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NAVAIR 16-30ARC52-502

Handbook
Service Instructions

RADIO SET
AN/ARC-52
RADIO SET
AN/ARC-52X
AND
AUTO RELAY CONTROL
C-2791/ARC

BASIC AND ALL CHANGES HAVE BEEN COLLATED TO MAKE THIS A COMPLETE PUBLICATION

PUBLISHED BY DIRECTION OF
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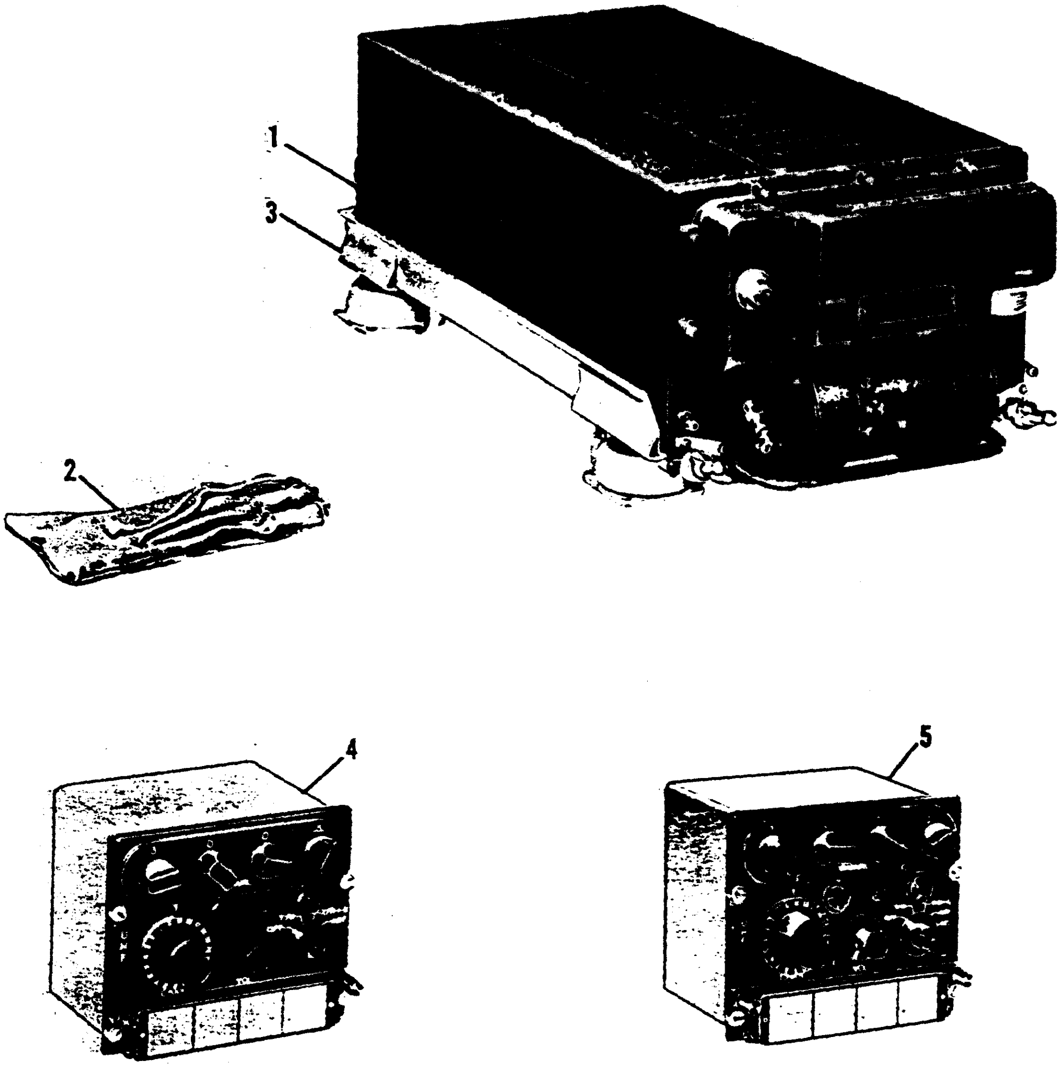


1 Receiver-Transmitter RT-332/ARC-52 or RT-424/ARC-52X
2 Tool Kit
3 Mounting MT-1477/ARC-52
4 Radio Set Control C-1607/ARC-52
5 Auto Relay Control C-2791/ARC

Figure 1-1. Radio Set AN/ARC-52, Radio Set AN/ARC-52X, and Auto Relay Control C-2791/ARC

INTRODUCTION

This service handbook is prepared for use by organizational and field maintenance personnel to aid in understanding and performing maintenance and service procedures on Radio Set AN/ARC-52, Radio Set AN/ARC-52X and Auto Relay Control C-2791/ARC. Repair, replacement, adjustment, and recalibration of the equipment is limited to organizational and field maintenance activities using common tools, test equipment, and spare parts authorized in allowance lists and special tools and test equipment listed in Section II of this handbook. For information concerning repair of mechanical components, refer to NavAir 16-30ARC52-503, Handbook of Overhaul Instructions, Radio Set AN/ARC-52. For information concerning any detail part of the equipment, refer to NavAir 16-30ARC52-504, Illustrated Parts Breakdown, Radio Set AN/ARC-52. This handbook is prepared in accordance with Specifications MIL-H-6757A(ASG) and MIL-H-5474A and conforms to applicable portions of the following specifications.

MIL-STD-15	Electrical and Electronic Symbols
MIL-STD-16	Reference Designations for Electrical and Electronic Symbols
MIL-STD-122	Color Code for Chassis Wiring for Electronic Equipment
ANA Bulletin 261	Abbreviations and Contractions: Approved list of

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. SCOPE OF HANDBOOK.

1-2. This publication comprises service instructions for Radio Set AN/ARC-52, Radio Set AN/ARC-52X, and Auto Relay Control C-2791/ARC manufactured in accordance with provisions of contracts NOas 57-478, NOas 59-0165, NOw 60-0088-a, NOw 61-0516, NOw 61-0785, N383(19-383)73759A, N383(19-383)77036A, N383(19-383)77603A, NOw 62-0416, N383(19-383) 84878A, N383(19-383)85242A, N383(19-383)86964A, N383(19-383)88171A, N383(19-383)88769A, NOw 66-0370, and N00383-67-C-3054. Except where specific differences are noted, all references to Radio Set AN/ARC-52 apply also to Radio Set AN/ARC-52X.

1-2A. In addition to the differences between AN/ARC-52 and AN/ARC-52X equipment, improvements in equipment design have been effected which have resulted in differences within the plug-in modules. Design variations within modules of a given type and series are noted in this handbook. These variations are distinguished by numerical module identification.

1-3. PURPOSE AND USE OF EQUIPMENT.
(See figure 1-1.)

1-4. The major components of Radio Set AN/ARC-52 are described in paragraph 1-16. Radio Set AN/ARC-52 provides 2-way, amplitude-modulated (AM), radio-telephone (A-3) communication between aircraft inflight, aircraft and shore, and aircraft and ship. The AN/ARC-52 is capable of transmitting and receiving on any one of 1750 manually selected frequency channels, spaced at 100-kc intervals, in the 225.0-mc to 399.9-mc band. Radio Set Control C-1607/ARC-52 permits selection of any one of 18 preset channels within the specified frequency range or the guard channel, which may be monitored on a predetermined frequency of 243.0 mc. Auto Relay Control C-2791/ARC (also referenced as Radio Set Control C-2791/ARC) is an alternate control that makes possible the use of Receiver-Transmitter RT-332/ARC-52 or RT-424/ARC-52X for automatic relay operation. Unless otherwise noted, Auto Relay Control C-2791/ARC may be used interchangeably where Radio Set Control C-1607/ARC-52 is referenced, and Receiver-Transmitter RT-424/ARC-52X is used interchangeably where Receiver-Transmitter RT-332/ARC-52 is referenced.

NOTE

The following six channels are unusable because of internally generated interference: 242.1 mc, 287.1 mc, 322.8 mc, 339.0 mc, 246.6 mc, and 253.3 mc.

1-5. Automatic direction-finding (adf) operation is provided by the AN/ARC-52 when used in conjunction with Direction-Finder Group AN/ARA-25. During adf operation, the AN/ARC-52 receives radio-frequency (r-f) signals from a direction-finding antenna and delivers appropriate signal components to direction-finder amplifying and indicating equipment.

1-6. Emergency or direction-finding (df) operation is provided by a self-generated tone that occurs between 920 and 1120 cycles. This tone modulates the r-f output of the transmitter section to develop a continuous, tone modulated (A-2) output signal, which may be intercepted to locate the sending apparatus.

1-7. Automatic relay operation may be provided by two Radio Sets AN/ARC-52 connected in tandem between two prime stations. However, to provide this operation, Auto Relay Control C-2791/ARC must be substituted for Radio Set Control C-1607/ARC-52 for use with at least one of the two Radio Sets AN/ARC-52. When connected in this manner, an incoming signal received on one radio set is retransmitted automatically from the second radio set but on an alternate frequency. When used in this service, the range of the prime stations is extended since the AN/ARC-52 effectively increases the line of sight between two prime stations.

1-8. An intercom provision is an optional facility that can be connected for use if the separate intercom amplifier system of the aircraft fails. When operated in this mode, the transmit function of Radio Set AN/ARC-52 is limited to the pilot only, unless special connections are included at the time of intercom installation.

1-9. Optimum performance of Radio Set AN/ARC-52 may be attained by using either a carbon or a dynamic microphone, which provides a high degree of flexibility in the AN/ARC-52. A change of connections within Receiver-Transmitter RT-332/ARC-52 is required when a change from a carbon type microphone to a dynamic type of microphone (and vice versa) is made.

1-10. Receiver-Transmitter RT-332/ARC-52 may be installed anywhere within the aircraft by using Mounting MT-1477/ARC-52. Since installation is thus permitted in any area, usually not in the pressurized aircraft cabin, the cabinet of RT-332/ARC-52 has been designed as a pressurized case. The pressurized case and relatively inaccessible location of the RT-332/ARC-52 prohibits replacement or repair of equipment parts while in flight. Radio Set Control C-1607/ARC-52 does not require a pressurized case.

1-11. EQUIPMENT SUPPLIED.

1-12. Equipment supplied with Radio Set AN/ARC-52 is illustrated in figure 1-1 through 1-5 and is listed in table I. Differences between Receiver-Transmitter RT-332/ARC-52 and RT-424/ARC-52X are noted. With the exception of the main chassis and case, all equipments indented under Receiver-Transmitter RT-332/ARC-52 are plug-in type modules.

1-13. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-14. Equipment required for operation of Radio Set AN/ARC-52 but not supplied is listed in table II.

1-15. Various signal outputs, derived from the AN/ARC-52, can be made available to the parent system. Depending upon the existing tactical situation, the parent system may make use of any of these outputs. However, to develop the full combined system capability using these outputs, the parent system must provide equipments not normally supplied with the AN/ARC-52. These specialized equipments include a junction box (J-17A/ARC-5 or equivalent) to terminate all outputs at a single convenient point, an on-off (tone) switch for emergency or df operation, Direction-Finder Group AN/ARA-25 for adf operation, Auto Relay Control C-2791/ARC for automatic relay operation, microphones, and headsets or loudspeakers.

1-16. DESCRIPTION OF MAJOR COMPONENTS.

1-17. Radio Set AN/ARC-52 (figure 1-1) consists of Receiver-Transmitter RT-332/ARC-52, Radio Set Control C-1607/ARC-52, and Mounting MT-1477/ARC-52.

1-18. Radio Set AN/ARC-52X consists of Receiver-Transmitter RT-424/ARC-52X, Radio Set Control C-1607/ARC-52, and Mounting MT-1477/ARC-52.

NOTE

Although not supplied as a component of either radio set, Auto Relay Control C-2791/ARC is interchangeable with Radio Set Control C-1607/ARC-52, which is normally supplied.

1-19. The two receiver-transmitter units operate identifically and are completely interchangeable when correct input power is present. The only difference between the two receiver-transmitters is the input power required. Receiver-Transmitter RT-332/ARC-52 requires both a-c and d-c power, but Receiver-Transmitter RT-424/ARC-52X requires only d-c power.

1-20. RECEIVER-TRANSMITTER RT-332/ARC-52.

1-21. The RT-332/ARC-52 (figures 1-1 and 1-2) consists of a pressurized aluminum case, a main chassis, and 13 plug-in unit subassemblies (modules).

1-22. The main chassis, with mounted subassemblies, is enclosed in a double-walled, pressurized aluminum case, which functions as a heat exchanger between the outside air and the air within the case. Air is forced between the walls of the case by a dual a-c blower mounted on the front panel of the main chassis. The air is expelled through vents in the top of the case, thus dissipating heat absorbed by the inner walls of the case. An axial-flow blower and a blower mounted on the a-c power unit circulate air inside the case.

1-23. The modules, each of which is a functional entity, are comparatively accessible so that module replacement may be used as an initial trouble-shooting procedure. The mounting base for the modules is the main chassis, which provides interunit electrical connections, plugs, jacks, and coaxial cables. The modules may be removed from the top of the main chassis by loosening the captive screws located on the underside of the main chassis.

1-24. The front panel of the RT-332/ARC-52 contains the external blower and the antenna input connector. Headset and microphone jacks, test jacks, and sensitivity controls are located on the main chassis right-hand gusset plate. All jacks and controls on the gusset plate provide local maintenance facilities for the AN/ARC-52 repairman.

1-25. RECEIVER-TRANSMITTER RT-424/ARC-52X.

1-26. The RT-424/ARC-52X (figure 1-3) is identical to the RT-332/ARC-52 except that the RT-424/ARC-52X contains only 12 plug-in unit subassemblies (modules). The a-c power unit and rectifier unit used in the RT-332/ARC-52 are removed, and a dynamotor power supply unit is installed in the space thus provided. Circulating air is provided by a blower on the dynamotor and by an external, d-c motor driven blower (in place of the dual a-c blower) located on the front panel.

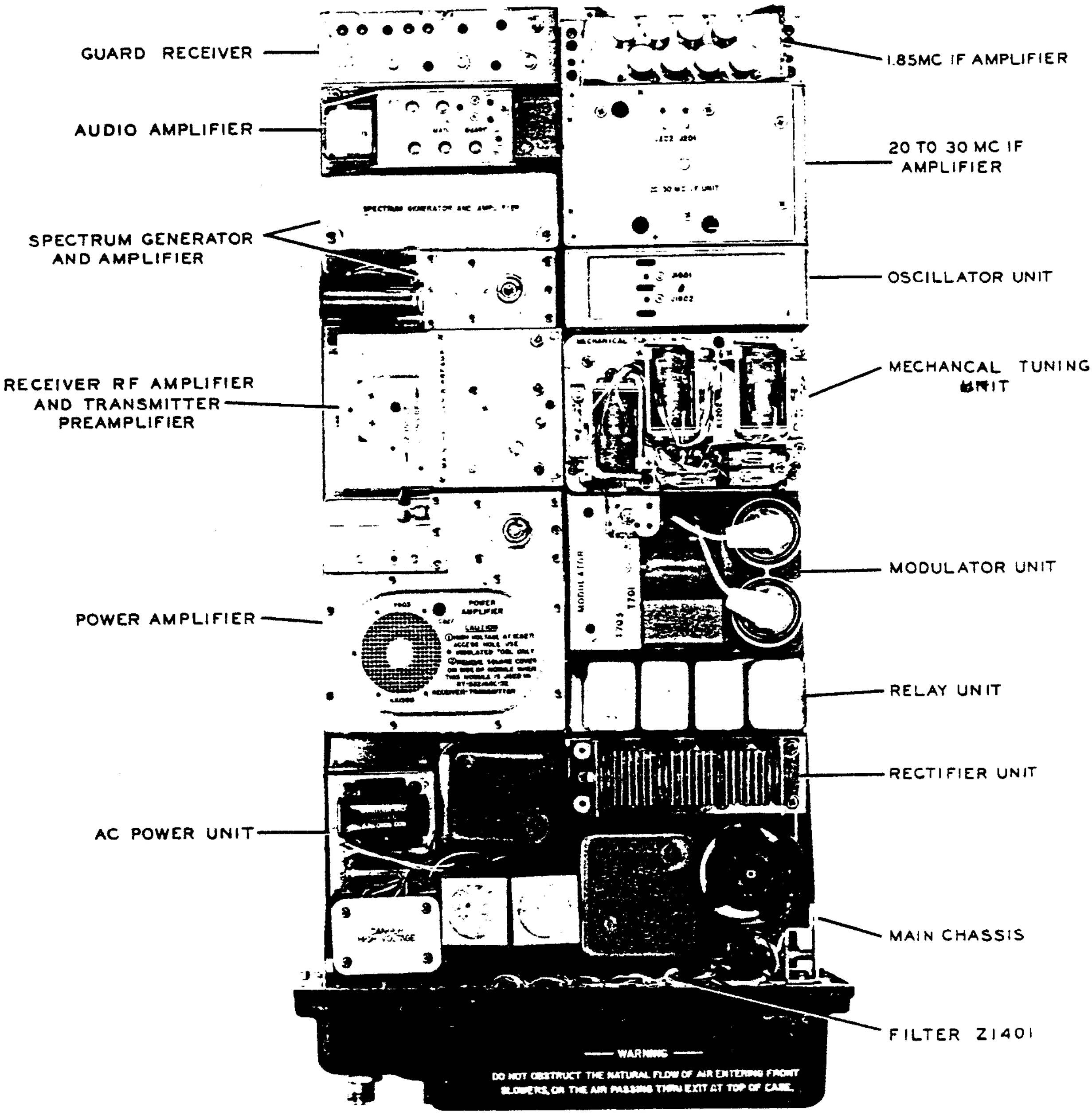


Figure 1-2. Receiver-Transmitter RT-332/ARC-52, Location of Units

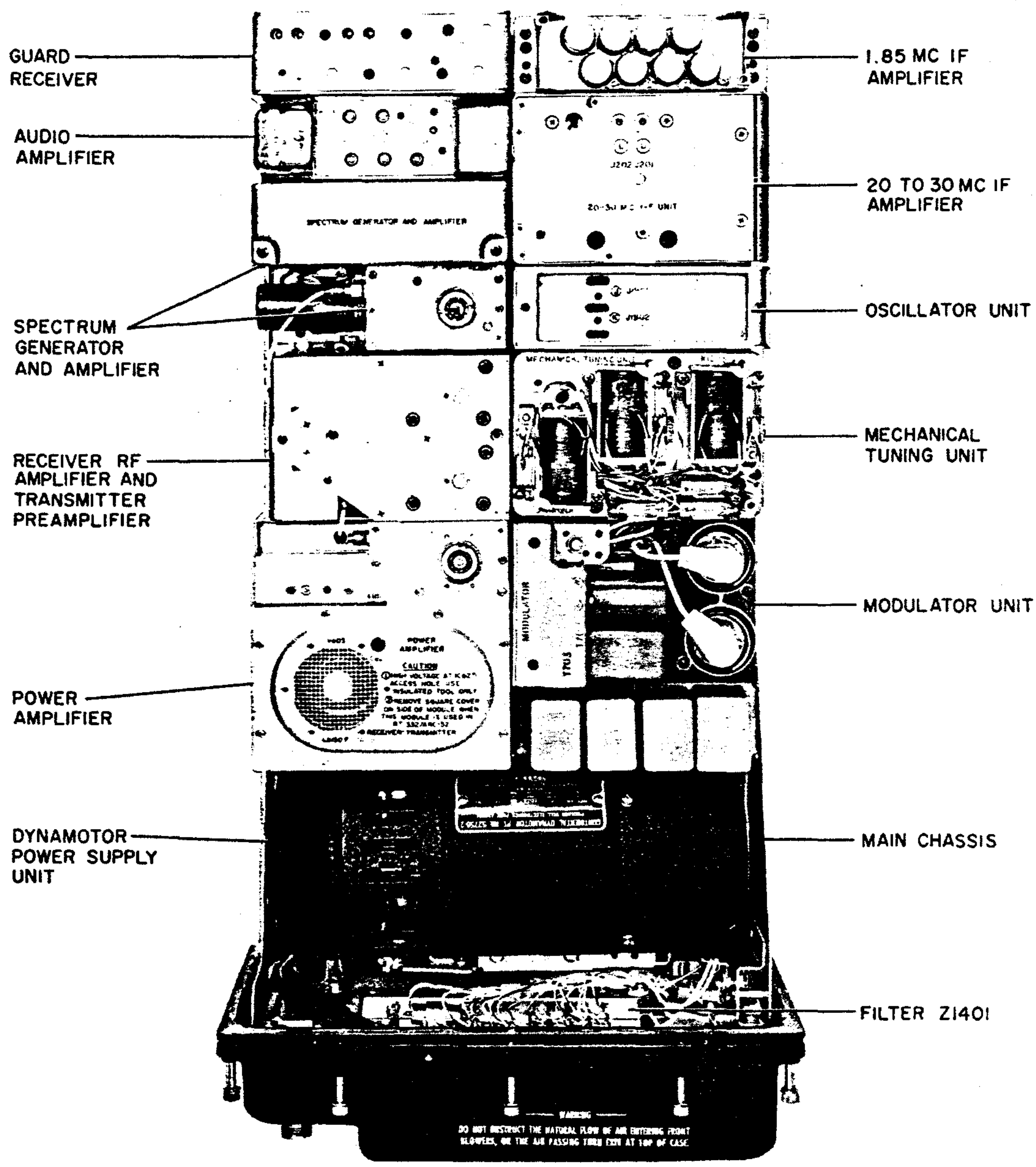


Figure 1-3. Receiver-Transmitter RT-424/ARC-52X, Location of Units

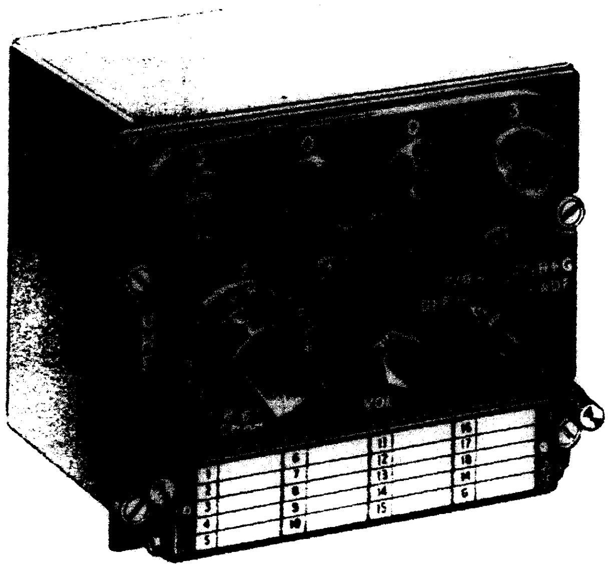


Figure 1-4. Radio Set Control C-1607/ARC-52

TABLE I. EQUIPMENT SUPPLIED

QUANTITY	NOMENCLATURE	REFERENCE DESIGNATOR
1	Receiver-Transmitter RT-332/ARC-52	
	Comprising:	
1	Main chassis	1500
1	Receiver r-f amplifier and transmitter preamplifier	1-122
1	20- to 30-mc i-f amplifier	200
1	1.85 mc i-f amplifier	300
1	Audio amplifier	400
1	Spectrum generator and amplifier	500
1	Power amplifier	600
1	Modulator	700
1	Guard receiver	800
1	Relay unit	900
1	Rectifier unit (RT-332/ARC-52 only)	1000
1	Dynamotor power supply unit (RT-424/ARC-52X only)	1000
1	A-c power unit (RT-332/ARC-52 only)	1100

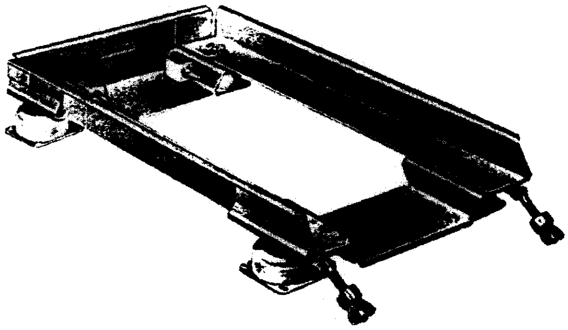


Figure 1-5. Mounting MT-1477/ARC-52

TABLE I. EQUIPMENT SUPPLIED (Cont)

QUANTITY	NOMENCLATURE	REFERENCE DESIGNATOR
1	Mechanical tuning unit	1200
1	Front panel	1400
1	Oscillator	1900
1	Case	
1	Radio Set Control C-1607/ARC-52	1800
1	Mounting MT-1477/ARC-52	
1	Tool Kit	
	Comprising:	
1	Tool bag	
1	Tuner tool	
1	Phillips screwdriver No. 1	
1	Tuner tool	
1	Adjusting tool	
1	Trimmer adjusting tool	
1	Hex socket wrench No. 8	
1	Bristol wrench No. 2	
1	Bristol wrench No. 4	
1	Bristol wrench No. 6	
1	Bristol wrench No. 8	

TABLE II. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY	NOMENCLATURE	CHARACTERISTICS
1	D-c prime power supply	†Twelve-cell, lead-acid storage batteries and engine-driven, d-c generator with negative pole grounded. Maximum load is approximately 8.0 amperes at 27.5 volts. *Twelve-cell, lead-acid storage batteries and engine-driven, d-c generator with negative pole grounded. Maximum load is approximately 15 amperes at 27.5 volts.
1	†A-c prime power supply	Three-phase, 400 cps, 115 volts, 450 volt-amperes.
1	Antenna AT-141 ARC-27 or equivalent	50-ohm, broadband type with standing-wave ratio of 2:0 or less, within frequency limits of 225.0 to 399.9 mc.
1	Headset H-1/AR or equivalent	Helmet type.
1	Microphone NAF21364-6 or equivalent (carbon)	Hand-held type.
1	Microphone ANB-MC1 or equivalent (dynamic)	Hand-held type.
1	R-F Cable RG-8 U	52 ohms impedance. Cable designated W1 terminates in P1402 of Receiver-Transmitter RT-332 ARC-52 and in Antenna AT-141 ARC-27 or equivalent
1	Multiwire cable	Cable designated W2 terminates in P1401 of RT-332 ARC-52 and in P1801 of C-1607 ARC-52.
1	Cable	Cable designated W3 interconnects RT-332 ARC-52 and automatic direction-finder equipment when latter equipment is used. Cable W3 branches off from cable W2.
1	Connector UG-21B U	Connector designated P1402 connects RG-8 U cable W1 to RT-332 ARC-52
1	Connector Amphenol 165-44 or equivalent	Connector designated P1401 connects cable W2 to RT-332 ARC-52.
1	Connector Cannon K03-21-30SN or equivalent	Connector designated P1801 connects cable W2 to C-1607/ARC-52.
1	Clamp Cannon K06-21-5 8	Used on P1801.
1	Connector Bendix PB06E-22-55S	Connector designated P2101 connects cable W2 to C-2791 ARC
1	Connector AN3108-22-14S	Connects cable W3 to automatic direction-finder equipment when used.
1	Clamp AN3057-12	Used on AN3108-22-14S connector.

†RT-332/ARC-52 only
*RT-424/ARC-52X only

1-27. RADIO SET CONTROL C-1607/ARC-52.

1-28. The C-1607/ARC-52 (figure 1-4) permits remote control of RT-332/ARC-52 operation. This control provides for selection of operational mode, volume control, frequency channel selection (channeling), setting up and recording the preset frequency channels.

1-29. MOUNTING MT-1477/ARC-52.

1-30. The MT-1477/ARC-52 (figure 1-5) provides a shock-absorbing installation for the RT-332/ARC-52 permitting rapid removal of the unit, an advantage either in troubleshooting or replacement.

1-31. AUTO RELAY CONTROL C-2791/ARC.

1-32. The C-2791/ARC performs all the functions of Radio Set Control C-1607/ARC-52 and additionally provides automatic relay (back-to-back) operation of two Radio Sets AN/ARC-52. The only visual difference between the radio set control and the auto relay control is the addition of an REL position on the function switch. By the use of internal relays and other additional detail parts, the C-2791/ARC can place two receiver-transmitters in operation. During this operation, the reception of a signal on a frequency to which either receiver-transmitter is tuned will result in retransmission of the signal on another frequency to which the other receiver-transmitter is tuned. The use of auto relay operation extends the distance, which would normally be limited to line-of-sight, between two other stations.

1-33. LEADING PARTICULARS.

1-34. ELECTRICAL CHARACTERISTICS.

1-35. Operating specifications and electrical characteristics of Radio Set AN/ARC-52 are given in table III. Differences between the RT-332/ARC-52 and the RT-424/ARC-52X are noted.

1-36. TUBE COMPLEMENT. Table IV lists the tubes in the radio set and also gives the tube functions. All tubes are installed in the receiver-transmitter and are listed under the appropriate subassembly.

1-37. FUSE COMPLEMENT. Table V lists all fuses in the radio set and also gives fuse ratings and functions. All fuses are installed in the receiver-transmitter.

1-38. OPERATING AND ADJUSTMENT CONTROLS. Operating and adjustment controls of the radio set are listed and described in table VI and are shown in figures 1-6 and 1-7.

1-39. DIFFERENCE DATA SHEETS.

1-40. Sections I through VII of this handbook apply to Radio Set AN/ARC-52, Radio Set AN/ARC-52X, and Auto Relay Control C-2791/ARC. New models will be covered in section VIII by use of Difference Data Sheets. Service instructions for models to be included in section VIII will be the same as procedures given in sections I through VII, except for specific differences noted by applicable Difference Data Sheet.

TABLE III. ELECTRICAL CHARACTERISTICS

Receiver-Transmitter RT-332/ARC-52	
Frequency range	225.0 mc to 399.9 mc
Frequency channels	1750
Preset channels	18 (plus guard and manual)
Power requirements	†115-volt a-c, 3-phase, 400-cycle power source that draws 240 volt-amperes during receive and 450 volt-amperes during transmit operation
	†27.5-volt d-c power source, 1.1 amperes during reception, 1.5 amperes during transmission, and 7.5 amperes during channeling (channel selection)
	*27.5-volt d-c power source, 8.0 amperes during reception, 15.0 amperes during transmission, and 8.0 amperes during channeling (channel selection)
	NOTE The following six channels are unusable because of internally generated interference: 242.1 mc, 287.1 mc, 322.8 mc, 339.0 mc, 246.6 mc, and 253.3 mc.

†Indicates RT-332/ARC-52 only
*Indicates RT-424/ARC-52X only

TABLE III. ELECTRICAL CHARACTERISTICS (Cont)

Receiver	
Sensitivity	An r-f input of 5 microvolts modulated 30 percent at 1000 cps produces an audio output of 50 milliwatts minimum, and the signal-plus-noise to noise ratio is at least 10 decibels. Receiver sensitivity is degraded to 20 uv input for 10 db signal-plus-noise to noise ratio on 241.1-, 241.2-, and 275.6-mc channels
Avc characteristics	A 1000-microvolt signal modulated 30 percent at 100 cps produces an audio power output of 250 milliwatts minimum; a variation in input from 10 to 100,000 microvolts produces an audio output of plus or minus 3 decibels from a 250-milliwatt reference
Input impedance	50 ohms
Output impedance	300 ohms, resistive
Harmonic distortion	Less than 10 percent
Audio-frequency response	300 to 4000 cps
Noise limiting	Instantaneous peak limiting
Auxiliary audio output	When a 1000-microvolt signal modulated 30 percent at 1000 cps is applied, the output shall be at least 0.25 volt. When the modulation frequency is varied from 70 to 200 cps, the output for this frequency range shall be within -3.5 and -3 db of the output obtained at 1000 cps. When the modulation frequency is varied from 200 to 7000 cps, the output from this frequency range shall be within +2 and -3 db of the output obtained at 1000 cps
Auxiliary audio output impedance	20,000 ohms, resistive
Transmitter	
Duty cycle	Five minutes transmit, and 10 minutes receive.
Power output	16 watts minimum
Output impedance	50 ohms
Modulation capabilities	Amplitude, 80 to 95 percent with a 1000-cps signal at 1 volt (open circuit) for carbon microphones and 25 millivolts for dynamic microphones
Tone modulation	70 to 100 percent at 1020 ±100 cps
Input impedance	82 ohms from carbon microphone and 82 ohms balanced to ground from dynamic microphone
Frequency response	150 to 10,000 cps
Sidetone	250 milliwatts into a 300-ohm load when carrier is 80 percent modulated at 1000 cps
Channel selection time	6.0 seconds maximum
Transmit-to-receive time delay	300 milliseconds, maximum
Fidelity	as follows

TABLE III. ELECTRICAL CHARACTERISTICS (Cont

Frequency	Response Flat Within (Decibels):
150 cps	-8 or lower
300 cps	-7 to -3
600 cps	-2 to +1
1000 cps	0 (ref)
3000 cps	±2
6000 cps	±2
10,000 cps	-5 to +1

TABLE IV. TUBE AND DIODE COMPLEMENT

REFERENCE DESIGNATION	TUBE TYPE	FUNCTION
Receiver R-F Amplifier and Transmitter Preamplifier:		
V1	JAN7077	Receiver amplifier
V2	JAN7077	Receiver amplifier
V3	JAN7077	Receiver amplifier
V4	JAN7077	Receiver 1st mixer
V5	USN7554	Transmitter amplifier
V6	JAN7077	Transmitter amplifier
V7	JAN7077	Transmitter 2nd mixer
**Receiver R-F Amplifier and Transmitter Preamplifier:		
V1	JAN6J4WA	Receiver amplifier
V2	JAN6J4WA	Receiver amplifier
V3	JAN5654 6AK5	Receiver 1st mixer
20- to 30-Mc I-F Amplifier:		
V201	JAN5840	Receiver/transmitter amplifier
V202	JAN5840	Receiver/transmitter amplifier
V203	JAN6205 **JAN6021	Receiver 2nd mixer
V204	JAN6021	Transmitter oscillator and transmitter 1st mixer
V205	JAN5840	Injection amplifier
1.85-Mc I-F Amplifier:		
V301	JAN5840	1st i-f amplifier
V302	JAN5840	2nd i-f amplifier
V303	JAN5840	3rd i-f amplifier
V304	JAN5840	4th i-f amplifier
Audio Amplifier:		
V401	JAN6021	Signal/noise amplifier
V402	JAN6021	D-c squelch amplifier and auxiliary audio amplifier
V403	JAN6021	Squelch relay puller and audio amplifier
V404	JAN5902	Audio output amplifier
Spectrum Generator and Amplifier:		
V501	JAN6021	Oscillator and doubler/tripler
V502	JAN5840	Isolation amplifier
V503	JAN5654 6AK5	Tripler
V504	JAN6J4WA	Amplifier
V505	JAN6J4WA	Amplifier

TABLE IV. TUBE AND DIODE COMPLEMENT (Cont)

REFERENCE DESIGNATION	TUBE TYPE	FUNCTION
Power Amplifier:		
V601	JAN6J4WA	Amplifier
V602	JAN6442	Amplifier
V603	USN7609	Power amplifier
Modulator:		
V701	JAN6021	Amplifier
V702	JAN5902	Driver
V703	JAN2E26	Power amplifier
V704	JAN2E26	Power amplifier
V705	JAN5840	Tone oscillator
Guard Receiver:		
V801	JAN5840	R-f amplifier
V802	JAN6021	1st mixer and r-f amplifier
V803	JAN6021	Injection oscillator and frequency doubler
V804	JAN5840	I-f amplifier
V805	JAN6205	2nd mixer
V806	JAN5840	First i-f amplifier
V807	JAN5840	Second i-f amplifier
V808	JAN6021	Audio output amplifier and squelch amplifier
Relay Unit:		
V901	NE-2	Current regulator
Mechanical Tuning Unit:		
V1201	NE-2	Current regulator
V1202	NE-2	Current regulator
V1203	NE-2	Current regulator
Oscillator:		
V1901	JAN6021	Oscillator
V1902	JAN6021	Mixer and oscillator
*Dynamotor Power Supply Unit:		
V1101	JAN5840	Bias voltage oscillator
V1102	JAN5644	Voltage regulator
Amplifier-Preamplifier:		
CR1	USN1N483B	Limiter

TABLE IV. TUBE AND DIODE COMPLEMENT (Cont)

REFERENCE DESIGNATION	TUBE TYPE	FUNCTION
1.85-Mc I-F Amplifier:		
CR301	USN1N483B	Noise limiter
CR302	USN1N483B	Avc gate
CR303	USN1N3070	Detector
Audio Amplifier:		
CR401	USN1N483B	Rectifier for audio
CR402	USN1N483B	Rectifier for noise
CR403	USN1N483B	Blocking diode
CR404	USN1N483B	Limiter
CR405	USN1N755A	Noise voltage limiter
CR406	USN1N968B	Zener diode
CR407	JAN1N647	Arc suppression diode
Modulator:		
CR701	USN1N965B	Voltage regulator
Guard Receiver:		
CR801	USN1N3070	Detector
CR802	USN1N3070	Detector
CR803	USN1N483B	Switching diode
CR804	USN1N483B	Noise limiter
CR805	USN1N483B	Avc gate
Rectifier Unit:		
CR1001	No type number	Rectifier
CR1002	No type number	Rectifier
CR1003	No type number	Rectifier
CR1004	JAN1N4858	Silicon rectifier
***A-C Power Unit:		
CR1101 through CR1109	JAN1N540	Rectifiers
*Dynamotor Power Supply Unit:		
CR1101	JAN1N459	Blocking diode
****CR1101	HD6008	Blocking diode
Antenna Relay:		
CR1401	USN1N933	Audio detector
CR1402	USN1N933	Audio detector

NOTES

1. *Applies to RT-424/ARC-52X only.
2. **Indicates tube type used on all units preceding Serial Number 50, Contract NOas 59-0165.
3. ***Applies to RT-332/ARC-52 only.
4. ****Used on Contracts NOw 60-0089-A and NOw 61-0785 only.

TABLE V. FUSE COMPLEMENT

REFERENCE DESIGNATION	FUSE TYPE	RATING	FUNCTION
**F1501	3AG	125 v, 2 amp	115V, 400 cps phase 1 line
**F1502	3AG	125 v, 2 amp	115V, 400 cps phase 2 line
**F1503	3AG	125 v, 2 amp	115V, 400 cps phase 3 line
F1504	3AG	250V dc, 0.5 amp	425V supply
	3AG	250V dc, 2 amp	Spare
	3AG	250V dc. 0.5 amp	Spare
**Not used in RT-424/ARC-52X			

TABLE VI OPERATING CONTROLS

CONTROL	FUNCTION	
Panel lamps	Two lamps enable the operator to view the C-1607/ARC-52 panel Illumination of panel lamps is independent of Radio Set Control C-1607 ARC-52, both lights being remotely controlled from aircraft instrument light panel.	
Function switch	Controls distribution of primary power throughout Radio Receiver-Transmitter RT-332 ARC-52 and selects operational mode of equipment	
	Position	Function
	OFF	All power is removed from RT-332/ARC-52 Equipment is essentially dead; panel lamps, however, may be lighted
	T/R	Radio Receiver-Transmitter RT-332/ARC-52 is energized for either receive or transmit function. Receive or transmit function is selected by microphone push-to-talk button. In normal condition (microphone button not actuated) equipment is in receive condition
	T/R-G	As in previous function switch position, RT-332 ARC-52 is energized. with actual receive or transmit function controlled by microphone push-to-talk button In addition guard receiver is turned on.
	ADF	Source power and signal are applied from Radio Set AN ARC-52 to Direction Finder Group AN/ARA-25 Adf operation controlled from the AN/ARA-25
	REL	Radio Receiver-Transmitter RT-332 ARC-52 is energized for either transmit or receive function and is set up to provide automatic relay operation in conjunction with another Radio Set AN/ARC-52 connected in tandem. This position applies only to Auto Relay Control C-2791/ARC.
CHAN Selector switch	Controls selection of frequency channel for AN/ARC-52 transmission and reception. Available channels, which are indicated on the CHAN selector switch dial, are listed below. During the channel presetting procedure, the CHAN selector switch is rotated to select the particular channel being set up on the digit selector pins (figure 1-7). However, the channel being set up is indicated on the preset channel dial (figure 1-7), and not on the CHAN selector switch dial itself.	

TABLE VI. OPERATING CONTROLS (Cont)

CONTROL	FUNCTION
CHAN Selector switch (Cont)	**Position** — **Function**
	1 through 18 — Channel with number indicated on dial (position) is automatically selected for transmit and receive operation of Radio Set AN/ARC-52. The frequency that has been preset on the digit selector pins (figure 1-7) for any particular one of the 18 channels is recorded on the operating frequency chart (figure 1-6).
	M — Permits manual selection of any one of 1750 frequency channels by the use of MANUAL frequency controls.
	G — Selects preset guard frequency of 243.0 mc for transmit and receive operation of Radio Set AN/ARC-52 with function switch set at T/R. This position is not a substitute for T/R+G position of function switch.
MANUAL frequency controls	Provides manual selection of any one of 1750 preset channels. Manual selection is permitted only when CHAN selector switch is set at M.
	Four MANUAL frequency controls provide selection within 225.0-mc and 399.9-mc band limits. The controls select hundreds-, tens-, units-, and tenths-digits of desired frequency in megacycles.
	Control — **Range**
	Hundreds digit — Selects either 2 or 3 which places selected frequency either in 200-mc or 300-mc range. Difference between positions is 100 mc.
	Tens digit — Provides 10 consecutive switch positions, 0 through 9. Difference between consecutive switch positions is 10 mc.
	Units digit — Provides 10 consecutive switch positions, 0 through 9. Difference between consecutive switch positions is 1 mc.
	Tenths digit — Provides 10 consecutive switch positions, 0 through 9. Difference between consecutive switch positions is 100 kc.
VOL control	Adjusts amplitude of audio signals delivered to headset.
Preset channel indicator	Indicates which one of 18 channels is being set up for automatic preset selection, as determined by rotation of CHAN selector switch. Note that number appearing on preset channel indicator does not correspond to channel number on CHAN selector switch dial.
Preset tool	Used to adjust selector pins for desired preset frequency on each of 18 automatic preset channels.
Preset channel frequency selector pins	There are 18 horizontal rows of selector pins, each row corresponding to a particular preset channel and each containing the 7 selector pins listed below. Only one row (channel) at a time is accessible for adjustment (presetting) of the selector pins. The selection of a particular row of pins (channel) for adjustment is made by rotating the CHAN selector switch until the desired channel number appears on the preset channel dial.
1st digit selector pin	Is moved by preset tool to either position 2 or position 3, as desired for channel indicated on preset channel dial.

TABLE VI. OPERATING CONTROLS (Cont)

CONTROL	FUNCTION	
1st digit selector pin (Cont)	Position	Function
	2	Hundreds digit of preset frequency is 2. Final frequency is in 200-mc band.
	3	Hundreds digit of preset frequency is 3. Final frequency is in 300-mc band.
2nd digit row selector pin	Is moved by preset tool to either 5 through 9 row of numbers or 0 through 4 row of numbers. Selection of actual number within selected row is made by 0-9 2nd digit selector pin.	
0-9 2nd digit selector pin	Is moved by preset tool over one of five pairs of 2nd digit (tens-digit) numbers. Actual number selected depends on whether row 5-9 or 0-4 has been selected by 2nd digit row selector pin. Frequency difference between consecutive digits is 10 mc.	
3rd digit row selector pin	Is moved by preset tool to either row 5-9 or row 0-4. Selection of actual number within selected row is made by 0-9 3rd digit selector pin.	
0-9 3rd digit selector pin	Is moved by preset tool over one of five pairs of 3rd digit (units-digit) numbers. Actual number selected depends on whether row 5-9 or row 0-4 has been selected by 3rd digit row selector pin. Frequency difference between consecutive digits is 1 mc.	
4th digit row selector pin	Is moved by preset tool to either row 5-9 or row 0-4. Selection of actual number within selected row is made by 0-9 4th digit selector pin.	
0-9 4th digit selector pin	Is moved by preset tool over one of five pairs of 4th digit (tenths digit) numbers. Actual number selected depends on whether row .5-.9 or row .0-.4 has been selected by 4th digit row selector pin. Frequency difference between consecutive digits is 100 kc.	
Operating frequency chart	Provides a semipermanent reference for all preset operating frequencies. Eighteen spaces are allotted for the 18 preset, automatic frequency channels; a single space is allotted for manual frequency to which MANUAL controls are normally set; and a single space is allotted for preset guard frequency.	

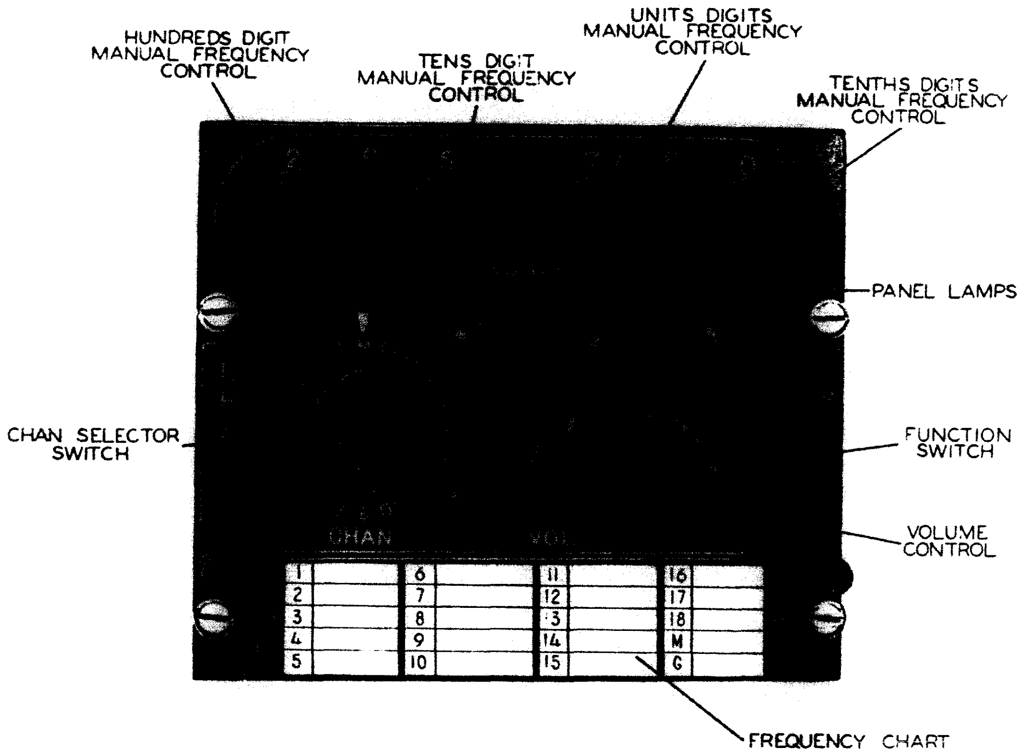


Figure 1-6. Radio Set Control C-1607/ARC-52, Front Panel

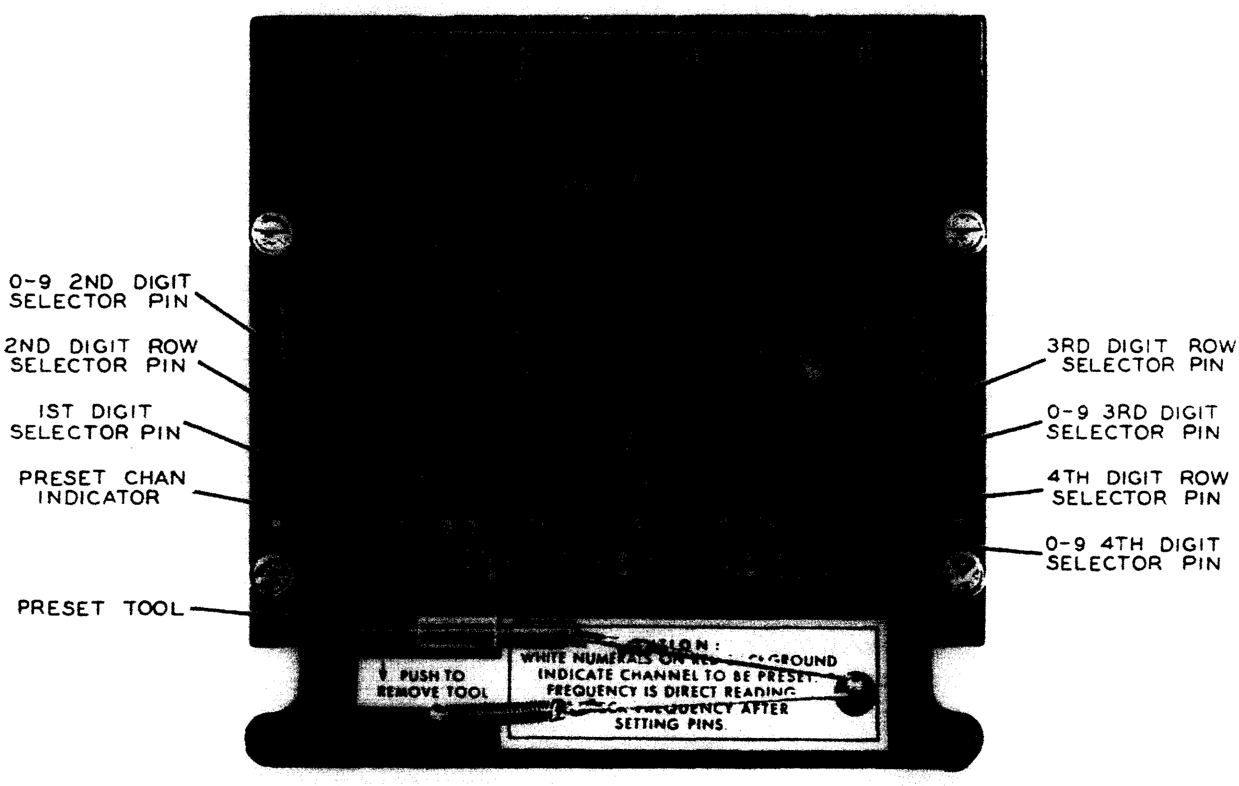


Figure 1-7. Auto Relay Control C-2791 ARC, Hinged Door in Open Position

SECTION II
TEST EQUIPMENT AND SPECIAL TOOLS

2-1. TEST EQUIPMENT.

2-2. Test equipment necessary for test and alignment of the radio set is listed in table VII.

2-3. SPECIAL TOOLS.

2-4. Special tools required for maintenance and alignment of the radio set are listed in table VIII and illustrated in figure 2-1.

2-5. RADIO SET TEST HARNESS AN/ARM-38. Radio Set Test Harness AN/ARM-38 provides equipment for testing and trouble shooting Radio Set AN/ARC-52. The test harness consists of a mounting distribution box and cables necessary for operating and testing the radio set on a test bench. The equipment supplied with the test harness is illustrated in figure 2-2. A brief description of the test harness is contained in paragraph 2-6. Refer to NAVWEPS 16-30ARM38-1 for more detailed information.

2-6. A brief description of the complement and use of the test harness follows:

a. Distribution Box J-995 ARM-38 provides the necessary circuitry, switches, indicator lamps, connectors, and controls to facilitate testing of Radio Set AN/ARC-52.

TABLE VII. TEST EQUIPMENT

NAME	AN DESIGNATION	ALTERNATE	USE
Signal Generator	AN/USM-44	HP-608D or equivalent	Signal source for receiver frequencies
Signal Generator	AN/URM-25	TS-413/U	Signal source for i-f circuit frequencies
Audio Oscillator	TS-382D/U	HP-205AG or equivalent	Signal source for audio frequencies
Oscilloscope	OS-8C/U	Dumont 304A or equivalent	Audio modulation measurements
Vacuum-Tube Voltmeter	TS-505/U	ME-30/U	Voltage measurements
Multimeter	AN/PSM-4	TS-352/U	Voltage, current, and resistance measurements
R-F Wattmeter	AN/URM-43A	Bird Type 16 or equivalent	R-f output measurements
A-F Power Meter	TS-585B/U		A-f power measurements
Frequency Meter	AN/USM-26	HP-525B or equivalent	Frequency measurements 10 cps to 12,000 mc
Distortion Analyzer	TS-723A/U	HP-330B or equivalent	Distortion measurements of frequencies between 20 and 20,000 cps
Microphone Simulator	AN/URM-14		Audio modulation measurements
Dummy Electrical Load	DA-79/U		Transmitter load for test and alignment
Pressurizing Unit	MK-20/UP		Pressurize receiver-transmitter
Air Gauge		Schraeder 3715 or equivalent	Air pressure measurement

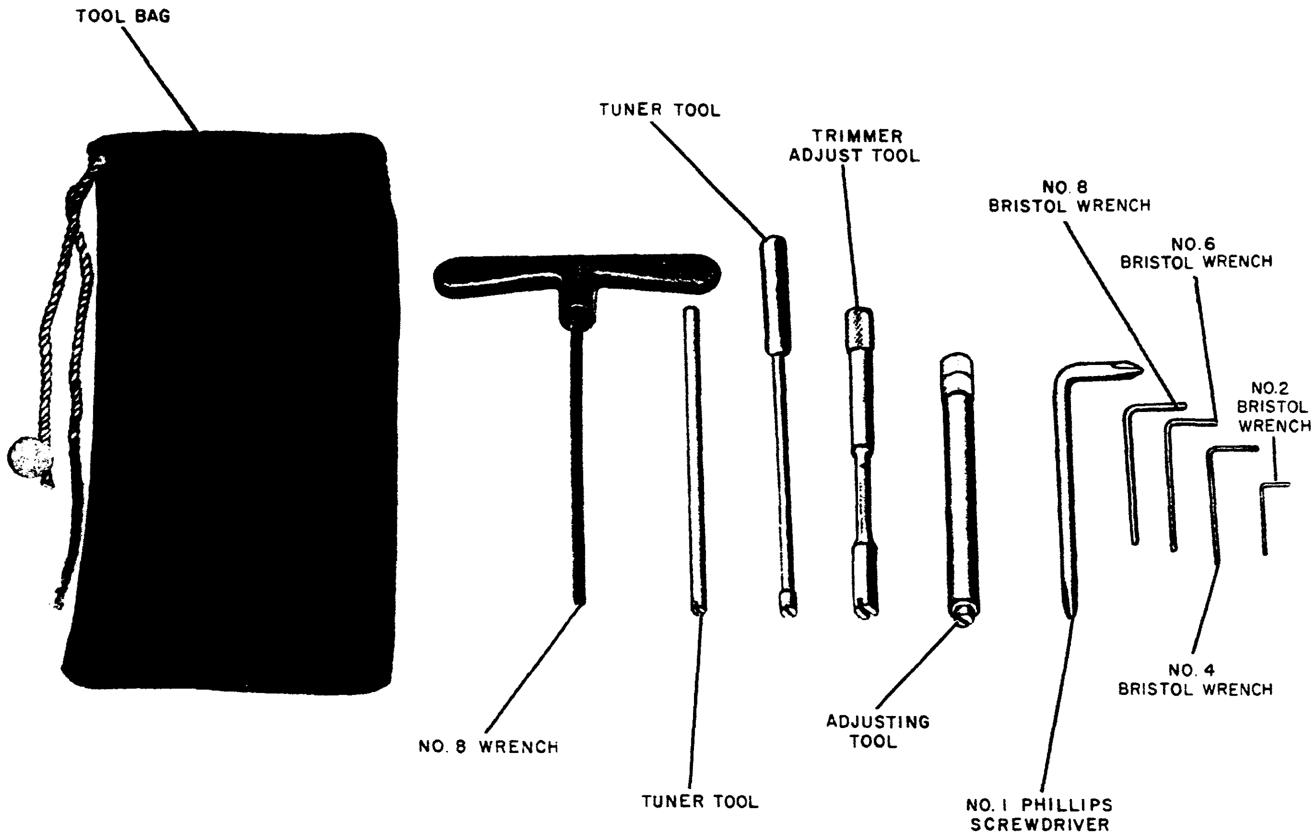
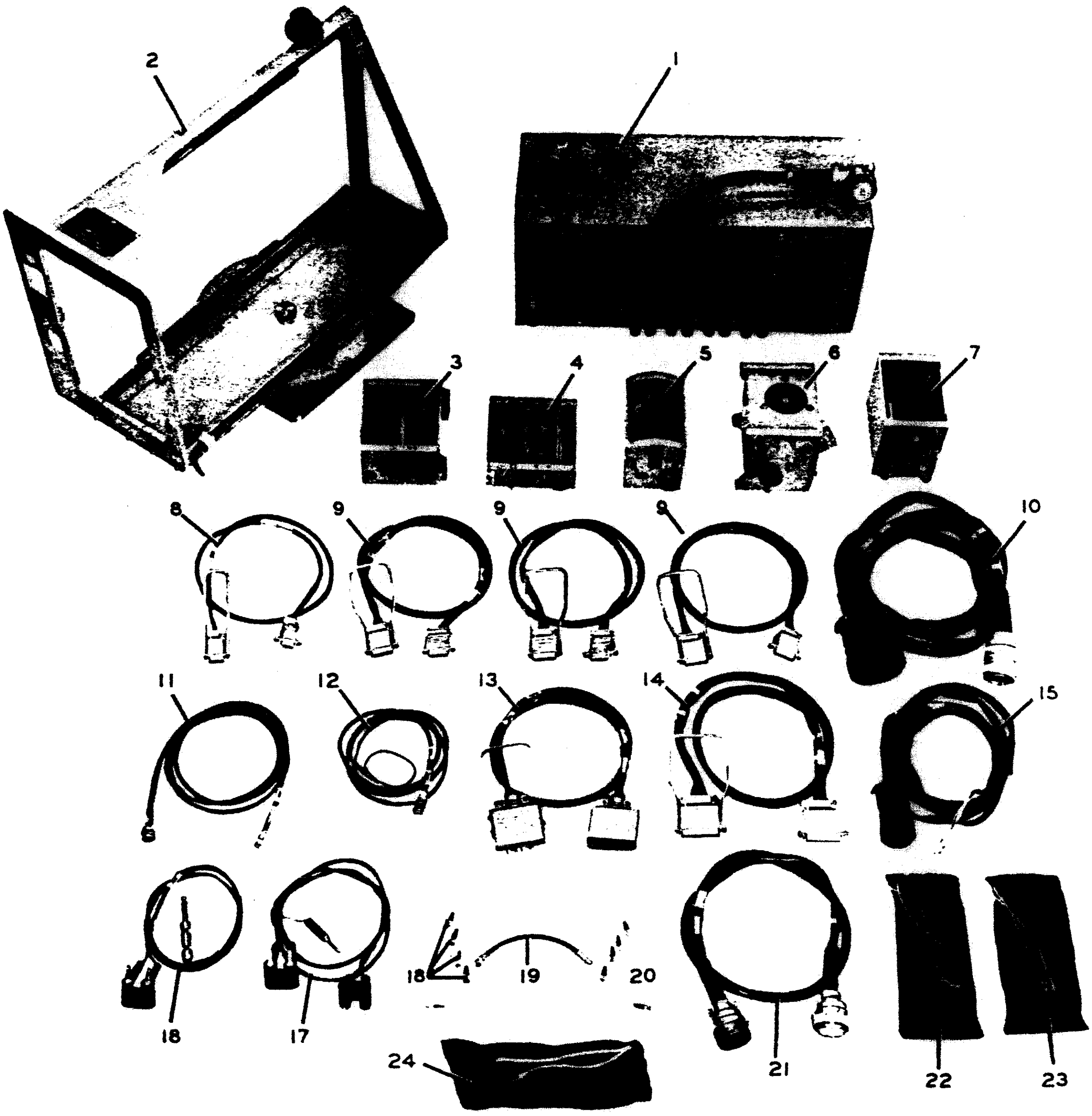


Figure 2-1. Special Tools

TABLE VIII. SPECIAL TOOLS

NOMENCLATURE	APPLICATION
Tool bag	Storage of tools
Tuner tool	Tuning slotted slugs of 20- to 30-mc i-f amplifier
Phillips screwdriver No. 1	For screw sizes up through 4
Tuner tool	Trimming glass trimmers of r-f tank circuits *Trimming glass capacitors of circuits in 20- to 30-mc i-f amplifier
Hex socket wrench No. 8	Receiver-Transmitter case removal
Bristol wrench No. 2	Mechanical adjustments
Bristol wrench No. 4	Mechanical adjustments
Bristol wrench No. 6	Mechanical adjustments
Bristol wrench No. 8	Mechanical adjustments
Adjusting tool	Tuning special coils having locking nuts
Trimmer adjust tool	**Tuning capacitors of 20- to 30-mc i-f amplifier
Radio Set Test Harness AN/ARM-38. (See paragraph 2-5.)	Provides equipment for testing and trouble-shooting components of Radio Set AN/ARC-52

*Indicates Contract NOw 60-0089.
**Indicates Contract NOas 59-0165 and 57-478.



1	Distribution Box J-995/ARM-38	13	Cable Assembly W-7/ARM-38
2	Mounting MT-2063/ARM-38	14	Cable Assembly W-4/ARM-38
3	Maintenance Fixture MT-2062/ARM-38	15	Cable Assembly W-1/ARM-38
4	Maintenance Fixture MT-2058/ARM-38	16	Cable Assembly W-9/ARM-38
5	Maintenance Fixture MT-2060/ARM-38	17	Cable Assembly W-5/ARM-38
6	Maintenance Fixture MT-2061/ARM-38	18	Cable Assembly W-14/ARM-38
7	Maintenance Fixture MT-2059/ARM-38	19	Cable Assembly W-12/ARM-38
8	Cable Assembly W-6/ARM-38	20	Cable Assembly W-13/ARM-38
9	Cable Assembly W-8/ARM-38	21	Cable Assembly W-2/ARM-38
10	Cable Assembly W-3/ARM-38	22	Tool Kit
11	Cable Assembly W-11/ARM-38	23	Adapter Kit
12	Cable Assembly W-10/ARM-38	24	Tuning Cover Kit

Figure 2-2. Radio Set Test Harness AN/ARM-38

b. Mounting MT-2063/ARM-38 provides mounting facilities for the receiver-transmitter during tests.

c. Maintenance Fixture MT-2062/ARM-38 provides mechanical linkage and electrical connections for the 20- to 30-mc i-f amplifier module during tests.

d. Maintenance Fixture MT-2058/ARM-38 provides mechanical linkage and electrical connections for the oscillator module during tests.

e. Maintenance Fixture MT-2060/ARM-38 provides mechanical linkage and electrical connections for the receiver r-f amplifier and transmitter preamplifier module during tests.

f. Maintenance Fixture MT-2061/ARM-38 provides mechanical linkage and electrical connections for the power amplifier module during tests.

g. Maintenance Fixture MT-2059/ARM-38 provides mechanical linkage and electrical connections for the spectrum generator and amplifier module during tests.

h. Cable Assembly W6/ARM-38 provides cable extension for the oscillator and power amplifier modules.

i. Cable Assembly W8/ARM-38 provides cable extension for the audio amplifier, mechanical tuning unit, rectifier unit, guard receiver, 1.85-mc i-f amplifier, and modulator modules.

j. Cable Assembly W3/ARM-38 provides connection between the receiver-transmitter being tested and Distribution Box J-995/ARM-38.

k. Cable Assembly W11/ARM-38 provides connection between a dummy load and the power amplifier module.

l. Cable Assembly W10-ARM-38 provides a means of injecting or extracting signals from coils and vacuum tubes during alignment procedures.

m. Cable Assembly W7/ARM-38 provides cable extension for the a-c power unit module.

n. Cable Assembly W4/ARM-38 provides cable extension for the relay unit module.

o. Cable Assembly W1/ARM-38 provides primary power to Distribution Box J-995/ARM-38.

p. Cable Assembly W9/ARM-38 provides connection between an a-f power meter and HEADSET jack of Distribution Box J-995/ARM-38.

q. Cable Assembly W5/ARM-38 provides connection between an audio oscillator and the AUDIO OSCILLATOR INPUT jack of Distribution Box J-995/ARM-38.

r. Cable Assembly W14/ARM-38 provides cable extension for a miniature r-f connector on the module being tested.

s. Cable Assembly W12/ARM-38 provides cable extension for the r-f output cable of the power amplifier module.

t. Cable Assembly W13/ARM-38 provides cable connection from the miniature r-f connector on the power amplifier module to the receiver r-f amplifier and transmitter preamplifier module.

u. Cable Assembly W2/ARM-38 provides cable extension for Radio Set Control C-1607/ARC-52 during servicing.

v. Tool kit provides special tools for servicing the test harness and the radio set.

w. Adapter kit provides three coaxial-cable adapters to connect cables of different types.

x. Tuning cover kit provides five tuning covers for use during alignment of the modules.

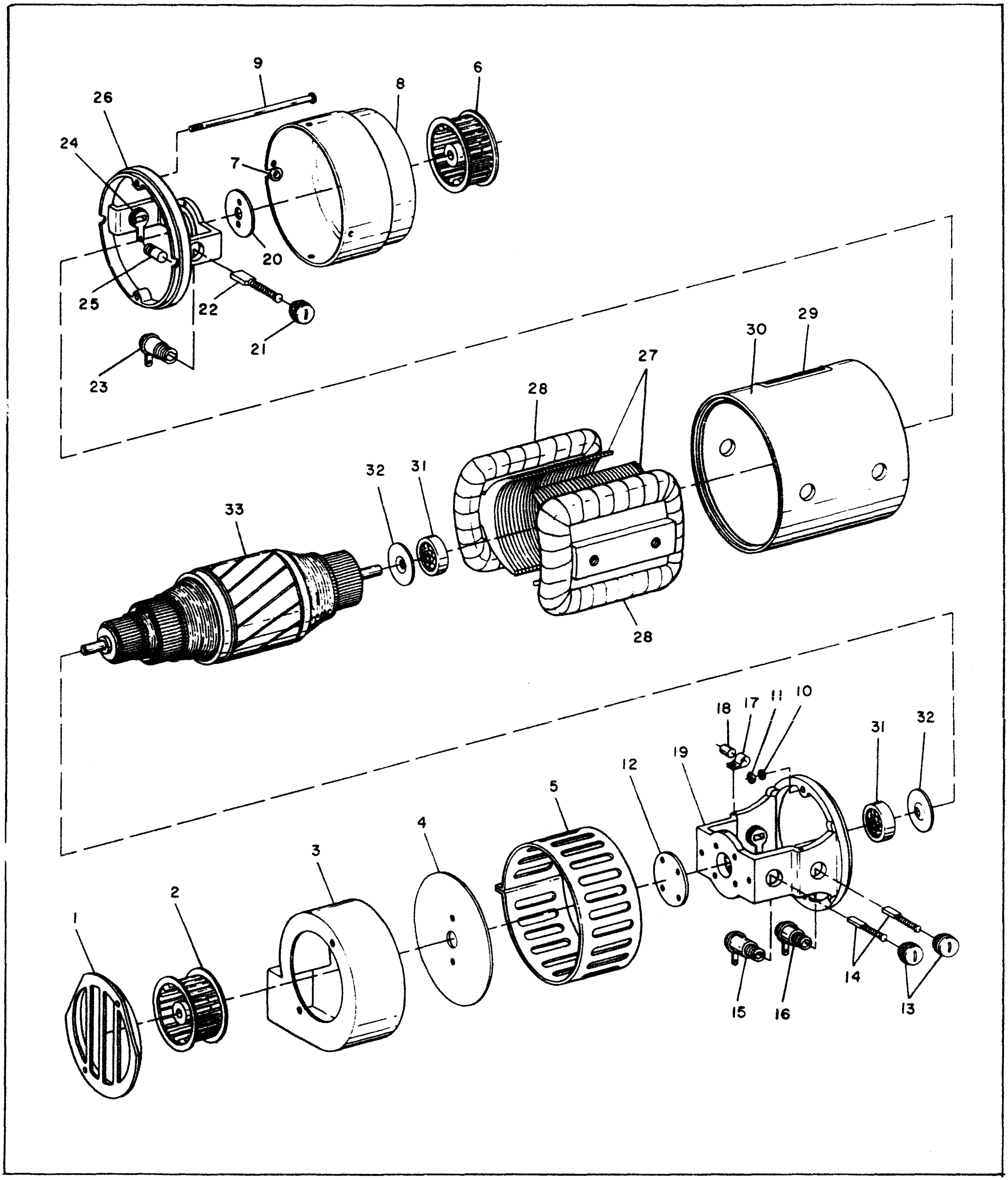


Figure 6. Dynamotor

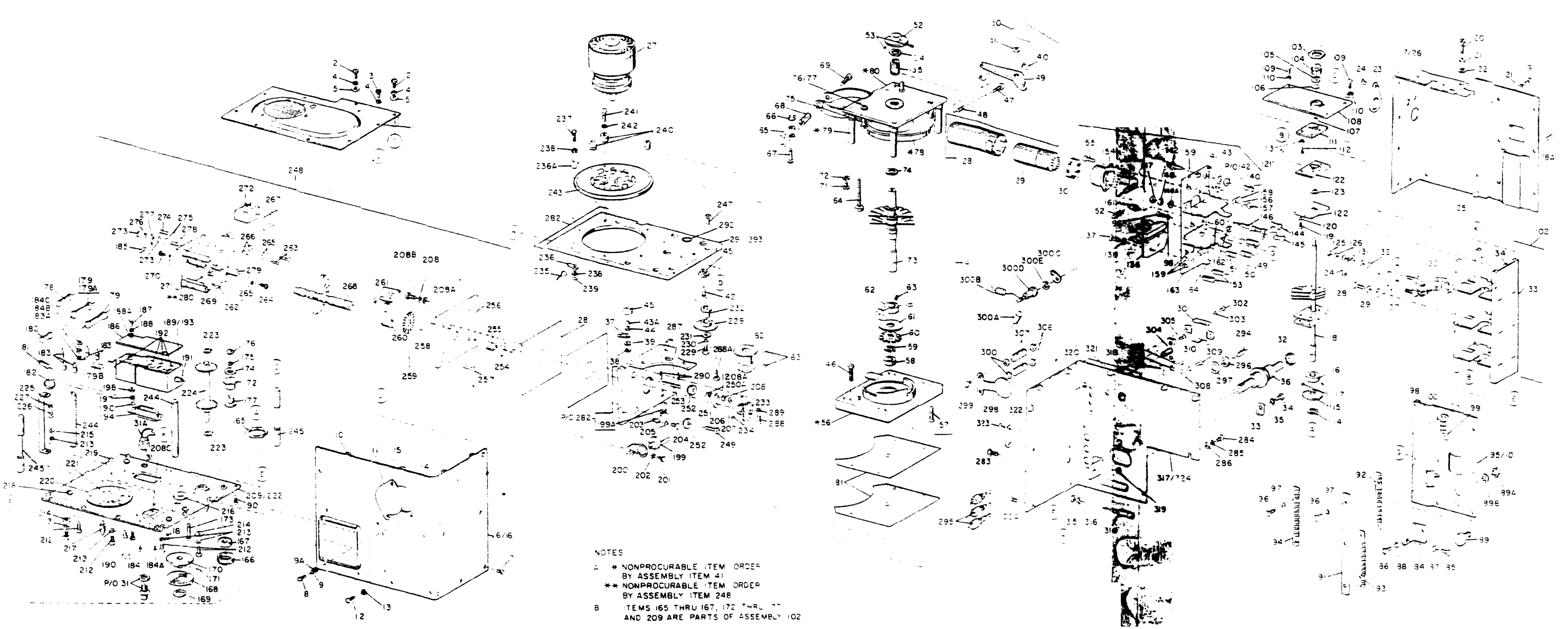
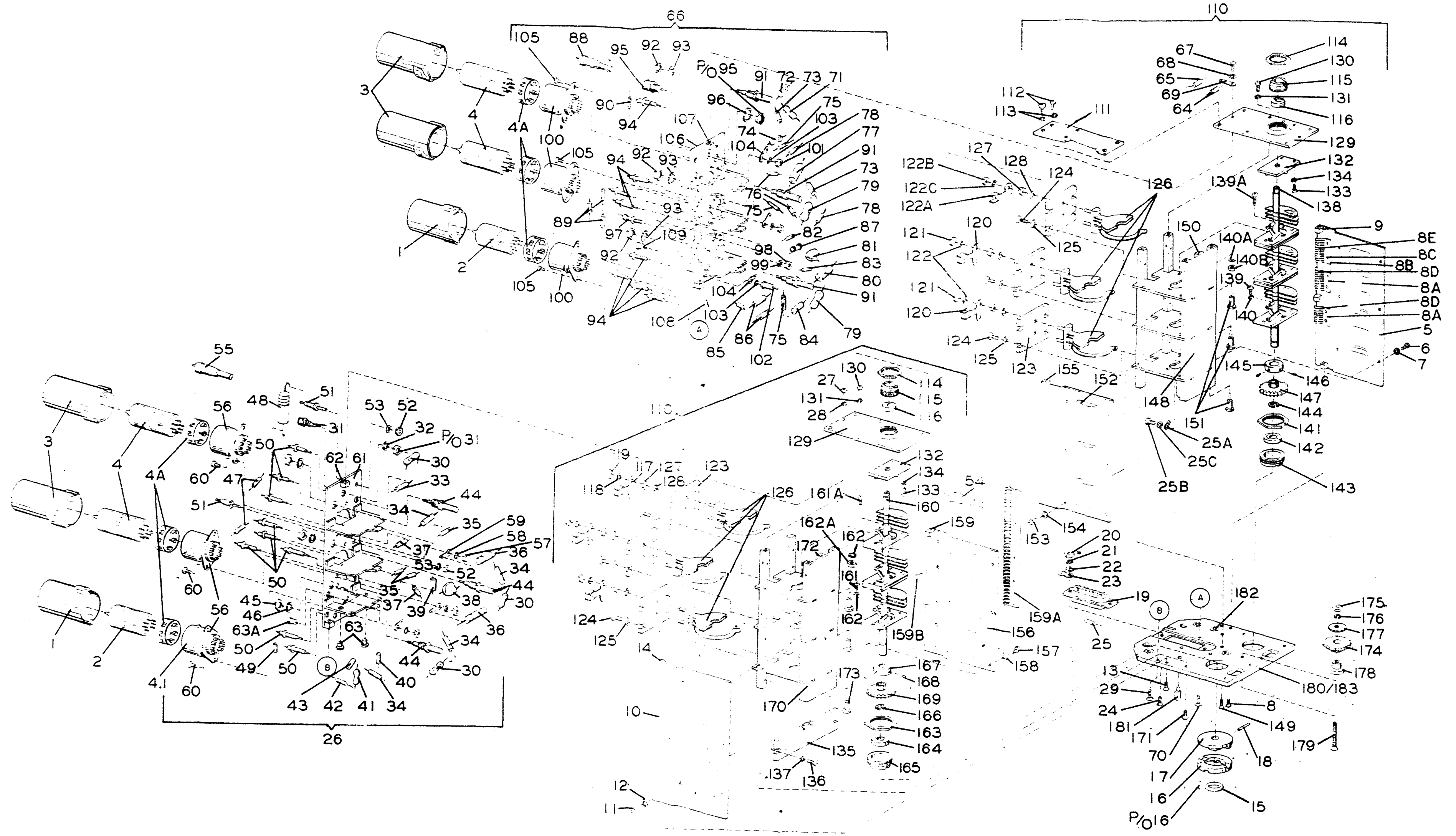


Figure 7. Power Amplifier



USED EFFECTIVE SERIAL NO. 1 THRU 90
CONTRACT NOas 57-478

Figure 9. Main Receiver and Preamplifier

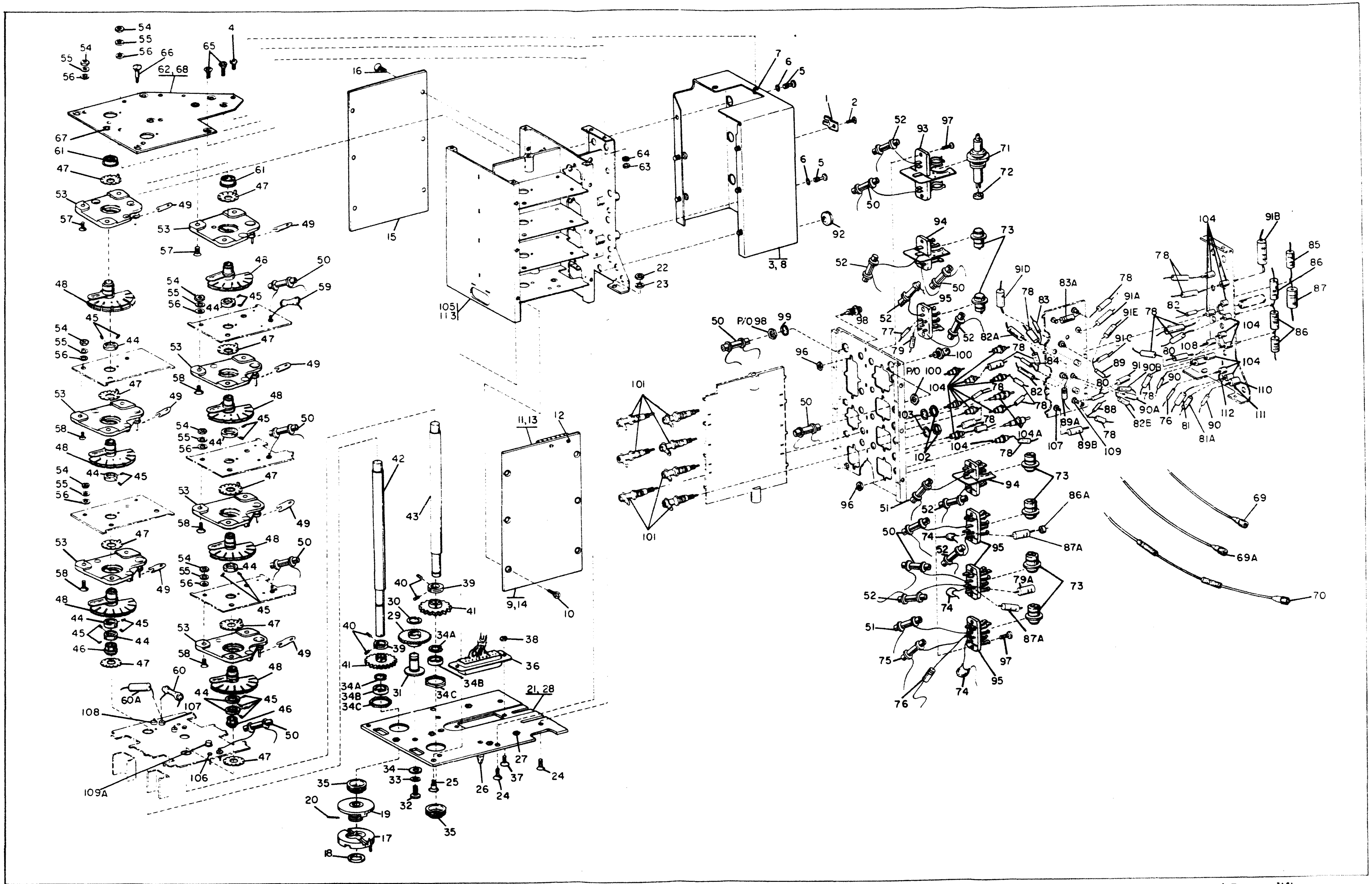


Figure 10. Main Receiver and Preamplifier

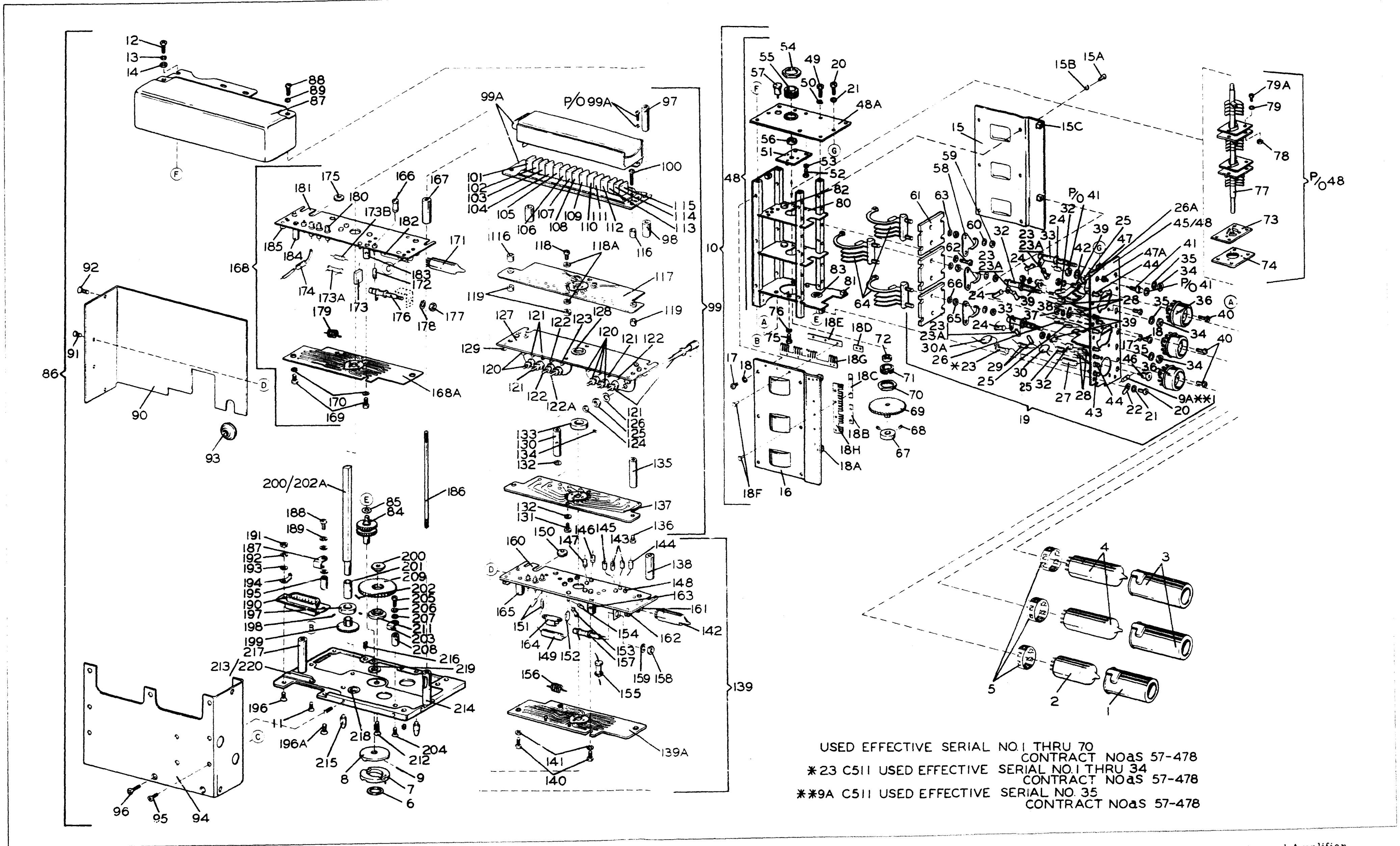


Figure 11. Spectrum Generator and Amplifier

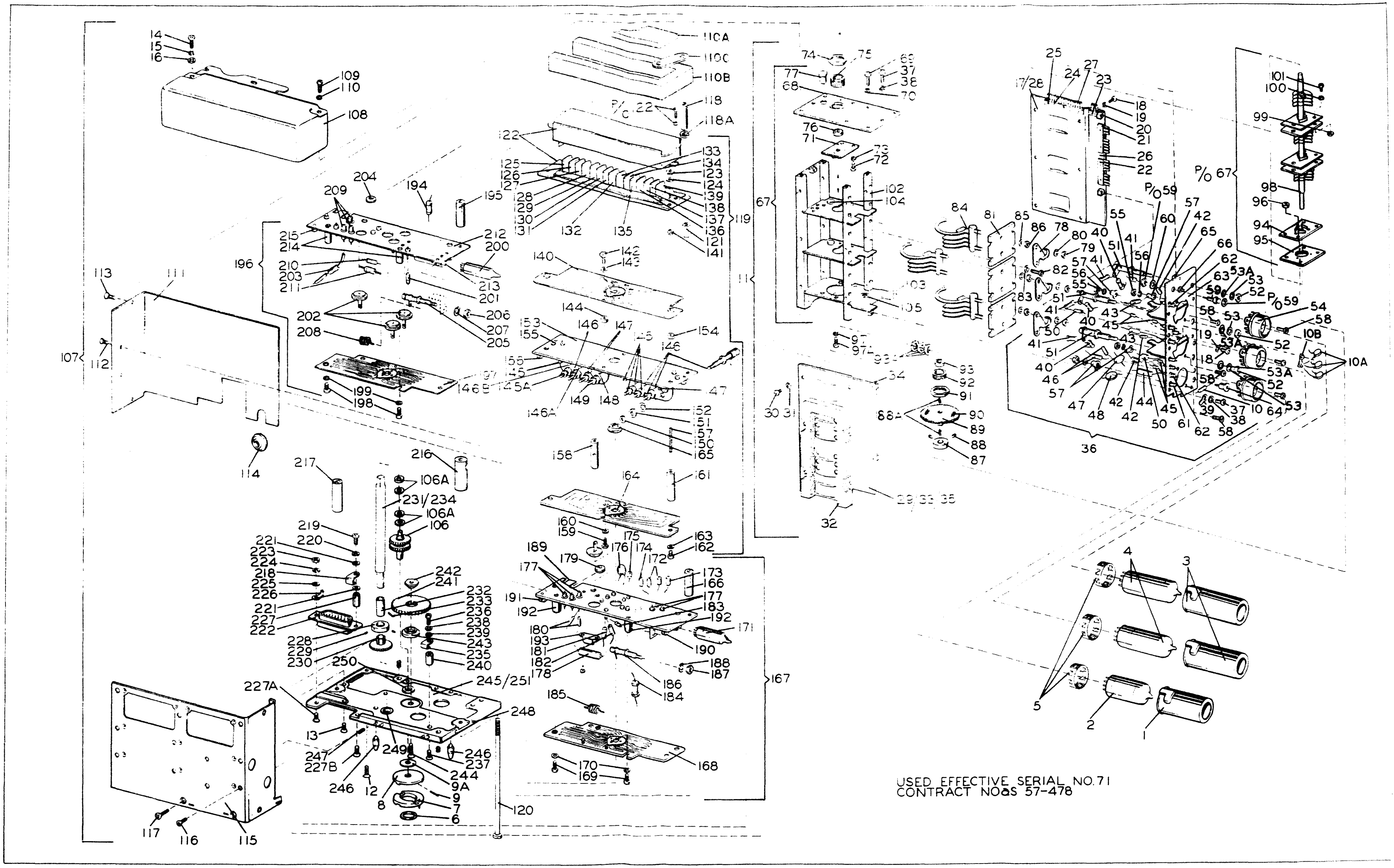


Figure 12. Spectrum Generator and Amplifier

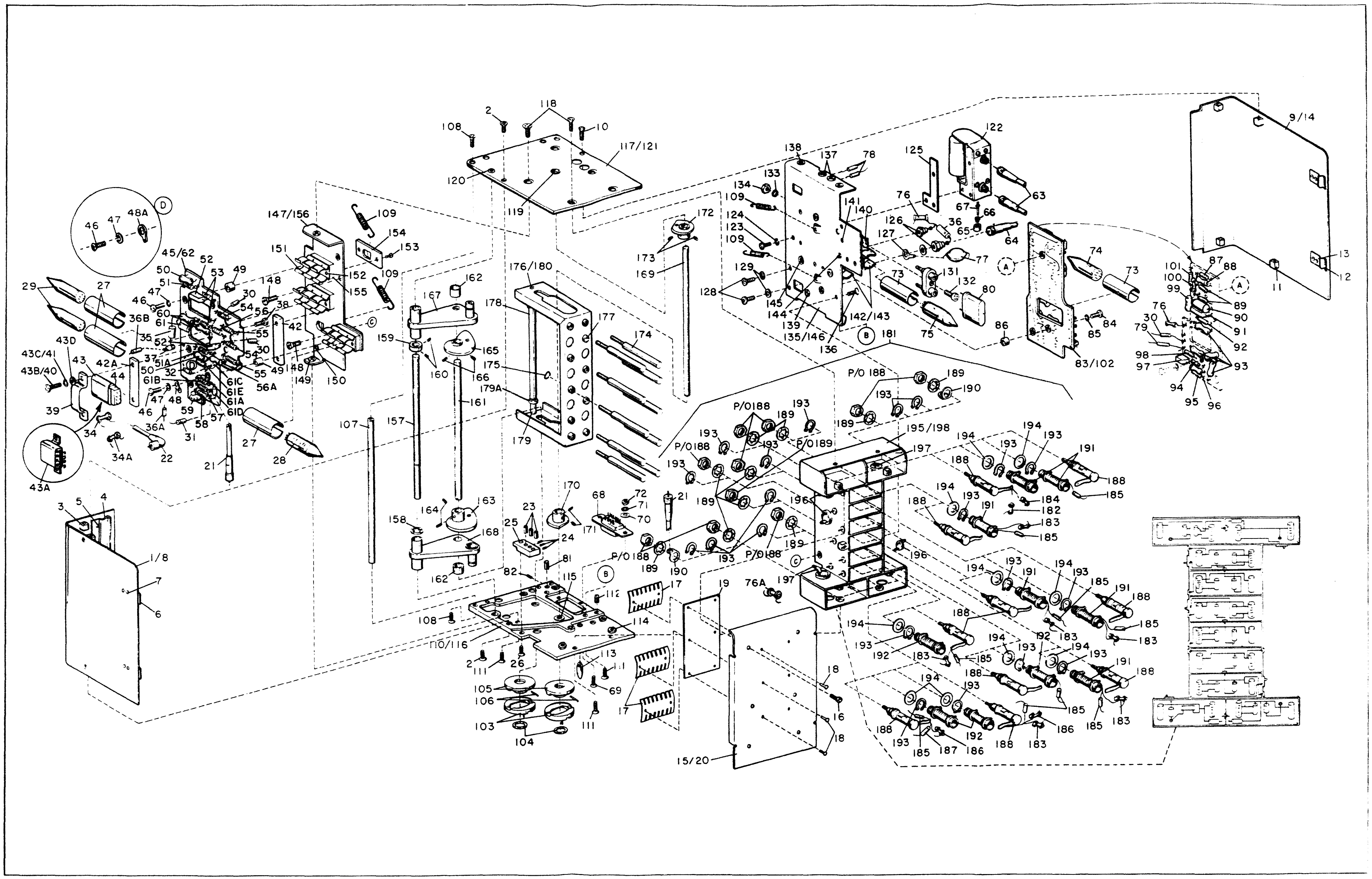


Figure 18. 20-30 MHz IF Amplifier

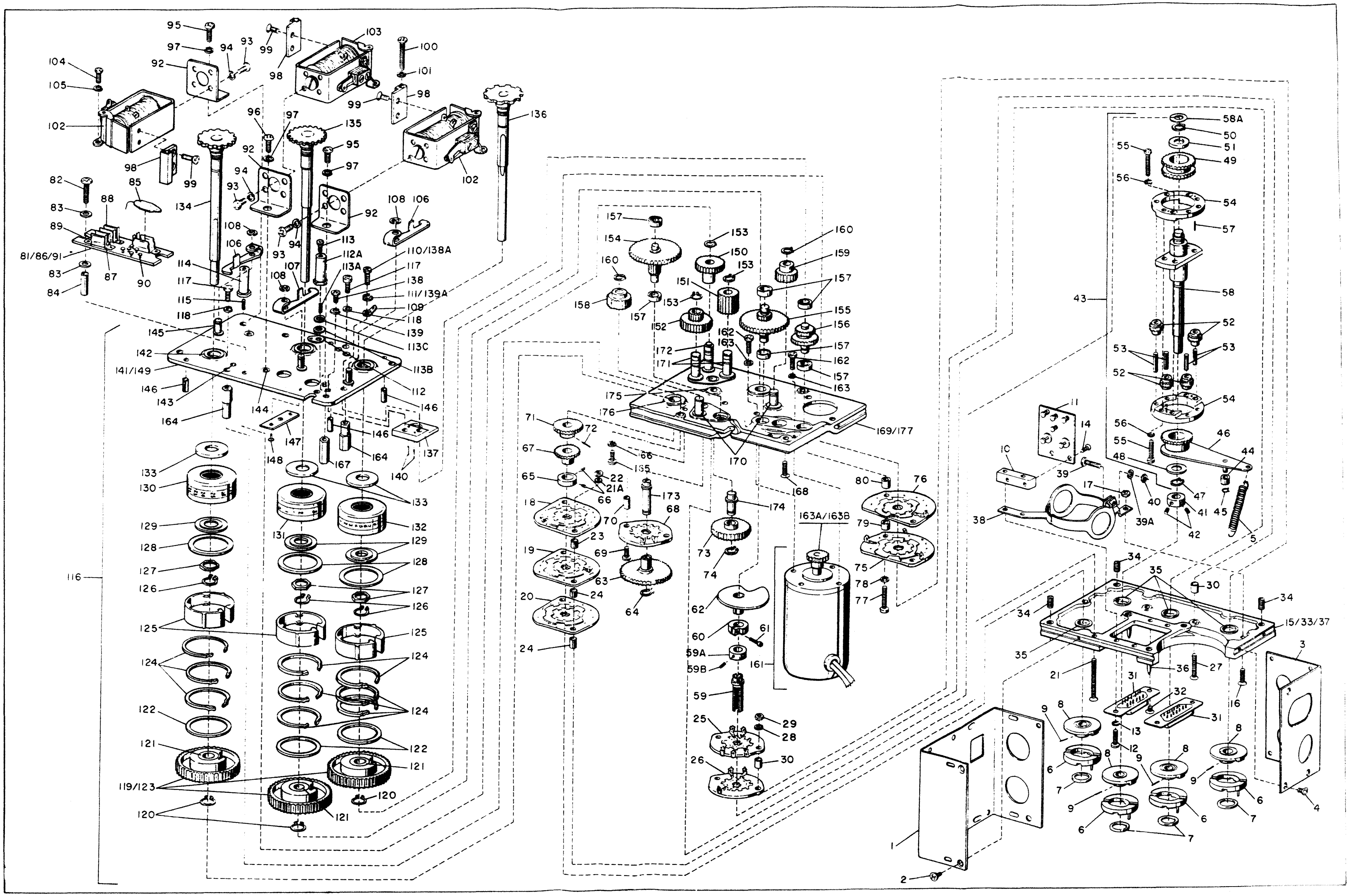


Figure 20. Mechanical Tuning Unit

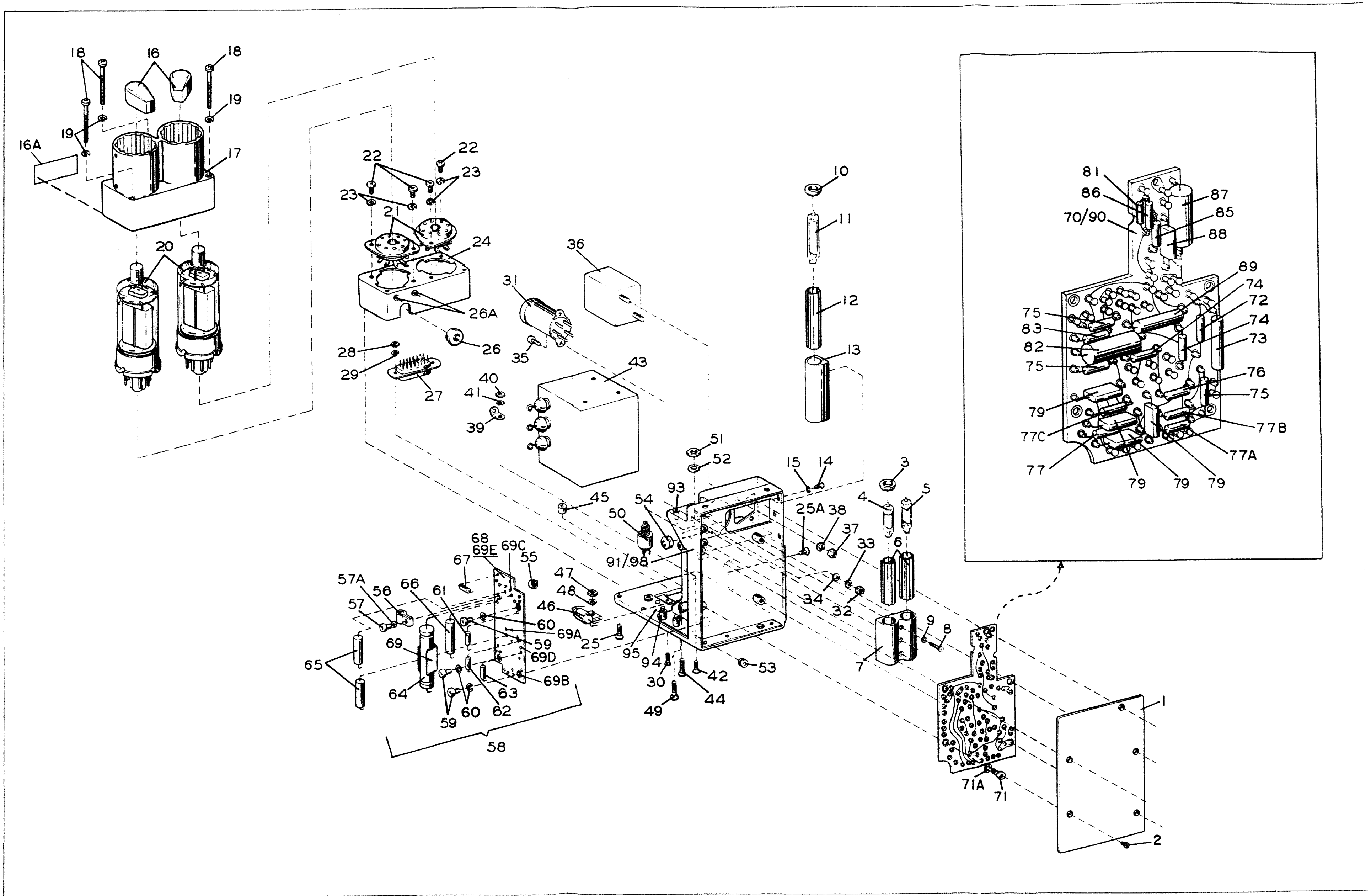


Figure 21. Radio Transmitter Modulator

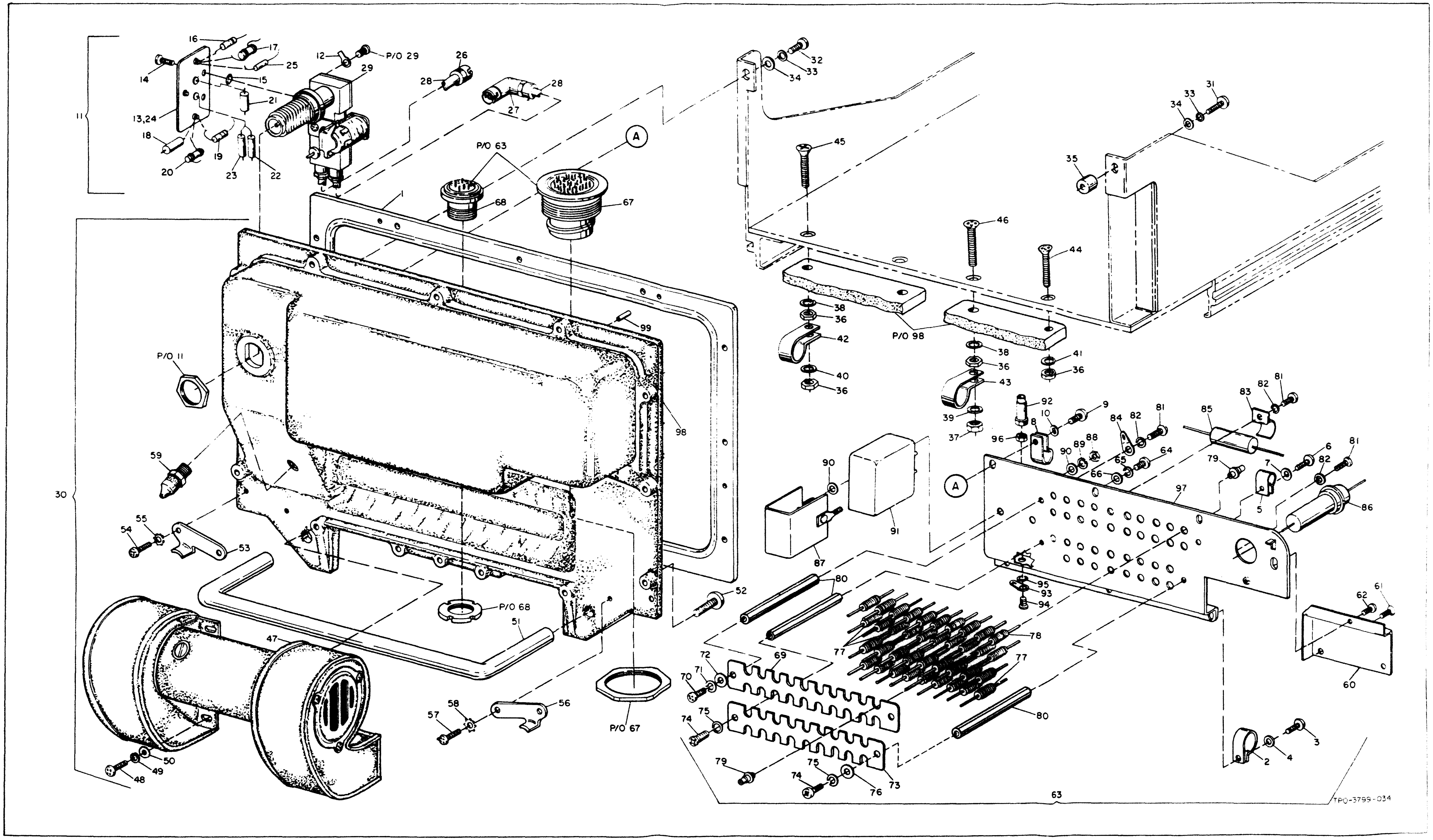
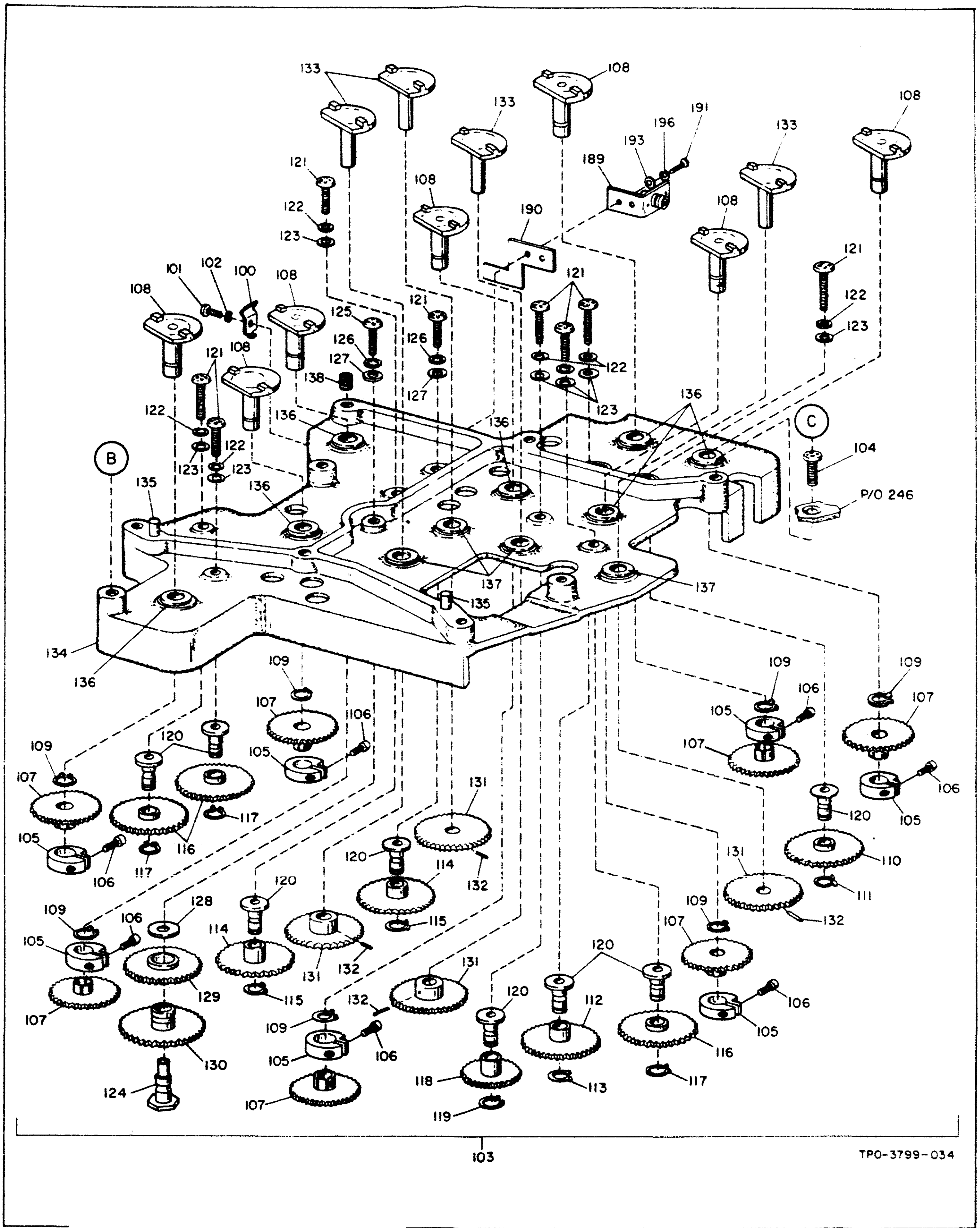


