follows:

a. Loosen front-panel screws and slide the R-1051/URR chassis out from the case.

b. Set switch S1 (COMP/INT/EXT) on top of the Frequency Standard Electronic Assembly to COMP. This electronic assembly is located at the right rear of the chassis.

c. Slide chassis back into case and secure it.

d. Connect cable between connector J24 (INT 5 MC OUT) on the rear of the R-1051/URR and the frequency standard input connector in the other unit.

7-17. If it is required to use an external frequency standard for calibration, proceed as follows:

a. Connect the output from the external frequency standard to connector J24 (EXT 5 MC IN) on the rear of the R-1051/URR.

b. Loosen front-panel screws and slide R-1051/URR chassis out from case.

c. Set switch S1 (COMP/INT/EXT) on top of the Frequency Standard Electronic Assembly to COMP. This electronic assembly is located at the right rear of the chassis.

d. After performing the required calibration, set switch S1 back to required position (Ext normal when Ext 5 MHz is available and installed).

e. Slide chassis back into case and secure it.

7-18. If the internal frequency standard is to be used for operation, ensure that switch S1 (COMP/INT/EXT) on top of the Frequency Standard Electronic Assembly is set to INT. This electronic assembly is located at the right rear of the chassis.

7-19. If the R-1051/URR is to be used in simplex operation, connect all cables as shown in figure 7-5. Then proceed as follows:

a. Loosen front-panel screws and slide the R-1051/URR chassis out from the case.

b. Set switch S9 (SIMPLEX/DUPLEX) to SIMPLEX. This switch is located just behind the front panel on the left.

c. Slide chassis back into case and secure it.

7-20. If the R-1051/URR is to be used in duplex operation, proceed as follows:

a. Ensure that connector J23 (ANT 50 Ω) on the rear of the R-1051/URR is connected to an antenna different from the one connected to the antenna coupler.

b. Loosen the front-panel screws and slide the R-1051/URR chassis out from the case.

c. Set switch S9 (SIMPLEX/DUPLEX) to DUPLEX. This switch is located just behind the front panel on the left.

d. Slide the chassis back into the case and secure it.

7-21. The audio transformers in the R-1051/URR (located in the Receiver IF/ Audio Electronic Assemblies) do not have grounded center taps as supplied. If it is required that these transformers work into a balanced, grounded, center-tap circuit, proceed as follows:

CAUTION

Do not ground center taps if working into an unbalanced circuit.

a. Loosen front-panel screws and slide chassis out from the case.

b. Tilt chassis up 90 degrees to expose bottom. Refer to figure 5-21 and locate J18 and J19.

c. Refer to figure 5-3 and perform the steps outlined in note 3 on that schematic.

d. Tilt the chassis back to horizontal, release slide locks, slide chassis back into case, and secure it.

7-22. <u>INSPECTION AND ADJUSTMENT.</u>

7-23. INSPECTION. Because of the design and construction of the R-1051/URR, relocation should have little or no effect on adjustment. Since the R-1051/URR is in an operational condition when packed, inspect for the following before applying power:

a. External damage to indicators, switches, lamps, and connectors.

b. Verify that tubes V1 and V2 in RF Amplifier Electronic Assembly A2A4 are secure in their respective sockets.

7-24. ADJUSTMENT. After installation, refer to Maintenance Standards Book, NAVELEX 0967-LP-970-9050, and use the procedures therein outlined to check out the R-1051/URR. Before applying power, ensure that all cables are properly connected and that all fuses are in place. Also, ensure that the following switches are in the proper positions, according to the type of operation required:

a. S9 (SIMPLEX/DUPLEX).

b. S7 (AUX/NORM).

c. A5S1 (COMP/INT/EXT).

7-25. INTERFERENCE REDUCTION. As a precaution against possible interference, operate the R-1051/URR with drawer fully closed and with front-panel mounting screw tightened. Verify that the R-1051/URR is properly grounded.

7-26. PERFORMANCE CHECKS. Refer to Section 5 and perform the applicable operating procedures to ensure proper installation.

ALPHABETICAL INDEX

ALPHABETICAL INDEX

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