Figure 24. Receiver-Transmitter Subassembly
(Sheet 1 of 3)



Transmitter Subassembly (Sheet 2 of 3)

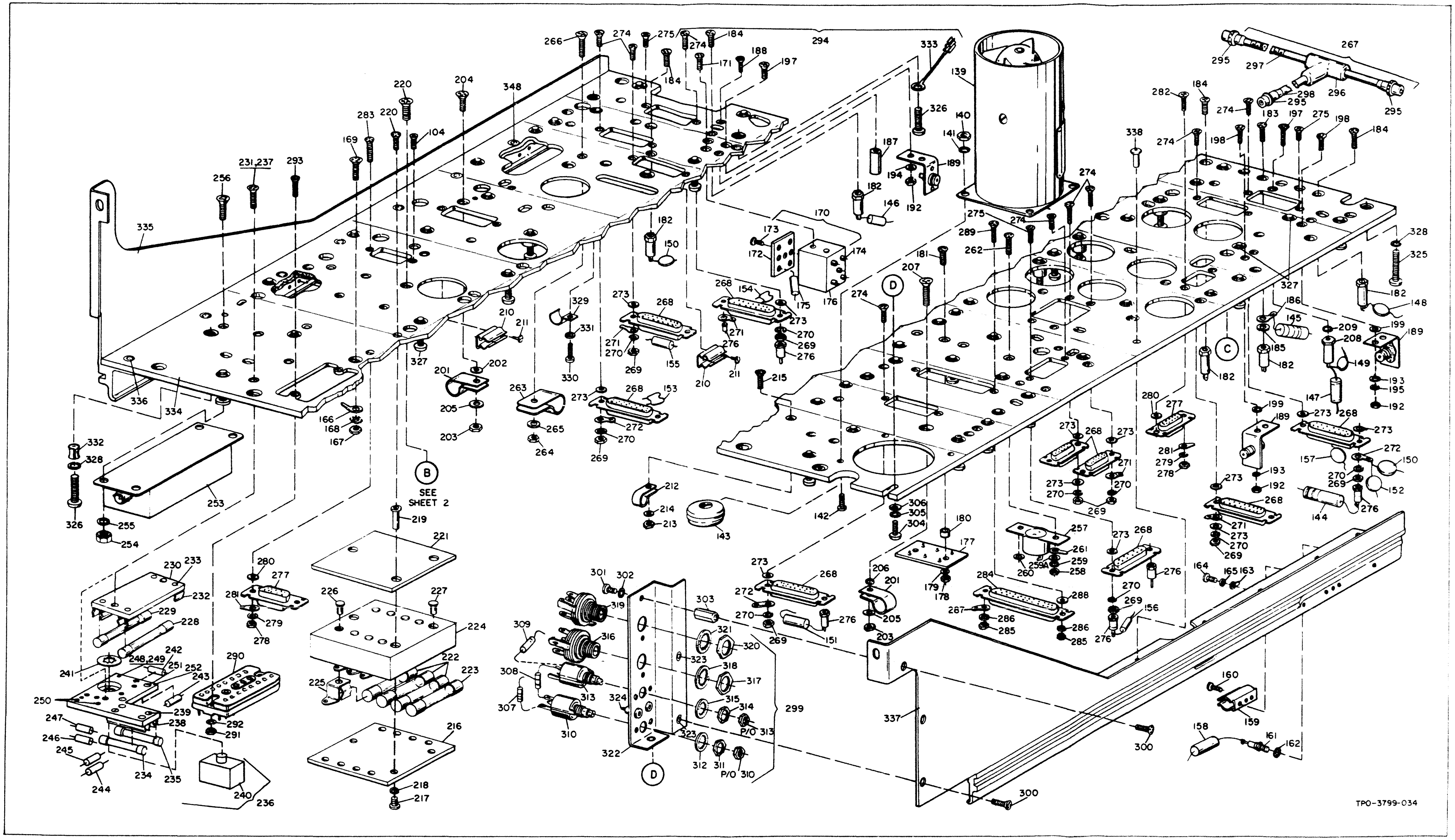


Figure 24. Receiver-Transmitter Subassembly
(Sheet 3 of 3)

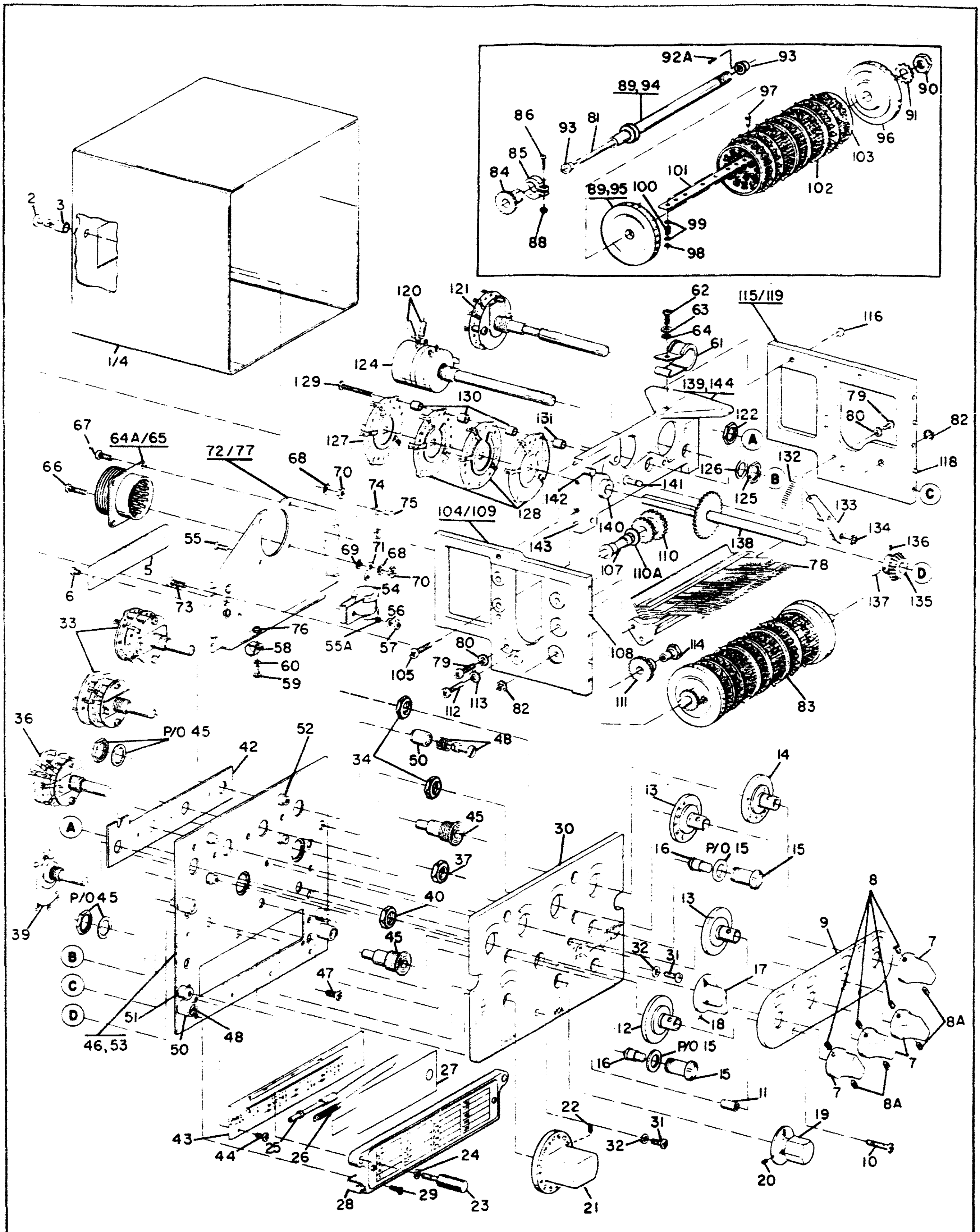


Figure 27. Radio Set Control C-1607/ARC-52

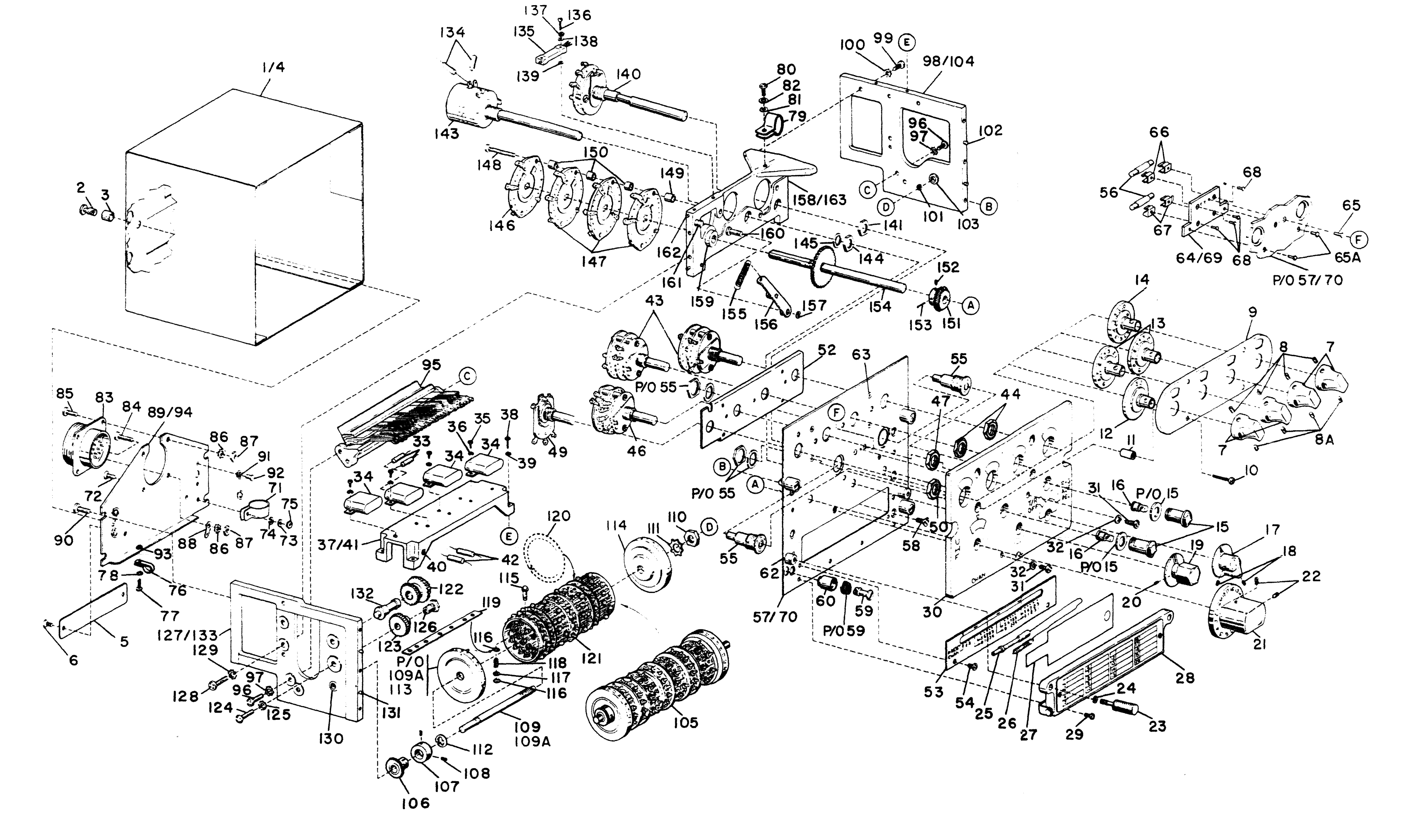


Figure 28. Radio Set Control C-2791/ARC

SECTION III
PREPARATION FOR USE AND RESHIPMENT

3-1. UNPACKING AND INSPECTING THE EQUIPMENT.

3-2. Exercise extreme care when unpacking the equipment. As each component is unpacked, make a visual inspection for evidence of damage incurred during shipment. Check the component against the packing slip and against the list of equipment supplied (table I). When all the equipment has been removed, place in the shipping containers all the packing, bracing, and filler used in the original packing. Save this packaging for use in storage or reshipment of the radio set.

CAUTION

Before loosening any hardware on the receiver-transmitter case depress the valve stem of the air valve on the front panel to release any internal pressure.

3-3. Remove Receiver-Transmitter RT-332/ARC-52 from the pressurized case by loosening twelve Allen-head screws around the edges of the front panel. Upend the unit on the front panel and slide off the pressurized case. Inspect for loose mountings, loose or unsoldered connections, improper intercabling, and secure tube-to-socket mounting.

3-4. Remove Radio Set Control C-1607/ARC-52 from the control case by loosening the two Dzus fasteners located at the rear of the unit. Closely inspect the wiring for loose connections. Check all switch contacts for excessive distortion, which might cause poor or no contact when the switch rotor is operated. Check the rotating drum and springs for obvious distortion or breakage.

NOTE

If any damage is discovered during the previous visual inspections, repack the equipment and follow established procedure for reporting equipment damaged in shipment.

3-5. INSTALLATION.

3-6. Installation of Radio Set AN/ARC-52 will conform to standards designated by the installation agency, to the type of aircraft, and to the existing tactical situation. Install Radio Set Control C-1607/ARC-52 at a site convenient to the operator; install Receiver-Transmitter RT-332/ARC-52 so that the flow of air into the front panel blower and from the air vents at the top of the case is not obstructed. Prior to installing the RT-332/ARC-52, however, refer to paragraph 3-7 and verify that the operational-mode connections of the modules are made properly for the type of installation and operation desired. Installation of Radio Set Control C-2791/ARC will conform to the standards designated by the installation agency, to the type of aircraft, and to the existing tactical situation.

3-7. OPERATIONAL-MODE CONNECTIONS.

3-8. In accordance with the provisions of contracts listed in section I, Radio Set AN/ARC-52, and AN/ARC-52X are delivered connected for normal two-way radio-telephone communication with carbon-microphone input and signal noise squelch. However, connections throughout the system may provide for dynamic-microphone input, carrier squelch, intercom facilities, adf operation, df operation, and automatic relay operation. All operation-mode extensions are discussed in the following paragraphs.

a. The modulator connections necessary for carbon or dynamic microphone operation are illustrated in figures 3-1 and 3-2. For a carbon microphone installation, make the tie point connections as shown in figure 3-1. For an installation using dynamic microphone, change the connections to those shown in figure 3-2.

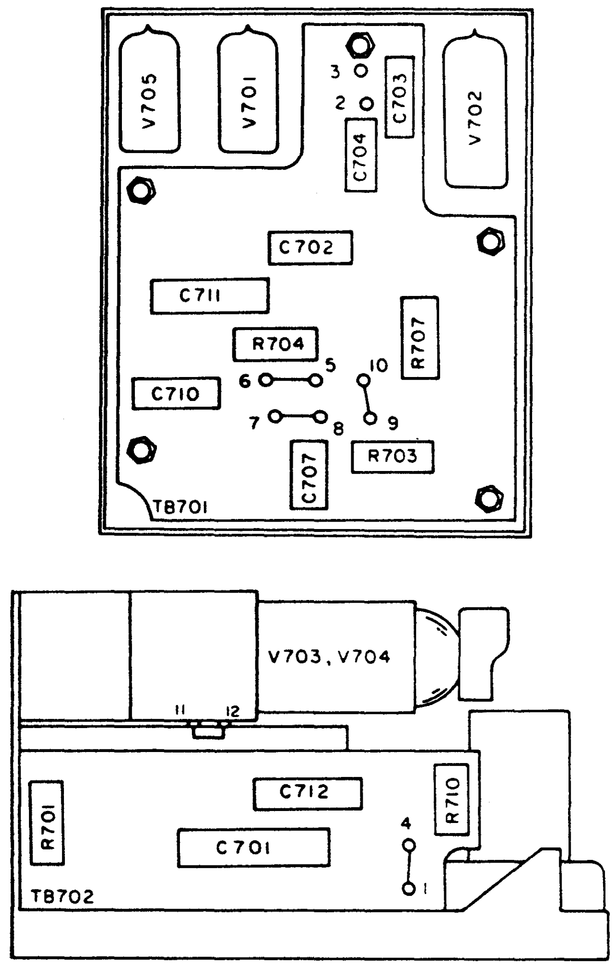
b. The audio amplifier connections necessary for signal/noise squelch or carrier squelch operation are illustrated in figures 3-3 and 3-4. For a signal/noise squelch installation, connect terminal A to terminal B at linkage points two and seven (figure 3-3) and linkage points one, three, four, five, and six (figure 3-4). For a carrier squelch installation, connect terminal A to terminal C at the above-mentioned linkage points.

c. For an installation using intercom facilities, make connections between tie points on main chassis terminal board TB1501 as indicated in figure 3-5 and remove jumper between pins 11 and 12 as shown in figure 3-2. If intercom is not used, the connections should be made as ~~indicated for normal~~ and A jumper connected between pins 11 and 12. When intercom is used, connect the parallel receiving headsets to the main audio output. An individual intercom microphone with grounding switch for each crew member should be connected to pin R of J1401 (figure 3-6). With this arrangement, each crew member can speak over the intercom system, but only the pilot and/or co-pilot can initiate an external radio transmission.

d. The inclusion of adf operation requires connections and equipment external to the radio set. Make the connections in accordance with the directions shown in figure 3-7.

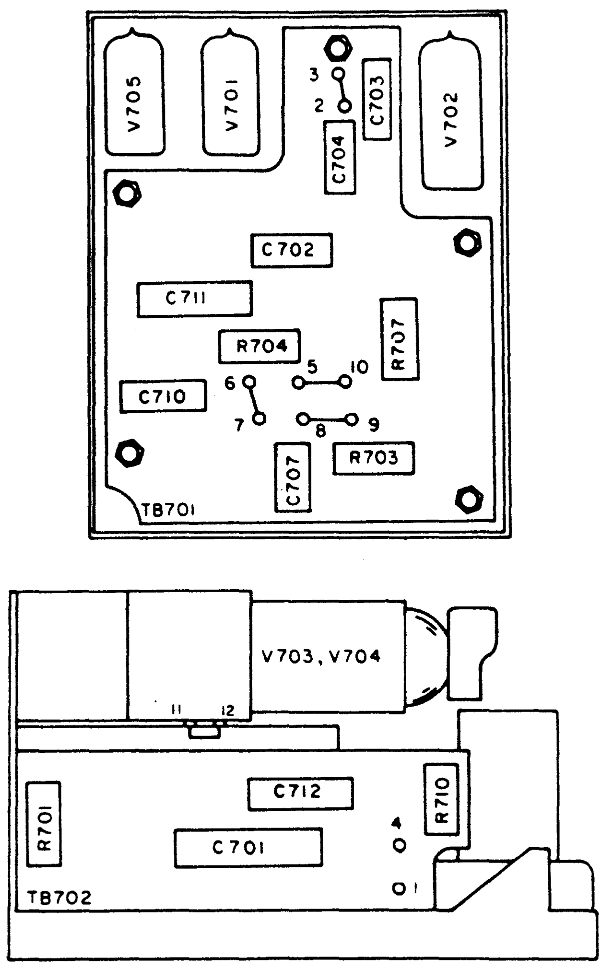
e. The inclusion of direction-finding operation requires the use of a tone switch usually located at the pilot's instrument panel. Connections to the tone switch are shown in figure 3-7.

f. For automatic relay operation, the operational-mode connections of paragraph 3-7 should be made for carrier-squelch operation; and the units should be connected according to the Interconnection Diagram for Automatic Relay Operation (figure 3-8), which illustrates connections between Radio Set Control C-2791/ARC, two Radio Sets AN/ARC-52, and Radio Set Control C-1607/ARC-52.



TIE POINTS	FOR CARBON MIKE
1 AND 4	CONNECTED
5 AND 6	CONNECTED
7 AND 8	CONNECTED
9 AND 10	CONNECTED
2 AND 3	OPEN
6 AND 7	OPEN
8 AND 9	OPEN
5 AND 10	OPEN

Figure 3-1. Modulator Connections for Carbon Microphone Operation



TIE POINTS	FOR DYNAMIC MIKE
1 AND 4	OPEN
5 AND 6	OPEN
7 AND 8	OPEN
9 AND 10	OPEN
2 AND 3	CONNECTED
6 AND 7	CONNECTED
8 AND 9	CONNECTED
5 AND 10	CONNECTED

Figure 3-2. Modulator Connections for Dynamic Microphone Operation

3-9. CABLING. Cabling between the radio components is illustrated in figure 3-7 and listed in table IX. Connections are made in accordance with the figure although the actual cable lengths are dependent upon the particular aircraft installation. Individual installation conditions and the intended use of the equipment should be carefully studied and planned before attempting actual installation.

3-10. INSTALLATION CHECK. Prior to the application of power, perform the following checks to avoid damage to the equipment:

a. At Receiver-Transmitter RT-332/ARC-52, be sure all four mounting feet are secured firmly to the aircraft frame and the front mounting wing nuts are sufficiently tight to prevent the equipment from moving or vibrating in the mounting. Check front panel connectors P1401 and P1402 for firm union with their respective lead-in cables.

b. At Radio Set Control C-1607/ARC-52, determine that mounting bolts are secure and check cable connections for firm union.

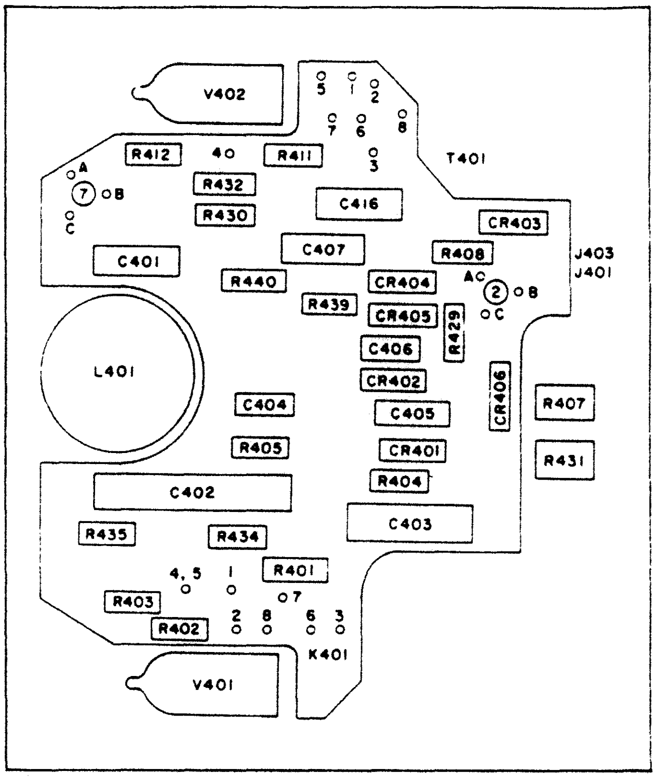


Figure 3-3. Audio Amplifier Unit. Front Cover Plate. Connections for Signal/Noise Squelch or Carrier Squelch Operation

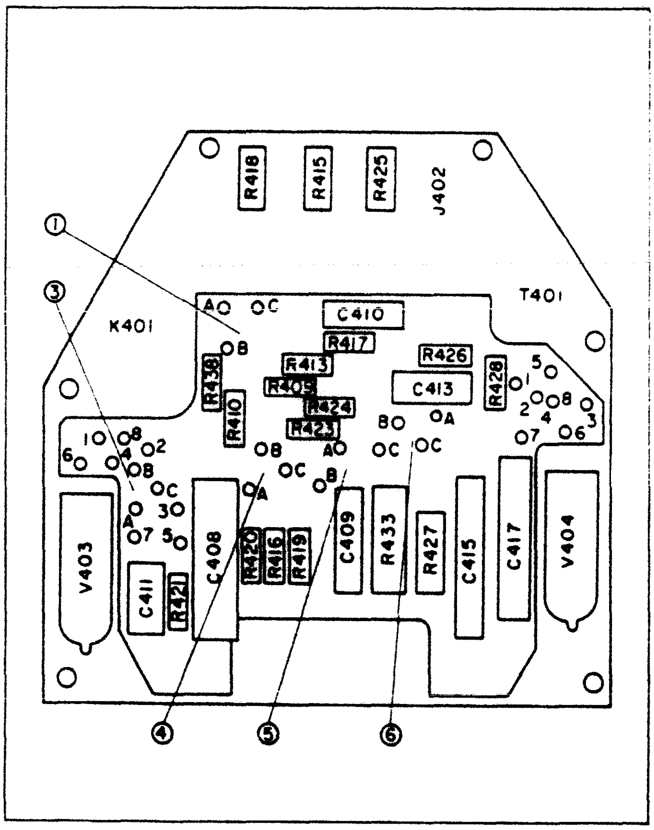
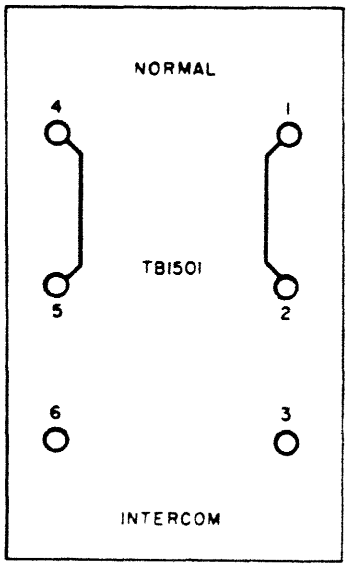


Figure 3-4. Audio Amplifier Unit, Rear Cover Plate. Connections for Signal/Noise Squelch or Carrier Squelch Operation



TIE POINTS	FOR INTERCOM	FOR NORMAL SIDETONE
1 AND 2	OPEN	CONNECTED
2 AND 3	CONNECTED	OPEN
4 AND 5	OPEN	CONNECTED
5 AND 6	CONNECTED	OPEN

Figure 3-5. Terminal Board TB1501. Connections for Normal Sidetone or Intercom Operation

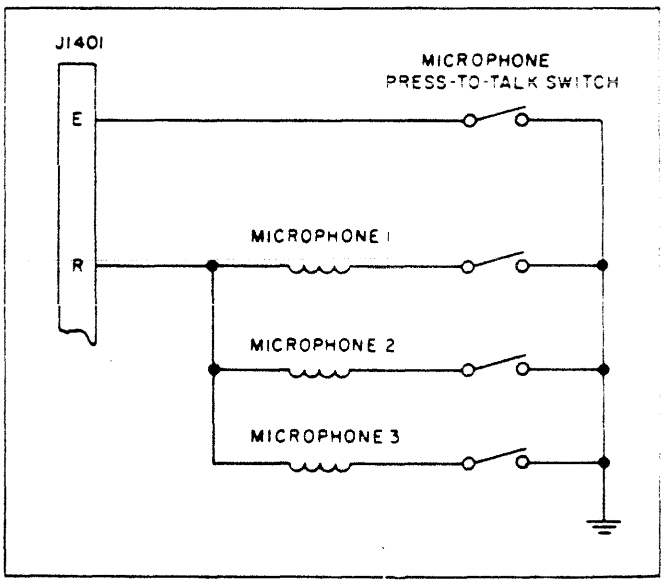


Figure 3-6. External Connections for Intercom Operation

3-11. INITIAL OPERATION. Connect a wattmeter between antenna connector P1402 and ground. Operate the equipment in accordance with the instructions given in the Handbook of Operating Instructions for Radio Set AN/ARC-52. Check the wattmeter indication and note whether sidetone audio is present in the earphones. Check proper operation of the equipment by performing the minimum performance checks given in section V.

CAUTION

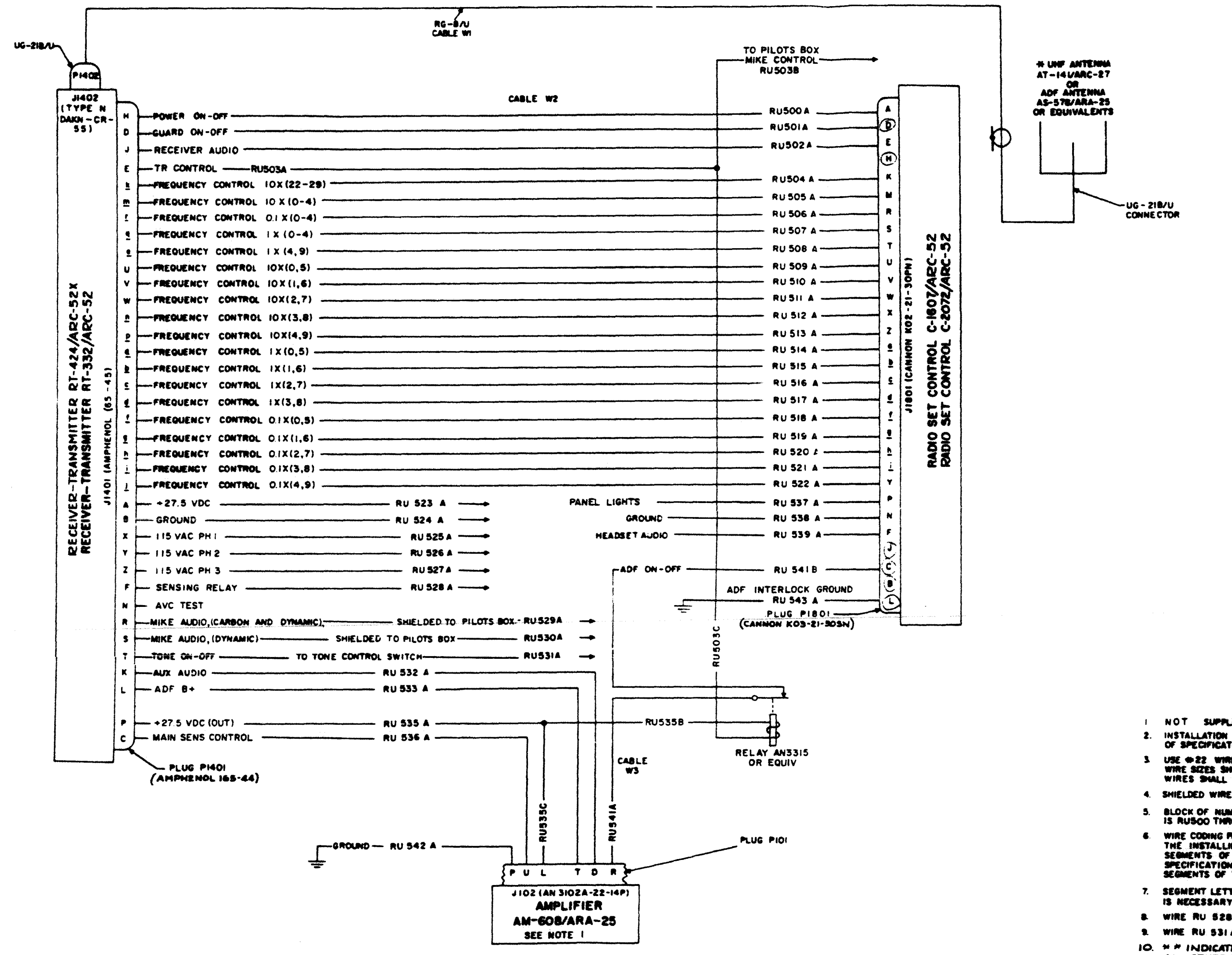
During this entire procedure, check the equipment carefully for evidence of shorts or burning.

3-12. RESHIPMENT.

3-13. To reship the equipment, package and pack in accordance with Specification JAN-P-658. The actual packing procedure should duplicate, in reverse order, the unpacking and installation procedures described in paragraph 3-1.

TABLE IX. CABLE DESIGNATIONS

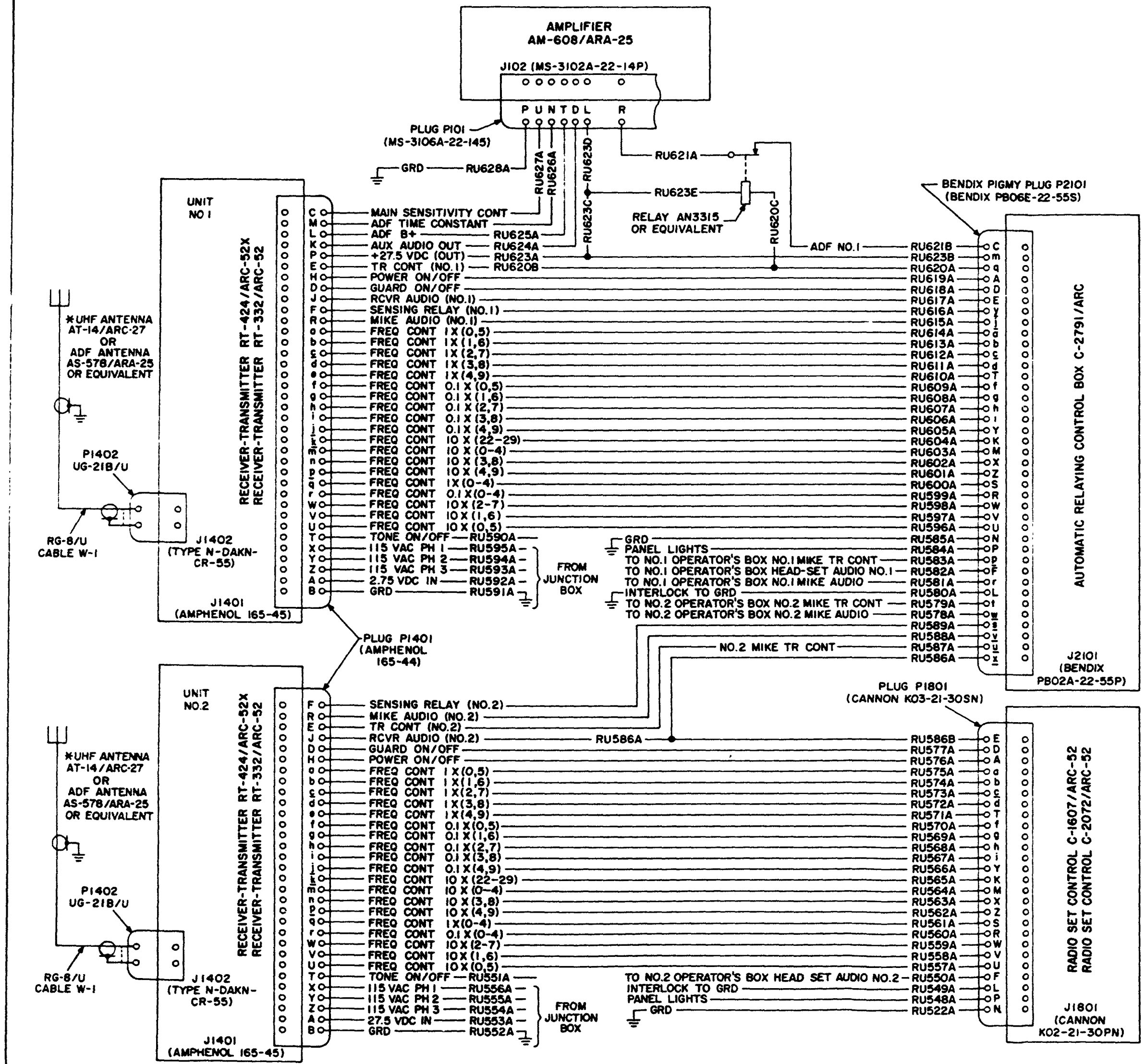
CABLE REFERENCE SYMBOL	SPECIFICATIONS	TERMINATIONS	
		CABLE TERMINATION	MATING JACK OR PLUG
W1	RG-8/U. Length determined by installation.	UG-21B/U jack J1402.	P1402.
		UG-21B/U connector.	Antenna AT-141/ARC-27, ADF AS-578/ARA-25, or equivalent.
W2	Multiwire. Length determined by installation.	Amphenol 165-44, jack J1401.	P1401.
		Cannon K03-21-30SN, plug P1801.	J1801.
W3	Multiwire. Length determined by installation.	1 connection to P1801.	J1801.
		5 connections to J1401.	
		1 connection to ground	
		AN3108-22-14S, plug P101.	J102 on AM-608/ARA-25 equipment, if used.



AN/ARC-52 & AN/ARC-52X						
WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES	WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES	
RU500A (22)	30	0.2	RU524A (16)	GROUND	10.0 15.0**	SEE NOTE 10
RU501 A (22)	30	0.2	RU525A (16)	115V, 400∿ PHASE 1	1.5 0.0**	SEE NOTE 10
RU502 A (22)	20	0.08				
RU503A (22)	30	0.5	RU526A (16)	115V, 400∿ PHASE 2	1.5 0.0**	SEE NOTE 10
RU503B (22)						
RU503C (22)			RU527A (16)	115V, 400∿ PHASE 3	1.5 0.0**	SEE NOTE 10
RU504A (22)	30	1.5				
RU505A (22)	30	1.5	RU528A (22)	30	0.5	
RU506A (22)	30	1.5	RU529A (22)	30	0.2	
RU507A (22)	30	1.5	RU530A (22)	5	0.1	
RU508A (22)	30	1.5	RU531A (22)	30	0.1	
RU509A (22)	30	1.5	RU532A (22)	10	0.1	
RU510A (22)	30	1.5	RU533A (22)	225	0.02	
RU511A (22)	30	1.5				
RU512A (22)	30	1.5	RU535A (22)	27.5	1.0	
RU513A (22)	30	1.5	RU535B (22)			
RU514A (22)	30	1.5	RU535C (22)			
RU515A (22)	30	1.5	RU536A (22)	10	0.025	
RU516A (22)	30	1.5	RU537A (22)	30	0.3	
RU517A (22)	30	1.5	RU538A (22)	GROUND	2.5	
RU518A (22)	30	1.5	RU539A (22)	20	0.08	
RU519A (22)	30	1.5	RU541A (22)	30	0.5	
RU520A (22)	30	1.5	RU541B (22)			
RU521A (22)	30	1.5	RU542A (22)	GROUND		
RU522A (22)	30	1.5	RU543 A	GROUND		
RU523A (16)	27.5	5.0 ** 15.0 SEE NOTE 10	RU544A			

1. NOT SUPPLIED WITH RADIO SET AN/ARC-52 OR AN/ARC-52X
2. INSTALLATION SHALL BE IN ACCORDANCE WITH APPLICABLE ISSUE OF SPECIFICATIONS MIL-I-8700 & APPLICABLE SPECIFICATIONS REFERENCED THEREIN.
3. USE #22 WIRE FOR 1.5 AMPS, #16 FOR HIGHER CURRENTS. WIRE SIZES SHOWN ARE MINIMUM SIZES ONLY AND LARGER WIRES SHALL BE USED AS REQUIRED, PER MIL-W-5088
4. SHIELDED WIRES SHALL CONFORM TO SPECIFICATIONS MIL-C-7078
5. BLOCK OF NUMBERS ASSIGNED FOR USE WITH RADIO SET AN/ARC-52 OR AN/ARC-52X IS RU500 THRU RU699. THE HIGHEST NUMBER USED IS RU 544A
6. WIRE CODING FOR PANEL LIGHTING WIRES SHALL BE ASSIGNED BY THE INSTALLING ACTIVITY. IN NEW AIRCRAFT, THIS WILL BE AS SEGMENTS OF THE PANEL LIGHTING CIRCUIT USING LETTER "L" PER SPECIFICATION MIL-W-5088. FOR OLD AIRCRAFT, THIS WILL BE AS SEGMENTS OF THE EXISTING CODING ON WIRES AT THE POINT OF TIE-IN.
7. SEGMENT LETTER IN ADDITION TO THOSE SHOWN MAY BE USED AS IS NECESSARY TO FIT THE PARTICULAR INSTALLATION.
8. WIRE RU 528 A OF P1401 IS USED ONLY IN AUTOMATIC RELAYING INSTALLATIONS.
9. WIRE RU 531 A USE IS OPTIONAL.
10. ** INDICATES CONDUCTED CURRENT FOR AN/ARC-52X. PRECEEDING VALUE FOR AN/ARC-52 ALL OTHER VALUES COMMON TO BOTH EQUIPMENTS.

Figure 3-7. Radio Set AN/ARC-52, Interconnection Diagram



WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES
RU628A (22)	GRD	0.7
RU627A (22)	10	0.025
RU626A (22)	5	0.2
RU625A (22)	225	0.02
RU624A (22)	10	0.1
RU623A (22)	27.5	1.0
RU623B (22)	27.5	1.0
RU623C (22)	27.5	1.0
RU623D (22)	27.5	1.0
RU623E (22)	27.5	1.0
RU621A (22)	30.0	0.5
RU621B (22)	30 0	0.5
RU620A (22)	30 0	0.5
RU620B (22)	30 0	0.5
RU620C (22)	30 0	0.5
RU619A (22)	30	0.2
RU618A (22)	30	0.2
RU617A (22)	20	0.08
RU616A (22)	30	0.5
RU615A (22)	30	0.2
RU614A (22)	30	1.5
RU613A (22)	30	1.5
RU612A (22)	30	1.5
RU611A (22)	30	1.5
RU610A (22)	30	1.5
RU609A (22)	30	1.5
RU608A (22)	30	1.5
RU607A (22)	30	1.5
RU606A (22)	30	1.5
RU605A (22)	30	1.5
RU604A (22)	30	1.5
RU603A (22)	30	1.5
RU602A (22)	30	1.5
RU601A (22)	30	1.5
RU600A (22)	30	1.5
RU599A (22)	30	1.5
RU598A (22)	30	1.5
RU597A (22)	30	1.5
RU596A (22)	30	1.5
RU595A (16)	115 V,400CPS PH 1	1.5 (0.0**)
RU594A (16)	115 V,400CPS PH 2	1.5 (0.0**)
RU593A (16)	115 V,400CPS PH 3	1.5 (0.0**)
RU592A (16)	27.5	5.0(15**)
RU591A (16)	GRD	10.0(15**)
RU590A (22)	30	0.1

WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES
RU589A (22)	30	0.5
RU588A (22)	30	0.2
RU587A (22)	30	0.5
RU586A (22)	20	0.08
RU586B (22)	20	0.08
RU586C (22)	20	0.08
RU585A (16)	GRD	2.5
RU584A (22)	30	0.3
RU583A (22)	30	0.5
RU582A (22)	20	0.08
RU581A (22)	30	0.2
RU580A (22)	GRD	0.5
RU579A (22)	30	0.5
RU578A (22)	30	0.2
RU577A (22)	30	0.2
RU576A (22)	30	0.2
RU575A (22)	30	1.5
RU574A (22)	30	1.5
RU573A (22)	30	1.5
RU572A (22)	30	1.5
RU571A (22)	30	1.5
RU570A (22)	30	1.5
RU569A (22)	30	1.5
RU568A (22)	30	1.5
RU567A (22)	30	1.5
RU566A (22)	30	1.5
RU565A (22)	30	1.5
RU564A (22)	30	1.5
RU563A (22)	30	1.5
RU562A (22)	30	1.5
RU561A (22)	30	1.5
RU560A (22)	30	1.5
RU559A (22)	30	1.5
RU558A (22)	30	1.5
RU557A (22)	30	1.5
RU556A (16)	115 V,400CPS PH 1	1.5 (0.0**)
RU555A (16)	115 V, 400CPS PH 2	1.5 (0.0**)
RU554A (16)	115 V,400CPS PH 3	1.5 (0.0**)
RU553A (16)	27.5	5.0(15**)
RU552A (16)	GRD	10.0(15**)
RU551A (22)	30	0.1
RU550A (22)	20	0.08
RU549A (22)	GRD	0.5
RU548A (22)	30	0.3
RU522A (16)	GRD	2.5

NOTES:
1. * NOT SUPPLIED WITH RADIO SET AN/ARC-52 OR AN/ARC-52X.
2. INSTALLATION SHALL BE IN ACCORDANCE WITH APPLICABLE ISSUE OF SPECIFICATIONS MIL-I-8700 AND APPLICABLE SPECIFICATIONS REFERENCED THEREIN.
3. USE NO.22 WIRE FOR 1.5 AMPS AND NO.16 FOR HIGHER CURRENTS. WIRE SIZES SHOWN ARE MINIMUM SIZES ONLY AND LARGER WIRES SHALL BE USED AS REQUIRED, PER MIL-W-5088.
4. SHIELDED WIRES SHALL CONFORM TO SPECIFICATIONS MIL-C-7078.
5. BLOCK OF NUMBERS ASSIGNED FOR USE WITH RADIO SET AN/ARC-52 AND AN/ARC-52X IS RU500 THRU RU699. NUMBERS RU548 THRU RU628 WERE USED.
6. WIRE CODING FOR PANEL LIGHTING WIRES SHALL BE ASSIGNED BY THE INSTALLING ACTIVITY. IN NEW AIRCRAFT THIS WILL BE AS SEGMENTS OF THE PANEL LIGHTING CIRCUIT USING LETTER "L" PER SPECIFICATION MIL-W-5088. FOR OLD AIRCRAFT THIS SHALL BE AS SEGMENTS OF THE EXISTING CODING ON WIRES AT THE POINT OF TIE-IN.
7. SEGMENT LETTER IN ADDITION TO THOSE SHOWN MAY BE USED AS IS NECESSARY TO FIT THE PARTICULAR INSTALLATION.
8. WIRES RU590A AND RU551A USE IS OPTIONAL.
9. ** INDICATES CONDUCTED CURRENT FOR AN/ARC-52X. PRECEEDING VALUE FOR AN/ARC-52. ALL OTHER VALUES COMMON TO BOTH EQUIPMENTS.

Figure 3-8. Automatic Relay Operation, Interconnection Diagram

SECTION IV
THEORY OF OPERATION

4-1. GENERAL SYSTEM OPERATION.

4-2. Radio Set AN/ARC-52 (figure 4-1) is a remotely operated transmitter and receiver unit equipped with all necessary control and mounting accessories. The equipment provides transmitting and receiving facilities on any one of 1750 frequency channels within the frequency range. To accomplish this function, transmitting and receiving components operate bilaterally: during reception, the signal path is in one direction; during transmission, the signal path is in the reverse direction.

4-3. Radio Set AN/ARC-52 uses double conversion, superheterodyne circuits. A received signal is mixed with two separate, but successive, injection frequencies to obtain a desired intermediate frequency. During transmission, a basic frequency is mixed with the two injection frequencies to provide a desired carrier frequency.

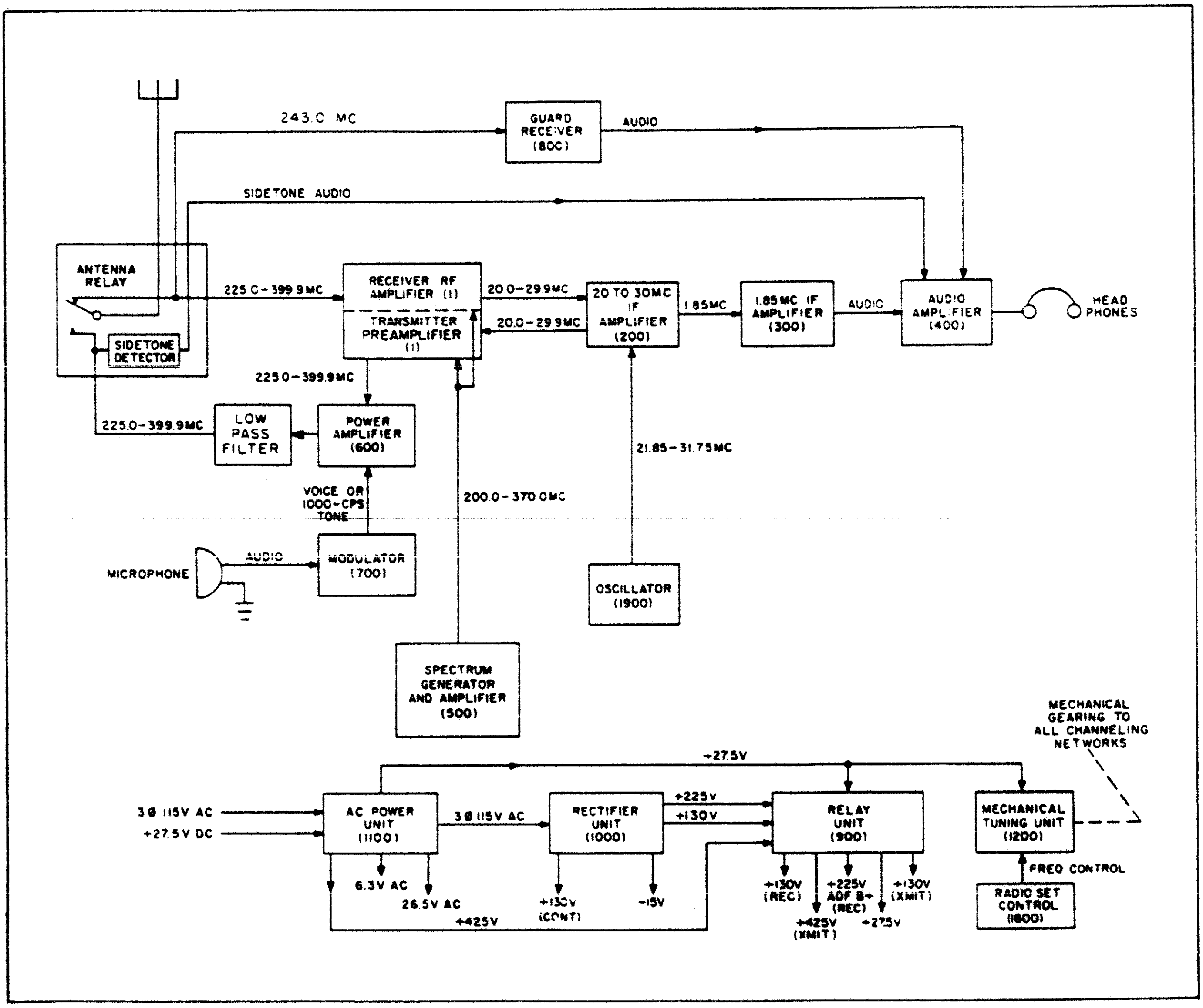


Figure 4-1. Radio Set AN/ARC-52, Block Diagram

4-4. A received signal, which occurs in the 225.0-mc to 399.9-mc frequency range, is applied to the r-f amplifier and transmitter preamplifier module. In this module, the received signal is mixed with a 200-mc to 370-mc injection voltage from the spectrum generator and amplifier module. The resultant 20.0-mc to 29.9-mc intermediate frequency is applied to the 20-mc to 30-mc i-f amplifier module, where this frequency is mixed with the 21.85-mc to 31.75-mc injection signal from the oscillator module. The resultant 1.85-mc intermediate frequency is filtered, amplified, and detected in the 1.85-mc i-f amplifier module and is then applied through an audio amplifier module to a headset.

4-5. A transmitted carrier is initiated within the oscillator module. The 21.85- to 31.75-mc output of the oscillator module is mixed with the 1.85-mc signal generated in the 20- to 30-mc i-f amplifier to produce a frequency of 20.0 to 29.9 mc. The resultant 20.0- to 29.9-mc frequency is applied to the r-f amplifier and transmitter preamplifier module simultaneously with the 200- to 370-mc injection output of the spectrum generator and amplifier module. The resultant mixed carrier frequency of 225.0 to 399.9 mc is amplified and fed to a power amplifier module where this carrier is modulated by audio signals applied by a microphone and modulator module. The power amplifier module develops a modulated carrier within the 225.0- to 399.9-mc frequency range. The modulated carrier is connected to an antenna and sampled by a sidetone detector on the antenna relay. The detected portion of the carrier is applied to the audio amplifier module as sidetone audio. This sidetone audio permits the operator to monitor the transmitted signal.

4-6. The guard receiver module is a single frequency receiver that operates on a 243.0-mc input frequency. The guard circuit is a double conversion, superheterodyne type similar to the main receiver. Both receivers work into a common audio output circuit and have a common antenna input circuit.

Crystal controlled injection systems, which are the source of the beat frequencies, are ganged mechanically to the tuning mechanism of the AN/ARC-52 so that the selection of any frequency results in the development of a 20.0-mc to 29.9-mc and a 1.85-mc intermediate frequency. All tuning or channeling is accomplished by a mechanical tuning module, which is activated by Radio Set Control C-1607/ARC-52.

4-8. The a-c power unit (RT-332/ARC-52 only) receives voltages from 115-volt a-c, 3-phase, 400 cycle, and 27.5-volt d-c power sources and distributes these voltages to the required modules. The a-c voltage is applied to a rectifier unit, and the d-c voltage is applied to a relay unit and the mechanical tuning unit. In addition, the a-c power unit supplies a rectified output of 425 volts dc to the relay unit and filament voltages of 6.3 volts ac and 26.5 volts ac to the appropriate filament distribution points.

4-9. The rectifier unit (RT-332/ARC-52 only) receives 115 volts ac from the a-c power unit and provides plate and bias voltages of +130 volts, +225 volts, and -15 volts dc.

4-10. The dynamotor power supply unit (RT-424/ARC-52X only) receives 27.5 volts dc from an external power source and distributes this voltage to internal circuits. This voltage also excites a dynamotor to produce d-c voltages of +425 and +130. From these voltages, additional d-c voltages of +225 (regulated) and -15 are developed (figure 4-2). All d-c output voltages from the dynamotor power supply unit are applied, either directly or through the relay unit, to the plate, screen, and grid circuits in the receiver-transmitter.

4-11. The relay unit, controlled by a microphone press-to-talk switch, performs the transition between transmit and receive functions of the AN/ARC-52. The relay unit also provides three other switching functions: disable, wherein channeling causes the AN/ARC-52 to revert to the receive function and any received audio signal is grounded; guard, wherein plate voltage is controlled for guard receiver operation; and tone, wherein a continuous 1,000-cps tone used for a homing signal is transmitted. To provide these switching functions, the relay unit receives positive d-c voltages of 27.5, 130, 225, and 425 volts and makes available d-c voltages of 130, 225, 425, and 27.5 volts.

4-12. The mechanical tuning unit, which performs frequency selection within the equipment, is remotely controlled from Radio Set Control C-1607/ARC-52.

4-13. The C-1607/ARC-52 provides operational control of Receiver-Transmitter RT-332/ARC-52. This controlling function includes selecting the mode of operation, actual equipment operation, and automatic or manual selection of operating frequency.

4-14. The remaining paragraphs of this section present detailed theory of the radio set. Because certain units perform bilateral functions, components and circuits are discussed under the appropriate overall system function or operational mode. Detailed theory is presented under the following main topic headings:

a. Main receiver circuits (paragraph 4-15) presents theory of circuits and components that affect the reception, detection, and amplification of signals received within the 225.0-mc to 399.9-mc frequency range. Circuit theory of the receiver r-f amplifier and transmitter preamplifier module and of the 20- to 30-mc i-f amplifier module is given for receiving only.

b. Guard receiver circuits (paragraph 4-105) presents theory of circuits and components that affect the reception and detection of signals received on the guard frequency channel. Components common to both main receiver and guard receiver operation are discussed under main receiver circuits.

c. Injection-frequency generation circuits (paragraph 4-136) presents theory of the spectrum generator and amplifier module and the oscillator module. These modules supply injection frequencies for both receiving and transmitting.

d. Transmitter circuits (paragraph 4-159) presents theory of circuits and components that affect the generation, modulation, amplification, and transmission of voice signals or the direction-finding tone. Circuit

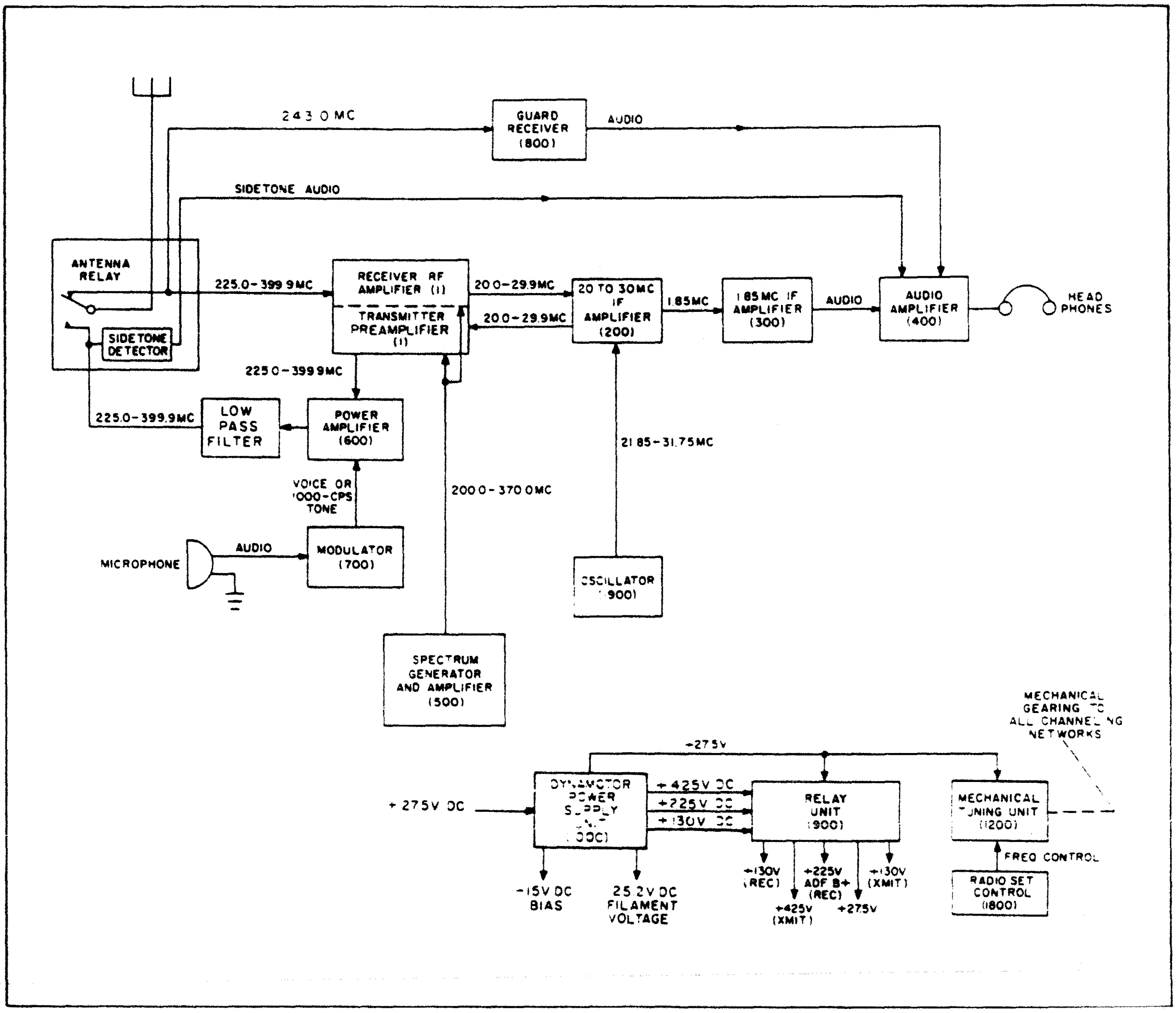


Figure 4-2. Radio Set AN/ARC-52X, Block Diagram

theory of the receiver r-f amplifier and transmitter preamplifier module and of the 20- to 30-mc i-f amplifier module is presented for transmitting only.

e. Power circuits (paragraph 4-207) presents theory of circuits and components that affect plate, bias, and filament power distribution for operation of the radio set in all operational modes.

f. Control system (paragraph 4-229) presents theory of circuits and components that affect the selection of operating mode and frequency range.

4-15. MAIN RECEIVER CIRCUITS.

4-16. The main receiver circuits comprise antenna relay K1401, the receiver sections of the receiver r-f amplifier and transmitter preamplifier module, the 20- to 30-mc i-f amplifier module, the 1.85-mc i-f amplifier module, and the audio amplifier module. Note that the first three of these components perform alternate functions during the transmitting cycle, which is discussed in paragraph 4-160. Injection frequency signals are supplied by the spectrum generator and amplifier module and the oscillator module (paragraph 4-136).

4-17. ANTENNA RELAY ASSEMBLY. (See figure 4-3.)

4-18. The radio set uses a common antenna for transmitting and receiving. The antenna relay assembly switches the antenna alternately to the receiver input or the transmitter output and contains a sidetone detector circuit. The following discussion covers operation of the antenna relay assembly during reception only. Transmission theory and sidetone detection within the assembly are given in paragraph 4-203.

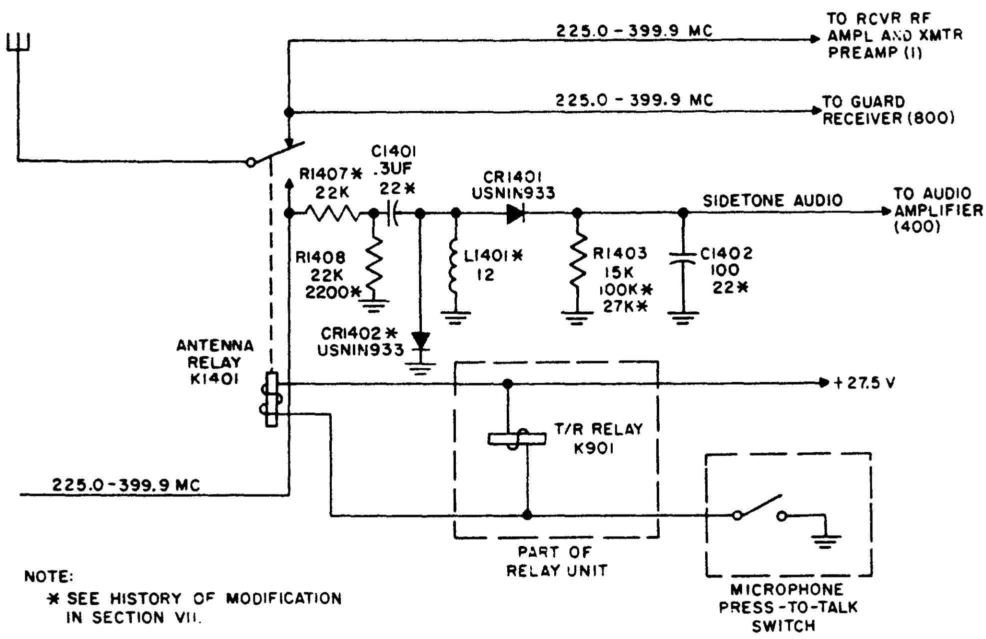


Figure 4-3. Antenna Relay Assembly, Simplified Schematic Diagram

4-19. With antenna relay K1401 in the receive, or de-energized condition, the antenna is terminated at the inputs of the main receiver and the guard receiver. Antenna relay K1401 and T/R relay K901 are in parallel and both relays are energized when the press-to-talk switch of the microphone is closed.

4-20. RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER, RECEIVING THEORY.

4-21. GENERAL. (See figure 4-4.)

4-22. Although physically connected to the transmitter preamplifier to form a single module, the receiver r-f amplifier is a separate functional unit. The discussion presented below covers theory of the receiving components only. Refer to paragraph 4-170 for theory of the transmitter preamplifier section of the module.

4-23. A modulated carrier received in the 225.0-mc to 399.9-mc range is applied from the antenna relay through three successive stages of r-f amplification (V1, V2, and V3) to receiver 1st mixer V4. At the same time an injection signal selected from the 200.0-mc to 370.0-mc range is applied from the spectrum generator and amplifier module to the receiver 1st mixer. The resultant beat or i-f frequency, which occurs between 20.0 and 29.9 mc, is applied to receiver circuits in the 20- to 30-mc i-f amplifier.

4-24. RECEIVER AMPLIFIERS V1, V2, AND V3. (See figure 4-5.)

4-25. The input signal from antenna relay K1401 is amplified by grounded grid amplifiers V1, V2, and V3. An avc voltage applied to r-f amplifiers V2 and V3 provides a constant audio output with varying levels of r-f carrier input. The avc also reduces module gain at high signal input levels to prevent receiver blocking. Since no avc is applied to V1, maximum sensitivity at low signal levels is ensured. The grids of V2 and V3 are held at r-f ground potential by paralleled capacitors C13 and C59 and by paralleled capacitors C19 and C60, respectively. Resistors R21, R1, and R20 form an avc divider network that provides optimum avc voltage to amplifiers V2 and V3. This method of avc application provides good sensitivity at low signal levels and proper blocking characteristics at high signal levels.

4-26. Matching between the antenna and the input circuit of V1 is provided by capacity divider C8 and C58. Capacitors C14, C55, C20, C56, C25, and C57 provide impedance matching between the output and the input of each following stage.

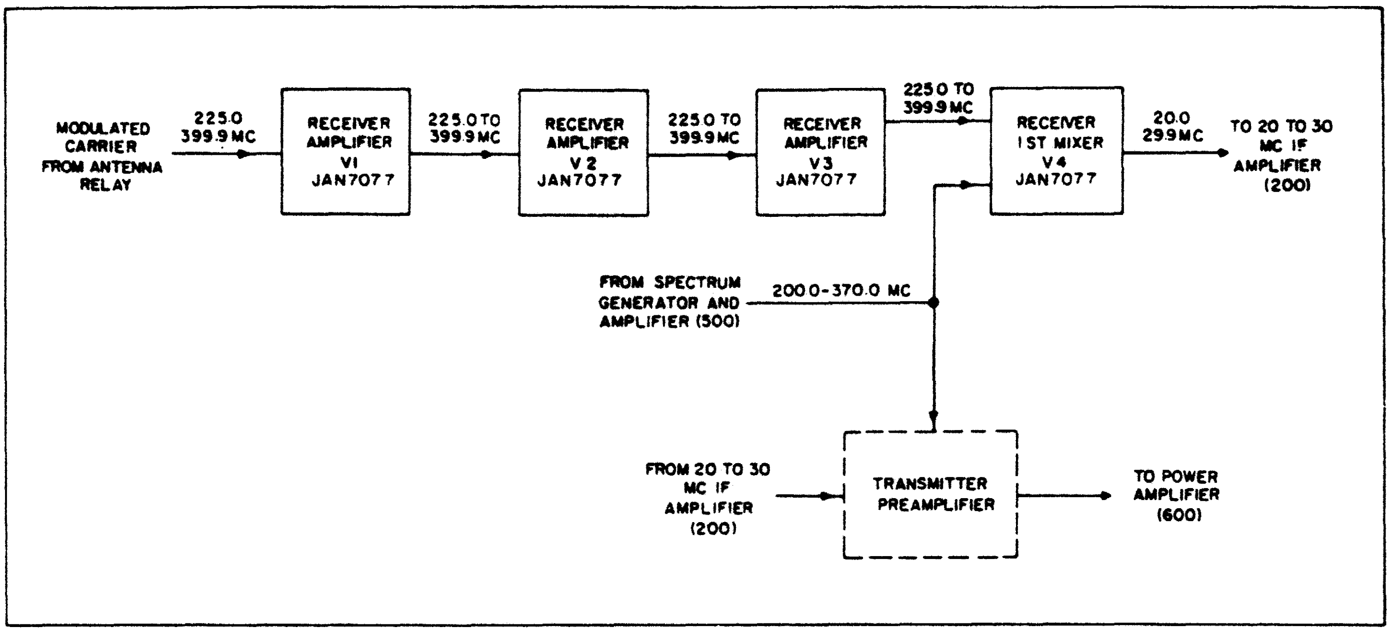


Figure 4-4. Receiver R-F Amplifier and Transmitter Preamplifier Receiving Circuits, Block Diagram

4-27. Selectivity of the main receiver r-f amplifier is achieved through tuned tank circuits Z1, Z2, and Z3, and Z4. Each tank consists of a variable inductance and capacitance (mechanically ganged) that provides a reasonably constant impedance over the frequency range. Capacitors C1, C2, C3, and C4 provide trimmer adjustment for each of the tuned tank circuits. The actual tuning of Z1, Z2, Z3, and Z4 is accomplished by mechanical linkage to the mechanical tuning unit.

4-28. RECEIVER 1ST MIXER V4.

4-29. The amplified r-f signal is applied to the cathode circuit of receiver 1st mixer V4. Coil L8 offers a high impedance to r-f. Resistor R10 develops self-bias for tube V4.

4-30. The injection signal from the spectrum generator and amplifier is applied through capacitor C28 to the grid of V4. Resistors R9 and R11 determine the operating point of the tube, which provides mixer action with a low noise level.

4-31. The signal output of receiver 1st mixer V4 contains heterodyne products of the amplified r-f signal and the injection frequency. Selective tuned circuits in the 1st i-f amplifier attenuate all of these frequency products except the desired i-f signal which is fed to a series tuned circuit in the 20- to 30-mc i-f amplifier module.

4-32. RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER. (CONTRACT NOas 57-478, SERIAL NUMBERS 1-90), RECEIVING THEORY. (See figure 4-6.)

4-33. The receiving theory for receiver r-f amplifier and transmitter preamplifier units that were produced in the first 90 serial numbers of Contract NOas 57-478 is covered in the following paragraphs.

4-34. GENERAL.

4-35. A modulated carrier in the 225.0-mc to 399.9-mc range is applied from the antenna relay through two successive stages of r-f amplification, V1 and V2, to receiver 1st mixer V3. At the same time an injection signal, selected from the 200.0-mc to 370.0-mc range, is applied from the spectrum generator and amplifier module to the receiver 1st mixer. The resultant beat frequency or if., which occurs between 20.0 and 29.9 mc, is applied to the receiver circuits of the 20- to 30-mc i-f amplifier.

4-36. RECEIVER AMPLIFIERS V1 AND V2.

4-37. Receiver amplifiers V1 and V2 amplify the input signals applied from the antenna relay. Both stages are grounded-grid amplifiers, a circuit arrangement used to prevent self-oscillation of the amplifiers at high input signal frequencies. The grids, which are maintained at r-f ground potential by grid capacitors C5 and C9, act like a screen grid within a pentode or tetrode to reduce the plate-to-cathode capacitances.

4-38. The incoming r-f signals, matched to tuned tank circuit Z1 by impedance-matching, voltage-divider capacitors C1 and C2, are coupled to the cathode circuit of V1 through capacitor C3.

4-39. Selectivity is attained by using tuned tank circuits Z1, Z2, and Z3. Each circuit consists of a variable inductor and variable capacitor in a mechanically ganged combination that provides constant impedance over the tuning range. Capacitors C19, C20, and C21 provide trimmer adjustments for each tank circuit.

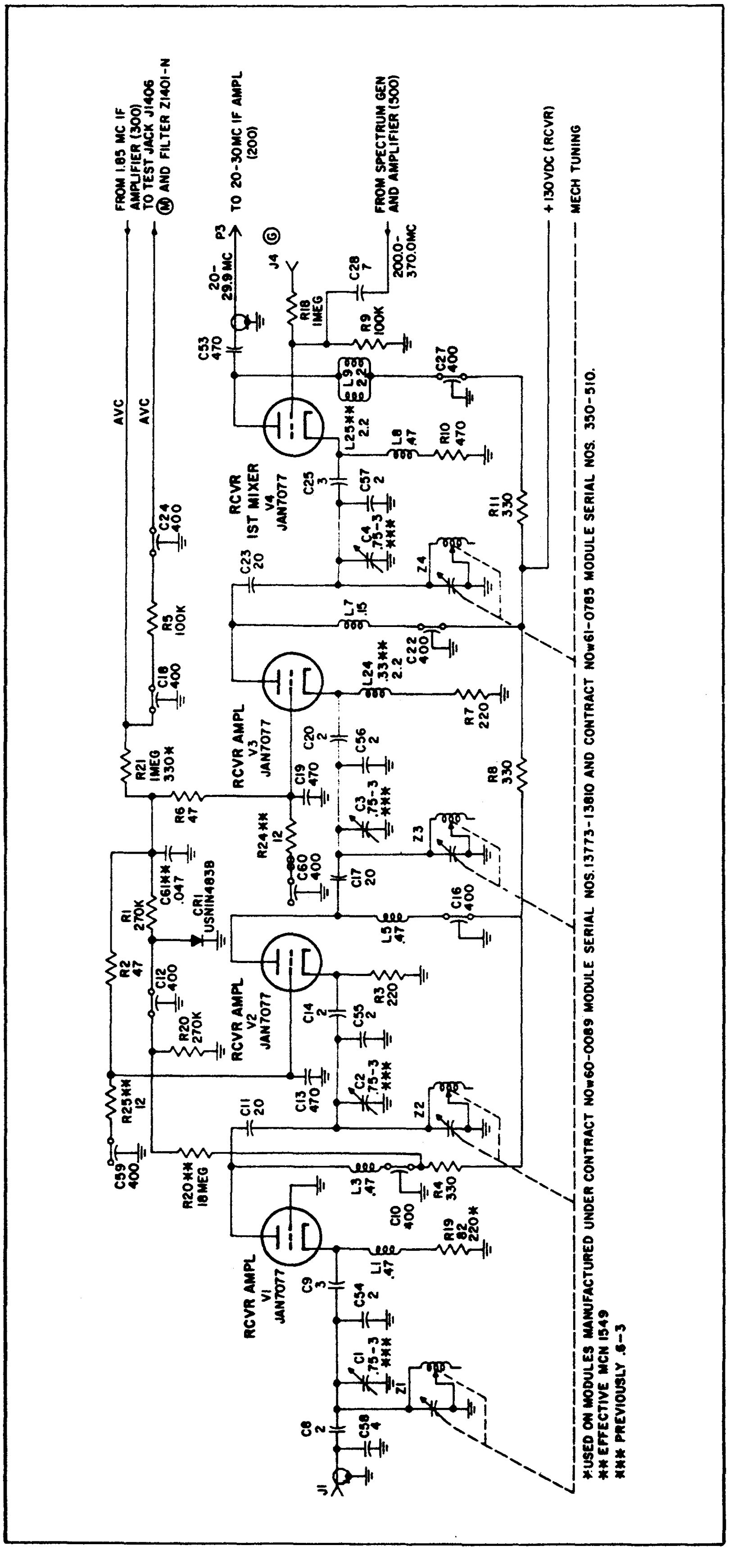


Figure 4-5. Receiver R-F Amplifier and Transmitter Preamplifier Receiver Section, Simplified Schematic Diagram

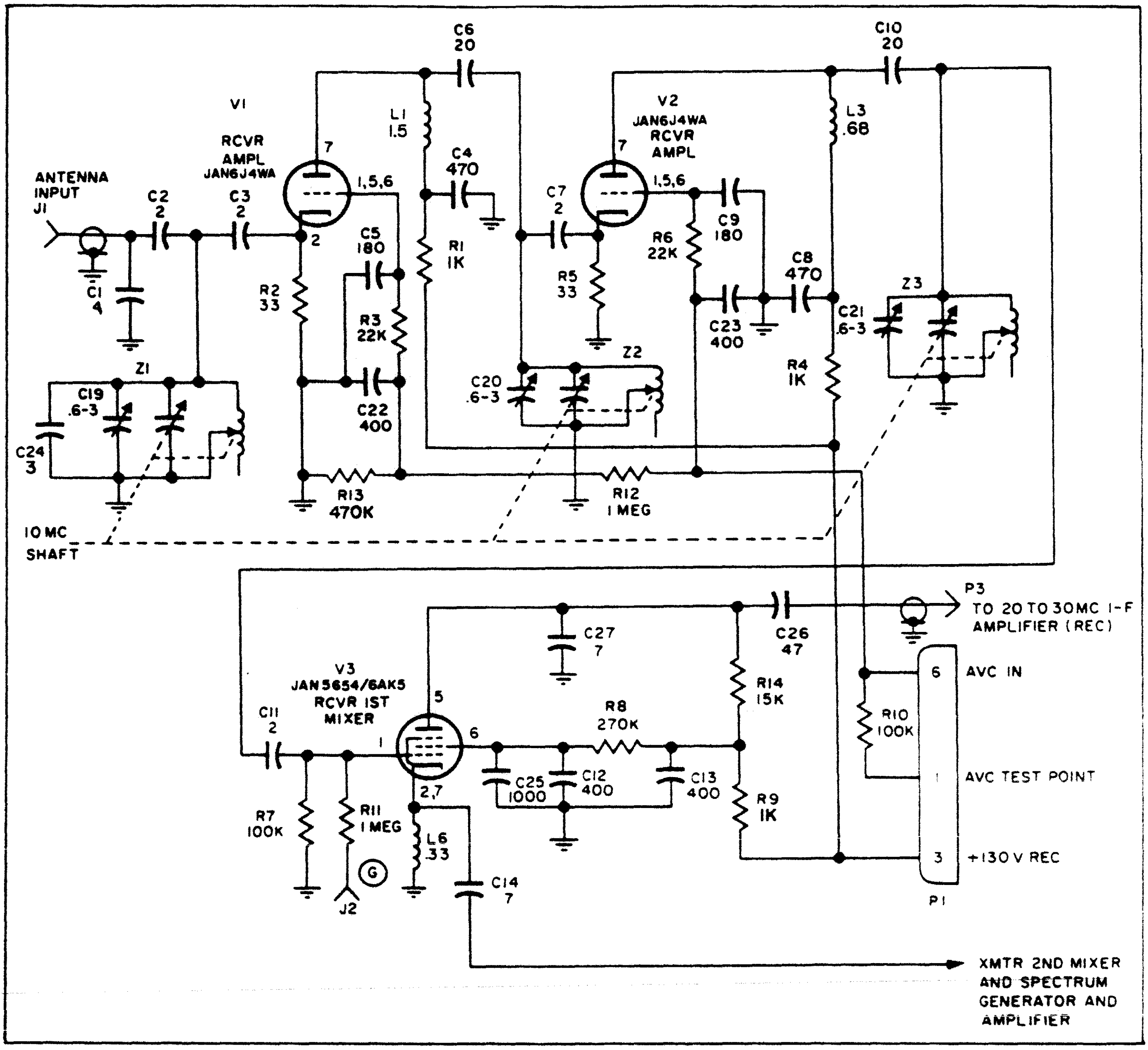


Figure 4-6. Receiver R-F Amplifier and Transmitter Preamplifier Receiver Section (Contract NOas 57-478, Serial Numbers 1 - 90), Simplified Schematic Diagram

4-40. Avc voltage is applied to the grids of V1 and V2 from the 1.85-mc i-f amplifier. The avc for V1 is developed across R13, the smaller resistor of voltage divider combination containing R12 and R13. This reduced avc voltage permits a greater amplification of weaker signals. However, the total avc voltage is applied from connector P1-6 (avc 1N) to the grid of V2. The greater avc provides a more uniform amplitude of the input to V3. Resistor R10 isolates the grid circuits from avc test jack (M), located on the control panel of the receiver-transmitter. The avc voltage is applied to the grids of V2 and V3 from the 1.85-mc i-f amplifier and is developed across R23 of voltage divider network R23, R1, and R20. R5 isolates test jack (M) from the grid circuits of V2 and V3: During low signal input, approximately +0.2 volt dc is developed at the junction of CR1 and R23 due to current flow through the R20, R23, and CR1 bleeder. This small positive voltage is applied to the control grids of V2 and V3 and allows maximum gain through the two stages. At high signal level, this positive voltage is overridden, and avc is applied to the grids. Diode CR1 clamps the avc line near ground and prevents the V2 and V3 grids voltage from becoming positive enough to damage the tubes during the short filament warmup time.

NOTE

This delayed action feature was added at MCN 2800.

4-41. The output of receiver amplifier V1 is applied to receiver amplifier V2, which functions in the same manner as V1, except for the difference in avc voltage. The output of receiver amplifier V2 is applied to receiver 1st mixer V3.

4-42. RECEIVER 1ST MIXER V3.

4-43. Receiver 1st mixer V3 heterodynes the received signal with the selected injection frequency from the spectrum generator and amplifier. The 20.0-mc to 29.9-mc beat frequency output of the mixer represents the initial intermediate frequency of the main receiver. Input from the spectrum generator and amplifier is developed across cathode choke L6; the received signal from tube V2 is developed across resistor R7. Since both signals are applied across the respective impedances of the cathode-grid circuit of mixer V3, the signals are effectively in series. Thus the two signals mix within the electron stream of the tube and vary the plate current to produce the original frequencies as well as sum and difference frequencies. Selective circuits within the 20- to 30-mc i-f amplifier filter out frequencies beyond the difference frequency limits 20.0 to 29.9 mc. Resistor R11 isolates the grid circuit from test jack J2, labelled Ⓖ. The tuned circuits of receiver amplifiers V1 and V2, receiver 1st mixer V3, and the spectrum generator and amplifier are driven by the mechanical tuning unit. Overall mechanical coordination of selective tuning provides the correct frequency inputs to produce a beat frequency in the 20.0- to 29.9-mc range for the initial i-f stage of the 20- to 30-mc i-f amplifier.

4-44. 20- TO 30-MC I-F AMPLIFIER.

4-45. GENERAL. (See figure 4-7.)

NOTE

All units produced under Contract NOas 57-478 and units having serial number 1 through 49 (figure 7-7) produced under Contract NOas 59-0165 used tube type 6021 as receiver second mixer V203. Effective with serial No. 50 (figure 7-4), units produced under Contract NOas 59-0165 and units produced under subsequent contracts used an i-f amplifier modified to use tube type 6205 as mixer V203. Some differences exist in the associated circuit, but operational theory for all units is identical.

4-46. The 20- to 30-mc i-f amplifier performs functions for both reception and transmission. The receiving functions are discussed in paragraph 4-47 following; for the theory of this module in the transmit mode of operation, refer to paragraph 4-161.

4-47. The 20.0-mc to 29.9-mc i-f signal output of the receiver r-f amplifier is applied through two successive stages of i-f amplification, V201 and V202, to receiver 2nd mixer V203. Simultaneously, an injection signal, selected from the 21.85-mc to 31.75-mc range, is applied from the oscillator module through injection amplifier V205 to the receiver 2nd mixer. The resultant 1.85 mc, 2nd i-f output of V203 is applied to the 1.85-mc i-f amplifier.

4-48. The 20- to 30-mc i-f amplifier relays are controlled by the microphone press-to-talk switch. The relay contacts are shown in the receiving position (relays de-energized).

NOTE

As the receiver is channeled through each 10.0-mc increment, the 20- to 30-mc i-f amplifier is tuned through its complete frequency range (20.0 to 29.9 mc). Thus, when the radio set is channeled to 399.9 mc, the spectrum generator and amplifier injection frequency is 370.0 mc; and the 20- to 30-mc i-f amplifier is driven to 29.9 mc. With the radio set tuned to 390 mc, the spectrum injection frequency is still 370.0 mc; and the 20- to 30-mc amplifier is tuned to 20.0 mc. Similarly, when the radio set is channeled to 229.9 mc, the spectrum injection frequency is 200.0 mc and the 20- to 30-mc i-f amplifier is tuned to 29.9 mc. Although the mechanically tuned r-f tank circuits will set up from 220 to 399.9 mc, the radio set is not used for communication below 225.0 mc. The Federal Communications Commission (FCC) allots only the 225.0 to 400.0 mc spectrum for military aircraft communication; the lower 5.0 mc of the tunable range is, therefore, not used.

4-49. RECEIVER/TRANSMITTER AMPLIFIERS V201 and V202. (See figure 7-6.)

4-50. Receiver/transmitter amplifiers V201 and V202 amplify i-f signals applied from the receiver r-f amplifier. The input signal is applied to the grid of V201 through coil L207, capacitor C201, coaxial relay K201, and across two parallel resonant (tank) circuits coupled capacitively. Three such capacity coupled circuit combinations provide the selectivity of the 20- to 30-mc i-f amplifier.

4-51. Tubes V201 and V202 are functionally identical and operate as class A amplifiers. The grid resistors are returned to the common avc line, which originates within the 1.85-mc i-f amplifier. The plate of each tube is tied to B+ in series with its associated tank circuit coil L203 or L205 and parasitic suppressor, R204 or R208. The screen-grid supply is bypassed to the cathode circuit through capacitors C209 and C219. The output of tube V202 is applied to 2nd receiver mixer V203 across two parallel resonant circuits capacitively coupled, capacitor C227, and closed contacts 4 and 2 of relay K202.

4-52. The three parallel resonant circuit combinations of the 20- to 30-mc i-f amplifier are slug tuned by the mechanical tuning unit, which also tunes the proper injection frequency circuits. Vernier adjustment of the resonant frequency for each tank circuit is provided by the associated trimmer capacitors C202, C207, C211, C217, C221, and C226.

4-53. RECEIVER 2ND MIXER V203. (See figure 4-8.) Receiver 2nd mixer V203 heterodynes the received signal from amplifier V202 with the selected injection frequency applied from the oscillator module through injection amplifier V205. The 1.85-mc output of the mixer represents the final intermediate frequency of the main receiver. Since frequencies other than 1.85 mc appear at the output of V203, a highly selective band-pass filter is used before the 1.85-mc i-f amplifier to sharply attenuate all frequencies except the second intermediate frequency of 1.85 mc.

4-54. **INJECTION AMPLIFIER V205.** Injection amplifier V205 amplifies the injection frequency output of the oscillator unit and continuously applies the signal to receiver 2nd mixer V203 and transmitter 1st mixer V204B. As with amplifier stages V201 and V202, the tank circuits of the injection amplifier are slug tuned by mechanical linkage to the mechanical tuning unit. Since the injection frequency is always 1.85-mc above the first if., the injection amplifier tanks tune from 21.85 mc to 31.75 mc.

4-55. 1.85-MC I-F AMPLIFIER.

4-56. GENERAL. (See figure 4-9.)

4-57. The 1.85-mc i-f amplifier functions only during the receive cycle of operation. The input signal is applied from the 20- to 30-mc i-f amplifier to the selective filter of the 1.85-mc i-f (second if.) amplifier module. Selectivity is provided by the filter, and gain is achieved by four successive stages of i-f amplification, V301 through V304. The audio component is detected by crystal diode CR303, which provides three outputs to the audio amplifier module: main audio through noise limiter crystal diode CR301; auxiliary audio, which provides a squelch signal for the audio circuits when a signal/noise squelch is used and also provides a high-fidelity audio signal for use by adf equipment; and a squelch voltage, which provides a squelch bias for the audio circuits when a carrier-type squelch is used.

4-58. The detected carrier from crystal diode CR303 is applied through avc gate diode CR302, the d-c output of which controls the gain of V301 and V302, as well as the gain of the receiver r-f amplifier and the 20- to 30-mc i-f amplifier. The avc delay level is preset by MAIN SENS control R1401.

4-59. **1.85-MC SELECTIVE FILTER.** The 1.85-mc filter (figure 7-1, 7-2, and 7-3) determines the selectivity of the main receiver. The filter is inserted between the output of the 20- to 30-mc i-f amplifier and the input of the second i-f amplifier unit so that all frequencies other than the desired 1.85-mc second i-f signal are sharply attenuated as shown by the filter selectivity curve (figure 4-10).

4-60. I-F AMPLIFIERS V301, V302, AND V303. (See figure 4-11.) Tubes V301, V302, and V303 are wide-band class A amplifiers. Inductors L310, L311, and L312, in series with plate load resistors R301, R302, and R303 respectively, compensate for high frequency loss caused by distributed circuit capacitance. Low-frequency response of the amplifiers is limited by the low value of interstage coupling capacitors C326, C327, and C328.

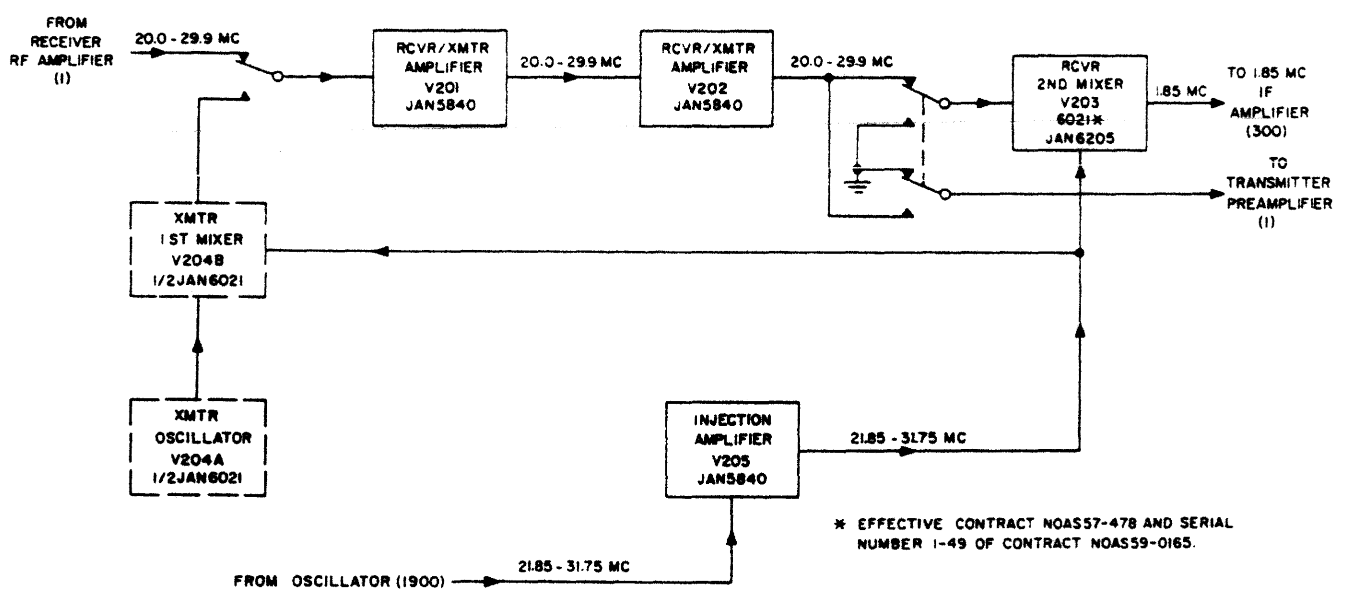


Figure 4-7. 20- to 30-Mc I-F Amplifier Receiving Circuits, Block Diagram

4-61. At low signal levels, tube gain from i-f amplifiers V301, V302, V303, and V304 is approximately two million. To provide uniform performance characteristics, two individual stage gain adjustments are provided by trimmer capacitors C339 and C340. These trimmers normally are set for a fixed, over-all i-f system gain as described in paragraph 6-49.

4-62. I-F AMPLIFIER V304. Amplifier V304 operates as a class A amplifier with no avc applied, providing constant gain over the normal range of signal input levels. Small changes in signal input at the grid of V304 result in an amplified change at the plate of this tube. The change in the peak a-c plate voltage of V304 produces a corresponding change in the d-c level at the detector plate. This d-c level determines the avc voltage.

4-63. AUDIO DETECTOR CR303. (See figure 4-12.)

4-64. Audio detector CR303 demodulates the i-f carrier. The detector circuit provides three outputs: main audio, auxiliary audio, and a squelch bias voltage (carrier squelch).

4-65. Audio detector CR303 is a shunt-type, half-wave detector that demodulates the i-f signal. During the

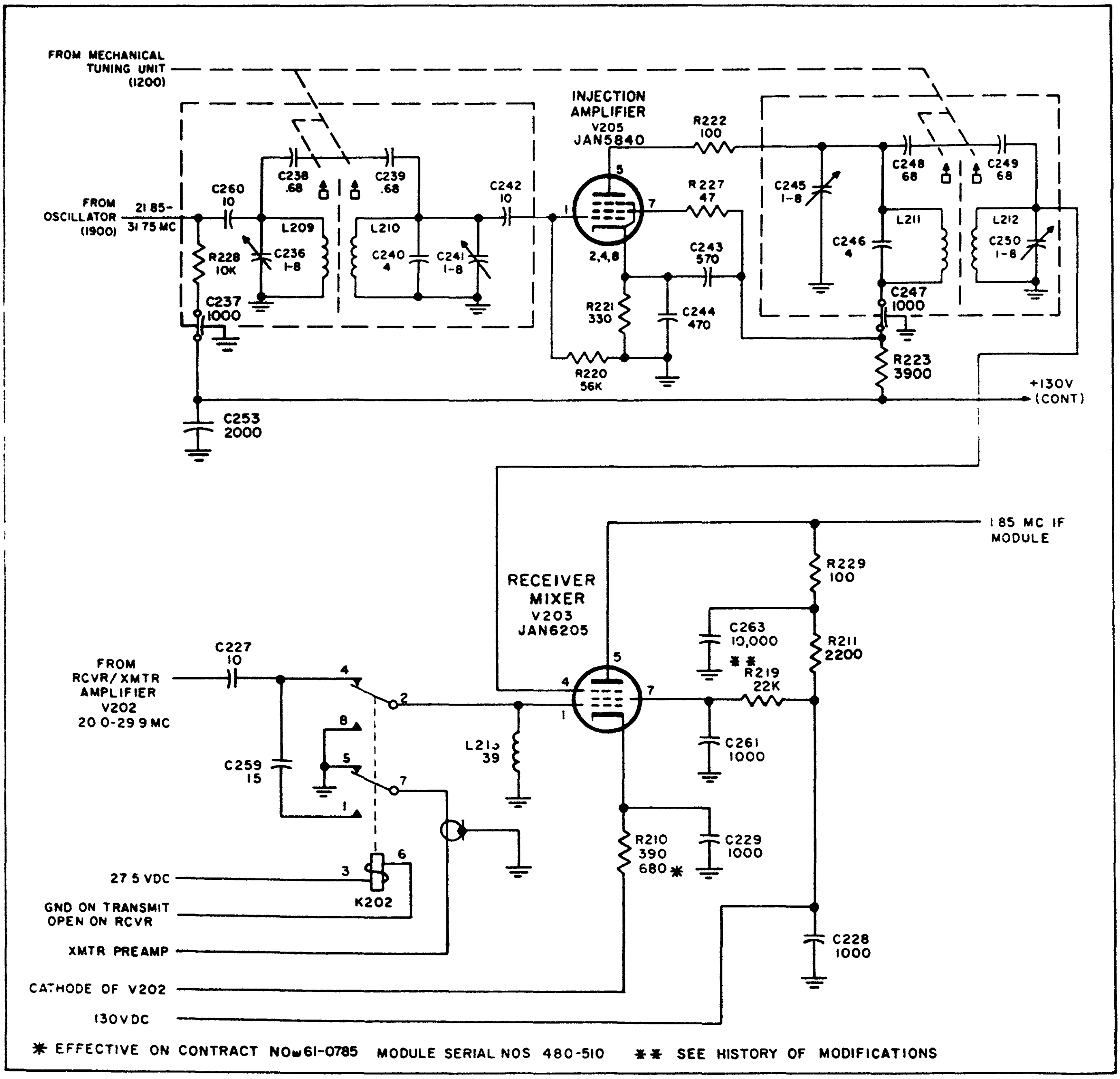


Figure 4-8. 20- to 30-Mc I-F Amplifier, Injection Amplifier and Receiver 2nd Mixer, Simplified Schematic Diagram

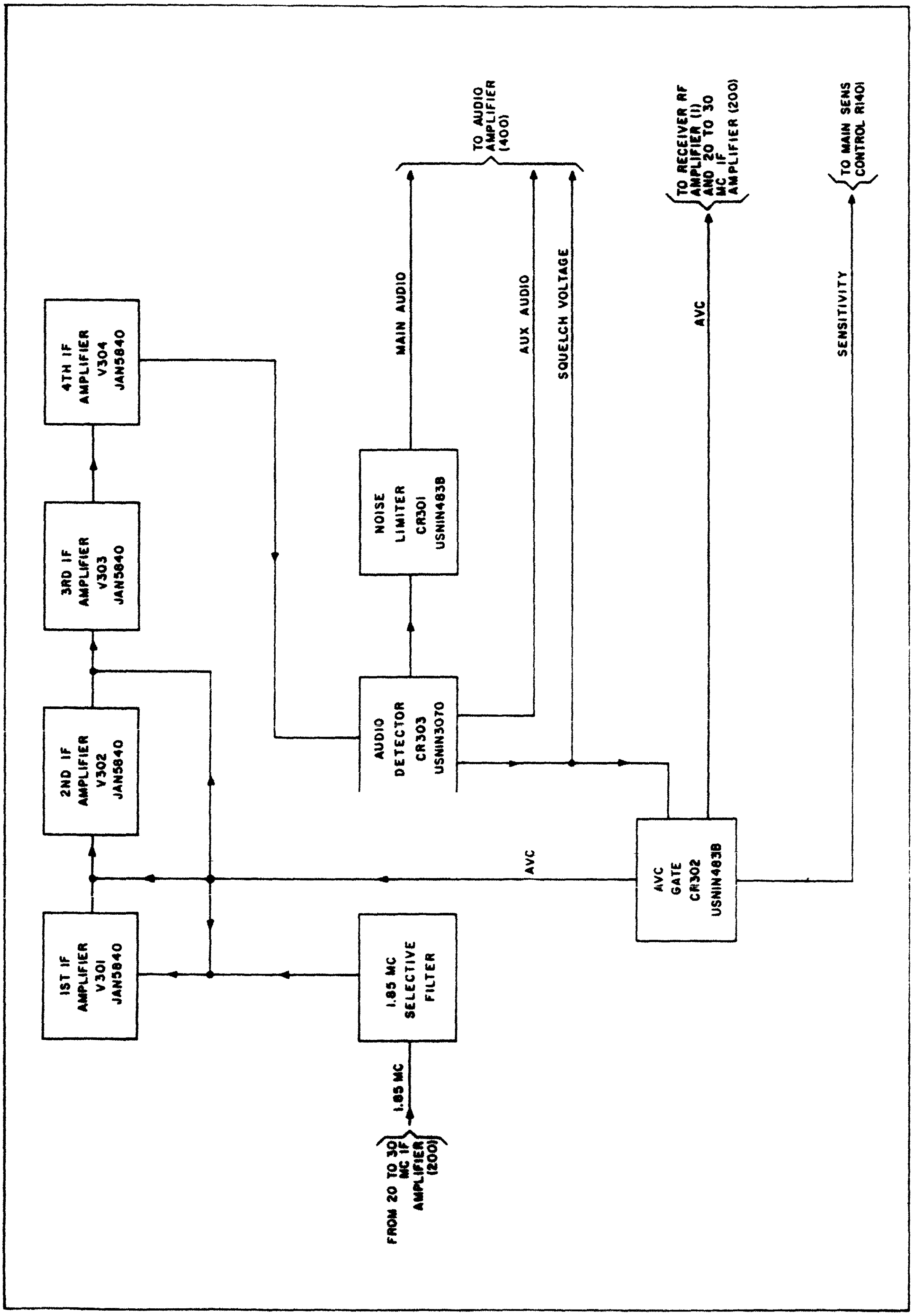


Figure 4-9. 1.85-Mc I-F Amplifier, Block Diagram

positive half-cycles of the incoming signal, the detector conducts and shorts diode load resistors R332 and R333. During the negative half-cycles, the detector is driven beyond cutoff; and capacitor C329 discharges through load resistors R332 and R333. The voltage at the junction of capacitor C329 and resistor R332 is negative with respect to ground and varies in accordance with the magnitude of the incoming carrier. In the static (no-signal) interval, the cathode of CR303 is maintained at a level of +22 volts, determined by the divider action of series resistors R335 and R336 across +130 volts. All subsequent detected signals are, therefore, referenced to the +22-volt level. The -22-volt reference and detected carrier signal determine the anode voltage of detector CR303.

4-66. The avc and squelch voltages are independent of any audio modulation. These voltages are dependent on a carrier signal that develops a related d-c voltage at the anode of detector CR303. This d-c level is also present at the cathode of avc gate CR302 and the carrier squelch voltage circuit. Since no closed path exists, no voltage is dropped across isolating resistors R334 and R329.

4-67. NOISE LIMITER CR301.

4-68. The audio voltage is developed across resistor R332 and R333. This voltage, with respect to ground at point "a," will always be less negative than the voltage at point "b." In parallel with R332 is another current path consisting of R330, R331, CR301, and R338. Since point "a" is always less negative than point "b," the anode of CR301 is less negative than its cathode; therefore CR301 conducts. While CR301 is conducting, the voltage at point "d" varies in the same direction as the detected audio voltage at point "a." Therefore, a true audio variation is present at the cathode of CR301. While diode CR301 is conducting, the potential at point "c" assumes one half the value of voltage appearing between points "b" and "d." This value is determined by the values of R330 and R331. If the carrier amplitude suddenly increases, the potential at point "a" becomes more negative with respect to ground than point "d"; and diode CR301 will cease to conduct. Therefore, point "c" and point "d" cannot change instantaneously because of the long RC time constant of C330 and R330. With diode CR301 cut off, the audio frequency will not appear in the main audio output.

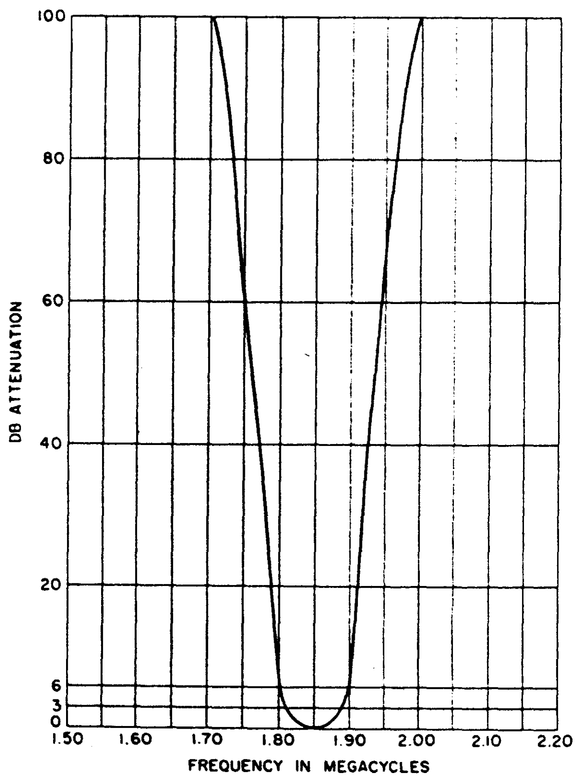


Figure 4-10. 1.85-Mc I-F Amplifier, Filter Selectivity Curve

4-69. AVC GATE CR302.

4-70. When the cathode of CR302 becomes more negative than its anode, this diode conducts. Therefore the negative detector output voltage is applied to the control stages in the receiver r-f amplifier, 20- to 30-mc i-f amplifier, and 1.85-mc i-f amplifier modules. The avc reference voltage (bias applied to the anode of CR302) is determined by the setting of main sensitivity control R1401. With R1401 set for maximum resistance (minimum sensitivity), a bias of several volts is applied to the diode. With sensitivity control R1401 set for minimum resistance (maximum sensitivity), the residual avc would theoretically be zero. However, in actual practice, tube and circuit noises in the receiver are amplified, detected, and develop a small residual avc.

4-71. The time constant of the avc circuit is determined by C333 and C331. For signal noise squelch operation, main sensitivity control R1401 is normally set at maximum. Sensitivity control R1401 is set for squelch operation at the desired signal input level.

4-72. AUDIO AMPLIFIER.

4-73. GENERAL. The audio amplifier provides the final stages of amplification for the main audio, high fidelity audio, guard receiver audio, and sidetone audio. The main audio circuits are biased by squelch voltage that removes from the headphones any "hiss" that may occur during the absence of signal input. Two alternate squelch modes are available: signal/noise squelch and carrier squelch. Either mode effectively mutes the main audio channel during the transmit cycle and during the receive cycle when no incoming carrier is present. The avc adjusts the receiver for maximum sensitivity when no signal is received. During the interval of maximum sensitivity, a background noise would normally be present in the headphones; but this noise is suppressed by squelch circuit action. The change from one squelch mode to another requires alterations of internal circuit connections within the audio amplifier.

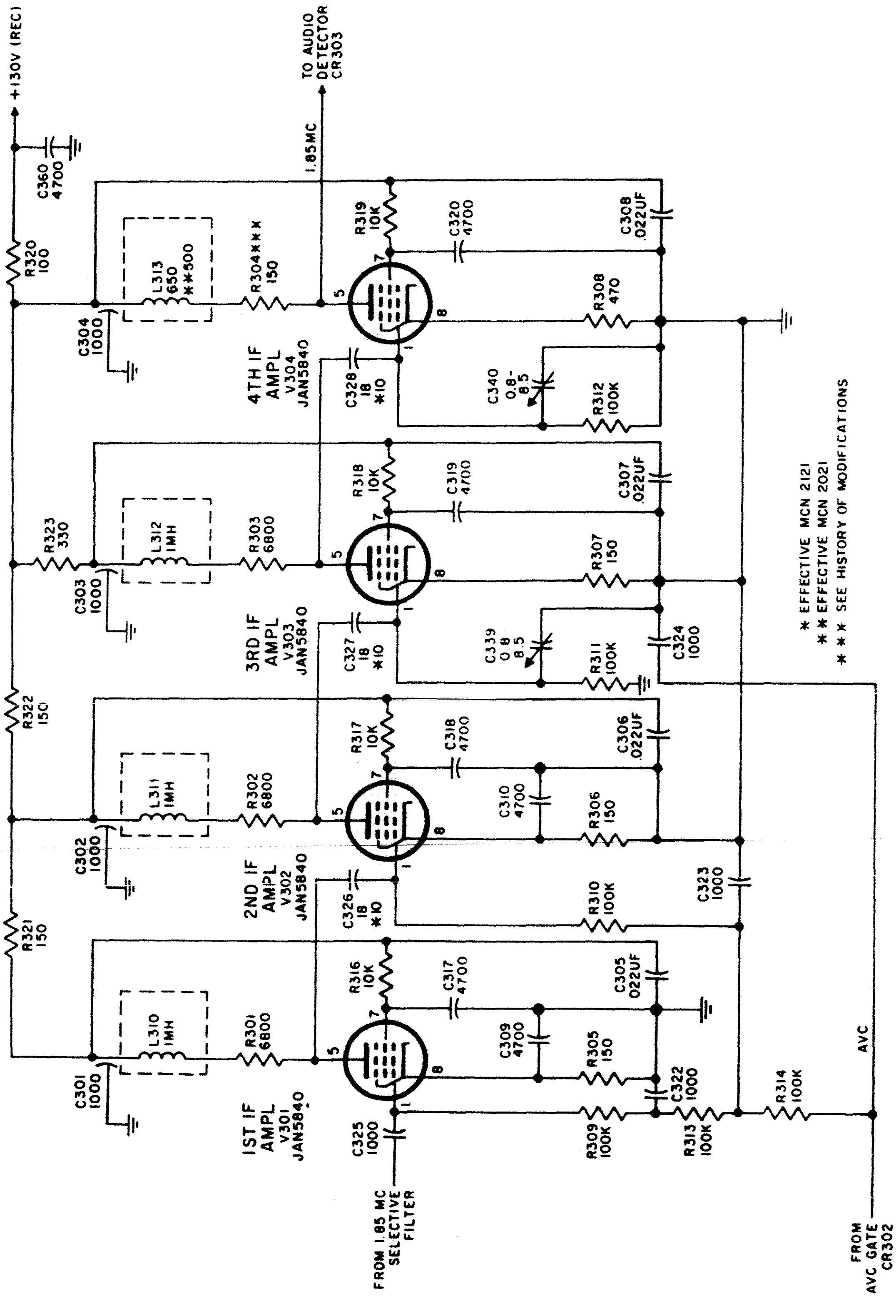


Figure 4-11. 1.85-Mc I-F Amplifier, Simplified Schematic Diagram

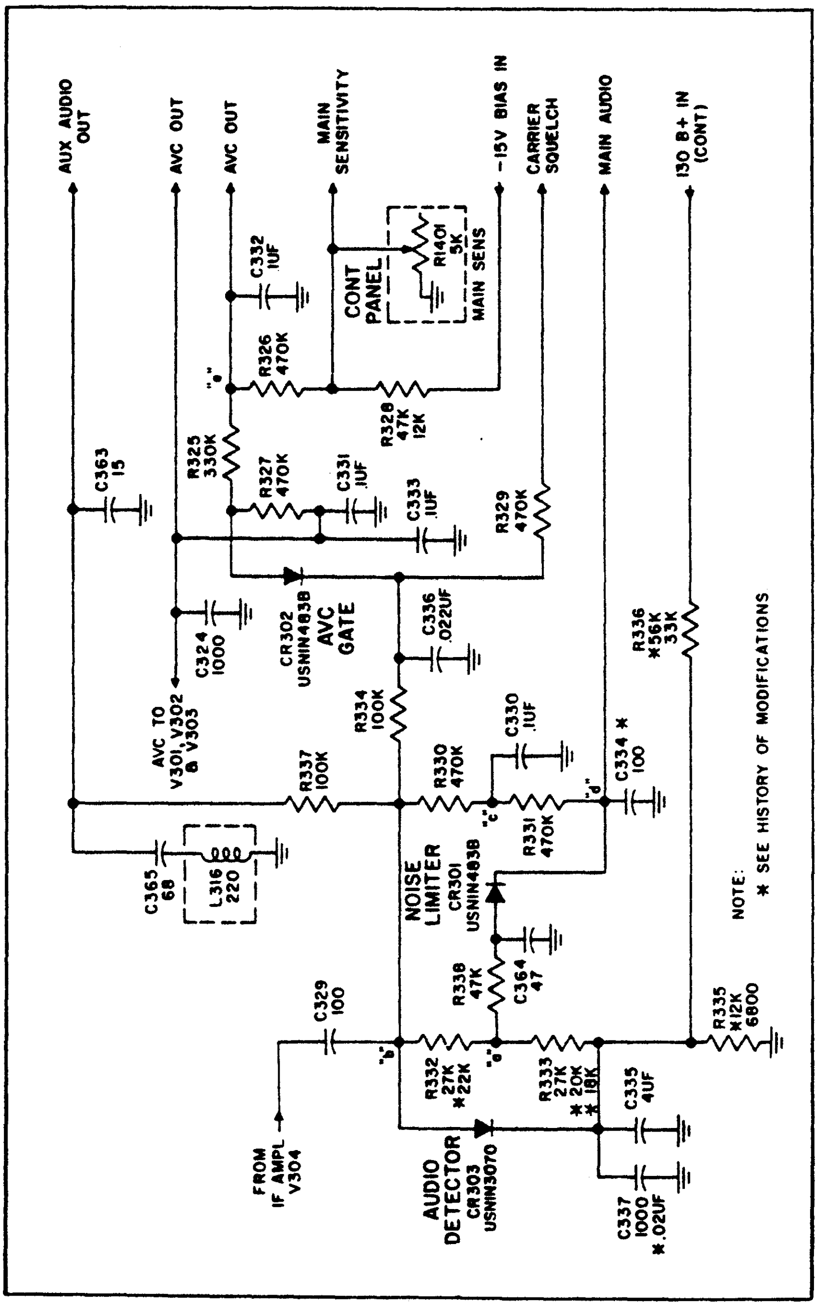


Figure 4-12. 1.85-Mc I-F Amplifier Output Circuits, Simplified Schematic Diagram

4-74. OPERATION USING SIGNAL/NOISE SQUELCH. (See figure 4-13.)

4-75. Main audio is applied to audio amplifier V403B through the normally closed contacts of squelch relay K401. Sidetone audio, which is sampled from the power output through the sidetone detector circuit at the antenna relay, is also applied to audio amplifier V403B. These sidetone signals, however, bypass the squelch relay since they are present during the transmit cycle only. The output of audio amplifier V403B and the guard audio are applied to audio output amplifier V404, from which an audio signal is fed to the headphones. The auxiliary audio is applied through auxiliary audio amplifier V402B to the auxiliary output. A parallel output of the auxiliary audio amplifier is used to drive the signal/noise squelch circuits. Inputs available to the audio amplifier module are as follows: During the receive cycle, with the function switch at T/R or T/R+G, the main audio and auxiliary audio inputs are available; guard audio is applied from the guard receiver only when the function switch is at T/R+G. During the transmit cycle, with the function switch at T/R or T/R+G and the microphone press-to-talk switch actuated, the sidetone audio input is available. This sidetone is an audio monitor of the transmitted signal, which is a carrier wave of the selected frequency modulated by either voice or 1000 cps for direction finding purposes.

4-76. The squelch circuits energize the squelch relay and thus ground the main audio if no auxiliary audio is present. When auxiliary audio is present, the squelch circuits keep the relay de-energized: and main audio is coupled through the amplifier. The output of auxiliary audio amplifier V402B is applied to signal/noise amplifier V401. The output of V401 is applied across two parallel-tuned circuits in series, one of which is resonant at 400 cps and the other at 20 kc. The 400-cps circuit develops an a-c voltage proportional to the signal (voice) component of the auxiliary audio (maximum energy in the human voice is centered around 400 cps). The 20-kc circuit develops an a-c voltage proportional to the noise component of the auxiliary audio. Note that auxiliary audio is applied to the audio amplifier without removal of noise components, whereas the main audio input is taken from noise limiter CR301 (paragraph 4-67) in the 1.85-mc i-f amplifier.

4-77. The a-c signal (voice) component, appearing at the output of V401 is developed across the 400-cps tuned circuit. The output of this circuit is applied to the signal/noise sensing circuit. In a similar manner, the output from the 20-kc tuned circuit is related to the presence of noise within the auxiliary audio signal. Both signals are rectified by the signal/noise sensing circuit, and the resulting d-c voltages are applied (series opposing) across the ends S/N threshold control R407. The predominance of signal voltage, therefore, produces a positive output, the level of which is determined by the slider of the threshold control; the absence of signal (presence of noise only) produces a negative output.

4-78. In the no-signal condition, the auxiliary audio components receive a noise voltage from the 1.85-mc i-f amplifier. The noise is amplified by tubes V402B and V401 and rectified by the signal/noise sensing circuit. The subsequent negative-going, d-c signal is amplified and inverted by V402A. The positive-going output of V402A drives squelch relay puller V403A into conduction so that current is drawn through squelch relay K401, which is energized. Therefore, the main audio line is disconnected, and capacitor C408 and resistor R438 are connected across the -27.5-volt line. (See paragraph 4-103.)

4-79. When an incoming modulated carrier is detected, the auxiliary audio components receive a demodulated signal voltage (audio) from the 1.85-mc i-f amplifier. The a-c signal is amplified by stages V402B and V401 and rectified by the signal/noise sensing circuit. The resultant d-c signal is applied to squelch amplifier V402A. The inverted output of V402A cuts off squelch relay puller V403A. With V403A at cutoff, current sensitive relay K401 is de-energized. Therefore, the main audio line is reconnected to audio amplifier V403B; and capacitor C408, which is precharged to -27.5 volts, discharges at the input of d-c squelch amplifier V402A. The discharge of capacitor C408 provides more stable operation of the squelch relay during periods of low modulation. The time constant of the signal/noise sensing output circuit is thus lengthened so that the squelch relay will not open during the pause between words of normal conversation. The capacitor is precharged so that the grid voltage of the squelch amplifier will not be lowered due to charging current when the capacitor voltage is applied to the grid.

4-80. OPERATION USING CARRIER SQUELCH. (See figure 4-14.)

4-81. In carrier squelch operation, the same inputs are applied to the module except the auxiliary audio is no longer used as the source from which the d-c squelch operating voltages are obtained. The d-c squelch bias input from the 1.85-mc i-f amplifier is now used instead.

4-82. In carrier squelch operation, the presence of an unmodulated carrier only is sufficient for squelch relay operation to the signal (energized) condition. In S/N operation, this carrier must be modulated to operate squelch relay K401 to the signal (de-energized) condition due to changed circuit connections.

4-83. Carrier operated squelch depends on the strength of the incoming carrier. Absence of carrier produces a more positive squelch voltage that de-energized the squelch relay. Presence of a strong carrier produces a more negative squelch voltage, which causes the relay to actuate.

4-84. During the interval in which no signal is detected within the 1.85-mc i-f amplifier, carrier squelch voltage is positive. The positive squelch voltage drives d-c squelch amplifier V402A into conduction, which produces a negative-going signal at the input of squelch relay puller V403A. The relay puller is thus driven beyond cutoff, which causes current sensitive squelch relay K401 to release and open the main audio line.

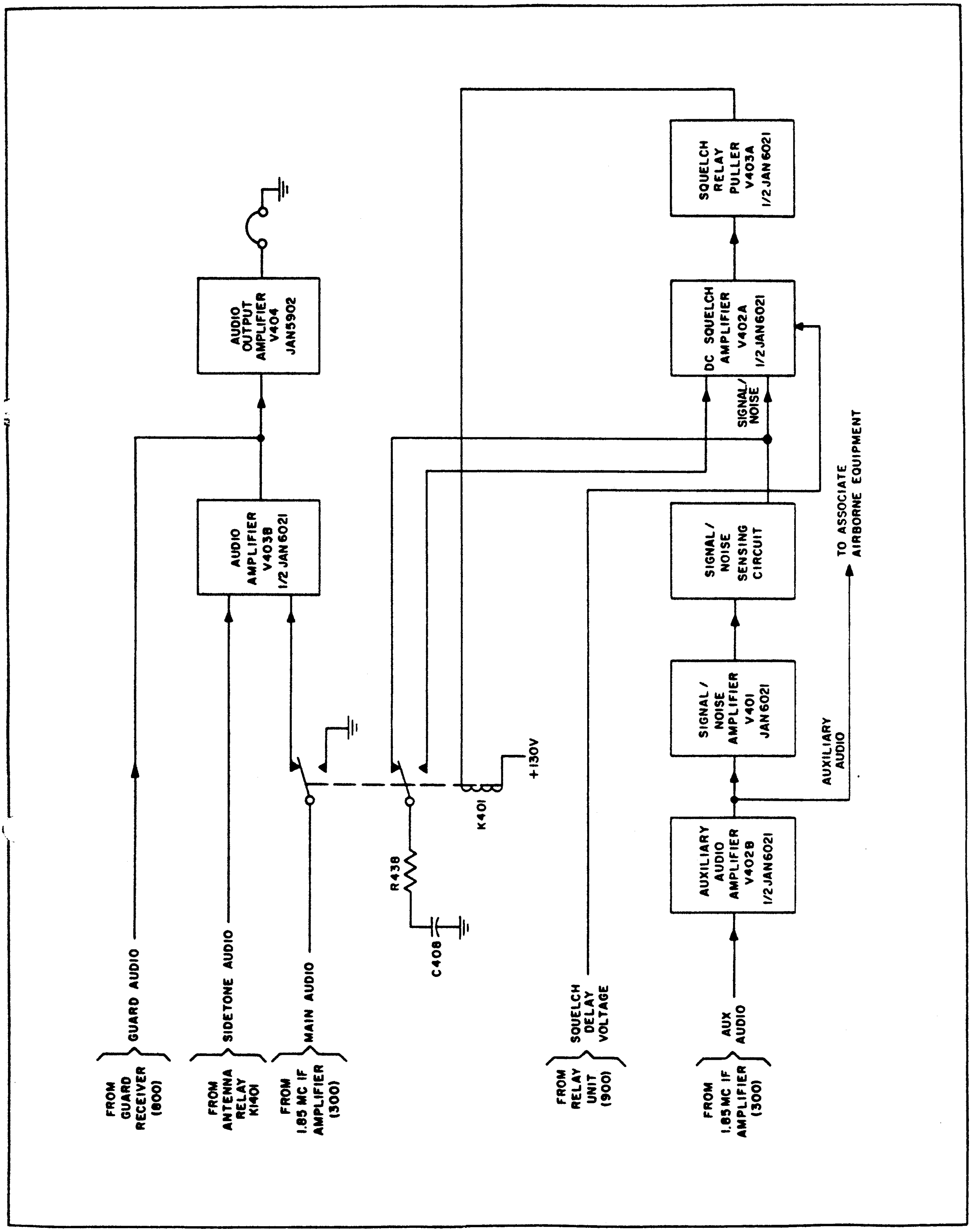


Figure 4-13. Audio Amplifier Using Signal/Noise Squelch, Block Diagram

4-85. When the signal carrier is detected within the 1.85-mc i-f amplifier, the carrier squelch input voltage appears at a more negative level. The negative squelch voltage produces a more positive voltage at the output of d-c squelch amplifier V402A. This output, in turn, drives squelch relay puller V403A into conduction, which energizes squelch relay K401. The audio input is thus connected to the audio amplifier.

4-86. Carrier squelch is used within an automatic relaying station. As described in paragraph 4-85, the presence of the incoming carrier causes the actuation of squelch relay K401. The subsequent grounding of the automatic relay input, T/R line from a companion radio set (figure 4-17), actuates the transmit/receive relay in the companion radio set. Consequently, a carrier received by the prime radio set places the companion radio set in the transmit condition. When the carrier is absent, the ground is removed; and the automatic relay input (27.5 volts) biases audio amplifier V403B beyond cutoff.

4-87. AUDIO AMPLIFIER V403B. (See figure 4-15.)

4-88. Audio amplifier V403B provides the initial stage of amplification for main and sidetone audio. Main audio is coupled through capacitor C409 and developed across main audio level control R415. When signal/noise squelch is used, the audio passes through contacts 8 and 7 of the de-energized relay; for carrier squelch, the audio passes through contacts 8 and 6 of the energized relay.

4-89. Sidetone audio is developed across resistor R417 and sidetone audio level control R418. Both audio signals are applied through their respective isolation resistors, R416 and R419. These resistors and capacitor C411 form a low-pass filter. Note that main audio is present during the receive cycle and sidetone audio is present during the transmit cycle. The output of audio amplifier V403B is applied to the grid circuit of audio output amplifier V404.

4-90. Cathode resistors R420 and R421 provide a single cathode resistance of approximately 2500 ohms in signal/noise squelch. However, in an automatic relay installation (using carrier squelch), the resistors form a voltage divider fed by the +27.5-volt T/R line of the second receiver-transmitter through the external automatic relay operation control.

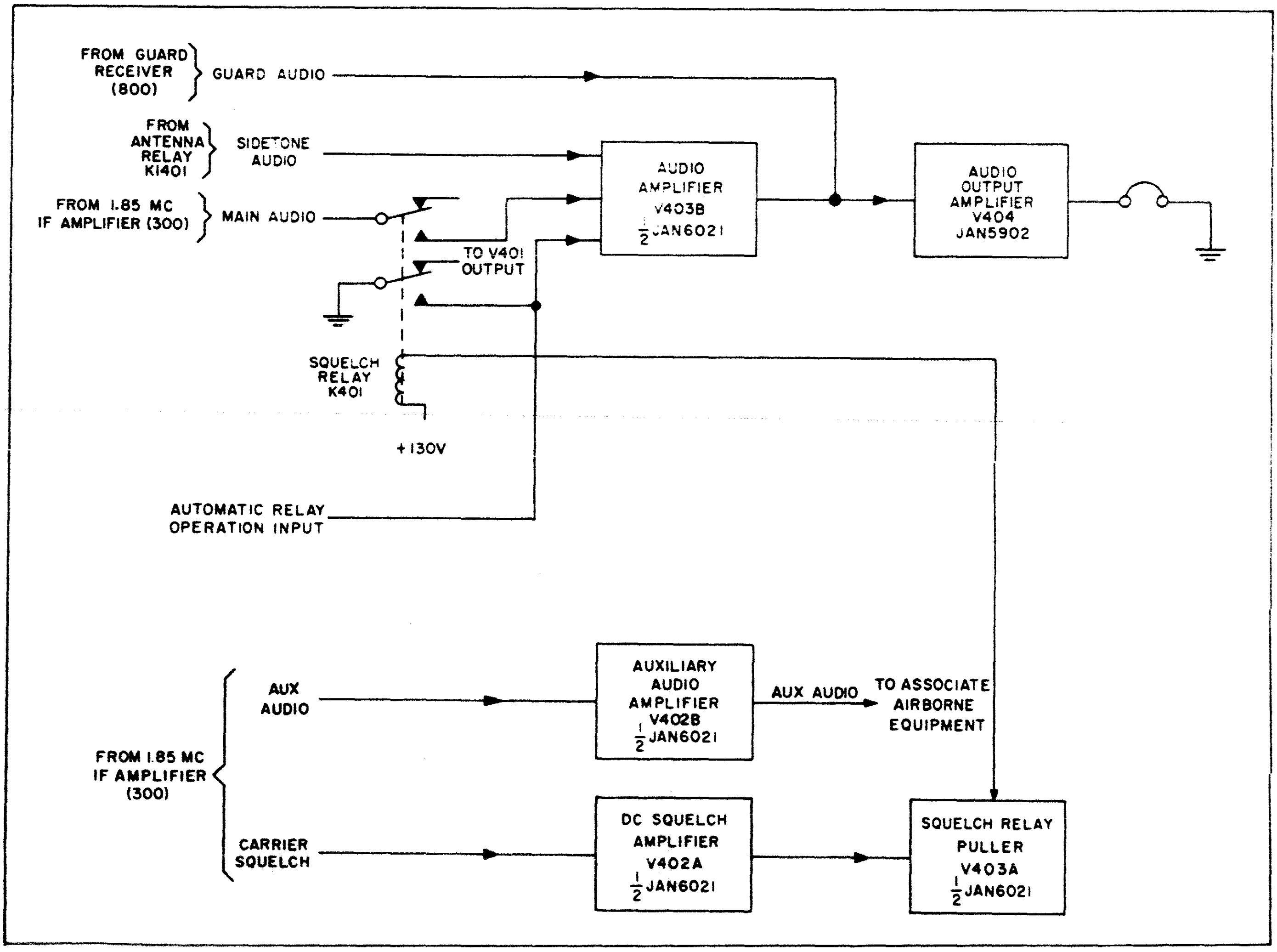


Figure 4-14. Audio Amplifier Using Carrier Squelch, Block Diagram

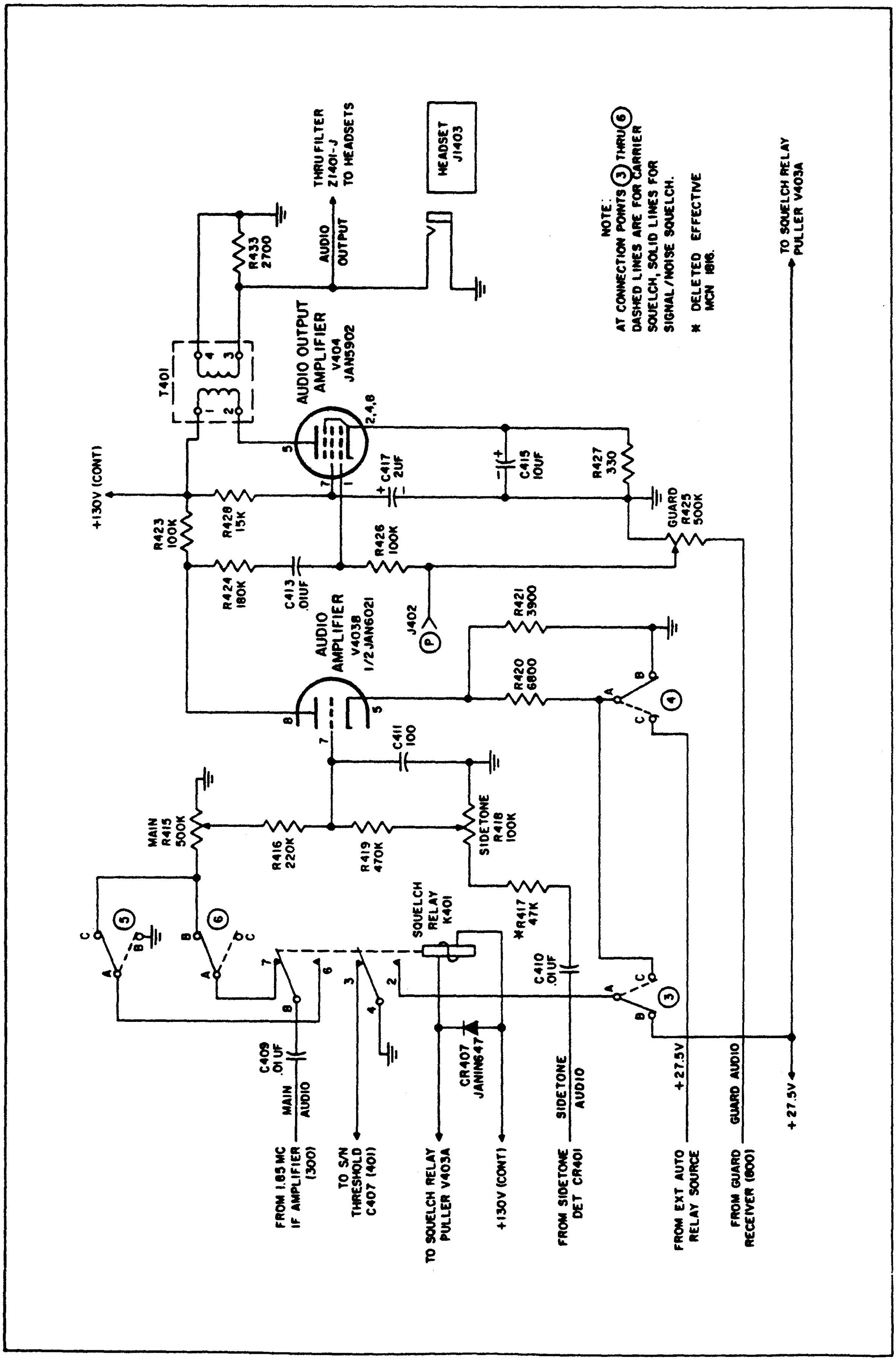


Figure 4-15. Audio Amplifier, Main Audio Amplifier, Simplified Schematic Diagram

4-91. AUDIO OUTPUT AMPLIFIER V404. Audio output amplifier V404 is a power-output pentode that provides final amplification of the main audio and guard audio. Guard gain control R425 is a level control for guard audio and has a minor effect on the main audio level. Bias is developed across bypassed cathode resistor R427. Capacitor C417 bypasses signal components appearing at the screen of tube V404. Screen voltage is obtained from the plate voltage supply through dropping resistor R428. Audio is coupled by transformer T401 to output circuits. A test output is available at **HEADSET** jack J1403 on the receiver-transmitter control panel. The main audio output, which includes main, guard, and sidetone audio, is applied to the headsets through filter Z1401.

4-92. AUXILIARY AUDIO AMPLIFIER V402B. (See figure 4-16.) Auxiliary audio amplifier V402B is a cathode follower that couples the auxiliary audio from the 1.85-mc i-f amplifier to the signal/noise squelch circuits through filter Z1401 for use in adf operation. The auxiliary audio input is developed across grid leak resistor R430 through coupling capacitor C416. The squelch output is taken from the junction of cathode resistors R431 and R432 and is applied to the grid circuit of signal/noise amplifier V401. The auxiliary audio output is taken from the wiper of cathode potentiometer R431.

4-93. SIGNAL/NOISE AMPLIFIER V401.

4-94. Signal/noise amplifier V401 is a parallel-connected, dual triode that amplifies the full range of frequencies in the output of amplifier V402B. The output of V401 is taken across a sensing network that compares the relative levels of signal and noise and produces a squelch voltage proportional to the signal-to-noise ratio. (Refer to paragraphs 4-73 through 4-90 for the over-all operation of the squelch circuits.) Degenerative action is provided by unbypassed, common-cathode resistor R403. Resistors R434 and R435 function as a parasitic suppressors. The output of the tube is applied through coupling capacitor C402 to a load consisting of two parallel-tuned circuits in series with the capacitor.

4-95. The tuned load circuit consisting of C403, R404, and L401B is resonant at 400 cps and offers high impedance and therefore high gain for voice signals. The frequency of 400 cps is chosen because the peak amplitude (energy) of voice signals normally occurs within the frequency range of 200 to 600 cps. The tuned load circuit consisting of C404, R440, CR404, and L401A is resonant at 20 kc and serves effectively as a noise-amplifying circuit. The frequency of 20kc is well above the received voice signal frequencies and represents the maximum-amplitude noise frequency.

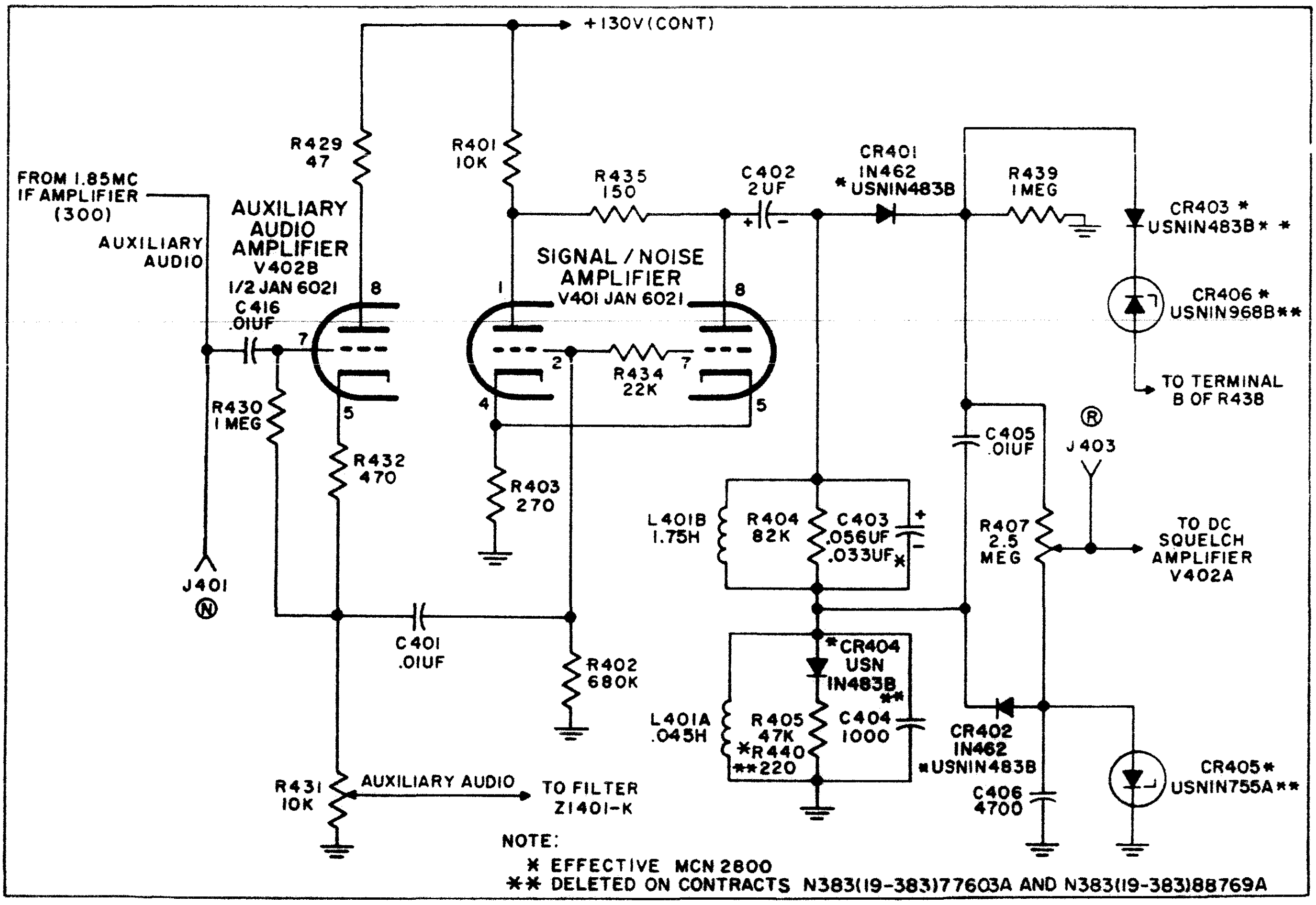


Figure 4-16. Audio Amplifier Signal/Noise Sensing Circuits, Simplified Schematic Diagram

Since the noise-sensing circuit is parallel-tuned, its peak impedance occurs at the resonant frequency of 20 kc. The noise component in the output of V401 develops a voltage across the noise-sensing circuit that presents a high impedance at 20 kc. The amplitude of this voltage is proportional to the noise level in the auxiliary audio. Similarly, the voice signal component in the output of V401 appears across the signal-sensing circuit that presents a high impedance at 400 cps. The amplitude at the output of the signal sensing circuit is proportional to voice level in the auxiliary audio.

4-96. The 400-cps voltage developed by the signal-sensing circuit is rectified by diode CR401. The resultant d-c signal, which is positive with respect to ground, is applied across the signal/noise threshold control, potentiometer R407. The 20-kc voltage developed by the noise-sensing circuit is rectified by diode CR402. The resultant d-c signal, which is negative with respect to ground, is also applied to potentiometer R407.

4-97. The rectified outputs of the 400-cps tuned circuit and the 20-kc tuned circuit are applied across the ends of S/N threshold control, potentiometer R407. The presence of signal (voice) produces a positive output, which is taken from the arm of the S/N control: the absence of signal (presence of noise only) produces a negative output. The output, which is applied to d-c squelch amplifier V402A, is positive when an audio signal is detected.

4-98. D-C SQUELCH AMPLIFIER V402A. (See figure 4-17.) D-c squelch amplifier V402A biases squelch relay puller V403A in response to the squelch voltage applied across low-pass filter components R408 and C407 to the grid of the tube. When the radio set is connected for signal/noise squelch, the squelch amplifier is maintained at cutoff by the noise component developed across the noise threshold control R407. When the radio set is on transmit or when channeling, the squelch delay bias, applied from the relay unit to the cathode of the squelch amplifier, maintains the squelch tube at cutoff. During channeling, a 27.5-volt bias is applied through the disable relay. When carrier squelch is used, the tube is held in conduction by the positive carrier squelch voltage from the 1.85-mc i-f amplifier. When a carrier signal is detected, the carrier squelch voltage output of the 1.85-mc i-f amplifier drives amplifier V402A beyond cutoff.

4-99. SQUELCH RELAY PULLER V403A.

4-100. Squelch relay puller V403A controls squelch relay K401 in response to the grid bias applied from d-c squelch amplifier V402A. Relay control current flows in the plate circuit of V403A. The plate at this tube is connected to +130 volts through the coil of the squelch relay. During signal noise squelch operation, d-c squelch amplifier V402A is cutoff by a no- or low-signal squelch input. A high positive bias therefore is applied to the grid of squelch relay puller V403A, which is tied to the plate of V402A. Conversely, when V402A is conducting, the consequent lower plate voltage of V402A drives the relay puller below cutoff. Thus, current in the plate circuit of V402A is controlled by the absence or presence of a detected signal. This condition, in turn, causes a bias variation that causes the relay puller to either conduct or not conduct.

4-101. When connected for carrier squelch, the signal/noise squelch voltage at the grid of d-c squelch amplifier V402A is replaced by the carrier squelch voltage from the 1.85-mc i-f amplifier. Cathode bias for V402A is obtained from the junction of resistors R411 and R412, while cathode bias for V403A is a constant +27.5 volts. When the d-c squelch amplifier is cut off by the carrier squelch signal, the squelch relay puller is driven into conduction as described in paragraph 4-102 following; and relay K401 is energized. When no carrier is received and d-c squelch amplifier V402A is conducting, the bias at the grid of squelch relay puller V403A falls below cutoff; and squelch relay K401 releases.

4-102. SQUELCH RELAY K401.

4-103. Squelch relay K401 controls application of the main audio to the audio amplifiers in response to the presence of a detected signal. In the initial condition, assume that the equipment is connected for signal/noise squelch and no voice signals are detected. Squelch relay puller V403A is driven into conduction by the plate current of V403A. The main audio line is grounded through contacts 8 and 6 of the relay. Capacitor C408 charges to +27.5 volts through relay contacts 4 and 2 and resistor R438. The presence of a voice signal causes relay puller V403A to cut off, the relay releases, and the main audio input is applied across main audio level control R415. Precharged capacitor C408 discharges through resistors R438, R407, R405, and R439 (figure 4-16), driving the wiper of R407 positive with respect to ground. This voltage, which appears at the grid of the d-c squelch amplifier V402A, keeps relay K401 energized. The time constant of C408, R405, R439, R407, and R438 keeps the relay de-energized during periods of low modulation and during the short intervals between words in normal conversation. Resistor R438 is a current limiter that protects the contacts of relay K401 during charge.

NOTE

Effective MCN 2800 Zener diode CR405 was added in parallel with C406 to maintain the detected noise voltage below a fixed level. Zener diode CR406 is added between the rectified audio and C408. This diode allows audio peaks over a predetermined level to keep C408 charged to a higher average level. Blocking diode CR403 in series with CR406 prevents the rapid discharge of C408. CR404 and resistor R440 clip all positive noise peaks.

4-104. Assume that the equipment is connected for carrier squelch, and no incoming carrier is present. The squelch relay puller is cut off because the positive squelch voltage drives the d-c squelch amplifier into conduction, and the relay is therefore deenergized. The main audio line is opened (contacts 8 and 7), and the signal/noise threshold input is grounded (contacts 4 and 3). With carrier present, the relay is energized;

main audio is applied through contacts 8 and 6 to the main audio level control R415; and the automatic relay control line is connected to ground.

4-105. GUARD RECEIVER CIRCUITS.

4-106. The functional circuits for guard reception consist of antenna cross over relay K1401, the guard receiver, and the final audio amplifier of the main receiver. During the receive cycle, the output of the antenna relay is connected to the parallel inputs of the main receiver and the guard receiver. Refer to paragraph 4-17 for a discussion of the antenna relay assembly function during the receive cycle.

4-107. GUARD RECEIVER.

4-108. GENERAL. (See figure 4-18.)

4-109. The guard receiver monitors all signals transmitted at the predetermined guard frequency of 243.0 mc. The guard receiver is operative when function switch S1801 is at the T/R+G position and the microphone press-to-talk switch is open (not actuated).

4-110. The guard receiver is a double-conversion fixed tuned superheterodyne receiver somewhat like the main receiver. The input to the guard receiver is reduced by two successive mixing circuits to a 1.85-mc final i-f signal, which then is demodulated, amplified, and applied to the audio amplifier output stage of the main receiver. Since the guard receiver has its own detector, noise limiter, squelch, and avc circuits, operation is independent of the main receiver. Input signals within the frequency range of 225.0 to 399.9 mc are received from the radio set antenna. R-f amplifiers V801 and V802A, which are tuned to 243 mc, amplify incoming carrier signals of that frequency and reject all others.

4-111. Oscillator injection frequencies of 206.7 mc and 34.45 mc are provided by frequency doubler V803A and injection oscillator V803B. The basic 34.45-mc frequency is the second injection signal, which is applied from V803B to 2nd mixer V805. The third harmonic (103.35 mc) of the basic frequency is developed across the tank circuit, formed by inductor L806 and capacitor C822; and applied to frequency doubler V803 to obtain the first injection frequency of 206.7 mc.

4-112. The 243.0-mc output of r-f amplifier V802A and the 206.7-mc injection signal from frequency doubler V803A are mixed in the 1st mixer V802B. The

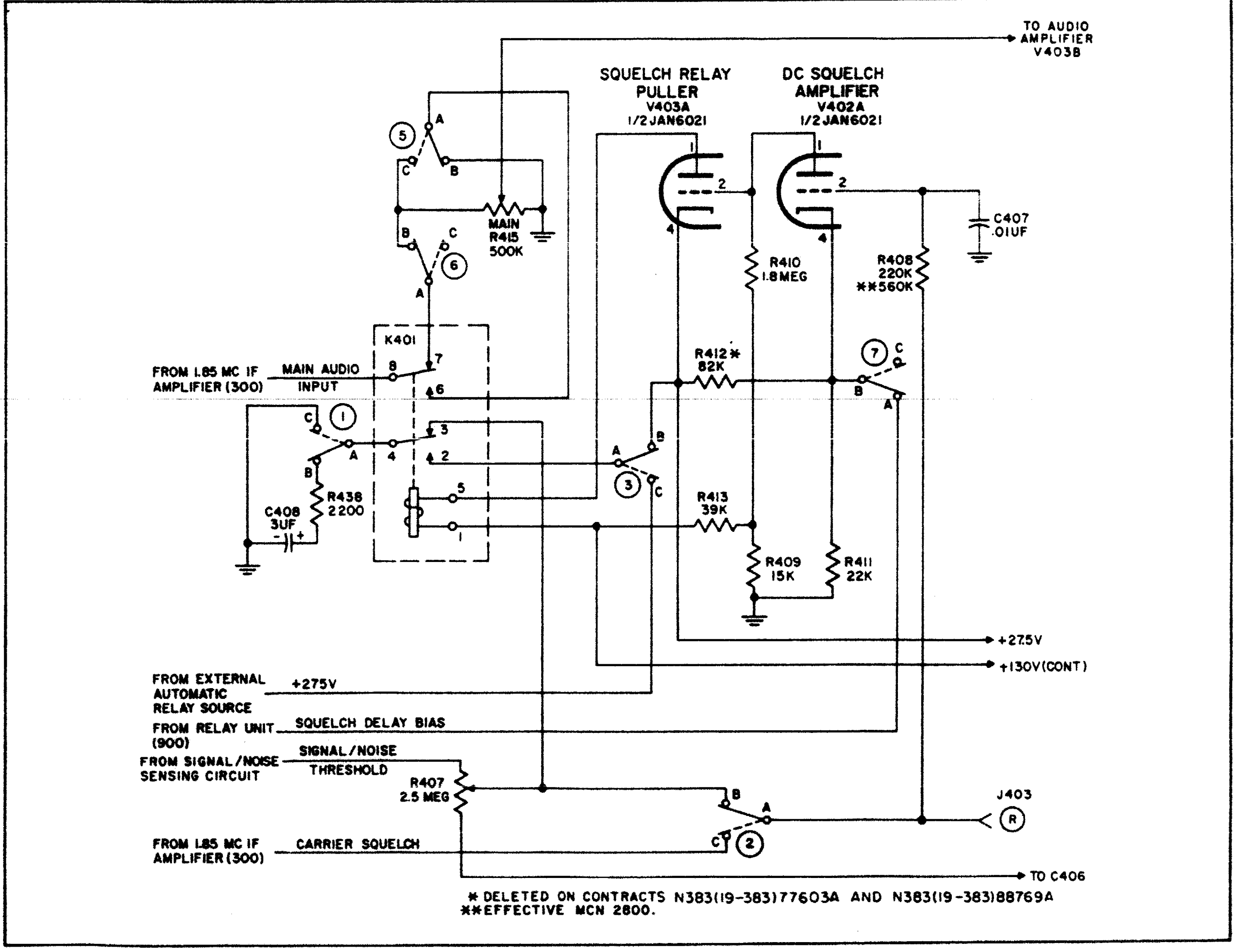


Figure 4-17. Audio Amplifier Squelch Circuits, Simplified Schematic Diagram

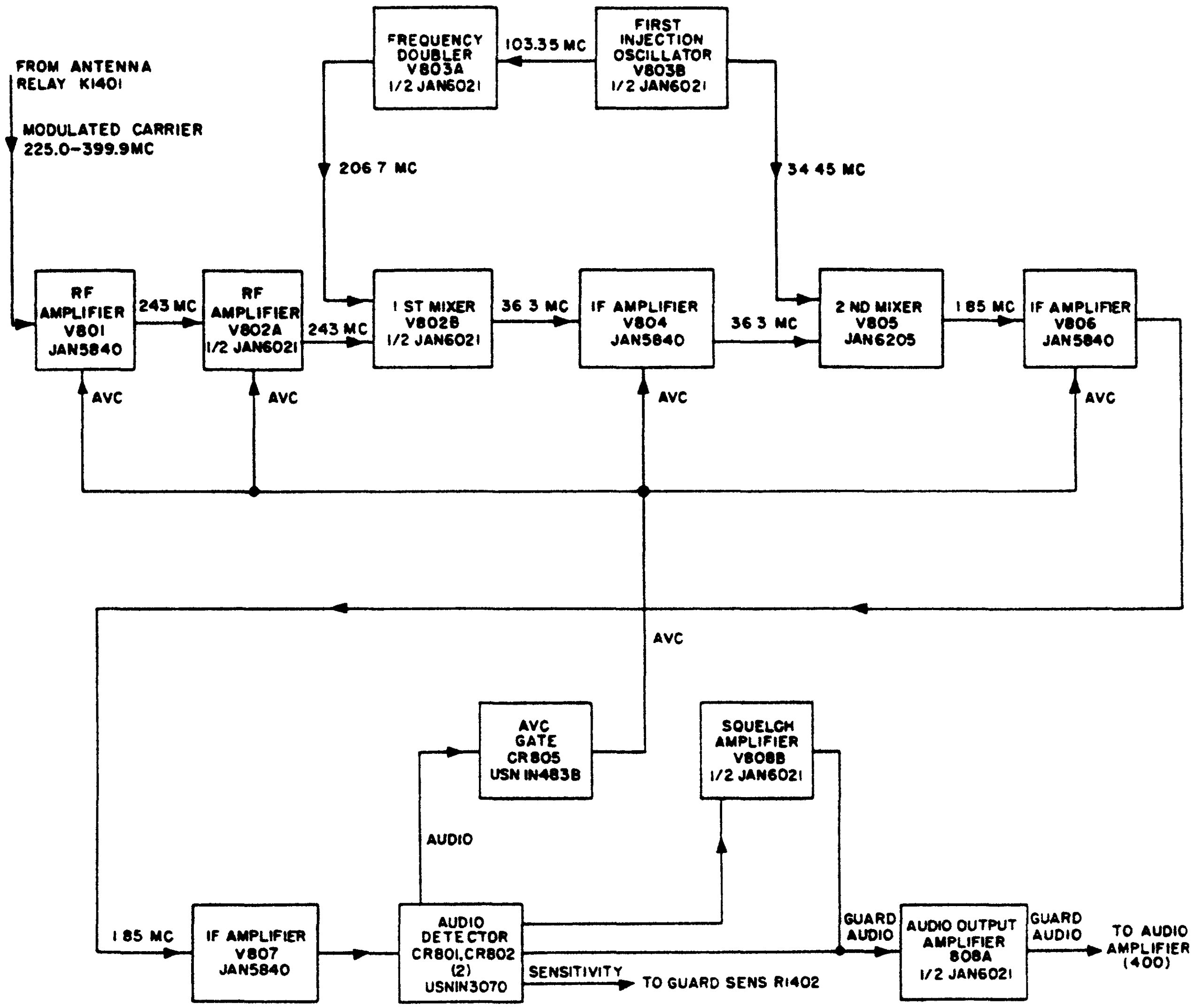


Figure 4-18. Guard Receiver, Block Diagram

resultant 36.3-mc difference frequency (first i-f) is amplified by V804 and applied to second mixer V805 together with the 2nd injection frequency of 34.45 mc. The 1.85-mc difference frequency output (final i-f) of V805 is amplified in two successive stages, V806 and V807, and then is rectified by voltage doubler CR801 and CR802 in the audio detector. The detected audio guard signal is amplified by audio output amplifier V808A and applied to the audio amplifier module.

4-113. Avc gate CR805, connected from the audio detector output, supplies an avc voltage to amplifier stages V801, V802A, V804, and V806. An audio detector output is also applied to squelch amplifier V808B for receiver muting during no-signal intervals when receiver sensitivity is highest.

4-114. R-F AMPLIFIERS V801 AND V802A. (See figure 7-5.)

4-115. R-f amplifiers V801 and V802A provide initial amplification to the incoming guard-frequency carrier and attenuate all other frequencies. The 243.0-mc guard frequency is developed across tank circuit Z801 and is applied to the grid of r-f amplifier V801. The output of this amplifier is applied to the cathode of r-f amplifier V802A.

4-116. Avc voltage is applied through an avc decoupling network capacitor C806 and resistor R802. Plate voltage to V802A and V801 is applied during the receive mode of operation across filter capacitors C834 and C833, dropping resistors R805 and R803, and output tanks circuits Z803 and Z802. R-f amplifier V802A output is developed across plate tank circuit Z803 and coupled to the cathode of 1st mixer V802B.

4-117. FIRST MIXER V802B. The 243.0-mc r-f signal from amplifier V802A and the 206.7-mc injection signal from frequency doubler V803A are applied to the cathode and grid, respectively, of first mixer V802B. Mixer output is coupled to a following amplifier by mutual inductance between two parallel resonant tank circuits acting like a double tuned transformer having loose coupling between primary and secondary windings. A 36.3-mc difference frequency is developed across a plate tank circuit formed by inductor L802 and capacitor C814 and tuned to 36.3 mc. Because of mutual coupling, this frequency is also developed across a grid tank circuit, formed by inductor L803 and capacitor C816; and is connected to the grid of i-f amplifier V804. The signal is amplified by V804 and coupled by mutual inductance of two parallel resonant circuits to the grid of second mixer V805.

4-118. INJECTION OSCILLATOR V803B. (See figure 4-19.)

4-119. Injection oscillator V803B is crystal controlled and oscillates at a fundamental frequency of 34.45 mc. The oscillator signal at the grid of V803B is coupled through C825 and developed across the suppressor grid circuit of second mixer V805. This circuit includes capacitor C826 and inductor L807, which form a parallel resonant tank at 34.45 mc and presents a maximum impedance at that frequency.

4-120. The plate tank of V803B (C822 and L806) is tuned to the third harmonic of the oscillator output or 103.35 mc. The signal developed across this tank is coupled through C821 to the grid of frequency doubler V803A.

4-121. The basic principles of oscillator V803B operation are as follows. The cathode circuit of V803B is capacitive when crystal Y801 is excited at its series resonant frequency. At this frequency, the crystal acts like a relatively low resistance. Part of the signal appearing at the grid of V803B is coupled back to the cathode through the interelectrode (grid to cathode) capacitance of the tube. This feedback voltage is of such phase and magnitude that conditions for sustained oscillation are correct. At frequencies other than the series resonant frequency of the crystal (34.45 mc in this case), the crystal appears as a capacitive reactance; and the total cathode impedance of V803B is inductive. Hence the feedback signal no longer has the proper phase and oscillation will not occur.

4-122. Second mixer V805 uses a pentode tube driven by two signal inputs. The 34.45-mc second injection frequency is connected to the suppressor grid; the 36.3-mc 1st i-f signal is fed to the control grid of V805. Since the injection voltage and the i-f signal

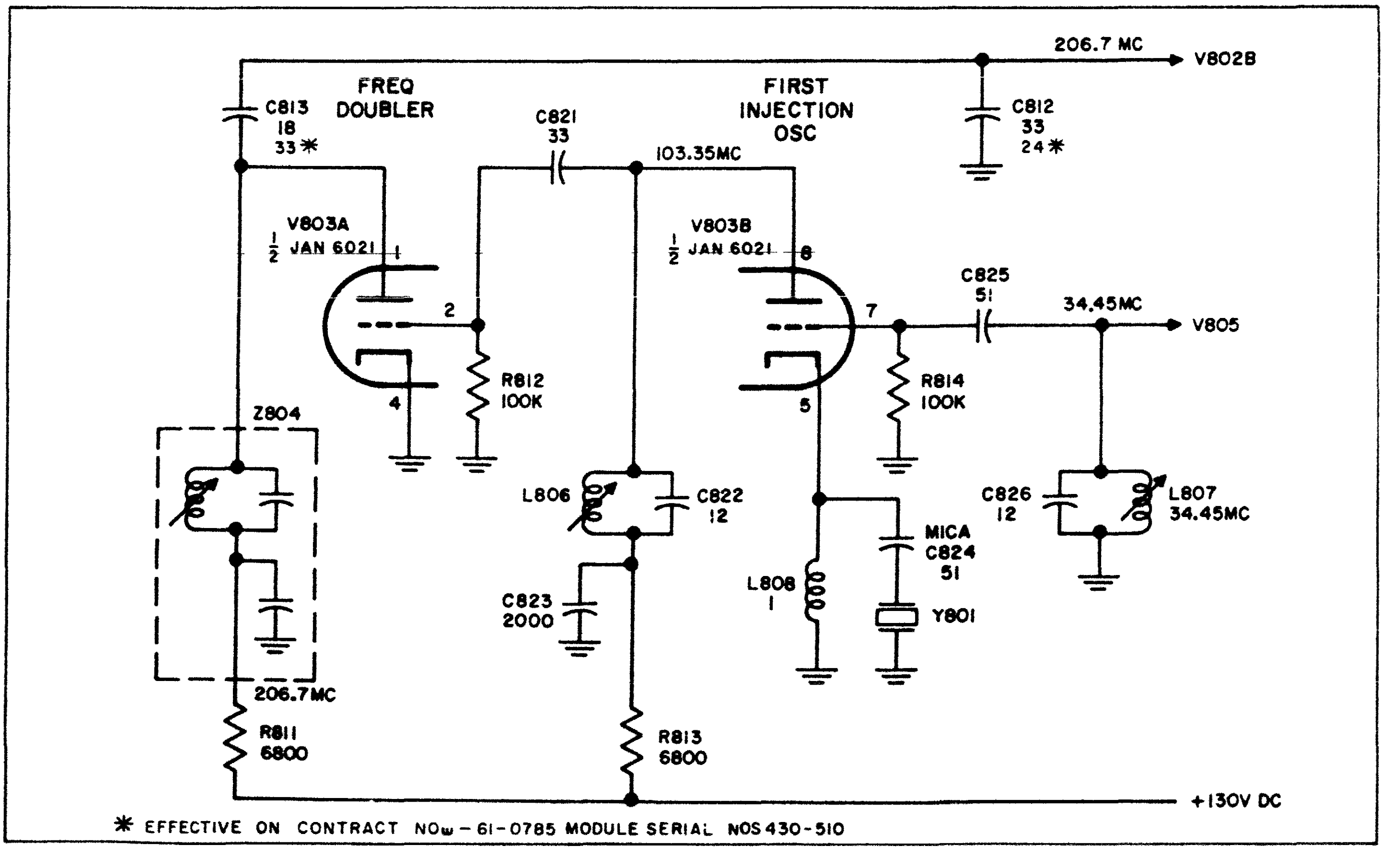


Figure 4-19. Guard Receiver Injection Frequency Generating Circuits, Simplified Schematic Diagram

voltage fed to mixer V805 are nearly the same frequency, adequate isolation must be provided between the two inputs to prevent a closed, feedback loop from being formed through the 1st i-f and injection circuits. A feedback loop could result in reduced guard receiver performance due to regeneration or spurious oscillations that might occur. Adequate isolation is provided by using the suppressor and control grids of V805 (well isolated from each other) for mixer inputs, rather than the grid and cathode elements, as is usual when the input frequencies are different and increased isolation is not required.

4-123. I-F AMPLIFIERS V806 AND V807. (See figure 7-10.)

4-124. I-f amplifiers V806 and V807 amplify the 1.85-mc signal (final if) prior to detection of the audio component. The input signal is developed by transformer T801 and applied to the grid of V806, which also receives avc bias through the secondary of T801. The output of V806 is coupled inductively by transformer T802 to the control grid of V807. Plate circuit decoupling is provided by resistor R822 and capacitor C835. I-f amplifier V807 is essentially the same as amplifier V806 except that no avc is applied to the second i-f amplifier. The output of V807 is coupled inductively by transformer T803 to the audio detector, crystal diodes CR801 and CR802.

4-125. The audio detector circuit (CR801, CR802, and Z805) demodulates the audio component from the 1.85-mc carrier and also produces a d-c detector output voltage from the carrier. The d-c voltage value is twice the peak amplitude of the 1.85-mc carrier and is used in the avc and squelch circuits.

4-126. DETECTOR D-C OUTPUT THEORY. The 1.85-mc carrier is developed across L811B and applied to CR801 and CR802. During the positive half-cycle of the 1.85-mc carrier waveform, conventional current will flow from T803-4 through CR802 and the two 100-k ode load resistors in Z805 to T803-3. Capacitor "b" in Z805 becomes negative with respect to ground. During the negative half-cycle, conventional current flows from T803-4 through CR801 and the 220-k resistors in Z805 to T803-3. Capacitor "a" becomes negative with respect to ground. The time constant of these RC circuits is long with respect to the carrier frequency; therefore, the capacitors maintain a voltage of approximately the peak value of the carrier input. Since capacitors "a" and "b" are charged with the same polarity and since they are in series between terminals 1 and 2 of Z805, a d-c detector output of approximately twice the carrier input is available between these terminals. A positive delay voltage of approximately +15 volts is applied to Z805-2 from R828, which is part of a voltage divider network from the +130-volt guard B+ to ground. Thus the detector d-c bias output at Z805-1 is referenced to the +15-volt delay voltage; i.e., the bias output at Z805-1 is then approximately 15 volts minus 2 times the peak of the 1.85-mc carrier input from T803.

4-127. AUDIO DETECTOR THEORY. In figure 4-20 consider for the moment only detector diode CR802 and its load between terminal 4 and 2 of Z805. Terminal 2 of Z805 has a very low impedance to ground through R828 compared to the impedance from Z805-4 to ground through the two 100-k diode load resistors. As explained in paragraph 4-126, capacitor "b" of Z805 charges to a negative voltage level approximately equal to the peak of the 1.85-mc carrier input from T803 due to the long time constant of the capacitor and its discharge path through the two 100-k resistors and R828. At audio frequencies, however, this time constant is short with the rate determined by the frequency of the 1.85-mc carrier modulation signal. The a-c voltage at Z805-3 is half that appearing at Z805-4 due to the divider action of the two 100-k load resistors. The detector audio output from Z805-3 is then coupled through noise limiter diode CR804 to the guard audio amplifier.

4-128. Noise limiter CR804 limits guard audio during the incidence of high noise voltage and also limits the audio signal for modulation greater than about 50% of the 1.85-mc i-f carrier.

4-129. Now consider only that portion of the circuit, CR802 and its associated load, concerned with audio detection. Diode CR804 is normally conducting when a carrier signal is present at the output of T803. Paragraph 4-126 explained how the conventional charging current for capacitor "b" of Z805 flows from L811B through CR802 to Z805-2, through the two 100-k resistors to Z805-4, and thence back to L811B. Note that a parallel, low current path between terminals 3 and 4 of Z805 exists through CR804, R827 and R825. The time constant of capacitor "b" of Z805 is short at audio frequencies and thus will follow the audio variations at Z805-4 up to approximately 50 kc. The voltage at the noise limiter audio output (junction of CR804 and R827) now will vary in accordance with the audio variations at Z805-3 (1/2 that at Z805-4) as determined by the time constant of R827 and C842. The time constant of this combination will follow audio variations up to approximately 8 kc. Thus when noise, having maximum energy centered about 20 kc is superimposed upon the carrier, the anode of noise limiter diode CR804 will follow the increased voltage variation but the cathode of the diode cannot, due to the time constant of R827 and C842. Thus the diode will cease to conduct during incidence of such noise pulses and effectively limit their appearance in the audio output to V808A.

4-130. LIMITER MODULATION CONTROL THEORY. (See figure 4-21.) Assume, for the purposes of explanation, that a 243.0-mc carrier signal is present at the input to the guard receiver which will produce a d-c level at Z805-4 of +5 volts. Terminal 2 of Z805 is fixed at +15 volts as determined by a voltage divider network from the +130-volt input at P801-9 to ground. The voltage at Z805-3 is therefore half of that between terminals 2 and 4 or +10 volts. If the carrier signal then is modulated to a depth of 30%, an audio variation will occur at the terminals of Z805 as shown by the solid line in figure 4-21. Assume that this modulation will result in a 5-volt peak variation at Z805-4. The peak variation at Z805-3 is then 2.5 volts. The audio output of the circuit V808A will increase as the modulation is increased until the peak of the audio swing at

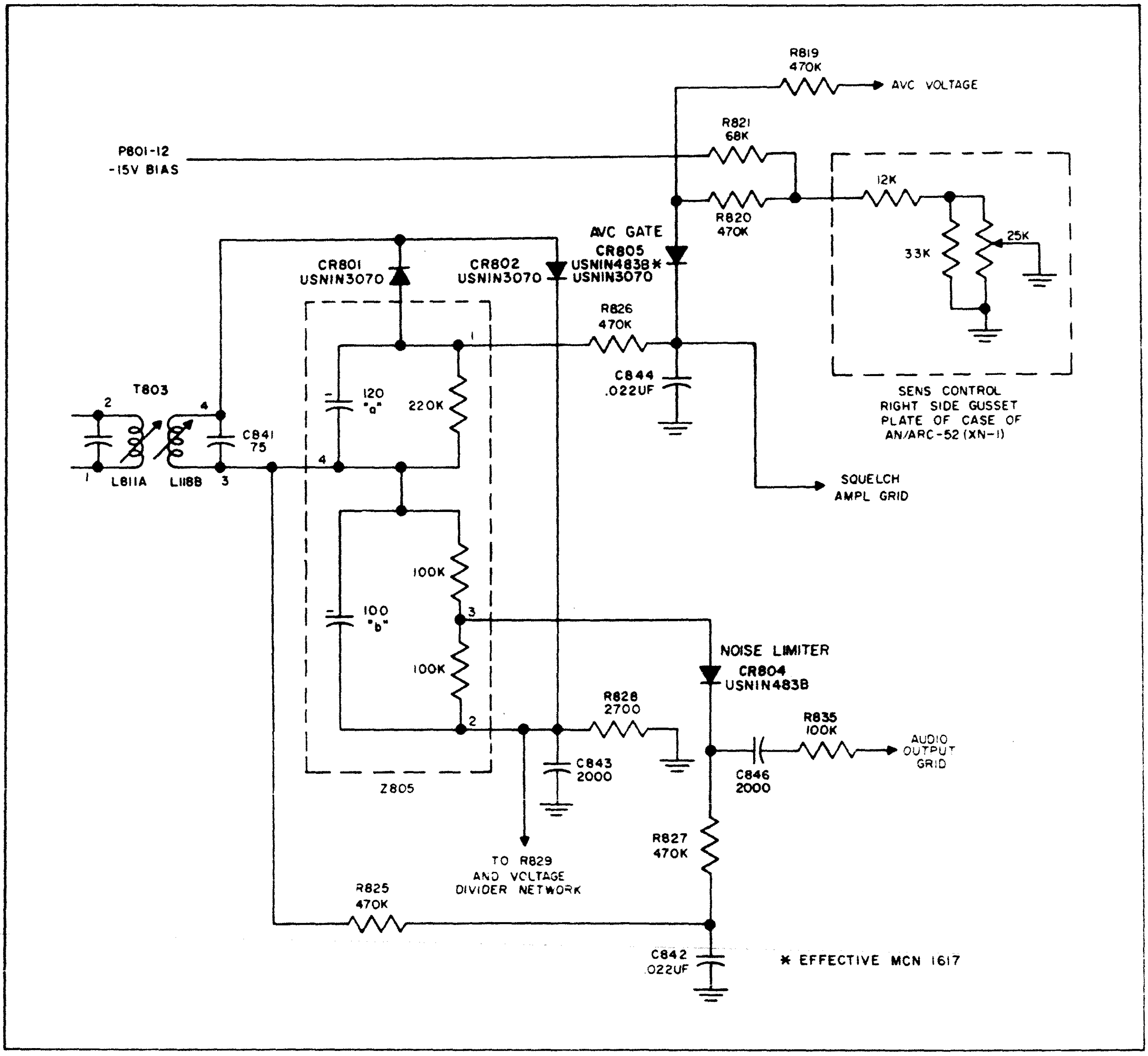


Figure 4-20. Guard Receiver Detector, Noise Limiter, and AVC Circuits, Simplified Schematic Diagram

terminal 4 of Z805, with respect to ground, approaches that of terminal 3 (condition shown by the dotted waveform of figure 4-21.) This point occurs at about 50 percent modulation of the carrier. If the modulation is increased beyond this point, the net voltage across the limiter diode CR804 is of the wrong polarity to maintain conduction and the diode will limit that portion of the audio waveform in excess of 50 percent modulation.

4-131. AVC GATE CR805. Avc gate CR805 applies bias to the controlled amplifier stages when the detector d-c output reaches a predetermined level. With the GUARD SENS control set for minimum resistance (maximum guard sensitivity), the voltage divider network of R821 and R1404 results in approximately -2.2 volts being applied to the anode of CR805 through isolation resistor R820. When the cathode of CR805, which is connected to the detector d-c output, reaches approximately -2.7 volts, the diode will conduct and any increase in detector d-c voltage will result in a like change at the grids of the controlled stages. Guard sensitivity potentiometer R1402 determines the residual avc bias on the controlled tubes and, thus, the amount of signal required to overcome this bias and cause normal receiver operation.

4-132. SQUELCH AMPLIFIER V808B. (See figure 4-22.)

4-133. The guard receiver has a carrier-type squelch system wherein the audio output tube is biased beyond

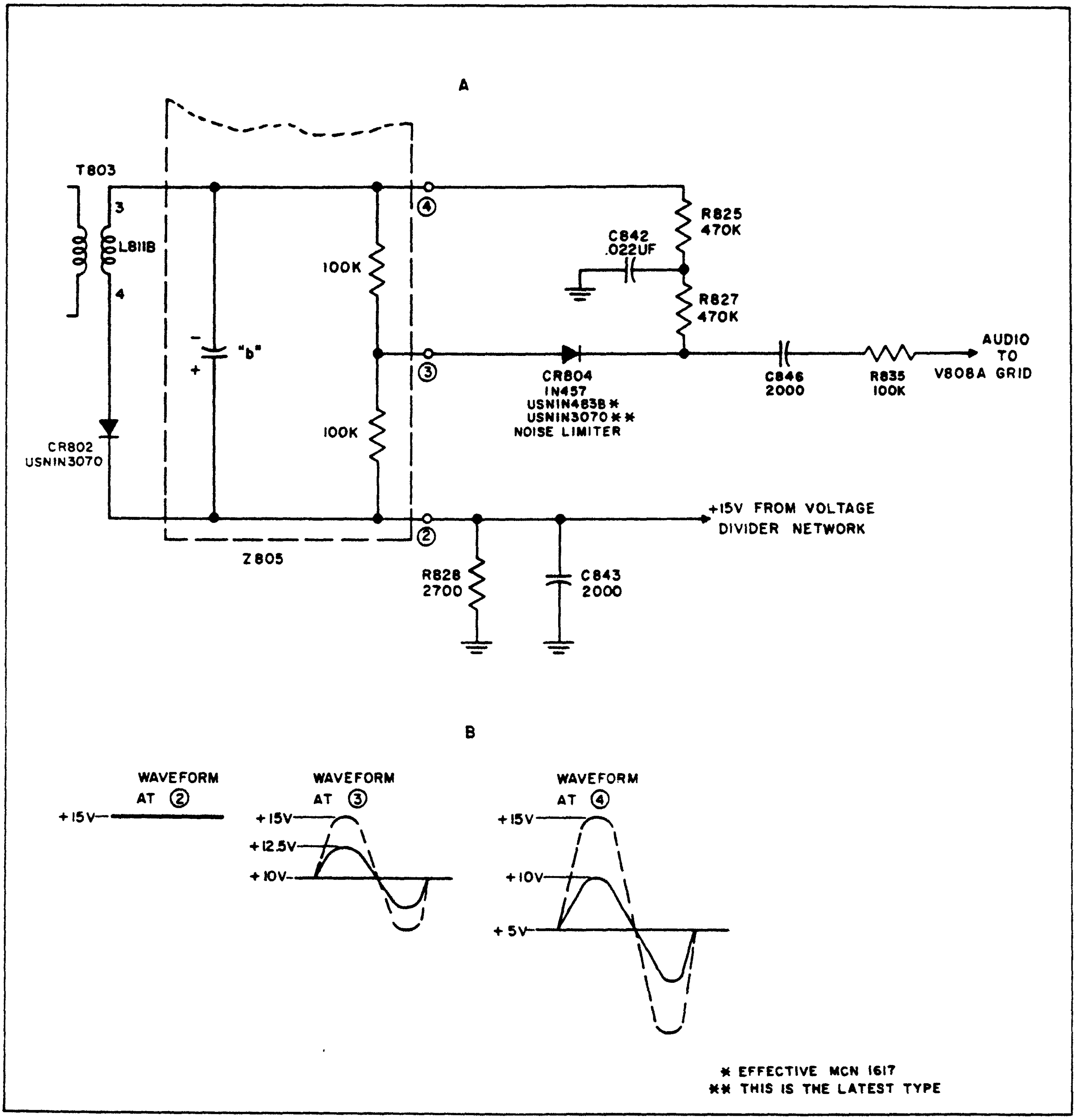


Figure 4-21. Guard Receiver Audio Detector and Noise Limiter, Simplified Schematic Diagram

cutoff when no carrier signal is present and for normal audio amplification when a carrier signal is received. The detector d-c output is applied to the grid of squelch amplifier V808B through an RC filter consisting of R826 and C844. When no carrier signal is received, the detector d-c output is positive and the squelch amplifier conducts. Plate current for V808B flows through R833 with a resultant voltage drop across it. This plate voltage of V808B is applied to the grid of audio amplifier V808A as a bias voltage; and, since it is considerably lower than the +39 volts applied to the cathode of V808A from the voltage divider network shown in figure 4-22, the audio output tube is biased beyond cutoff.

4-134. When a carrier signal is received, the detector output voltage goes more negative and the squelch amplifier is biased beyond cutoff. When the squelch amplifier is cut off, it draws no plate current. The voltage at the junction of R834 and R833 normally

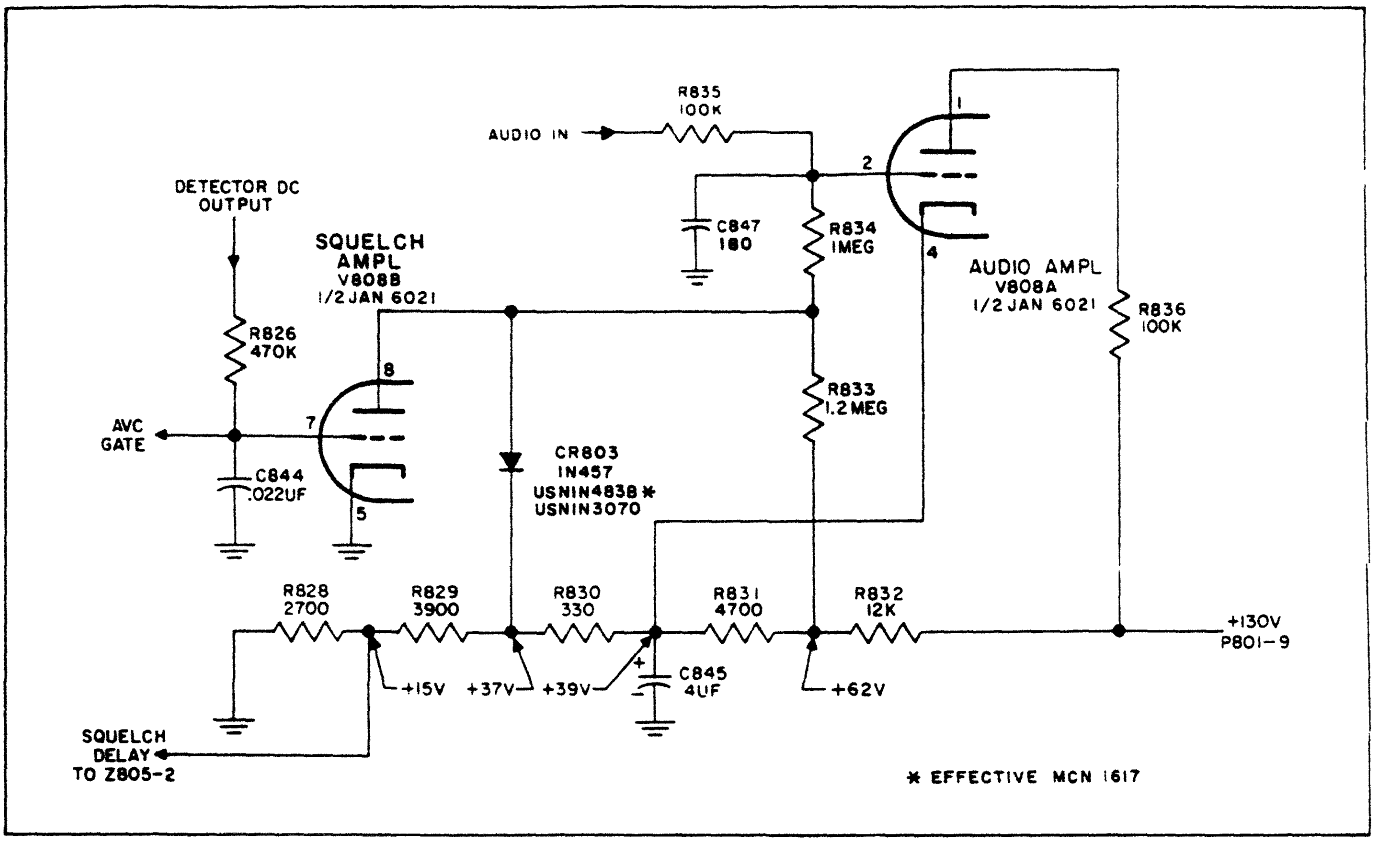


Figure 4-22. Guard Receiver Squelch Circuits, Simplified Schematic Diagram

would rise to +62 volts since there is no current path to ground through R833 and one end of R833 is connected to +62 volts. However, when the voltage at the junction of R833 and R834 (which is also the voltage on the plate of diode CR803) reaches +37.5 volts signal, the diode (whose cathode is at +37 volts) will conduct and provide a current path to ground. Thus the grid of audio amplifier V808A is held at approximately +38 volts for further increases in carrier signal level and the grid to cathode voltage of audio amplifier V808A remains negative. If this grid to cathode voltage were not held constant, the grid would go positive with resulting distortion of the audio signal.

4-135. AUDIO OUTPUT AMPLIFIER V808A. (See figure 7-10). Audio output amplifier V808A provides preamplification of the guard audio, which is amplified further in the audio amplifier module (refer to paragraph 4-91). Bias for V808A is controlled by the squelch amplifier (paragraph 4-132), which drives the audio amplifier below cutoff when no audio signals are present.

4-136. INJECTION-FREQUENCY GENERATOR CIRCUITS.

4-137. Injection-frequency generation components comprise the spectrum generator and amplifier module and the oscillator module. The generated injection frequencies are used during reception to reduce the modulated carrier to an intermediate frequency; during transmission, the injection frequencies are mixed to produce a high-frequency carrier. Control of frequency-generating circuits for selection of proper injection frequencies is accomplished by the mechanical tuning unit, which tunes the modules in response to switch settings of the radio set control. The following discussion covers the function of frequency-generating components only. For the theory of the control switching and linkage systems, refer to paragraph 4-238.

4-138. FIRST INJECTION FREQUENCY, SPECTRUM GENERATOR AND AMPLIFIER.

4-139. GENERAL. (See figure 4-23.)

4-140. The spectrum generator provides an output frequency that is an integral multiple of 10 mc within the frequency band of 200 to 370 mc. During the receive cycle, the amplified output of the spectrum generator is applied to the receiver r-f amplifier to produce the initial if.; and during the transmit cycle, the output is fed to the 2nd mixer in the transmitter preamplifier for carrier generation.

4-141. Oscillator V501A generates a basic frequency of 33.3333 to 41.1111 mc in 18 frequency increments. The oscillator output is doubled or tripled in V501B. The 66.6667 to 123.3333 output of the doubler/tripler is amplified by V502 and tripled by V503. The resultant 200-mc to 370-mc signal is amplified by V504 and V505 and applied to the receiver r-f amplifier and transmitter preamplifier.

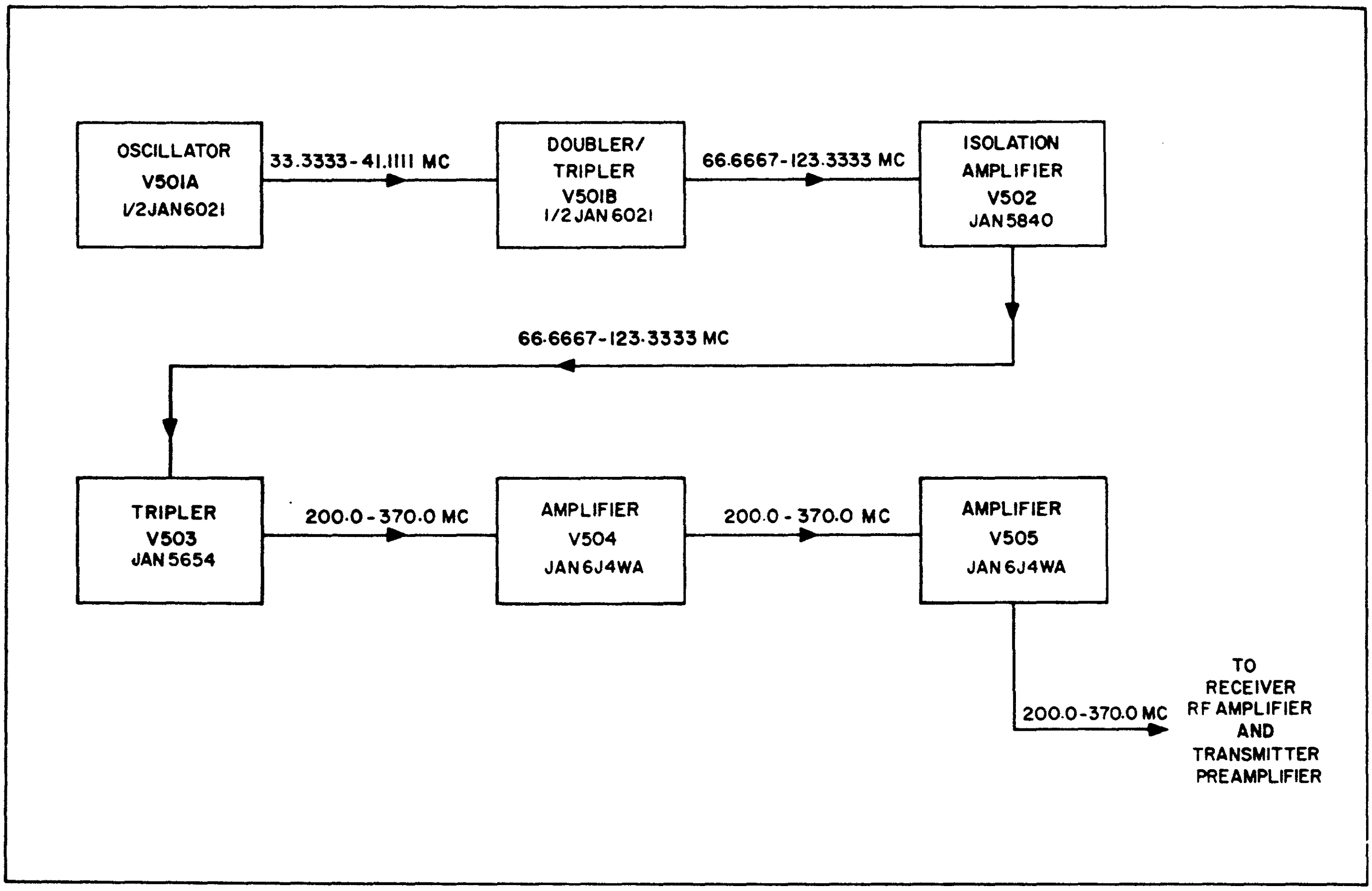


Figure 4-23. Spectrum Generator and Amplifier, Block Diagram

4-142. OSCILLATOR V501. (See figure 4-24.)

4-143. Oscillator V501 is a crystal-controlled oscillator that generates a strong output on the crystal fundamental and also provides separate frequency multiplication. One of 15 crystals, Y501 through 5, is selected to produce the required fundamental, which is doubled or tripled as determined by the coil selected from coils L501 through L518. The selection of the crystal and coil is made by controlling switches S501 and S502, which are driven by gearing from the mechanical tuning unit in response to switch settings of the radio set control. Table X lists each crystal, the crystal fundamental frequency, the available coils, the doubled or tripled frequency provided by the available crystal-coil combination, and the final frequency output of the module for each of the crystal-coil combinations. Crystals Y501, Y503, and Y505 are used twice, each time with a different coil, to produce the appropriate output frequency.

NOTE

See figure 7-11 for the complete schematic illustration of switches S501 and S502 with all crystals and coils.

4-144. Control switch S501 is a printed circuit switch that mounts multiplier coils L501 through L518. L520 and L521 are printed inductance coils and the rotor tab is the wiper arm. L531 and L532 are air-wound coils, which are adjusted together with C506 and C508, for proper tracking of V501B and V502 tuned plate circuits. The terminals of printed circuit switch S502 are connected to leads from crystals Y501 through Y515 in the crystal oven. Since both switches are mounted on a single shaft, the selection of crystal and coil is uniform and synchronized. Thus, when a particular final carrier frequency is selected, the appropriate crystal and coil are selected simultaneously to produce the required injection frequency in the 200-mc to 370-mc range. Subsequent mixing in the main receiver produces an if. in the 20.0-mc to 29.9-mc range; mixing in the transmitter preamplifier produces an r-f carrier in the 225.0-mc to 399.9-mc range.

4-145. Assume a positive pulse on the cathode of V501A. This pulse decreases current flow through the tube, causing a positive pulse to appear on the plate of V501A. This pulse is coupled through capacitor C502 and developed across V501B grid return resistor R505. A positive pulse on the grid of V501B increases the plate current through that half of the tube, causing a positive pulse to appear across its cathode resistor R504. Since there is no phase shift through the series resonant crystal, Y501 - Y515, the positive pulse is coupled back to the cathode of V501A in phase with the original pulse and at a level sufficient to sustain oscillations.

TABLE X. SPECTRUM GENERATOR FREQUENCY SELECTION CHART

SELECTED CRYSTAL	FUNDAMENTAL FREQUENCY (mc)	SELECTED COIL	MULTIPLIED OUTPUT (mc)	MODULE OUTPUT (mc)
Y501	33.3333	L501	66.667	200
Y502	35.0000	L502	70.0000	210
Y503	36.6667	L503	73.3333	220
Y504	38.3333	L504	76.6666	230
Y505	40.0000	L505	80.0000	240
Y506	41.6667	L506	83.3333	250
Y507	43.3333	L507	86.6667	260
Y508	45.0000	L508	90.0000	270
Y509	31.1111	L509	93.3333	280
Y510	32.2222	L510	96.6666	290
Y501	33.3333	L511	100.0000	300
Y511	34.4444	L512	103.3333	310
Y512	35.5555	L513	106.6667	320
Y503	36.6667	L514	110.0000	330
Y513	37.7777	L515	113.3333	340
Y514	38.8888	L516	116.6667	350
Y505	40.0000	L517	120.0000	360
Y515	41.1111	L518	123.3333	370

4-146. The oscillator plate load consists of capacitor C501 and a coil selected from L501 through L518. These coils provide resonance from 31.1111 mc through 45.0000 mc. The plate load of doubler/tripler V501B consists of coil L531, trimmer capacitor C506, and variable coil L520. These detail parts together with bypass capacitor C504 form a parallel resonant (tank) circuit tunable from 66.6667 to 123.3333 mc in 3.33-mc steps. Either the second or third harmonic of the oscillator output is developed by the plate tank of V501B and is coupled through capacitor C510 to isolation amplifier V502.

4-147. ISOLATION AMPLIFIER V502. (See figure 7-12.) Isolation amplifier V502 amplifies the selected output harmonic of oscillator V501. Maximum impedance to the selected frequency is provided by the tuned plate circuit consisting of L521, L532, and C508. Coil L521 is ganged mechanically with coil L520 of the doubler/tripler plate circuit. Since the tuned plate circuit of V502 provides frequency selectivity in 3.33-mc steps, the amplifier output is matched to the frequency input from the oscillator doubler/tripler V501B. The isolation amplifier output is applied to tripler V503.

4-148. TRIPLER V503. Tripler V503 is a harmonic amplifier that develops an output frequency three times that of the input signal. The tripler selects the desired harmonic, and attenuates all other frequencies. Tripler output is developed across a parallel resonant circuit formed by r-f tuner Z501 and applied to amplifier V504.

4-149. AMPLIFIERS V504 AND V505. Amplifiers V504 and V505 amplify the output frequency of tripler V503 developed across r-f tuner Z501. The three r-f tuners, Z501, Z502, and Z503, are ganged to a single shaft driven by the mechanical tuning unit. Both V504 and V505 are grounded-grid amplifiers that are identical to those discussed in paragraph 4-37. The output of amplifier V505 is matched to the 50-ohm coaxial output cable by capacity divider C527 and C528.

4-150. SECOND INJECTION FREQUENCY, OSCILLATOR UNIT.

4-151. GENERAL. (See figure 4-25.)

4-152. The oscillator provides an output frequency in 0.1-mc increments from 21.85 to 31.75 mc. Selection of the specific frequency is controlled from the

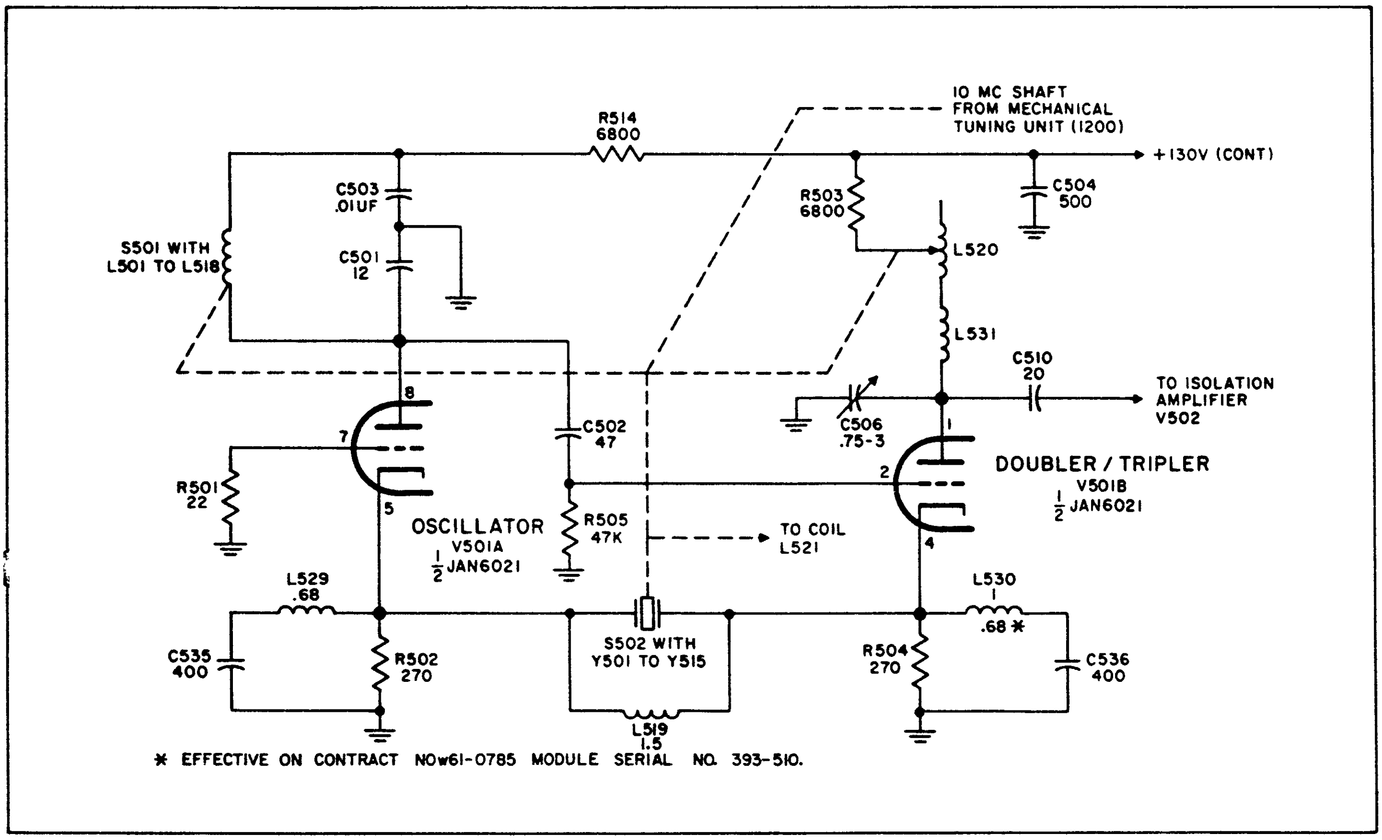


Figure 4-24. Spectrum Generator and Amplifier Oscillator Circuits, Simplified Schematic Diagram

radio set control through the mechanical tuning unit. The selected oscillator output frequency is applied to the 2nd receiver mixer in the 20- to 30-mc i-f amplifier module for generation of either the final receiving i-f or the initial transmitter carrier injection frequency.

4-153. Oscillator V1901 generates a basic frequency 24.9 to 33.9 mc in 1.0-mc frequency increments. Oscillator V1902B generates a basic frequency of 2.15 to 3.05 mc in 0.1-mc frequency increments. Both outputs are heterodyned in mixer V1902A, the beat frequency output of which is applied to the 20- to 30-mc i-f amplifier. The frequency of each oscillator is controlled separately through the mechanical tuning system, so that any one of the 10 outputs of oscillator V1901 may be mixed with any of the 10 outputs of oscillator V1902A. Thus, any one of 100 mixer outputs in 0.1-mc increments may be selected within the 21.85-mc through 31.75-mc range. Table XI lists specific oscillator frequency selection data. For brevity, however, only a basic 10 of 100 possible frequency combinations and mixer outputs are given in 1.10-mc increments.

4-154. OSCILLATOR V1901. (See figure 4-26.) Oscillator V1901 is a cathode-coupled, crystal-controlled oscillator, the operation of which is similar to that of spectrum generator oscillator V501 (paragraph 4-141). The notable difference between the two oscillators, however, is that the tuned plate circuit of V1901B is resonant at the selected crystal fundamental, whereas the tuned plate circuit of V501B is resonant at a multiple of the crystal fundamental frequency.

NOTE

See figure 7-12 for the complete schematic illustration of switches S1901 and S1902 with all coils L1901 through L1910 and crystals Y1901 through Y1910.

4-155. OSCILLATOR V1902B. (See figure 4-27.)

4-156. Oscillator V1902B is a modified Colpitts oscillator, the feedback of which is controlled by the ratio of capacitors C1906 and C1907. When power is applied, a voltage across cathode inductor L1913 caused by plate current charges capacitor C1907 positive with respect to ground. The signal, without change in polarity, is passed through a-c voltage divider capacitor C1906 to the grid circuit. The grid signal is sufficiently positive with respect to ground to start a crystal, selected from Y1911 through Y1920, into oscillation. When the polarity of the feedback reverses, at a time determined by the resonant frequency of the particular crystal selected, the voltage across capacitor C1907 is negative with respect to ground.

NOTE

On modules manufactured under contract NOw 60-0089 serial No. 01461-01497 and contract NOw 61-0785 serial No. 350-510, the cathode of the mixer is coupled directly to the cathode of the oscillator.

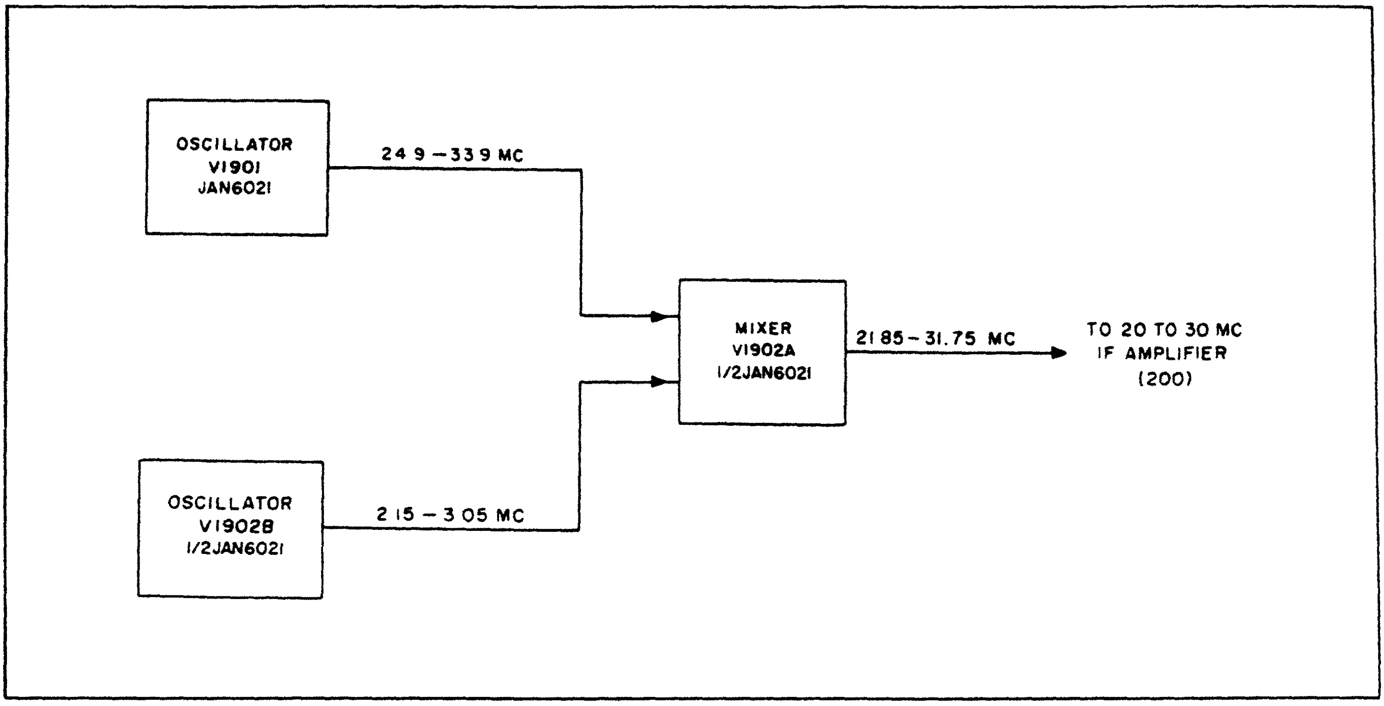


Figure 4-25. Oscillator. Block Diagram

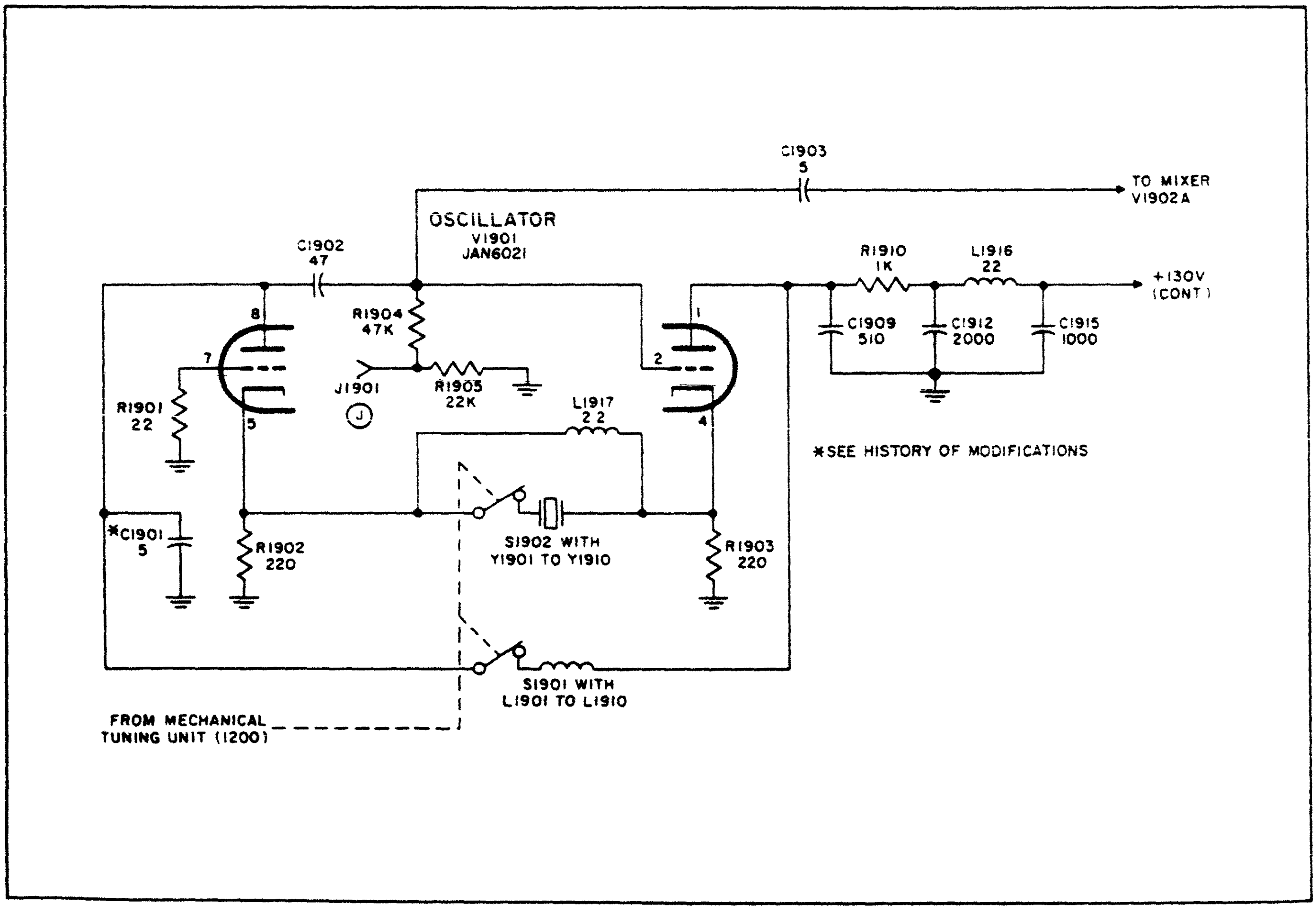


Figure 4-26. Oscillator V1901, Simplified Schematic Diagram

4-157. The cathode output of the stage is taken across coil L1913 and coupled to the mixer through capacitor C1905. Coil L1912 maintains the cathode above ground for rf.

NOTE

See figure 7-12 for the complete schematic illustration of the crystal complement on switch S1903.

4-158. MIXER V1902A. Mixer V1902A receives a selected frequency within the 2.15-mc to 3.05-mc range by cathode injection from oscillator V1902B, and a selected frequency within the 24.9-mc to 33.9-mc range by grid coupling from oscillator V1901. The two frequencies mix within the electron stream of the tube in a manner similar to that of guard receiver mixer V802B (paragraph 4-117). The difference frequency, which is within the 21.85-mc to 31.75-mc range, is applied from the plate circuit to the 20- to 30-mc i-f amplifier.

4-159. TRANSMITTER CIRCUITS.

4-160. The transmitter circuits consist of the transmitter sections of the 20- to 30-mc i-f amplifier module, receiver r-f amplifier and transmitter preamplifier module, the modulator, the power amplifier, and the antenna relay assembly. Note that the first two modules perform alternate functions during the receive cycle, which is discussed in paragraph 4-17. The basic carrier signal for transmission is provided by the mixer outputs of the oscillator module and transmitter oscillator V204A of the 20- to 30-mc i-f amplifier (paragraph 4-167).

4-161. 20- TO 30-MC I-F AMPLIFIER.

4-162. GENERAL. (See figure 4-28.)

4-163. The 20- to 30-mc i-f amplifier performs separate functions for reception and transmission. Transmitting functions are discussed below; receiving functions are discussed in paragraph 4-44.

4-164. The 21.85-mc to 31.75-mc injection frequency from the oscillator module is amplified by injection amplifier V205 and applied to transmitter 1st mixer V204B simultaneously with the 1.85-mc output of transmitter oscillator V204A. The resultant 20.0-mc to 29.9-mc carrier is applied through two successive stages of i-f amplification, V201 and V202, to the transmitter preamplifier.

4-165. The 20- to 30-mc i-f amplifier relays (the contacts of which are shown in figure 4-28) are controlled by the press-to-talk switch on the microphone. The relay contacts are shown in the transmit (energized) position, which is the condition when the press-to-talk switch is actuated.

4-166. INJECTION AMPLIFIER V205. Injection amplifier V205 amplifies the 21.85-mc output of the oscillator module and applies the output to the transmitter 1st mixer. The operational theory of injection amplifier V205 is discussed in paragraphs 4-53 and 4-54, under the receiving application.

4-167. TRANSMITTER OSCILLATOR V204A. (See figure 4-29.) Transmitter oscillator V204A is a crystal-controlled, modified Colpitts oscillator that uses capacitors C232 and C233 as an a-c voltage divider. Operational theory of this oscillator is essentially the same as that of oscillator V1902B in the oscillator module (paragraph 4-155). Crystal Y201 is resonant at 1.85-mc, and this frequency is coupled from the grid circuit through capacitor C234 transmitter 1st mixer V204B.

TABLE XI. OSCILLATOR, FREQUENCY SELECTION CHART

OSCILLATOR V1901			OSCILLATOR V1902B		
CRYSTAL	COIL	FREQUENCY (mc)	CRYSTAL	FREQUENCY (mc)	MIXER V1902A OUTPUT (mc)
Y1901	L1901	24.9	Y1911	3.05	21.85
Y1902	L1902	25.9	Y1912	2.95	22.95
Y1903	L1903	26.9	Y1913	2.85	24.05
Y1904	L1904	27.9	Y1914	2.75	25.15
Y1905	L1905	28.9	Y1915	2.65	26.25
Y1906	L1906	29.9	Y1916	2.55	27.35
Y1907	L1906	30.9	Y1917	2.45	28.45
Y1908	L1908	31.9	Y1918	2.35	29.55
Y1909	L1909	32.9	Y1919	2.25	30.65
Y1910	L1910	33.9	Y1920	2.15	31.75

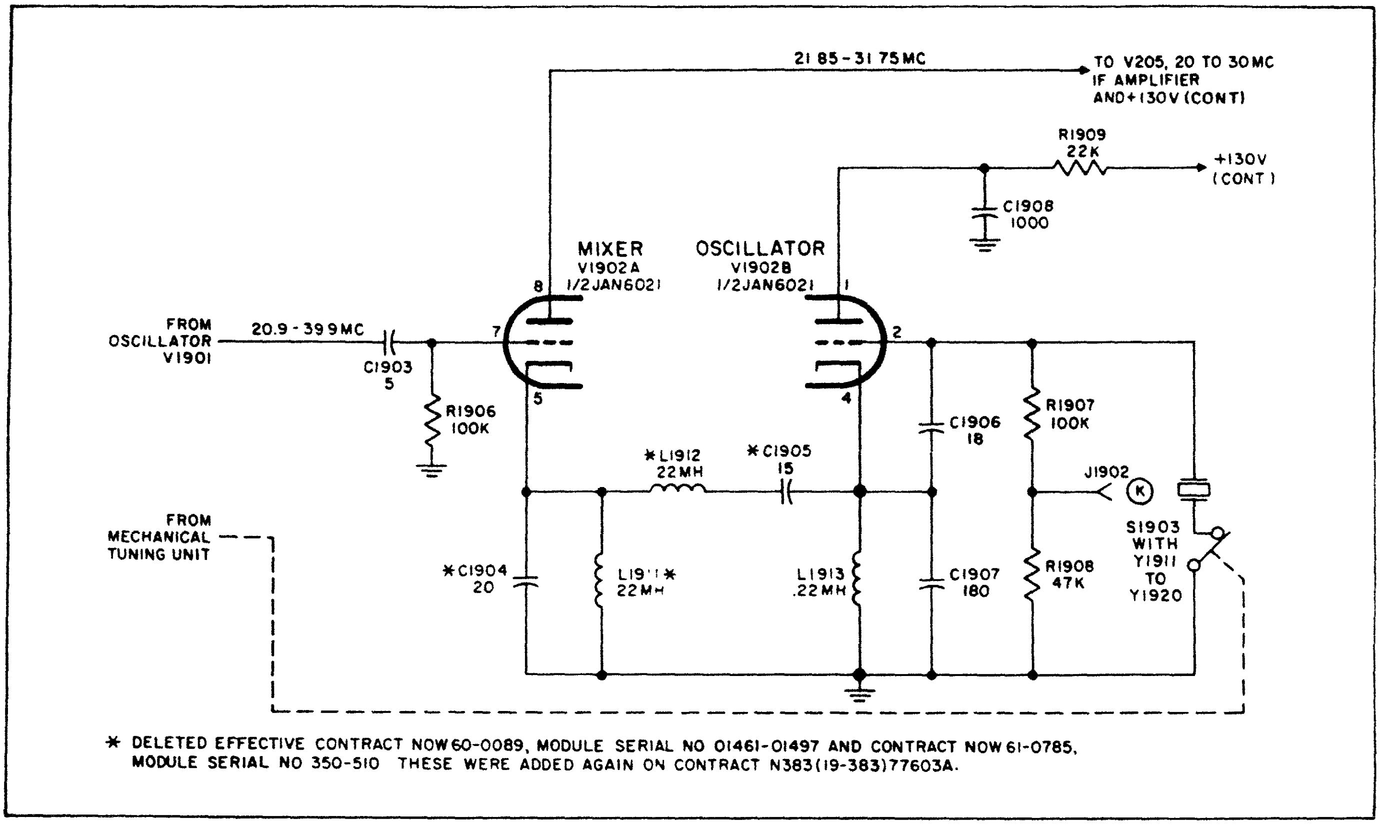


Figure 4-27. Oscillator Mixer V1902A and Oscillator V1902B, Simplified Schematic Diagram

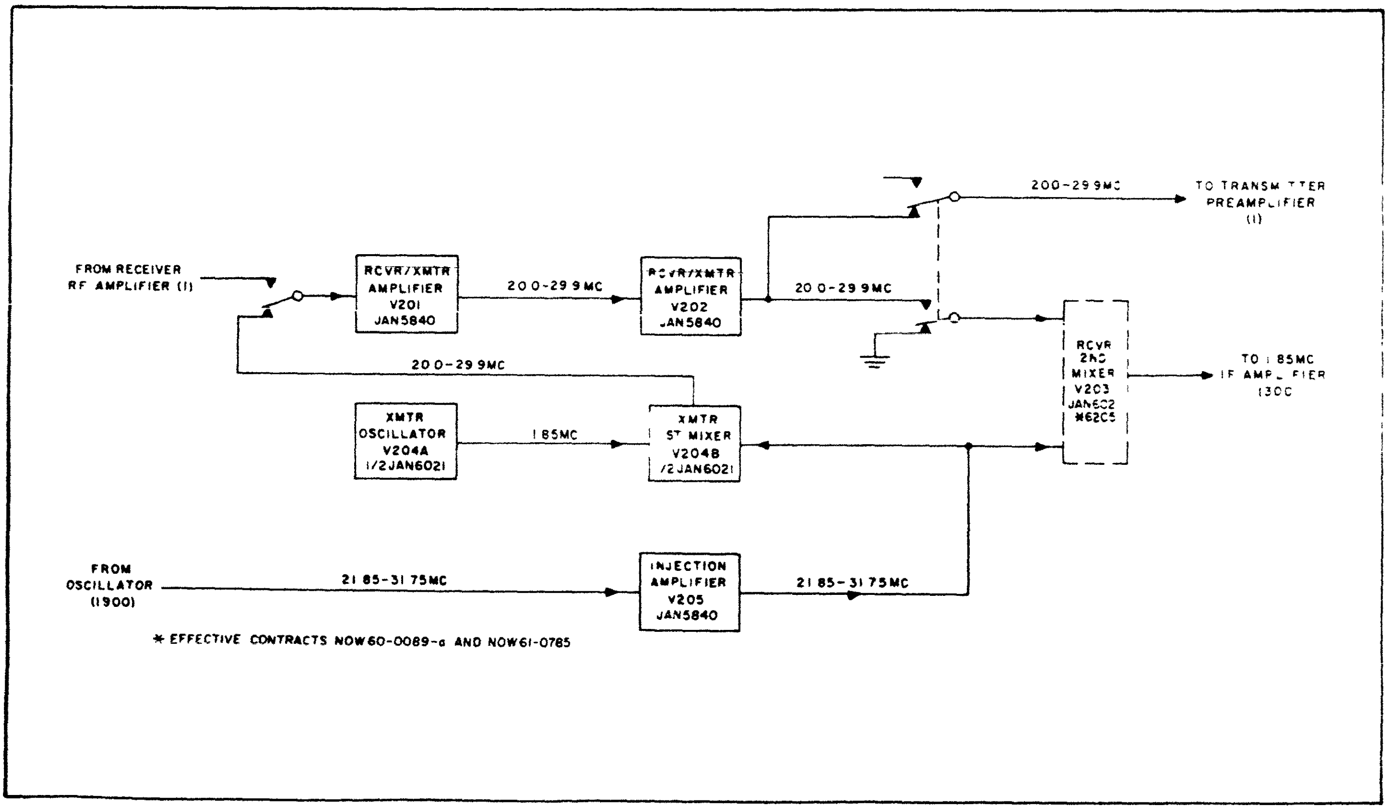


Figure 4-28. 20- to 30-Mc I-F Amplifier Transmitting Circuits, Block Diagram

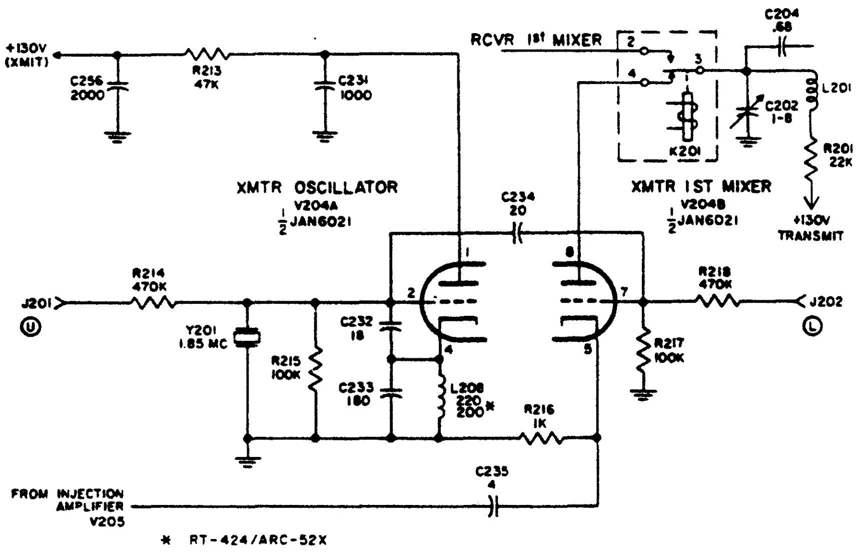


Figure 4-29. 20- to 30-Mc I-F Amplifier Transmitting Frequency Generation Circuits, Simplified Schematic Diagram

4-168. TRANSMITTER 1ST MIXER V204B. Transmitter 1st mixer V204B receives a 1. 85-mc signal by grid coupling from transmitter oscillator V204A, and a selected frequency within the 21. 85- to 31. 75-mc range by cathode injection from amplifier V205. The two frequencies mix within the electron stream of the tube in a manner similar to that described for guard receiver 1st mixer V802B (refer to paragraph 4-117). The difference-frequency output, which is within the 20. 0-mc to 29. 9-mc range, is applied from the plate circuit to the tuned input circuit of receiver/transmitter amplifier V201. D-c plate-supply for tube V204B is available only during the transmit cycle and is fed through dropping resistor R201, in the input circuit of V201, and relay K201 contacts 3 and 4 when the microphone press-to-talk switch is closed.

4-169. RECEIVER/TRANSMITTER I-F AMPLIFIERS V201 AND V202. Receiver/transmitter amplifiers V201 and V202 amplify the 20. 0-mc to 29. 9-mc input signal from the transmitter 1st mixer and apply the selected carrier frequency to the transmitter preamplifier. The functional theory of amplifiers V201 and V202 is presented in the discussion of receiving circuits (paragraph 4-49). The output of V202 is coupled through capacitors C227 and C259 and contacts 7 and 1 of relay K202 (see figure 4-8) to the grid input circuit of transmitter 2nd mixer V7 in the transmitter preamplifier.

4-170. RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER, TRANSMITTING THEORY.

4-171. GENERAL. (See figure 4-30.)

4-172. Although physically a part of the receiver r-f amplifier, the transmitter preamplifier is a separate functional unit. The theory of the receiver r-f amplifier section of this module is discussed under paragraph 4-20.

NOTE

The receiver r-f amplifier and transmitter preamplifier, serial numbers 1 through 90 produced under Contract NOas 57-478, are covered in paragraph 4-176.

4-173. A 20. 0-mc to 29. 9-mc signal from the 20- to 30-mc i-f amplifier is applied to transmitter 2nd mixer V7 simultaneously with a 200. 0-mc to 370. 0-mc signal from the spectrum generator and amplifier. The resultant 225. 0-mc to 399. 9-mc carrier is applied through two successive r-f amplifiers V5 and V6 to the power amplifier module.

4-174. TRANSMITTER 2ND MIXER V7. (See figure 4-31.) Transmitter 2nd mixer V7 develops the final carrier frequency by heterodyning two injection frequencies. One frequency, the selected output of the spectrum generator, is developed across cathode coil L15. The other frequency, the selected output of the 20- to 30-mc i-f amplifier, is coupled to the control grid of the mixer. The two frequencies mix within the electron stream of the tube in a manner similar to that of guard receiver 1st mixer V802B (paragraph 4-117). Choke L16 prevents feedback from the spectrum generator to the 20- to 30-mc i-f amplifier. The transmitter mixer output is applied to transmitter amplifier V6.

4-175. TRANSMITTER AMPLIFIERS V5 AND V6. Transmitter amplifiers V5 and V6 amplify the 225. 0- to 399. 9-mc carrier applied from the transmitter 2nd mixer. The theory of the amplifiers is essentially

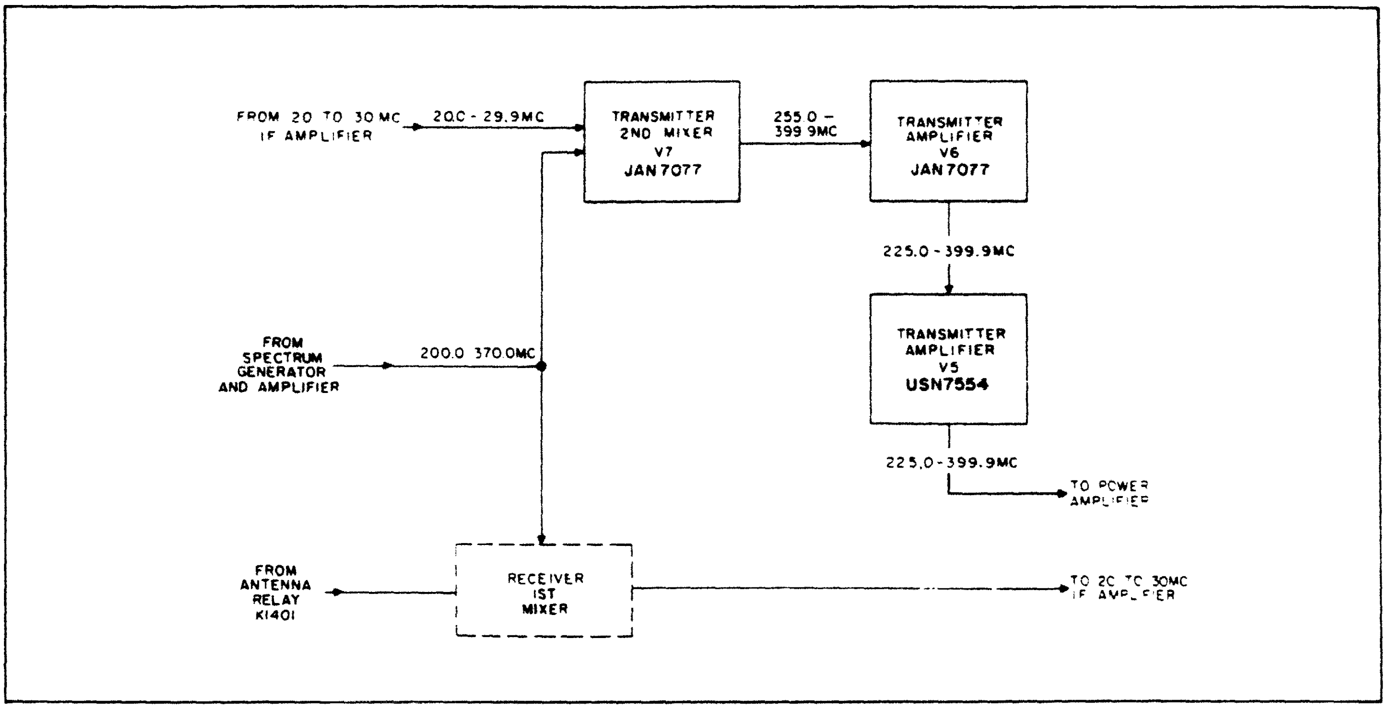


Figure 4-30. Receiver R-F Amplifier and Transmitter Preamplifier Transmitting Circuits, Block Diagram

the same as that of receiver amplifiers V1 and V2 (paragraph 4-24). The carrier output of V5 is applied to the power amplifier module.

4-176. RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1-90), TRANSMITTING THEORY. The transmitting theory for receiver r-f amplifier and transmitter preamplifier, serial numbers 1 through 90 manufactured under Contract NOas 57-478 (figure 4-32) is covered in the following paragraphs.

4-177. Although physically connected to the receiver r-f amplifier, the transmitter preamplifier is a separate functional unit. The theory of the receiver r-f amplifier section of this module is discussed in paragraph 4-33. The theory of the transmitter r-f amplifier section is discussed in paragraphs 4-178 through 4-180.

4-178. A 20.0-mc to 29.9-mc signal from the 20- to 30-mc i-f amplifier is applied to transmitter 2nd mixer V101 simultaneously with a 200.0-mc to 370.0-mc signal from the spectrum generator and amplifier. The resultant 225.0-mc to 399.9-mc carrier is applied through two successive r-f amplifiers V102 and V103 to the power amplifier module.

4-179. TRANSMITTER 2ND MIXER V101. Transmitter 2nd mixer V101 develops the final carrier frequency by heterodyning two injection frequencies. One frequency, the selected output of the spectrum generator, is developed across cathode coil L101. The other frequency, the selected output of the 20- to 30-mc i-f amplifier, is coupled to the control grid of the mixer. The two frequencies mix within the electron stream of the tube. Choke L110 prevents feedback from the spectrum generator to the 20- to 30-mc i-f amplifier. The transmitter mixer output is applied to transmitter amplifier V102. Choke L110 and capacitor C122 are series-resonant in the 20- to 30-mc range, thereby providing relatively constant i-f output over the 20- to 30-mc band.

4-180. TRANSMITTER AMPLIFIERS V102 AND V103. Transmitter amplifiers V102 and V103 amplify the 225.0- to 399.9-mc carrier applied from the transmitter 2nd mixer. The theory of the amplifiers is essentially the same as that of receiver amplifiers V1 and V2 (paragraph 4-36). The carrier output of V103 is applied to the power amplifier.

4-181. MODULATOR.

4-182. GENERAL. (See figure 4-33.) The modulator supplies to the power amplifier an audio signal for modulating the transmitter carrier. This modulating signal may be either the microphone input signal or the tone (df or homing) signal that occurs at a nominal 1000 cps. Audio is applied to the input stage, amplifier V701A, either from a dynamic microphone or a carbon microphone. When a dynamic microphone is used, V701A is connected as a class A amplifier; when a carbon microphone is used, V701A is connected as a cathode follower. The output of V701A in either case is applied through two successive amplifier stages V701B and V702 to push-pull amplifiers V703 and V704. The push-pull audio output is applied to the power amplifier. During emergency or direction-finding operation, tone oscillator V705 provides a 1000-cps continuous wave output to amplifier V701B for transmission as a homing signal. When the intercom feature of the transceiver is used, a portion of the

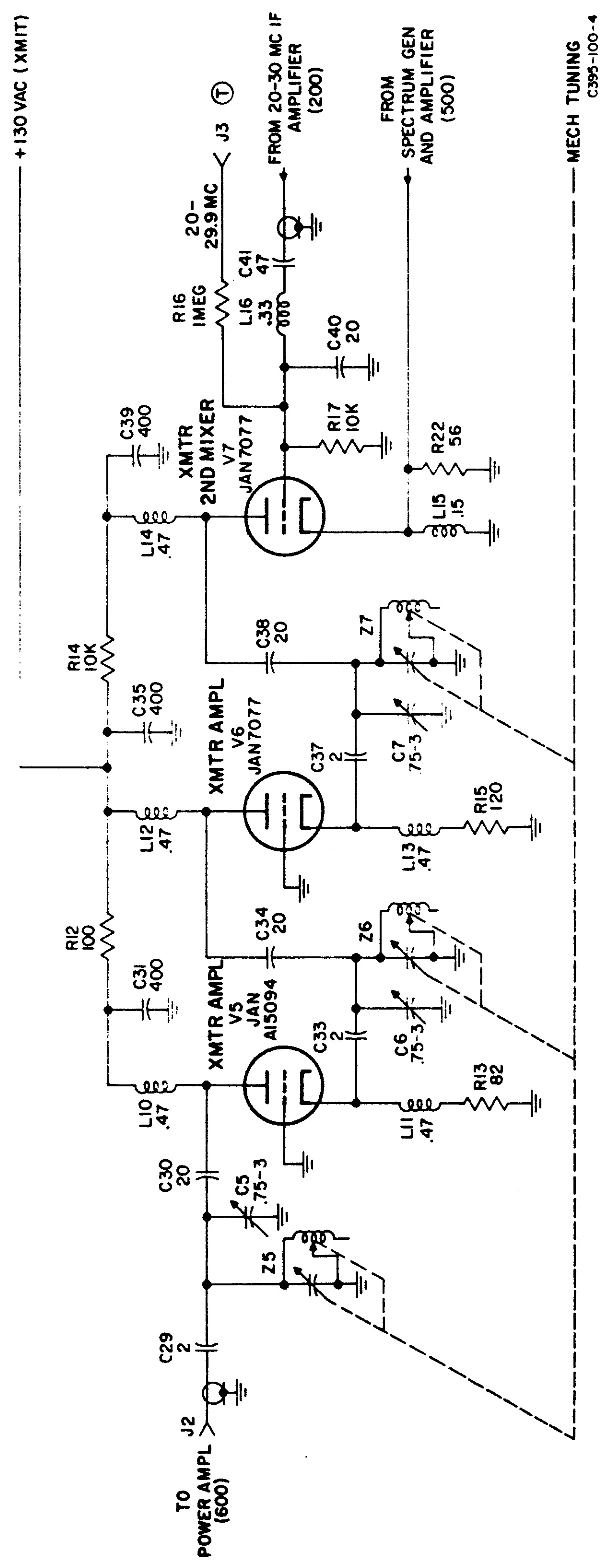


Figure 4-31. Receiver R-F Amplifier and Transmitter Preamplifier Transmitting Circuits, Simplified Schematic Diagram

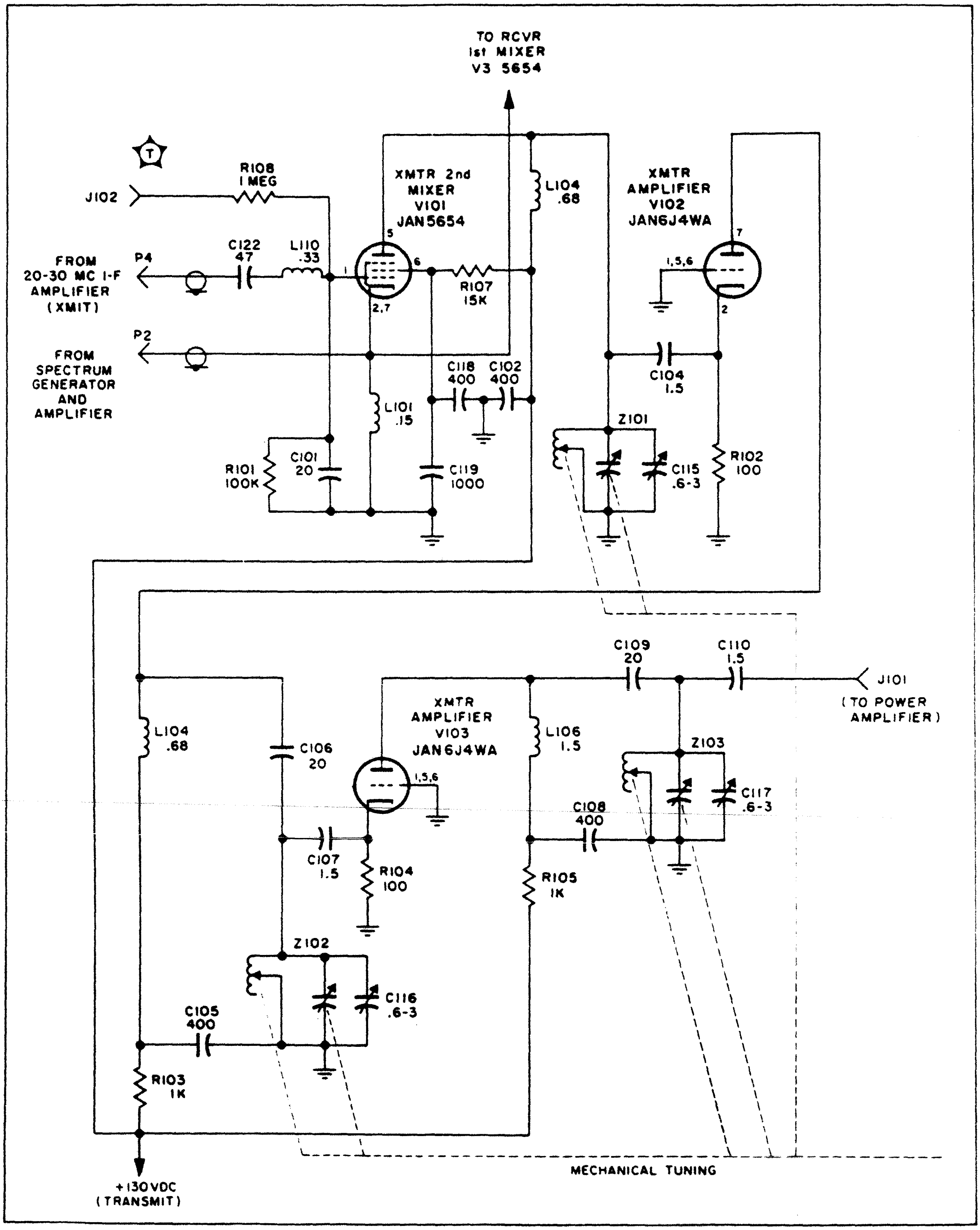


Figure 4-32. Receiver R-F Amplifier and Transmitter Preamplifier Transmitting Circuits (Contract NOas 57-478, Serial Numbers 1 - 90), Simplified Schematic Diagram

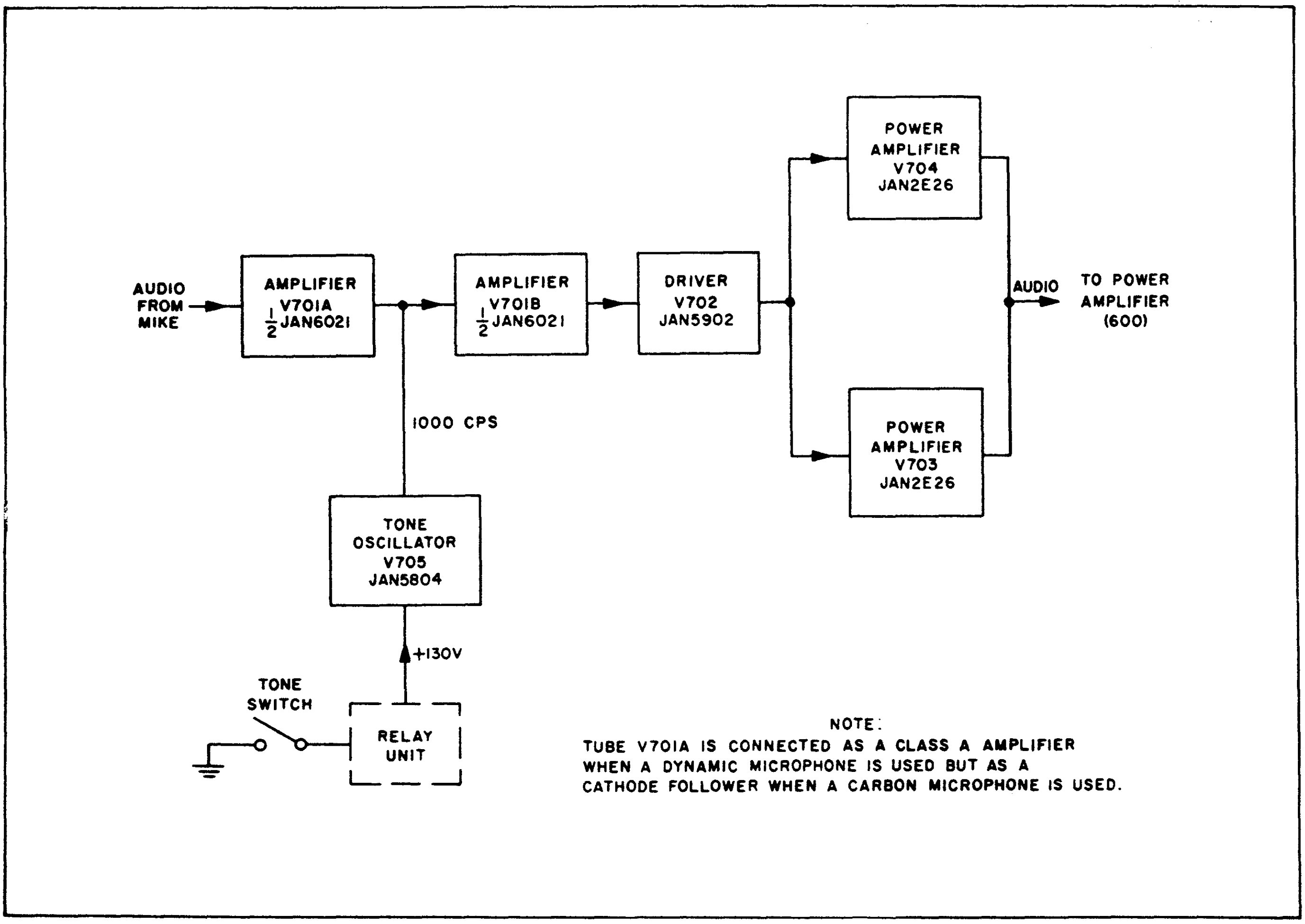


Figure 4-33. Modulator, Block Diagram

output from amplifier V701B is applied to the audio amplifier module.

4-183. AMPLIFIER V701A.

4-184. Amplifier V701A is connected either as an amplifier (figure 4-34) or as a cathode follower (figure 4-35). The connections for either circuit are made at the time of manufacture but may be changed as part of a special installation procedure (section III).

4-185. With a dynamic microphone input (figure 4-34), V701A is connected as a conventional class A amplifier; this circuit is required by the relatively lower amplitude of the audio input. A balanced circuit to ground is provided by the primary of transformer T701. The secondary of this transformer is connected in parallel with variable resistor R702, which controls the input signal amplitude to V701A. The audio output is coupled through capacitor C702 to amplifier V701B.

4-186. With a carbon microphone input (figure 4-35), V701A is connected as a cathode follower to avoid excessive amplification of the higher-level audio input. The microphone requires a d-c voltage source and is therefore connected in series with the +27.5-volt supply, current limiting resistor R701, the primary of transformer T701, and ground. The audio signal input is developed across variable resistor R702: and the output, which is developed across resistors R703 and R704, is coupled to amplifier V701B through capacitor C702.

4-187. TONE OSCILLATOR V705. (See figure 4-36.)

4-188. Tone oscillator V705 supplies a 1000-cps homing signal which is initiated by the closing of an external tone switch. The tone switch energizes tone relay K904 in the relay unit (paragraph 4-220). This relay applies plate voltage to the tone oscillator and also grounds the T/R line to place the radio set in the transmit condition. The oscillator is a phase-shift type; feedback from the plate is coupled to the grid across three, phase-shifting RC circuits.

4-189. When power is applied to the tube, capacitor C707 charges to the plate level through resistor R712. The voltage dropped across the resistor is in phase with the current, but the current through the capacitive reactance of C708 leads the impressed voltage by 60 degrees. Since the capacitor is charged in series with resistor R713, the same current-voltage relationship is present across that resistor. A second phase shift of 60 degrees is produced by capacitor C709

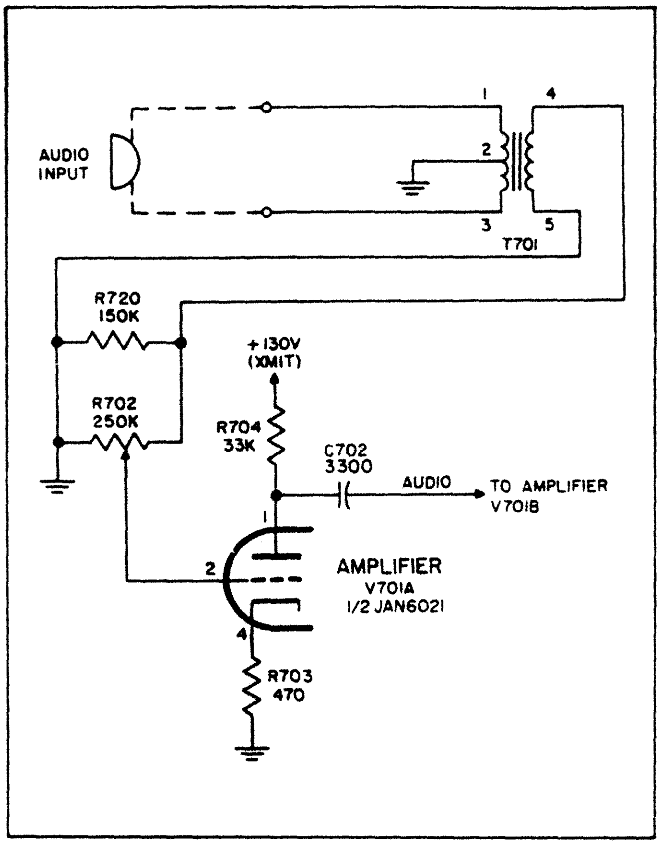


Figure 4-34. Modulator Input Circuits Using Dynamic Microphone, Simplified Schematic Diagram

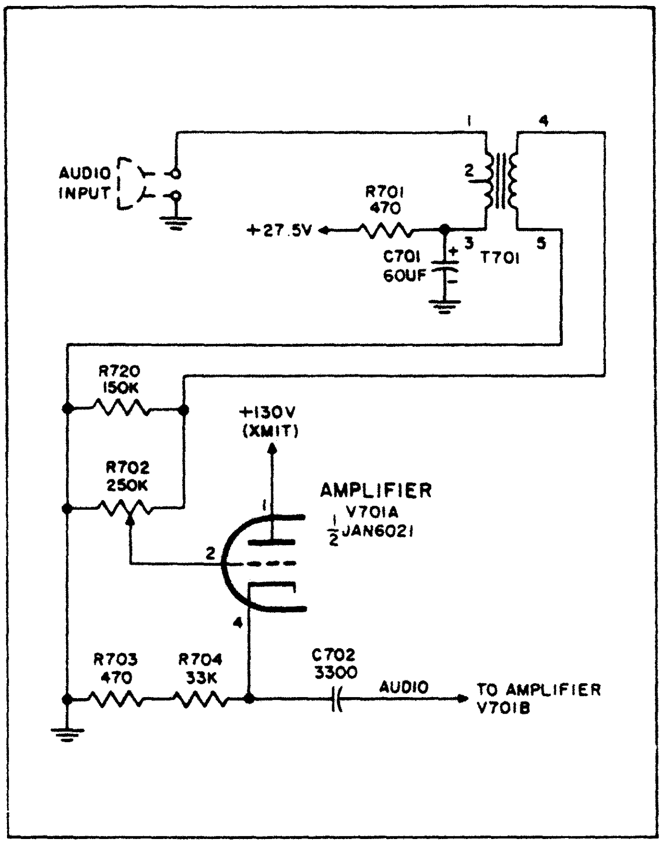


Figure 4-35. Modulator Input Circuits Using Carbon Microphone, Simplified Schematic Diagram

and resistor R714, and a third phase shift of 60 degrees is produced by capacitor C710 and resistor R715. A total phase shift of 180 degrees is thus developed by the three phase-shift networks. Therefore, feedback voltage at the grid has the proper phase and magnitude to sustain oscillations.

4-190. The capacitive reactances of the phase-shift network are designed to produce 180 degrees of phase shift at 1000 cps. The phase shift at other frequencies will be other than 180 degrees, and feedback voltage will have the wrong phase to sustain oscillations. Thus, the oscillator operates selectively within the frequency range of 920 cps to 1120 cps. The tone output is developed across resistor R712 and fed to the grid circuit of amplifier V701B.

4-191. AMPLIFIER V701B. (See figure 4-37.)

4-192. Amplifier V701B is a degenerative-amplifier biased for class A operation. Self-bias for the stage is developed across unbypassed cathode resistor R706. Degenerative feedback is applied through resistor R710 to reduce distortion.

4-193. Input from amplifier V701A is coupled through capacitor C702 and developed across grid resistor R719. Tone from oscillator V705 also is developed across grid resistor R719, which thus functions as a voltage divider in conjunction with resistor R705. Output from the amplifier is coupled through capacitor C703 to the grid circuit of driver V702.

4-194. DRIVER V702. Driver V702 provides a balanced output to power amplifiers V703 and V704, the inputs of which are 180 degrees out-of-phase. The stage is a conventional class A amplifier, which develops output across the primary of interstage transformer T703.

4-195. AUDIO POWER AMPLIFIERS V703 AND V704.

4-196. Power amplifiers V703 and V704 provide a balanced modulating voltage output to the power amplifier. Out-of-phase voltages of balanced amplitude are applied from the secondary of transformer T703 to the grid circuits of the modulator tubes. The input signals are referenced to the negative 15-volt bias that is applied to the center tap of the transformer secondary.

4-197. Zener diode CR701 performs the functions of a voltage regulator tube. The diode maintains the modulator push-pull amplifiers at a fixed grid bias, even during periods of increased modulation when the tubes draw grid current. This fixed bias results in reduced distortion that normally would occur at higher levels of modulation if the grid bias were allowed to increase.

4-198. Power amplifiers V704 and V703 are operated in push-pull to obtain higher efficiency and a more linear output. The output of the modulator is taken from terminal 3 of T702 and applied to the power amplifier. Capacitor C706 provides bias line filtering

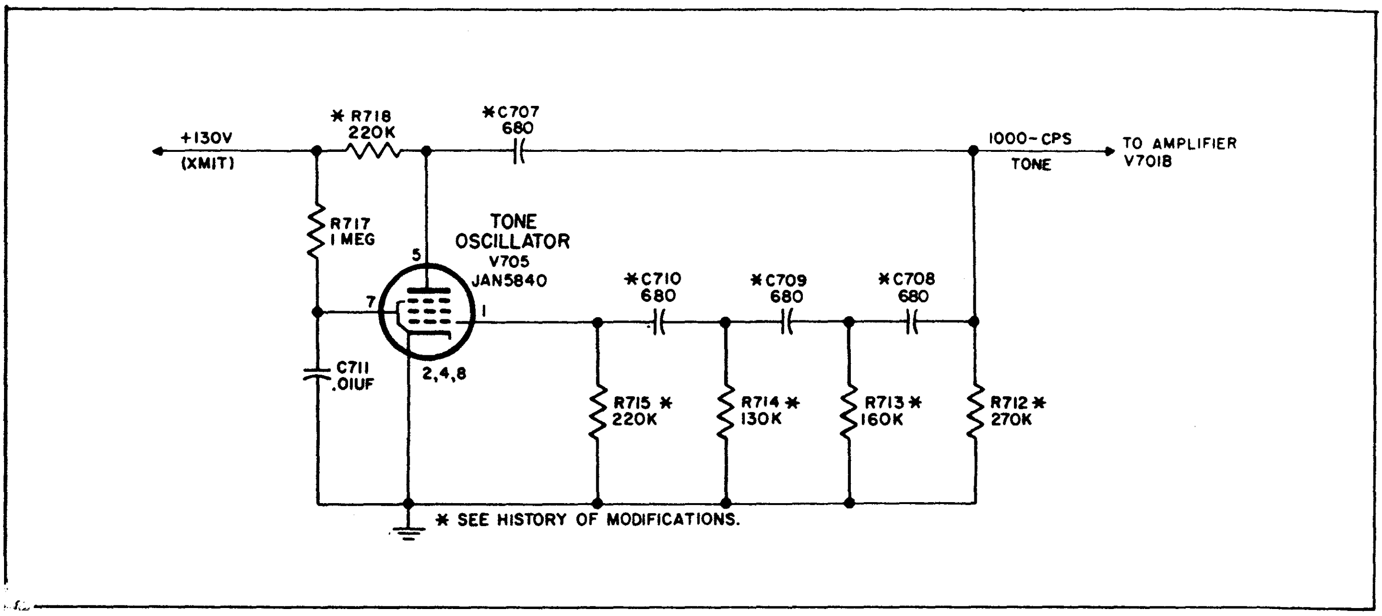


Figure 4-36. Modulator Tone Oscillator, Simplified Schematic Diagram

and resistor R711 develops a voltage at test jack J702 that allows calculation of cathode current. This resistor does not affect the actual operation of the power amplifiers.

4-199. R-F POWER AMPLIFIER.

4-200. GENERAL. (See figure 4-38.) The r-f power amplifier provides a modulated uhf carrier signal to the antenna. Conventional plate modulation is used to modulate the r-f carrier amplified by power amplifier V603. The r-f carrier input to V603 is applied from the transmitter preamplifier through r-f amplifiers V601 and V602.

4-201. AMPLIFIERS V601 AND V602. (See figure 4-39.) Amplifiers V601 and V602 amplify the unmodulated carrier, which is in the 225.0- to 399.9-mc frequency range. The grounded-grid, class C amplifiers are essentially the same in operation as receiver amplifier V1 (paragraph 4-24).

4-202. R-F POWER AMPLIFIER V603. R-F power amplifier V603 provides final power output to the antenna. The stage is biased for class C operation by the voltage drop developed across grid resistor R604. The r-f carrier is applied to the control grid; the audio input is applied to the plate and the screen grid at a +425-volt reference level. This d-c voltage is dropped by voltage divider R605 and R610 in the grid circuit. Because of the variation of tube characteristics between tubes used as the r-f power amplifier V603, resistor R611 and potentiometer R613 have been added to voltage divider network R605 and R610 (figure 4-40). Potentiometer R613 varies the proportional voltage between the plate and grid of V603 and can be used to vary the modulation level of the stage. This modification is effective on r-f power amplifier modules 510 and 511, manufactured under Contract NOw 61-0785 and subsequent modules. Audio signals are applied to the screen by coupling capacitor C622 and to the plate through decoupling coil L608 and tuned circuit impedance Z604. Modulation therefore is attained in the plate circuit wherein the audio is superimposed upon the r-f output of the stage and screen grid modulation is also used. The modulated carrier is applied to the antenna relay assembly through tuned capacitor C615 and 400-mc filter FL605

4-203. ANTENNA RELAY ASSEMBLY. (See figure 4-3.)

4-204. The antenna relay assembly performs separate functions during the transmission and reception. Theory of the unit during transmission is discussed below; refer to paragraph 4-17 for receiving theory.

4-205. During the transmit cycle, the antenna relay assembly is coupled to the output of the power amplifier. In figure 4-3, note that antenna relay K1401 and T/R relay K901 are controlled by the press-to-talk switch on the microphone. Thus, the actuation and release of the antenna relay occurs simultaneously with the T/R relay, which controls the application of plate power to the transmit and receive components of the transceiver.

4-206. The sidetone detector of the antenna relay assembly samples the transmitter output to produce a sidetone audio signal for monitoring carrier modulation. During the transmit cycle, a small portion of the carrier is coupled through capacitor C1401 to sidetone diode CR1401. The crystal diode rectifies the signals, and capacitor C1402 bypasses to ground the r-f carrier component. Coil L1401 maintains the anode of the crystal at d-c ground potential and resistor R1403 loads the diode cathode. Sidetone audio, which is developed across resistor R1403, is applied to the audio amplifier.

4-207. PRIMARY POWER CIRCUITS.

4-208. The primary power circuits consist of all the components that generate and distribute supply voltages. These components and the operations they perform are described in the following paragraphs. A basic difference in primary power circuits of Receiver-Transmitter

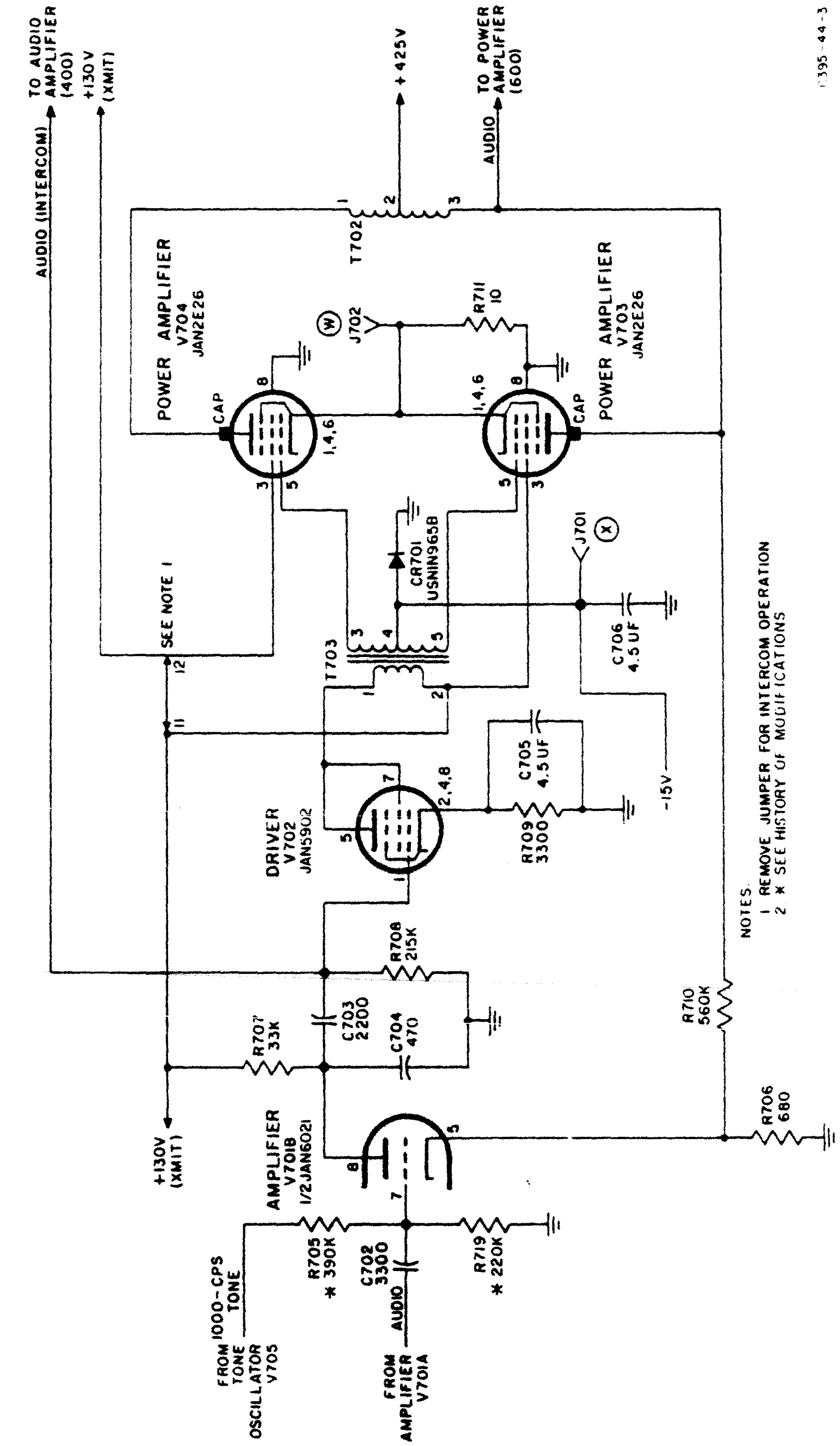


Figure 4-37. Modulator Output Amplifier, Simplified Schematic Diagram

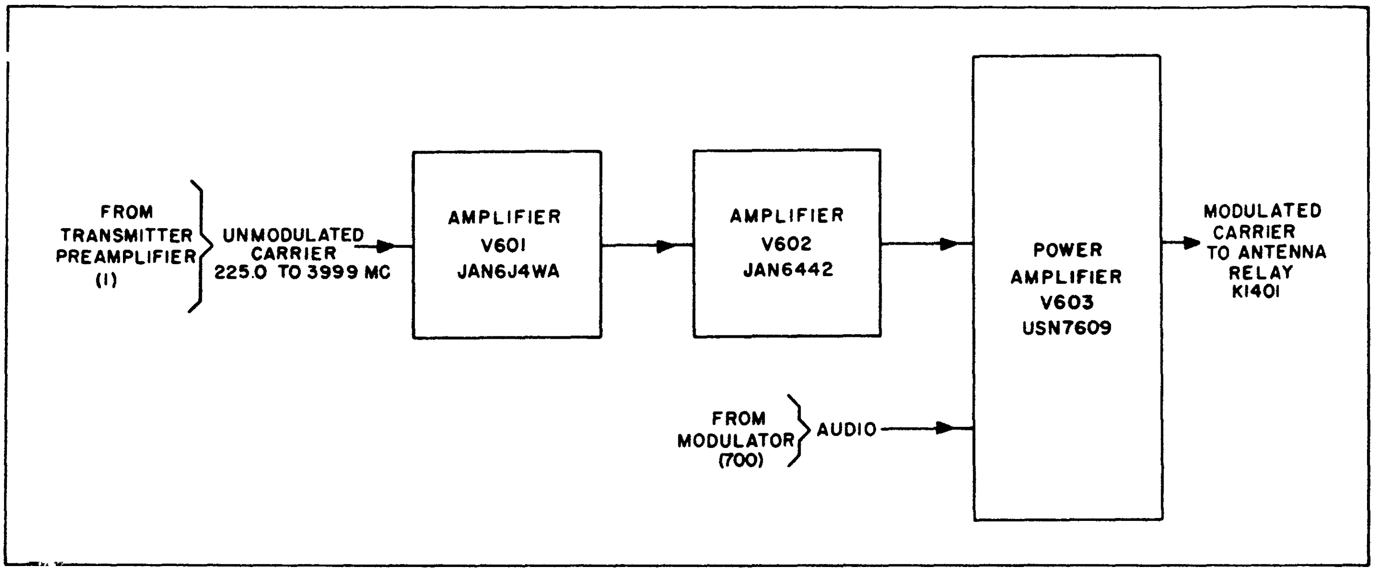


Figure 4-38. Power Amplifier, Block Diagram

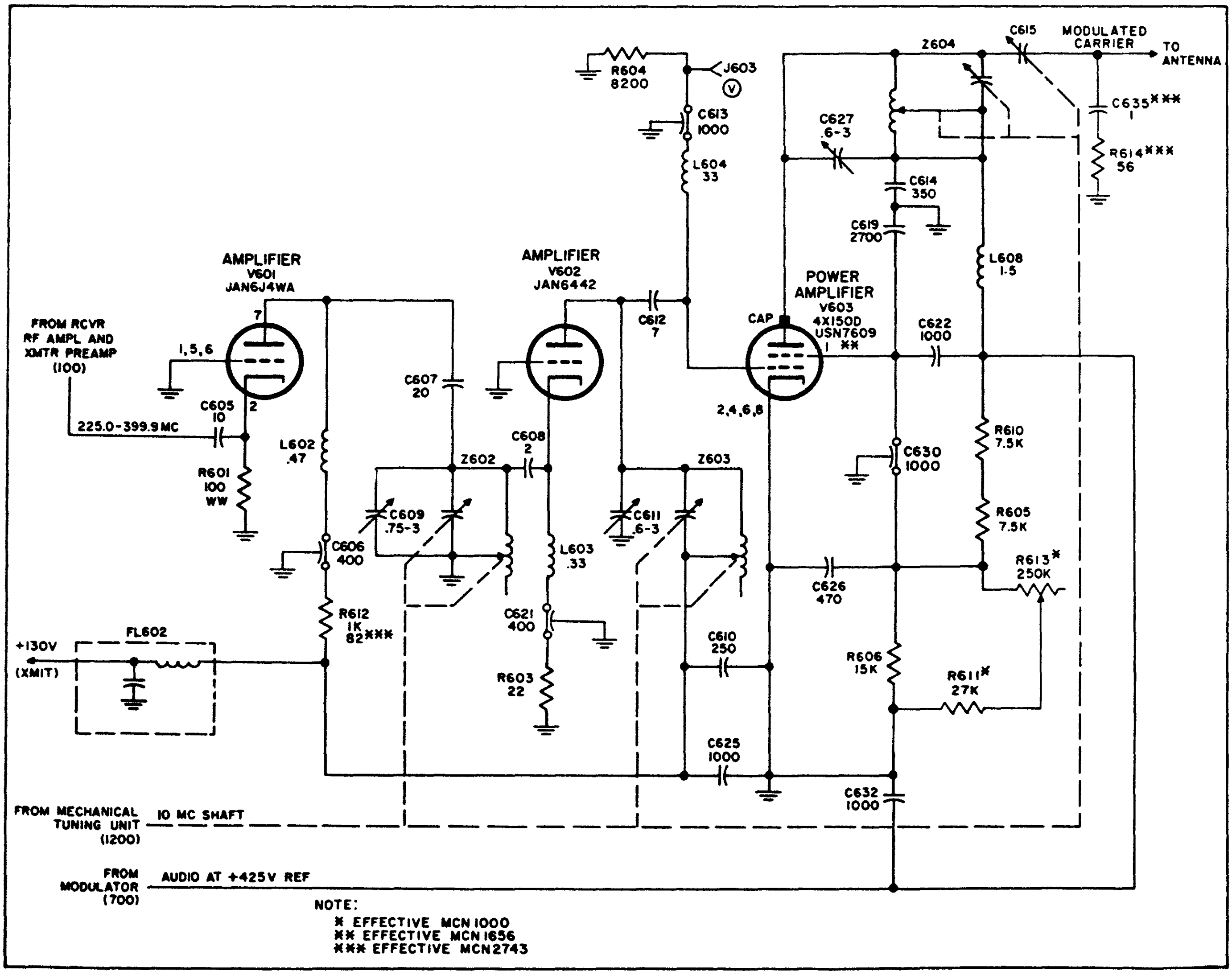


Figure 4-39. Power Amplifier, Simplified Schematic Diagram

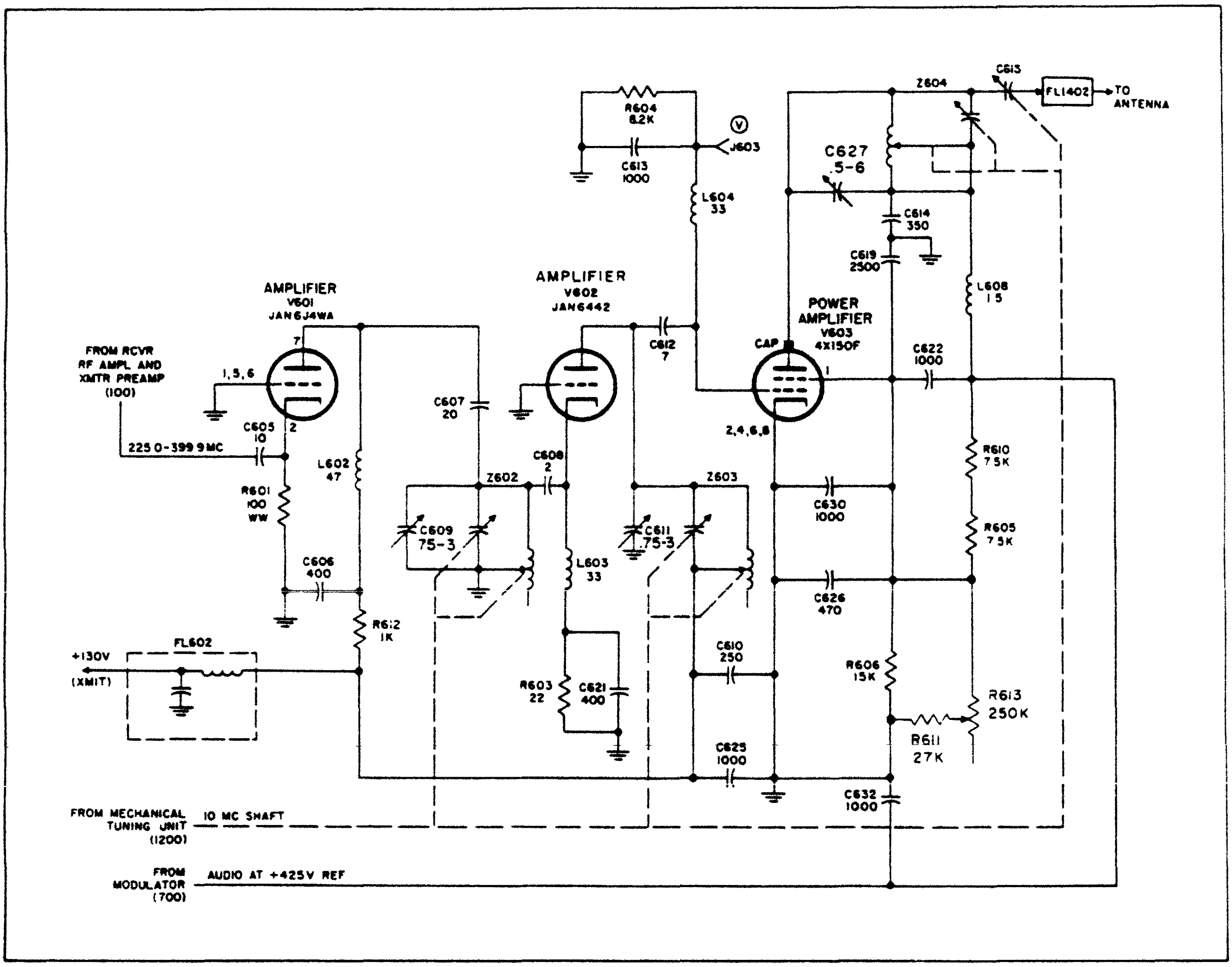


Figure 4-40. R-F Power Amplifier Simplified Schematic Diagram (Effective Contract NOw 61-0785 Module Serial No. 510 and 511)

RT-332/ARC-52 and Receiver-Transmitter RT-424 ARC-52X is: an a-c power unit and a rectifier unit are used in Receiver-Transmitter RT-332/ARC-52, but a dynamotor power supply unit is used in Receiver-Transmitter RT-424/ARC-52X.

4-209. RECEIVER-TRANSMITTER RT-332/ARC-52 PRIMARY POWER CIRCUITS. (See figure 4-41.)

4-210. The primary power circuit components of the RT-332/ARC-52 are the a-c power unit, relay unit, rectifier unit, and the main chassis components.

a. The a-c input is applied to 3-phase silicon rectifier CR1001, and the 130-volt output is developed across resistors R1001 and R1002. The resistors ensure equal voltage distribution across capacitors C1001 and C1002. Choke coil L1001 and capacitors C1001, C1002, and C1003 filter the output.

b. The rectifier unit converts the 3-phase, 115-volt a-c input into d-c outputs of +225 volts, +130 volts, and -15 volts.

c. The relay unit contains the switching circuits that distribute power and signals as required to place the radio set in the desired operating mode or condition.

d. The main chassis of the receiver-transmitter includes components that filter all incoming and outgoing signals, except the radiated signal. It also provides the means to switch from normal sidetone to intercom operation, and contains power decoupling circuits, blower circuits, and a control panel that mounts adjustment controls and test jacks. The antenna relay assembly, which is discussed under paragraphs 4-17 and 4-203, is a component part of the main chassis.

4-211. A-C POWER UNIT. (See figure 4-42.)

4-212. The a-c power unit distributes source power and develops filament voltages of 6.3 volts ac and 26.5 volts ac and a plate (B+) voltage of +425 volts dc. All voltage distribution is interlocked to the +27.5-volt supply through power on-off relay K1101. When function switch S1801 of the radio set control is turned from OFF to an operational position, +27.5 volts is applied across the coil of relay K1101. Actuation of the relay distributes 115 volts ac and +27.5 volts dc to the relay and rectifier units. Within the a-c power unit, 115 volts ac is applied to blower B1101 and to the primaries of transformers T1101 and T1102.

a. Application of source voltage to the blower and blower capacitor C1103 results in cooling air being supplied to the power amplifier for dissipating the heat generated by the USN7609 power amplifier tube.

b. Step-down transformer T1101 provides two filament outputs of 6.3 volts ac at 6.25 amperes and one filament output of 26.5 volts ac at 0.67 milliampere.

c. Autotransformer T1102 and crystal rectifiers CR1101 through CR1109 provide a +425-volt d-c output at 280 milliamperes. The d-c output is filtered by choke coil L1101 and capacitors C1101, C1102, and C901 in the relay unit. Resistor R1101 is a bleeder resistor.

4-213. RECTIFIER UNIT. (See figure 4-43.)

4-214. The rectifier unit converts the 3-phase, 115-volt, a-c input into d-c outputs of +130 volts, +225 volts, and -15 volts.

a. The a-c input is applied to 3-phase silicon rectifier CR1001, and the 130-volt output is developed across resistors R1001 and R1002. The resistors ensure equal voltage distribution across capacitors C1001 and C1002. Choke coil L1001 and capacitors C1001, C1002, and C1003 filter the output.

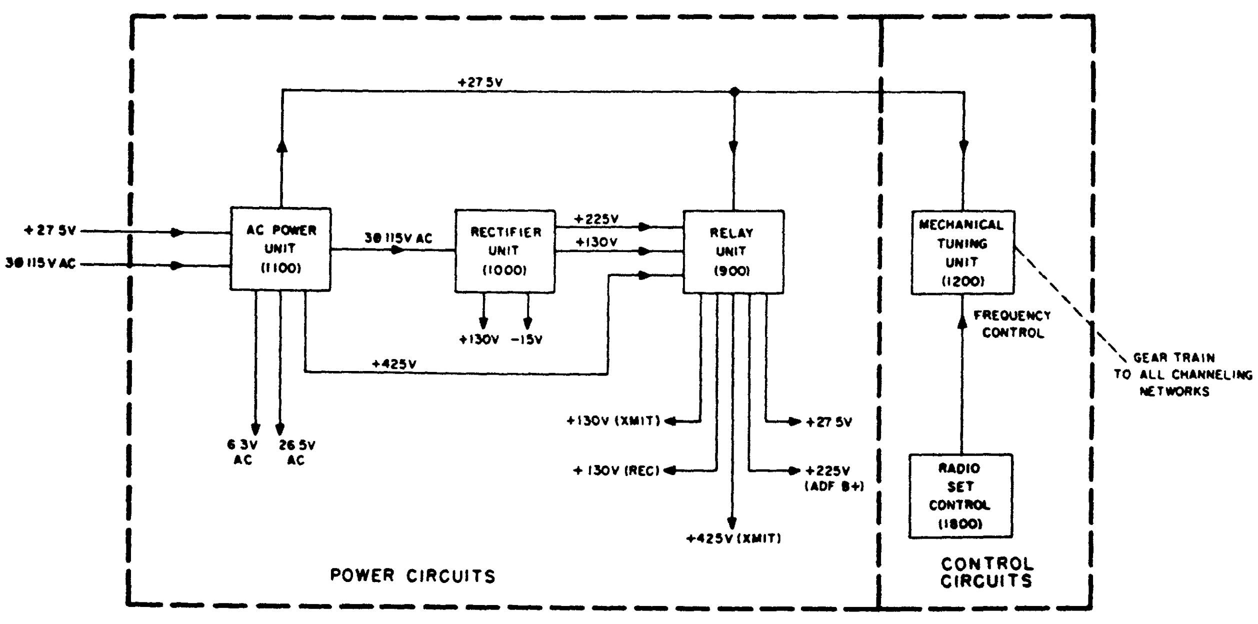


Figure 4-41. Receiver-Transmitter RT-332 ARC-52 Power and Control Circuits, Block Diagram

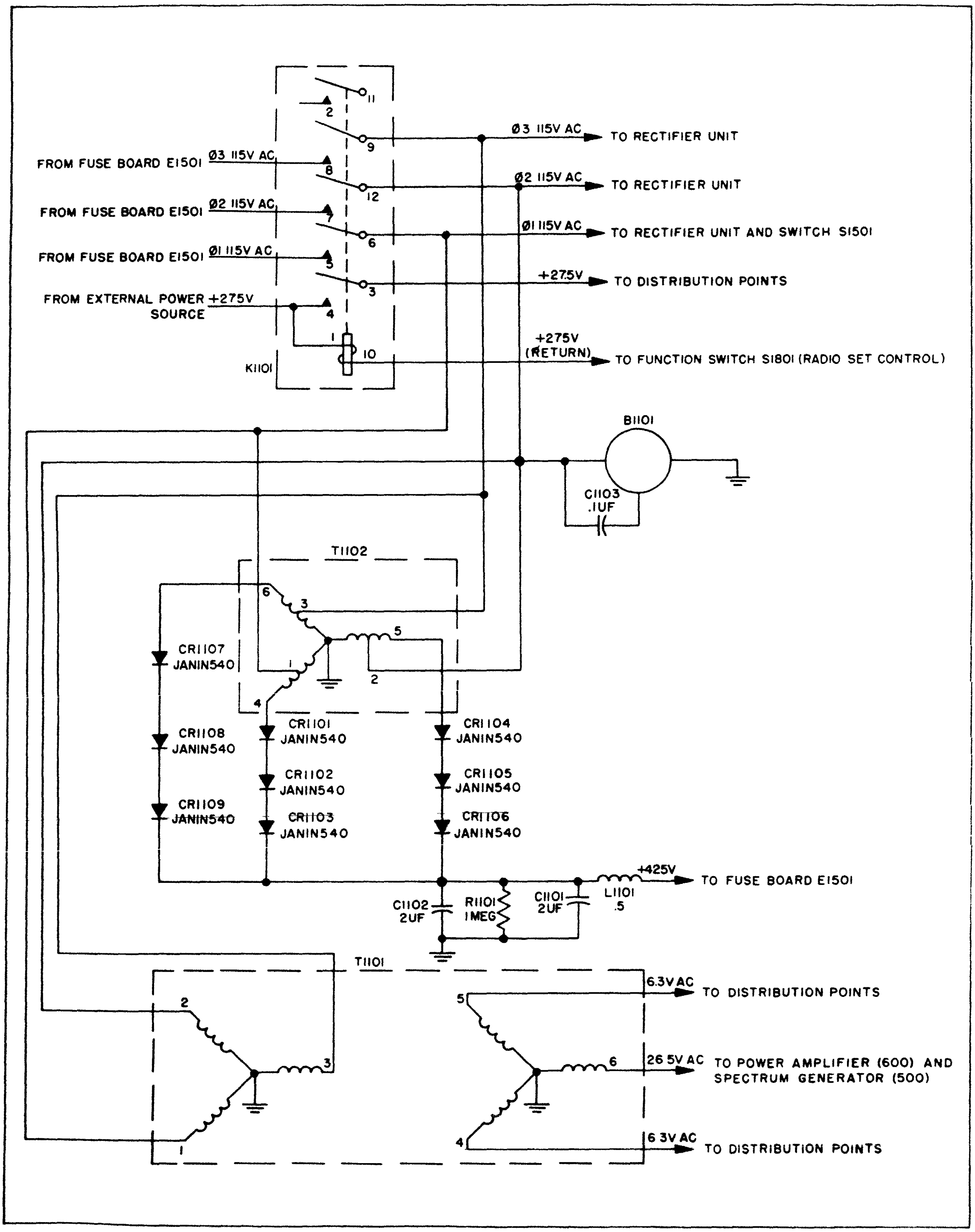


Figure 4-42. A-C Power Unit, Simplified Schematic Diagram

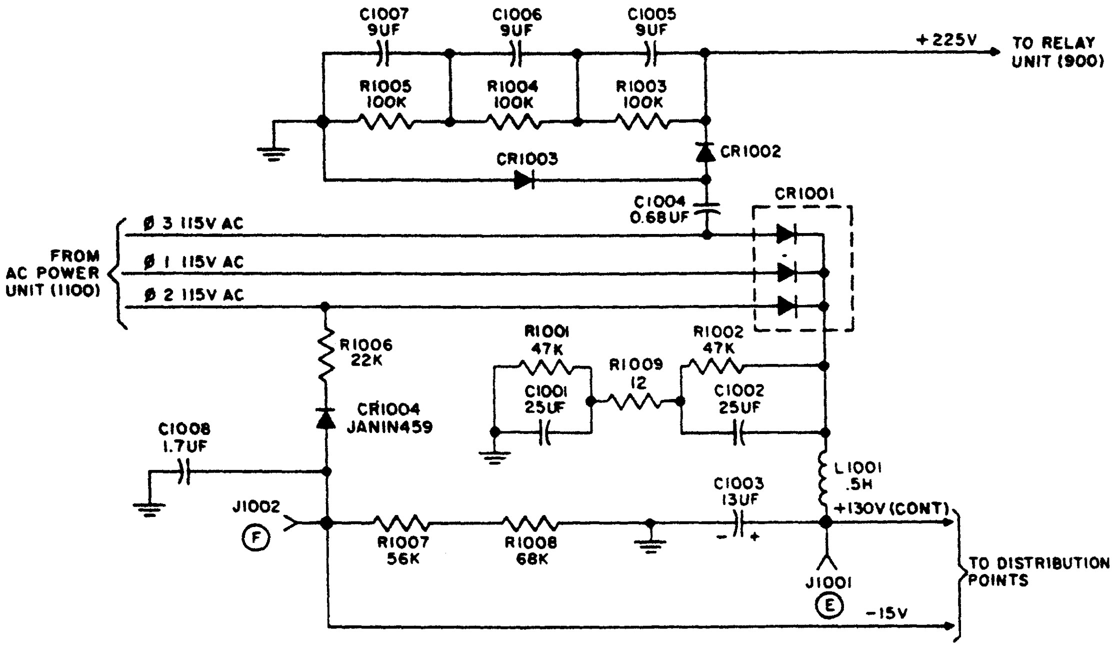


Figure 4-43. Rectifier Unit, Simplified Schematic Diagram

b. One phase of the a-c input is coupled through capacitor C1004 to the +225-volt, half-wave, cascade-type double circuit. The rectified output taken from capacitor C1005 is approximately twice the peak a-c input voltage at capacitor C1004. Voltage equalizing resistors R1003, R1004, and R1005 ensure equal voltage distribution across capacitors C1005, C1006 and C1007. Refer to the discussion of guard receiver audio detectors CR801 and CR802 (paragraph 4-126) for the theory of a voltage doubler circuit.

c. One phase of the a-c input is applied through resistor R1006 to crystal rectifier CR1004. With no external bias load on the rectifier module, the voltage at test point (F) is approximately -45 volts. The normal bias loads in the 1.85-mc i-f amplifier and the guard receiver reduce this voltage to approximately -20 volts. Zener diode CR701 in the modulator regulates this voltage to -15 volts.

4-215. RECEIVER-TRANSMITTER RT-424/ARC-52X POWER CIRCUITS. (See figure 4-44.)

4-216. The power circuit components of the RT-424/ARC-52X are the dynamotor power supply unit, relay unit, and main chassis components.

4-217. DYNAMOTOR POWER SUPPLY UNIT. (See figures 4-45 and 4-46.) The dynamotor power supply unit distributes source power of 27.5 volts dc controlled by relay K1101. Filament power at 25.2 volts is developed by voltage drop across resistor R1101. Two generator sections in dynamotor develop 130 and 425 volts output. Regulated 225 volts is developed from the 425-volt output by the action of glow-discharge tube V1102 and resistor R1108 (figure 4-45) or R1102 (figure 4-46). Choke L1101 and capacitor C1102 form a low pass filter to remove any noise components

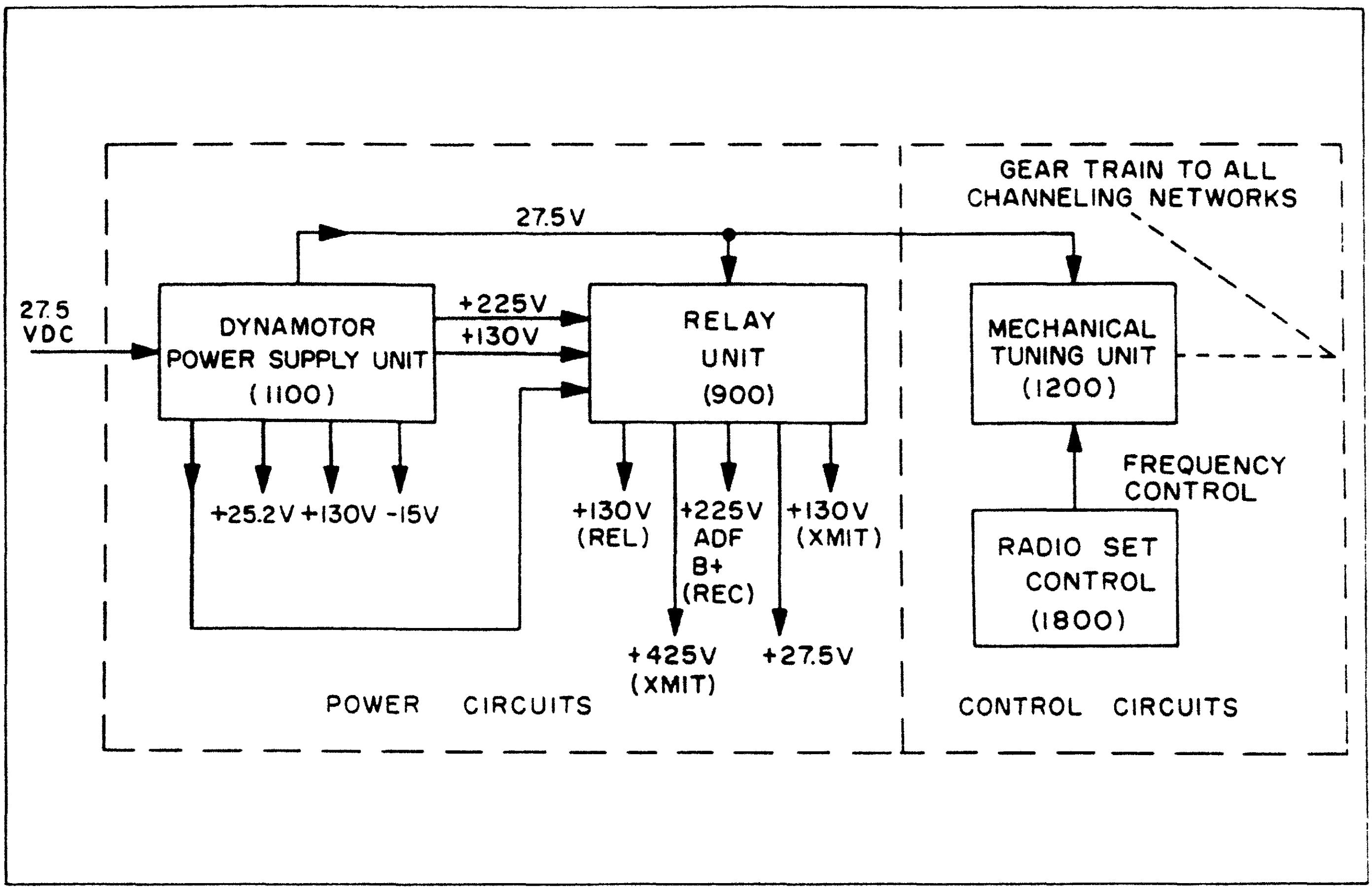


Figure 4-44. Receiver-Transmitter RT-424/ARC-52X Power and Control Circuits, Block Diagram

from the 27.5-volt input line. Capacitor C1105 filters commutator ripple components from the 425-volt line. Choke L1102 and capacitor C1101 form a low pass filter to remove commutator ripple components from the 130-volt line, monitored at test point TP1101 (Ⓔ).

4-218. Bias at -15 volts is developed from the +130-volt line by a series-fed Hartley oscillator circuit containing tube V1101. The +130 volts is reduced by resistor R1103 and applied through center-tapped inductor L1103 to the plate of tube V1101. Bypass capacitor C1102 (figure 4-45) or C1107 (figure 4-46) establishes the center tap of inductor L1103 at a-c ground potential. This inductor and capacitor C1103 form the oscillator tank circuit. D-c blocking capacitor C1104 couples feedback voltage from the tank circuit through parasitic suppression resistor R1107 (figure 4-45) or R1102 (figure 4-46) to the control grid of tube V1101. Resistor R1104 is a grid leak. Operating bias for tube V1101 is developed across cathode resistor R1105. The a-c output voltage from the oscillator circuit is coupled by capacitor C1108 to half-wave rectifier diode CR1101. The rectified output is filtered by a single section, choke input filter formed by choke L1104 and capacitor C1106. Resistors R1106 and R1107 are bleeder resistors. The output from the filter, monitored at test point TP1102 (Ⓕ), is -15 volts d-c used for bias voltage.

4-219. RELAY UNIT. (See figure 4-47.)

4-220. GENERAL. The relay unit controls application of plate voltages to the transmit and receive components of the transceiver, disables all transmit circuits during rechanneling, energizes the guard receiver, and energizes the tone oscillator of the modulator. Each of these switching cycles is controlled by a separate switch available to the radio set operator. Each switch completes the +27.5-volt path to ground through the coil of each relay.

NOTE

As illustrated in figure 4-47, all relays are shown in the de-energized (released) condition.

4-221. TRANSMIT/RECEIVE FUNCTION. The transmit/receive function is controlled by the press-to-talk switch of the microphone. When the switch is

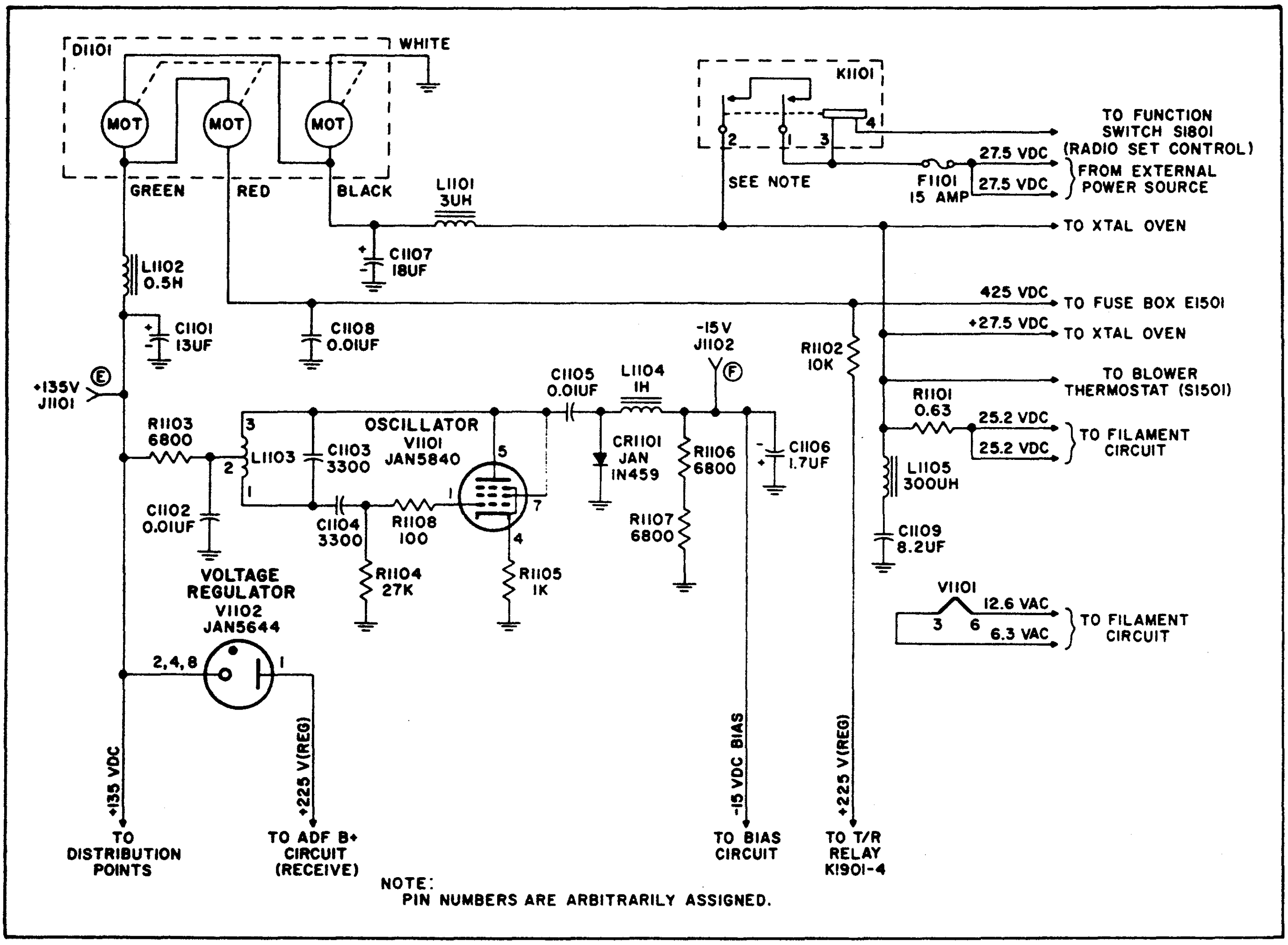


Figure 4-45. Dynamotor Power Supply Unit, Simplified Schematic Diagram

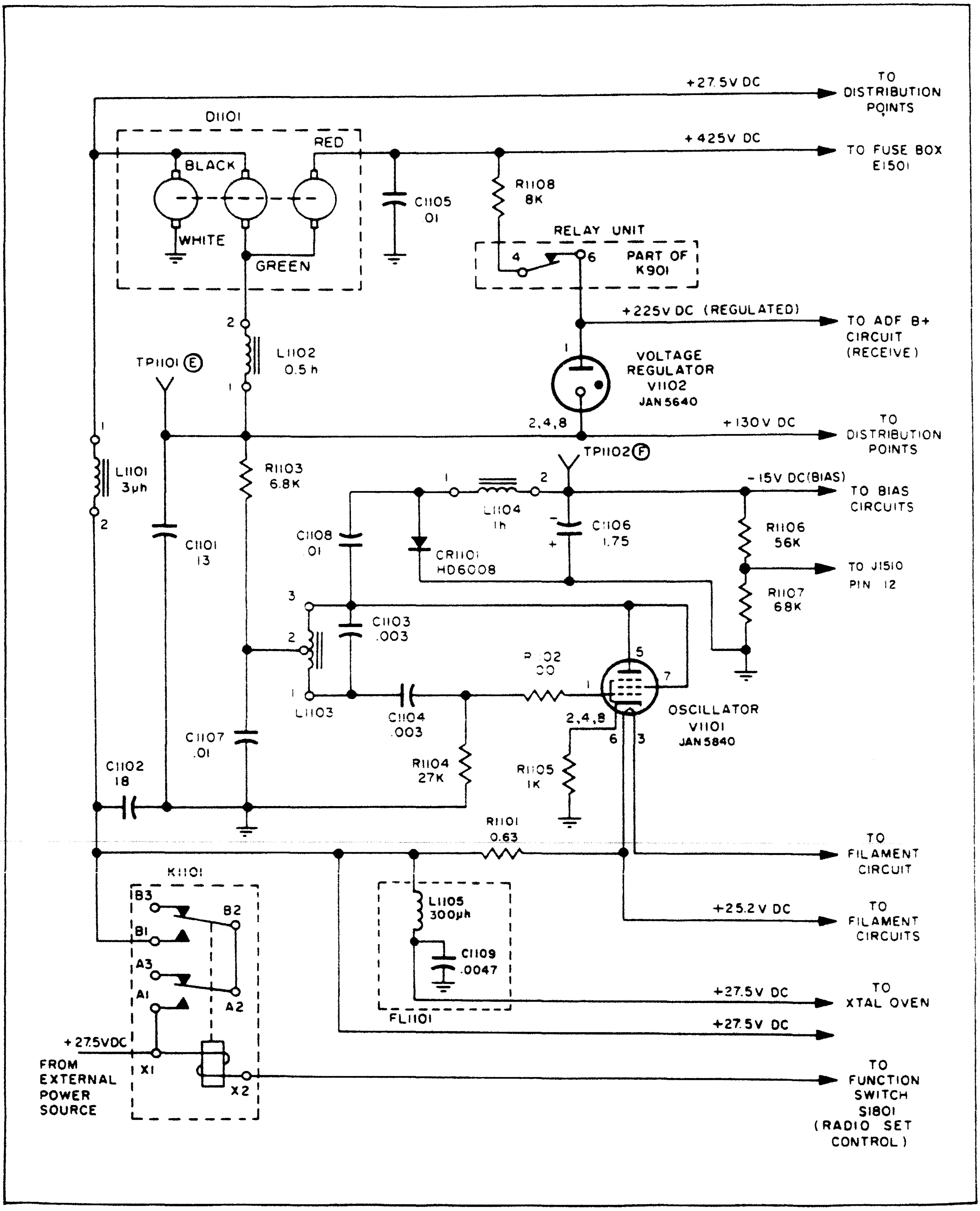


Figure 4-46. Dynamotor Power Supply Unit, Simplified Schematic Diagram (Effective Contracts NOw 60-0089A and NOw 61-0785 Only)

actuated, T/R relay K901 is energized (transmit). When the press-to-talk switch is released. the relay releases (receive).

a. When the T/R relay is de-energized, the continuous +130-volt supply is fed to receiver distribution points through K901 contacts 8 and 9. In this condition, +130 volts also is available at contact 6 of guard relay K903.

b. When the T/R relay is energized, the continuous +130-volt supply is switched from receiver distribution points to transmitter distribution points through K901 contacts 8 and 7. In this condition, -130 volts is removed from contact 6 of guard relay K903. In addition, +425 volts (B+) is applied to the modulator through K901 contacts 2 and 3 and also is developed across parallel voltage divider resistors R902 and R901. Approximately +72 volts is tapped from the R901 - R902 junction and is applied as a squelch voltage to the audio amplifier. This squelch delay voltage provides a means of holding audio relay K401 in the no-signal condition for a brief interval after the microphone press-to-talk switch is released, so that relay and circuit noise pulses resulting from the transition to receive will not actuate relay K401. This delay is accomplished by applying a bias to squelch amplifier V402A from capacitor C902, which is precharged from a transmit B+ voltage. This voltage is derived from a divider network of resistors R901 and R902 and decays through divider resistor R901 in parallel with squelch amplifier cathode resistor R411.

NOTE

The coils of antenna relay K1401 and the 20- to 30-mc i-f amplifier relays K201 and K202 are connected across the T/R relay coil and are controlled simultaneously by the microphone press-to-talk switch. Thus, as power is switched from receive to transmit and back, signal flow and supply voltage are correspondingly switched to the appropriate circuits.

4-222. DISABLE FUNCTION. The disable function is controlled by autopositioning relays K1201, K1202, and K1203 in the mechanical tuning unit. When the transceiver is rechanneled, one or more of these relays are actuated, which ground (energizes) the coil of disable relay K902 (disable). At all other times, disable relay K902 is released (normal)

a. When the disable relay is de-energized, +27.5 volts is applied to the coils of relays K901, K903, and K904 through contacts 3 and 2 of disable relay K902.

b. When disable relay K902 is energized, main audio is grounded through its contacts 6 and 5, and the +27.5-volt line is switched from the coils of relays K901, K903, and K904 to the squelch delay circuit of the audio amplifier through K902 contacts 3 and 4. When the disable relay is energized, +27.5 volts is applied across capacitor C902, thereby charging the capacitor and providing a squelch delay voltage for purposes identical to those described in paragraph 4-221.

NOTE

When the disable relay is energized, relays K901, K903, and K904 are de-energized regardless of the setting of the microphone press-to-talk switch, function switch, or tone switch.

4-223. GUARD OPERATION. Guard operation is controlled by the function switch on the radio set control. When the switch is set to T/R+G, the coil of guard relay K903 is grounded through the switch; and the guard receiver is energized. At any other function switch position, the guard relay is released (guard receiver disabled).

a. When K903 is de-energized, the guard receiver is de-energized and inoperative; no other operational circuit is affected.

b. When K903 is energized, +130-volt plate supply is applied to the guard receiver through contacts 8 and 9 of relay K901 and contacts 6 and 5 of relay K903.

NOTE

No plate voltage is applied to the guard receiver, regardless of the condition of relay K903, unless T/R relay K901 is in the receive (de-energized) condition.

4-224. TONE FUNCTION. The tone function is controlled by the tone switch located on the pilot's instrument panel. When the switch is set to the on position, tone relay K904 is energized, which places the radio set in the transmit condition and actuates the modulator tone oscillator. When the switch is set at the off position, the tone relay is released; and the radio set reverts to the receive condition.

a. When K904 is de-energized, the tone oscillator is disabled and no other operational circuits are affected.

b. When K904 is energized, the coil of T/R relay K901 is grounded (energized) through K904 contacts 3 and 4, thus placing the radio set in the transmit condition. This action occurs regardless of the position of the microphone press-to-talk switch. Also, -130-volt plate voltage is applied through T/R relay K901 contacts 8 and 7 and tone relay K904 contacts 6 and 5 to the tone oscillator within the modulator.

4-225. MAIN CHASSIS COMPONENTS. (See figures 7-1, 7-2, and 7-3.)

4-226. Filter components, fuses, blowers, and control circuits that are distributed through the main chassis are extensions of the modules to which they apply.

4-227. The functions of the main chassis circuit components are:

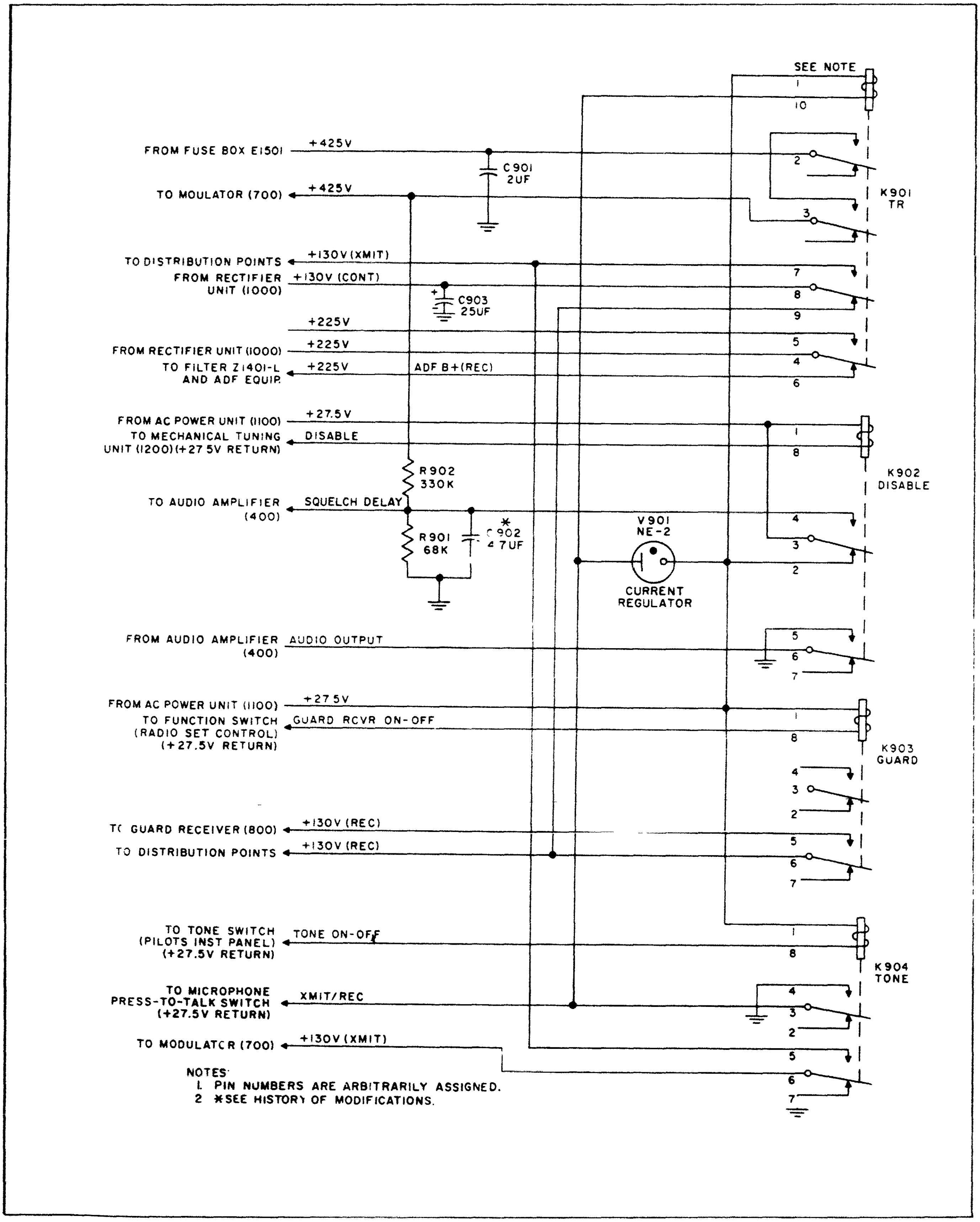


Figure 4-47. Relay Unit, Simplified Schematic Diagram

a. Fuses F1501 through F1503 provide overload protection for the 115-volt, a-c power input circuits of the RT-332/ARC-52.

b. Fuse F1504 provides overload protection for the +425-volt transmitter circuits.

c. Resistors R1501 and R1502 are filament balancing resistors for use in the d-c version of the radio set. Capacitors C1501 through C1511 and coils L1502 through L1507 filter a-c pickup on the d-c power circuits.

d. Filter Z1401 filters all r-f inputs and outputs of the receiver-transmitter.

e. Output filter FL605 was added between the output of the power amplifier and the antenna of Radio Sets AN/ARC-52 and AN/ARC-52X manufactured under Contracts NOw 60-0089-A and NOw 61-0785. Filter FL605 was changed to FL1402 on all contracts following NOw 61-0785. This filter prevents harmonics of the generated signal from being transmitted.

f. The control panel (right-hand gusset plate) provides local monitoring facilities for receiver-transmitter testing.

4-228. Dual blower motor B1401 forces air between the walls of the pressurized case and around the outside of the case. The air is expelled through vents in the top of the case. The motor operates on a 115-volt, single-phase, 400-cps input and draws approximately 0.13 amperes. Axial blower B1501 circulates air within the pressurized case. The motor operates on a 115-volt, single-phase, 400-cps input and draws approximately 0.112 amperes.

NOTE

On Radio Set AN/ARC-52X, axial blower B1501 has been eliminated; and the blower contained in the dynamotor power supply is utilized to circulate air within the pressurized case. Also, dual blower motor B1401 operates on 27.5-volt d-c primary power supply, drawing approximately 0.54 amperes.

4-229. CONTROL SYSTEM.

4-230. The control system permits remote selection of the frequency channel and selection of the operational mode of the equipment. Frequency channel selection is a function of selector circuits in the radio set control operating with the mechanical tuning unit and the main chassis gear train. These channel selection systems are discussed in paragraph 4-238. The operational mode control components of the radio set control are discussed under paragraph 4-231.

4-231. OPERATIONAL CONTROL CIRCUITS. (See figure 4-48.)

4-232. The operational control circuits vary the level of the audio output signal, provide panel illumination, and select the following operational modes: transmit/receive (T/R), transmit/receive with guard monitoring (T/R+G), and automatic direction-finding (ADF).

a. VOL control attenuator network R1801, R1802, and R1803 provides a means of adjusting the audio level fed to the pilot's headset, and maintains a constant load impedance to the receiver audio output circuits.

b. Illumination of the radio set control panel is provided by lamps I1801 and I1802, both of which are remotely controlled from the pilot's instrument panel.

c. T/R operation is selected by rotating function switch S1801 to T/R, one position clockwise from OFF. At this position, the coil of power unit relay K1101 (figure 4-42 or 4-46) is grounded (energized) through contacts 5 and 4 of switch S1801 and operating power is distributed throughout the radio set. For T/R+G operation, the function switch is rotated to T/R+G, two positions clockwise from OFF. A ground return path for -27.5-volt supply is provided through guard relay K903 in the relay unit (paragraph 4-223) and switch S1801, contacts 2 and 10. For ADF operation, the function switch is rotated to ADF, three positions clockwise from OFF. A ground path is thus provided through switch S1801, contacts 3 and 10, to the AM-608/ARA-25 equipment.

4-233. Radio set Control C-2791/ARC provides an additional position of the function switch marked REL (see figure 1-7). All other operating and adjustment controls are identical in operation and appearance to those given in table VI for Radio Set Control C-1607/ARC-52.

4-234. AUTOMATIC RELAY OPERATIONAL THEORY.

4-235. When the function selector switch on Radio Set Control C-2791/ARC is set to the REL position, two radio receiver-transmitters are operated in conjunction to provide automatic relay operation. In this type of operation, the two receiver-transmitters are connected so that reception of a signal on the frequency to which either receiver-transmitter is tuned will result in retransmission of the signal on the frequency to which the other receiver-transmitter is tuned. Automatic relay operation makes possible several tactical advantages. By using an aircraft equipped for automatic relay operation and cruising at moderate altitudes between any uhf transmitter and receiver, the line of sight distance, which ordinarily limits the range of uhf equipment, can be increased considerably. Any signal transmitted from a uhf equipment can be received by another uhf equipment that is not within line-of-sight operation when the signal is automatically relayed by an aircraft within line of sight of both equipments. Several such relay links may be possible; but, in each case, retransmission must always be on a frequency other than that received.

4-236. A simplified schematic diagram of the automatic relay installation is shown in figure 4-49. Automatic relay operation requires that the audio amplifier modules of the two radio receiver-transmitters be adjusted for the carrier-squelch mode of operation

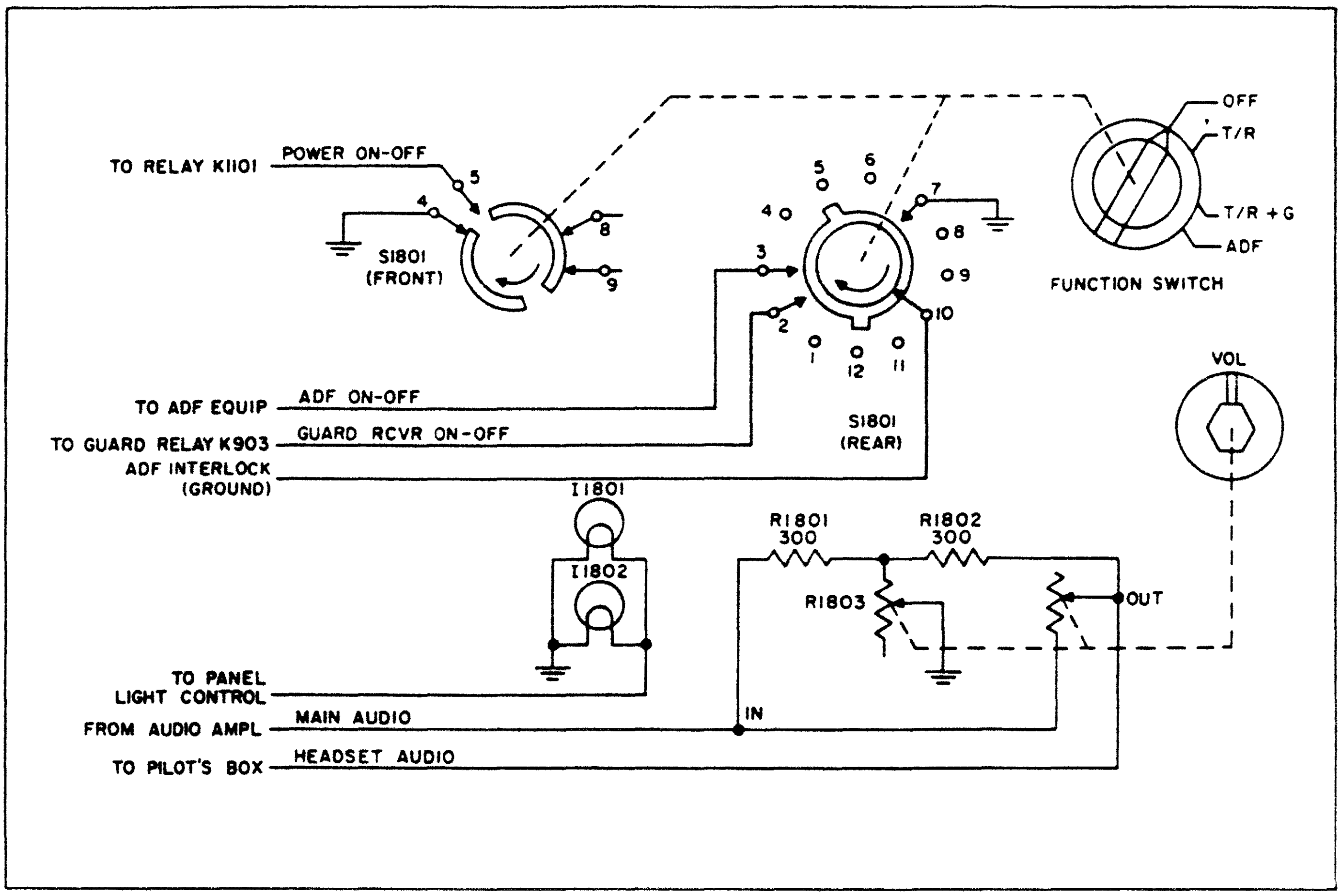


Figure 4-48. Operational Control Circuits, Simplified Schematic Diagram

and that each of these receiver-transmitters be tuned to a different frequency. Frequency selection of one radio receiver-transmitter is provided by Radio Set Control C-2791/ARC, while frequency selection of the second radio receiver transmitter is provided by Radio Set Control C-1607/ARC-52. When function selector switch S2102 is in the REL (automatic relay) position, relays K2101, K2103, and K2104 are energized by 27.5 volts. This voltage is applied to the relay coils from pin m of plug P2101 on Radio Set Control C-2791/ARC. The relay coil circuit is completed through closed contacts of relay K2102, switch S2102, and pin L of plug P2101 to ground. Closed contacts of energized relays K2101 and K2104 connect the audio output of a transceiver to the modulator input of the other transceiver. Closed relay K2103 contacts connect the 1st audio amplifier biasing circuit (in the audio amplifier module) of a transceiver to transmit/receive relay K901 of the other transceiver. Figure 4-49 shows radio receiver-transmitter No. 1 receiving a transmitted signal. The audio amplifier module is adjusted for carrier squelch and is receiving a demodulated carrier signal. Therefore, squelch relay puller V403A is conducting, and squelch relay K401 is energized. Closed contacts of K401 place a ground on cathode resistor R420 to change the bias of 1st audio amplifier V403B. This same ground is connected through pin F of plug P1401 on radio receiver-transmitter No. 1, through pin y of plug P2101 on Radio Set Control C-2791/ARC, through closed contacts of relay K2103, through pin J of plug P2101, and through pin E of plug P1401 to transmit receive relay K901 on radio receiver-transmitter No. 2. This transmit receive relay K901 is energized, and receiver-transmitter No. 2 is placed in the transmit condition. When receiver-transmitter No. 2 is in transmit condition, the cathode of squelch relay puller V403A is biased off; and squelch relay K401 in receiver-transmitter No. 2 is not energized. The audio output is applied through pin J of plug P1401 on receiver-transmitter No. 1, through pin E of plug P2101 on Radio Set Control C-2791/ARC, through the closed contacts of energized relays K2101 and K2104, through pin v of plug P2101, and through pin R of plug P1401 to the modulator input of receiver-transmitter No. 2 for retransmission on the frequency of receiver-transmitter No. 2. Audio output to the modulator of radio receiver-transmitter No. 1 through pin j of plug P2101 and pin R of plug P1401 has no effect since receiver-transmitter No. 1 is in the receive condition. The automatic relay signal may be monitored at the pilot's headset through pin F of plug P2101 on Radio Set Control C-2791/ARC. The volume (VOL) control adjusts the amplitude of the audio signals delivered to the headset.

4-237. When radio receiver-transmitter No. 2 is receiving on its frequency, receiver-transmitter No. 1 will be transmitting on its frequency during automatic relay operation. This operation, when radio receiver

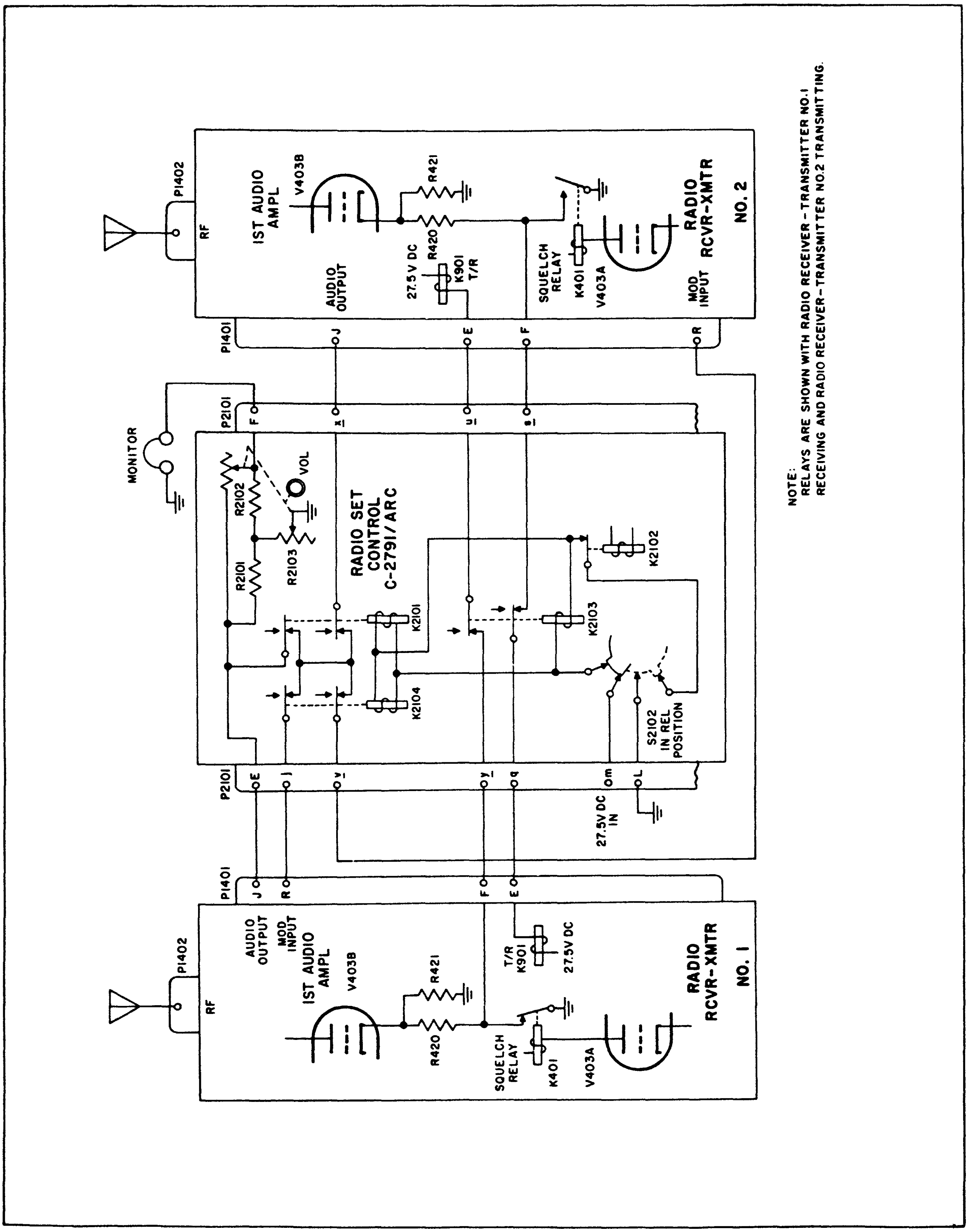


Figure 4-49. Automatic Relay Installation, Simplified Schematic Diagram

transmitter No. 2 is receiving, is essentially the same as described in paragraph 4-236 except that audio signal flow is reversed and squelch relay K401 in transceiver No. 2 switches transceiver No. 1 into the transmit condition. Whichever transceiver first receives a signal will switch the other transceiver into the transmit condition.

4-238. CHANNEL SELECTION SYSTEM.

4-239. GENERAL. The channel selection system provides for automatically selecting any one of 18 preset frequencies for transmitting and receiving; the system also provides for manual selection of any one of 1750 frequency channels within the 225.0-mc to 399.9-mc operating band of the radio set. Both automatic and manual channel selections are accomplished by tuning the tank circuits of the following modules for reception or transmission of the selected frequency: receiver r-f amplifier and transmitter preamplifier, power amplifier, 20- to 30-mc i-f amplifier, oscillator, and spectrum generator and amplifier.

NOTE

When applied to channel selection, the terms "automatic" and "manual" are used to differentiate between the selection of one of 18 preset channels by rotating the CHAN selector switch and the selection of one of 1750 frequency channels by individual setting of the MANUAL frequency controls. In either case, the actual mechanical and electrical tuning operations within the radio set are fully automatic.

a. The radio set control provides switches that control selection of a given operating frequency by completing appropriate drive circuits in the mechanical tuning unit.

b. In response to signals set up by switches on the radio set control, the mechanical tuning unit mechanically tunes the receiver-transmitter tank circuits to settings that correspond to the selected frequency.

c. The gear train drive provides the mechanical tuning linkage within the mechanical tuning unit and between the mechanical tuning unit and the adjustable tank circuits of the modules.

4-240. THEORY OF SIMPLIFIED SYSTEM.

4-241. Selection of any frequency is initiated at the radio set control, at which point the operator rotates the decade selectors until the desired frequency is indicated. By rotating a particular decade selector, the switch circuit that corresponds to the new frequency setting is grounded. By grounding the switch circuit, the positioning system of the mechanical tuning unit is energized and produces a synchronized rotation of the gear train in the prescribed direction for a predetermined amount. The motion imparted to the gear train automatically adjusts the module tank circuits for operation of the radio set on a selected frequency.

4-242. A simplified automatic positioning system is illustrated in figure 4-50. The selector switch (decade selector) chooses the operating frequency and the seeking switch determines the angular position to which the drive-motor rotates for a specific selected frequency.

4-243. As shown, the equipment is at rest with the selector switch and the seeking switch at position 1.

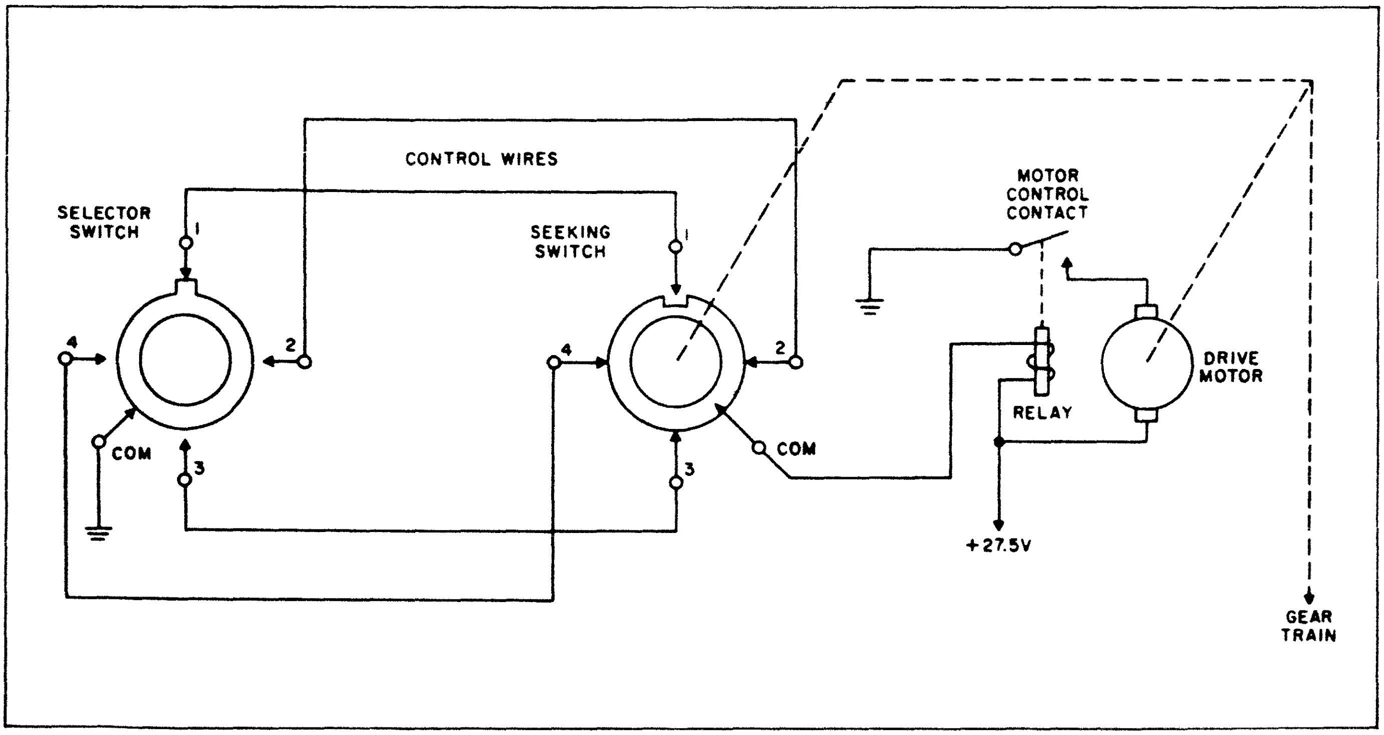


Figure 4-50. Simplified Automatic Positioning System, Schematic Diagram

When the switches are at corresponding positions (symmetrical), no contact of the seeking switch is grounded through the selector switch: the electrical circuit of the drive motor is broken by the open motor control contacts of the de-energized relay.

NOTE

The drive motor, which has driven the seeking switch to rest at position 1, has driven the module tank circuits to the selected frequency in the same angular rotation.

4-244. Assume the selector switch is rotated so that the tab of the selector switch contacts the terminal at position 2 (figure 4-50). A closed path to ground then is completed from the +27.5-volt supply through the relay coil, the common contact and contact 2 of the seeking switch, and the common contact and contact 2 of the selector switch. The relay is energized and closes the motor control contacts: the drive motor then rotates in the predetermined direction. The seeking switch, which is geared to the drive motor, is driven until the cutout of the seeking switch is adjacent to position 2. At this position, the +27.5-volt path is opened, the relay releases, the motor stops, and the system comes to rest. Since the seeking switch and the tank circuits are gear-driven by the motor, the tank circuits are driven through the required angular displacement, which is proportional to the seeking switch travel from position 1 to position 2.

4-245. The system illustrated in figure 4-51 is functionally the same as the one described above. However, this system uses a switch arrangement that permits fewer control wires than actual switch positions. This system also includes a notched stop wheel and pawl that accurately position the seeking switch as soon as the drive motor is de-energized, and a clutch that decouples the switches from the drive motor and gear train when the final position is reached and the pawl engages the stop wheel. As illustrated in figure 4-58 the clutch permits a single motor to drive several seeking switch shafts. As shown in figure 4-51, the system is at rest with the relay motor contacts open, the drive motor de-energized, and the pawl engaged in a stop-wheel notch.

4-246. Assume the selector switch is rotated so that the circuit having increments of the selected frequency is grounded. A complete path to ground is provided from the +27.5-volt supply through the relay coil, the seeking switch, the applicable control wire, and the selector switch. The actuated relay withdraws the

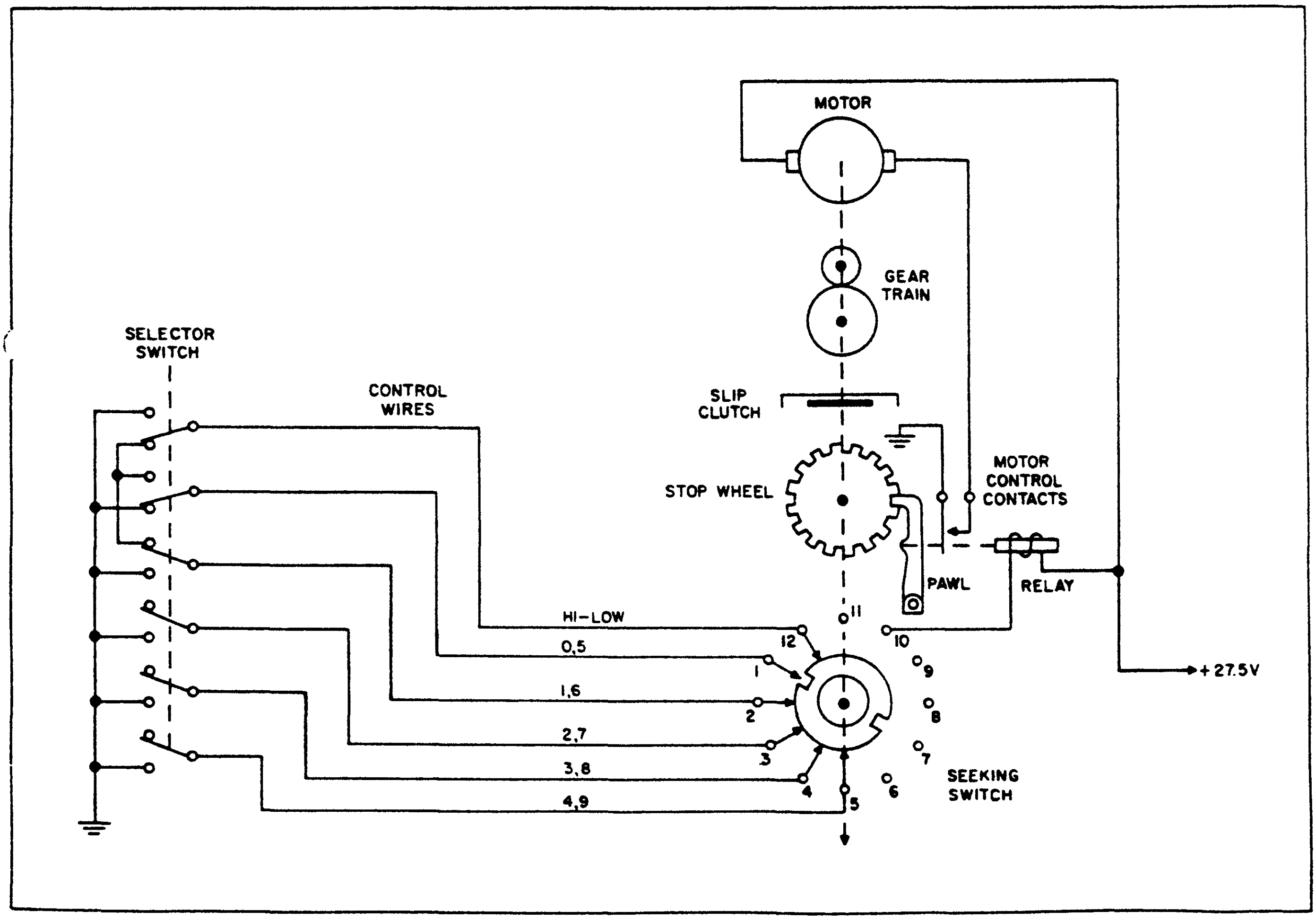


Figure 4-51. Single Automatic Positioning System, Schematic Diagram

pawl from the notch along the periphery of the stop wheel and energizes the drive motor through the closed motor control contacts of the relay.

4-247. The subsequent rotation of the drive motor, which is always in the same direction, drives the gear train, clutch, stop wheel, and seeking switch. The motor rotation is continuous until the motor (and tuning gear train) has rotated through the required tuning angle. At this point, the corresponding contact of the seeking switch is open, breaking the path to ground from the +27.5-volt supply. The relay releases, permitting the pawl to engage a stop-wheel notch at which time the motor control contacts open. The subsequent loss of stop-wheel motion brakes the seeking switch and shaft. The kinetic energy of the drive motor that persists after the removal of the drive-motor source power is dissipated in the gear train and clutch. At rest, the seeking switch and shaft are in a position synchronous with the position of the selector switch.

NOTE

In actual practice, to ensure proper positioning of the stop wheel, the seeking switch opens the relay circuit shortly before the stop wheel reaches the notch to be engaged by the pawl. The relay motor control contacts are operated mechanically by the pawl arm so the contacts remain closed until the pawl drops into the prescribed notch.

4-248. THEORY OF COMPLETE CHANNEL SELECTION SYSTEM.

2-249. GENERAL. The channel selector circuits of the AN/ARC-52 are similar to the single selector-seeking system shown in figure 4-51. The actual system, however, employs three selector-seeking switch groups, which are driven by a single motor (figures 4-52 and 7-22). Each of the three groups has individual switch connections, relay, pawl, stop wheel, and relay motor contacts. The seeking switches are driven by the motor through three separate friction-type slip clutches, one of which is attached to each of the three primary shafts (figures 4-52 and 4-53). When a pawl is not engaged in a stop-wheel notch, the tension in the clutch spring is sufficient to allow the motor to turn the seeking switch shaft. When the stop wheel is held by the pawl, the motor side of the clutch can rotate while the seeking switch side of the clutch remains motionless. Several seeking-switch shafts thus may be independently positioned by a single drive motor and gear system. The channel selector system is, essentially, a three-section decade system that allows two alternative methods of inserting a different frequency setting: automatic and manual. In automatic, any one of 18 preset channels may be selected by the CHAN selector switch (S1807, figure 7-23). In manual, any one of 1750 channels may be selected by means of four separate decade selectors. Each of these selectors must be set up individually for the frequency increment within its range. The two methods may both be subdivided into four parts consisting of the 200- to 300-mc selector and the 10-mc, 1.0-mc, and 0.1-mc decade selectors.

NOTE

The terms automatic and manual as used in this discussion refer to the method of inserting the desired frequency at the selector switches. This action may be performed automatically by rotation of the CHAN switch in conjunction with preset switches S1802A through S1802X (figure 7-23), or manually by separate rotation of the four decade selector switches S1803, S1804, S1805, and S1806 (figure 7-23). All selector switches are located in the radio set control. The automatic positioning (tuning drive) circuits and seeking switches of the mechanical tuning unit do not differentiate between the automatic and manual methods of inserting the frequency selection.

4-250. MANUAL SELECTOR SYSTEM.

4-251. The manual selector system can operate only when the CHAN switch is at the M position (figure 7-23). Selector switches S1804, S1805, and S1806 provide the 10-mc, 1.0-mc, and 0.1-mc decade selection, while selector switch S1803 is a two-position switch that covers the 200-mc to 300-mc increment of the tuning range.

4-252. The seeking switches of the mechanical tuning unit are shown in figure 4-52. Seeking switches S1201, S1202, and S1203 and relay K1201 provide the 10-mc function; S1205 and S1206 and relay K1202 provide the 1.0-mc function; S1207 and S1208 and relay K1203 provide the 0.1-mc function. A simplified pictorial presentation of the mechanical tuning unit components and linkages is shown in figure 4-58.

4-253. When the current through relay K1201, K1202, or K1203 is interrupted, an instantaneous inductive voltage appears across each coil. A small neon tube is connected across each relay coil so that, when the magnetic field of the relay coil collapses, the resultant inductive voltage bypasses the relay coil.

4-254. OPERATION OF MANUAL SELECTOR SYSTEM. The following example describes the sequence that occurs when one particular frequency is chosen by means of the manual selector system. All switching sequences conform to the principles of the illustrated sequence.

NOTE

When frequencies are chosen by means of the manual selector system, switch S1802 is used only as a tie point, and switches S1807B, S1807C, and S1807D provide the ground connection for decade switches S1804A, S1805A, and S1806A (see figure 7-23).

4-255. The system is at rest at a frequency of 220.0 mc, which is reflected by the positions of the selector switches and seeking switches (figure 4-54).

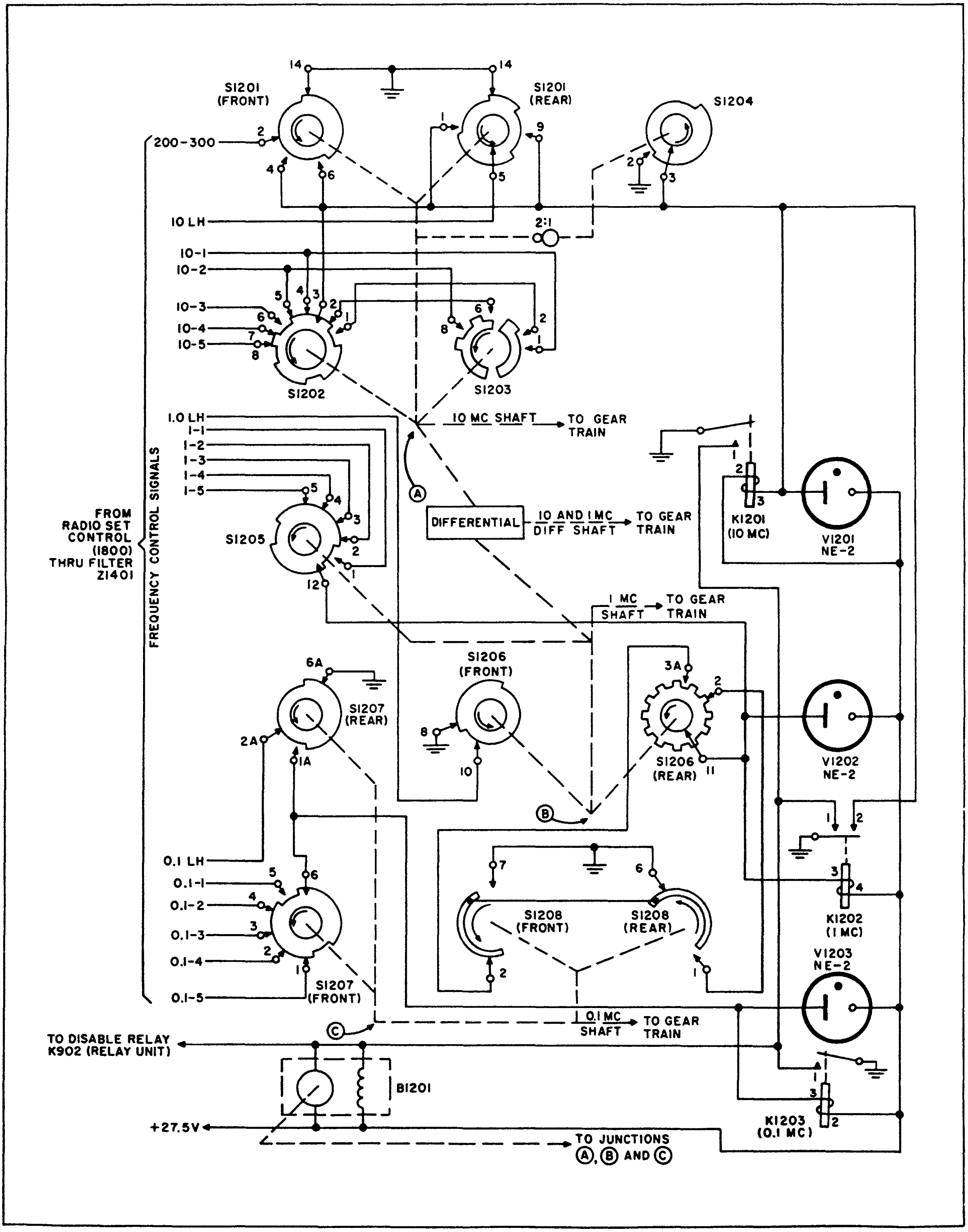


Figure 4-52. Mechanical Tuning Unit, Simplified Schematic Diagram

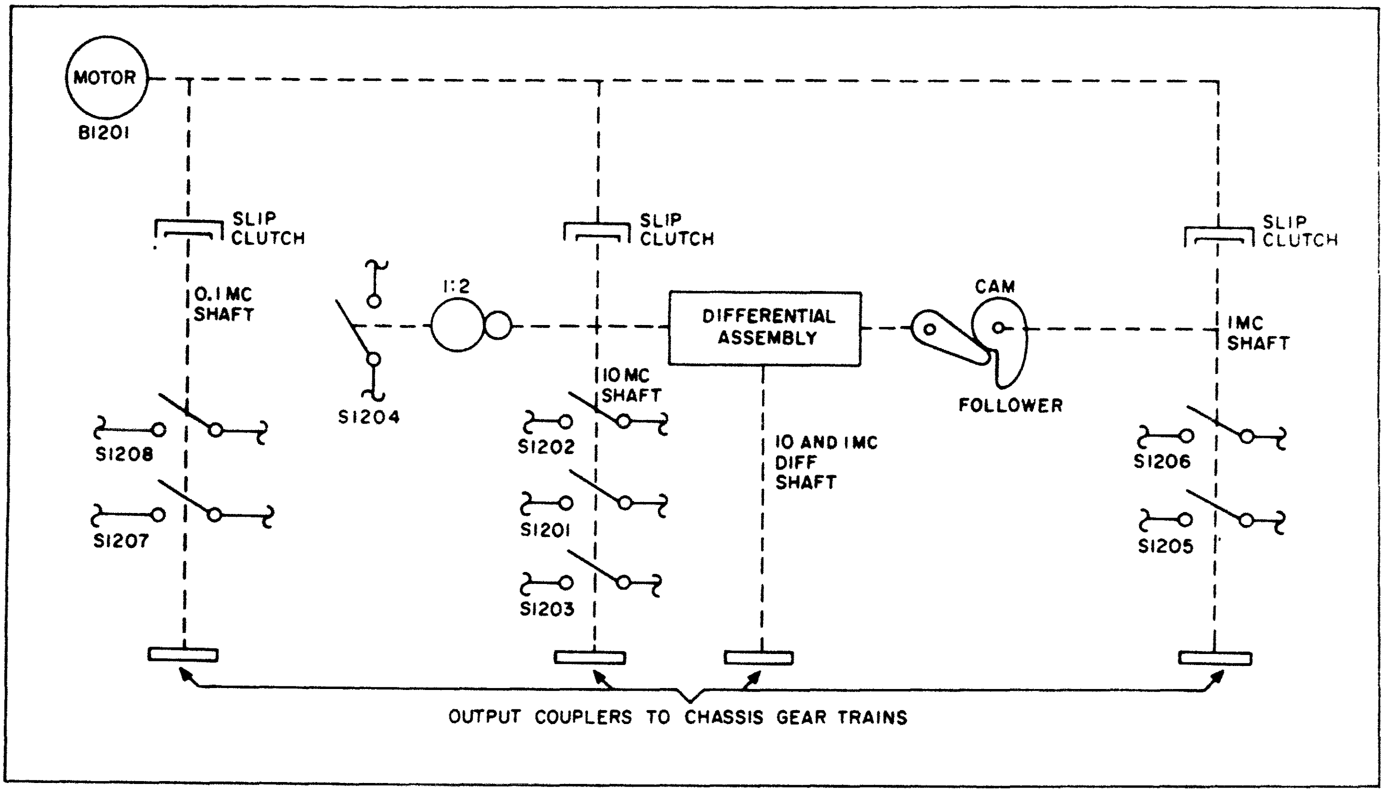


Figure 4-53. Mechanical Tuning Unit, Automatic Positioning System, Simplified Schematic Diagram of Switch Drive Linkage

NOTE

To illustrate this sequence, the CHAN selector is set to M and the system is set up at 220.0 mc even though the lower frequency limit of the radio set is 225.0 mc.

a. The tenths selector knob, which drives switch S1806, is rotated to the .5 position. A path to ground (figure 4-54) thus is completed from the +27.5-volt supply through the coil of 0.1-mc relay K1203, contacts 6 and 4 of S1207, contacts 2 and 12 of S1806A, contacts 12 and 5 of S1806B, and contacts 2A and 6A of S1207.

b. The 0.1-mc shaft (figure 4-56) rotates in the counterclockwise direction until the ground path completed through the back wafer of S1207 and contact 6A is broken at contact 4. However, at this position, another ground from contact 5 of S1207 is completed through contacts 1 and 8 of S1806A. Thus S1207 continues to rotate until the ground is broken between the front wafer of S1207 and contact 5. The 0.1-mc relay K1203 releases; but, as S1207 was rotated to the .5 position, it drove S1208. As S1208 was rotated from .4 to .5, the 1.0-mc relay K1202 was energized due to the complete path to ground through contacts 11 and 2 of S1206 and contacts 1 and 7 of S1208.

c. The 1.0-mc shaft (figure 4-57) rotates one-half position until contact 2 of S1206 finds an open contact; this is the 0.5-mc position, at which point the 1.0-mc relay K1202 releases. The additional contact on relay K1202 causes relay K1201 to be energized whenever K1202 is activated. Thus the 10-mc section will cycle in the above example and set up last.

4-256. AUTOMATIC SELECTOR SYSTEM.

4-257. The automatic selector system (figures 4-52 and 7-23) is controlled by CHAN selector switch S1807, via switches S1802A through S1802X. The CHAN selector switch drives a rotating metal drum which has small slots along the horizontal plane. Each slot mounts seven pins that are preset in specific positions in accordance with the desired preset frequencies. As the drum is rotated by the CHAN selector switch, the preset pins of the particular channel close seven switches selected from switches S1802A through S1806X to provide the desired frequency variation as follows.

a. Switches S1802A and S1802B select either the 200- or 300-mc increment.

b. Switches S1802C through S1802J select the 10-mc increment.

c. Switches S1802K through S1802R select the 1.0-mc increment.

d. Switches S1802S through S1802X select the 0.1-mc increment.

NOTE

CHAN selector switches S1807A, S1807B, and S1807D switch the frequency selector S1807C system to the four manual selectors when the CHAN selector is at M.

4-258. Whenever a selector pin is adjusted to contact a switch arm, the switcharm is placed in the "up" position. Thus, in figure 7-23, for a frequency setting

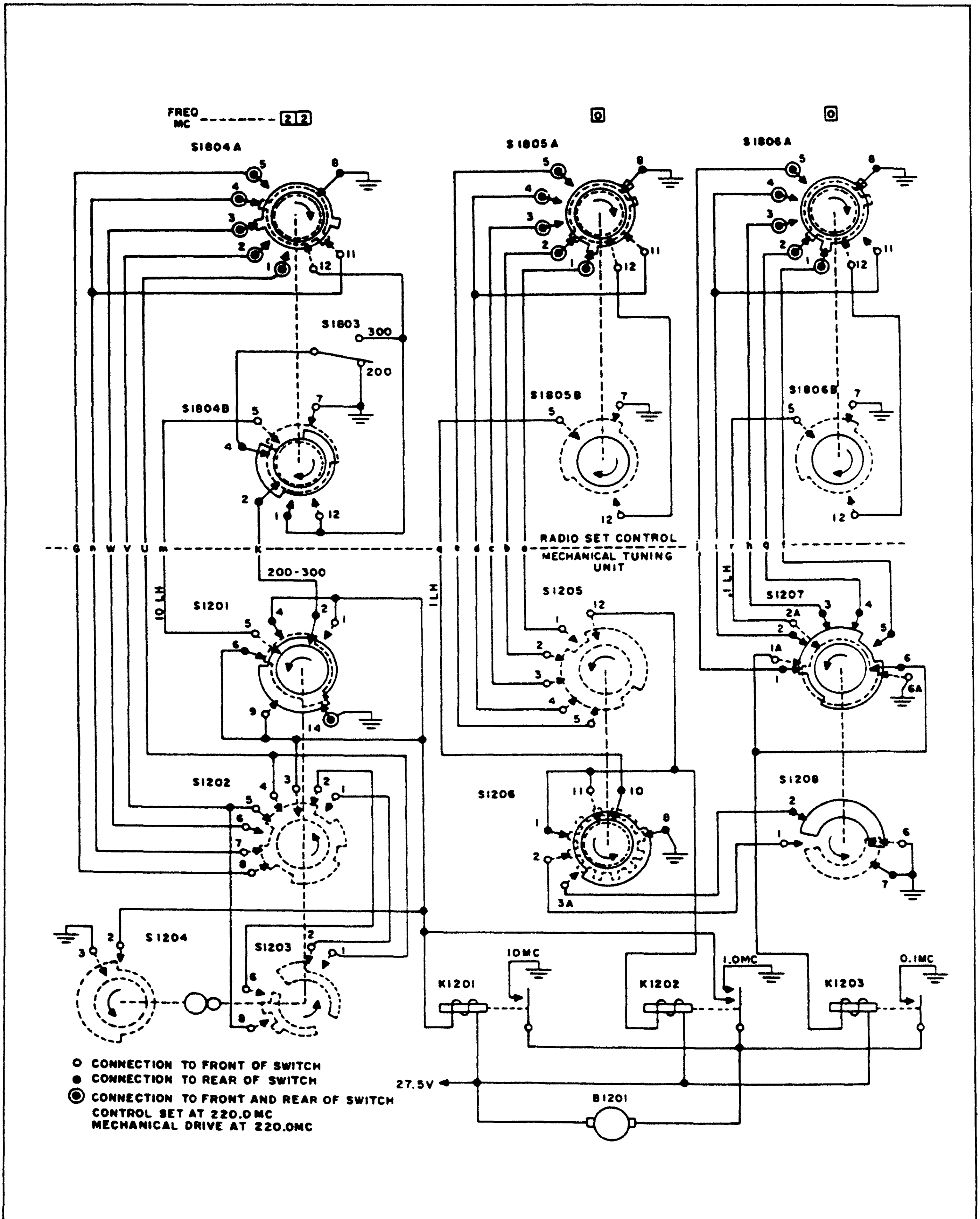


Figure 4-54. Manual Selector System Operation, First Switching Sequence, Simplified Schematic Diagram

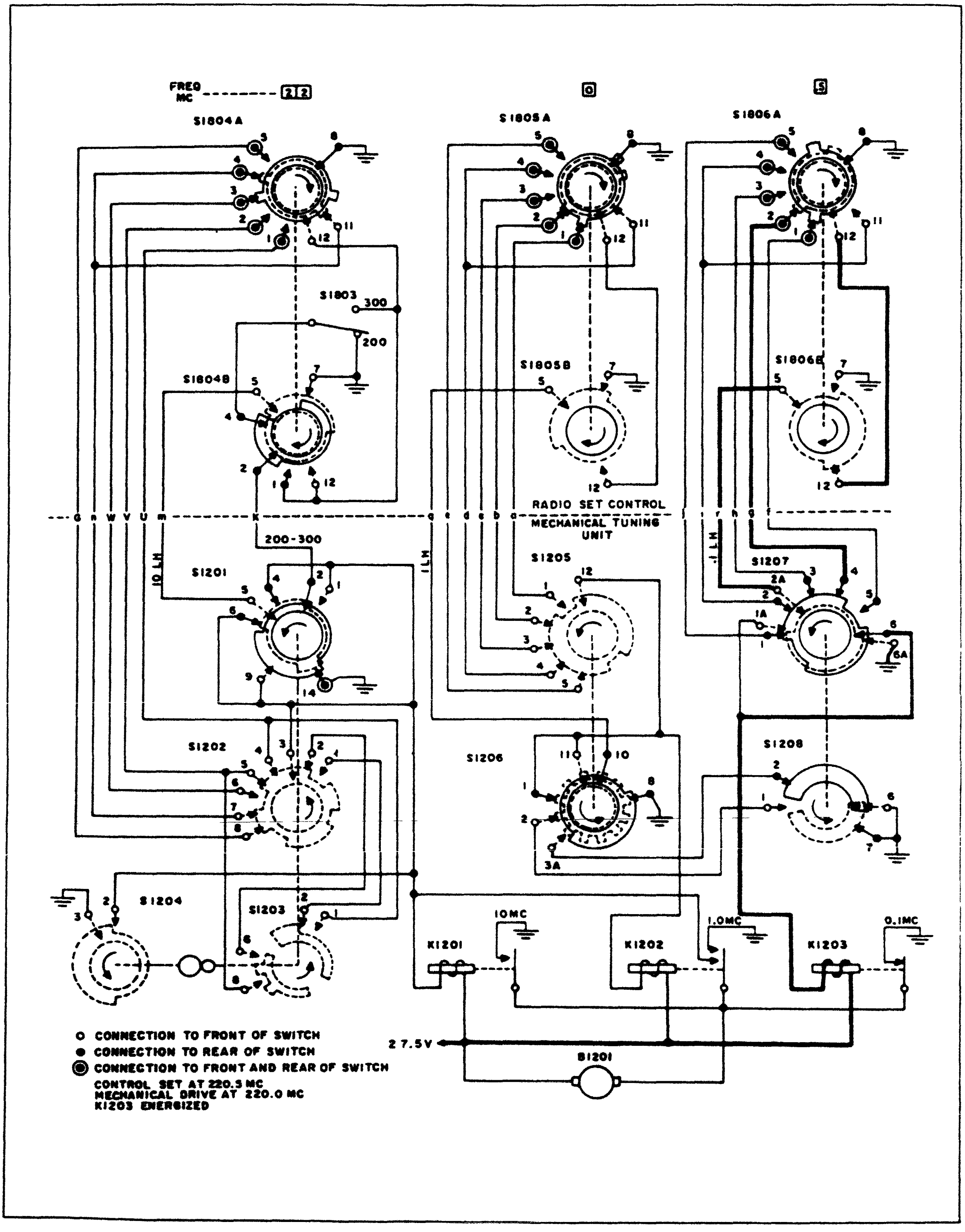


Figure 4-55. Manual Selector System Operation, Second Switching Sequence, Simplified Schematic Diagram

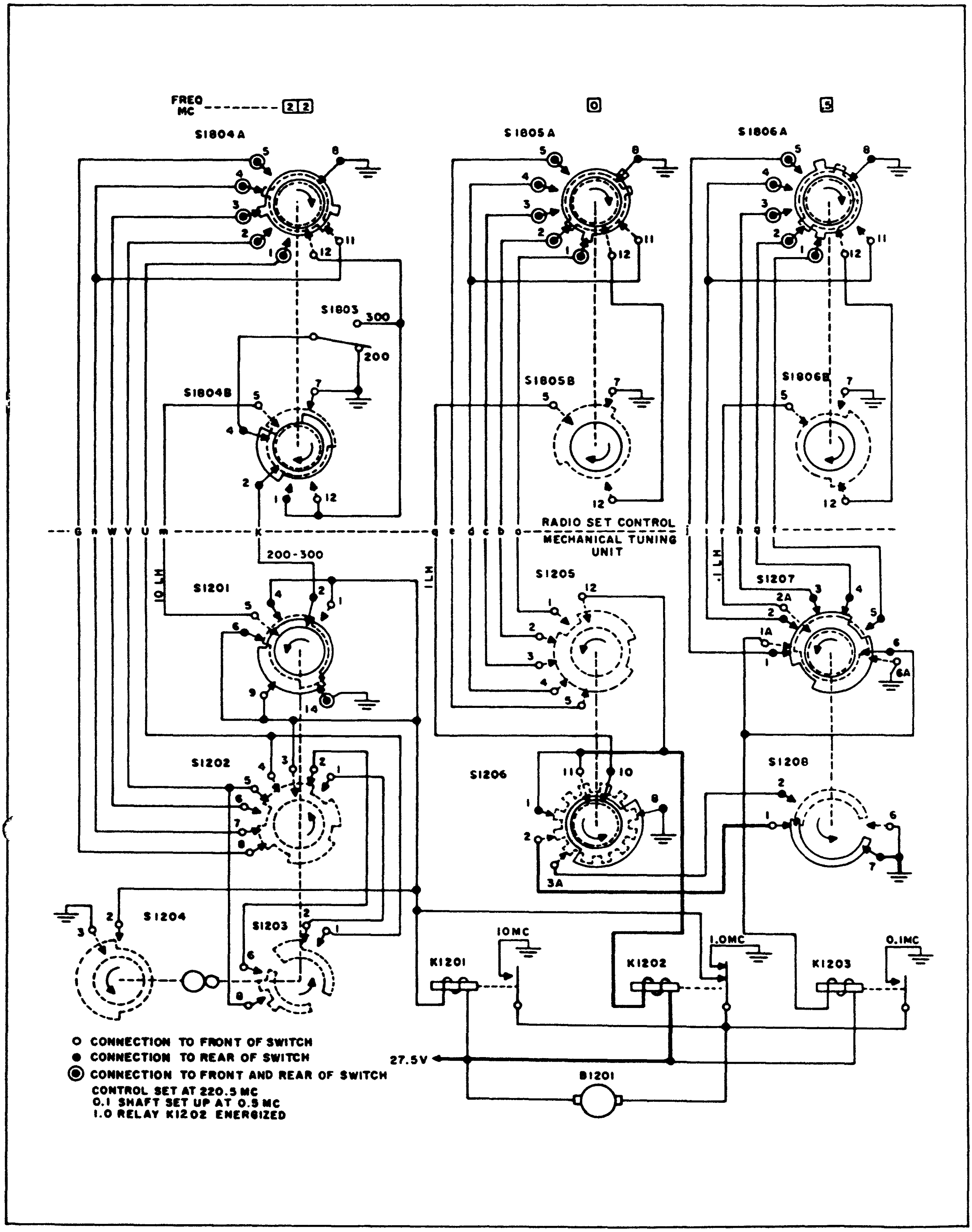


Figure 4-56. Manual Selector System Operation, Third Switching Sequence, Simplified Schematic Diagram.

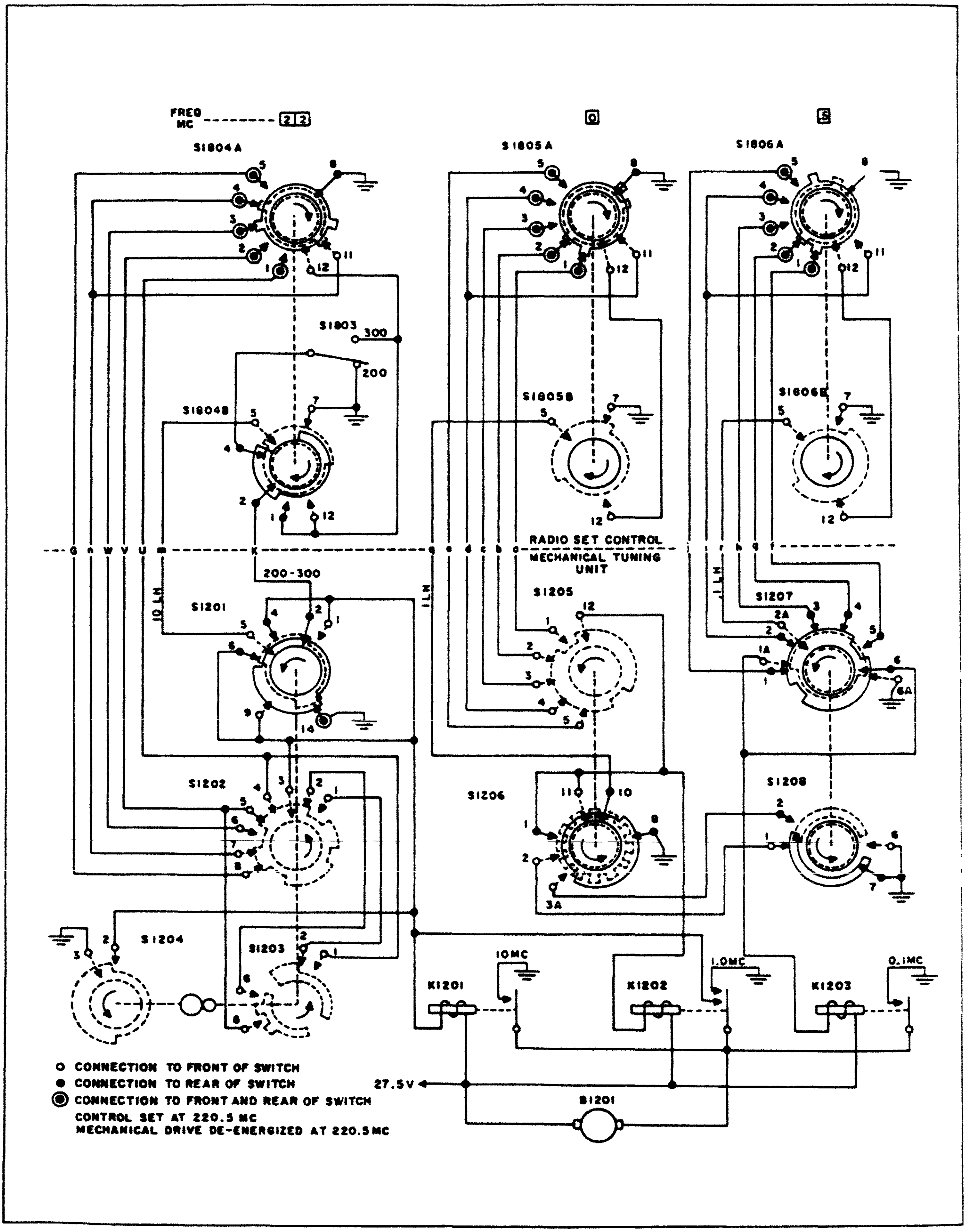


Figure 4-57. Manual Selector System Operation, Fourth Switching Sequence, Simplified Schematic Diagram

of 241.1 mc, the selector pins press the following switches in the "up" position.

a. The 1st digit selector pin presses switch S1802A in the "up" position and the hundreds digit for the specific channel is 2.

b. The 2nd digit row selector pin presses switch S1802C in the "up" position and the 0 through 4 (low) row of numbers provides the limits from which the tens digit will be selected for the specific channel.

c. The 0-9, 2nd digit selector pin presses switch S1802J in the "up" position and the tens digit for the specific channel is 4.

d. The 3rd digit row selector pin presses switch S1802K in the "up" position and the 0 through 4 (low) row of numbers provides the limits from which the units digit will be selected for the specific channel.

e. The 0-9, 3rd digit selector pin presses switch S1802M in the "up" position and the units digit for the specific channel is 1.

f. The 4th digit row selector pin presses switch S1802S in the "up" position and the 0 through 4 (low) row of numbers provides the limits from which the tenths digit will be selected for the specific channel.

g. The 0-9, 4th selector pin presses switch S1802U in the "up" position and the tenths digit for the specific channel is .1 .

NOTE

The operating procedure for selecting the preset channel frequency is described in the handbook of operating instructions for Radio Set AN/ARC-52.

h. With the preset frequency illustrated in figure 7-23, a path to ground is closed in the circuits that correspond to the digits and digit row selectors that represent the 241.1-mc frequency. Note in the referenced figure that all wafers of the S1807 switch bank are rotated two places in the clockwise direction when the CHAN selector switch is rotated from the M position to the 1 position.

4-259. MECHANICAL COMPONENTS.

4-260. The mechanical components of the channel selection system (figures 4-52, 4-53, and 4-58) consist of the four output shafts in the mechanical tuning unit, which are driven by the motor through the internal gear train, the necessary seeking switches that control the motor rotation, and the gear train that is driven by the four shafts to a position corresponding to the selected frequency. The four shafts protrude through the bottom of the mechanical tuning unit and are terminated in Oldham-type couplers. These couplers mate with comparable couplers on the main chassis to drive the main chassis gear train and thus the variable tuning elements of the modules.

4-261. The 10-mc shaft tunes the spectrum generator and amplifier in steps of 10 mc. This increment is derived from the ratio of 20 degrees of shaft rotation to 10 mc of frequency change inserted at the radio set control. Thus, to tune the spectrum generator and amplifier over the range from 200 mc through 370 mc, the 10-mc shaft is rotated through 360 degrees. A 2:1 gear ratio within the spectrum generator and amplifier reduces the rotation of the amplifier tank circuits to 180 degrees in tuning over this range. Blanking switch S1204 (figure 4-52) is geared to the 10-mc shaft through a 2:1 reduction. Thus, after each 360 degrees of rotation of the 10-mc shaft, the blanking switch energizes the motor for an additional cycle so that the tuned circuits of the spectrum amplifier will be driven through the unused 180 degrees of the rotational cycle.

4-262. The 1.0-mc shaft tunes the 20- to 30-mc i-f amplifier and the oscillator modules in steps of 500 kc. This increment is derived from the ratio of 30 degrees of shaft rotation to 1.0 mc of frequency change inserted at the radio set control.

4-263. The 10- and 1-mc differential shaft tunes the power amplifier and receiver r-f amplifier and transmitter preamplifier modules in steps of 500 kc. This increment is derived from the ratio of 10 degrees of shaft rotation to 10 mc of frequency change inserted at the radio set control. The actual rotation of the 10- and 1-mc differential shaft is accomplished through a differential gear assembly that utilizes the motion of the 10-mc shaft and the 1.0-mc shaft. The two differential inputs are independent of each other, and the output rotation is the algebraic sum of the two inputs.

a. The 10-mc shaft drives the differential through reduction gears having a 2:1 ratio. Thus the 20 degrees to 10-mc frequency change ratio of the 10-mc shaft is converted at the differential input to 10 degrees for each 10-mc frequency change inserted at the radio control. Using the common denominator 10, this ratio may be expressed as 1 degree for each megacycle of frequency change.

b. The 1.0-mc shaft drives the differential through a follower cam and coupler. The 1.0-mc shaft rotates 30 degrees for each 1-mc frequency change. The cam reduces the input to the differential to a 2-degree rotation for each 1-mc increment. The 2:1 ratio of the differential results in an output of 1 degree of rotation for each 1 mc of tuning. The 500-kc increment tuning is provided by electrical linkage between the 0.1-mc and 1.0-mc tuning sections. The .5 to .9 frequency settings advance the 1.0-mc section 500 kc from that advanced with the .0- to .4-mc settings.

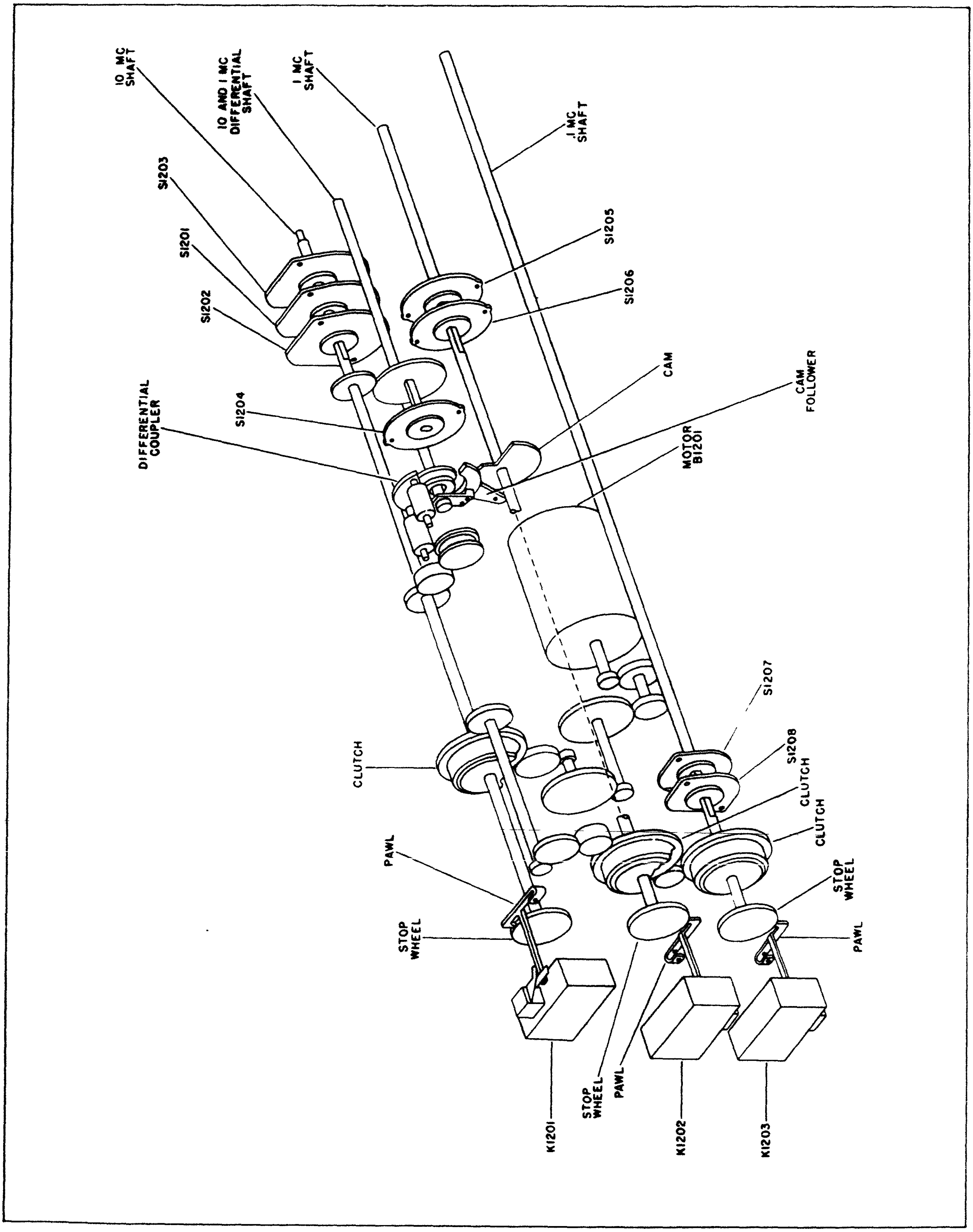


Figure 4-58. Mechanical Tuning Unit, Mechanical Linkage Diagram

SECTION V
ORGANIZATIONAL MAINTENANCE

5-1. GENERAL.

5-2. Trouble shooting and repair at an organizational maintenance level is limited to localization of a defective module, removal of the module, or localization and replacement of a defective part that is readily replaceable (accessible tubes, pilot lamps, fuses, and cables). The test procedures presented in this section are used to determine either that the equipment is operating at an optimum performance level or that a particular module is defective. If a fault exists but the cause cannot be determined by the procedures given in this section, trouble shooting and corrective measures at a field maintenance level are required. (Refer to section VI.)

5-3. The procedures utilized for organizational maintenance include minimum performance standards checks and trouble shooting. Techniques employed for trouble shooting the radio set include visual inspection, operational tests, tube tests, and simple voltage or continuity checks. The material is presented in the order normally followed by a repairman in servicing a defective radio set. When these procedures are not sufficient to determine a malfunction, trouble shooting at a field maintenance level is required.

NOTE

Throughout these procedures, test equipment is identified by common or functional names. For complete test equipment nomenclature, refer to tables VII and VIII in section II.

5-4. TEST POINTS.

5-5. Test points, which are designated by an encircled letter (Ⓐ, Ⓑ, etc), provide monitoring points that are used to check over-all performance of the radio set, to localize trouble to a defective module, and for isolating trouble to a defective detail part within a module. Test points are listed in table XII and illustrated in figures 5-1, 5-2, 5-3, 5-13 and 5-14. Note, however, that these test points are not the only points at which measurements may be taken.

5-6. MINIMUM PERFORMANCE STANDARDS CHECKS.

5-7. GENERAL. The following procedures presuppose that the radio set is functional but not necessarily providing optimum performance. Operation of the radio set to the standards itemized below indicates beyond reasonable doubt that the equipment is operating properly. If the equipment does not conform to these standards, trouble shooting is required

5-8. PRELIMINARY.

CAUTION

Internal pressure must be released prior to loosening any hardware.

a. Depress the valve stem of the air valve on the front panel until air pressure within the case is released.

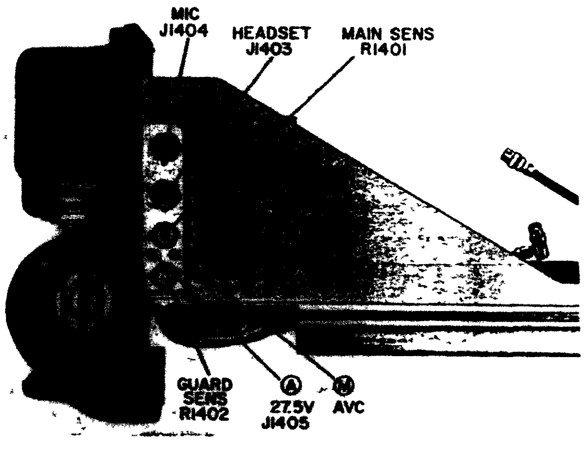


Figure 5-1. Receiver-Transmitter Right-Hand Gusset Plate, Location of Test Points

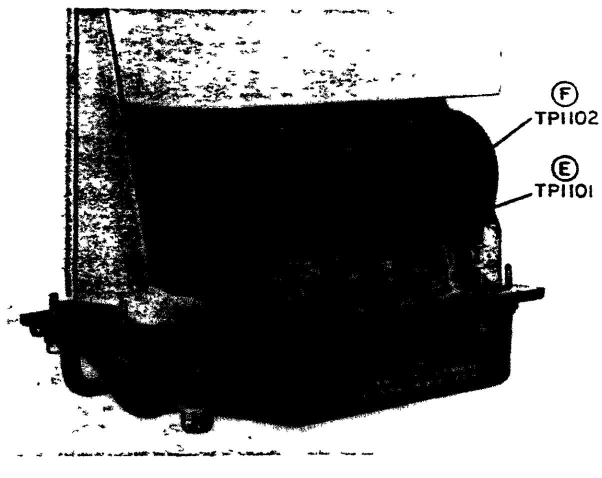


Figure 5-2. Receiver-Transmitter RT-424 ARC-52X. Dynamotor Power Supply Unit, Location of Test Points

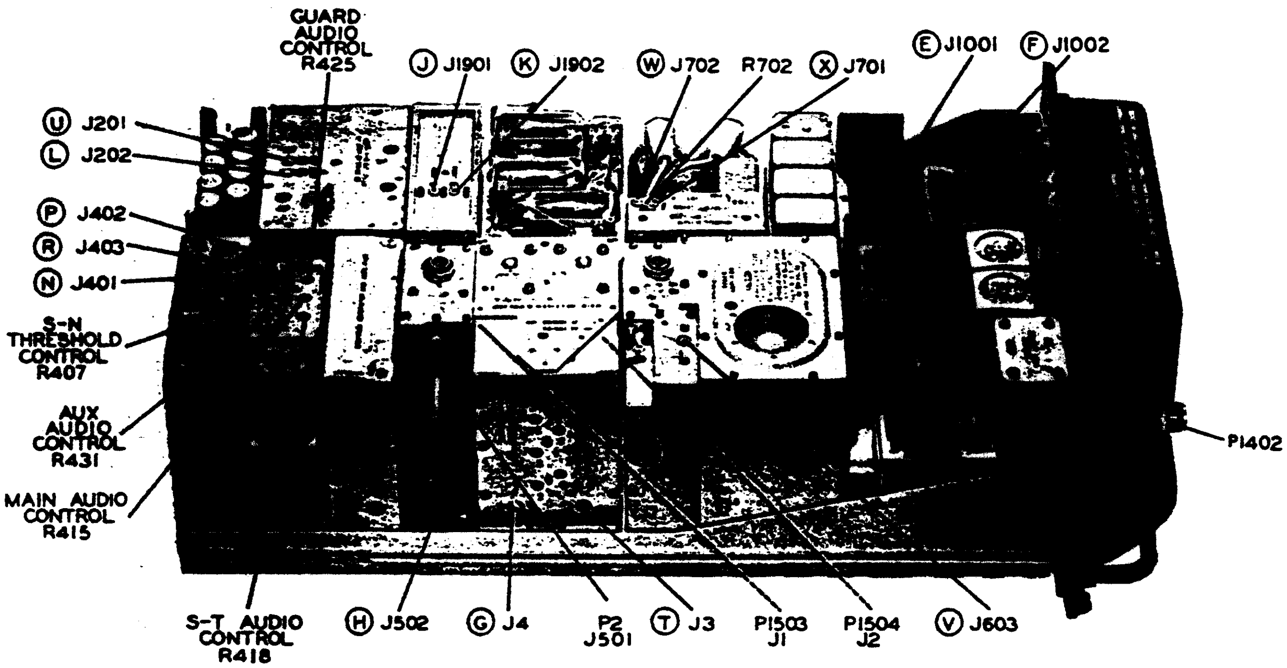


Figure 5-3. Receiver-Transmitter RT-332/ARC-52, Location of Test Points

TABLE XII. TEST POINTS

TEST POINT	LOCATION	FIGURE REFERENCE	TO CHECK OUT	VOLTAGE
		POWER AND CONTROL CIRCUITS		
(A) J1405	Right-hand gusset plate	5-1	Prime d-c supply	-27.0 dc to -28.0V dc
† (B) F1501	Fuseboard E1501	5-13 & 5-14	115V, 400 cps, phase 1 supply	114V ac to 116V ac
† (C) F1502	Fuseboard E1501	5-13 & 5-14	115V, 400 cps, phase 2 supply	114V ac to 116V ac
† (D) F1503	Fuseboard E1501	5-13 & 5-14	115V. 400 cps, phase 3 supply	114V ac to 116V ac
(E) J1001	Rectifier unit (RT-332/ARC-52)	5-3	D-c plate supply	+125V dc to +138V dc
(F) J1002	Rectifier unit (RT-332/ARC-52)	5-3	Bias supply	-13.0V dc to -15.0V dc
(E) TP1101	Dynamotor power supply (RT-424/ARC-52X)	5-2	D-c plate supply	+125V dc to +138V dc

† Used in RT-332/ARC-52 only.

TABLE XII. TEST POINTS (Cont)

TEST POINT	LOCATION	FIGURE REFERENCE	TO CHECK OUT	VOLTAGE
POWER AND CONTROL CIRCUITS (Cont)				
(F) TP1102	Dynamotor power supply (RT-424/ARC-52X)	5-2	Bias supply	-13.5V dc to -15.0V dc
(S) F1504	Fuseboard E1501	5-13 & 5-14	Transmitter power amplifier d-c plate supply	+425V dc to +440V dc
MAIN RECEIVER CIRCUITS				
(M) J1406	Right-hand gusset plate	5-1	Main receiver avc	-3.5V dc minimum to -4.5V dc maximum with 1000 uv input, modulated 30% at 1000 cps
** (G) J2	Receiver r-f amplifier	6-6	R-f gain of receiver r-f amplifier	-1.0V dc minimum with plug P2 disconnected from jack J1516 and test signal of 0.1-volt at 304.7 mc at P1402 (MANUAL frequency controls set to 304.7 mc)
(N) J401	Audio amplifier	5-3	Audio amplifier auxiliary audio output	0.25V ac minimum, with 1000-uv input, modulated 30% at 1000 cps
(P) J402	Audio amplifier	5-3	Audio gain	3.0V ac minimum, with guard receiver off, GUARD gain control R425 at midposition, MAIN audio control R415 fully clockwise, and with 1000-uv input, modulated 30% at 1000 cps
(R) J403	Audio amplifier	5-3	Signal/noise sensing circuit	Audio amplifier connected for signal noise squelch and S/N threshold control R407 at midposition: ~~+4.0V dc minimum,~~ with 1000-uv input modulated 30% at 400 cps. -4.0V dc minimum, with 1000-uv input modulated 30% at 20 kc Audio amplifier connected for carrier-operated squelch: -4.5 dc minimum, with 1000-uv input
(P) J402	Audio amplifier	5-3	Guard receiver audio output	5.0V ac minimum, with guard receiver on, GUARD gain control R425 fully clockwise, and with a 243.0 mc 1000-uv input to guard receiver, modulated 30% at 1000 cps
GUARD RECEIVER CIRCUITS				
(Y) P801-1	Guard receiver	5-13 & 5-14	Guard receiver avc	-2.5V dc with GUARD SENS control R1402 fully ccw and no input signal. -5V dc ±0.5V with a 243.0 mc 1000-uv input signal

**Applicable to serial numbers 1-90, Contract NOas 57-478 only.

TABLE XII. TEST POINTS (Cont)

TEST POINT	LOCATION	FIGURE REFERENCE	TO CHECK OUT	VOLTAGE
GUARD RECEIVER CIRCUITS (Cont)				
(Z) P801-8	Guard receiver	5-13 & 5-14	Guard receiver detector voltage	As input signal is increased, detector voltage should start to rise at or below 2-uv with GUARD SENS R1402 set full ccw.
FREQUENCY INJECTION CIRCUITS				
(G) J4	Receiver r-f amplifier	5-3	Spectrum generator and amplifier injection	-1.0V dc minimum
(H) J502	Spectrum generator and amplifier	5-3	Spectrum generator output to spectrum generator and amplifier tripler stage	-7.0V dc minimum
(J) J1901	Oscillator unit	5-3	24.9- to 33.9-mc oscillator drive	-1.0V dc minimum
(K) J1902	Oscillator unit	5-3	2.15- to 3.05-mc oscillator drive	-0.8V dc minimum
(L) J202	20- to 30-mc i-f amplifier	5-3	Oscillator unit injection (and injection amplifier of 20- to 30-mc i-f amplifier)	-1.0V dc minimum in receive condition
(T) J3 or **J102	Transmitter preamplifier	5-3	Spectrum generator and amplifier injection	-1.0V dc minimum in receive condition
TRANSMITTER CIRCUITS				
(T) J3 or **J102	Transmitter Preamplifier	5-3	20- to 30-mc i-f amplifier output	-0.5V dc minimum, in transmit condition, with spectrum generator and amplifier disconnected by removing plug P2 from jack J1519. (Fuse F1504 should be removed before making this test, then replaced.)
(U) J201	20- to 30-mc i-f amplifier	5-3	1.85-mc oscillator drive	-3.0V dc minimum in transmit condition
(V) J603	Power amplifier	5-3	Drive to power amplifier tube V603	-20V dc minimum

**Applicable to serial numbers 1-90, Contract NOas 57-478 only.

TABLE XII. TEST POINTS (Cont)

TEST POINT	LOCATION	FIGURE REFERENCE	TO CHECK OUT	VOLTAGE
TRANSMITTER CIRCUITS (Cont)				
(W) J702	Modulator	5-3	Cathode current of modulator tubes V703 and V704	+1.0V dc maximum
(X) J701	Modulator	5-3	Bias voltage for modulator tubes V703 and V704	-13.5V dc to -15.0V dc

b. Remove the receiver-transmitter from the depressurized case by loosening the 12 screws that are spaced around the outside edge of the front panel.
c. Lay the receiver-transmitter on its front panel and slip off the depressurized case.
d. Install Radio Set Control C-1607/ARC-52 into Distribution Box J-995/ARM-38.

WARNING

High voltages may be present at fuseboard E1501. Do not place hands indiscriminately on the underside of the main chassis.

e. Install Radio Receiver-Transmitter RT-332/ARC-52 into Mounting MT-2063/ARM-38. Be certain that the grooves on the sides of the receiver-transmitter engage properly with the runners of the mounting.
f. Connect plug P1401 of Cable Assembly W-3/ARM-38 to P1401 on Radio Receiver-Transmitter RT-332/ARC-52. (See figure 5-4).
g. Apply power to the receiver-transmitter as specified in NAVWEPS 16-30ARM38-1, Handbook Operation and Service Instructions, Radio Set Test Harness AN/ARM-38.

5-9. MAIN RECEIVER SENSITIVITY CHECK. Check sensitivity of the main receiver as follows.
a. Connect the output of Signal Generator AN/USM-44 in series with a 6-db pad and a 1/16-ampere fuse to antenna connector P1402 (figure 5-4). Use a 10-foot RG-8/U coaxial cable from the fuse to the antenna jack.

CAUTION

The fuse is required to protect the signal generator and pad if the transmitter is accidentally actuated.

b. Connect a-f power meter TS-585B/U to Distribution Box J-995/ARM-38 HEADSET jack J108. Set the impedance switch on the TS-585B/U to the 300-ohm position.
c. Adjust Signal Generator AN/USM-44 for 304.7 mc, at 1000 microvolts signal output, modulated 30 percent with 1000 cps.

NOTE

The attenuator of the signal generator is read directly in microvolts when the signal generator output is connected to a 50-ohm load.

d. On Radio Set Control C-1607/ARC-52, set MANUAL frequency selectors for 304.7 mc, the function switch to T/R, CHAN switch to M, and turn VOL control fully clockwise. Refer to figure 1-6.
e. Turn MAIN SENS control R1401 (figure 5-1) to the maximum clockwise position. At the audio amplifier, rotate MAIN audio level control R415 (figure 5-3) fully clockwise. Adjust MAIN audio level control R415 for a 250-milliwatt indication on the TS-585B/U.
f. At Radio Set Control C-1607/ARC-52, set MANUAL frequency controls for 225.0 mc.
g. Adjust the signal generator for 225.0 mc at 5 microvolts signal output modulated 30 percent with 1000 cps. Record the audio output indicated on the TS-585B/U. The level should not be less than 50 milliwatts.
h. Remove the modulation and record the level of system noise indicated on the a-f power meter. The signal plus noise-to-noise ratio should be 10 db or more. If the results of this check are unacceptable, refer to paragraph 5-32.

5-10. GUARD RECEIVER SENSITIVITY CHECK. To check sensitivity of the guard receiver, use equipment connections shown in figure 5-4 and follow the procedures given below.
a. At the radio set control, rotate the function switch to T/R+G.
b. At the signal generator, set the frequency to 243.0 mc, with an output level of 1000 microvolts modulated 30 percent at 1000 cps.
c. At the receiver-transmitter rotate MAIN SENS control R1401 (figure 5-1) fully counterclockwise.
d. At the receiver-transmitter, rotate GUARDS SENS control R1402 (figure 5-1) fully clockwise; and adjust GUARD audio gain control R425 (figure 5-3) for a 250-milliwatt indication on the TS-585B/U.
e. At the signal generator, reduce the output level to 6 microvolts and record the indication on the TS-585B/U. The audio output should be not less than 50 milliwatts. Remove the modulation and again record the indication. The signal-plus-noise to noise ratio

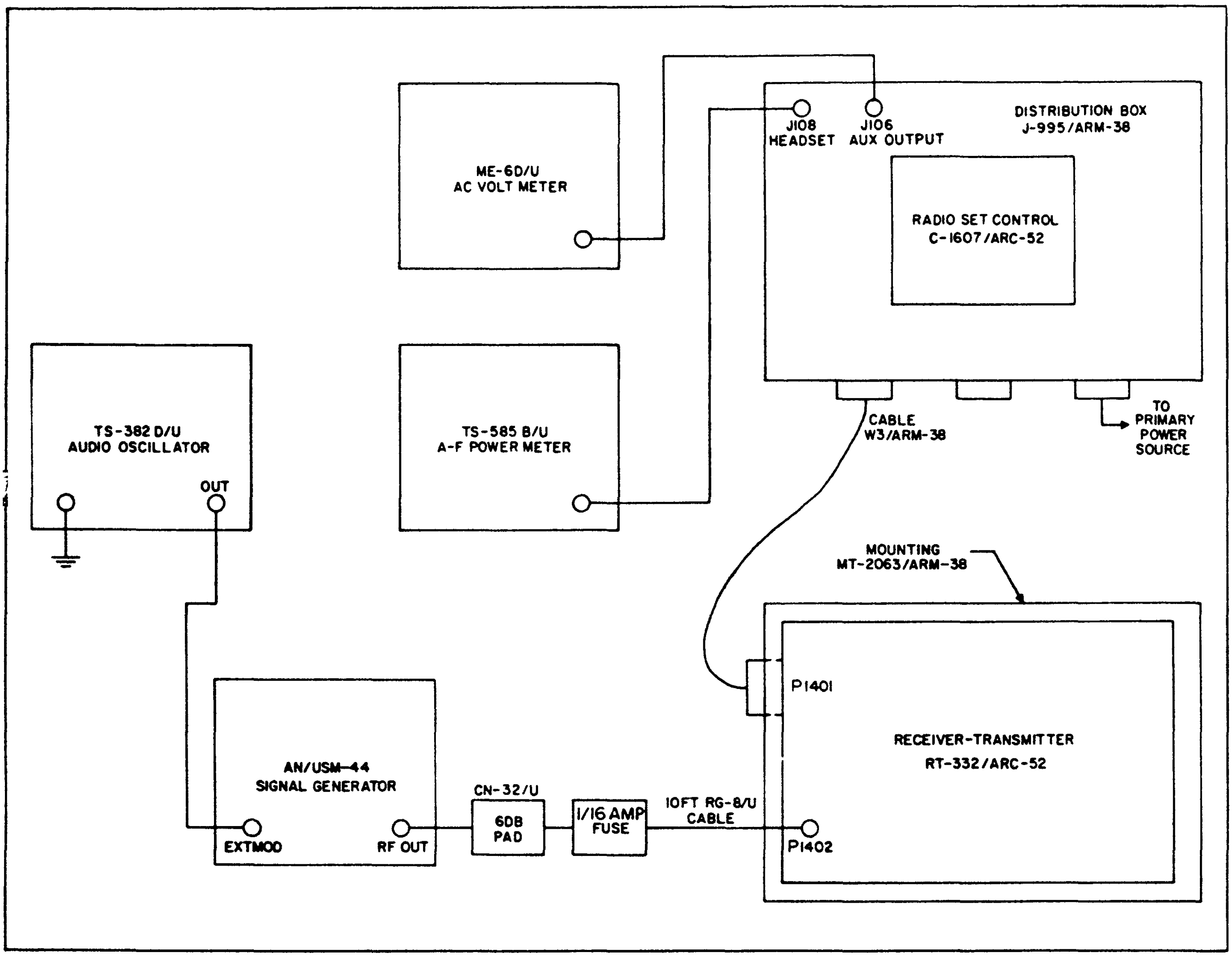


Figure 5-4. Receiver, Test Setup

should be 10 db. If the results of this check are unacceptable, refer to paragraph 5-32.

5-11. MAIN RECEIVER AVC CHARACTERISTIC CHECK. To check avc characteristics of the main receiver, use the equipment connections shown in figure 5-4 and follow the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R.

b. At the signal generator, set the frequency to 304.7 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the reading on the TS-585B/U.

c. Reduce the output level of the signal generator to 10 microvolts and again record the reading. This audio output level recorded should not vary more than ±3 db from the level obtained in step b. If the results of this check are unacceptable, refer to paragraph 5-32.

d. Increase the output level of the signal generator to 100,000 microvolts and again record the reading on the TS-585B/U. This audio output level recorded should not vary more than ±3 db from the level obtained in step b. If the results of this check are unacceptable, refer to paragraph 5-32.

5-12. GUARD RECEIVER AVC CHARACTERISTIC CHECK. To check avc characteristics of the guard receiver, use the equipment connections shown in figure 5-4 and follow the procedures given below.

a. At the radio set control, rotate the function switch to T/R+G.

b. At the signal generator, set the frequency to 243.0 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the reading on the TS-585B/U.

c. Reduce the output level of the signal generator to 10 microvolts and again record the reading. This audio output level recorded should not vary more than +3 db from the level obtained in step b. If the results of this check are unacceptable, refer to paragraph 5-32.

d. Increase the output level of the signal generator to 100,000 microvolts and again record the reading on the TS-585B/U. This audio output level recorded should not vary more than +3 db from the level obtained in step b. If the results of this check are unacceptable, refer to paragraph 5-32.

5-13. MAIN RECEIVER AUDIO CAPABILITY CHECK. To check audio capability of the main receiver, use the equipment connections shown in figure 5-4 and follow the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R.

b. At the signal generator, set the frequency to 304.7 mc, with an output level of 100 microvolts, modulated 30 percent at 1000 cps.

c. At the audio amplifier, rotate MAIN audio level control R415 (figure 5-3) fully clockwise.

d. Record the audio output indicated on TS-585B/U. The meter should not indicate less than 250 milliwatts. Increase the output level of the signal generator to 1000 microvolts and then to 100,000 microvolts. After each increase, record the audio output measured on the TS-585B/U. The meter should not indicate less than 250 milliwatts for each of the signal inputs. If the results of this check are unacceptable, refer to paragraph 5-32.

5-14. GUARD RECEIVER AUDIO CAPABILITY CHECK. To check audio capability of the guard receiver, repeat the procedure of main receiver audio capability check (paragraph 5-13) with the signal generator adjusted to 243.0 mc, the function switch set at T/R+G, and GUARD audio level control R425 (figure 5-3) fully clockwise. If the audio outputs recorded in this check measure less than 250 milliwatts for each of the signal inputs, refer to paragraph 5-32.

5-15. MAIN RECEIVER AUDIO DISTORTION CHECK. To check audio distortion of the main receiver, connect a distortion analyzer, (Hewlett-Packard 325-B or equivalent) across the TS-585B/U shown in figure 5-4. Follow the procedure given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc, and rotate the function switch to T/R.

b. At the signal generator, adjust the frequency to 304.7 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps.

c. At the receiver-transmitter, adjust MAIN audio level control R415 (figure 5-3) for 250 milliwatts on the TS-585/U.

d. Record harmonic distortion present in the main audio output measured by the distortion analyzer. The harmonic distortion should not exceed 10 percent. If the results of this check are unacceptable, refer to paragraph 5-32.

5-16. GUARD RECEIVER AUDIO DISTORTION CHECK. To check audio distortion of the guard receiver, repeat the procedure of main receiver audio distortion check (paragraph 5-15) with the signal generator adjusted to 243.0 mc, the function switch set at T/R+G, and GUARD audio level control R425 (figure 5-3) adjusted for 250 milliwatts on the TS-585B/U. If the harmonic distortion measurements taken in this check exceed 10 percent, refer to paragraph 5-32. Remove the distortion analyzer.

5-17. MAIN RECEIVER FREQUENCY RESPONSE CHECK. To check frequency response of the main receiver, use the equipment connections shown in figure 5-4 and follow the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R.

b. At the signal generator, set the frequency to 304.7 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the audio output measured on the TS-585B/U.

c. At the audio oscillator, set the modulation frequency to 300 cps; but maintain 30 percent modulation of the signal generator output. Record the audio output measured on the TS-585B/U. The audio output level at 300 cps should be within +1 to -3 decibels of the reference output level (at 1000 cps) recorded in step b.

d. At the audio oscillator, set the modulation frequency to 4000 cps. Record the audio output measured on the TS-585B/U. The audio output at 4000 cps should be within +1 to -4 decibels of the output at 1000 cps (step b). If the results of this check are unacceptable, refer to paragraph 5-32.

5-18. GUARD RECEIVER FREQUENCY RESPONSE CHECK. To check frequency response of the guard receiver, repeat the procedure of the main receiver frequency response check (paragraph 5-17), with the signal generator and the radio set control adjusted to 243.0 mc, and the function switch set at T/R-G. If the audio output level at 300 cps is not within -1 to -3 db of the reference level (at 1000 cps), or the output at 4000 cps is not within -1 to -4 db of the reference level, refer to paragraph 5-32.

5-19. MAIN RECEIVER NOISE LEVEL CHECK. To check noise level of the main receiver, use equipment connections shown in figure 5-4 and follow the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R.

b. At the signal generator, set the frequency to 304.7 mc, with an output level of 10,000 microvolts, modulated 30 percent at 1000 cps. Record the audio output measured on the TS-585B/U.

c. At the audio oscillator, remove the modulation and again record the audio output. The decrease in audio output from a modulated input signal to an unmodulated input signal should not be less than 30 decibels. If the results of this check are unacceptable, refer to paragraph 5-32.

5-20. GUARD RECEIVER NOISE LEVEL CHECK. To check noise level of the guard receiver, repeat the procedure for the main receiver noise level check (paragraph 5-19), with the signal generator and radio set control adjusted to 243.0 mc and the function switch set to T/R+G. The decrease in audio output resulting from first measuring a modulated input and then an unmodulated input should not be less than 30 decibels. If the results of this check are unacceptable, refer to paragraph 5-32.

5-21. AUXILIARY AUDIO CHARACTERISTIC CHECK. To check characteristics of the auxiliary audio, connect an ME-6D/U a-c voltmeter to AUX OUTPUT jack J106 on Distribution Box J-995/ARM-38. Use all other connections shown in figure 5-4. Perform the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R.

b. At the signal generator, set the frequency to 304.7 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the audio output measured on the ME-6D/U. The auxiliary audio indication should be at least 0.25 volt.

c. At the audio oscillator, set the frequency to 70 cps; but maintain the 30 percent modulation of the signal generator output. Record the auxiliary audio output measured on the ME-6D/U. The audio output at the 70-cps modulation frequency should not vary by more than +2 to -3 decibels from the reference level 000 cps.

d. At the audio oscillator, set the frequency in turn to 200 cps, 4000 cps, and 7000 cps while maintaining 30 percent modulation of the signal generator output. Record the auxiliary audio output reading on the ME-6D/U for each frequency. At all three frequencies, the audio output should not vary more than +2 to -3 decibels from the 1000-cps reference level (0.25 volt). If the results of this check are unacceptable, refer to paragraph 5-32.

5-22. FINAL ADJUSTMENTS OF RECEIVER SYSTEMS. When all the minimum performance checks of the main receiver and the guard receiver have been completed satisfactorily, return both receivers to the normal operating condition. Use the equipment connections shown in figure 5-4 and perform the procedures given below.

a. At the radio set control, set MANUAL frequency control for 304.7 mc, and turn the function switch to T/R.

b Adjust the signal generator frequency to 304.7 mc a microvolts output, modulated with 400 cps.

c. Adjust the percentage of modulation until a 4-db signal plus noise to noise ratio is indicated on the TS-585B/U. At the audio amplifier, adjust S/N threshold control R407 (figure 5-3) for operation at this point.

d. Increase the signal generator output to 1000 microvolts, modulated 30 percent at 1000 cps. Adjust MAIN audio control R415 (figure 5-3) for a 250-milliwatt indication on the TS-585B/U.

e. Using the same signal generator input as in step d, set AUX audio control R431 for a 0.5-volt a-c indication on the ME-6D/U.

f. At the radio set control, rotate the function switch to T/R+G.

g. At the signal generator, set the frequency to 243.0 mc, with an output level of 5 microvolts, modulated 30 percent at 1000 cps. Adjust GUARD SENS control R1402 (figure 5-1) for point of operation where squelch takes over (no audio). This action will be indicated by a db drop on the TS-585B/U.

h. Increase the signal generator output to 1000 microvolts, modulated 30 percent at 1000 cps. At the audio amplifier, set GUARD audio level control R425 (figure 5-3) for a 250-milliwatt indication on TS-585B/U.

5-23. TRANSMITTER R-F POWER OUTPUT CHECK. To check r-f power output of the transmitter, connect the test equipment as shown in figure 5-5, and follow the procedures given below.

a. Connect R-F Wattmeter AN/URM-43A to antenna connector P1402.

b. At the radio set control, set MANUAL frequency controls for 225.0 mc and rotate the function switch to T/R. Actuate the press-to-talk switch on the microphone and record the power reading measured by the wattmeter. The power reading should be at least 16 watts.

c. At the radio set control, change the setting of the MANUAL frequency controls in increments of 10 mc from 225.0 mc to 399.9 mc. After each frequency change, actuate the microphone press-to-talk switch and record the power output indicated on the wattmeter. The power output shall not be less than 16 watts. If the results of this check are unacceptable, refer to paragraph 5-32. Disconnect the test equipment.

5-24. MODULATION FIDELITY CHECK. To check modulation fidelity, connect the test equipment as shown in figure 5-6 and follow the procedures given below.

a. Connect the dummy electrical load through a 10-foot length of RG-8/U coaxial cable from jack J4501 to antenna connector P1402 (figure 5-3) of the receiver-transmitter.

b. Connect a length of RG-8/U coaxial cable from jack J4502, J4503, or J4504 of the dummy electrical load to the vertical input (deflection plates) accessible at the rear of the oscilloscope.

c. Connect the audio oscillator to the microphone simulator that is connected to MIC jack J1404 (figure 5-1) of the receiver-transmitter. Adjust the audio oscillator frequency to 1000 cps and the gain for an amplitude of 0.5 volt (1.0 volt no-load) at the microphone simulator output.

d. Connect the TS-585B/U to the AUDIO connector of the dummy electrical load. Set the impedance switch on the TS-585B/U to the 300-ohm position.

e. At the radio set control, set the function switch to T/R and adjust MANUAL frequency controls to 304.7 mc.

f. At the modulator module, adjust modulation control R702 (figure 5-3) until the modulation pattern indicated on the oscilloscope barely reaches the clipping level.

NOTE

At this level the modulation should be between 80 and 95 percent. This level can be determined by measuring the vertical amplitude of the oscilloscope display pattern under cw and modulated carrier conditions.

g. At the audio oscillator, adjust the output to a level 3 db below the level required for clipping at 1000 cps, as indicated on the oscilloscope. Record the audio power indicated on the TS-585B/U. Use this reading as a reference level.

h. At the audio oscillator, adjust the modulating frequency progressively to the settings listed in table XIII. After each frequency change, note the indication on the

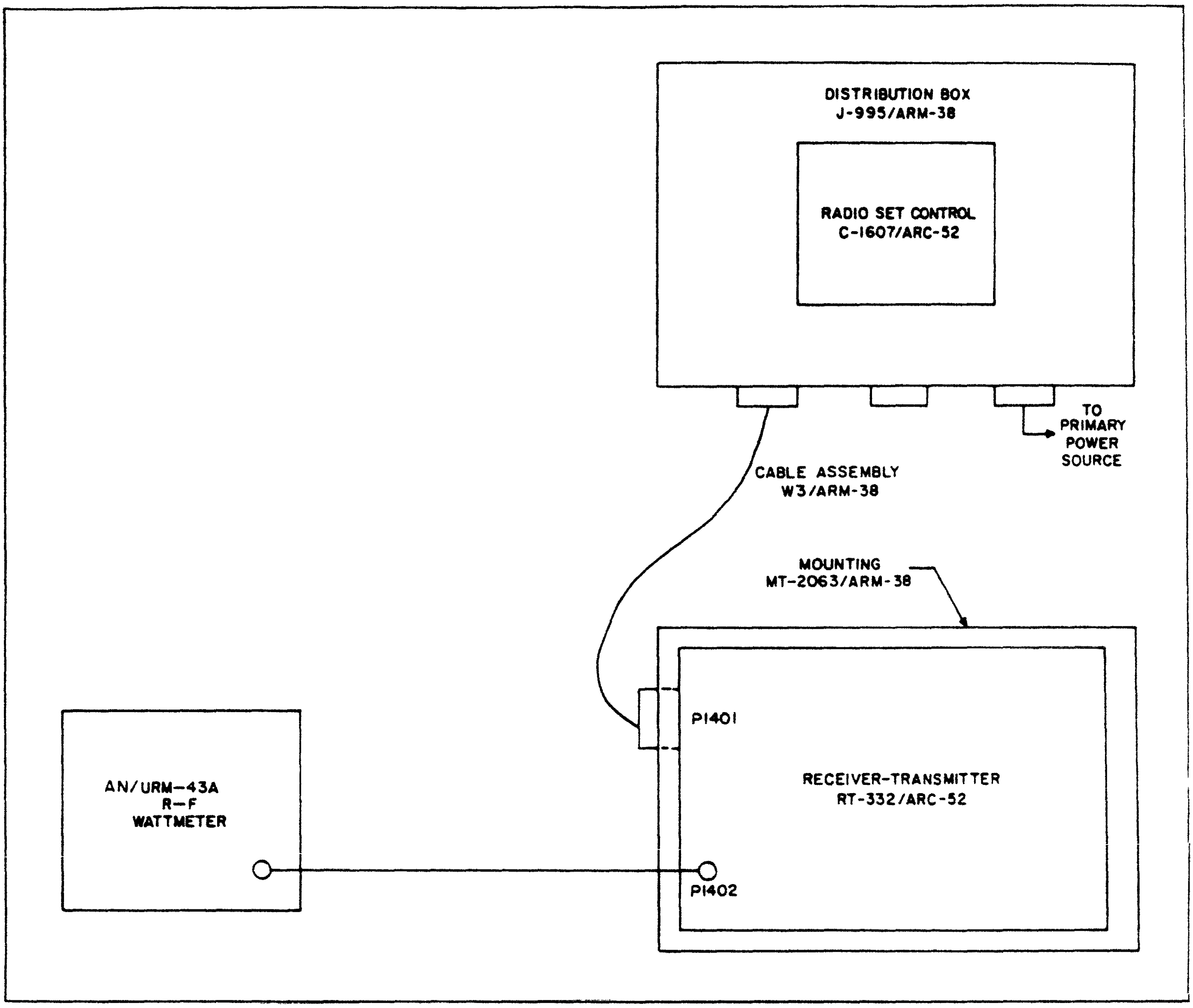


Figure 5-5. Transmitter Power Check, Test Setup

TS-585B/U. The db change, in reference to the db level at 1000 cps, indicates the fidelity characteristics of the transmitter and should be within the limits listed below. If the results of the check are unacceptable. refer to paragraph 5-32.

TABLE XIII. MODULATION FIDELITY TEST READINGS

FREQUENCY (cps)	RELATIVE LIMITS (decibels)
150	-8, or lower
300	-3 to -7
600	+1 to -2
1,000	zero
3,000	+2 to -2
6,000	+2 to -2
12,000	+1 to -5

5-25. TRANSMITTER DISTORTION CHECK. To check distortion of the transmitter, connect a distortion analyzer (TS-723A/U or equivalent) to the AUDIO connector of the dummy electrical load in place of the power meter illustrated in figure 5-6. Perform the procedures given below.

a. At the audio oscillator, adjust the output to a level 3 db below the level required for clipping at 1000 cps, as indicated on the oscilloscope.

b. Record the harmonic content indicated by the distortion analyzer. Harmonic content should not exceed 10 percent. Disconnect the distortion analyzer. If the results of this check are unacceptable, refer to paragraph 5-32.

5-26. MICROPHONE CURRENT CHECK. To check microphone current, use the equipment connections shown in figure 5-6 and input signals of paragraph 5-25a. Note the microphone current, which is measured at the microphone simulator. The current should be

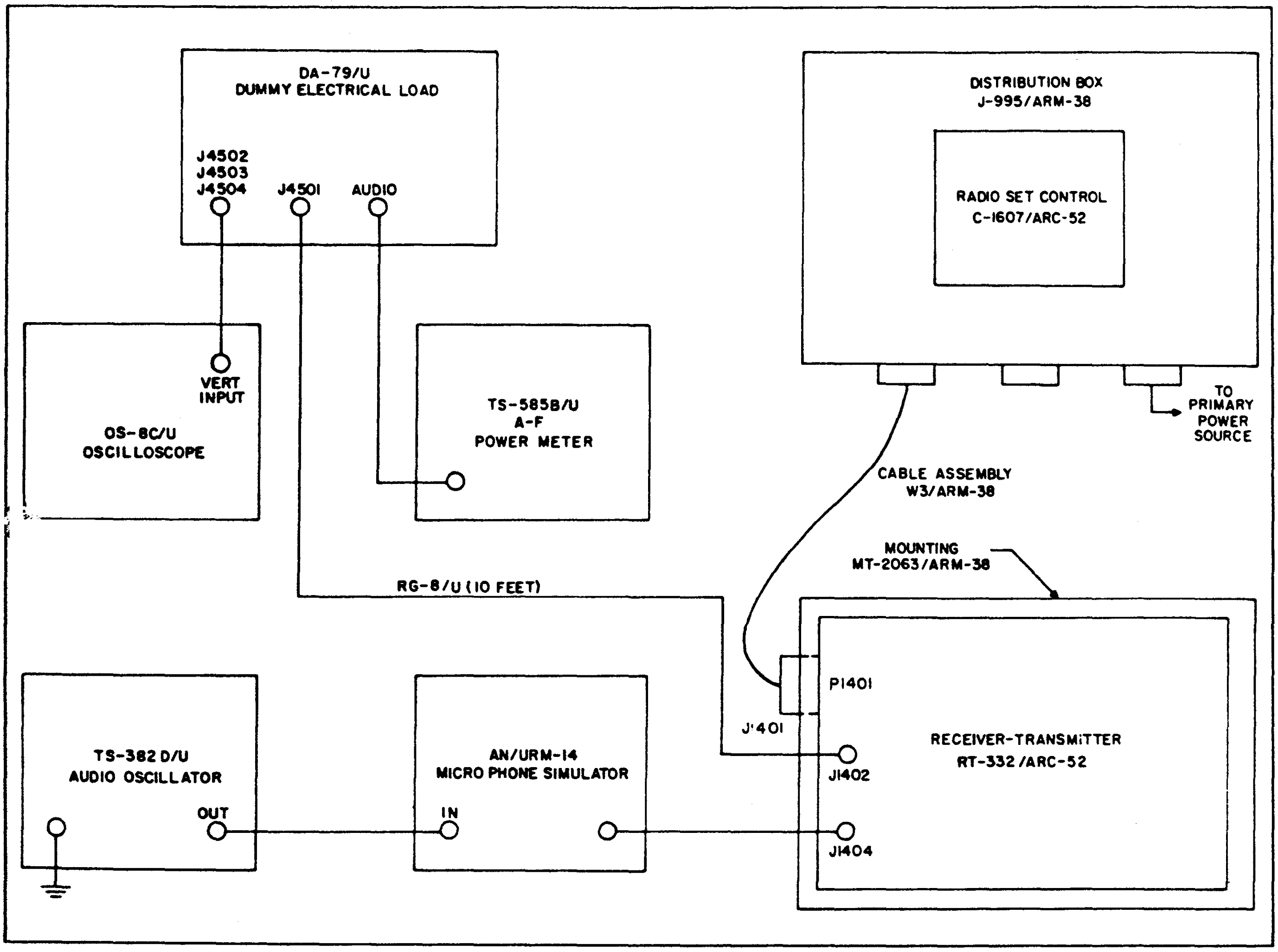


Figure 5-6. Modulation Fidelity Check, Test Setup

...thin the range of 43 to 57 milliamperes. If the results of this check are unacceptable, refer to paragraph 5-32.

5-27. TONE MODULATION CHECK. To check tone modulation, use the equipment connections shown in figure 5-6. Actuate TONE ON switch S103 on Distribution Box J-995/ARM-38. As indicated on the oscilloscope, the carrier should be modulated not less than 70 percent and the tone frequency should be between 920 and 1120 cps. Modulation level is determined by measuring the peak to peak and valley to valley amplitude on the oscilloscope. The formula is:

$$\frac{E_{max}-E_{min}}{E_{max}+E_{min}} \times 100 = \%\ \text{modulation}$$

If the results of this check are unacceptable, refer to paragraph 5-32.

5-28. FINAL ADJUSTMENTS OF TRANSMITTER. When all the minimum performance checks of the transmitter have been completed satisfactorily, return the equipment to normal operating condition by performing the procedures given below. Use the equipment connections shown in figure 5-6.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc and rotate the function switch to T/R. Actuate the tone switch on Distribution Box J995/ARM-38. Adjust S-T (sidetone) level control R418 (figure 5-3) for a 250-milliwatt indication on the TS-585B/U.

b. At the microphone simulator, set the frequency to 1000 cps with an output level of 0.5 volt (1.0 volt no-load amplitude). At the modulator module, adjust modulation gain control R702 (figure 5-3) to a level at which clipping just begins.

c. Disconnect the test equipment.

5-29. TEST COMPLETION. When all minimum performance tests indicate satisfactory results, perform steps a through f given below. When any test indicates unsatisfactory results, refer to paragraph 5-32.

a. Remove all power from the radio set.

b. Remove the receiver-transmitter from Mounting MT-2063/ARM-38.

c. Replace the receiver-transmitter chassis within its case, and tighten the 12 screws that are spaced around the outside edge of the front panel.

d. Secure the receiver-transmitter within the case.
e. Reestablish pressure inside the case from 3 to 5 psi with the pressurizing unit (see table VII).
f. Check case pressure with the air gage at the pressure valve on the front panel.

5-30. PRELIMINARY TROUBLE ANALYSIS.

5-31. When the radio set fails to operate properly and a cause is not immediately apparent, check as many of the items listed below as possible before starting a systematic operational check. Do not, however, disassemble the set for a complete inspection without making the following preliminary checks:
a. Check with the operator of the radio set to ascertain the cause of equipment failure or the trouble symptoms at the time of equipment failure.
b. Check the equipment mountings and the cable connections; do not overlook the obvious.
c. Operate all control knobs; do not, however, keep the equipment in operating condition when the possibility of a burned-out component exists. Check for overheating and for evidence of burning. If the radio set is completely dead, remove all power. If not, operate it in all possible modes to ascertain the extent of malfunction. If possible, use the radio set to communicate with the base control tower.
d. When the receiver-transmitter is removed from the pressurized case, check for the presence of all hardware; check all module mountings; check for the presence of damaged or deteriorated wiring. Check fuses and all connections.

5-32. SYSTEM TROUBLE ANALYSIS.

5-33. Symptoms of radio set malfunction may be caused by trouble within the receiver-transmitter, radio set control, aircraft power supplies, headsets, microphone, and/or auxiliary controls available at the pilot's instrument panel. Before starting any maintenance procedure on the radio set, make certain that the trouble actually is located in the receiver-transmitter or the radio set control, regardless of how obvious it may seem. Consistent with the existing tactical situation, operate the equipment in all possible modes; and monitor the outputs for each mode.

5-34. The ideal method of eliminating external equipment as a possible trouble source is to replace external equipment to see if the trouble disappears. If possible, substitute a new microphone, headset, tone switch, or new cables. If a replacement tone switch is not available, ground terminal T of the input to filter Z1401 (figure 5-7). Check other equipments on the aircraft to verify that the a-c and d-c power supplies are functioning properly. Do not start the trouble-shooting procedure by disassembling the equipment.

5-35. Test points of the radio set provide check points necessary for localizing trouble within the equipment to a system (e.g., transmitter) and, very often, to a module within the system. Once the trouble has been localized, connect test equipment according to the applicable test setup (figures 5-4, 5-5, or 5-6) and make the appropriate minimum performance check (paragraphs 5-6 through 5-29). The trouble shooting block diagrams (figures 5-8, 5-11, and 5-12) are a guide for localizing trouble within the radio set by signal substitution and continuity checks.

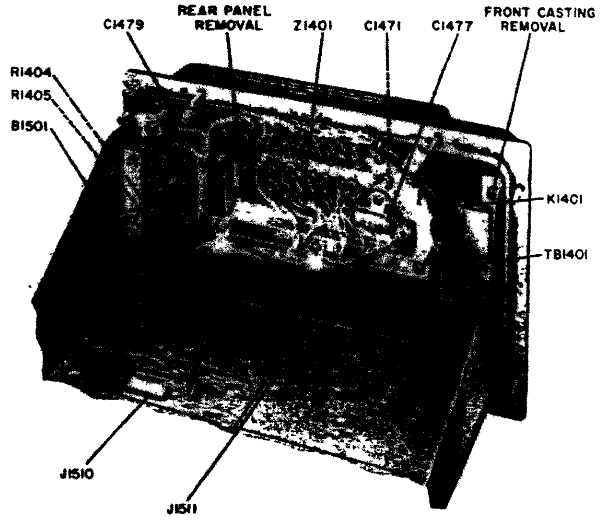


Figure 5-7. Receiver-Transmitter RT-332 ARC-52, Rear View of Front Panel

NOTE

Figures 5-9 and 5-10 are to be used with figure 5-8 when trouble-shooting Radio Set AN/ARC-52X or units containing modules manufactured under Contract NOas 57-478, serial numbers 1 through 90.

5-36. The system trouble isolation chart, table XIV, provides a check list that aids in localizing trouble to a functional system within the radio set, which comprises the following systems: power, injection frequency, main receiver, guard receiver, transmitter, and control. Each of these systems is contained in several modules that may be checked out by means of the test points. The checkout procedures follow the trouble analysis chart and are referenced in the chart.

NOTE

At an early stage in the trouble-shooting procedure, ascertain that the tie point connections of the main chassis correspond to the mode of operation. Refer to figures 3-1 and 3-2 for microphone connections, figures 3-3 and 3-4 for squelch connections, and figure 3-5 for normal sidetone - intercom connections.

5-37. REMOVAL AND REPLACEMENT.

5-38. Use the following procedures to remove and replace all modules requiring repair, replacement, or lubrication.

WARNING

High voltages are present at fuseboard E1501. Prior to removing any module, make certain that all power has been disconnected from the radio set. Do not place hands indiscriminately on the underside of the main chassis.

a. Unless the channeling system is defective, channel the radio set to 220.0 mc prior to removing any module having gear-driven, tuned circuits or the mechanical tuning unit.
b. Disconnect any r-f cables that are terminated at the module to be removed.
c. Loosen the captive screws that secure the module to the main chassis. The screws are accessible from the underside of the main chassis (figures 5-13 and 5-14).
d. Lift the module straight up from the main chassis until all connectors and couplers are pulled clear of the main chassis mating components.

CAUTION

Do not disturb the position of any exposed gears on the main chassis or on a particular module.

e. To replace a module, the mechanical tuning unit must be replaced first or be in place before replacing other gear-driven modules. When replacing a module having gear-driven tuned circuits, channel the radio set to 220.0 mc as a preliminary procedure. Adjust the Oldham coupler on the module so that the coupler guide pin is located over the silk-screened reference circle (refer to figure 5-21). On the spectrum generator and amplifier, a two-to-one ratio exists between the coupler and the tuned circuits. Therefore, synchronization is not applicable between the main chassis gear train and the coupler on the spectrum generator and amplifier. To ensure proper synchronization, determine that the green marker dot on the raised portion of the tuner shaft is nearest the 6J4 tubes and that the coupler guide pin is located over the reference circle.

CAUTION

When replacing the spectrum generator and amplifier, failure to synchronize properly the spectrum generator and amplifier with the main chassis will result in damage to the USN7609 power amplifier tube. Observe the replacement procedure in step e.

f. To ensure proper mesh between the main chassis couplers and the couplers of those modules having gear-driven tuned circuits, the module shaft is slotted and the main chassis gear is hollow. Insert a screwdriver into the slotted section of the module shaft, gaining access through the main chassis gear. Rotate the screwdriver back and forth through small angular displacements until the two couplers mesh. Energize the radio set and channel the equipment to 399.9 mc. This step synchronizes the gear trains of the module and the main chassis.
g. Perform in reverse order steps b and c.

5-39. MINOR REPAIRS.

5-40. GENERAL. Minor repairs that may be performed on radio set AN/ARC-52 at the organizational level are limited to the replacement of pilot lamps, fuses, and certain tubes. Any repairs other than these replacement procedures are beyond the scope of organizational maintenance.

5-41. PILOT LAMP REPLACEMENT. The two pilot lamps of the equipment are located on the radio set control. Access to either lamp is gained by removing the covering lens. Replace defective pilot lamp with a good lamp, Mazda 327.

5-42. FUSE REPLACEMENT. Fuses used in the equipment are mounted on fuseboard E1501 (figures 5-13 and 5-14), located on the underside of the receiver-transmitter. Replacement fuses are mounted adjacent to the fuseboard.

5-43. TUBE REPLACEMENT. Tubes that are accessible, when the receiver-transmitter is removed from the pressurized case or when a module is removed from the main chassis, may be replaced at the discretion of the organizational maintenance repairman. If access to a tube requires dismantling of any module, the tube must be replaced at field maintenance level. (Refer to section VI.)

5-44. LUBRICATION.

5-45. Lubrication instructions for all the modules of RT-332/ARC-52 and RT-424/ARC-52X are presented in table XV, and lubrication points are illustrated in figures 5-15 through 5-29. These procedures should be performed only on those detail parts that obviously require lubrication. If any detail part is clean and well lubricated, do not apply lubricant. If the detail part is dry or dirty, clean the detail part with dry-cleaning solvent made up of 70% Fed. Spec P-S-661a, 25% ANA Spec AN-M-37, and 5% Fed. Spec O-T-236. Dry the part with compressed air and apply the specified lubricant as instructed below. When performing these procedures, check all setscrews and clamps for secure fitting. Schedule these procedures after each 1000-hour operating period.

CAUTION

Overlubrication may cause serious damage to the equipment. Wipe excess lubrication from exposed equipment immediately after application. Take care not to saturate any electrical insulation, windings, or rubber with lubricant. Do not saturate switches; apply one drop of oil to each switch listed in the table.

NOTE

Clean and lubricate the detail parts specified in table XV, in accordance with conventional cleaning and lubricating procedures.

5-46. INSPECTION SCHEDULE.

5-47. Assemblies of the radio set that require regular inspection are listed in table XVI. Make the inspections at the designated intervals; always check for wear, deterioration, looseness of mountings, dirt, corrosion, and satisfactory lubrication in addition to the inspection specified in table XVI.

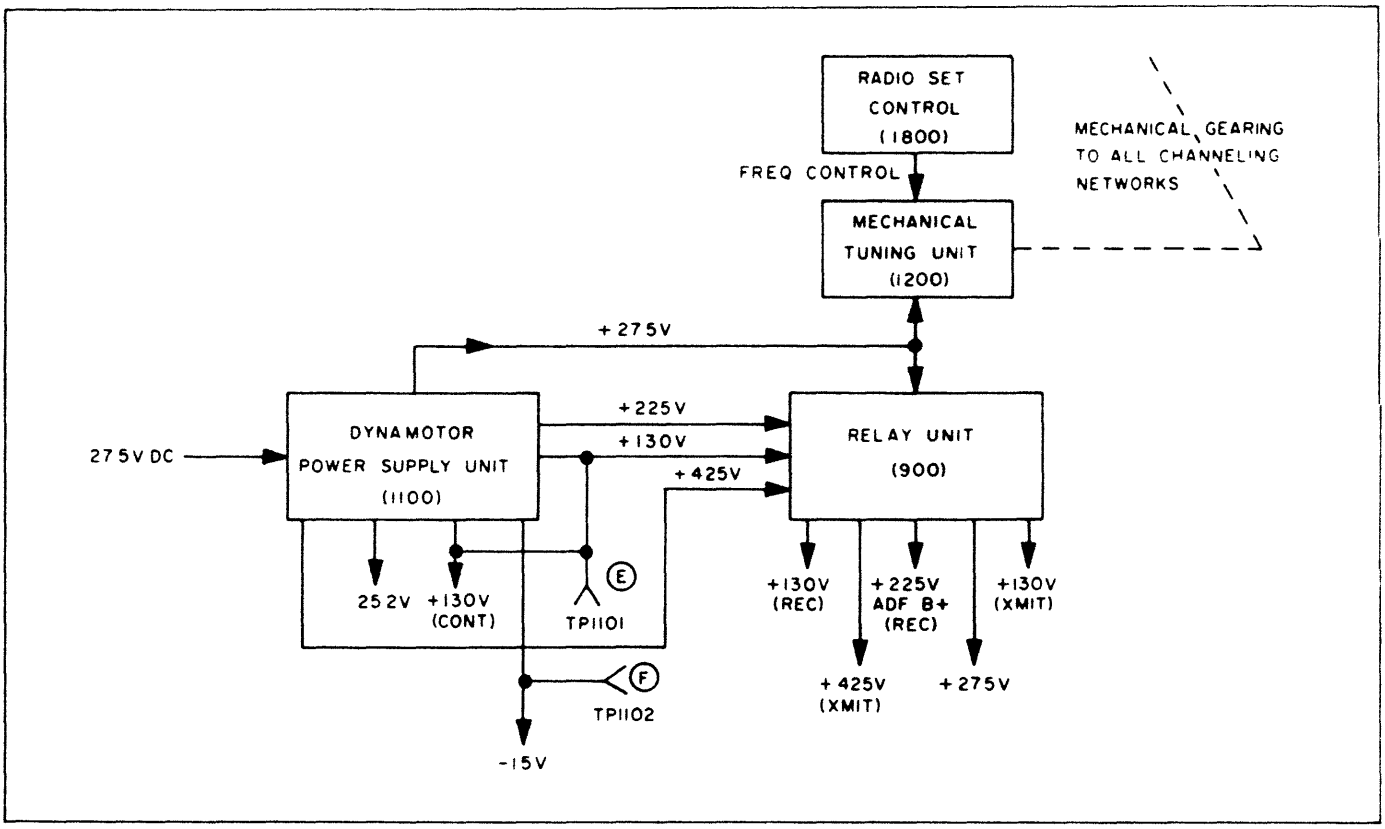


Figure 5-9. Power and Control Modules of Receiver-Transmitter RT-424/ARC-52X. Block Diagram

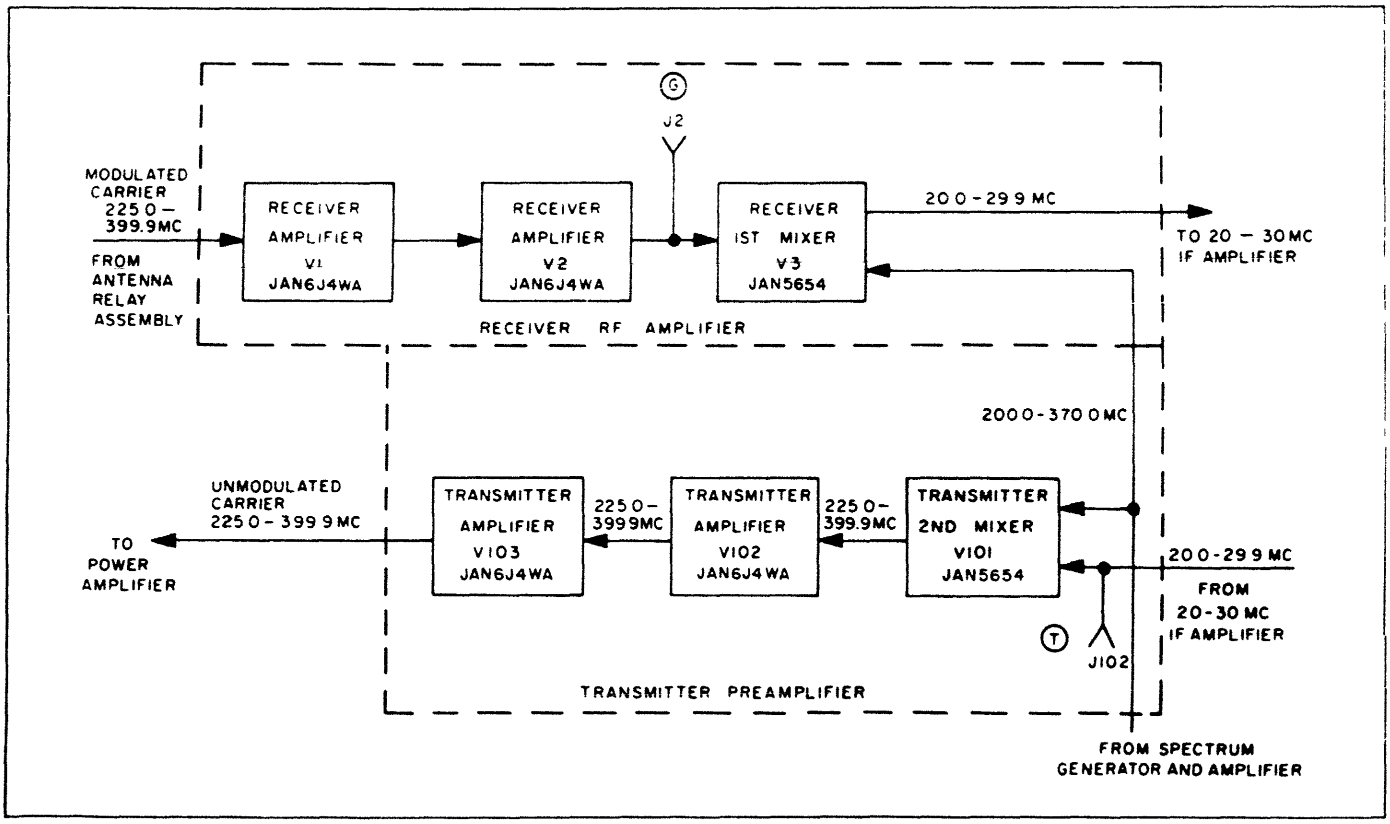


Figure 5-10. Receiver R-F Amplifier and Transmitter Preamplifier (Contract NOas 57-478. Serial Numbers 1-90). Block Diagram

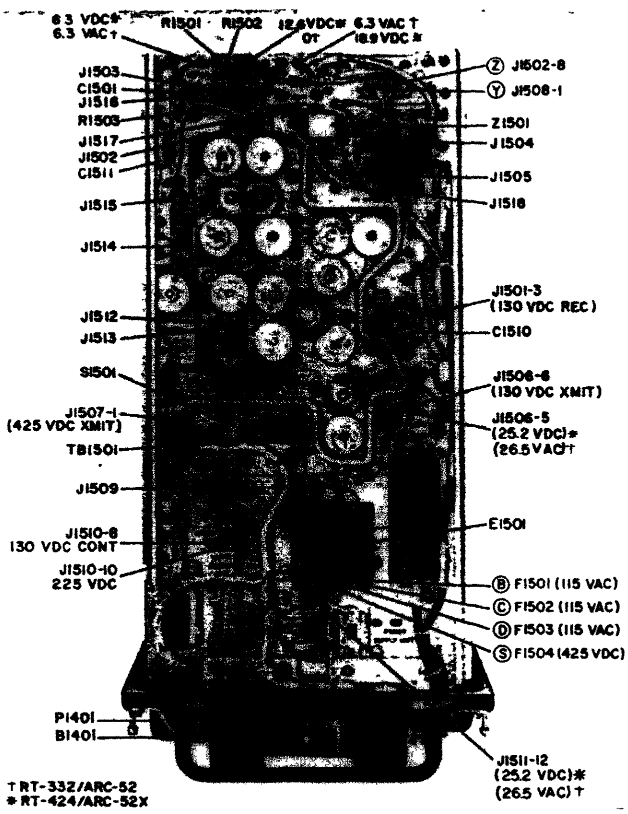


Figure 5-13. Main Chassis Receiver-Transmitter RT-424/ARC-52X and Receiver-Transmitter RT-332/ARC-52

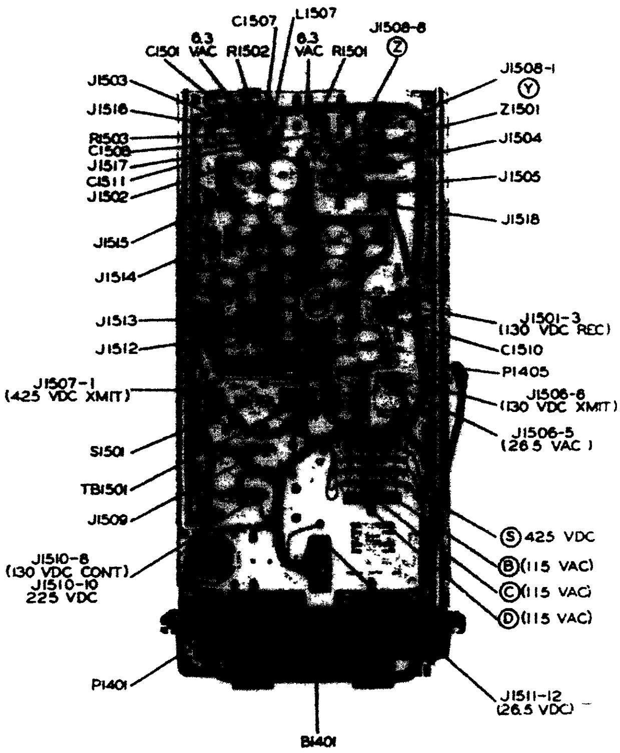


Figure 5-14. Main Chassis Receiver-Transmitter RT-332/ARC-52

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Visual check	None.	Turn on panel light control at pilot's instrument panel.	Panel lights go on	Proceed to step 2.	Adjust panel light control. Replace panel lights. Check applicable circuits between pilot's instrument panel and panel source. Repair in accordance with instructions issued with that equipment

TABLE XIV SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
2	Headsets	None.	Operate radio set in conformance with normal operating procedures.	Main audio and guard audio present at normal level.	Complete minimum performance checks (paragraph 5-6) prior to returning radio set to service.	Follow instructions of applicable note (notes 1 through 11) below to localize malfunctioning circuit to a single module.

NOTE

1. MAIN RECEIVER AND TRANSMITTER INOPERATIVE. The procedures contained in part I of this table are used to localize a trouble within a "dead" radio set (one which neither transmits nor receives). A dead radio set may be caused by a defective power circuit or frequency injection system. Since a malfunctioning system may be caused by a defective power supply component, always perform the procedures of part I. following.

2. MAIN RECEIVER INOPERATIVE. If no main audio is present (with signal input), proceed to part II and check out main receiver circuits.

3. MAIN RECEIVER SENSITIVITY LOW. If main audio is present (with signal input) but the sensitivity is low (see minimum performance standards checks, paragraph 5-9). proceed to part II(a) and check out main receiver circuits.

4. GUARD RECEIVER INOPERATIVE If no guard audio is present (with signal input) proceed to part III and check out guard receiver circuits.

5 GUARD RECEIVER SENSITIVITY LOW. If guard audio is present (with signal input) but sensitivity is low (see minimum performance standards checks, paragraph 5-10). proceed to part III(a) and check out the guard receiver and its cabling.

6. FREQUENCY GENERATING CIRCUITS INOPERATIVE If no injection signal is monitored at test point (T) or (L) with radio set in the receive condition, proceed to part IV and check the injection-frequency generation circuits.

7. TRANSMITTER INOPERATIVE If no power is indicated at antenna connector P1402 with the radio set in the transmit condition. proceed to part V and check out transmitter circuits

8 TRANSMITTER OUTPUT LOW If transmitter power output is present but low (see minimum performance standards checks, paragraph 5-23). proceed to part V(a) and check out transmitter circuits.

9 CONTROL CIRCUITS MALFUNCTION If the tuning mechanism does not run. runs continuously, or runs erratically, proceed to part VI and check out the control circuits.

10. Although all checks shown in this chart are performed with the radio set at 225.0 mc. other frequencies may be used. If the radio set is malfunctioning only at a specific frequency setting, the checks should be made at this frequency. For each specific frequency to which the radio set may be tuned, the required signal generator output frequency may be calculated for application directly to the 20- to 30-mc i-f amplifier at jack J1518. This calculation is made by adding 20 mc to the last two digits of the specific frequency indicated on the radio set control To illustrate, when this frequency is 304.7 mc. the required 20- to 30-mc i-f frequency is 4.7 - 20 - 24.7 mc. The injection frequency necessary for step 49 may be calculated by adding 1.85 mc to the 20- to 30- i-f frequency.

11 Whenever a transceiver checks out or has been restored to an operating condition, perform the minimum performance checks (paragraphs 5-6 through 5-29) prior to assigning a tactical status to the equipment.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
Part I (See note 1 at beginning of chart.) MAIN RECEIVER AND TRANSMITTER INOPERATIVE						
3	Ⓐ J1405	D-c voltmeter.	Set frequency controls to 225.0 mc, and function switch to T/R.	-27.5 volts.	Proceed with step 4.	Take d-c voltmeter reading across capacitor C1479 (figure 5-7). If indication normal check power unit relay K1101. If indication at C1479 abnormal, check +27.5-volt power supply, interconnecting power cable, and capacitor C1479.
† 4	Ⓑ Fuseboard E1501	A-c voltmeter.	Same as step 3.	114 volts to 116 volts.	Proceed with step 5.	Proceed with step 5.
† 5	Ⓒ Fuseboard E1501	A-c voltmeter.	Same as step 3.	114 volts to 116 volts.	Proceed with step 6.	Proceed with step 6.
† 6	Ⓓ Fuseboard E1501	A-c voltmeter.	Same as step 3.	114 volts to 116 volts.	Proceed with step 7.	If one phase only is abnormal, replace single fuse. If test point Ⓑ reading is abnormal, replace F1501; if test point Ⓒ reading is abnormal, replace F1502; and if test point Ⓓ reading is abnormal, replace F1503. If replacement fuse blows, check circuit for shorts.

† RT-332/ARC-52 only.
*RT-424/ARC-52X only.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
6 (Cont)						If all fuses are good, check output at X, Y and Z on Z1401 filter (figure 5-7). If readings taken at test points Ⓑ, Ⓒ, and Ⓓ are abnormal, check power cable and power source.
7	Filament voltage tie points (figures 5-13 and 5-14)	†A-c voltmeter. *D-c voltmeter.	Same as step 3.	†6.3 volts ac. *6.3 volts. *12.6 volts. *18.9 volts. *25.2 volts.	Proceed with step 8.	Trouble is in power unit or module filament circuits. Perform procedures of steps 8 and 9, and then make continuity checks necessary to localize trouble.
8	Filament voltage tie points (figures 5-13 and 5-14	†A-c voltmeter. *D-c voltmeter.	Same as step 3.	†6.3 volts ac. *6.3 volts. *12.6 volts. *18.9 volts. *25.2 volts dc.	Proceed with step 9.	Refer to step 7.
9	Filament voltage tie points (figures 5-13 and 5-14.	†A-c voltmeter. *D-c voltmeter.	Same as step 3.	†26.5 volts ac. *6.3 volts. *12.2 volts. *18.9 volts. *25.2 volts dc.	Proceed with step 10.	Refer to step 7.

†RT-332/ARC-52 only.
*RT-424/ARC-52X only.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
10	(E) †J1001 *TP1101	D-c voltmeter.	Same as step 3.	+130 volts.	Proceed with step 11.	Replace rectifier unit. (RT-332/ARC-52 only) or dynamotor power supply (RT-424/ARC-52X only).
11	(F) †J1102 *TP1102	D-c voltmeter.	Same as step 3.	-13.5 volts to -15.0 volts.	Proceed with step 12.	Replace rectifier unit (RT-332/ARC-52 only) or dynamotor power supply (RT-424/ARC-52X only).
12	Pin 21, J1509 (figures 5-13 or 5-14	D-c voltmeter.	Same as step 3.	+130 volts (dc).	Proceed with step 13.	Replace relay unit.
13	Pin 18, J1509 (figures 5-13 or 5-14	D-c voltmeter.	Actuate press-to-talk switch	+130 volts (xmit).	Proceed with step 14.	Replace relay unit.
14	(L) J202	D-c voltmeter.	Same as step 3.	-1.0 volt, minimum.	Proceed with step 15.	Proceed to part IV, step 39.
15	(T) J3	D-c voltmeter.	Same as step 3.	-1.0 volt, minimum.	If indications listed in all previous steps are normal, and trouble is a "dead" radio or an inoperative main receiver, proceed to step 16; otherwise, proceed to the section of the chart covering the type of trouble as defined by the notes at the beginning of the chart.	

†RT-332/ARC-52 only.
*RT-424/ARC-52X only.

NOTE

The procedures of part II (steps 16 through 23) presuppose that the power circuits (steps 3 through 15) have been checked out, that the transmitter and frequency injection circuits are operative, and that sidetone audio is present.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTING AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
Part II - (See note 2 at beginning of chart.) MAIN RECEIVER INOPERATIVE						
16	HEADSET jack J108 on J-995/ ARM-38	Connect audio oscillator, signal generator, and a-f power meter to radio set as shown in figure 5-4. Adjust test equipment to output of 225.0 mc at 1000 uv modulated 30% at 1000 cps.	Set frequency controls to 225.0 mc, and function switch to T/R. Rotate S N threshold control R407 (figure 5-3) fully clockwise. Rotate MAIN audio control R415 (figure 5-3) to midposition. Rotate MAIN SENS control R1401 (figure 5-1) fully clockwise.	Presence of audio.	Check out antenna and antenna cable external to antenna connector P1402	Proceed with step 17
17	Ⓜ J1406	Same as step 16. Connect d-c voltmeter to test point.	Same as step 16.	Indication of avc voltage.	Trouble is in audio portion of 1.85-mc i-f amplifier, audio amplifier, or cable connecting both modules Remove signal generator and connect wattmeter to connector P1402. Proceed with step 18.	Trouble is between antenna connector P1402 and detector of 1.85-mc i-f amplifier. Proceed with step 20 unless transmitter and guard receiver circuits are also abnormal In latter event, proceed with step 23
18	HEADSET jack J108 on J-995 ARM-38	Same as step 16, except disconnect signal generator input from P1402.	Same as step 16 and actuate press-to-talk switch. Speak into microphone.	Sidetone audio present.	Trouble is in audio squelch circuits of audio amplifier or audio section of 1.85-mc i-f amplifier. Proceed with step 19 to localize trouble between the two modules.	Replace audio amplifier
19	Ⓝ J401	Test equipment of step 16, and a-c voltmeter to test point.	Same as step 16.	Audio indication.	Replace audio amplifier.	Replace 1.85-mc i-f amplifier.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTING AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
20	Ⓜ J1406	Connect d-c voltmeter to test point, and connect signal generator to P301. Adjust signal generator to 1.85 mc, 1000-uv output modulated 30% at 1000 cps.	Same as step 16.	Indication of avc.	Reconnect P301 and proceed with step 21.	Trouble is in 1.85-mc i-f amplifier.
21	Ⓜ J1406	Connect signal generator to connector P201. Adjust signal generator to 25 mc, 1000 uv output modulated 30% at 1000 cps. Maintain d-c voltmeter connection to test point.	Check that frequency controls are set at 225.0 mc.	Indication of avc.	Reconnect P201 and proceed with step 22.	Replace 20- to 30-mc i-f amplifier.
22	Ⓜ J1406	Connect signal generator to connector J1. Adjust signal generator to 225.0 mc, 1000-uv output modulated 30% at 1000 cps. Maintenance d-c voltmeter connection to test point.	Same as step 21.	Indication of avc voltage.	Reconnect P1503 and proceed with step 23.	Replace receiver r-f amplifier and transmitter preamplifier.
23	Ⓜ J1406	Test equipment of step 16, but reconnect signal generator to antenna connector P1402.	Same as step 21.	Indication of avc voltage.	Complete minimum performance checks (paragraph 5-6) prior to returning equipment to service.	Check out circuits between antenna connector P1402 and receiver r-f amplifier. These include antenna relay K1401 assembly and cables.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
NOTE The procedures of part II(a), steps 24 through 32, presuppose that the power circuits have been checked out and that the transmitter circuits are operative.						
Part II(a) - (See note 3 at beginning of chart.) MAIN RECEIVER SENSITIVITY LOW						
24	HEADSET jack J108 on J-995/ ARM-38	Connect audio oscillator, signal generator and a-f power meter to radio set as shown in figure 5-4, except that output of signal generator will be connected to J1 after removing the main receiver-preamplifier module cover. Adjust test equipment output to 225.0 mc at 5 microvolts modulated 30% at 1000 cps.	Set frequency controls to 225.0 mc and function switch to T/R. Rotate S/N threshold control R407 (figure 5-3) fully clockwise. Rotate MAIN SENS control R1401 (figure 5-1) fully clockwise.	10 db signal-plus-noise to noise ratio.	Check out coaxial T-cable and coaxial antenna relay K1401.	Proceed to step 25.
25	HEADSET jack J108 on J-995/ ARM-38	Same as step 24 except adjust signal generator to 25.0 mc at 5 microvolts, modulated 30% at 1000 cps. Connect signal generator to J1518.	As in step 24.	10 db signal-plus-noise to noise ratio.	Proceed to step 26.	Proceed to step 30.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
26	(T) J3	D-c voltmeter (no signal input).	As in step 24.	-1.0 volt minimum.	Reconnect test equipment as in step 24. Increase signal generator output to obtain -1.0 volt AVC at TP (M). Channel the radio set to 399.9 mc and trim C1, C2, C3 and C4 for maximum (negative) AVC voltage at TP (M). Rechannel the radio set to 225.0 and repeat step 24. If indication is still abnormal, check the cathode voltages of V1. V2, V3 and V4 (see table XVIII). If any of the voltages are abnormal, replace the tube and retrim C1, C2, C3 and C4 as above. If indication is still abnormal, replace main receiver-preamplifier module.	Proceed to step 27 to check the cable connecting spectrum generator and amplifier module to the main receiver-preamplifier module.
27	None	Connect ohmmeter from center conductor of cable at plug P2 to cathode of V7.	Remove all power. Disconnect P2 from J1519.	Zero resistance.	Proceed to step 28.	Replace defective coaxial cable between P2 and cathode of V7.
28	None	Connect ohmmeter from center conductor of cable at plug P1507 to center conductor of cable at P1506.	Remove jumper cable (with P1506 on one end and P1507 on the other) between J1519 and J501.	Zero resistance.	Check J1519 first and replace if necessary. Proceed to step 29.	Replace defective coaxial cable between J1519 and J501.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
29	Ⓗ	D-c voltmeter.	As in step 24.	-7.0 volts minimum.	Check out spectrum generator and amplifier tubes V503, V504 and V505 and replace if necessary. Repeat procedures of step 26.	Replace spectrum generator and amplifier module.
30	Ⓛ J202	D-c voltmeter.	As in step 24. No signal input.	-1.0 volt minimum.	Proceed to step 31.	Proceed to step 32.
31	HEADSET jack J-108 on J-995/ARM-38	Same as step 24, except connect signal generator to J1516. Adjust signal generator to 1.85 mc at 10 microvolts output, modulated 30% at 1000 cps.	As in step 24.	15 db signal-plus-noise to noise ratio.	Proceed to step 32.	Replace 1.85-mc i-f amplifier module.
32	Ⓛ J202	Connect d-c voltmeter to the test point and signal generator to jack J1515 through a 0.01-uf capacitor. **CAUTION** Do not operate equipment without the d-c blocking capacitor. Adjust the signal generator to 26.85 mc at 0.2 volts rms input level.	As in step 24.	-1.0 volt minimum.	Replace oscillator module.	Replace 20-30-mc i-f amplifier module.

NOTE

The procedures of part III (steps 33 and 34) presuppose that power circuits have been checked out (part I) and that the main receiver and transmitter circuits are operative.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
Part III(a) - (See note 4 at beginning of chart.) GUARD RECEIVER INOPERATIVE						
33	Ⓟ J402	Connect audio oscillator and signal generator to connector P1402 as shown in figure 5-4. Connect a-c voltmeter across test point. Adjust test equipment for a 1000-uv signal at 243.0 mc modulated 30% at 1000 cps.	Set function switch to T/R+G. Rotate GUARD audio gain control R425 (figure 5-3) fully clockwise. Rotate GUARD SENS control R1402 (figure 5-1) fully clockwise.	3.0 volts ac, minimum.	Perform minimum performance checks (paragraphs 5-6 through 5-29).	Proceed with step 34.
34	Ⓟ J402	Connect signal generator output to connector P802. Maintain all other test equipment conditions.	Same as step 33.	Presence of audio.	Check coaxial T cable that terminates input at connector P802.	Replace guard receiver.
NOTE The procedures of part III(b), step 35, presuppose that power circuits have been checked out and that the main receiver and transmitter circuit are operative.						
Part III(b) - (See note 5 at beginning of chart.) GUARD RECEIVER SENSITIVITY LOW						
35	HEADSET jack J108 on J-995/ARM-38	Connect audio oscillator, signal generator and a-f power meter as shown in figure 5-4, except signal generator will be connected to P802, guard cable. Adjust test equipment for a 5-microvolt signal at 243.0 mc modulated 30% at 1000 cps.	Set function switch to T/R+G. Rotate GUARD SENS control R1402 fully clockwise (figure 5-1).	10 db signal-plus-noise to noise ratio.	Check out coaxial cable.	Replace guard receiver.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
NOTE The procedures of part IV (steps 36 through 39) presuppose that power circuits have been checked out (part I), and that failure within the frequency injection circuits prevents the proper operation of the main receiver and the transmitter circuits.						
Part IV - (See note 6 at beginning of chart.) FREQUENCY GENERATING CIRCUITS INOPERATIVE						
36	(T) J3	D-c voltmeter.	Set frequency controls to 225.0 mc, and function switch to T/R.	-1.0 volt spectrum drive.	Proceed with step 38.	Proceed with step 37 to check cable connecting spectrum generator and transmitter preamplifier.
37	None	Connect ohmmeter from center conductor of cable at plug P2 to cathode of V7.	Remove all power. Disconnect plug P2 from jack J1519.	Zero resistance.	Repeat step 28 and if necessary step 29.	Replace defective cable between P2 and cathode of V7.
38	(L) J202	D-c voltmeter.	Same as step 36.	-1.0 volt oscillator drive.	Trouble is not in injection frequency system. Repeat procedures of step 2.	Proceed with step 39.
39	(L) J202	Connect d-c voltmeter to test point and connect signal generator through 0.01-uf capacitor to jack J1515. Adjust signal generator to 26.85 mc at 0.3 to 0.5 V rms input level. **CAUTION** Do not operate equipment without d-c blocking capacitor.	Same as step 36.	-1.0 volt.	Replace oscillator.	Replace 20-to 30-mc i-f amplifier.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
NOTE The procedures of part V (steps 40 through 45) presuppose that power circuits have been checked out, and that the main receiver, guard receiver, and frequency injection circuits are operative.						
Part V - (See note 7 at beginning of chart.) TRANSMITTER INOPERATIVE						
40	Ⓢ Fuse-board E1501	D-c volt-meter.	Set frequency controls to 225.0 mc, function switch to T/R, and actuate tone switch on J-995/ARM-38.	+425 volts.	Proceed with step 41.	Remove power and replace fuse. If replacement fuse blows, check for shorts in +425-volt load. If replacement fuse does not remedy condition, check out +425-volt supply through relay unit.
41	P1402	R-f watt-meter.	Same as step 40.	16 watts to 30 watts.	Proceed with step 42.	Proceed with step 45.
42	J1403 HEADSET jack	Connect headset to test point, microphone to J1404, r-f watt-meter to P1402.	Same as step 40. Actuate press-to-talk switch. Speak into microphone.	Sidetone audio present.	Proceed with step 43.	Indicates fault in sidetone or modulator circuits. Proceed with step 44.
43	J1403 HEADSET jack	Same as step 42.	Same as step 40. Actuate TONE switch J-995/ARM-38.	Sidetone audio present.	Complete minimum performance checks (see paragraph 5-6) prior to returning equipment to service.	Replace modulator module.
44	Tapped point on dummy load.	Connect audio oscillator, microphone simulator, dummy load, oscilloscope and a-f power meter as for modulation check (see figure 5-6). Adjust audio oscillator to 1000 cps at 1.0 volt (open circuit).	Same as step 40. Use press-to-talk switch and not TONE switch.	Modulation pattern on oscilloscope.	Indicates fault is in sidetone circuit. After repairing, check by repeating step 42. NOTE The portion of the sidetone circuit located in the audio module can be checked by replacement of the module.	Replace modulator module.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
45	J602 (output of power amplifier)	Connect wattmeter to test point after disconnecting plug P1405 from J602.	Same as step 40.	16 watts to 30 watts.	Indicates fault is between P1402 and P1405. Proceed with step 46.	Proceed with step 47.
46	J1526	Connect wattmeter to test point after disconnecting plug P609 from J1526.	Same as step 40.	16 watts to 30 watts.	Replace coaxial antenna relay.	Replace 400 mc filter FL605.
47	Ⓥ J603	To test equipment of step 45, add d-c voltmeter to test point.	Same as step 40.	-20 volts grid drive.	Replace power amplifier tube V603. If no power output with new USN7609 tube, replace power amplifier.	Proceed with step 48 to check output of transmitter preamplifier. NOTE To avoid excessive power dissipation in power amplifier, remove fuse F1504.
48	J2 (output of transmitter preamplifier)	Connect milliwattmeter to test point after disconnecting plug P1504 from jack J2.	Same as step 40.	0. 15 watt output from transmitter preamplifier.	Replace power amplifier tubes V601 and V602. If this does not correct trouble, check cable connecting power amplifier to transmitter preamplifier. If trouble persists, replace power amplifier.	Proceed with step 49.
49	Connector P205	Connect milliwattmeter to P205.	Same as step 40.	30-milliwatt output from 20- to 30-mc i-f amplifier.	Replace transmitter preamplifier tubes V5, V6 and V7; and repeat procedures of step 48. If results are still abnormal, replace transmitter preamplifier.	Replace 20- to 30-mc i-f amplifier.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
NOTE The procedures of part V(a) (steps 50 through 53) presuppose that power circuits have been checked out and that the main receiver and guard receiver circuits are operative.						
Part V(a) - (See note 8 at beginning of chart.) TRANSMITTER OUTPUT LOW						
50	J602	Connect wattmeter to J602 after disconnecting plug P1405.	Set frequency controls to 225. 0 mc, function switch to T/R, and actuate mike press-to-talk switch or TONE switch.	16 watts minimum.	Check out coaxial output cable, 400-mc filter FL605, and coaxial antenna relay K1401. (See steps 45 and 46.)	Proceed with step 51.
51	(V) J603	D-c voltmeter.	Same as step 50.	-20 volts grid drive minimum.	Replace V603. Perform adjustments of C627 and C615 as given in paragraph 6-123(e) and (f). Rechannel radio to 225. 0 mc and repeat step 50. If indication is still abnormal replace power amplifier module.	Proceed with step 52.
52	J2 Output of preamplifier	Connect milliwattmeter to J2 (P1504 disconnected).	Remove power from the radio set and remove the 425v B+ fuse F1504. Turn radio on and set up for step 50.	0. 15 watt output from transmitter preamplifier.	Replace V601 and V602. Rechannel radio set to 399. 9 mc. Key radio set and trim C609 and C611 for maximum voltage at TP (V). Rechannel radio set to 225. 0 mc and repeat step 50. If indication is still abnormal, check microdot cable between J2 and J601. If trouble persists, replace power amplifier module.	Proceed with step 53.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
53	Plug P205	Connect milli-wattmeter to P205.	Same as step 50. (F1504 is still removed.)	30 milliwatt output from 20- to 30-mc i-f amplifier.	Rechannel radio to 399.9 mc. Actuate mike press-to-talk switch and trim C5, C6, and C7 for maximum voltage at TP (V). Rechannel radio set to 225.0 mc and repeat step 50. If indication is still abnormal, replace V5, V6 and V7, trim C5, C6 and C7 as above, and repeat step 50. If indication is still abnormal, replace main receiver-preamplifier module. For preamplifier modules produced under Contract NOas 57-478, serial numbers 1 through 90, use the same procedure and trim C117, C116, and C115. Replace V103, V102 and V101.	Replace the 20-30-mc i-f amplifier.
NOTE The procedures of part VI (steps 54 through 56) presuppose that power circuits have been checked out (part I) and that the trouble symptoms have been localized to the control circuits.						
Part VI - (See note 9 at beginning of chart.) CONTROL CIRCUITS MALFUNCTION						
54	None	None.	Replace radio set control. Channel radio set throughout tuning range to determine that equipment operates satisfactorily.	Radio set continues to set up at selected frequency.	Repair original radio set control.	Trouble is in either mechanical tuning unit or interconnecting cabling. Proceed with step 55.

TABLE XIV. SYSTEM TROUBLE ISOLATION CHART (Cont)

STEP	TEST POINT	TEST EQUIPMENT	RADIO CONTROL SETTINGS AND INSTRUCTIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
55	None	None.	Replace mechanical tuning unit. Channel radio set throughout tuning range to determine that equipment operates satisfactorily.	Radio set continues to set up at selected frequency.	Repair original mechanical tuning unit.	Trouble exists in cabling between radio set control and mechanical tuning unit.
56	Jacks J1512, J1513, and J1801	Ohmmeter.	Remove radio set control and mechanical tuning unit. Using figure 3-7 as a reference, check cabling between radio set control and receiver-transmitter: using figures 7-1, 7-2, and 7-3 as a reference, check cabling to mechanical tuning unit. NOTE Open circuit usually is indicated by radio setting up to improper frequency. Short circuit usually is indicated by continuous channeling at some or all frequencies.			

TABLE XV. LUBRICATION INSTRUCTIONS

COMPONENT	PART	REFERENCE	LUBRICANT SPECIFICATION	METHOD OF APPLICATION
Transmitter preamplifier	Gear teeth	1. figure 5-15	MIL-G-3278	Brush
	Ball bearing	2. figure 5-15	MIL-L-6085A	Dropper
	Inductor	3. figure 5-15	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper

TABLE XV LUBRICATION INSTRUCTIONS (Cont)

COMPONENT	PART	REFERENCE	LUBRICANT SPECIFICATION	METHOD OF APPLICATION
Receiver r-f amplifier	Gear teeth	1, figure 5-16	MIL-G-3278	Brush
	Ball bearing	2, figure 5-16	MIL-L-6085A	Dropper
	Inductor	3, figure 5-16	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
Spectrum generator and amplifier	Gear teeth	3, figure 5-17	MIL-G-3278	Brush
	Gear teeth	3, figure 5-18	MIL-G-3278	Brush
	Brushing	4, figure 5-17	MIL-L-6085A	Dropper
	Bushing	4, figure 5-18	MIL-L-6085A	Dropper
	Ball bearing	5, figure 5-17	MIL-L-6085A	Dropper
	Switches and inductors	6, figure 5-17	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
	Switches and inductors	6, figure 5-18	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
	Shaft	7, figure 5-7	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
20- to 30-mc i-f amplifier	Sleeve bearings	7, figure 5-19	MIL-L-6085A	Dropper
	Sleeve bearings	7, figure 5-20	MIL-L-6085A	Dropper
	Sleeve bearings	7, figure 5-21	MIL-L-6085A	Dropper
	Cam followers	8, figure 5-19	MIL-L-6085A	Dropper
Oscillator	Sleeve bearings	9, figure 5-22	MIL-L-6085A	Dropper
	Switch contacts	10, figure 5-22	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
Power amplifier	Gear teeth	11, figure 5-23	MIL-G-3278	Brush
	Gear teeth	11, figure 5-24	MIL-G-3278	Brush
	Tuner shaft bearings	12, figure 5-24	MIL-L-6085A	Dropper
	Roller shaft	13, figure 5-23	MIL-L-6085A	Dropper
	Idler hubs and shaft sleeve bearings	14, figure 5-23	MIL-L-6085A	Dropper
	Sliding contacts of variable inductors	15, figure 5-24	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper

TABLE XV. LUBRICATION INSTRUCTIONS (Cont)

COMPONENT	PART	REFERENCE	LUBRICANT SPECIFICATION	METHOD OF APPLICATION
Power amplifier (Cont)	Sliding contacts of variable inductors.	15, figure 5-25	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
	Shaft	16, figure 5-24	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
Mechanical tuning unit	Gear teeth and hubs	16, figure 5-26	MIL-G-3278	Brush
	Gear teeth and hubs	16, figure 5-27	MIL-G-3278	Brush
	Sleeve bearings and cam followers	17, figure 5-26	MIL-L-6085A	Dropper
	Sleeve bearings and cam followers	17, figure 5-27	MIL-L-6085A	Dropper
	Switches	18, figure 5-26	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
	Switches	18, figure 5-27	10 parts MIL-G-3278 45 parts Butyl alcohol 45 parts Xylene	Dropper
Mechanical tuning unit	Pawl pins and tips, detent wheel notches, relay arm and springs	19, figure 5-26	MIL-G-3278	Brush
	Pawl pins and tips, detent wheel notches, relay arm and springs	19, figure 5-28	MIL-G-3278	Brush
Main chassis gear plate	Gear teeth	20, figure 5-29	MIL-G-3278	Brush
	Drive gear bearings	21, figure 5-29	MIL-L-6085A	Dropper
	Idler gear hubs	22, figure 5-29	MIL-G-3278	Brush

TABLE XVI. INSPECTION SCHEDULE

COMPONENT	INSPECTION	TIME
Equipment mountings	Determine that mountings are secure.	Preflight

TABLE XVI. INSPECTION SCHEDULE (Cont)

COMPONENT	INSPECTION	TIME
Cable connections	Determine that cable connections are secure.	Preflight
Transmitter	Perform transmitter power output check (paragraph 5-23).	Preflight
Receiver	Establish contact with radio control tower. Transmit and receive on at least six different frequency channels.	Preflight
Over-all radio set	Minimum performance standards checks (paragraphs 5-6 through 5-29).	120 hours
Mechanical detail parts	Lubrication procedures (table XV).	1000 hours

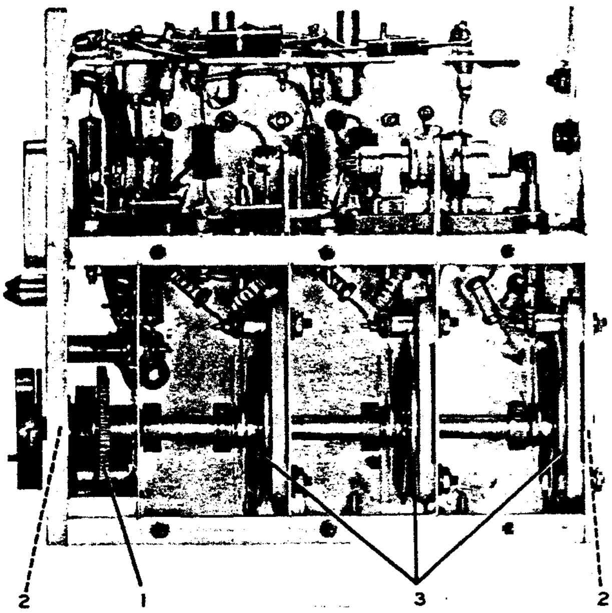


Figure 5-15. Transmitter Preamplifier, Lubrication Points

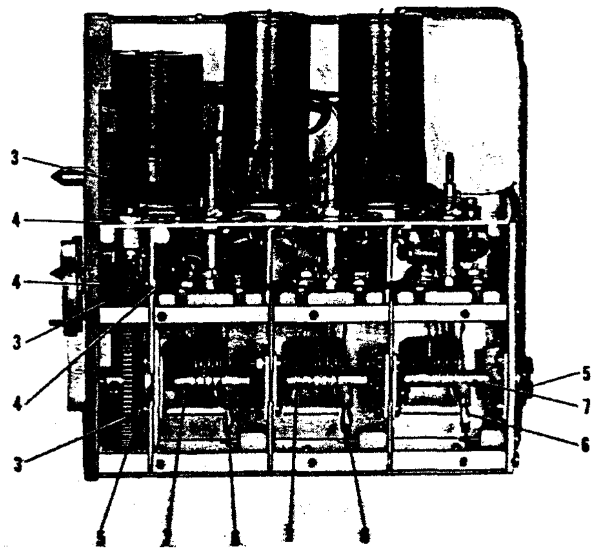


Figure 5-17. Spectrum Generator and Amplifier, Side Lubrication Points

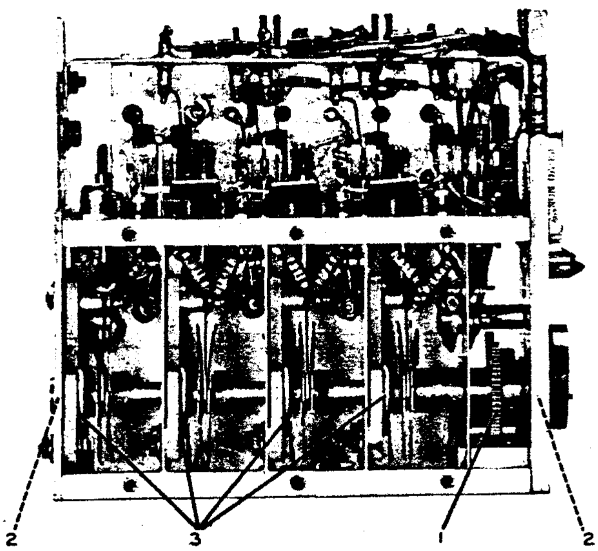


Figure 5-16. Receiver R-F Amplifier, Lubrication Points

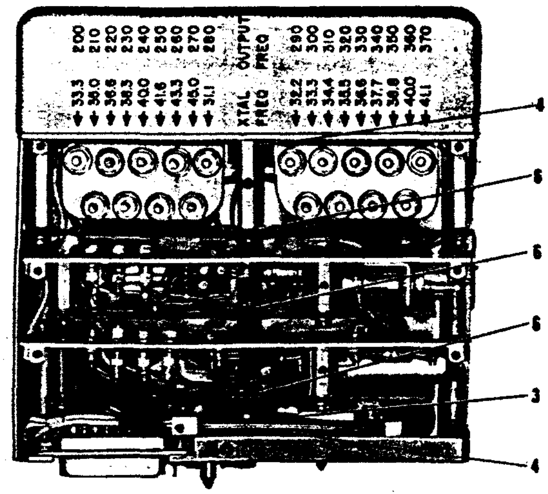


Figure 5-18. Spectrum Generator and Amplifier, Bottom Lubrication Points

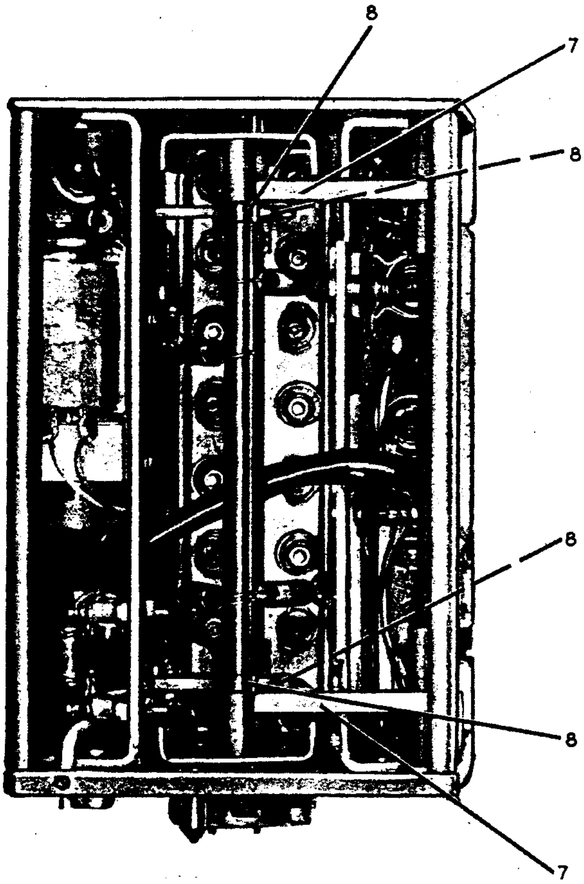


Figure 5-19. 20- to 30-Mc I-F Amplifier, Side Lubrication Points

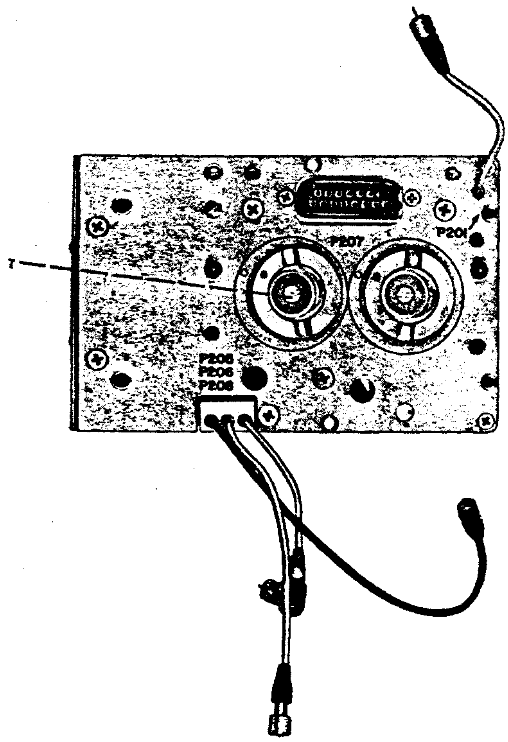


Figure 5-21. 20- to 30-Mc I-F Amplifier, Bottom Lubrication Points

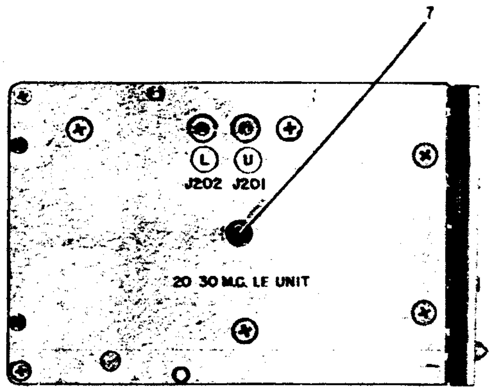


Figure 5-20. 20- to 30-Mc I-F Amplifier, Top Lubrication Points

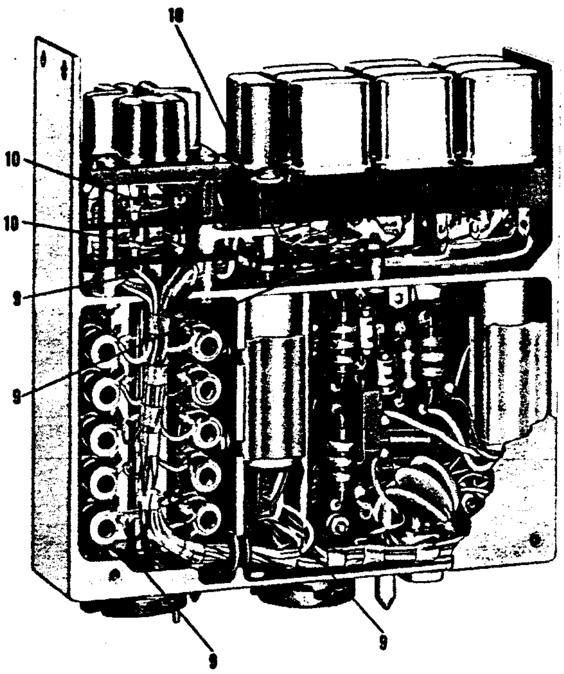


Figure 5-22. Oscillator, Lubrication Points

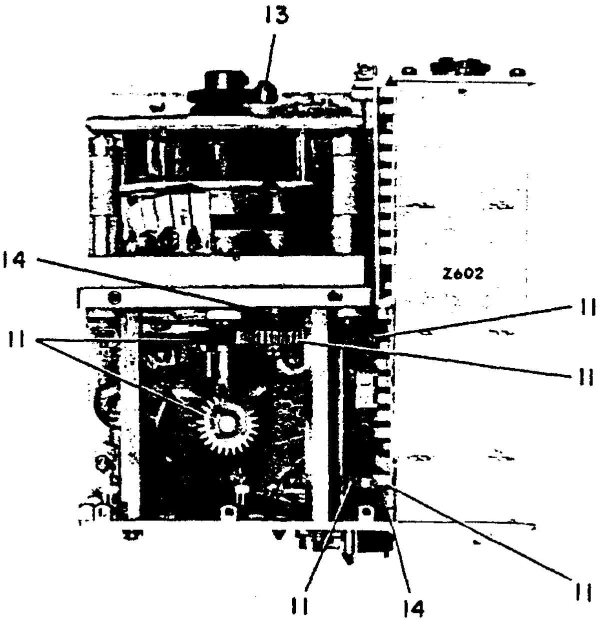


Figure 5-23. Power Amplifier, Side Lubrication Points

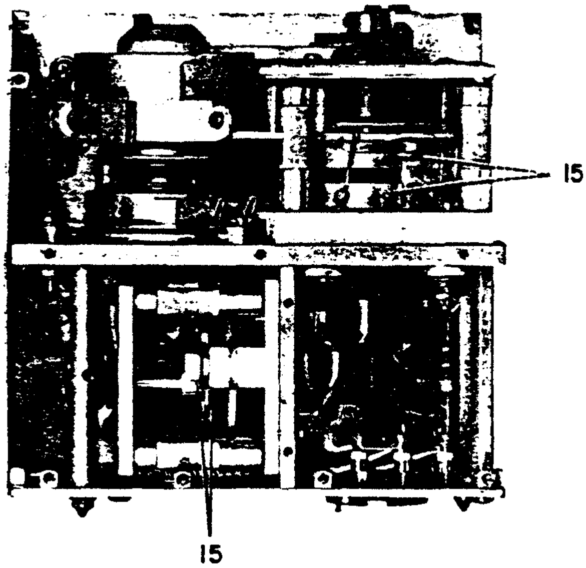


Figure 5-25. Power Amplifier, Front Lubrication Points

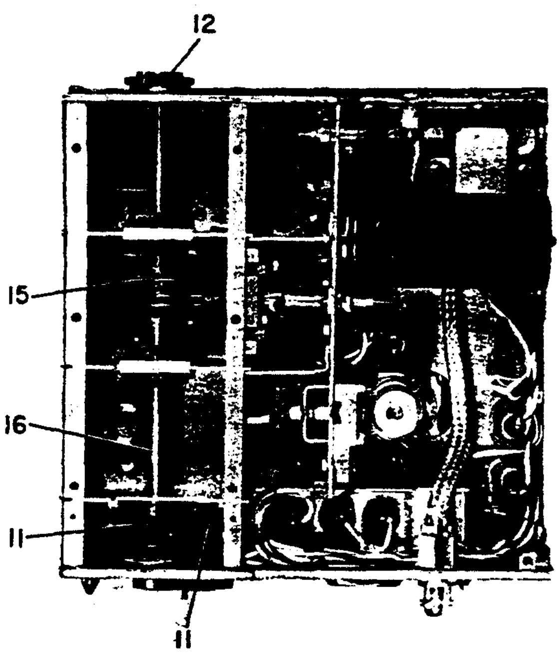


Figure 5-24. Power Amplifier, Rear Lubrication Points

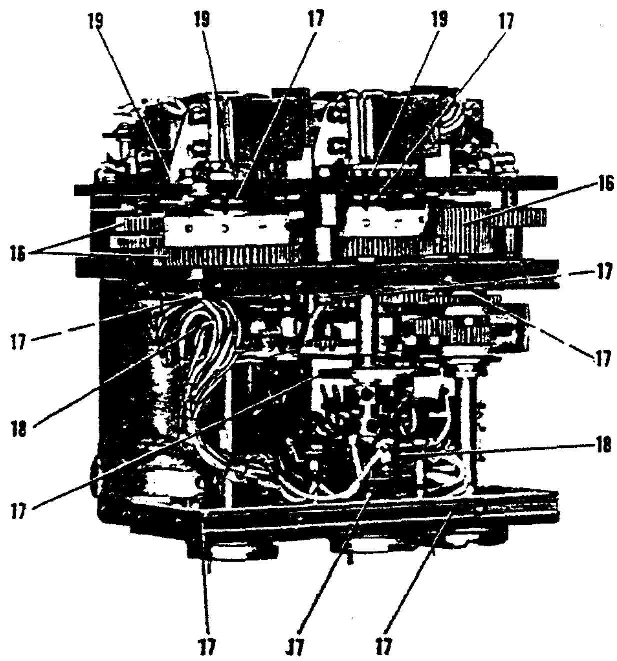


Figure 5-26. Mechanical Tuning Unit, Lubrication Points, Left Rear View

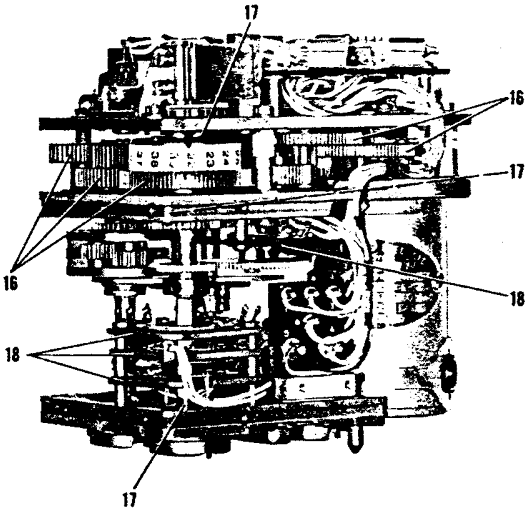


Figure 5-27. Mechanical Tuning Unit, Lubrication Points, Right Front View

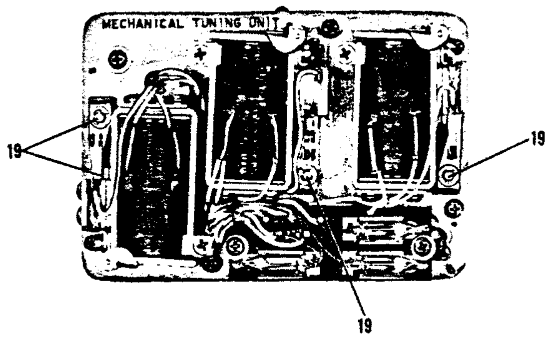


Figure 5-28. Mechanical Tuning Unit, Lubrication Points, Top View

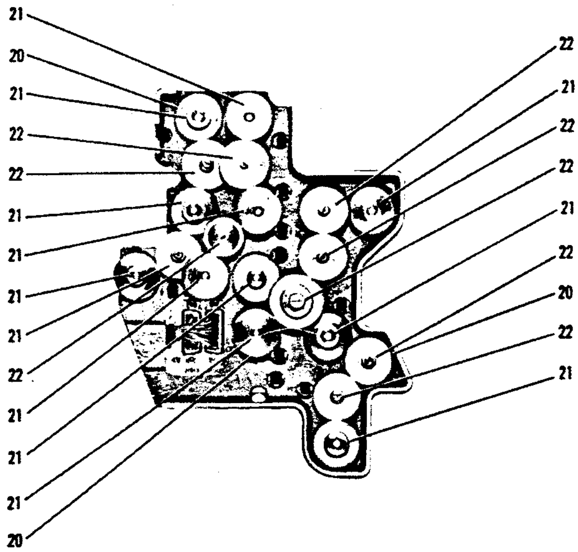


Figure 5-29. Receiver-Transmitter Main Chassis Gear Plate, Lubrication Points

SECTION VI

FIELD MAINTENANCE

6-1. GENERAL.

6-2. Field maintenance includes all the procedures outlined for organizational maintenance (section V), but does not include the disassembly and repair procedures normally associated with overhaul. (Refer to the AN/ARC-52 handbook of overhaul instructions for the complete maintenance procedures of the mechanical detail parts.) This section assumes that organizational maintenance procedures (section V) have localized a trouble to a particular module, a main chassis component, or the radio set control. Field maintenance procedures, therefore, pertain to the isolation of a trouble within a module, main chassis, or radio set control known to be defective. Further, the instructions within this section presuppose that only the assembly under test is defective and that all associated equipment is operating normally.

NOTE

Associated equipment refers to Radio Set Test Harness AN/ARM-38 (paragraph 2-5) or to a properly operating radio set that is used in this section as a source of power, input, and load for components under test. This auxiliary radio set is referenced in this section as the "test radio set."

6-3. If the organizational maintenance procedures of section V have not localized the defective module, eliminate properly functioning units by substitution. This substitution is accomplished by removing one module at a time from the defective radio set and installing it in the test radio set. When the defect of the initial radio set has been transferred to the test radio set, the trouble source has been localized to the module just substituted.

6-4. GENERAL TROUBLE-SHOOTING PROCEDURES.

6-5. General trouble-shooting procedures are those steps that are applicable to more than one module of the radio set.

6-6. Perform a visual check of the equipment to determine whether the cause of trouble is evident. Check any tags that may accompany the equipment for indications from a lower maintenance echelon concerning the trouble symptoms. Prepare to test the defective module by removing the appropriate module from the test radio set (paragraph 6-7) and substituting the defective one (paragraph 6-8). Perform the applicable minimum performance checks and trouble-shooting procedures, as described throughout this section, upon the defective module. Replace any defective part and, as necessary, perform printed circuit-board maintenance (paragraph 6-9) or replace feedthrough capacitors (paragraph 6-10).

6-7. Prepare the defective module for field maintenance using those units of Radio Set Test Harness AN/ARM-38 that provide the appropriate testing facilities. (Refer to paragraph 5-37 for the standard module replacement procedure, and to paragraph 2-5 for the equipment complement and application of the AN/ARM-38.

6-8. For illustrative purposes, assume the defective module is the receiver r-f amplifier section of the receiver r-f amplifier and transmitter preamplifier module; and perform the following steps:

a. Remove the receiver r-f amplifier and transmitter preamplifier module from the test radio set.

b. Mount the defective module on r-f amplifier Maintenance Fixture MT-2060/ARM-38.

c. Install the maintenance fixture on the main chassis of the test radio set in place of the removed module

NOTE

Figure 6-1 illustrates the receiver i-f amplifier and transmitter preamplifier prepared for field maintenance; all gear-driven modules are installed in the same manner. Refer to section II of this handbook or to the service instructions issued with the AN/ARM-38 to determine which maintenance fixture and/or cables are used with a specific radio set component.

6-9. PRINTED CIRCUIT BOARD MAINTENANCE. An epoxy resin coating covers detail parts on printed circuit boards within receiver-transmitter. To remove a detail part, first remove coating around part. After a detail part has been replaced, new epoxy resin coating (Collins part number 005-0308-00) must be applied to securely bond part to board for protection against vibration. The procedure used to remove and apply protective coating is described in the following steps. Typical coating materials are illustrated in figure 6-2.

a. Using a soldering iron, destroy the epoxy resin coating over the part to be removed.

CAUTION

Make certain that applied heat is localized to the immediate area around the part to be removed. Make certain that the part is mechanically free of the board and adjacent items before unsoldering. Do not attempt to pry or tear the part free from its bonded or soldered connection points. Failure to observe this caution can result in weakening the board assembly and damage to the bonded security of adjacent items.

b. When the resin has been properly and thoroughly removed from the detail part, unsolder the electrical connections to it.

c. Allow cooling of the board to normal ambient temperature. Thoroughly clean the soldered connection

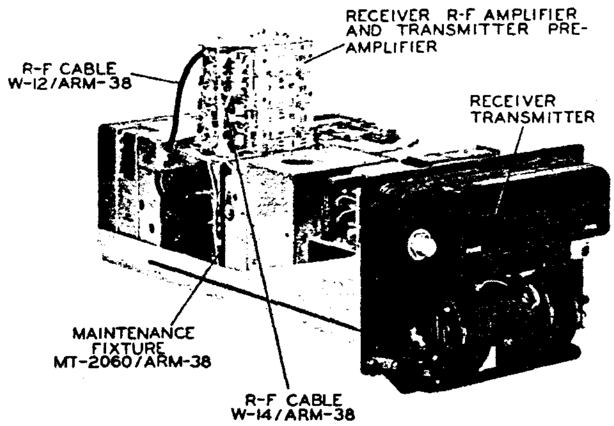


Figure 6-1. Typical Installation of Module for Field Maintenance Checks

points using trichlorethylene, Federal Specification O-T-634.

WARNING

Use trichlorethylene sparingly in a well ventilated area. Avoid breathing fumes. Keep the chemical covered when not actually in use.

d. Use a new detail part to replace the removed item. Make certain that the replacement part has the correct part number.

e. Solder the new part in place using solder, Federal Specification QQ-S-571, in accordance with the highest requirements of Specification MIL-S-6872.

f. To secure the newly installed parts apply epoxy re(, Specification MIL-R-21931 in accordance with the standard procedures prescribed for its use.

CAUTION

Make certain that application of new coating overlaps and blends into the remaining resin in adjoining areas to produce a smooth uniform coating of all items.

6-10. FEEDTHROUGH CAPACITOR REPLACEMENT. Feedthrough capacitors may be replaced by means of a modified solder gun. Clip off the solder point leaving two closely spaced prongs. (This renders the solder gun useless until the circuit is completed across the two prongs.) Bend the prongs so that the distance between the prongs is barely wide enough to straddle the capacitor. When the gun is energized with the heating prongs straddling the capacitor, a complete circuit is provided through the module chassis. The current thus drawn is sufficient to heat the chassis in the area about the capacitor. This heat is sufficient to melt the solder, and the capacitor may thus be removed.

CAUTION

Do not permit the module chassis to get hotter than the level required to melt the solder.

6-11. RECEIVER R-F AMPLIFIER. (For Serial Numbers 1-90. Contract NOas 57-478, see paragraph 6-21.)

6-12. MINIMUM PERFORMANCE CHECKS. The minimum performance checks of table XVII provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XVIII. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

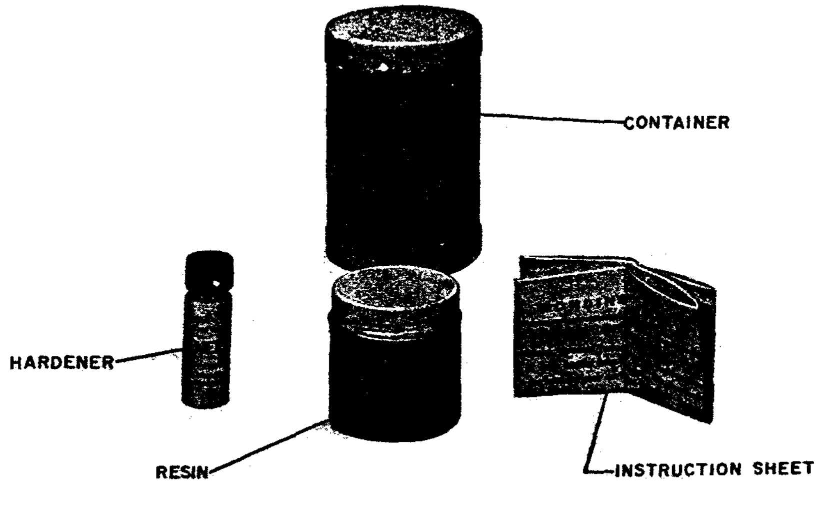


Figure 6-2. Bonding Agent for Printed Circuit Board Maintenance

TABLE XVII. RECEIVER R-F AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
HEADSET jack J108	J-995/ARM-38	Main receiver sensitivity.	With an r-f signal input to the antenna of 5 uv, modulated 30% at 1000 cps, signal-plus-noise to noise ratio of audio output at J108 should be 10 db minimum. (Refer to paragraph 5-9 for detailed procedure of check.)

TABLE XVIII. RECEIVER R-F AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
With no signal input, less than 0.3 volt is measured at the cathode of V1 (figure 6-4).	V1 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XIX).
With no signal input, less than 0.45 volt is measured at the cathode of V2 (figure 6-4).	V2 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XIX).
With no signal input, less than 0.45 volt is measured at the cathode of V3 (figure 6-4).	V3 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XIX).
With no signal input, less than 1.1 volt is measured at the cathode of V4 (figure 6-4).	V4 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XIX).
Voltage measured at cathodes of V1, V2, V3 and V4 is too low.	Defective V1, V2, V3 or V4.	Replace the defective tube.
	High resistance connection due to position of tube in socket.	Reposition tube in socket.

NOTE

Refer to table XII for conditions of receiver r-f amplifier test point checks.

6-13. TROUBLE SHOOTING. Check all the module tubes to make certain that the tubes are operative and that they are the specified types (see figures 6-3 and 7-4). Remove the cover plate to expose the rear of the module (figure 6-4). Check tank circuits Z1, Z2, Z3 and Z4 over the entire tuning range to determine that the tuning capacitor rotor blades do not short against the stators. Also, verify that each inductance arm makes contact with the corresponding inductance ring over the entire tuning range (figure 6-4). Manually rotate the gear train counter and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Check all detail parts for evidence of burning or shorts. If the visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table XVIII.

NOTE

The procedures of table XVIII are an extension of the minimum performance check chart (table XVII); both tables should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XVIII. Voltage and resistance measurements are listed in table XIX.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately set the function switch to OFF.

6-14. REMOVAL. The following removal procedures permit access to detail parts. Removal and disassembly procedures of the module gear train are given in the handbook of overhaul instructions for Radio Set AN/ARC-52.

a. Remove module side covers.

b. Remove the following cable connectors: P1507 from jack J501, P3 from jack J1518, P4 from jack J1517, P1503 from jack J1, and P1504 from jack J2.

c. Remove the module from the main chassis or maintenance fixture as described in paragraph 5-37.

d. Tubes may be removed by pulling on the grid ring (figure 6-4).

CAUTION

After module is removed from main chassis, care must be taken to prevent binding of the tuner shaft.

REPLACEMENT. With the equipment disassembled, check the tuner shaft gear for broken or scarred teeth. Where necessary, clean the mechanical detail parts with a small brush moistened in cleaning solvent. After making any detail part replacements required, reassemble the module by reversing the removal procedure (paragraph 6-14). Make certain that the tuner shaft gear actually meshes with the idler gear (figure 6-4). Synchronize the receiver r-f amplifier and transmitter preamplifier (paragraphs 6-16 and 6-17). Check the tuned circuits for resonance at several points along the band (paragraph 6-18); retrack, if necessary.

6-16. SYNCHRONIZATION. Check synchronization of the receiver r-f amplifier tuned circuits with those of the transmitter preamplifier as described in steps a through d below. When the conditions of steps a through d are satisfied, omit steps e through i, which describe the procedure for synchronization. Mount the receiver r-f amplifier and transmitter preamplifier on Maintenance Fixture MT-2060/ARM-38. If the MT-2060/ARM-38 is not available, the power amplifier and the spectrum generator and amplifier modules must be removed to permit access to the receiver r-f amplifier and transmitter preamplifier.

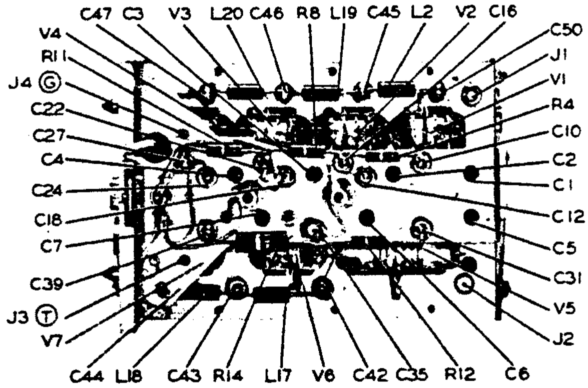


Figure 6-3. Receiver R-F Amplifier and Transmitter Preamplifier, Left Side View

NOTE

The transmitter preamplifier and the main chassis gear train are in synchronization; the receiver r-f amplifier removal procedures have not affected this status. Do not rotate the gear train couplers.

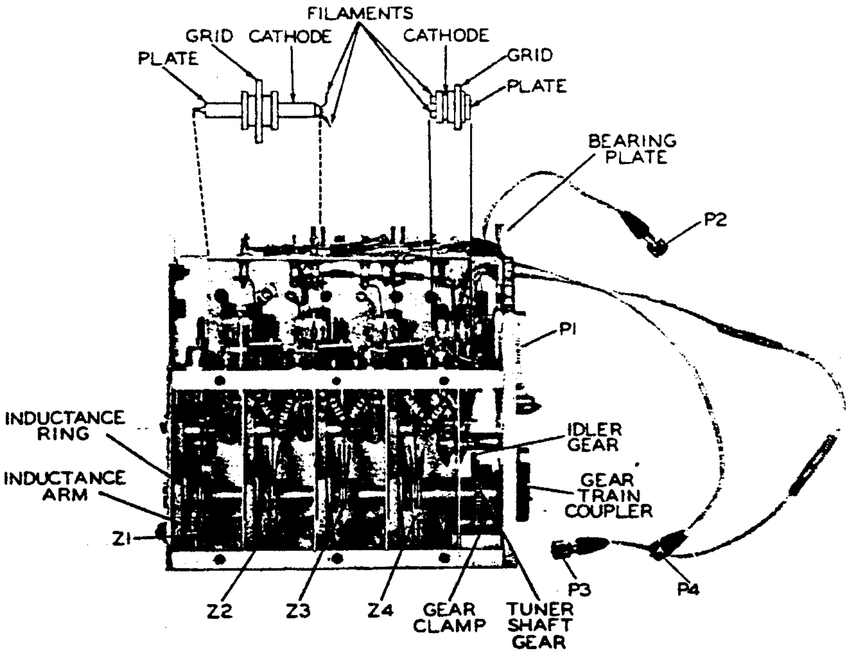


Figure 6-4. Receiver R-F Amplifier, Rear View, Cover Removed

a. Channel the radio set to 225.0 mc.

b. Determine that the capacitor rotor blades of tanks Z5, Z6, and Z7 (figure 6-26) in the transmitter preamplifier are fully meshed as viewed from the inside cover of the tank.

c. Determine that the capacitor rotor blades of tanks Z1, Z2, Z3, and Z4 (figure 6-4) of the receiver r-f amplifier are fully meshed as viewed from outside the tank.

d. Determine that the gears (figures 6-4 and 6-26) are tightly clamped to the rotor shafts by the gear clamps.

e. If the capacitor rotor blades in tanks Z5, Z6, and Z7 of the transmitter preamplifier are not fully meshed, loosen the setscrews that secure the rotor of Z5 to the tuner shaft (figure 6-26). Manually rotate the rotor of Z5 until the rotor blades are fully meshed with the stator blades as viewed from the inside cover

TABLE XIX. RECEIVER R-F AMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (Transmit)	VOLTAGE (Receive)	RESISTANCE
V1 (JAN7077)	cathode	0	0.3 minimum	82
	filament	† 6.3 ac (See note 4)	† 6.3 ac (See note 4)	0.7 (See note 6)
		*6.3	*6.3	0.7
	grid	0	0	0
	plate	-2.6	130	∞
V2 (JAN7077)	cathode	0	0.45 minimum	220
	filament	† 6.3 ac (See note 4)	† 6.3 ac (See note 4)	0.7 (See note 6)
		*6.3	*6.3	0.7
	grid ††	0	-0.65	270K
	plate	-2.6	130	∞
V3 (JAN7077)	cathode	0	0.45 minimum	220
	filament	† 6.3 ac (See note 4)	† 6.3 ac (See note 4)	0.7 (See note 6)
		*6.3	*6.3	0.7
	grid ††	0	-1.1	540 k
	plate	-2.5	130	∞
V4 (JAN7077)	cathode	0.1 - 0.3	1.1 minimum	470
	filament	† 6.3 ac (See note 4)	† 6.3 ac (See note 4)	0.7 (See note 6)
		*6.3	*6.3	0.7
	grid ††	0.8 - 2.0	-1 minimum	100K
	plate	-1.8	130	∞

NOTES

1. All voltages are volts dc (positive) unless otherwise noted.
2. All resistances are taken with module removed from main chassis and r-f connectors detached.
3. Unless otherwise noted, all voltage measurements taken with vtvm from socket terminals to ground and no signal input.
4. Filament voltages are measured from pin 9 of jack J1501 (figure 5-13).
5. All resistances are in ohms and are measured between socket terminals and module chassis unless otherwise noted.
6. Filament resistances are measured between pin 9 of plug P1 and module chassis.
7. ††Grid voltage at tubes V2, V3 and V4 measured with MAIN SENS potentiometer R1401 turned maximum clockwise.
8. †Applies to RT-332/ARC-52 only.
9. *Applies to RT-424/ARC-52X only.

of the tank. Tighten the setscrews that secure the rotor of Z5 to the tuner shaft, and determine that the blades remain fully meshed.

NOTE

Determine that the rotor blades are centered between the stator blades.

f. Apply the procedure described in step e to adjust capacitor rotor blades in tanks Z6 and Z7.
g. If the capacitor rotor blades in tanks Z1, Z2, Z3, and Z4 of the receiver r-f amplifier are not fully meshed, loosen the setscrews in the gear clamp on the receiver r-f amplifier shaft (figure 6-4).

NOTE

Be certain that the receiver r-f amplifier shaft is sufficiently loose so that the gear train coupler will not be disturbed.

h. Manually rotate the receiver r-f amplifier shaft until the capacitor rotor blades are fully meshed as viewed from outside the tank. Tighten the setscrews in the gear clamp and observe that the blades remain fully meshed.
i. Channel the radio set and perform steps b and c as required for a final check of proper synchronization.
j. Place the tuning cover on the module.

6-17. Check the positions of the receiver r-f amplifier tank circuits as follows.
a. Set the MANUAL frequency controls to 399.9 mc and rotate the function switch to OFF.
b. At 399.9 mc, the outside corners of sections one and two of tanks Z1, Z2, Z3, and Z4 capacitor rotor blades should be in line with the edge of the stator blades so that the rotor blade is about to engage the stator.

6-18. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-19 are to be performed on the receiver r-f amplifier when that unit is mounted on Maintenance Fixture MT-2060/ARM-38. The procedure of paragraph 6-20 is performed when no maintenance fixture is available. Since the Radio Set Test Harness AN/ARM-38 will be available in most maintenance depots, the procedure of paragraph 6-19 is preferred to that of paragraph 6-20, which gives only the deviations from the former procedure.

CAUTION

Retracking should be performed only when misalignment (mistracking) has been established as the cause of abnormal operation.

6-19. Proceed as follows to align the receiver r-f amplifier when the receiver r-f amplifier and transmitter preamplifier module is mounted on Maintenance Fixture MT-2060/ARM-38.
a. Remove power from the equipment and connect a signal generator through a 6 db pad to antenna connector P1402 (figure 5-3).
b. Connect a vtvm to AVC jacks J103 on Distribution Box J-995/ARM-38. Set the vtvm to use the minus 3-volt d-c scale.
c. Rotate the function switch to T R and the MANUAL frequency controls to 399.7 mc. Adjust the signal generator to 399.7 mc at a level sufficient to produce a vtvm voltage reading within a range of -1 to -2 volts dc.
d. If not previously done, remove the side cover from the receiver r-f amplifier; and substitute the tuning cover supplied with the AN/ARM-38. For rapid removal and replacement, use thumbscrews converted from standoffs to secure cover.
e. Adjust trimmer capacitors C1, C2, C3, and C4 (figure 6-3) for maximum avc output on the vtvm.
f. Adjust the frequency of the radio set and the signal generator to 395.7 mc. Adjust the output level of the signal generator to develop a vtvm voltage reading within a range of -1 to -2 volts dc.
g. Check the tuning of each tank circuit by inserting the iron end and then the brass end of the tuning wand near the tank coil. If the voltage monitored by the vtvm increases when the iron slug is inserted, more capacity is required. If the avc voltage increases when the brass slug is inserted, less capacity is required. If the avc decreases in both cases, the tank circuit is properly tuned.
h. If an adjustment is necessary, proceed with the following steps.
i. The tuning capacitor rotor blades are illustrated in figure 6-5. Each blade is tabbed and each tab is a trimmer for a specific frequency within the range of

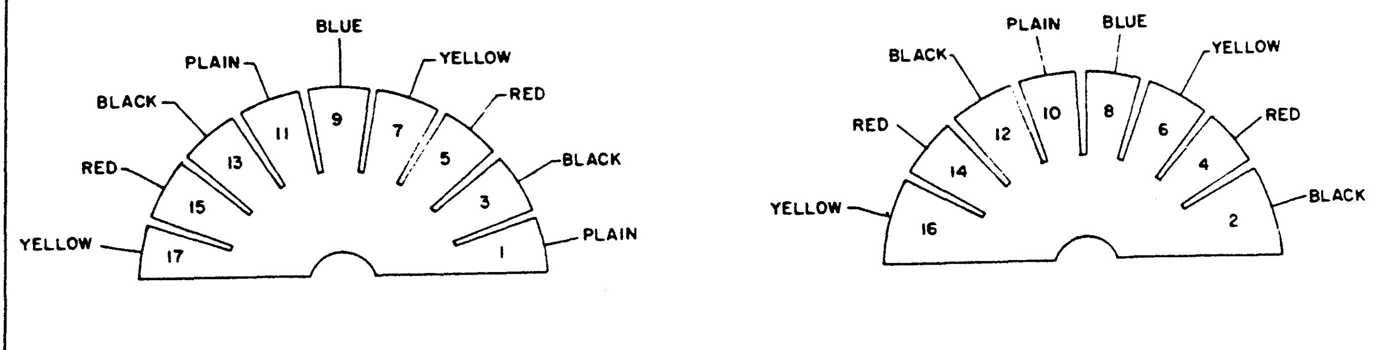


Figure 6-5. Receiver R-F Amplifier, Transmitter Preamplifier, and Power Amplifier Z602 Tuning Capacitor Rotor Blade Adjustment Diagram

225.7 to 385.7 mc. The tab or sector to be adjusted for each frequency is given in table XX. If at 395.7 mc the tank circuits are not at resonance, recheck the alignment of tanks Z1. Z2, Z3, and Z4 as described in the synchronization procedure; and readjust capacitors C1, C2, C3, and C4 as described in steps c. d, and e. Then continue with the alignment procedure for all frequencies listed in table XX.

NOTE

All adjustment tabs are coded with a dot of colored paint as specified in figure 6-5. The tab to be adjusted is identified further as the one partially meshed. If more capacity is required, bend tab towards stator blade. If less capacity is required, bend the rotor tab away from the stator blade. The configuration of the tabs after adjustment should be a smooth contour with no sharp discontinuities. Rechannel the radio set after each tab is bent to remove any gear backlash.

CAUTION

Never bend the tabs out beyond a 40-degree angle. Excessive inward bending will cause the tab to short against the stator. If tuned circuit is far from resonance, this condition may be caused by a circuit discontinuity. If this condition occurs, check inductor arm contacts and inductor rings (figure 6-4) for proper contact.

j. Carefully recheck the alignment of tanks Z1. Z2. Z3, and Z4 again. using procedures in steps c through i. As a final check, avc voltages should fall in the range of -3.5 to -4.5 volts dc (use appropriate vtvm scale) with an input signal level of 1000 microvolts.

k. After all tab adjustments have been made, remove tuning cover, replace side cover, and readjust trimmer capacitors C1, C2, C3, and C4 (figure 6-3) at 399.9 mc for maximum avc output on the vtvm.

l. After all maintenance of the module is completed, reinstall the module in the original radio set and complete all the minimum performance checks specified under paragraph 5-6 before returning the module to a tactical operating status.

6-20. Proceed as follows to align the receiver r-f amplifier when the AN/ARM-38 is unavailable.

a. Remove power from the equipment and connect a signal generator to antenna connector P1402 (figure 5-3).

b. Connect a vtvm to avc test point (M), jack J1406 (figure 5-1), and adjust the meter to the minus 3-volt scale.

c. Channel the radio set and the signal generator to 399.7 mc.

NOTE

Since the receiver r-f amplifier and transmitter preamplifier is not mounted upon an extension, the spectrum generator and amplifier module must be removed so that the misaligned components of the receiver r-f amplifier may be made accessible. The spectrum generator and amplifier is placed on the test bench. and power and signal connections are made using extension cables. Tuning of this module. however. must be done manually. Considerable care must be exercised during manual tuning to ensure equipment operation at the correct frequency. The initial tuning of the spectrum generator and amplifier is accomplished by the procedure of step c, since the spectrum generator is automatically tuned to 370 mc when the radio set is channeled to 399.7 mc.

TABLE XX. TRIMMER ADJUSTMENTS FOR RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER

FREQUENCY (mc)	TRIMMER OR TAB
399.7	Capacitors C1. C2. C3. and C4 (for receiver r-f amplifier) Capacitors C5, C6. and C7 (for transmitter preamplifier) Capacitor C609 (for power amplifier)
395.7	No trimming Necessary
385.7	1
375.7	2
365.7	3
355.7	4
345.7	5
335.7	6
325.7	7
315.7	8
305.7	9
295.7	10
285.7	11
275.7	12
265.7	13
255.7	14
245.7	15
235.7	16
225.7	17

NOTE: See figure 6-5 for diagram of tuning capacitor rotors.

d. Connect a second vtvm to test point (T), jack J3 (figure 6-3). The monitored reading should be at least -1.0 volt dc during receive operation.
e. Turn off the equipment and remove the spectrum generator and amplifier from the main chassis. Place the module on the test bench and connect it to the main chassis by extension cables: J501 to P2 (figure 5-3), and P501 to J1505 (figure 6-46).
f. Energize the equipment and monitor the reading at test point (T). This reading should be identical to the one obtained in step d.

NOTE

The spectrum generator is tuned by hand from 370 mc in 10-mc increments toward the lower frequency limits. Each incremental change corresponds to a frequency range required by the receiver r-f amplifier tracking procedure. As the receiver r-f amplifier and the signal generator work down range in 10-mc increments, the output frequency of the spectrum generator must be correspondingly decreased. The frequency settings for the successive capacitor rotor tab adjustments are listed in table XX. These settings are made by means of the MANUAL frequency controls at the radio set control, which drives the tuned circuits of the receiver r-f amplifier. The spectrum generator is then manually tuned in the counterclockwise direction for resonance at the subsequent 10-mc intervals, as indicated by peaking of the vtvm reading at test point (T).

g. Perform steps d and e of paragraph 6-19.
h. Adjust the frequency of the radio set and the signal generator to 395.7 mc.
i. Perform steps g, h, i, and j of paragraph 6-19.
j. After the four tank circuits are properly adjusted at 395.7 mc, repeat the procedures (paragraph 6-19, steps g through j) successively for each frequency listed in table XX. Channel the radio set by using the MANUAL frequency controls, but tune the spectrum generator and amplifier manually. Rotate the spectrum generator tuning shaft clockwise (looking at the bottom of the module) until the reading, monitored at test point (T), peaks.
k. Perform steps k and l of paragraph 6-19.

6-21. RECEIVER R-F AMPLIFIER. (Contract NOas 57-478, Serial Numbers 1-90.)

6-22. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XXI provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XXII; if the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the overall radio set (section V).

NOTE

Refer to table XII for conditions of receiver r-f amplifier test point checks.

6-23. TROUBLE SHOOTING. Check all module tubes to make certain that they are operative and that they are the specified types (see figures 6-6 and 4-6). Remove the cover plate to expose the rear of the module (figure 6-7). Check tank circuits Z1, Z2, and Z3 over the full tuning range to determine that the tuning capacitor rotor blades do not short against the stators. Also, determine that each inductance arm makes contact with the corresponding inductance ring over the full tuning range (figure 6-7). Manually rotate the gear train coupler and check the gear and tuner shaft

TABLE XXI. RECEIVER R-F AMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
(G) J2 (figure 6-6)	Receiver r-f amplifier.	R-f gain of receiver r-f amplifier.	Disconnect plug P2 from jack J501. Connect signal generator to antenna connector P1402; set generator for 0.1-volt output at 304.7 mc. Set MANUAL frequency controls for 304.7 mc and peak signal generator for maximum indication on d-c voltmeter at test point (G). This indication should be -1.0 volt, approximately.
HEADSET J108	J-995/ARM-38.	Main receiver sensitivity.	With an r-f signal input to the antenna of 5 uv, modulated 30% at 1,000 cps, signal +noise/noise ratio of audio output at J108 should be 10 db minimum. (Refer to paragraph 5-9 for detailed procedure of check.)

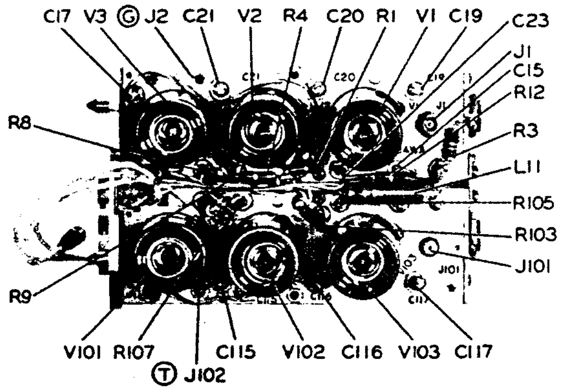


Figure 6-6. Receiver R-F Amplifier and Transmitter Preamplifier (Contract NOas 57-478, Serial Numbers 1 - 90), Left Side View

mechanism for proper rotation, freedom from binding, and proper lubrication. Check all detail parts for evidence of burning or shorts. If the visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table XXII.

NOTE

The procedures of table XXII are an extension of the minimum performance check chart (table XXI); both tables should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XXII. Voltage and resistance measurements are listed in table XXIII.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately set the function switch to OFF.

6-24. REMOVAL. The following removal procedures permit access to detail parts located beneath the tubes. Removal and disassembly procedures of the module gear train are given in the handbook of overhaul instructions for Radio Set AN/ARC-52.

a. Remove the module from the main chassis or maintenance fixture as described in paragraph 5-37.

CAUTION

All leads that require unsoldering should be tagged to ensure correct reassembly.

b. Unsolder the 6.3-volt filament wire from capacitor C17 (figure 6-6).

c. Unsolder the 6.3-volt filament wire from capacitor C15 leading to capacitor C114 (figure 6-6).

d. Remove the side covers of the module.

e. Remove the five smaller Phillips-head screws from the bottom of the module bearing plate (figure 6-7).

CAUTION

After step e has been performed, the module should be handled carefully to prevent binding of the tuner shaft and excessive strain on the intermodule internal connections that have not, as yet, been disconnected.

f. Slide the receiver section forward just enough to unsolder capacitor C14 (figure 6-7) from the standoff

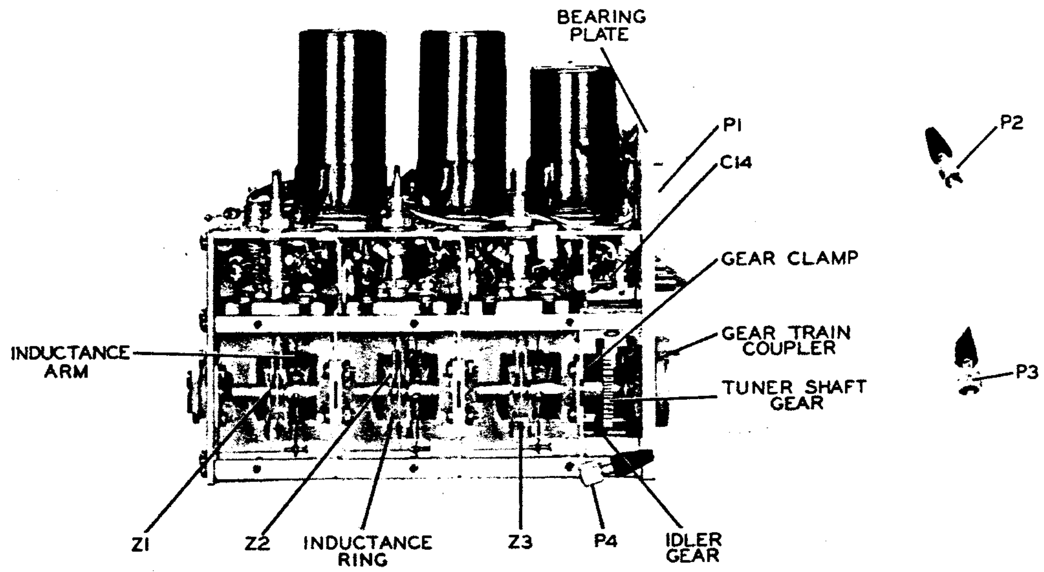


Figure 6-7. Receiver R-F Amplifier (Contract NOas 57-478, Serial Numbers 1 - 90), Rear View, Cover Removed

TABLE XXII. RECEIVER R-F AMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
With no signal input, less than 13 volts dc is measured across resistor R1 (figure 6-6).	V1 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XXIII).
With no signal input, less than 13 volts dc is measured across resistor R4 (figure 6-6).	V2 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XXIII).
With no signal input, less than 2 volts dc is measured across resistor R9, and 100 volts dc is measured across screen resistor R8 (figure 6-6).	V3 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty part (table XXIII).
R-f gain, measured at test point Ⓖ (table XXI), is below minimum standard.	Dirty damaged or shorting component of tank circuit Z1, Z2, or Z3.	Check tanks circuits for dirty, damaged or shorting detail part, and clean or repair.
	Loss of synchronization between receiver r-f amplifier and transmitter preamplifier or main chassis gear grain.	Resynchronize mechanical detail parts of receiver r-f amplifier and those of transmitter preamplifier and main chassis (paragraph 6-26).
	Receiver r-f amplifier out of alignment.	Realign receiver r-f amplifier (paragraph 6-28).

connection inside the module between tubes V3 and V101.

g. Unsolder the ground connection from terminal 3 of tube socket XV3.

h. Unsolder the connection between coil L11 (figure 6-6 and terminal 9 of plug P1.

i. Remove the avc connection from the junction of resistor R12 and capacitor C23 (figure 6-6).

j. Remove the B+ connection from the standoff at the junction of resistors R1, R4, and R9 (figure 6-6).

k. Carefully separate the receiver r-f amplifier section from the bottom bearing plate (figure 6-7). All receiver r-f detail parts are now accessible after the inside cover plate has been removed.

6-25. REPLACEMENT. With the equipment disassembled, check the tuner shaft gear for broken or scarred teeth. Where necessary, clean the mechanical detail parts with a small brush moistened in cleaning fluid. After making any detail parts replacements required, reassemble the module by reversing the removal procedure (paragraph 6-24). Make certain that the tuner shaft gear actually meshes with the idler gear (figure 6-7). Synchronize the receiver r-f amplifier and the transmitter preamplifier (paragraphs 6-26 and 6-27). Check the tuned circuits for resonance at several points along the band (paragraph 6-28); retrack, if necessary.

6-26. SYNCHRONIZATION. Synchronize the tuned circuits of the receiver r-f amplifier with those of the transmitter preamplifier and the main chassis gear train, as described in the following steps.

NOTE

The transmitter preamplifier and the main chassis gear train are in synchronization; the receiver r-f amplifier removal procedures have not affected this status. Do not rotate the gear train couplers.

a. Remove the module from the main chassis or maintenance fixture (paragraph 5-37) and remove the cover plate to expose the gear train of the transmitter preamplifier (figure 6-8).

b. Rotate the transmitter preamplifier gear train coupler (figure 6-8) until the inductance arms are about to mesh in preamplifier tanks Z101, Z102, and Z103 (figure 6-8). Determine that the inductance arms in receiver tanks Z1, Z2, and Z3 (figure 6-7) are in the same position. If they are not, loosen the gear clamp (figure 6-7) on the receiver r-f amplifier tuner shaft; and rotate Z1, Z2, and Z3 until they match the position of tanks Z101, Z102, and Z103. Tighten the gear clamp.

c. Replace the transmitter preamplifier side cover.

d. Replace the module on Maintenance Fixture MT-2060/ARM-38.

6-27. Check the positions of the receiver r-f amplifier tank circuits as follows.

TABLE XXIII. RECEIVER R-F AMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (transmit)	VOLTAGE (receive)	RESISTANCE
V1 (JAN 6J4WA)	1	-0.1	-0.1	250 k
	2	0	0	33
	3	6.3 ac	6.3 ac	0.7
	4	0	0	0
	5	-0.1	-0.1	250 k
	6	-0.1	-0.1	250 k
	7	-1.9	130	∞
V2 (JAN 6J4WA)	1	-0.1	-0.1	1.25 meg
	2	0	0	33
	3	6.3 ac	6.3 ac	0.7
	4	0	0	0
	5	-0.1	-0.1	1.25 meg
	6	-0.1	-0.1	1.25 meg
	7	-1.8	130	∞
V3 (JAN 5654)	1	0	0	100 k
	2	0	0	0
	3	6.3 ac	6.3 ac	0.7
	4	0	0	0
	5	-1.5	126	∞
	6	-1.5	123	∞
	7	0	0	0

NOTES

1. All voltages are volts dc (positive) unless otherwise noted.
2. All resistances are taken with module removed from main chassis and r-f connectors detached.
3. All voltage measurements taken with a vtvm from socket terminals to ground and no signal input.
4. All resistances are in ohms unless otherwise noted.

a. Set the MANUAL frequency controls to 399.9 mc and rotate the function switch to OFF.
b. At 399.9 mc, the outside corners of sections one and two of the Z1, Z2, and Z3 capacitor rotor blades should be in line with the edge of the stator blades in such a manner that the rotor blade is just starting to engage the stator.

6-28. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-29 are to be performed on the receiver r-f amplifier when that unit is mounted on Maintenance Fixture MT-2060/ARM-38; the procedure of paragraph 6-30 is performed when no maintenance fixture is available. Since the AN/ARM-38 will be available in most maintenance depots, the procedure of paragraph 6-29 is preferred; that of paragraph 6-30 gives only the deviations from the former procedure.

CAUTION

Retracking should be performed only when it has been established that misalignment (mistracking) is the cause of abnormal operation.

6-29. Proceed as follows to align the receiver r-f amplifier when the receiver r-f amplifier and transmitter preamplifier module is mounted on Maintenance Fixture MT-2060/ARM-38.
a. Remove power from the equipment and connect a signal generator through a 6-db pad to antenna connector P1402 (figure 5-3).
b. Connect a vtvm to jack J103 on Distribution Box J-995/ARM-38. Adjust the vtvm to the minus 3-volt scale.
c. Rotate the function switch to T/R and the MANUAL frequency controls to 399.7 mc. Adjust the signal generator output to 399.7 mc at a level sufficient to produce a readable avc variation on the vtvm.
d. Remove the side cover from the receiver r-f amplifier. Substitute the tuning cover supplied with the AN/ARM-38. For rapid removal and replacement of side cover, use thumbscrews converted from standoffs to secure cover.

NOTE

The tuning cover must be in place when the tank circuit tuning is checked, but must be removed to provide access to the tanks when the capacitor rotor blade tabs are aligned (bent). Always replace the tuning cover after each separate bending procedure.

e. Adjust trimmer capacitors C19, C20, and C21 (figure 6-6) for a maximum avc output on the vtvm.
f. Adjust the frequency of the radio set and the signal generator to 395.7 mc. Adjust the output level of the signal generator to peak the avc indication on the vtvm.
g. Check the tuning of each tank circuit by inserting the iron end and then the brass end of the tuning wand through the 3/8-inch holes in the tuning cover. If the voltage monitored by the vtvm increases when the iron slug is inserted, more capacity is required. If the avc voltage increases when the brass end is inserted, less capacity is required. If the avc decreases in both cases, the tank circuit is properly tuned.
h. If an adjustment is necessary, remove the tuning cover and proceed with the following steps.
i. The tuning capacitor rotor blades are illustrated in figure 6-9. Note that each blade is tabbed and that each tab is a trimmer for a specific frequency within the range of 225.7 to 395.7 mc. (The tab, or sector, to be adjusted for each frequency is given in table XXIV.) If at 395.7 mc more capacity is required, bend tab 1 (figure 6-9) of tanks Z1, Z2, and Z3 toward the stator blade. If less capacity is required, bend the tab away from the stator blade.

NOTE

All adjustment tabs are coded with a dot of colored paint, as specified in figure 6-9. The tab to be adjusted is further identified as the one most fully meshed.

TABLE XXIV TRIMMER ADJUSTMENTS FOR RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478 SERIAL NUMBERS 1 - 90)

FREQUENCY (mc)	TRIMMER OR TAB
399.7	Capacitors C19 C20 and C21 (for receiver r-f amplifier) Capacitors C115, C116 and C117 (for transmitter preamplifier)
395.7	1
385.7	2
375 7	3
365 7	4
355.7	5
345.7	6
335.7	7
325.7	8
315 7	9
305 7	10
295.7	11
285 7	12
275.7	13
265 7	14
255.7	15
245.7	16
235.7	17
225 7	18

NOTE See figure 6-9 for diagram of tuning capacitor rotors.

CAUTION

Never bend tabs out beyond a 40-degree angle. Excessive inward bending will cause tab to short against the stator. If a tuned circuit is far from resonance, it may be caused by a circuit discontinuity. If this occurs, check inductance arm contacts and inductance rings (figure 6-7) for proper contact.

j Replace the tuning cover plate and recheck the alignment of tanks Z1, Z2, and Z3 as described in step g.
k After the three tank circuits are properly aligned at 395 7 mc, repeat the procedure (steps g through j) for all frequencies listed in table XXIV

NOTE

The configuration of the tabs after adjustment should be a smooth contour with no sharp discontinuities.

l. After all tab adjustments have been made, replace the original side cover and readjust trimmer capacitors C19, C20, and C21 (figure 6-6).
m. After all maintenance of the module is completed, reinstall the module in the original radio set. and complete all the minimum performance checks specified under paragraph 5-6 prior to returning the module to a tactical operating status.

6-30 Proceed as follows to align the receiver r-f amplifier when the AN/ARM-38 is unavailable.
a Remove power from the equipment and connect a signal generator to antenna connector P1402.
b. Connect a vtvm to test point Ⓜ, jack J1406, and adjust the meter to the minus 3-volt scale.
c Channel the radio set and the signal generator to 399 7 mc.

NOTE

Since the receiver r-f amplifier and transmitter preamplifier is not mounted upon an extension, the spectrum generator and amplifier module must be removed so that the misaligned detail parts of the receiver r-f amplifier may be made accessible. The spectrum generator and amplifier is placed on the test bench and power and signal connections are made using extension cables. Tuning of this module, however, must be done manually Considerable care must be exercised in the manual tuning to ensure equipment operation at the correct frequency. The initial tuning of the spectrum generator and amplifier is accomplished by the procedure of step c, since the spectrum generator is automatically tuned to 370 mc when the radio set is channeled to 399.7 mc.

d. Connect a second vtvm to test point Ⓣ, jack J102 (figure 6-6) The monitored reading should be at least -1.0 volt dc during receive operation.
e. Turn off the equipment and remove the spectrum generator and amplifier from the main chassis. Place the module on the test bench and connect it to the main chassis by extension cables: J501 to P2, and P501 to J1505.
f. Energize the equipment and monitor the reading at test point Ⓣ. This reading should be identical to the one obtained in step d.

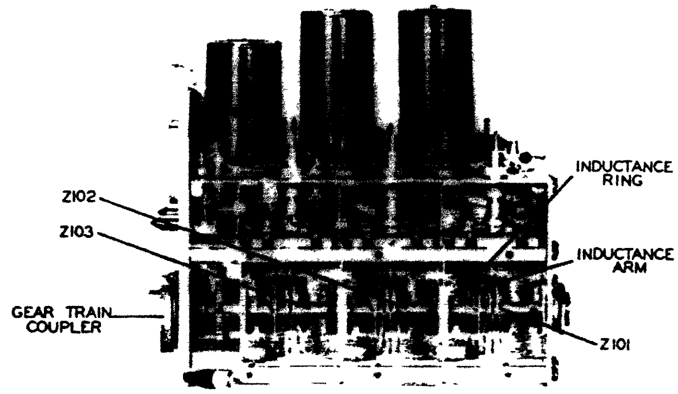


Figure 6-8. Transmitter Preamplifier (Contract NOas 57-478, Serial Numbers 1 - 90). Front View, Cover Removed

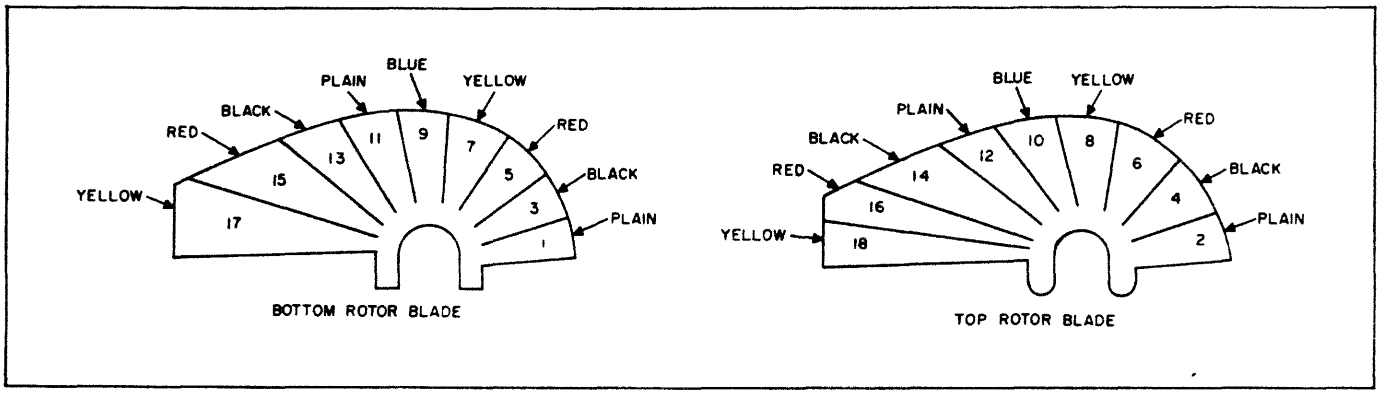


Figure 6-9. Receiver R-F Amplifier and Transmitter Preamplifier (Contract NOas 57-478, Serial Numbers 1 - 90), Tuning Capacitor Rotor Blade Adjustment Diagram

NOTE

The spectrum generator is tuned by hand from 370 mc in 10-mc increments toward the lower frequency limits. Each incremental change corresponds to a frequency range required by the receiver r-f amplifier tracking procedure. As the receiver r-f amplifier and the signal generator work down range in 10-mc increments, the output frequency of the spectrum generator must be correspondingly decreased. The frequency settings for the successive capacitor rotor tab adjustments are listed in table XXIV. These settings are made by means of the MANUAL frequency controls at the radio set control, which drives the tuned circuits of the receiver r-f amplifier. The spectrum generator is then manually tuned in the counterclockwise direction for resonance at the subsequent 10-mc intervals, as indicated by peaking of the vtvm reading at test point (T).

g. Perform steps d and e of paragraph 6-29.
h. Adjust the frequency of the radio set and the signal generator to 395.7 mc.
i. Perform steps g, h, i, and j of paragraph 6-29.
j. After the three tank circuits are properly adjusted at 395.7 mc, repeat successively steps g through j of paragraph 6-29 for each frequency listed in table XXIV. Channel the radio set by using the MANUAL frequency controls but tune the spectrum generator and amplifier manually. Rotate the spectrum generator tuning shaft clockwise (looking at the bottom of the module) until the reading, monitored at test point (T), peaks.
k. Perform steps l and m of paragraph 6-29.

6-31. 20- TO 30-MC I-F AMPLIFIER.

6-32. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XXV provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XXVI. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the overall radio set (section V).

TABLE XXV. 20- TO 30-MC I-F AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
(L) J202 (figure 5-3)	20- to 30-mc i-f amplifier.	I-f gain of 20- to 30-mc i-f amplifiers, V201 and V202.	Disconnect oscillator plug P1902 from jack J1515 (figure 5-13). Connect signal generator to plug P201; set generator for a 2000-uv output at 20.0 mc. With MANUAL frequency controls set to 300.0 mc, d-c voltmeter at test point should indicate -1.0 volt. Reconnect P1902 after completing gain check.
HEADSET jack J108	J-995/ARM-38.	I-f sensitivity check	With an r-f signal input to the antenna of 5 uv, modulated 30% at 1000 cps, signal+noise/noise ratio of audio output at J108 should be 10 db minimum. (Refer to paragraph 5-9 for detailed procedure of check.)
(T) J3 (figure 5-3)	Transmitter preamplifier	I-f amplifier stages V201 and V202 and relays K201 and K202.	With mike press-to-talk switch actuated and plus P2 disconnected from jack J501 (figure 5-3), vtvm at test point should indicate -0.5 volt dc, minimum. (Fuse F1504 removed.)

NOTE

Refer to table XII for conditions of 20- to 30-mc i-f amplifier test point checks.

6-33. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-10), rear of the module (figure 6-11), and the left side of the module (figure 6-12). Manually rotate the gear train coupler and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Check all detail parts for evidence of burning or short circuits. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table XXVI. Check mechanical synchronization of the cams (paragraph 6-36).

NOTE

The procedures of table XXVI are an extension of the minimum performance check chart (table XXV); both tables should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XXVI. Refer to tables XXVII and XXVIII for voltage and resistance checks.

CAUTION

Whenever power is applied to an abnormally functioning module, check the signs of burning or short circuits. If such an indication is present, immediately set function switch to OFF.

6-34. REMOVAL. The following procedure describes the method of tube removal from the 20- to 30-mc i-f amplifier. (See figures 6-10 and 6-11.) Insert a flat bladed screwdriver under the end of the metal shield that covers the tube envelope. Pry the shield and tube from the tube clip. Remove the tube shield and unsolder the tube leads. As each lead is unsoldered, tag it to facilitate reassembly.

6-35. REPLACEMENT. Replace the tubes by reversing the removal procedure described in paragraph 6-34.

6-36. CAM SYNCHRONIZATION CHECK. Check synchronization of the cam with the cam follower in the 20- to 30-mc i-f amplifier according to the following steps.

a. Place the module in the radio set, or place the module in Maintenance Fixture MT-2062/ARM-38 mounted in the radio set.

b. Adjust the operating frequency of the radio set to any frequency ending in digits 0.0.

c. When the radio set is adjusted as described in step b, the cam followers should be just starting up the rise after passing through the depression points on the cams

d. Increase the operating frequency in 1.0 mc or 0.1 mc steps. During this increase, the followers should travel slowly up the cam rise.

e. If cam synchronization is required, replace the module; and send the defective module to the next higher maintenance echelon.

6-37. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-38 are to be performed on

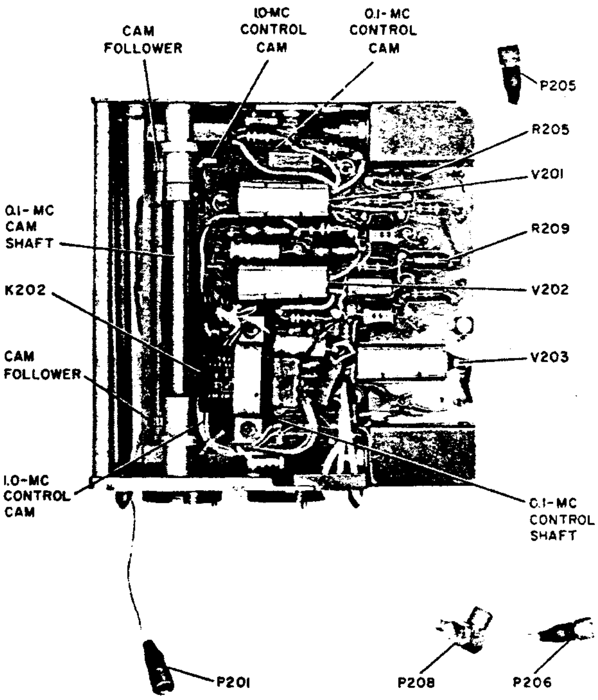


Figure 6-10. 20- to 30-Mc I-F Amplifier, Front View, Covers Removed

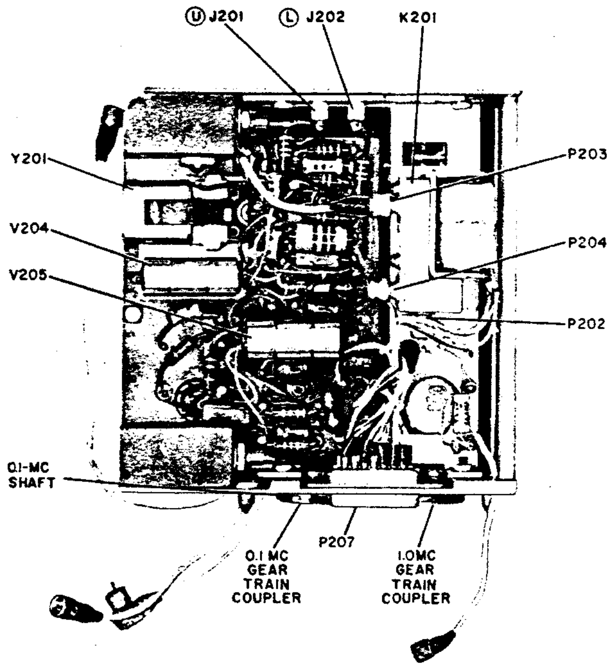


Figure 6-11. 20- to 30-Mc I-F Amplifier, Rear View, Covers Removed

the 20- to 30-mc i-f amplifier when that unit is mounted on Maintenance Fixture MT-2062/ARM-38. The procedures of paragraph 6-40 are to be performed on the 20- to 30-mc i-f amplifier when no maintenance fixture is available. Since the AN/ARM-38 will be available in most maintenance depots, the procedure of paragraph 6-38 is preferred; that of paragraph 6-40 gives only the deviations from this procedure.

CAUTION

Retracking should be performed only when misalignment (mistracking) has been established as the cause of abnormal operation.

6-38. Proceed as follows to align the 20- to 30-mc i-f module when this module is mounted on Maintenance Fixture MT-2062/ARM-38.

a. Disconnect plug P201 (figure 6-10) from jack J1518 and connect the plug through a 6-db pad to the signal generator.

b. Connect a vtvm to AVC jack J103 on J-995/ARM-38.

c. Energize the equipment and set the MANUAL frequency controls to 300.2 mc.

NOTE

The operating frequency of the 20- to 30-mc i-f amplifier is determined as 20 megacycles plus the last two digits on the frequency controls. Thus, any radio set frequency setting that ends in the digits 0.2 is satisfactory for step c. Throughout the tracking procedure for this module, any radio set frequency having the same two final digits as the particular frequency specified may be used.

d. Adjust the signal generator to 20.2 mc at a level sufficient to produce a readable avc variation on the vtvm.

e. Adjust coils L201 through L205 (figure 6-12) for maximum avc. Keep the avc level below -1.5 volts by reducing the signal generator output during the alignment process.

f. Connect the vtvm to test point Ⓛ, jack J202 (figure 5-3).

g. Adjust coils L209 through L212 (figure 6-12) for a maximum negative voltage of 6 to 8 volts.

h. Set the MANUAL frequency controls to 309.7 mc and adjust the signal generator to 29.7 mc.

i. Connect the vtvm to AVC jack J103 on Distribution Box J-995/ARM-38.

j. Adjust capacitors C202, C207, C211, C217, and C221 (figure 6-13) for maximum avc. Keep the avc level below -1.5 volts dc by reducing the signal generator output during the alignment process.

k. Connect the vtvm to test point Ⓛ, jack J202 (figure 5-3).

l. Adjust capacitors C236, C241, C245, and C250 (figure 6-12) for a maximum negative voltage of 6 to 8 volts.

m. Repeat steps d through l until the coils and capacitors have been properly adjusted. A maximum avc reading indicates proper adjustment.

n. Disconnect plug P2 from jack J501 (figure 5-3) of the spectrum generator and amplifier. With a vtvm connected to test point Ⓣ and the TONE switch at Distribution Box J-995/ARM-38 set to the TONE ON position, adjust coil L206 at 20.2 mc and capacitor C226

TABLE XXVI. 20- TO 30-MC I-F AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Vtvm fails to measure at least -3.0 volts dc at test point Ⓤ (figure 5-3) with mike press-to-talk switch actuated.	Crystal Y201 defective.	Replace crystal Y201 (figure 6-11).
	Tube V204A defective.	Take voltage and resistance measurements. If improper readings are obtained, replace tube V204 (figure 6-11), or locate faulty circuit part.
Vtvm fails to measure at least -1.0 volt dc at test point Ⓛ (figure 5-3).	Tube V205 defective.	Take voltage and resistance measurements. If improper readings are obtained, replace tube V205 (figure 6-11), or locate faulty circuit part.
	Mistracking of injection amplifier tank circuits.	Retrack (paragraph 6-37).
Vtvm fails to measure ir drop across R205 (figure 6-10).	Defective tube V201 (figure 6-10).	Take voltage and resistance measurements. If improper readings are obtained, replace tube V201 (figure 6-10), or locate faulty circuit part.
Vtvm fails to measure ir drop across R209 (figure 6-10).	Tube V202 defective.	Take voltage and resistance measurements. If improper readings are obtained, replace tube V202 (figure 6-10), or locate faulty circuit part.
No signal output monitored at test point Ⓣ (figure 5-3) with spectrum cable P2 disconnected at J501 (figure 5-3), and radio in transmit condition. (An actual contact potential of approximately -0.3 volt dc is measured at test point Ⓣ.)	Relay K201 (figure 6-11) or K202 (figure 6-10) defective.	Check continuity across relay. If component is defective, replace.
	Defective coaxial cable.	Check continuity of associated cable.
	Crystal Y201 defective. (Test point Ⓤ indicates less than -3.0 volts dc.)	Replace crystal Y201 (figure 6-11).
	Tube V204A defective.	Replace tube V204 (figure 6-11).
Low signal output (-0.5 volt dc, minimum). Monitored at test point Ⓣ with spectrum cable P2 disconnected at jack J501 (figure 5-3), and radio in transmit condition.	Coil L206 and capacitor C226 (figure 6-12) mistracked.	Retrack (paragraph 6-37).
Low i-f sensitivity indicated by an S+N/N ratio less than 10 db. (Perform this step with signal generator output applied directly to 20- to 30-mc i-f amplifier at P201 (figure 6-10). (See i-f sensitivity check, table XXV.)	Low gain in tubes V201 or V202.	Replace tubes. Note: Approximately 10-millivolt input should produce minimum reading of 1.0 volt rms at grid or cathode of tube V203.

TABLE XXVI. 20- TO 30-MC I-F AMPLIFIER, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Low i-f gain indicated by poor sensitivity or low audio output.	Mistracking of amplifier tank circuits.	Retrack (paragraph 6-37). Note: L206 and C226 (figure 6-12) must be retracked with radio set in transmit condition.
Positive residual avc.	Amplifier V201 or V202 defective.	Replace tubes. (The defective tube can be located by lifting the grid lead and monitoring the avc output. When the grid of the defective tube is lifted, the avc goes negative.
No tuning indication when tuning a specific slug.	Broken slug wire.	Replace broken slug assembly.
Oscillations	Poor ground connection between amplifier printed circuit board and chassis (figure 6-10).	Tighten screws if loose. If tight, check underside of board for epoxy on the ground terminals acting as an insulator.

TABLE XXVII. 20- TO 30-MC I-F AMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (receive)	RESISTANCE
V201 (JAN 5840)	1	-0.3	∞
	2	2.3	330
	3	0	0
	4	2.3	330
	5	110	∞
	6	†6.3 ac *6.3	1.6 1.6
	7	110	∞
	8	2.3	330
V202 (JAN 5840)	1	-0.3	∞
	2	2.5	330
	3	†6.3 ac *6.3	1.6 1.6

TABLE XXVII. 20- TO 30-MC I-F AMPLIFIER, VOLTAGE AND RESISTANCE CHART (Cont)

TUBE	PIN	VOLTAGE (receive)	RESISTANCE
V202 (JAN 5840) (Cont)	4	2.5	330
	5	110	∞
	6	0	0
	7	110	∞
	8	2.5	330
V203 (JAN 6205)	1	0	1.8
	2	3.2	720
	3	0	0
	4	0	0
	5	115	∞
	6	†6.3 ac *6.3	-1.6 -1.6

TABLE XXVII. 20- TO 30-MC I-F AMPLIFIER VOLTAGE AND RESISTANCE CHART (Cont)

TUBE	PIN	VOLTAGE (receive)	RESISTANCE
V203 (JAN 6205) (Cont)	7	90	∞
	8	3.2	720
V204** (JAN 6021)	1	57	∞
	2	-3 minimum	100 k
	3	†0 *12.6	5.3 5.3
	4	0	0
	5	2.6	1000
	6	†6.3 ac *6.3	1.6 1.6
	7	-2.5	100 k
	8	77	∞
V205 (JAN 5840)	1	-1.5	56 k
	2	1.5	330
	3	0	0
	4	1.5	330
	5	96	∞
	6	†6.3 ac *6.3	1.6 1.6
	7	96	∞
	8	1.5	330

NOTES

1. All voltage measurements taken with a vtvm from tube socket terminal to ground and no signal input.
2. All resistance measurements taken with module removed from the main chassis and r-f connectors detached.
3. All voltages are d-c (positive) unless otherwise noted.
4. All resistances are in ohms unless otherwise noted.
5. † Applies to RT-332/ARC-52 only.
6. * Applies to RT-424/ARC-52X only.
7. ** Indicates voltages at this tube measured in transmit condition.

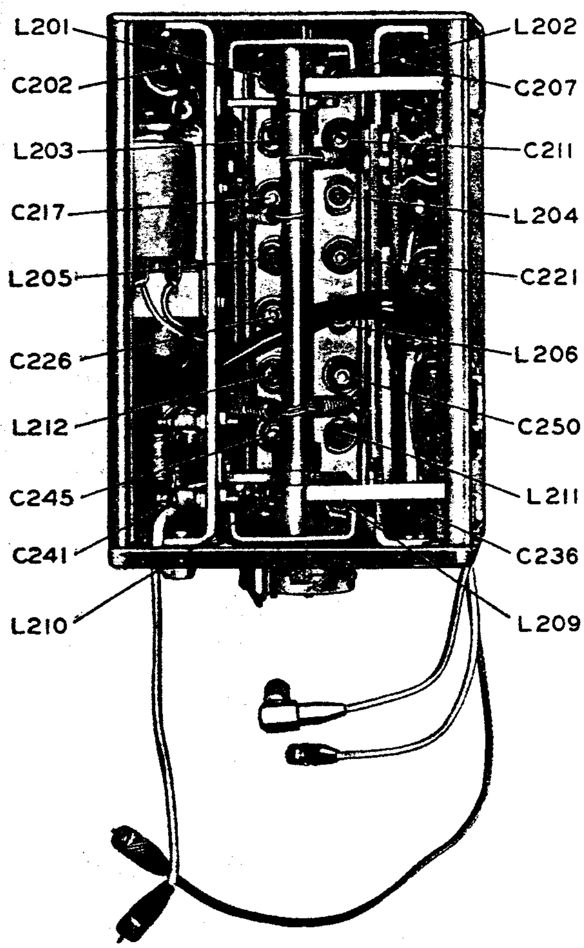


Figure 6-12. 20- to 30-Mc I-F Amplifier, Left Side View

at 29.7 mc for maximum meter indication. Continue to alternate between coil and capacitor adjustment for maximum indication at test point (T). The final reading should be not less than -0.5 volt dc.

o. Reconnect plug P201 to jack J1518 and plug P2 to jack J501. Connect the signal generator to antenna connector P1402 (figure 5-3), and adjust the r-f frequency output of the signal generator and the frequency output of the signal generator and the frequency of the radio set to 309.7 mc. Adjust capacitor C202 for maximum indication of avc voltage. Set the frequency output of the signal generator and the frequency of the radio set to 300.2 mc. Adjust coil L201 for maximum indication of avc voltage at jack J103 on J-995/ARM-38.

6-39. 20- TO 30-MC I-F AMPLIFIER. (Contract NOas 59-0165, Serial Numbers 1-49 and Prior Units.) All maintenance for the 20- to 30-mc i-f amplifier, manufactured prior to radio set Serial No. 50, Contract NOas 59-0165, is identical to that maintenance contained in sections V and VI of this handbook except for tube pin voltage and resistance. These voltages and resistances are given in table XXVIII.

TABLE XXVIII. 20- TO 30-MC I-F AMPLIFIER (CONTRACT NOas 59-0165. SERIAL NUMBERS 1-49 AND PRIOR UNITS). VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (receive)	RESISTANCE
V201 (JAN 5840)	1	-0.3	∞
	2	2.3	330
	3	0	0
	4	2.3	330
	5	110	∞
	6	6.3 ac	1.6
	7	110	∞
	8	2.3	330
V202 (JAN 5840)	1	-0.3	∞
	2	2.5	330
	3	6.3 ac	1.6
	4	2.5	330
	5	110	∞
	6	0	0
	7	110	∞
	8	2.5	330
V203 (JAN 6021)	1	0	∞
	2	0	∞
	3	0	0
	4	0	∞
	5	0.7	100
	6	6.3 ac	1.6
	7	0	5600
	8	90	∞
V204** (JAN 6021)	1	57	∞
	2	-3 minimum	100 k
	3	0	5.3
	4	0	0
	5	2.6	1000
	6	6.3 ac	1.6
	7	-2.5 ac	100 k
	8	77	∞
V205 (JAN 5840)	1	-1.5	56 k
	2	1.5	330
	3	0	0
	4	1.5	330
	5	96	∞
	6	6.3 ac	1.6
	7	96	∞
	8	1.5	330

NOTES

** Voltage at this tube measured in transmit condition.

1. All voltage measurements taken with a vtvm from tube socket terminal to ground and no signal input.
2. All resistance measurements taken with module removed from the main chassis and r-f connectors detached.
3. All voltages are dc (positive) unless otherwise noted.
4. All resistances are in ohms unless otherwise noted.

6-40. Proceed as follows to align the 20- to 30-mc i-f amplifier when the AN/ARM-38 is unavailable.

a. Disconnect plug P201 (figure 6-10) from jack J1518 and connect it through a 6-db pad to the signal generator.

b. Connect a vtvm to test point (M), jack J1406 (figure 5-1).

c. Energize the equipment and set the MANUAL frequency controls to 300.2 mc.

NOTE

Since the 20- to 30-mc i-f amplifier is not mounted upon an extension, the spectrum generator and amplifier, audio amplifier, 1.85-mc i-f amplifier, and oscillator modules must be removed so that components of the 20- to 30-mc i-f amplifier may be accessible. The spectrum generator and amplifier may remain inoperative but the 1.85-mc i-f amplifier, audio amplifier, and oscillator are placed on the test bench and power and signal connections are made using extension cables. Tuning of the oscillator unit, however, must be done manually. Considerable care must be exercised in the manual tuning to ensure equipment operation at the correct frequency. The initial tuning of the oscillator unit is accomplished by the procedure of step c since channeling the radio set to 300.2 mc automatically tunes the oscillator unit to 22.05 mc.

d. Connect a second vtvm to test point (L), jack J202 (figure 5-3). The monitored reading should be at least -1.0 volt dc during receive operation.

e. Turn off the equipment and remove the spectrum generator and amplifier, 1.85-mc i-f amplifier, audio amplifier, and oscillator from the main chassis. Place the modules on the test bench and reconnect the module plugs through extension cables to the respective jacks as follows: connect audio amplifier plug P401 (figure 6-15) to jack J1504; 1.85-mc i-f amplifier plugs P301 and P302 (figure 6-13) to jacks J1516 and J1503, respectively; and oscillator unit plugs P1901 and P1902 (figure 6-25) to jacks J1514 and J1515, respectively.

f. Energize the equipment and monitor the reading at test point (L). This reading should be identical to the one obtained in step d.

NOTE

The oscillator unit is tuned by hand from the original 22.05-mc frequency to 31.55 mc when the radio set is channeled to 309.7 mc. To increase the oscillator frequency from 22.05 mc to 31.55 mc, rotate the 0.1-mc and 1.0-mc couplers (figure 6-25) in the clockwise direction. Resonance at 31.55 mc is indicated when the radio set is channeled to 309.7 mc, the signal generator is set for 29.7 mc, and the oscillator couplers are rotated until the vtvm at test point (L) peaks. Resonance at 220.0 mc is indicated when the radio set is channeled to 300.2, the signal generator is set for 20.2 mc, and the oscillator couplers are rotated until the vtvm at test point (L) peaks.

g. Adjust the signal generator to 20.2 mc at a level sufficient to produce a readable avc variation at test point (M) on the vtvm. Adjust coils L201 through L205 (figure 6-12) for maximum avc. Keep the avc level below -1.5 volts by reducing the signal generator output during the alignment process.

h. Adjust coils L209 through L212 (figure 6-12) for maximum negative voltage of 6 to 8 volts at test point (L).

i. Set MANUAL frequency controls to 309.7 mc and adjust the signal generator to 29.7 mc. Rotate the oscillator couplers until the vtvm at test point (L) peaks.

j. Adjust capacitors C202, C207, C211, C217, and C221 (figure 6-12) for maximum avc at test point (M). Keep the avc level below -1.5 volts by reducing the signal generator output during the tuning process.

k. Adjust capacitors C236, C241, C245, and C250 (figure 6-12) for maximum negative voltage of 6 to 8 volts at test point (L).

l. Repeat steps g through k until the coils and capacitors have been properly adjusted. Proper adjustments are shown by a maximum avc voltage reading.

m. Perform the procedures of paragraph 6-38, steps n and o.

NOTE

It is not necessary to disconnect plug P2 from jack J501 (paragraph 6-38, step n) as part of the procedure of step e.

6-41. 1.85-MC I-F AMPLIFIER.

6-42. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XXIX provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XXX. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of 1.85-mc i-f amplifier test point checks.

6-43. BANDPASS CHECK. Determine if the bandpass of the 1.85-mc i-f amplifier meets the equipment specifications by performing the procedures given in the following steps.

a. Disconnect plug P301 (figure 6-14) from jack J1516 and connect the plug to a signal generator.

b. Connect a vtvm to AVC test point J103 at J-995/ARM-38.

c. Adjust the signal generator for a low-level output at 1.85 mc. Record the signal generator output level and also the avc voltage monitored at avc test point J103 at J-995/ARM-38.

d. Increase the signal generator output level 6 db and detune the signal generator until the avc voltage reaches the value recorded in step c. Measure and record the difference between the frequency setting of the signal generator and 1.85 mc.

e. Detune the signal generator on the opposite side of the 1.85 mc center frequency. Continue to detune the signal generator until the avc voltage reaches the value recorded in step c. Measure and record the difference between the frequency setting of the signal generator and 1.85 mc.

f. The sum of the frequency setting changes recorded in steps d and e must fall between a minimum of 60 kc and a maximum of 90 kc.

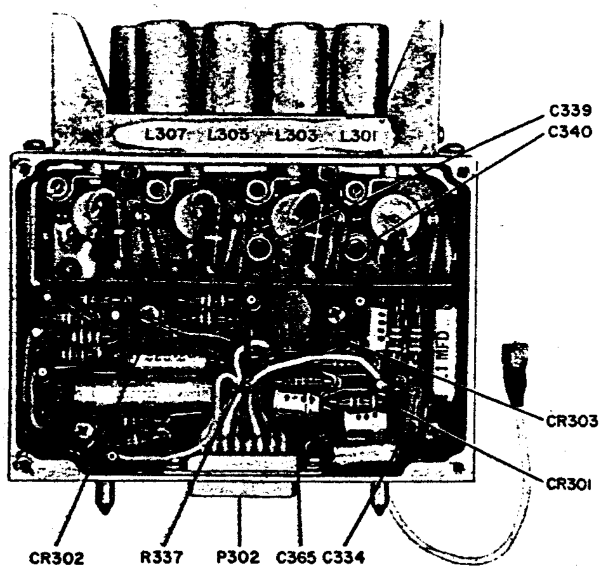


Figure 6-13. 1.85-Mc I-F Amplifier, Front View, Cover Removed

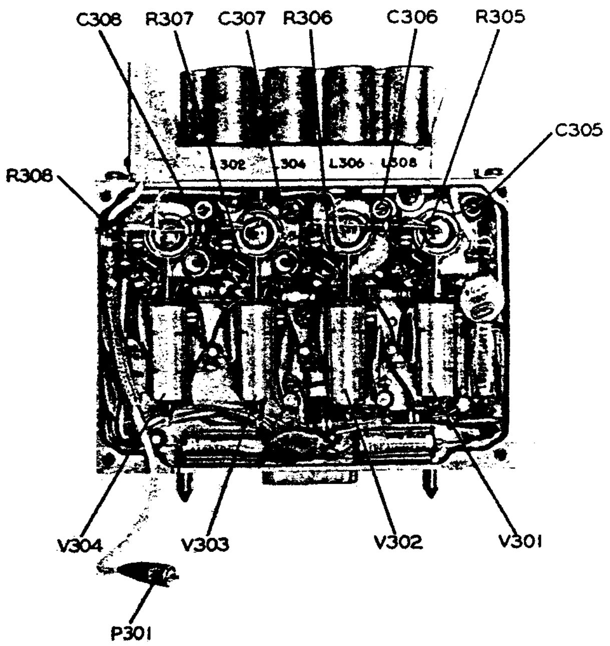


Figure 6-14. 1.85-Mc I-F Amplifier, Rear View with Filter Detached

g. The difference between the frequency setting changes recorded in steps d and e must be less than 15 kc.

NOTE

Thus, with the requirement of step g obtained. the maximum permissible displacement of the center frequency is 7.5 kc either side of 1.85 mc.

h. Repeat the procedures of steps d, e, and f using a 60 db change in out level instead of a 6 db change.

i. The sum of the frequency setting changes recorded at 60 db points must not exceed 200 kc.

6-44. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-13) and the rear of the module (figure 6-14). Check all detail parts for evidence of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures of table XXX.

TABLE XXIX. 1.85-MC I-F AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
		Bandpass of 1.85-mc i-f filter.	At 6-db points (paragraph 6-43), filter band pass is a minimum of 60 kc and a maximum of 90 kc. At 60-db points (paragraph 6-43), filter band pass is not more than 200 kc. (Refer to paragraph 6-43 for the band-pass measurement procedure.)
Terminals 4, 5, and 6 of jack J1503 (figures 5-13 or 5-14)	Main chassis.	1.85-mc i-f amplifier, with signal input.	Disconnect plug P301 (figure 6-14) from jack J1516 and connect plug to signal generator. Rotate capacitors C339 and C340 (figure 6-13) counterclockwise and MAIN SENS control R1401 (figure 5-1) fully clockwise.
Avc jack J103 Terminals 4, 5, and 6 of jack J1503	J-995/ARM-38 Main chassis.		Adjust signal generator output to 1.85 mc. modulated 30% at 1000 cps. Maintain signal generator output at 10 uv (open circuit). Using vtvm, measure voltages at following test points: a. Auxiliary audio at J1503-4 should measure at least 2.5V rms. b. Squelch voltage at J1503-5 should measure between -0.8 and -2.0V. c. Main audio at J1503-6 should measure at least 1.0V rms. d. Avc at test point J-103 should measure between -0.5 and -2.0V.
Terminals 4, 5, 6, and 12 of jack J1503 (figures 5-13 or 5-14)	Main chassis.	1.85-mc i-f amplifier, without signal input.	Remove signal generator from setup of above check and use vtvm to measure voltages at following test points: a. Auxiliary audio at J1503-4 should measure 1V rms, maximum. b. Squelch voltage at J1503-5 should measure between +4 and +8.3V dc. c. Main audio at J1503-6 should measure +18V dc, approximately. d. Noise component at J1503-6 should measure 0.2V rms, maximum. e. Bias supply at J1503-12 should measure between -13.5 and -15V. NOTE If the module performs satisfactorily, adjust capacitors C339 and C340 (paragraph 6-49).

TABLE XXX. 1.85-MC I-F AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Vtvm fails to measure 1.1 volt dc (approx) across V301 cathode resistor R305 (figure 6-14) with P301 (figure 6-14) disconnected from J1516.	Tube V301 defective.	Take voltage and resistance measurements. If readings are improper, replace tube V301, or locate faulty circuit part.
Vtvm fails to measure 1.2 volt dc (approx) across V302 cathode resistor R306 (figure 6-14) with P301 (figure 6-14) disconnected from J1516.	Tube V302 defective.	Take voltage and resistance measure ments. If readings are improper, replace tube V302, or locate faulty circuit part.
Vtvm fails to measure 1.15 volt dc (approx) across V303 cathode resistor R307 (figure 6-14) with P301 (figure 6-14) disconnected from J1516.	Tube V303 defective.	Take voltage and resistance measurements. If readings are improper, replace tube V303, or locate faulty circuit part.
Vtvm fails to measure 2.2 volts dc (approx) across V304 cathode resistor R308 (figure 6-14) with P301 (figure 6-14) disconnected from J1516.	Tube V304 defective.	Take voltage and resistance measurements. If voltage and resistance readings are improper, replace tube V304, or locate faulty circuit part.
Connect signal generator to P301. With signal generator set for 1.85 mc, modulated 30% at 1000 cps and no-load output level of 10 uv, a-f power meter at HEADSET jack J-108 on J-995/ARM-38 fails to measure 15 db (S+N/N ratio) or between -1 and -2V rms at J1503-4 (figures 5-13 or 5-14).	1.85-mc filter defective.	To verify this conclusion, disconnect C325 from the grid of V301. Connect a signal generator through a 1000-uuf capacitor to the grid of V301. Measure sensitivity as in trouble column. A reading of 12 db should be obtained. Do not attempt to repair a defective filter; replace it. Verify this conclusion by repeating the procedures of paragraph 5-9, main receiver sensitivity check. For an input test signal, however, use a 1.85-mc carrier applied directly to plug P301.
Positive residual avc.	Amplifier V301, V302, V303, or V304 (figure 6-14) defective.	Replace tubes. (The defective tube can be located by lifting the grid lead and monitoring the avc output. When the grid of the defective tube is disconnected, the avc goes negative.)
Module output oscillates.	Capacitor C305, C306, C307, or C308 (figure 6-14) defective. Poor cable ground.	Replace defective capacitor. Check cables and replace as necessary.
Abnormal avc characteristics.	Avc gating diode CR302 (figure 6-13) defective. Short in avc circuit component.	Replace crystal diode. Replace shorted component.
Main audio output abnormal but auxiliary output normal.	Noise limiter CR301 (figure 6-13) defective. Capacitor C334 (figure 6-13) defective.	Replace noise limiter. Replace capacitor.

TABLE XXX. 1.85-MC I-F AMPLIFIER, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Main audio output abnormal but auxiliary output normal. (Cont)	Defective main audio output component.	Replace defective component.
Main audio output normal but auxiliary audio output abnormal.	Resistor R337 or capacitor C365 (figure 6-13) defective.	Replace defective component.
Reduced gain through module.	Defective tube.	Check voltage and resistance of each tube.

NOTE

The trouble-shooting chart of table XXX is an extension of the minimum performance check chart (table XXIX); both tables should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XXX. Voltage and resistance measurements are given in table XXXI.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-45. With the 1.85-mc i-f amplifier removed from the main chassis, connect a short ground lead between the module and the main chassis. Without this connection, spurious oscillations may appear at the output of the module. Remove the front and rear covers when taking voltage and resistance readings (refer to table XXXI). Replace the covers, however, when injecting test signals into the module.

6-46. REMOVAL. To remove a tube from the 1.85-mc i-f amplifier (see figure 6-14), insert a nonmetallic tuning tool under the end of each tube. Pry the tube from the tube clip, and unsolder the tube leads. As each lead is unsoldered, tag it to facilitate replacement.

6-47. REPLACEMENT. Replace the tubes by reversing the removal procedure described in paragraph 6-46.

6-48. FILTER ALIGNMENT. The 1.85-mc i-f filter FL301 is factory-aligned equipment. Do not attempt to align it.

6-49. ALIGNMENT. Align the amplifier section of the 1.85-mc i-f amplifier as follows.

a. Disconnect plug P201 from jack J1518 and connect the signal generator to plug P201. Make certain a good ground exists between the module and the main chassis.

b. Adjust the radio set control to a frequency ending in 9.9 mc, such as 309.9.

c. Connect a vtvm to pin 5 of jack J1503.

d. Adjust the signal generator for 29.9 mc at 2 uv output.

e. Rotate trimmer capacitors C339 and C340 clockwise from a fully counterclockwise position. Advance both trimmers an equal amount until a voltage of -3 volts is indicated on the vtvm.

6-50. AUDIO AMPLIFIER.

6-51. MINIMUM PERFORMANCE CHECKS. The minimum performance checks of table XXXII provide indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XXXIII. If the module does check out, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of audio amplifier test point checks.

6-52. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-15) and the rear of the module (figure 6-16). Check the tubes (figures 6-15 and 6-16) making certain that the tubes are securely mounted and that they are the specified types. Check all detail parts for evidences of burning or shorts. If visual checks fail to isolate the cause of trouble, refer to the trouble shooting chart, table XXXIII; and perform the procedures of the paragraphs referenced in this table.

NOTE

The trouble-shooting chart (table XXXIII) and the complementary trouble-shooting paragraphs are an extension of the minimum performance check chart (table XXXII). Both tables and paragraphs should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XXXIII.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

TABLE XXXI. 1.85-MC I-F AMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V301 (JAN 5840)	1	**-0.5 to -3.1 (See note 1)	∞
	2	-	-
	3	0	0
	4	-	-
	5	75	∞
	6	†6.3 ac	6
		*6.3	6
	7	95	∞
	8	1.0	150
V302 (JAN 5840)	1	**-0.5 to -3.1 (See note 1)	∞
	2	-	-
	3	†6.3 ac	6
		*6.3	6
	4	-	-
	5	80	∞
	6	†0	12
		*12.6	12
	7	95	∞
	8	1.0	150
V303 (JAN 5840)	1	0	100 k
	2	-	-
	3	†0	12
		*12.6	12
	4	-	-
	5	85	∞
	6	†6.3 ac	18
		*18.9	18
	7	95	∞
	8	1.0	150
V304 (JAN 5840)	1	0	100 k
	2	-	-
	3	†6.3 ac	18
		*18.9	18
	4	-	-
	5	110	∞
	6	†0	24
		*25.2	24
	7	105	∞
	8	2.5	470

†RT-332/ARC-52
*RT-424/ARC-52X
**-0.5V with MAIN SENS (R1401) maximum cw, -3.1V with MAIN SENS (R1401) maximum ccw.

1. All measurements taken with a vtvm from tube socket terminal to ground except grids (1) of V301, V302, and V303: Take these measurements from the low side of the grid resistors to ground.
2. All voltages are volts dc (positive) unless otherwise noted.
3. All resistance readings are in ohms and are taken with the module removed from the main chassis.

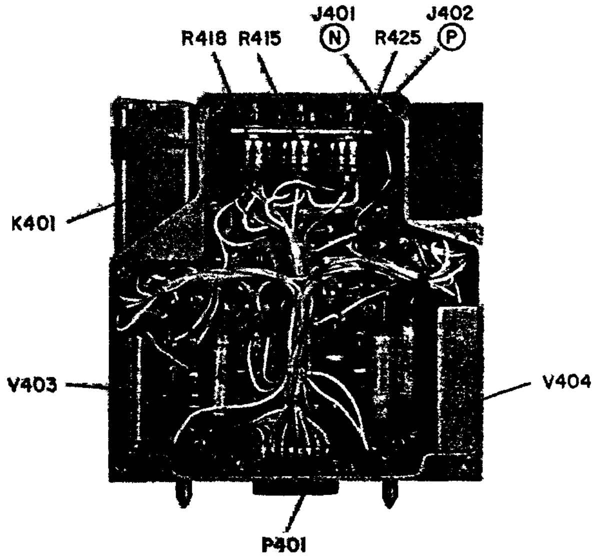


Figure 6-15. Audio Amplifier, Front View, Cover Removed

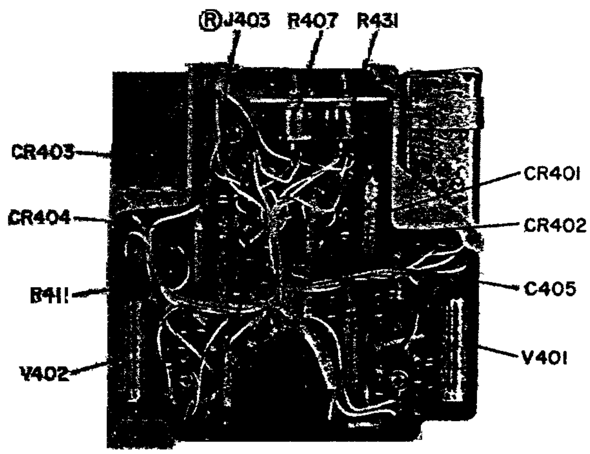


Figure 6-16. Audio Amplifier, Rear View, Cover Removed

NOTE

Trouble shooting of the audio amplifier is performed with the module connected for signal/noise squelch. (Refer to paragraph 3-8.)

TABLE XXXII. AUDIO AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
HEADSET jack J108	J-995/ARM-38	Main audio power output.	Adjust MAIN audio control R415 (figure 5-3) for 250 milliwatts, as described in paragraph 5-22d and illustrated in figure 5-4.
HEADSET jack J108	J-995/ARM-38	Sidetone audio power output	Adjust S-T control R418 (figure 5-3) for 250 milliwatts on TS-585B/U connected as shown in figure 5-6 and with the TONE switch of Distribution Box J-995/ARM-38 set to ON.
AUX OUTPUT jack J106 or test point Ⓝ	J-995/ARM-38 Audio amplifier	Auxiliary audio power output	Adjust AUX audio control R431 (figure 5-3) for 0.5 volt rms indication, as described in paragraph 5-22e.
Ⓡ J403 (figure 5-3)	Audio amplifier	Squelch relay operation	Using the test equipment connections and settings of paragraphs 5-22b and 5-22c, rotate S/N threshold control R407 (figure 5-3) throughout range of control. Relay K401 (figure 6-15) picks up and drops out, as evidenced by an audible sound.
HEADSET jack J108	J-995/ARM-38	Guard audio power output	Adjust GUARD audio control R425 (figure 5-3) for 250 milliwatts as described in paragraph 5-22h and illustrated in figure 5-4.

TABLE XXXIII. AUDIO AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
No main audio.	Tube V403B or V404 defective.	Refer to paragraph 6-53.
No sidetone audio.	Tube V403B or V404 defective.	Refer to paragraph 6-54.
No auxiliary audio.	Tube V402B defective.	Refer to paragraph 6-55.
Malfunction of signal/noise squelch circuit.	Tube V401 defective.	Refer to paragraph 6-55.
Malfunction of squelch relay.	Tube V402A or V403A defective.	Refer to paragraph 6-55.
No guard audio.	Tube V404 defective.	Refer to paragraph 6-56.

6-53. MAIN AUDIO TROUBLE SHOOTING. Trouble shoot the main audio circuits as described in succeeding steps when a 250-milliwatt output at HEADSET jack J108 on J-995/ARM-38 is unobtainable throughout the range of MAIN audio control R415 (figure 6-15).

a. Verify that the trouble exists in the audio circuits and not in the squelch circuits by introducing a 400-cps, 1-volt signal at test point Ⓝ (figure 6-15).

NOTE

When test point Ⓝ is used as a feed-in, the AUX AUDIO pot. R431 must be set at its maximum clockwise position.

Rotate S/N threshold control R407 (figure 6-16) throughout the range of the control. If relay K401 (figure 6-15) responds (a condition indicated by the clicking of the relay contacts), the main audio is defective.

NOTE

If the squelch relay does not respond, refer to paragraph 6-55.

b. Connect a dummy load to antenna connector P1402 (figure 5-3). Maintain squelch relay K401 in the open condition by connecting a jumper from test point Ⓡ (figure 6-16) to the high side of R411 (figure 6-16).

This latter connection is common to pin 4 of tube V402A.) Insert a test signal by setting the TONE switch at J-995/ARM-38 to ON. This switch applies a modulated sidetone input to pin 4 of plug P401 (figure 6-15).

CAUTION

Never place the radio set in the transmit condition with the signal generator connected to antenna connector P1402.

c. Adjust S-T control R418 (figure 6-15) for a 250-milliwatt output at HEADSET jack J108 on J-995/ARM-38. If this indication is obtained, a defect exists within those components relating only to the main audio. (Check the circuit between pin 8 of plug P401 and pin 7 of audio amplifier V403B.) If the appropriate indication is not present at the HEADSET jack, a defect exists within the circuits common to main audio and sidetone audio. (Refer to step d.)

d. Localize the trouble by inserting a 4-volt. 1000-cps signal at pin 1 of tube V404. Monitor the output at HEADSET jack J108. If an output of 250 milliwatts minimum is obtained, audio amplifier V403B or associated circuit components are defective. If the appropriate indication is not present at the HEADSET jack, audio output amplifier V404 or associated circuit components are defective. Take voltage and resistance measurements (table XXXIV) at the applicable tube. If these voltage and resistance measurements are improper, replace tube or locate and replace faulty circuit component. Remove jumper from test point Ⓡ and pin 4 of tube V402.

TABLE XXXIV. AUDIO AMPLIFIER. VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V401 (JAN 6021)	1	100	65 k
	2	0	680 k
	3	† 6.3 ac	∞
		* 18.9	∞
	4	1.1	270
	5	1.1	270
	6	† 0	∞
		* 12.6	∞
	7	0	700 k
	8	100	65 k
V402 (JAN 6021)	1	10(V402A conducting)	1.8 meg
	1	25(V402A nonconducting)	1.8 meg
	2	0 to 5 (See note 5)	1.2 meg (See note 5)
	3	† 6.3 ac	∞
		* 18.9	∞
	4	5	22 k
	5	27	10.5 k
	6	† 0	∞
		* 12.6	∞
	7	20	1 meg
	8	130	55 k
V403 (JAN 6021)	1	90(V402A conducting)	55 k
	1	130(V402A nonconducting)	55 k
	2	10(V402A conducting)	1.8 meg
	2	25(V402A nonconducting)	1.8 meg
	3	† 6.3 ac	∞
		* 18.9	∞
	4	27.5	100 k
	5	2	3900 (with carrier squelch)
	5	10	2500 (with S/N squelch)
	6	† 0	∞
		* 12.6	∞
	7	0	150 k to 320 k (depends on main and sidetone potentiometer settings)
	8	75	150 k
V404 (JAN 5902)	1	0	100 k to 600 k (depends on guard potentiometer setting)
	2	10	330
	3	† 0	∞

TABLE XXXIV. AUDIO AMPLIFIER, VOLTAGE AND RESISTANCE CHART (Cont)

TUBE	PIN	VOLTAGE	RESISTANCE
V404 (JAN 5902) (Cont)		* 25.2	∞
	4	10	330
	5	120	55 k
	6	† 6.3 ac	∞
		* 18.9	∞
	7	115	70 k
	8	10	330

NOTES

1. All measurements taken with a vtvm from tube terminal to ground.
2. All voltages are volts dc (positive) unless otherwise noted.
3. All resistances are in ohms unless otherwise noted.
4. All resistances taken with module removed from main chassis and r-f connectors detached.
5. Voltage and resistance range determined by setting of S/N threshold control R407.
6. † RT-332/ARC-52.
7. * RT-424/ARC-52X.

6-54. SIDETONE AUDIO TROUBLE SHOOTING. Trouble-shoot sidetone audio circuits, when a 250-milliwatt output at HEADSET jack J108 is unobtainable throughout range of S-T audio control R418 (figure 6-15), as follows.

a. Determine that main audio power output level provides required indication at HEADSET jack J108. (Refer to table XXXII.)

b. If results of step a are unacceptable, perform procedures of paragraph 6-53. If results are acceptable, check circuitry between pin 4 of plug P401 and pin 7 of audio amplifier V403B.

6-55. SQUELCH CIRCUIT TROUBLE SHOOTING. Trouble within squelch circuits may be caused by a defect within auxiliary audio amplifier, signal/noise squelch circuits, or squelch relay circuits. Trouble-shoot squelch circuits as follows whenever squelch operation is abnormal.

a. Adjust AUX audio control R431 to its maximum clockwise position.

b. At test point Ⓝ, alternately introduce a 400-cps, 1-volt signal and a 20,000-cps, 1-volt signal. Set S/N threshold control R407 (figure 6-16) at midrange and monitor output at test point Ⓡ (figure 6-16). Signal/noise squelch circuits are normal if reading is at least +6 volts dc for a 400-cps input and more negative than -5 volts dc for a 20,000-cps input. If these indications are abnormal, proceed to step c; if normal, proceed to step f.

NOTE

Effective at MCN 2800 with S/N threshold control rotated to maximum clockwise position. With a 400-cps, 1-volt input, voltage at test point Ⓡ should be not less than +6.5 volts. At 20,000-cps, 1-volt input, voltage at test point Ⓡ should be not more than +4.0 volts.

c. If readings taken at test point Ⓡ are abnormal for 400-cps and 20,000-cps inputs, take voltage and resistance readings at pins of signal/noise amplifier V401. If readings are abnormal, replace tube or locate faulty circuit part.

d. If readings taken at test point Ⓡ are abnormal only during 400-cps input, measure voltage at junction of capacitor C405 and crystal diode CR401 (figure 6-16). A voltage of +6 volts indicates satisfactory operation of signal sensing circuit. If this voltage is low, measure a-c voltage at pin 4 of choke L401 (figure 6-16). This voltage should be a minimum of 5 volts rms; and if this value is found, diode CR401 (figure 6-16) is probably faulty. If a-c voltage at pin 4 of choke L401 is low, check a-c voltage at pin 2 of tube V401. If this voltage exceeds 4 volts rms, tube V401 is defective.

e. If readings taken at test point Ⓡ are abnormal during 20,000-cps input interval only, measure voltage at junction of capacitor C405 and crystal diode CR402 (figure 6-16). This voltage should exceed -5 volts. If this voltage is low, measure a-c voltage at pin 2 of choke L401. If this measurement is 4 volts, diode CR402 is probably defective; if less than 4 volts, check tube V401 as described in step d.

NOTE

Effective MCN 2800 d-c voltage at junction of C406 and CR402 should be not less than -2 volts with an input of 20,000 cps and 1 volt.

f. With normal output monitored at test point Ⓡ, isolate a trouble within squelch relay circuits by setting TONE switch at ON and monitoring sensing circuit output at test point Ⓡ. Rotate S/N threshold control R407 fully counterclockwise, and monitor plate voltage (pin 1) of d-c squelch amplifier V402A. The tube should be cut off, a condition evidenced by a plate voltage reading of +25 volts dc. Rotate S/N threshold control in clockwise direction until a reading of approximately +4 volts dc is monitored at test point Ⓡ. At this point, squelch amplifier is driven into conduction. This condition is evidenced by a drop in plate voltage from +25 volts dc to +10 volts dc. If these voltages are not obtained, squelch amplifier is not functioning properly.

NOTE

Effective MCN 2800 with S/N threshold control in maximum counterclockwise position, a 1-volt, 400-cps input, voltage at test point Ⓡ should be not more than +3.5 volts. At 1-volt, 20,000-cps input, voltage at test point Ⓡ should be not more than 0 volt.

g. As squelch amplifier is driven from a nonconducting status to a conducting status, squelch relay puller V403A is correspondingly driven from a conducting status to a nonconducting status. These conditions are evidenced by a rise in plate (pin 1) voltage from +90 volts dc to +130 volts dc. If these voltages are not obtained, squelch relay puller is not functioning properly.

h. Check squelch relay K401 by taking resistance readings across coil. If resistance is not 8000 ohms ±10 percent, replace relay. If resistance is normal, take voltage and resistance measurements (table XXXIV) at pins of squelch relay puller V403A. If readings are abnormal, replace tube or locate faulty circuit part.

6-56. GUARD AUDIO TROUBLE SHOOTING. Troubleshoot guard audio circuits of audio amplifier as follows when a 250-milliwatt output at HEADSET jack J108 on J-995/ARM-38 is unobtainable throughout range of GUARD AUDIO control R425 (figure 6-15).

a. Determine that main audio power level provides required indication at HEADSET jack J108. (Refer to table XXXII).

b. If results of step a are unacceptable, perform procedures of paragraph 6-53. If results are acceptable, check circuit between pin 5 of plug P401 and pin 1 of audio amplifier V404.

6-57. REMOVAL. To remove a tube from audio amplifier (see figures 6-15 and 6-16), insert a small flat-bladed screwdriver under end of metal shield that covers tube envelope. Pry tube from tube clip and unsolder tube leads. As each lead is unsoldered, tag it to facilitate reassembly.

NOTE

Tubes V401, V402, and V403 are reached through access holes within the module subassembly.

6-58. REPLACEMENT. To replace audio amplifier tubes, reverse removal procedure described in paragraph 6-57.

6-59. GUARD RECEIVER.

6-60. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XXXV provide indications by which maintenance personnel can determine that a repaired module meets minimum standards of performance. If module fails to check out, perform trouble-shooting procedures given in table XXXVI. If module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform minimum performance checks of over-all radio set (section V).

TABLE XXXV. GUARD RECEIVER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
HEADSET jack J108	J-995/ARM-38	Guard receiver sensitivity.	Connect test equipment to radio set as illustrated in figure 5-4 and set function switch to T/R-G. Adjust output of signal generator to 1000 uv (open circuit), modulated 30% 1000 cps at 243.0 mc. Rotate MAIN SENS control R1401 and GUARD SENS control R1402 (figure 5-1) fully clockwise. Rotate MAIN audio gain control R415 (figure 5-3) fully counterclockwise. Adjust GUARD audio gain control R425 (figure 5-3) for an a-f power meter reading of 250 milliwatts at the test point. Adjust the signal generator for a 5-uv output and record the audio power indication. Remove the modulation and again record the audio power indication. The difference between the readings with modulation and without modulation should be at least 10 db.
HEADSET jack J108	J-995/ARM-38	Guard receiver avc.	Maintain test equipment and control settings used in above check. Adjust signal generator output level successively to 5 uv, 10 uv, and 1000, 000 uv (open circuit). Audio output measured on a-f power meter should not vary more than ±3 db from 1000-uv reference level as signal generator output is varied through output level range.
HEADSET jack J108	J-995/ARM-38	Guard receiver squelch circuit.	Maintain test equipment and control settings used in above check. Reduce signal generator output level to 5 uv (open circuit)and adjust GUARD SENS control R1402 (figure 5-1) until squelch operates. Squelch circuit should produce 10-db quieting with 1-db reduction in signal generator input.

TABLE XXXVI. GUARD RECEIVER. TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Normal guard receiver avc obtained at test point Ⓨ, and normal guard receiver detector voltage obtained at test point Ⓩ (figure 6-17), but abnormal guard receiver audio output obtained at test point Ⓟ (figure 5-3). (Refer to table XII for conditions of guard receiver test point check.)	Tube V808A defective.	Take voltage and resistance measurements. If the readings are abnormal, replace tube or locate faulty circuit part.
Normal guard receiver detector voltage obtained at test point Ⓩ (figure 6-17) and normal guard receiver audio output obtained at test point Ⓟ (figure 5-3), but abnormal guard receiver avc obtained at test point Ⓨ (figure 6-17).	Diode CR805 (figure 6-17) defective.	Take voltage and resistance measurements. If the readings are abnormal, replace diode or locate faulty circuit part.
With application of test signals introduced at plug P802 (figure 6-18), no changes are observed at detector test point Ⓩ and avc test point Ⓨ (figure 6-17). Change is observed at test point Ⓟ (figure 5-3) but this audio is not normal.	Diode CR801 (figure 6-17) defective.	Take voltage and resistance measurements. If the readings are abnormal, replace diode or locate faulty circuit part.
No voltage changes are observed at detector test point Ⓩ, avc test point Ⓨ, or audio test point Ⓟ. Introduce 1.85-mc test signal across L805 (figure 6-18) in series with a 1000-uuf capacitor; disable injection oscillator V803B by shorting grid (pin 7) to ground. Note. Be certain to remove ground from pin 7 of V803B upon completion of this step.	Tube V805, V806, or V807 defective.	Take voltage and resistance measurements. If the readings are improper, replace tubes one at a time or locate faulty circuit part.
	Transformer T801, T802 or T803 misaligned.	Retune. (Refer to paragraphs 6-66 and 6-67.)
No oscillator drive detected at grid (pin 2) of frequency doubler V803A.	Coils L806 and L807 (figure 6-18) misaligned.	Retune coils L806 and L807. (Refer to paragraphs 6-67 and 6-68.)
	Tube V803 defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Crystal Y801 (figure 6-18) defective.	Replace crystal.
Inject 36.3-mc test signal at pin 8 of 1st mixer V802B through a 1000-uuf capacitor. All previous steps of this chart indicate that i-f and audio circuits are functional.	Tube V804 defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Coils L802, L803, L804 or L805 (figure 6-18) misaligned.	Retune. (Refer to paragraph 6-67.)
With test signal reintroduced at P802 (figure 6-18), no voltage change is observed at detector test point Ⓩ.	Tube V801, V802A, or V802B defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Coils Z801, Z802, and Z803 misaligned (figure 6-18).	Retune. (Refer to paragraph 6-68.)

NOTE

Refer to table XII for condition of guard receiver test point checks.

6-61. TROUBLE SHOOTING. Remove cover plates to expose the front of the module (figure 6-17) and the rear of the module (figure 6-18). Check the tubes (figures 6-17 and 6-18), making certain that the tubes are securely mounted and that they are the specified types. Check all detail parts for evidences of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures of table XXXVI. Refer to table XXXVII for voltage and resistance checks.

TABLE XXXVII. GUARD RECEIVER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE		RESISTANCE
V801 (JAN 5840)	1	-2.75		3 meg approx
	2	0		0
	3	0		0
	4	0		0
	5	130		26 k
	6	†6.3 ac		1.9
		*6.3		1.9
	7	128		26.5 k
	8	0		0
V802 (JAN 6021)	1	130		25 k
	2	-2.5		3 meg approx
	3	0		0
	4	0		0
	5	4		3.3 k
	6	†6.3 ac		1.9
		*6.3		1.9
	7	0, 0.75 ac or greater		12 k
	8	130		29 k
V803 (JAN 6021)	1	110		30 k
	2	-1.5		100 k
	3	†6.3 ac		1.9
		*6.3		1.9
	4	0		0
	5	0		0
	6	†0		3.8
		*12.6		3.8
	7	-0.36		100 k
	8	105		30 k
V804 (JAN 5840)	1	-2.5		3 meg approx
	2	0		0
	3	†6.3 ac		1.9
		*6.3		1.9
	4	0		0
	5	70		61 k
	6	†0		3.8
		*12.6		3.8
	7	70		61 k
	8	0		0
V805 (JAN 6205)	1	0		0
	2	4.5		2.7 k
	3	†0		3.8
		*12.6		3.8
	4	0		0
	5	128		26 k
	6	†6.3 ac		9.5
		*18.9		9.5
	7	100		130 k
	8	4.5		2.7 k
V806 (JAN 5840)	1	-2.5		3 meg approx
	2	0		0
	3	†6.3 ac		9.5
		*18.9		9.5
	4	0		0
	5	128		26.5 k
	6	†0		11
		*25.2		11
	7	128		26.5 k
	8	0		0
V807 (JAN 5840)	1	0		2.8
	2	2		270
	3	†6.3 ac		9.5
		*18.9		9.5
	4	2		270
	5	125		26.5 k
	6	†0		11
		*25.2		11
	7	125		26.5 k
	8	2		270
		Squelched	Not Squelched	
V808 (JAN 6021)	1	130	102	125 k
	2	10	45	2 meg
	3	†6.3 ac	†6.3 ac	9.5
		*18.9	*18.9	9.5
	4	42	48	7 k
	5	0	0	0
	6	0	†0	11
		*25.2	*25.2	11
	7	-0.2	-3.5	500 k
	8	11	43	6.5 k

NOTES

1. Voltage measurements are taken from tube terminal to ground with vtvm.
2. All voltages are volts dc (positive) unless otherwise noted.
3. Resistance measurements are taken with the module removed from the main chassis and with r-f connectors removed.
4. All resistances are in ohms unless otherwise noted.
5. All voltage readings are taken without signal input and with the GUARD SENS control rotated fully clockwise.
6. *Indicates voltage in RT-424/ARC-52X only.
7. †Indicates voltage in RT-332/ARC-52 only.

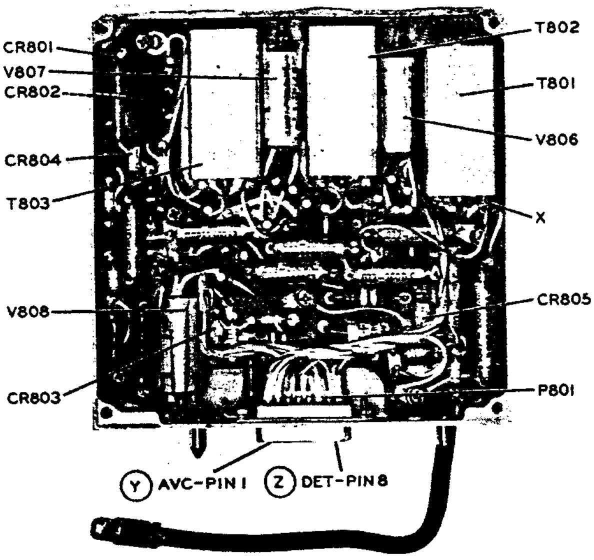


Figure 6-17. Guard Receiver, Front View, Cover Removed

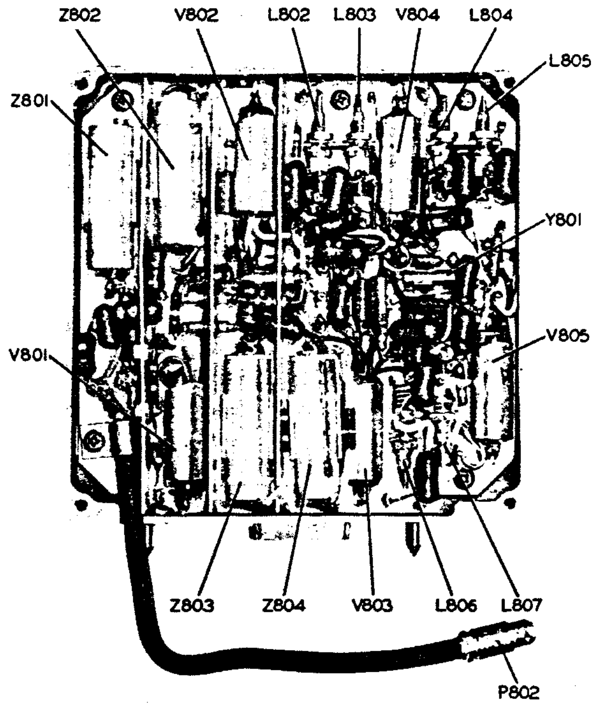


Figure 6-18. Guard Receiver, Rear View, Cover Removed

NOTE

The trouble-shooting chart of table XXXVI is an extension of the minimum performance check chart (table XXXV), and both tables should be used to isolate a trouble. Set the function switch to T/R+G and perform the procedures of table XXXVI using a test signal at 243.0 mc modulated 30 percent at 1000 cps inserted at guard receiver plug P802 (figure 6-18).

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-62. TUBE REMOVAL.
a. To remove tubes V806, V807, and V808 (figure 6-17) insert a small flat-bladed screwdriver under the metal shield surrounding the tube. Pry the tube from its tube clip and unsolder the tube leads.
b. To remove tubes V801, V802, V803, V804, and V805, unsolder the tube leads on the appropriate tube (figure 6-18). Loosen the screws holding the metal board, lift the board, and slide the tube out of its tube shield.

6-63. TUBE REPLACEMENT. To replace tubes within the guard receiver module, reverse the removal procedure of paragraph 6-62.

6-64. PRINTED CIRCUIT BOARD REMOVAL. To remove a printed circuit board, loosen the six screws holding the board in place, unsolder the plate connection of V805 at the primary of transformer T801 (x of figure 6-17), pry the tubes from the tube clips, and lift the board away from the board mounting sufficiently to reach the printed board connectors at the underside of the board.

6-65. PRINTED CIRCUIT BOARD REPLACEMENT. To replace a printed circuit board, reverse the removal procedure of paragraph 6-64.

6-66. ALIGNMENT OF 1.85-MC I-F CIRCUITS. Align the 1.85-mc i-f circuits of the guard receiver as follows.
a. Remove cover plates to expose the front of the module (figure 6-17) and the rear of the module (figure 6-18).
b. Connect the signal generator through a 1000-$\mu\mu$f capacitor to the grid (pin 1) of tube V805 (figure 6-18), and disable injection oscillator V803B by detuning coil L807 (figure 6-18).
c. Connect a vtvm to test point Ⓩ, and set range to the low negative scale.
d. Set signal generator to 1.85 mc modulated 30 percent at 1000 cps, and increase the output level of the signal generator until detector voltage at test point Ⓩ begins to rise.

NOTE

If a reading cannot be obtained at test point Ⓩ, reconnect the signal generator to the grid (pin 1) of tube V807 (figure 6-17), and tune transformer T803 (figure 6-17) for maximum indication at test point Ⓩ.

e. Reconnect the signal generator to the grid (pin 1) of tube V806, and tune transformer T802 (figure 6-17) for maximum indication at detector test point Ⓩ.

NOTE

During each adjustment, decrease the output level of the signal generator so that a voltage peak can be located at test point Ⓩ.

f. Reconnect the signal generator to the grid (pin 1) of tube V805, and tune the secondary of transformer T801 (figure 6-17) and then the primary for maximum indication at detector test point Ⓩ.

g. Place an 8200-ohm resistor across the primary of transformer T803 (figure 6-17), and adjust the transformer secondary for maximum voltage indication at detector test point Ⓩ.

h. Remove the resistor, place it across the secondary of transformer T803, and adjust the transformer primary for maximum voltage indication at detector test point Ⓩ.

i. Repeat steps g and h for transformers T802 and T803 (figure 6-17).

NOTE

An input of approximately 6000 microvolts at tube V805, pin 2, should produce an indication of -4 volts at test point Ⓩ.

6-67. ALIGNMENT OF 36.3-MC I-F CIRCUITS. Align the 36.3-mc i-f circuits of the guard receiver as follows.

a. Connect the signal generator through a 1000-μμf capacitor to the cathode (pin 5) of tube V802B (figure 6-18). With the output of the signal generator set to 36.3 mc, adjust oscillator coil L807 (figure 6-18) for maximum indication at test point Ⓩ.

b. Tune coil L805 for maximum indication at detector test point Ⓩ. Repeat this procedure for coil L804.

c. Tune coil L803 for maximum indication at detector test point Ⓩ. Repeat this procedure for coil L802.

NOTE

An input of approximately 100 microvolts at tube V802B, pin 5, should produce an indication of -4 volts at test point Ⓩ. This input should also produce an i-f sensitivity of 19 db measured at test point Ⓩ.

6-68. ALIGNMENT OF R-F SECTION. Align the r-f section of the guard receiver as follows.

a. Connect the signal generator to the guard receiver at plug P802 (figure 6-18). With the output of the signal generator set to 243.0 mc, modulated 30 percent at 1000 cps, adjust the slugs in coil L806 and tank Z804 (figure 6-18) for maximum indication at detector test point Ⓩ.

b. Adjust the slugs in tanks Z801, Z802, and Z803 for maximum output at test point Ⓩ.

c. Attach the covers and retune coils and tanks L807, L806, Z804, L805, L804, L803, Z803, Z802, and Z801 for maximum detector output at test point Ⓩ.

NOTE

The squelch should open at 2 microvolts or less. The sensitivity at 5 microvolts should be at least 10 db.

6-69. SPECTRUM GENERATOR AND AMPLIFIER.

6-70. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XXXVIII provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XXXIX. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of spectrum generator and amplifier test point checks.

6-71. DIODE TEST LOAD. The diode test load or milliwattmeter is connected to jack J501 (figure 6-19) whenever a check of amplifier stages V503 through V505 is required. Fabricate the diode test load (figure 6-20) with a connector to mate with jack J501. Use a vtvm to indicate the d-c voltages present at the test point.

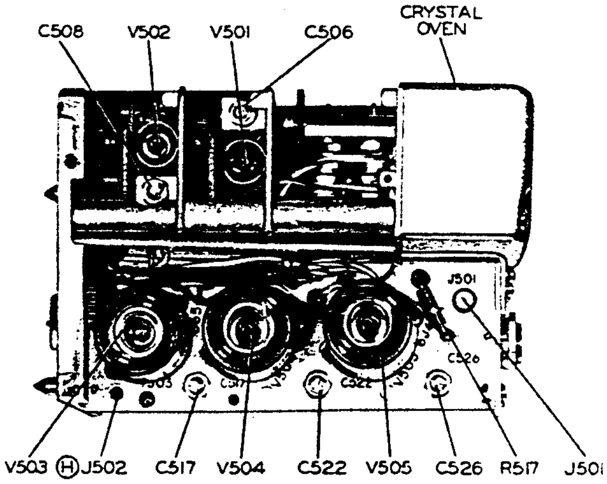


Figure 6-19. Spectrum Generator and Amplifier, Left Side View

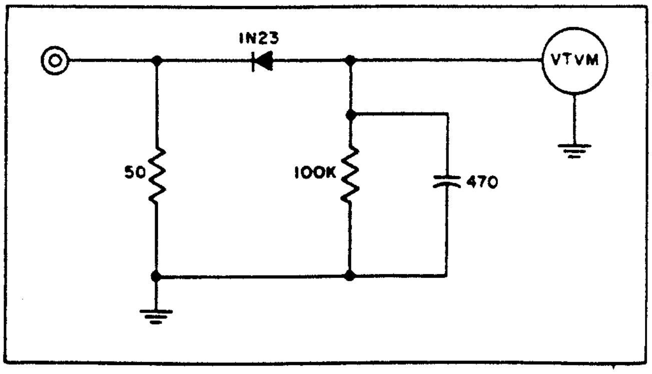


Figure 6-20. Spectrum Generator and Amplifier, Schematic Diagram of Diode Test Load

TABLE XXXVIII. SPECTRUM GENERATOR AND AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
(H) J502 (figure 6-19)	Spectrum generator and amplifier.	Spectrum generator output to amplifier.	With radio set energized and MANUAL frequency controls set to 225.0 mc, vtvm indicates -7.0 volts dc minimum. Channel the radio set from 225.0 mc to 395.0 mc in 10-mc increments. At each increment, the vtvm indicates -7.0 volts dc minimum.
J501 (figure 6-19)	Spectrum generator and amplifier.	Spectrum generator and amplifier output.	Disconnect plug P2 from jack J501 (figure 5-3). Connect the 50-ohm diode test load or milliwattmeter (refer to paragraph 6-71) to jack J501. Energize radio set and adjust MANUAL frequency controls to 304.7 mc and 225.0 mc. Vtvm indicates -3.0 volts dc or milliwattmeter indicates 0.18 watts minimum for both frequency settings.

TABLE XXXIX. SPECTRUM GENERATOR AND AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Less than -7.0V dc is measured at test point (H) (figure 6-19) for several frequencies taken throughout frequency range of spectrum generator and amplifier.	Tube V501 or V502 (figure 6-19) or a defective component.	Take voltage and resistance measurements (table XL) to locate faulty tube or circuit part. Approximately -6.8 volts should be measured at pin 1 of tube V502. If not, the trouble is probably in oscillator stage V501.
Less than -7.0V dc is measured at test point (H) (figure 6-19) for a particular frequency within the range of spectrum generator and amplifier.	Selected coil from L501 through L518 (figure 6-22) misaligned.	Tune appropriate coil (refer to paragraph 6-77).
	Selected crystal from Y501 through Y515 (figure 6-22) defective.	Replace defective crystal (refer to paragraph 6-75).
Minus 7.0V dc is measured at test point (H) (figure 6-19) but milliwattmeter or vtvm with diode load at jack J501 (figure 6-19) fails to measure 0.18 watts or -3.0 volts, respectively.	Tubes V503, V504, or V505 (figure 6-19) defective.	Check tubes. If tubes are good, take voltage and resistance measurements at tube socket to locate faulty circuit part.
	Tank circuits Z501, Z502, and Z503 (figure 6-21) misaligned.	Check tracking and retrack if necessary (refer to paragraph 6-79).
	Tank circuits Z501, Z502, and Z503 (figure 6-21) are 180 degrees out of phase with switches.	Resynchronize tank circuits and switches (refer to paragraph 6-76). NOTE When synchronized, the green marking on the end of the amplifier tuner shaft is toward the 6J4's at 220 mc. Refer to paragraph 6-74.

TABLE XXXIX. SPECTRUM GENERATOR AND AMPLIFIER, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Abnormal readings measured at test point Ⓗ and jack J501 on all or many frequency channels.	Printed switches are not synchronized with gear train.	Resynchronize (refer to paragraph 6-76).
No output measured at test point Ⓗ or jack J501.	Tank circuits of V501B and V502 are out of alignment.	Align circuits (refer to paragraph 6-77).
Operation of spectrum generator and amplifier is abnormal, but all tubes and circuit elements check out.	Synchronization between module and main chassis gear train is lost.	Synchronize mechanical components. Refer to overhaul.

6-72. TROUBLE SHOOTING. Check all the module tu s to make certain that the tubes are operative and that they are the specified types. (See figure 6-19.) Remove the cover plate to expose the front of the module (figure 6-21). Check tank circuits Z501, Z502, and Z503 over the full tuning range to determine that the tuning capacitor rotor blades do not short against the stators. Also determine that each inductance arm makes contact with the corresponding inductance ring over the full tuning range. Manually rotate the gear train coupler; and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Remove the cover plate to expose the rear of the module (figure 6-22). Check all detail parts for evidence of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table XXXIX. Refer to table XL for voltage and resistance measurements.

NOTE

The procedures of table XXXIX are an extension of the minimum performance check chart (table XXXVIII); both tables should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table XXXIX.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately set the function switch to OFF.

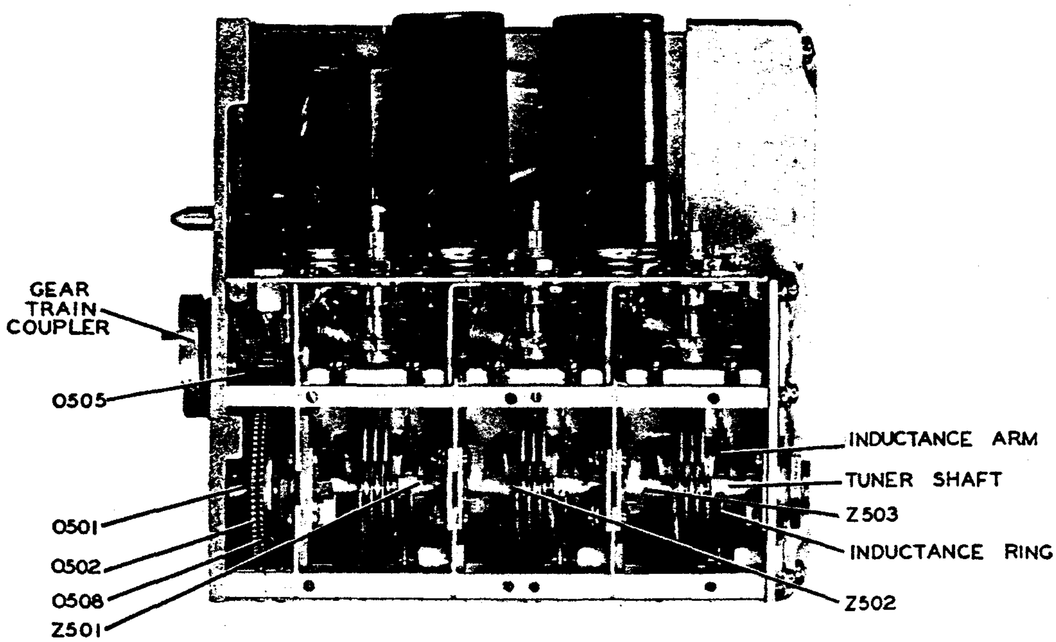


Figure 6-21. Spectrum Generator and Amplifier, Front View, Cover Removed

TABLE XL. SPECTRUM GENERATOR AND AMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V501	1	105	∞
(JAN	2	-3	47 k
6021)	3	†6.3 ac	∞
		*18.9	∞
	4	1.4	135
	5	1.4	135
	6	†0	∞
		*12.6	∞
	7	0	22
	8	105	∞
V502	1	-6.8	100 k
(JAN	2	1.8	270
5840)	3	†0	∞
		*25.2	∞
	4	1.8	270
	5	115	∞
	6	†6.3 ac	∞
		*18.9	∞
	7	115	∞
	8	1.8	270
V503	1	-7 minimum	100 k
(JAN	2	0	0
5654)	3	†0	∞
		*25.2	∞
	4	†6.3 ac	∞
		*18.9	∞
	5	130	∞
	6	130	∞
	7	0	0
V504	1	0	0
(JAN	2	0	100
6J4WA)	3	†0	∞
		*25.2	∞
	4	†6.3 ac	∞
		*18.9	∞
	5	0	0
	6	0	0
	7	130	∞
V505	1	0	0
(JAN	2	0	100
6J4WA)	3	†6.3 ac	∞
		*18.9	∞
	4	†0	∞
		*12.6	∞
	5	0	0
	6	0	0
	7	130	∞

NOTES

1. All measurements taken with a vtvm from tube terminal to ground, no signal input, and tubes V503, V504, and V505 removed.
2. All voltages are volts dc (positive) unless otherwise noted.
3. All resistances taken with module removed from main chassis and r-f connectors detached.
4. †applies to RT-332/ARC-52 only.
5. *applies to RT-424/ARC-52X only.

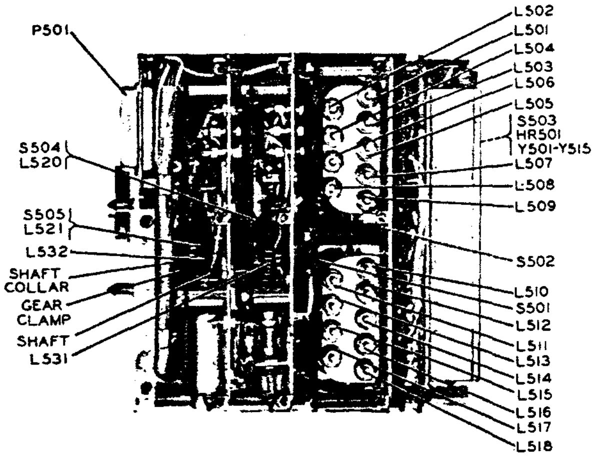


Figure 6-22. Spectrum Generator and Amplifier, Rear View, Cover Removed

6-73. REMOVAL. Remove the module covers to expose the front of the module (figure 6-21) and the rear of the module (figure 6-22). Most of the detail parts of the spectrum generator and amplifier are now accessible. Removal of tubes V501, V502, and detail parts of the inside of the module require further disassembly. Perform the following steps when further disassembly is required.

a. Remove the four screws on the right side of the spectrum generator. Detach the inside cover of the spectrum generator. Remove tubes V503, V504, and V505 (figure 6-19). Tubes V501, V502 (figure 6-19), and detail parts on the left half of the generator section are now accessible. If further access is desired to the front of the generator section or to the rear of the amplifier section, disassemble the two sections as described in step b following.

CAUTION

If it becomes necessary to remove a detail part that is accessible only by separating the two sections of the spectrum generator and amplifier, the spectrum gear O502, antibacklash gear O508, and driven gear O505 (figure 6-21) must be carefully marked prior to disengaging. Separation of these gears disturbs their relative positions and releases the tension on antibacklash gear O508. Proper marking will ensure correct meshing of the gear train during reassembly.

b. Disconnect capacitor C511 from capacitor C508 (figure 6-19). Disconnect the ground wire between the amplifier and generator sections. Remove five screws (three Phillips, two slotted) holding the amplifier section to the bottom plate. Gently lift the amplifier section straight up until it clears the gears. The front of the generator section and the rear of the amplifier section are now accessible.

6-74. REPLACEMENT. Check the tuner shaft (figure 6-21) for broken or scarred teeth. When necessary, clean the mechanical detail parts with a small brush moistened in dry cleaning solvent made up of 70% Fed. Spec P-S-661a 25% ANA Spec AN-M-37, and 5% Fed. Spec O-T-236. To reassemble, reverse the procedures of paragraph 6-73. The antibacklash gear may be "loaded" by turning gear O508 two or three teeth relative to gear O502, thereby compressing the springs (figure 6-21).

CAUTION

Before replacing the spectrum generator and amplifier on the main chassis, make sure the green marker dot on the raised portion of the tuner shaft is toward the 6J4's and that the coupler guide pin is located over the reference circle. (Refer to paragraph 5-38.)

After replacement, check tracking for resonance at several points along the band (paragraph 6-77).

6-75. CRYSTAL FREQUENCY SELECTION. The selection of a particular crystal is dependent on the frequency setting of the radio set control. The spectrum generator and amplifier output frequency and the fundamental crystal frequency that provide this output are listed in table XL1.

6-76. SYNCHRONIZATION. The following procedure, steps a through e, provides a method of checking the synchronization of the tank circuits and the printed circuit switches of the spectrum generator and amplifier. When the conditions of steps a through e are satisfied, omit steps f through j, which describe the procedure for synchronization. Mount the spectrum generator and amplifier on maintenance fixture MT-2059/ARM-38. If MT-2059/ARM-38 is not available, the receiver r-f amplifier and transmitter preamplifier and the audio amplifier modules must be removed from the main chassis to permit access to the spectrum generator and amplifier.

a. Channel the radio set to 225.0 mc.
b. Determine that the rotor tab on switch S501 (figure 6-22) is located at the first contact clockwise from the center position as viewed from the crystal oven.
c. Check the positions of switches S504 and S505 (figure 6-22). The rotor tabs of these switches should be aligned with the rotor tab of switch S501.
d. Check the position of switch S502 (figure 6-22). The rotor tab of this switch should be 180 degrees displaced from the rotor tab of switch S501.
e. Determine that the capacitor rotor blades of tanks Z501, Z502, and Z503 (figure 6-21) are fully meshed.
f. If switches S505, S504, S502, and S501 are incorrectly aligned, loosen the setscrews in the gear clamp at the bottom of the switch shaft (figure 6-22).

NOTE

Be certain that the switch shaft (figure 6-22) is sufficiently loose so that the gear train coupler position will not be disturbed.

g. Manually rotate the switch shaft until the conditions in steps b, c, and d are satisfied. Tighten the setscrews in the gear clamp on the switch shaft and determine that the rotor tab positions have not altered.
h. If capacitor rotor blades in tanks Z501, Z502, and Z503 are not fully meshed, loosen the setscrews in the gear clamp on the tuner shaft (figure 6-21).

NOTE

Be certain that the tuner shaft (figure 6-21) is sufficiently loose so that the gear train coupler position will not be changed.

i. Manually rotate the tuner shaft until the capacitor rotor blades are fully meshed. Tighten the setscrews in the gear clamp on the tuner shaft and determine that the blades remain fully meshed.
j. Channel the radio set and perform steps b, c, and d or step e as required for a final check of proper synchronization.

6-77. ALIGNMENT. The alignment (tracking) procedures given in paragraphs 6-78, 6-79, and 6-80 are performed on the spectrum generator and amplifier when the module is mounted on Maintenance Fixture MT-2059/ARM-38. Since the Radio Set Test Harness AN/ARM-38 will be available at most maintenance depots these procedures are normally followed. Paragraph 6-81 gives deviations from these procedures for alignment of the spectrum generator and amplifier when the AN/ARM-38 is unavailable.

CAUTION

Retracking should be performed only when misalignment (mistracking) has been established as the cause of abnormal operation.

6-78. Proceed as follows to align the tank circuits of oscillator V501A when the spectrum generator and amplifier is mounted on Maintenance Fixture MT-2059/ARM-38.

a. Remove the module covers to expose the front of the module (figure 6-21) and the rear of the module (figure 6-22).
b. Channel the radio set to 225 mc, which selects a module output of 200 mc. Connect a vtvm to test point Ⓗ (figure 6-19).

NOTE

Coils L501 through L518 (figure 6-22) have locking nuts that require the use of the adjusting tool illustrated in figure 2-1.

c. Adjust coil L501 for a peak reading on the vtvm.
d. Channel the radio set to 300.0 mc, and adjust capacitors C506 and C508 (figure 6-19) for a peak reading on the vtvm.
e. Channel the radio set to 230 mc, which corresponds to a module output of 210 mc. Adjust coil L502 for a peak reading on the vtvm.
f. Repeat the procedure of step e to adjust successively coils L503 through L518, but increase the radio set frequency by 10 mc before adjusting the next coil. Coil L503 is aligned at 220 mc. This is the frequency to which the module is driven when the radio set is channeled to 240.0 mc. Refer to table XLI for the successive spectrum generator and amplifier outputs, the corresponding radio set carrier frequency, and the particular coil to be adjusted at the selected frequency.

TABLE XLI. ALIGNMENT ADJUSTMENTS FOR OSCILLATOR V501

RADIO SET CARRIER FREQUENCY (mc)	SPECTRUM CRYSTAL FUNDAMENTAL FREQUENCY (mc)	MODULE FREQUENCY OUTPUT (mc)	INDUCTANCE ADJUSTMENT
225.0 to 229.9	33.3 (Y501)	200	L501
230.0 to 239.9	35.0 (Y502)	210	L502
240.0 to 249.9	36.6 (Y503)	220	L503
250.0 to 259.9	38.3 (Y504)	230	L504
260.0 to 269.9	40.0 (Y505)	240	L505
270.0 to 279.9	41.6 (Y506)	250	L506
280.0 to 289.9	43.3 (Y507)	260	L507
290.0 to 299.9	45.0 (Y508)	270	L508
300.0 to 309.9	31.1 (Y509)	280	L509
310.0 to 319.9	32.2 (Y510)	290	L510
320.0 to 329.9	33.3 (Y501)	300	L511
330.0 to 339.9	34.4 (Y511)	310	L512
340.0 to 349.9	35.5 (Y512)	320	L513
350.0 to 359.9	36.6 (Y503)	330	L514
360.0 to 369.9	37.7 (Y513)	340	L515
370.0 to 379.9	38.8 (Y514)	350	L516
380.0 to 389.9	40.0 (Y505)	360	L517
390.0 to 399.9	41.1 (Y515)	370	L518

6-79. Proceed as follows to align the tuned plate tank circuits of amplifiers V501B and V502 when the spectrum generator and amplifier is mounted on Maintenance Fixture MT-2059/ARM-38.

a. Channel the radio set to 390 mc, which selects a module output of 370 mc. Connect a vtvm to test point (H) (figure 6-19).

b. Adjust coils L531 and L532 (figure 6-22) for a maximum indication on the vtvm.

NOTE

This adjustment is made by using a screwdriver-type, bakelite alignment tool to compress or expand the coil windings.

c. Channel the radio set to 300 mc, which selects a module output of 280 mc.

d. Adjust capacitors C506 and C508 (figure 6-19) for a maximum indication on the vtvm.

e. Repeat the procedures of steps a through d until the settings of coils L531 and L532 and capacitors C506 and C508 required for a peak indication do not change upon repetition of the steps.

f. Check the alignment procedure by channeling the radio set from 225 mc to 300 mc in increments of 10 mc after an initial increment of 5 mc. This channeling results in a module output of 200 mc to 280 mc in 10-mc increments. For each of these settings, the vtvm should indicate -7.0 volts dc.

g. Channel the radio set from 300 mc to 390 mc in increments of 10 mc. This channeling results in a module output of 280 mc to 370 mc in 10-mc increments. For each of these settings, the vtvm should indicate -10.0 volts dc minimum.

h. Turn off power and replace the cover plates. Energize the equipment and recheck the voltage at test point (H). If the voltage is less than that specified in steps f and g, retrack coil L532 and capacitor C508.

6-80. Proceed as follows to align the tuned plate tank circuits of tripler V503, V504, and V505 when the spectrum generator and amplifier is mounted on Maintenance Fixture MT-2059/ARM-38.

a. Remove power from the equipment and connect the 50-ohm diode test load (figure 6-20) to jack J501 (figure 6-19). Connect a vtvm across the diode load.

b. Rotate the function switch to T/R and channel the radio set to 390.0 mc, which selects a module output frequency of 370.0 mc.

c. Remove the side cover from the spectrum generator and amplifier. Substitute the tuning cover provided in the AN/ARM-38. For rapid removal and replacement, use thumbscrews converted from standoffs to secure the cover.

NOTE

The tuning side cover must be in place when the tank circuit tuning is checked, but must be removed to provide access to the tanks when the capacitor rotor blades are aligned (bent). Always replace the tuning cover after each separate bending procedure.

d. Adjust capacitors C517, C522, and C526 (figure 6-19) for a peak reading on the vtvm.

NOTE

Capacitors C517, C522, and C526 are the trimmers for tanks Z501, Z502, and Z503, respectively.

e. Channel the radio set to 380 mc, which selects a module output of 360 mc.

f. Check the tuning of each tank circuit by inserting the iron end and then the brass end of a tuning wand into the Z501 tuned circuit chamber adjacent to the inductance ring. If the voltage on the vtvm increases when the iron core is inserted, more capacity is required.

If the voltage increases when the brass end is inserted, less capacity is required If the voltage decreases in both cases, the tank circuit is properly tuned

g. If an adjustment is necessary, remove the tuning cover and proceed with the following steps.

h. The tuning capacitor rotor blades are illustrated in figure 6-23. Note that the two outer rotor blades of each tank circuit are tabbed and that each tab is a trimmer for a specific frequency within the range of 200.0 mc to 370.0 mc. (The tab or sector to be adjusted for each frequency is given in table XLII.) If, at the module output frequency of 360 mc, more capacity is required, bend tab 2 (figure 6-23) of the applicable tank or tanks rotors toward the stator blade. If less capacity is required, bend the rotor tab away from the stator blade.

NOTE

All adjustment tabs are coded with a dot of colored paint, as specified in figure 6-23

The tab to be adjusted may further be identified as the tab most fully meshed

CAUTION

Never bend tabs out beyond a 40-degree angle Excessive bending inward will cause tab to short against the stator If a tuned circuit is far from resonance, this condition may be caused by a circuit discontinuity. If this condition occurs, check inductance arm contacts and inductance rings (figure 6-21) for proper contact.

i. Replace the tuning cover plate and recheck the alignment of tanks Z501, Z502, and Z503, as described in step f.

j. After the three tank circuits are properly aligned at 360 mc (radio set at 380 0 mc), repeat the procedure (steps f through i) for all frequencies listed in table XLII.

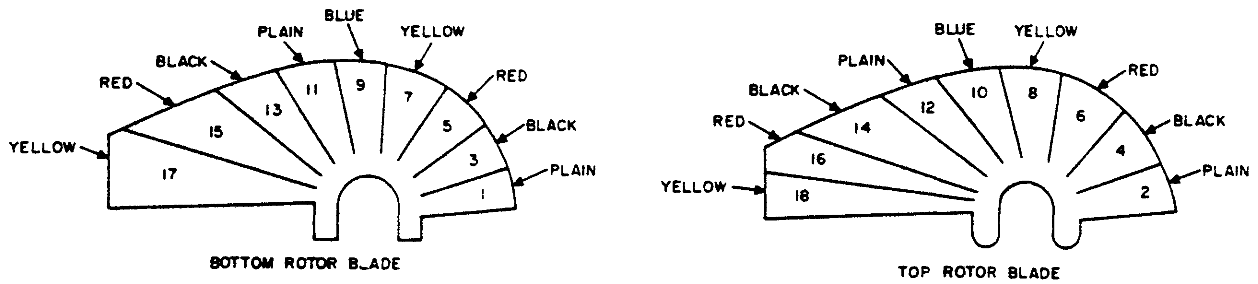


Figure 6-23. Spectrum Generator and Amplifier, Tuning Capacitor Rotor Tab Adjustment Diagram

TABLE XLII. SPECTRUM GENERATOR AND AMPLIFIER, TUNING CAPACITOR ROTOR TAB ADJUSTMENTS

FREQUENCY RANGE (mc)	SPECTRUM GENERATOR AND AMPLIFIER FREQUENCY (mc)	ADJUST SECTOR NUMBER
390.0 to 399.9	370	(1) Trimming Frequency
380.0 to 389.9	360	2
370.0 to 379.9	350	3
360.0 to 369.9	340	4
350.0 to 359.9	330	5
340.0 to 349.9	320	6
330.0 to 339.9	310	7
320.0 to 329.9	300	8
310.0 to 319.9	290	9
300.0 to 309.9	280	10
290.0 to 299.9	270	11
280.0 to 289.9	260	12
270.0 to 279.9	250	13
260.0 to 269.9	240	14
250.0 to 259.9	230	15
240.0 to 249.9	220	16
230.0 to 239.9	210	17
225.0 to 229.9	200	18

k. When tanks Z501, Z502, and Z503 are tracked across the entire operating frequency range, rechannel the radio set to 390 mc, which selects a 370-mc module output frequency. Bend the 10-degree tabs (sector number 1) for a maximum indication on the vtvm.

l. Carefully recheck alignment by repeating the procedure described in steps b through k.

6-81. To align the spectrum generator and amplifier when the test cable set is unavailable, remove the audio amplifier and the receiver r-f amplifier and transmitter preamplifier for access to detail parts of the spectrum generator and amplifier. With these modules on the test bench, the radio set may be made fully operative by tuning the transmitter preamplifier manually for maximum voltage at test point (T) (figure 5-3) with the radio set in the transmit condition. As required, connect the audio amplifier to the main chassis by connecting an extension cable from plug P401 to jack J1504. Connect the receiver r-f amplifier and transmitter preamplifier with extension cables from plug P1504 to jack J2, plug P1503 to jack J1, plug P3 to jack J1518, plug P4 to jack J1517, and plug P1 to jack J1501. With the modules removed, perform the alignment procedures of paragraphs 6-78, 6-79, and 6-80.

6-82. THERMOSTATIC SWITCH S503 CHECK. The spectrum generator and amplifier crystal oven thermostat is factory-adjusted to an 85°C (185°F) operating point. For this reason, heater HR501 need not be disturbed, but the action of thermostatic switch S503 and current flow must be checked as follows.

a. Connect a test bench 28-volt d-c supply between P501-3 (positive) and P501-8 (ground). See figure 6-22.

b. Connect a d-c ammeter in series with the 28-volt d-c supply connected to P501-3. Adjust the meter to use the 0 to 3 ampere range.

c. Turn on all equipment. The current drain through switch S503 should be less than 1.1 amperes.

d. Permit the circuit to remain in operation for 5 to 10 minutes. After approximately 5 minutes of operation, the thermostat should open and then cycle on and off at regular intervals. If the results of this check are unacceptable, refer to the handbook of overhaul instructions for Radio Set AN/ARC-52 for oven disassembly procedures, or send the module to the next higher echelon for overhaul.

6-83. OSCILLATOR.

6-84. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XLIII provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table XLIV. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of oscillator test point checks.

6-85. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-24) and the rear of the module (figure 6-25). Check the tubes (figure 6-24), making certain that they are securely seated and that they are the specified types. Check all detail parts for evidences of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures in table XLIV. Refer to table XLV for voltage and resistance checks.

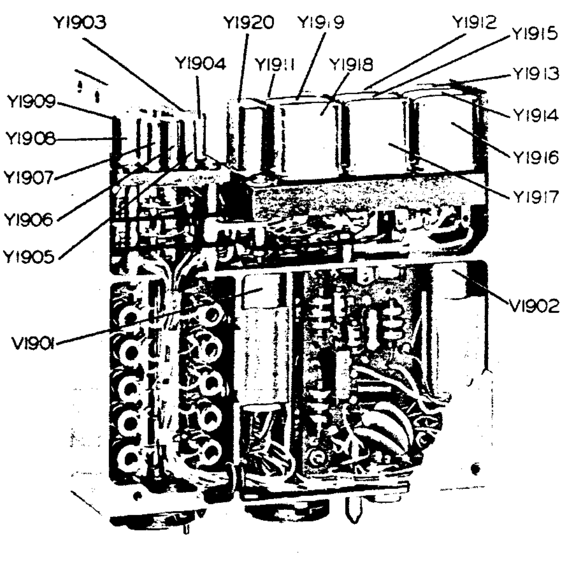


Figure 6-24. Oscillator, Front View, Covers Removed

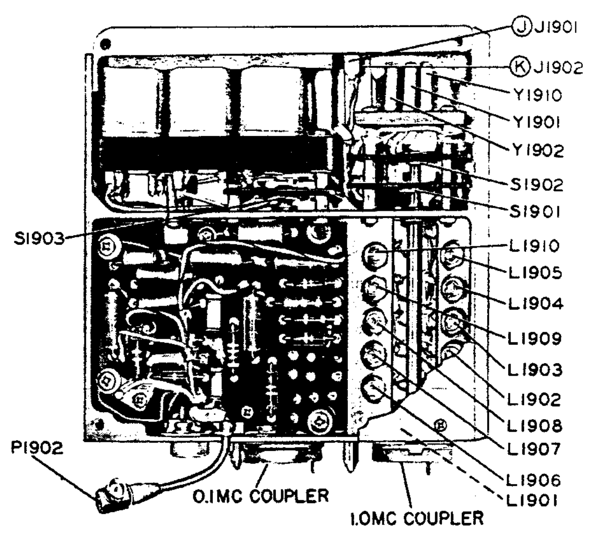


Figure 6-25. Oscillator, Rear View, Covers Removed

TABLE XLIII. OSCILLATOR, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
Ⓙ J1901 (figure 5-3)	Oscillator.	V1901 (figure 6-24).	With radio set energized, vtvm indicates -1.0 volt, minimum.
Ⓚ J1902 (figure 5-3)	Oscillator.	V1902B (figure 6-24).	With radio set energized, vtvm indicates -0.8 volt, minimum.
Ⓛ J202 (figure 5-3).	20- to 30-mc i-f amplifier.	Oscillator output.	With radio set energized, vtvm indicates -1.0 volt, minimum.

TABLE XLIV. OSCILLATOR, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Less than -1.0 V dc is measured at test point Ⓙ (figure 6-25) for readings taken throughout oscillator module range.	Tube V1901 defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Loss of synchronization between switches S1901, S1902, (figure 6-25) and crystal bank.	Synchronize switches (paragraph 6-87) and check tuning of coils L1901 through L1910 (refer to paragraph 6-88).
	Defective crystal.	Replace crystal.
Less than -0.8 V dc is measured at test point Ⓚ (figure 6-25) for readings taken throughout oscillator module range.	Tube V1902B defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Loss of synchronization between switch S1903 (figure 6-25) and crystal bank.	Synchronize switch (refer to paragraph 6-87).
	Defective crystal.	Replace crystal.
-1.0 V dc measured at test point Ⓙ (figure 6-25) and -0.8 V dc measured at test point Ⓚ (figure 6-25), but less than -1.0 V dc is measured at test point Ⓛ (figure 5-3) throughout oscillator module range.	Tube V1902A defective.	Take voltage and resistance measurements. If readings are improper, replace tube or locate faulty circuit part.
	Faulty coaxial cable.	Check output cable from oscillator module.
Abnormal module output is measured at test point Ⓛ (figure 5-3) for a single 1-mc frequency setting.	Defective crystal within crystal bank, Y1901 through Y1910.	Replace defective crystal.
	Misaligned coil.	Tune appropriate coil. (Refer to paragraph 6-88).
Abnormal module output is measured at test point Ⓛ (figure 5-3) for a single 0.1-mc frequency setting.	Defective crystal within crystal bank, Y1911 through Y1920.	Replace defective crystal.

TABLE XLV. OSCILLATOR, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V1901 (JAN 6021)	1	120	∞
	2	-3	69 k
	3	†0	∞
		*12.6	∞
	4	1.4	108
	5	1.4	108
	6	†6.3 ac	∞
		*6.3	∞
	7	0	22
	8	120	∞
V1902	1	89	∞
	2	-2.4	147 k
	3	†0	∞
		*12.6	∞
	4	0	5
	5	0	5
	6	† 6.3 ac	∞
		*6.3	∞
	7	-0.4	100 k
	8	55	∞

NOTES

1. All measurements taken from tube terminal to ground with a vtvm and no signal input.
2. All resistance measurements taken with module removed from main chassis and r-f connectors detached.
3. All voltages are volts dc (positive) unless otherwise noted.
4. All resistances are in ohms unless otherwise noted.
5. †Applies to RT-332/ARC-52 only.
6. *Applies to RT-424/ARC-52X only.

NOTE

The procedures in table XLIV are an extension of the minimum performance check chart (table XLIII). Both tables should be used to isolate a trouble.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-86. REMOVAL AND REPLACEMENT. All removal and replacement procedures are contained in the handbook of overhaul instructions for Radio Set AN/ARC-52.

6-87. SYNCHRONIZATION. The procedure for accomplishing synchronization between switches S1901, S1902, and S1903 and the crystal banks (figures 6-24 and 6-25) is contained in the handbook of overhaul instructions for Radio Set AN/ARC-52. However, a check that may be used to determine the need for synchronization is given in the following steps.

NOTE

Mount the module on Maintenance Fixture MT-2058/ARC-38, if available; if unavailable, remove the 20-to 30-mc i-f amplifier for access to the oscillator components.

a. Channel the radio set to any frequency having 0.0 in the last two digits (for example, 310.0 mc).
b. Verify the rotor positions of switches S1901 and S1902 (figure 6-25). Switch S1901 rotor tab should be set on the first half of the contact section connected to crystal Y1901. Switch S1902 rotor tab should be set on the first half of the contact section connected to coil L1901.
c. Verify the rotor position of switch S1903. Switch S1903 rotor tab should be centered on the contact section connected to crystal Y1911 (figures 6-24 and 6-25).
d. Channel the radio set to any frequency having 0.5 in the last two digits (for example, 310.5 mc).
e. Check the rotor tabs of switches S1901 and S1902. The tabs should be set on the second half of the same contact sections specified in steps b and c. Switch S1903 should now be centered on the contact section connected to crystal Y1916.

6-88. ALIGNMENT. The oscillator module is aligned as described in the following steps. Mount the oscillator on Maintenance Fixture MT-2058/ARM-38 if available; if unavailable, remove the 20- to 30-mc i-f amplifier for excess to the components of the oscillator.
a. Remove the side cover from the oscillator module. Substitute the tuning cover provided in the AN/ARM-38. The tuning cover permits access to adjustable coils L1901 through L1910 (figure 6-25). For rapid removal and replacement, use thumb screws converted from standoffs to securing the tuning cover.
b. Connect a vtvm to test point (J) (figure 6-25) and rotate the function switch to T/R.
c. Channel the radio set to 300.2 mc, and adjust coil L1901 (figure 6-25) for a maximum indication on the vtvm.
d. Channel the radio set to 301.2 mc, and adjust coil L1902 (figure 6-25) for a maximum indication on the vtvm.
e. In sequence, channel the radio set in 1-mc increments from 301.2 mc to 309.2 mc. After such succeeding frequency has been set, adjust the single corresponding coil for a maximum indication on the vtvm. Coils L1901 through L1910 (figure 6-25) are

TABLE XLVI. TRANSMITTER PREAMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
J2 (figure 5-3)	Transmitter preamplifier.	Preamplifier output.	With power removed from equipment, remove fuse F1504 (figure 5-13) from fuse board E1501. Disconnect plug P1504 from jack J2 (figure 5-3). Connect the 50-ohm load (figure 6-20) or milliwatt meter to the jack. With the TONE switch at ON, vtvm across load should indicate not less than -2.7 volts, or 0.15 watt indication on the milliwatt meter.

TABLE XLVII. TRANSMITTER PREAMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
With tone switch at ON, less than 0.8 volt is measured at the cathode of V5 (figures 6-3 and -4).	Tube V5 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part. Also check position of tube in socket.
With tone switch at ON, less than 0.36 volt is measured at the cathode of V6 (figures 6-3 and 6-4).	Tube V6 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part. Also check position of tube in socket.
With tone switch at ON, less than 0.1 volt is measured at the cathode of V7 (figures 6-3 and 6-4).	Tube V7 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part. Also check position of tube in socket.
Operation of transmitter preamplifier is abnormal; but V5, V6, V7 and associated circuit components check out.	Dirty, damaged, or shorting parts of tank circuit Z5, Z6, or Z7 (figure 6-26).	Check tank circuits for dirty, damaged, or shorting parts and clean or repair.
	Loss of synchronization between transmitter preamplifier and receiver r-f amplifier.	Resynchronize transmitter preamplifier and receiver r-f amplifier (paragraph 6-16).
	Transmitter preamplifier out of alignment.	Realign transmitter preamplifier (paragraph 6-95).
Low power output at some or all frequencies.	Poor contact between inductance arm and inductance ring (figure 6-26).	Bend contact for proper contact pressure, and check tracking of the transmitter preamplifier.

adjusted at frequency settings of 300.2 mc through 309.2 mc, respectively.

f. The vtvm should peak at a minimum level of -1.0 volt for each of the 10 adjustments described in steps c, d, and e.

g. Connect the vtvm to test point Ⓚ (figure 6-25).

h. Channel the radio set from 300.0 mc to 300.9 mc in 0.1-mc increments.

i. The vtvm should peak at a minimum level of -0.8 volt for each of the 10 frequency settings described in step h. A value less than -0.8 volt at any setting indicates low crystal drive. If low drive occurs, replace the appropriate crystal.

j. Realign the oscillator module if the value specified in step f is not obtained.

6-89. TRANSMITTER PREAMPLIFIER. (Refer to paragraph 6-98 for procedures applicable only to Contract NOas 57-478, Serial Numbers 1-90.)

6-90. MINIMJM PERFORMANCE CHECKS. Minimum performance checks in table XLVI provide indications by which maintenance personnel can determine that a repaired module meets minimum standards of performance. If the module fails to check out, perform trouble-shooting procedures given in table XLVII. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform minimum performance check for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of transmitter preamplifier test point checks.

6-91. TROUBLE SHOOTING. Check the tubes (figure 6-3), making certain that the tubes are operative and that they are in the specified types. Remove the cover plate to expose the front of the module (figure 6-26). Check tank circuits, Z5, Z6, and Z7 over the full tuning range to determine that the tuning capacitor rotor blades do not short against the stators. Also determine that each inductance arm makes contact with the corresponding inductance ring over the full tuning range. Manually rotate the gear train coupler and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Check all detail parts for evidence of burning or shorts. If the visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table XLVII. Refer to table XLVIII for voltage and resistance checks.

NOTE

The procedures given in table XLVII are an extension of the minimum performance check chart (table XLVI); both tables should be used to isolate a trouble. De-energize the equipment and remove fuse F1504 (figure 5-13) from fuse board E1501. Set the function switch to T/R and the tone switch to ON. Perform the procedures of table XLVII.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-92. REMOVAL. This procedure is described in paragraph 6-14.

6-93. REPLACEMENT. Replace the module components by performing the procedures described in paragraph 6-15.

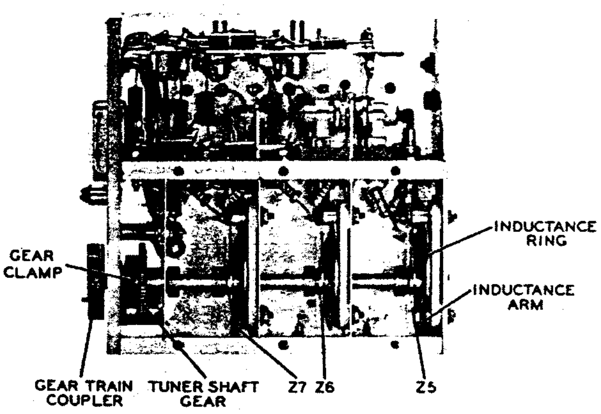


Figure 6-26. Transmitter Preamplifier, Front View, Cover Removed

6-94. SYNCHRONIZATION. Synchronize the tuned circuits of the receiver r-f amplifier with those of the transmitter preamplifier as described in paragraph 6-16.

6-95. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-96 are performed on the transmitter preamplifier when that unit is mounted on Maintenance Fixture MT-2060/ARM-38; the procedure of paragraph 6-97 is performed when no maintenance fixture is available. Since Radio Set Test Harness AN/ARM-38 will be available in most maintenance depots, the procedure in paragraph 6-96 is preferred. The procedure of paragraphs 6-97 gives only the deviations from the latter procedure.

CAUTION

Retracking should be performed only when misalignment (mistracking) has been established as the cause of abnormal operation.

6-96. Proceed as follows to align the transmitter preamplifier when the receiver r-f amplifier and transmitter preamplifier is mounted on Maintenance Fixture MT-2060/ARM-38. (Refer to paragraph 6-97 when this fixture is not available.)

a. Remove power from the equipment and remove fuse F1504 from fuse board E1501 (figure 5-13).

b. Connect a vtvm to test point (V) on the power amplifier module. Adjust the meter to the minus 50-volt range.

c. Remove the side cover from the transmitter preamplifier, and replace this cover with the tuning cover supplied in the AN/ARM-38. For rapid removal and replacement of the tuning cover, use thumbscrews converted from standoffs to secure the cover.

d. Rotate the function switch to T/R, set the MANUAL frequency controls to 399.7 mc and set the TONE switch to the ON position.

e. Adjust trimmer capacitors C5, C6, and C7 (figure 6-3) for a maximum indication of the vtvm.

NOTE

The tuning cover must be in place when the tank circuit tuning is checked.

f. Rechannel the radio set to 399.7 mc to remove any backlash of gears, and then readjust capacitors C5, C6, and C7 for a maximum indication of the vtvm.

g. Channel the radio set to 395.7 mc.

h. Check the tuning of each tank circuit by inserting the iron end and then the brass end of the tuning wand through the 3/8-inch holes in the tuning cover. If the voltage on the vtvm increases when the iron end is inserted, more capacity is required. If the voltage increases when the brass end is inserted, less capacity is required. If the voltage decreases in both cases, the tank circuit is properly tuned.

i. If an adjustment is necessary, remove the tuning cover plate and proceed with the following steps.

TABLE XLVIII. TRANSMITTER PREAMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (transmit)	VOLTAGE (receive)	RESISTANCE
V5	cathode	0.8 - 1.2	0.3	82
(JAN	grid	0	0	0
7554)	filament	†0 (See)	†0 (See)	1.8 (See)
		*12.6 (note 7)	*12.6 (note 7)	1.4 (note 8)
		†6.3 ac (See)	†6.3 ac (See)	0.7 (See)
		*6.3 (note 4)	*6.3 (note 4)	0.7 (note 6)
	plate	130	-7.5	∞
V6	cathode	0.36 - 0.6	0 (+0.2)	120
(JAN	grid	0	0	0
7077)	filament	†0 (See)	†0 (See)	1.8 (See)
		*12.6 (note 7)	*12.6 (note 7)	1.8 (note 8)
		†6.3 ac (See)	†6.3 ac (See)	0.7 (See)
		*6.3 (note 4)	*6.3 (note 4)	0.7 (note 6)
	plate	130	-7.4	∞
V7	cathode	0.1	(0.1)	0.1
(JAN	grid	2.3 - 3	0.8 - 1.5	10 k
7077)	filament	†6.3 ac (See)	†6.3 ac (See)	0.7 (See)
		*6.3 (note 4)	*6.3 (note 4)	0.7 (note 6)
	plate	80 - 90	-7.2	∞

NOTES

1. All voltages are volts dc (positive) unless otherwise noted.
2. All resistances are taken with module removed from main chassis and r-f connectors detached.
3. Unless otherwise noted, all voltage measurements taken with vtvm from socket terminals to ground and no signal input.
4. Filament voltages are measured from pin 9 of jack J1501 (figure 5-13).
5. All resistances are in ohms and are measured between socket terminals and module chassis unless otherwise noted.
6. Filament resistances are measured between pin 9 of plug P1 and module chassis.
7. Filament voltages are measured from pin 11 of jack J1501 (figure 5-13).
8. Filament resistances are measured between pins 9 and 11 of plug P1.
9. †Applies to RT-332/ARC-52 only.
10. *Applies to RT-424/ARC-52X only.

NOTE

The tuning cover must be in place when the tank circuit is checked, but must be removed to provide access to the tanks when the capacitor rotor blade tabs are aligned (bent). Always replace the tuning cover after each separate bending procedure.

j. Check the capacitor rotor blades, which are illustrated in figure 6-5. Each blade is tabbed and each tab is a trimmer for a specific frequency within the range of 225.7 mc to 385.7 mc. The tab or sector to be adjusted for each frequency is given in table XX. If, at 395.7 mc, the tank circuits are not at resonance, recheck the synchronization of tanks Z5, Z6, and Z7 as described in paragraph 6-16, and readjust capacitors C5, C6, and C7 as described in steps d and e. Then continue with the alignment procedure for all frequencies listed in table XX.

NOTE

All adjustment tabs are coded with a dot of colored paint, as specified in figure 6-5. The tab or sector to be adjusted is further identified as the one most fully meshed. The configuration of the tabs after adjustment should be a smooth contour with no sharp discontinuities.

CAUTION

Never bend the tabs beyond a 40-degree angle. Excessive inward bending will cause the tab to short against the stator. If a tuned circuit is far from resonance, this condition may be caused by a circuit discontinuity. If this condition occurs, check inductance arm contacts and inductance rings (figure 6-26) for proper contact.

k. Carefully recheck the alignment of tanks Z5, Z6, and Z7 using procedures described in steps d through j.
l. After all tab adjustments have been made, replace the original cover plate and readjust trimmer capacitors C5, C6, and C7 (figure 6-3) for a maximum indication on the vtvm.
m. After all maintenance of the module is completed reinstall the module in the original radio set and complete the minimum performance checks of the over-all radio set (section V) prior to returning the module to a tactical operating status.

6-97. Proceed as follows to align the transmitter preamplifier when the AN/ARM-38 is unavailable.
a. Remove power from the equipment and remove fuse F1504 from fuse board E1501 (figure 5-13).
b. Connect a vtvm to test point (V) and adjust the meter to the minus 50-volt scale.
c. Rotate the function switch to T/R, set the MANUAL frequency controls to 399.7 mc, and set the TONE switch to the ON position.

NOTE

Since the receiver r-f amplifier and transmitter preamplifier is not mounted upon an extension, the power amplifier module must be removed so that the misaligned detail parts of the transmitter preamplifier may be made accessible. The power amplifier is placed on the test bench and power and signal connections are made using extension cables. Tuning of this module, however, must be done manually. Considerable care must be exercised in the manual tuning to ensure equipment operation at the correct frequency. The initial tuning of the power amplifier is accomplished by the procedure of step c.

d. Turn off the equipment and remove the power amplifier from the main chassis. Place the module on the test bench and connect it to the main chassis by an extension cable interconnecting jack J1506 and plug P601.

NOTE

The power amplifier is tuned manually from 399.7 mc at frequencies that match those of the transmitter preamplifier. The frequency settings for the successive tab adjustments are listed in table XX. Note that, with the exception of the first change, the frequency is worked down range in 10-mc intervals. These settings are obtained by channeling the radio set and then manually tuning the power amplifier. Power amplifier resonance for each setting of the transmitter preamplifier is obtained by rotating the tuner shaft of the power amplifier clockwise (looking at the bottom of the power amplifier) and simultaneously monitoring the vtvm. As the power amplifier tuner approaches the subsequent resonant point, the vtvm will peak. The radio set must be channeled first, before the power amplifier is manually tuned.

e. Perform the procedure of steps c, d, and e of paragraph 6-96.
f. Channel the radio set to 399.7 mc. Rotate the tuning shaft of the power amplifier clockwise (looking at the bottom of the module) until the reading monitored at test point (V) (figure 5-3) peaks.
g. Perform the procedures of paragraph 6-96, steps g, h, i, and j.
h. After the three tank circuits are properly adjusted at 399.7 mc, repeat the procedures (paragraph 6-96, steps g through j). Channel the radio set by using the MANUAL frequency controls, but tune the power amplifier manually, noting that the resonant points are indicated by the successive peak indications on the vtvm at test point (V).
i. Perform the procedures of paragraph 6-96, steps l and m.

6-98. TRANSMITTER PREAMPLIFIER. (Contract NOas 57-478, Serial Numbers 1-90.)

6-99. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table XLIX provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures given in table L. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for conditions of transmitter preamplifier test point checks.

TABLE XLIX. TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90). MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
J101 (figure 6-6)	Transmitter preamplifier.	Preamplifier output.	With power removed from equipment, remove fuse F1504 from fuse board E1501 (figure 5-14). Disconnect plug P101 from jack J101. Connect the 50-ohm load (figure 6-20) or milliwattmeter to the jack. With the TONE switch at ON, vtvm across load should indicate not less than -2.7 volts or 0.15 watt into the milliwattmeter.

6-100. TROUBLE SHOOTING. Check the tubes (figure 6-6), making certain that the tubes are operative and that they are the specified types. Remove the cover plate to expose the front of the module (figure 6-8). Check tank circuits Z101, Z102, and Z103 over the full tuning range to determine that the tuning capacitor rotor blades do not short against the stators. Also determine that each inductance arm makes contact with the corresponding inductance ring over the full tuning range. Manually rotate the gear train coupler and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Check all detail parts for evidence of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table L. Refer to table LI for voltage and resistance checks.

NOTE

The procedures given in table L are an extension of the minimum performance check chart (table XLIX); both tables should be used to isolate a trouble. De-energize the equipment and remove fuse F1504 (figure 5-14) from fuse board E1501. Set the function switch to T/R and the TONE switch to ON. Perform the procedures in table L.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-101. REMOVAL. Removal procedure consists of separating the transmitter preamplifier section from the receiver r-f amplifier section of the module. This procedure is described in paragraph 6-24.

CAUTION

Except when specifically required, never separate the transmitter preamplifier and the receiver r-f amplifier sections of the module.

6-102. REPLACEMENT. Replace the module components by performing the procedures described in paragraph 6-25.

6-103. SYNCHRONIZATION. Synchronize the tuned circuits of the receiver r-f amplifier with those of the transmitter preamplifier as described in paragraph 6-26.

6-104. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-105 are performed on the transmitter preamplifier when that unit is mounted on Maintenance Fixture MT-2060/ARM-38. The procedure of paragraph 6-106 is performed when no maintenance fixture is available. Since Radio Set Test Harness AN/ARM-38 will be available in most maintenance depots, the procedure in paragraph 6-105 is preferred; paragraph 6-106 gives only the deviations from this procedure.

CAUTION

Retracking should be performed only when misalignment (mistracking) has been established as the cause of abnormal operation.

6-105. Proceed as follows to align the transmitter preamplifier when the receiver r-f amplifier and transmitter preamplifier is mounted on Maintenance Fixture MT-2060/ARM-38.

a. Remove power from the equipment and remove fuse F1504 (figure 5-14) from fuse board E1501.

b. Connect a vtvm to test point Ⓥ on the power amplifier module. Adjust the meter to the minus 50 volt range.

c. Rotate the function switch to T/R, set the MANUAL frequency controls to 399.7 mc, and set the TONE switch to the ON position.

d. Remove the side cover from the transmitter preamplifier and replace it with the tuning cover supplied with the AN/ARM-38. For rapid removal and replacement of the side cover, use thumbscrews converted from standoffs to secure the cover.

NOTE

The tuning cover must be in place when the tank circuit tuning is checked, but must be removed to provide access to the tanks when the capacitor rotor blade tabs are aligned (bent). Always replace the tuning cover after each separate bending procedure.

TABLE L. TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
With TONE switch at ON, no voltage drop is measured across resistor R105 (figure 6-6).	Tube V103 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part.
With TONE switch at ON, no voltage drop is measured across resistor R103 (figure 6-6).	Tube V102 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part.
With TONE switch at ON, no voltage drop is measured across resistor R107 (figure 6-6).	Tube V101 defective.	Check tube. If tube is good, take voltage and resistance measurements at tube socket to locate faulty circuit part.
Operation of transmitter preamplifier is abnormal, but V101, V102, V103 and associated circuit components check out.	Dirty, damaged, or shorting detail parts of tank circuit Z101, Z102, or Z103 (figure 6-9).	Check tank circuits for dirty, damaged, or shorting detail parts and clean or repair.
	Loss of synchronization between mechanical detail parts of transmitter preamplifier and main chassis.	Resynchronize mechanical detail parts of transmitter preamplifier and main chassis (paragraph 6-26).
	Transmitter preamplifier out of alignment.	Realign transmitter preamplifier (paragraph 6-104).
Low power output at some or all frequencies.	Poor contact between inductance arm and inductance ring (figure 6-9).	Bend contact for proper contact pressure.

TABLE LI. TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (transmit)	VOLTAGE (receive)	RESISTANCE
V101 (JAN 5654)	1	0	0	100 k
	2	0	0	0
	3	6.3 ac	6.3 ac	0.7
	4	0	0	2.5
	5	130	-1.4	∞
	6	129	-1.4	∞
	7	0	0	0
V102 (JAN 6J4WA)	1	0	0	0
	2	0	0	100
	3	6.3 ac	6.3 ac	0.7
	4	0	0	2.5

TABLE LI. TRANSMITTER PREAMPLIFIER (CONTRACT NOas 57-478, SERIAL NUMBERS 1 - 90), VOLTAGE AND RESISTANCE CHART (Cont)

TUBE	PIN	VOLTAGE (transmit)	VOLTAGE (receive)	RESISTANCE
V102 (JAN 6J4WA) (Cont)	5	0	0	0
	6	0	0	0
	7	130	-3.2	∞
V103 (JAN 6J4WA)	1	0	0	0
	2	0	0	100
	3	6.3 ac	6.3 ac	0.7
	4	0	0	0
	5	0	0	0
	6	0	0	0
	7	130	-3.2	∞

NOTES

1. All voltage measurements taken with a vtvm from socket terminals to ground, tubes removed, and no signal input.
2. All voltages are volts dc (positive) unless otherwise noted.
3. All resistances are taken with module removed from main chassis and r-f connectors detached.
4. All resistances are in ohms unless otherwise noted.

e. Adjust trimmer capacitors C115, C116, and C117 (figure 6-6) for a maximum indication on the vtvm.

f. Channel the radio set to 395.7 mc.

g. Check the tuning of each tank circuit by inserting the iron end and when the brass end of the tuning wand through the 3/8-inch holes in the tuning cover. If the voltage on the vtvm increases when the iron end is inserted, more capacity is required. If the voltage in- eases when the brass end is inserted, less capacity is required. If the voltage decreases in both cases, the tank circuit is properly tuned.

h. If an adjustment is necessary, remove the tuning cover and proceed with the following steps.

i. Check the capacitor rotor blades illustrated in figure 6-9. Each blade is tabbed and each tab is a trimmer for a specific frequency within the range of 225.7 mc to 395.7 mc. (The tab, or sector, to be adjusted for each frequency is given in table XXIV.) If, at 395.7 mc, more capacity is required, bend rotor tab 1 (figure 6-9) of tanks Z101, Z102, and Z103 (figure 6-8) toward the stator blade. If less capacity is required, bend the rotor tab away from the stator blade.

NOTE

All adjustment tabs are coded with a dot of colored paint, as specified in figure 6-9. The tab to be adjusted is further identified as the one most fully meshed.

CAUTION

Never bend tabs beyond a 40-degree angle. Excessive inward bending will cause the tab to short against the stator. If a tuned circuit is far from resonance, it may be caused by a circuit discontinuity. If this condition occurs, check inductance arm contacts and inductance rings (figure 6-8) for proper contact.

j. Replace the tuning cover and recheck the alignment of tanks Z101, Z102, and Z103, as described in step g.

k. After the three tank circuits are properly adjusted at 395.7 mc, repeat the procedure (steps g through j) for all frequencies listed in table XXIV.

NOTE

The configuration of the tabs after adjustment should be a smooth contour with no sharp discontinuities.

l. After all tab adjustments have been made, replace the original cover plate and readjust trimmer capacitors C115, C116, and C117 (figure 6-6) for a maximum indication on the vtvm.

m. After all maintenance of the module is completed, reinstall the module in the original radio set and complete the minimum performance checks of the over-all radio set (section V) prior to returning the module to a tactical operating status.

6-106. Proceed as follows to align the transmitter preamplifier when the AN/ARM-38 is unavailable.

a. Remove power from the equipment and remove fuse F1504 (figure 5-14) from fuse board E1501.

b. Connect a vtvm to test point (V) on the power amplifier module, and adjust the meter to the minus 50-volt scale.

c. Rotate the function switch to T/R. set the MANUAL frequency controls to 399.7 mc, and set the TONE switch to the ON position.

NOTE

Since the receiver r-f amplifier and transmitter preamplifier module is not mounted upon an extension, the power amplifier module must be removed so that the misaligned detail parts of the transmitter preamplifier may be made accessible. The power amplifier module is placed on the test bench and power and signal connections are made using extension cables. Tuning of this module, however, must be done manually. Considerable care must be exercised in the manual tuning to ensure equipment operation at the correct frequency. The initial tuning of the power amplifier is accomplished by the procedure of step c.

d. Turn off the equipment and remove the power amplifier module from the main chassis. Place the module on the test bench and connect the module to the main chassis by an extension cable interconnecting jack J1506 and plug P601.

NOTE

The power amplifier is tuned manually from 399.7 mc at frequencies that match those of the transmitter preamplifier. The frequency settings for the successive tab adjustments are listed in table XXIV. Note that, with the exception of the first change, the frequency is worked down range in 10-mc intervals. These settings are obtained by channeling the radio set and then manually tuning the power amplifier. Power amplifier resonance for each setting of the transmitter preamplifier is obtained by rotating the tuner shaft of the power amplifier clockwise (looking at the bottom of the power amplifier) and simultaneously monitoring the vtvm. As the power amplifier tuner approaches the subsequent resonant point, the vtvm will peak. The radio set must be channeled first, before the power amplifier is manually tuned.

e. Perform the procedure of steps d and e of paragraph 6-105.

f. Channel the radio set to 395.7 mc. Rotate the tuning shaft of the power amplifier clockwise (looking at the bottom of the module) until the reading monitored at test point (V) (figure 5-3) peaks.

g. Perform the procedures of paragraph 6-105, steps g, h, i, and j.

h. After the three tank circuits are properly adjusted at 395.7 mc, repeat the procedures (paragraph 6-105, steps g through j). Channel the radio set by means of the MANUAL frequency controls; but tune the power amplifier manually, noting that the resonant points are indicated by the successive peak indications on the vtvm at test point (V).

i. Perform the procedures of paragraph 6-105, steps l and m.

6-107. MODULATOR.

6-108. MINIMUM PERFORMANCE CHECKS. Minimum performance checks of the modulator are performed with the module mounted on a test bench but connected to the main chassis through an extension cable. These checks, listed in table LII, provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures listed in table LIII. If the module does check out, no further maintenance is needed. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks of section V for the over-all radio set.

WARNING

High voltage exists on pins 1, 2, 3, 4, and 9 of jack J1507 (figure 5-13 or 5-14) and the corresponding pins of plug P701. Caution must be used to avoid shock hazard while taking voltage measurements.

NOTE

Refer to table XII for conditions of modulator test point checks.

6-109. TROUBLE SHOOTING. Check the tubes (figures 6-27 and 6-28), making certain that the tubes are the specified type and are securely mounted. Determine that the caps of tubes V703 and V704 are firmly in place and have not been interchanged. Check all detail parts for evidence of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures given in table LIII. Refer to table LIV for voltage and resistance checks.

WARNING

Unless specifically checking the power stages of the module, always remove fuse F1504 from fuse board E1501 (figure 5-13 or 5-14) making certain that the radio set is de-energized prior to the removal or replacement of the fuse.

NOTE

The procedures given in table LIII are an extension of the minimum performance check chart (table LII); both tables should be used to isolate a trouble. Set the function switch to T/R, actuate the microphone press-to-talk switch, and perform the procedures of table LIII.

TABLE LII MODULATOR, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
Ⓦ J702 (figure 5-3)	Modulator	Cathode current of modulator tubes V703 and V704 (figure 6-27)	Connect audio oscillator to microphone simulator and simulator to MIC jack J1404 (figure 5-1) With simulator output set for 1000 cps at an amplitude of 0.5V ac (1 0V open circuit) vtvm indicates 1 0 volt maximum
Ⓧ J701 (figure 5-3)	Modulator.	Bias voltage of modulator tubes V703 and V704 (figure 6-27).	With test conditions maintained as in above check, vtvm indicates between -13 5V and -15V.
T702-3 (figure 6-27)	Modulator.	Modulator output.	Adjust audio signal input to the radio set to 1.0V rms (open circuit). With test conditions maintained as above. vtvm indicates 210 volts rms minimum with gain control R702 (figure 6-27) set to level at which clipping of modulated carrier envelope just starts.
Across resistor R706 (figure 6-28)	Modulator.	Tone oscillator.	Remove audio oscillator and microphone simulator Set TONE switch at J-995 ARM-38 to ON Vtvm indicates -2 1 volts dc minimum

TABLE LIII. MODULATOR, TROUBLE-SHOOTING CHART

NOTE

The values given in the chart were taken on a typical modulator module connected for carbon-microphone input. The test signal introduced at MIC jack J1404 (figure 5-1) is 1000 cps with a 1.0-volt amplitude level.

TROUBLE	PROBABLE CAUSE	REMEDY
Stage gain of V701A, as measured at grid (2) and cathode (4), is less than 0.9, approximately.	Tube V701A defective.	Take voltage and resistance measurements to locate faulty circuit part or tube.
Stage gain of V701B, as measured at grid (7) and plate (8), is less than 5, approximately.	Tube V701B defective.	Take voltage and resistance measurements to locate faulty circuit part or tube.
Stage gain of V702, as measured at grid (1) and plate (5), is less than 4, approximately.	Tube V702 defective.	Take voltage and resistance measurements to locate faulty circuit part or tube.
Vtvm fails to measure between -13.5 volts dc -15 volts at test point Ⓧ	Zener diode CR701 (figure 6-27) defective. or rectifier unit.	Check diode and replace if necessary. If diode is normal, replace rectifier unit.

TABLE LIII. MODULATOR, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Less than 210 volts rms is measured at T702-3 (figure 6-27) as described in table LII.	Tubes V703 and V704 defective.	Check tubes. If new tubes are good, take voltage and resistance measurements to locate faulty circuit part.
Less than 210 volts rms is measured at T702-3 with TONE switch of junction box set at ON (as described in table LII), but vtvm indicated 210V in preceding check.	Tube V705 defective.	Take voltage and resistance measurements to locate faulty circuit part or tube.
Distortion greater than 10%.	V703 and V704 plate caps reversed.	Reverse caps.

TABLE LIV. MODULATOR, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V701 (JAN 6021)	1	130	∞
	2	0	0-70 k (See note 8)
	3	†0	∞
		*25.2	∞
	4	5.6	34 k or 470 (See note 6)
	5	1.8	1000
	6	†6.3 ac	∞
		*18.9	∞
	7	0	165 k
	8	76	∞
V702 (JAN 5902)	1	0	215 k
	2	20	4700
	3	†0	∞
		*12.6	∞
	4	20	4700
	5	125	∞
	6	†6.3 ac	∞
		*18.9	∞
	7	125	∞
	8	20	4700
V703 (JAN 2E26)	1	1	10
	2	†6.3 ac	∞
		*18.9	∞
	3	130	∞
	4	1	10
	5	-14	1100 (See note 7)
	6	1	10
	7	†0	∞
		*25.2	∞
	8	0	0
V704 (JAN 2E26)	1	1	10
	2	†0	∞
		*12.6	∞
	3	130	∞
	4	1	10
	5	-14	1100 (See note 7)

TABLE LIV. MODULATOR, VOLTAGE AND RESISTANCE CHART (Cont)

TUBE	PIN	VOLTAGE	RESISTANCE
V704 (JAN 2E26) (Cont)	6	1	10
	7	†6.3 ac	∞
		*18.9	∞
	8	0	0
V705 (JAN 5840)	1	1.3	220 k
	2	0	0
	3	†0	∞
		*25.2	∞
	4	0	0
	5	70	∞
	6	†6.3 ac	∞
		*18.9	∞
	7	27	∞
	8	0	0

NOTES

1. Voltage measurements are taken from tube terminal to ground with a vtvm
2. All voltages are volts dc (positive) unless otherwise noted.
3. Resistance measurements are taken with the module removed from the main chassis.
4. All resistances are in ohms unless otherwise noted.
5. All voltage readings taken with the equipment in the transmit condition, with the modulator gain control fully clockwise, and no audio signal input.
6. Resistance of 34 k is developed with carbon microphone; 470 ohms is developed with dynamic microphone.
7. Resistance measured with negative probe grounded.
8. With modulator gain control R702 fully clockwise, resistance is 5.5 k.
9. †Applies to RT-332/ARC-52.
10. *Applies to RT-424/ARC-52X.
11. All tubes are JAN.

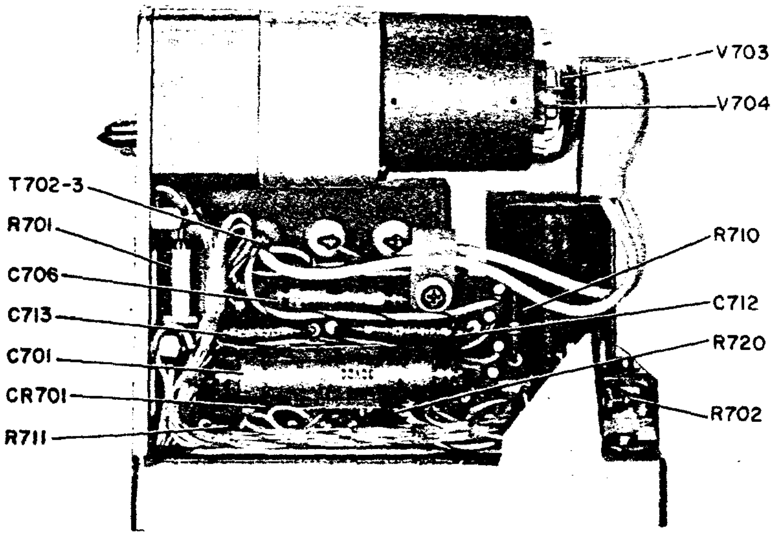


Figure 6-27. Modulator, Left Side View, Cover Removed

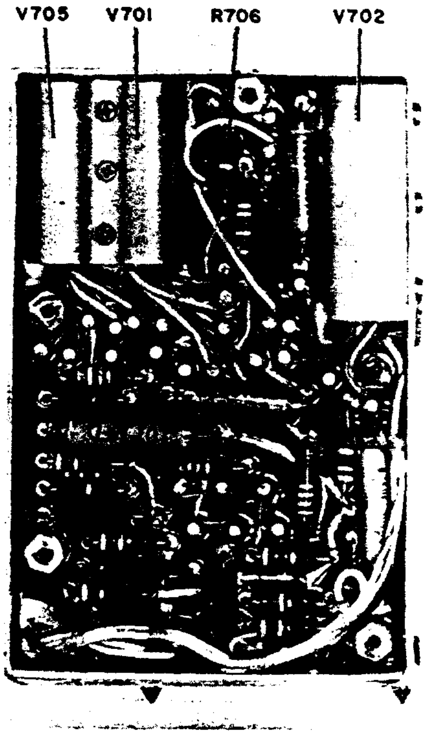


Figure 6-28. Modulator, Rear View, Cover Removed

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-110. REMOVAL. Removal procedure for tubes V701, V702, and V705 is described in step a; for tubes V703 and V704, in step b.

a. Remove the screws securing the tube shields to the chassis. Slide the shield from the tubes and unsolder the tube leads. As each lead is unsoldered, tag it to facilitate reassembly. Pry the tube from the tube clip with a nonmetallic tuning tool.

b. Lift off the plate caps from tubes V703 and V704. Remove the three Phillips-head screws that secure the tube shields to the chassis subassembly. Remove the tube shields and then remove the tubes.

6-111. REPLACEMENT. Replace the tubes by reversing the removal procedure described in paragraph 6-110.

6-112. MODULATION PERCENTAGE CHECK. Connect the radio set to the test equipment as illustrated in figure 5-6. The dummy load is tapped to sampled signal under modulated carrier conditions (step a following) and c-w conditions (step b following). For the test signal used in step a, adjust the frequency to 1000 cps at 1 volt (open circuit) for carbon microphone connections or 25 millivolts for dynamic microphone connections.

a. With modulation gain control R702 (figure 6-27) adjusted so that clipping just starts on the oscilloscope, the percentage of modulation should be at least 80 percent. This figure can be determined by measuring the vertical deflection on the oscilloscope trace. Assume a peak-to-peak measurement of 9 and a valley-to-valley measurement of 1. By substitution:

$$\frac{E_{max} - E_{min}}{E_{max} + E_{min}} \times 100 = \%\text{ modulation}$$

$$\frac{9 - 1}{9 + 1} \times 100 = 80\%$$

b. Set the TONE switch at J-995 ARM-38 to ON. As measured on the oscilloscope, the tone modulation should not be less than 80 percent of the r-f carrier. The waveform will be slightly clipped under this condition.

c. If clipping occurs before the required percentage of modulation can be attained, this condition is probably caused by a tube with low gain. If insufficient drive is noted at test point (V) (figure 5-3), the percentage of modulation will be low because of the increased current drawn by tube V603. If the modulation envelope appears distorted, determine that the plate caps of tubes V703 and V704 are securely in place and the leads are well soldered.

6-113. POWER AMPLIFIER.

6-114. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table LV provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble shooting procedures listed in table LVI. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the overall radio set (section V).

NOTE

Refer to table XII for conditions of power amplifier test point checks.

CAUTION

High voltages fused by F1504 are present within the power amplifier module. Always de-energize the equipment before removing or replacing the fuse. Always remove fuse F1504 (figure 5-13 or 5-14) except when high voltage circuits are being checked.

6-115. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-29), the rear of the module (figure 6-30), the top of the module (figure 6-31), and the left side of the module (figure 6-32). Check tank circuits Z602, Z603, and Z604 to determine that the tuning capacitor rotor blades do not short against the stators. Also determine that the inductance arm makes contact with the inductance ring over the full tuning range. Manually rotate the gear train coupler and check the gear and tuner shaft mechanism for proper rotation, freedom from binding, and proper lubrication. Check the tubes, making certain they are securely mounted and are the specified types. Check all detail parts for evidence of burning or shorts. If visual checks fail to isolate the cause of trouble, perform the trouble shooting procedures in table LVI. Refer to table LVII for voltage and resistance checks.

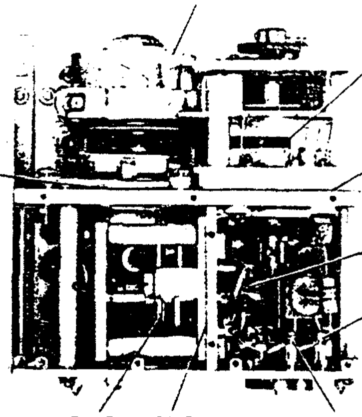


Figure 6-29. Power Amplifier, Front View, Covers Removed

CAUTION

Output tube V603 must not be operated if grid bias is incorrect. If this bias (-20 to -55 volts dc) is not obtained at test point (V) (figure 5-3), turn off the equipment immediately, and disconnect plate and screen grid voltages by removing fuse F1504 from fuse board E1501 (figure 5-13 or 5-14).

NOTE

The procedures of table LVI are an extension of the minimum performance check chart (table LV); both tables should be used to isolate a trouble. Set the function switch to T R and the TONE switch at J-995 ARM-38 to ON. Perform the procedures of table LV.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-116. REMOVAL. Removal procedure for tube V602 is given in step a; removal procedure for tube V603 is given in step b. No special removal procedure applies for tube V601.

a. To remove tube V602 (figure 6-30), loosen the two screws and clips holding the grid flange to the module chassis. Lift the tube vertically to clear the tube clips. Remove the tube.

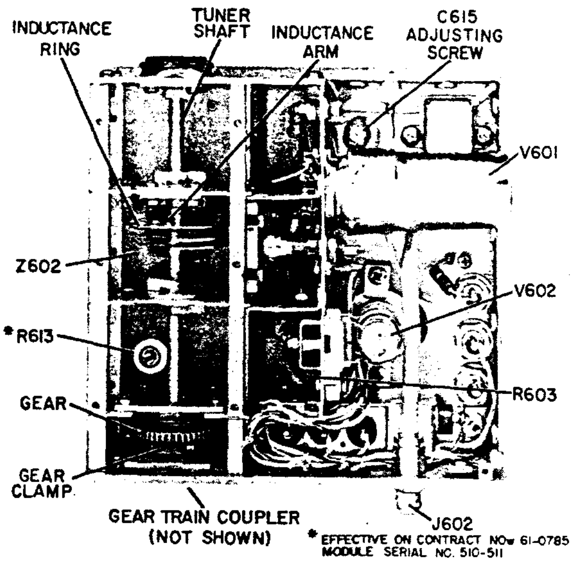


Figure 6-30. Power Amplifier, Rear View, Covers Removed

b. To remove tube V603 (figure 6-29), remove the screws holding the top dust cover, and lift off the dust cover. Loosen the clamp around the plate by rotating the locking clamp a half-turn in the clockwise direction. Remove the tube.

6-117. REPLACEMENT. Replace tube V602 and V603 by reversing the removal procedure of paragraph 6-116.

6-118. CAM ALIGNMENT CHECK. Channel the radio set to 220 mc. Determine that the hole in the cam located at the top of the power amplifier (figure 6-31) is radially aligned with the cam follower. If it is not, loosen the setscrews and reposition the cam (figure 6-31). Capacitor C615 should be at its closest position to tube V603.

6-119. SYNCHRONIZATION. Synchronize tank circuits Z602, Z603, and Z604 in the following manner.

NOTE

Each time an adjustment is made, the radio set should be rechanneled and the adjustment rechecked for any discrepancies that might occur due to backlash in the gears.

a. Mount the power amplifier module on Maintenance Fixture MT-2061/ARM-38. If MT-2061/ARM-38 is not available, the receiver r-f amplifier and transmitter preamplifier module must be removed to permit access to the rear of the power amplifier module.

b. Channel the radio set to 399.9 mc. Remove the cover that shields tank Z602. The short tabs of the rotor blades should be just begining to mesh with the stator blades. If not, loosen the gear clamp (figure 6-30) and adjust the rotor shaft.

c. Channel the radio set to 220.0 mc and determine that the rotor blades of tanks Z603 and Z604 are completely meshed with their respective stator blades. In each case, the edge of the rotor blades should be parallel to and flush with the straight edge of the stator blades. Tanks Z603 and Z604 are individually rotated

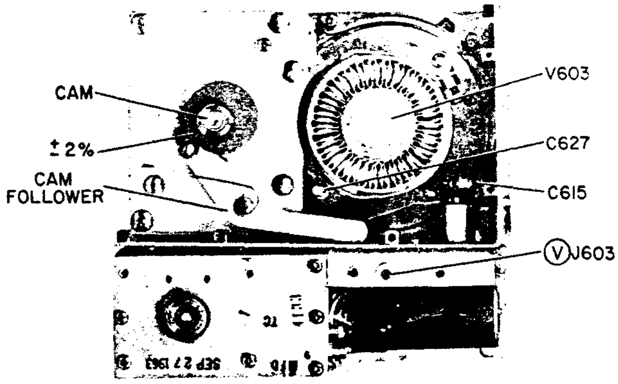


Figure 6-31. Power Amplifier. Top View, Cover Removed

to achieve synchronization by loosening the setscrews on the bevel gear of the tank to be rotated (figure 6-29).

d. With the capacitor blades of tanks Z603 and Z604 set as described in step c, the inductance arms of these two tanks should be positioned as shown in figure 6-33 by loosening the two setscrews on each arm.

NOTE

Z603 inductance arm may not be repositioned effective MCN 700.

6-120. ALIGNMENT. The alignment (tracking) procedures given in paragraph 6-121 are performed on the power amplifier when the module is mounted on Maintenance Fixture MT-2061 ARM-38. The procedure of paragraph 6-122 is performed when no maintenance fixture is available. Since the AN/ARM-38 will be available at most maintenance depots, the procedure given in paragraph 6-121 is preferred. The procedure in paragraph 6-122 gives only the deviations from the procedure in paragraph 6-121.

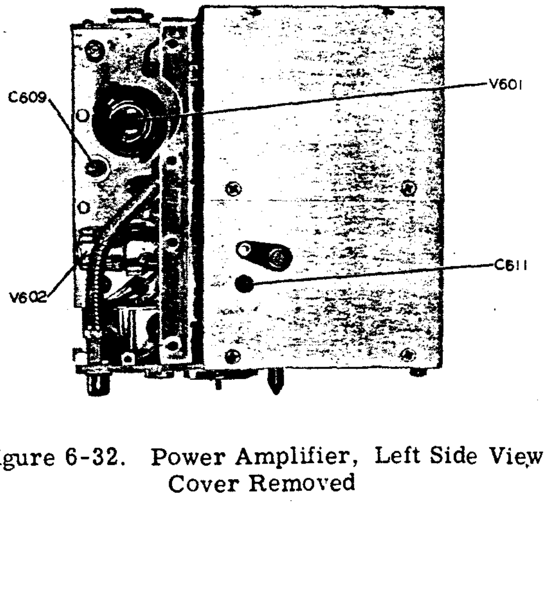


Figure 6-32. Power Amplifier, Left Side View, Cover Removed

TABLE LV. POWER AMPLIFIER, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
Ⓥ J603 (figure 5-3)	Power amplifier.	Drive to V603 (figure 6-31).	With equipment at transmit, vtvm indicates between -20 and -55 volts dc.
Antenna jack P1402 (figure 5-3)	Front panel of receiver-transmitter	Power amplifier output.	Connect r-f wattmeter to test point. With equipment at transmit, wattmeter indicates 16 watts minimum.

TABLE LVI. POWER AMPLIFIER, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
With r-f wattmeter connected to antenna connector P1402 (figure 5-3), less than 16 watts is measured. Bias indication on vtvm at test point Ⓥ (figure 5-3) is between -20 volts and -55 volts dc.	Tube V603 (figure 6-31) defective. (See note at end of this table.) Tank circuit Z604 (figure 6-29) and capacitor C615 (figure 6-31) are out of alignment.	Replace tube. If operation of module with new tube is abnormal, take voltage and resistance measurements to locate faulty circuit part. Realign tank circuit Z604 and capacitor C615 (refer to paragraph 6-123).
During normal operation, vtvm fails to measure approximately -1.2 volts across R603 (figure 6-30), cathode resistor of V602.	Tube V601 (figure 6-30) defective.	Check tube. If tube is good, take voltage and resistance measurements to locate faulty circuit part.
During normal operation, vtvm at test point Ⓥ fails to measure between -20 volts and -55 volts dc.	Tank circuits Z602 (figure 6-30) and Z603 (figure 6-29) are out of alignment. Tube V602 (figure 6-30) defective.	Check and realign tank circuits Z602 and Z603 as required (refer to paragraphs 6-120 and 6-123). Replace tube. If operation of module with new tube is abnormal, take voltage and resistance measurements to locate faulty circuit part.

NOTE

Because of the high voltages present at output stage V603, the following check-points are offered to facilitate voltage measurements of that stage.

1. The plate voltage of V603 may be measured at pin 1 of J1506 (figures 5-13 or 5-14). This measurement should be approximately 400 volts dc.
2. The screen voltage of V603 may be measured at the junction of R605, R606, R613 and C626 (figures 6-29). This measurement should be between 170 volts and 190 volts.
3. The screen grid current and the plate current may be measured by inserting a milliammeter into each circuit. The screen grid current should not exceed 10 milliamperes; the plate current should be between 135 and 175 milliamperes.

TABLE LVII. POWER AMPLIFIER, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE (transmit)	VOLTAGE (receive)	RESISTANCE
V601 (JAN6J4WA)	1	0	0	0
	2	0	0	100
	3	† 6.3 ac	†6.3 ac	∞
		*6.3	*6.3	∞
	4	0	0	0
	5	0	0	0
	6	0	0	0
	7	130	-2.1	∞
V602 (JAN6442)	Filament (top	0	0	∞
		12.6	12.6	∞
	Filament (center	† 6.3 ac	†6.3 ac	∞
		*6.3	*6.3	∞
	Cathode (bottom)	0.7	0	22
	Grid (flange)	0	0	0
	Plate (at tank Z603)	130	-2.2	∞
V603 (USN7609)	1	Variable from 170-190 volts	Variable**	15 k**
	2	0‡	0‡	0‡
	3	† 26.5 ac	†26.5 ac	5.4
		*25.2	*25.2	5.4
	4	0‡	0‡	0‡
	5	0‡	0‡	0‡
	6	0‡	0‡	0‡
	7	0‡	0‡	0‡
	8	0‡	0‡	0‡
	Plate	400***	0***	25.8 k***

NOTES

1. All voltages are volts dc (positive) unless otherwise noted.
2. All resistances taken with module removed from main chassis and r-f connectors detached.
3. All voltage measurements taken with vtvm from socket terminals to ground unless otherwise noted.
4. All resistances are in ohms unless otherwise noted.
5. ‡indicates internally grounded; terminals are not accessible.
6. **indication dependent upon position of R613.
7. ***indicates take measurement at junction of inductor L608 and resistor R610 (figure 6-29).
8. †Indicates applies to RT-332/ARC-52 only.
9. *Indicates applies to RT-424/ARC-52X only.

CAUTION

Retracking is performed only when misalignment (mistracking) has been established as the cause of abnormal behavior.

6-121. Proceed as described in the following steps to align a power amplifier when the module is mounted on Maintenance Fixture MT-2061/ARM-38.

a. Remove power from the equipment and remove fuse F1504 from fuse board E1501 (figure 5-13 or 5-14).

b. Connect a vtvm to test point (V) (figure 6-31) and adjust the meter to the minus 50-volt range.

c. Rotate the function switch to T/R and set the MANUAL frequency controls to 399.7 mc.

d. Remove the side cover that shields tank circuit Z602 and replace this cover with the tuning cover supplied in the AN/ARM-38. For rapid removal and replacement of the side cover, use thumbscrews converted from standoffs to secure the cover. Place the radio set in the continuous transmit condition by placing the TONE switch at J-995/ARM-38 to ON.

NOTE

The tuning cover must be in place when the tank circuit tuning is checked.

e. In using Maintenance Fixture MT-2061/ARM-38, jack J2 of the transmitter preamplifier must be connected to jack J601 of the power amplifier by long

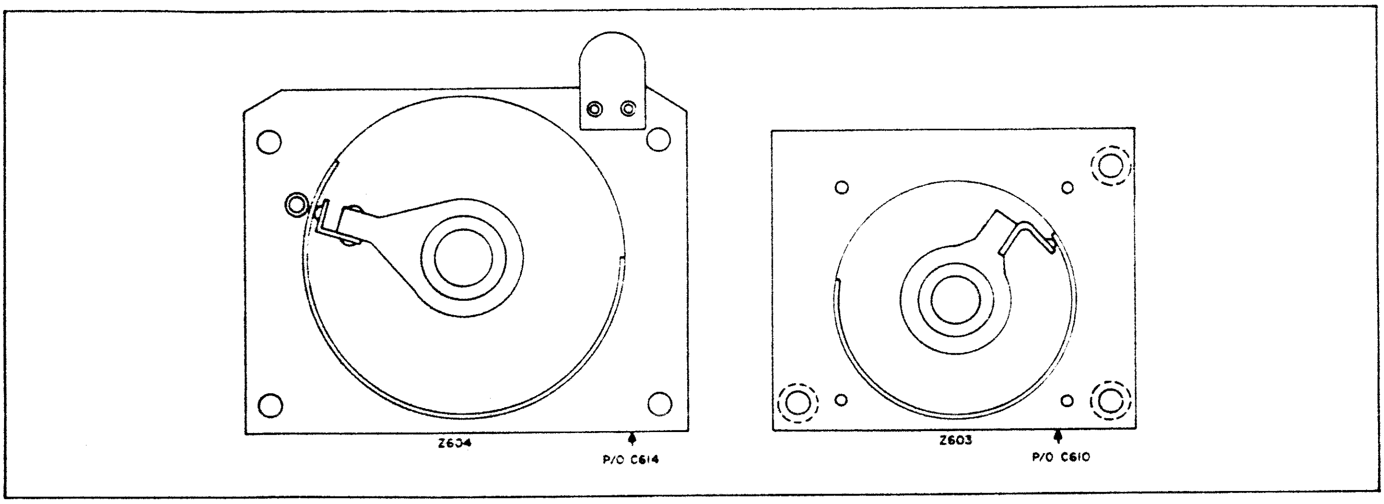


Figure 6-33. Position of Rotor Arms of Z603 and Z604 at 220.0 Mc

Microdot Cable W-13/ARM-38. This connection detunes tank Z5 of the transmitter preamplifier. Adjust capacitor C5 of the transmitter preamplifier for maximum indication on the vtvm.

f. Adjust trimmer capacitors C609 and C611 (figure 6-32) for a maximum indication on the vtvm.

CAUTION

Capacitors C609 and C611 may be adjusted only at a 399.7-mc operating frequency.

g. Channel the radio set to 395.7 mc.

h. Check the tuning of tank circuit Z602 by inserting the iron end and then the brass end of the tuning wand through the 3/8-inch hole in the tuning cover. If the voltage monitored by the vtvm increases when the iron end is inserted, more capacity is required. If the voltage increases when the brass end is inserted, less capacity is required. If the voltage decreases in both cases, the tank circuit is properly tuned.

i. If an adjustment is necessary, place the TONE switch at J-995/ARM-38 in the off position (unkey the transmitter); and remove the tuning cover.

j. Check the capacitor rotor blades illustrated in figure 6-5. Each blade is tabbed and each tab (sector) is a trimmer for a specific frequency within the range of 225.7 mc to 385.7 mc. The tab or sector to be adjusted for each frequency is given in table XX. If at 395.7 mc the tank circuit is not at resonance, recheck the synchronization of tank Z602 and readjust capacitors C609 and C611 as described in step f. Then continue with the alignment procedure for all frequencies listed in table XX.

NOTE

The tuning cover must be in place when the tank circuit is being checked, but must be removed to provide access to the tank when the capacitor rotor blade tabs are aligned (bent). Always replace the tuning cover after each separate bending procedure. All Adjustment sectors are coded with a dot of colored paint, as specified in figure 6-5. The configuration of tabs after adjustment should be a smooth contour with no sharp discontinuities. Rechannel the radio set after each tab is bent to remove any backlash of gears.

CAUTION

Never bend a tab out beyond a 40-degree angle. Excessive inward bending will cause the tab to short against the stator. If a tuned circuit is far from resonance, this condition is likely caused by a circuit discontinuity. If this condition occurs, check inductance arm contacts and inductance rings for proper contact.

k. Carefully recheck the alignment of tank circuit Z602 according to the procedures in steps f through j.

l. After all tab adjustments have been made, replace the original cover plate and readjust trimmer capacitors C609 and C611 for a maximum indication on the vtvm at 399.7 mc. Then proceed to paragraph 6-123.

6-122. Perform the following procedure to align a power amplifier when the AN/ARM-38 is unavailable.

a. Perform the procedure described in steps a, b, and c of paragraph 6-121.

NOTE

Since the power amplifier is not mounted on an extension, the receiver r-f amplifier and transmitter preamplifier must be removed so that the misaligned detail parts of the power amplifier may be made accessible. The receiver r-f amplifier and transmitter preamplifier is placed on the test bench and power and signal connections are made using extension cables. Tuning of this module, however, must be done manually. Considerable care must be exercised during manual tuning to ensure equipment operation at the appropriate frequency. Initial tuning of the receiver r-f amplifier and transmitter preamplifier has been provided by channeling the radio set to 399.7 mc.

b. Turn off equipment and remove receiver r-f amplifier and transmitter preamplifier from main chassis. Place module on test bench and connect it to main chassis by extension cables interconnecting J1501 (figure 6-46) and P1, and J2 and P1504 (figure 5-3).

NOTE

The receiver r-f amplifier and transmitter preamplifier is tuned manually from 399.7 mc at frequencies that match those of the power amplifier. Frequency settings for successive tab adjustments are listed in table XX. Note that, with the exception of the first change, frequency is worked down range in 10-mc intervals. These settings are obtained by channeling radio set and then manually tuning receiver r-f amplifier and transmitter preamplifier. Receiver r-f amplifier and transmitter preamplifier resonance for each setting of power amplifier is obtained by rotating tuner shaft of receiver r-f amplifier and transmitter preamplifier counterclockwise (looking at the bottom of the module) and simultaneously monitoring the vtvm. As transmitter preamplifier section approaches succeeding resonant point, vtvm will peak. The radio set must be channeled, before receiver r-f amplifier and transmitter preamplifier is manually tuned.

c. Perform procedures of steps d, e, and f of paragraph 6-121. (Ignore references to AN/ARM-38 unless a tuning cover is available.)

d. Channel radio set to 395.7 mc. Rotate tuning shaft of receiver r-f amplifier and transmitter preamplifier clockwise (looking at bottom of module) until reading monitored at test point (V) peaks.

e. Perform procedures of paragraph 6-121, steps h, i, j, and k.

f. After tank circuit is properly tuned at 395.7 mc, repeat procedures (paragraph 6-121, steps h through k). Channel radio set by means of MANUAL frequency controls, but tune receiver r-f amplifier and transmitter preamplifier manually, noting that resonant points are indicated by successive peak indications of test point (V).

g. Perform procedures of paragraph 6-121, step 1.

6-123. Tank circuits Z603 and Z604 (figure 6-34) are aligned (tracked) immediately after alignment of tank circuit Z602.

NOTE

Capacitor blades to be adjusted at different frequencies are shown in figure 6-5. When increasing or decreasing capacity, bend corresponding tabs on rotor blades an equal amount.

When Maintenance Fixture MT-2061/ARM-38 is available, perform steps c through m. When maintenance fixture is not available, power unit must be removed for access to tank circuit Z603. In this discussion, power unit means the a-c power unit only (figure 6-42) for the AN/ARC-52 or the dynamotor power supply unit (figure 6-44) for the AN/ARC-52X. Proceed as follows.

a. Remove power unit and connect it from test bench to main chassis using extension cables between all jacks and plugs separated by removal procedure.

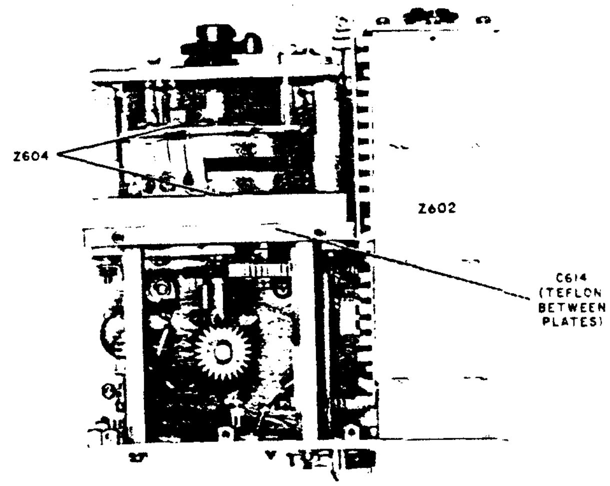


Figure 6-34. Power Amplifier, Right Side View, Cover Removed

b. With the a-c power unit removed, supply cooling air from an auxiliary source directed at the top of tube V603 (figure 6-31). Prior to tracking tank circuit Z604, replace the power unit. Tuning of the transmitter preamplifier, when the MT-2061/ARM-38 is unavailable, is accomplished manually for maximum drive at test point (V), as described in paragraph 6-122. With the exception of the test setups described previously in this paragraph, tracking of tank circuits Z603 and Z604 using the maintenance fixture is identical to the tracking procedure without the maintenance fixture.

NOTE

Replace all cover plates before the actual check of tank circuit resonance. Access to tank circuit Z603 may be obtained through the air input hole on the front side of the module. Access to tank circuit Z604 may be obtained through the access hole in the front cover that is normally covered by a circular plate.

CAUTION

Care must be exercised in making the following adjustments. High voltage is present at tank circuits Z603 and Z604. Each time a tab is to be bent, set the TONE switch at J-995/ARM-38 to the off position. Adequate cooling air must be supplied to the module when the transmitter is keyed (TONE switch ON).

c. Connect an r-f wattmeter with 52 ohm input impedance to antenna connector P1402 (figure 5-3) and channel the radio set to 225.7 mc. Replace fuse F1504 on fuse board E1501 (figure 5-13 or 5-14).

d. Adjust capacitor C615 until it is approximately 1/8 inch from the 4X150F tube plate clamp. Set the TONE switch at Distribution Box J-995/ARM-38 to ON. Adjust potentiometer R613 (figure 6-30) for proper modulation level (tables LVI and LVII).

e. Adjust trimmer C627 with a nonmetallic tuning tool for maximum power output. Turn capacitor C615 tuning screw in 1/4-turn increments, each time retrimming capacitor C627 for maximum power output. Note the setting of capacitor C615 that gives optimum power output and adjust capacitor C615 to that position.
f. Channel the radio set to 399.7 mc and adjust capacitor C627 for maximum power output. Retrim capacitor C611 for maximum bias voltage at test point Ⓥ.
g. Starting at 395.7 mc, track tank Z604 in 10-mc steps down to and including 225.7 mc. Access to tank Z604 is obtained by opening the access hole on the side of the power amplifier. In tracking tank Z604, press lightly on the air screen; then pull up gently on the air screen. If the output goes up when the screen is pressed in, more capacity is needed. If the output goes up when the screen is pulled out, less capacity is needed. If the output goes down in each case, the tank is properly tracked.

NOTE

The capacitor blades to be adjusted at the different frequencies are shown in figure 6-35. When increasing or decreasing the capacity, bend the corresponding tabs on both rotor blades an equal amount. Notice in figure 6-35 that each pair of tabs adjusts a 20-mc range; therefore, the setting of the tabs will be for optimum average output on the channels concerned.

h. Fine track Z604 again using the procedures in steps f and g.
i. Channel the radio set to 399.7 mc and adjust capacitor C611 for maximum voltmeter reading at test point Ⓥ. At least -20 volts should be obtained.
j. Channel the radio set to 395.7 mc. Check the tuning of tank Z603 by inserting first the iron end and then the brass end of the tuning wand through the square air hole. Always place the iron and brass slug as close as possible to the "used" portion of the inductance ring to obtain best results. If the voltage at test point Ⓥ increases as the iron slug is inserted, more capacity is needed. If the voltage increases as the brass slug is inserted, less capacity is needed. If the voltage decreases in both cases, tank Z603 is properly tuned and no adjustment is necessary at this frequency. The tabs to be bent at the alignment frequencies are shown in figure 6-36. Note that both tabs are bent an equal amount when increasing or decreasing the capacity of the tank.

WARNING

130 volts dc is present on tank Z603. The capacitor tabs should not be bent with the radio set in transmit condition.

k. Track tank Z603 in steps of 10 mc down to 225.7 mc by the method given in step j. Notice in figure 6-36 that each pair of tabs adjusts a 20 mc range; therefore, the setting of the tabs will be for optimum average output on the two channels concerned. Any adjustments made at 245.7, 235.7 and 225.7 mc will affect the tracking at 395.7-, 385.7- and 375.7-mc frequencies. Check the two ends several times.
l. Carefully recheck tracking of tank circuit Z604 using procedures in steps i, j, and k.
m. Replace the power amplifier module on the main chassis. Connect all cables. Channel the radio set to 399.7 mc and adjust capacitor C5 in the transmitter preamplifier for maximum indication on the vtvm.

6-124. MECHANICAL TUNING UNIT.

6-125. MINIMUM PERFORMANCE CHECKS. Minimum performance checks presented in the following subparagraphs provide indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting

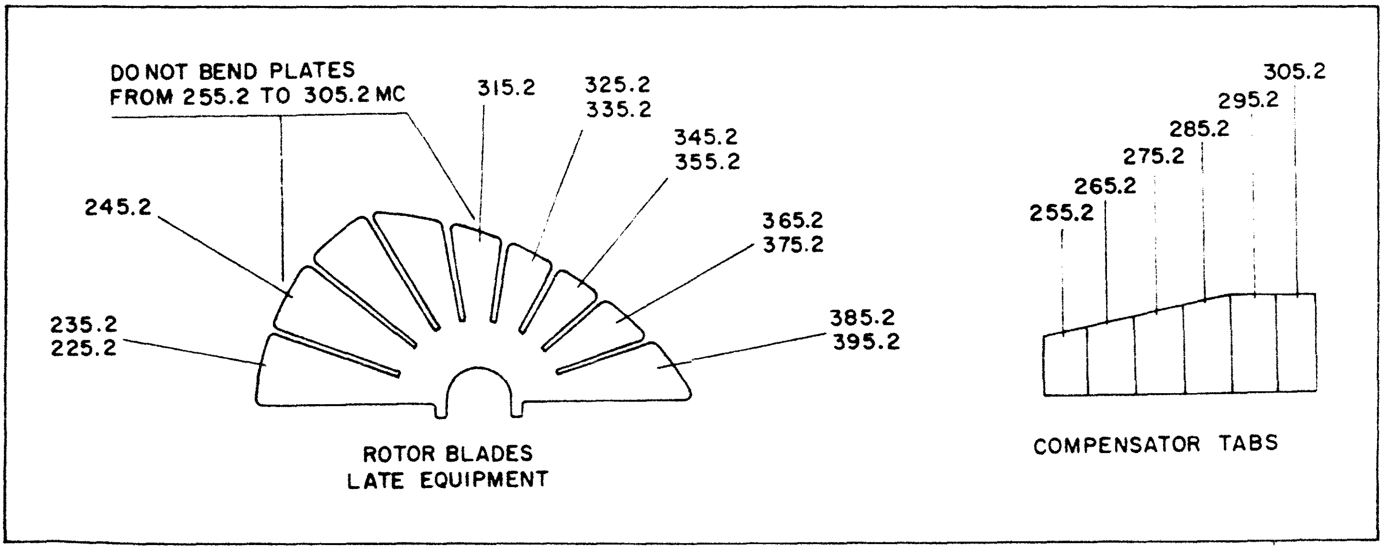


Figure 6-35. Power Amplifier, Z604 Tuning Capacitor Rotor Blade Adjustment Diagram

TABLE LVIII. MECHANICAL TUNING UNIT, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Motor B1201 continues to rotate after automatic positioning system sets up frequency designated by radio set control.	Negative side of motor shorted to ground.	Repair short.
	1-mc seeking switch out of synchronization, causing pawl to drop late and not seat fully.	Adjust seeking switch (refer to handbook of overhaul instructions).
	Relay contacts do not disconnect when relay is de-energized.	Straighten contacts.
	Relay spring weak and pawl does not seat fully.	Replace relay and spring (refer to handbook of overhaul instructions). Note. Spring may be bent to increase tension.
Autopositioning system fails to set up on any channel, stop wheel rotates, and relay releases momentarily for each revolution of respective shaft.	Spring is bent and pawl does not engage stop wheel with sufficient braking force.	Replace relay and spring, or remove and bend spring to increase tension.
	Seeking switch out of synchronization (applicable only to 1-mc decade).	Adjust seeking switch.
	Pawl sticks on pivot.	Remove relay. Remove and clean pawl and pivot pin. Reassemble pawl and lubricate pivot with oil, MIL-L-6085A. Replace and align relay.
	Relay has shifted preventing pawl from seating.	Align relay.
	Pawl distorted.	Remove relay and replace pawl. Align relay.
Autopositioning system fails to set up on any channel, stop wheel rotates freely, and relay remains energized continuously.	Control wires shorted to ground or to each other.	Check wires from relay to seeking switch. Repair undesired short.
	Component of seeking switch grounded.	Remove ground or, if necessary, replace switch.
Autopositioning system fails to set up on any channel, stop wheel does not rotate, relay is energized, and motor rotates continuously.	Pawl does not lift clear of notch. Relay has shifted away from pawl, or relay has insufficient travel.	Realign relay.
	Gears physically obstructed.	Remove obstruction.
	Gears out of alignment.	Realign gears.
Automatic positioning system periodically sets up on wrong channel.	Open connection on control wire.	Introduce various frequency settings at radio set control and note those channels at which automatic positioning system does not set up. Note and repair wire that differentiates between these channels.

TABLE LVIII. MECHANICAL TUNING UNIT, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Automatic positioning system sets up on some channels, but does not come to rest on others. (Tuning drive runs continuously.)	Control wires shorted to ground or to each other.	Introduce various frequency settings at radio set control and note those channels at which automatic positioning system does not set up. Note wires used when system runs continuously. Check these wires to determine that only designated ones are grounded or shorted to each other.
Automatic positioning system fails to set up on any channel. Stop wheel, relay, and motor are de-energized.	Defective motor or power circuit.	Force clapper to engage relay contacts. Motor is defective if it does not start with relays engaged. If it does start, check continuity of wires within power circuit.
	Pawl sticks on pivot.	Remove relay. Remove and clean pawl and pivot pin. Reassemble pawl and lubricate pivot with oil. MIL-L-6085A. Replace and align relay.
	Improper bearing lubrication.	Disassemble and clean bearings. Lubricate bearings with oil, MIL-L-6085A. Reassemble bearings.
	Insufficient clutch torque due to broken clutch springs or to glazing of clutch surfaces.	Disassemble clutch. Replace springs or clutch drum and clutch shoe as required. Reassemble and realign clutch.
Automatic positioning system sets up and then recycles.	Relay spring bent and does not hold pawl in notch.	Remove relay spring and bend spring to increase tension. Reassemble relay spring and readjust relay air gap.
	Relay has shifted, preventing pawl from seating completely.	Realign relay. Check relay air gap and readjust if necessary.
	Pawl distorted.	Remove relay and replace pawl. Align relay.
	Control wires shorted to ground or to each other.	Check wires from relay to seeking switch. Repair any short.
	Open connection on control wire.	Check wires from relay to seeking switch. Repair open circuit.
Relay closes, but motor does not operate.	Relay contacts bent, failing to close motor circuit.	Adjust relay contacts.
	Open circuit between relay and motor.	Check continuity and repair open circuit.
	Moving relay contact improperly grounded.	Check connections.
	Dirty relay contact.	Clean or replace contact. Readjust relay for proper contact spacing and pressure.

TABLE LVIII. MECHANICAL TUNING UNIT, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
Relay closes, but motor does not operate (Cont).	Insufficient contact pressure.	Readjust or replace contact.
	Motor armature burned out.	Replace motor.
	No power to motor.	Check wires and repair open circuit.
	Reduction gears jammed.	Check gears by rotating manually. Remove obstruction.
Relay does not operate.	No power to relay.	Check wires and repair open circuit.
	Open connection on control wire.	Check wires from relay to seeking switch and repair open circuit.
	Relay coil open.	Replace relay and adjust.
	Improper relay air gap.	Readjust relay air gap.

NOTE

All disassembly procedures indicated in the previous chart are described in the handbook of overhaul instructions for Radio Set AN/ARC-52.

i. Rotate the 10-mc MANUAL frequency control from a frequency dial indication of 39 to an indication of 22. Determine that the 10-mc drive coupler advances 380 degrees. Determine that the pointer on the 10-mc clutch drum indicates 22.

j. Operation of the 1.0-mc output coupler can be checked by following the procedure outlined in steps k through q.

k. Set the 1-mc MANUAL frequency control at C-1607 ARC-52 for an indication of 0 on corresponding frequency dial. Determine that the pointer on the 1.0-mc clutch drum indicates 0.

l. Observe the position of the 1.0-mc drive coupler and then set the MANUAL frequency control for a frequency indication of 1. Determine that the 1.0-mc drive coupler advances 30 degrees. Determine that the pointer on the 1.0-mc clutch drum indicates 1.

m. Repeat the conditions of the test for steps k and l above as the 1.0-mc MANUAL frequency control is rotated for dial indications of 2 through 9. The drive couplers must always advance in 30-degree increments, and the pointer must indicate settings that correspond to the 1.0-mc frequency dial of the C-1607 ARC-52.

n. Set the .1-mc MANUAL frequency control at C-1607/ARC-52 for an indication of .4 on the corresponding frequency dial. The clutch drum position should be unchanged from that of step m.

o. Observe the position of the 1.0-mc drive coupler and then set the .1-mc MANUAL frequency control for a frequency indication of .5. Determine that the 1.0-mc drive coupler advances 15 degrees. The pointer should be positioned at the mark between 1 and 2.

p. Set the .1-mc MANUAL frequency control at C-1607/ARC-52 for an indication of .9 on the corresponding frequency dial. The clutch drum position should be unchanged from that of step o.

q. Observe the position of the 1.0-mc drive coupler, and then set the .1-mc MANUAL frequency control at C-1607 ARC-52 for a frequency dial indication of .4. Determine that the 1.0-mc drive coupler advances 345 degrees. The pointer should be on the last number described in step m.

r. The operation of the 10-mc and 1.0-mc differential shaft drive coupler can be checked by the following procedures outlined in steps s through aa.

s. Set the 10-mc MANUAL frequency control at the C-1607 ARC-52 for an indication of 22 on the corresponding frequency dial.

t. Observe the position of the 10-mc and 1.0-mc differential shaft drive coupler, and then set the 10-mc MANUAL frequency control for a frequency dial indication of 23. Determine that the 10-mc and 1.0-mc differential drive coupler advances 10 degrees.

u. Repeat the test conditions for steps s and t as the 10-mc frequency control is rotated for frequency dial indications of 24 through 39. The drive coupler must always advance in 10-degree increments.

v. Rotate the 10-mc MANUAL frequency control from a frequency dial indication of 39 to 22. Determine that the differential drive coupler advances 190 degrees.

w. Set the 1-mc MANUAL frequency control for an indication of 0 on the corresponding frequency dial.

x. Observe the position of the 10-mc and 1.0-mc differential shaft drive coupler, and then set the 1.0-mc MANUAL frequency control for a frequency dial indication of 1. Determine that the differential drive coupler advances 1 degree.

y. Repeat the conditions of steps w and x as the 1.0-mc MANUAL frequency control is rotated for dial indications of 2 through 9. The differential drive coupler must always advance in 1-degree increments.

z. Set the .1-mc MANUAL frequency control for an indication of .4 on the corresponding frequency dial.

aa. Observe the position of the differential shaft drive coupler and then set the .1-mc MANUAL frequency control for a frequency dial indication of .5. Determine that the differential shaft drive coupler advances .5 degrees.
ab. Operation of the 0.1-mc output coupler can be checked by following the procedure outlined in steps ac through ae.
ac. Set the .1-mc MANUAL frequency at the C-1607/ARC-52 for an indication of 0.0 on the corresponding frequency dial. Determine that the pointer on the 0.1-mc clutch drum indicates .0.
ad. Observe the position of the 0.1-mc drive coupler, and then set the .1-mc MANUAL frequency control for an indication of .1. Determine that the 0.1-mc drive coupler advances 36 degrees. Determine that the pointer on the 0.1-mc clutch drum indicates .1.
ae. Repeat the conditions of the test in steps ac and ad as the .1-mc MANUAL frequency control is rotated for dial indications of .2 through .9. The drive coup must always advance in 36-degree increments, and the pointer must indicate settings that correspond to the .1-mc MANUAL frequency dial of C-1607/ARC-52.

6-126. TROUBLE SHOOTING. Remove the cover plates to expose the front of the module (figure 6-37) and the rear of the module (figure 6-38). Check all detail parts for evidence of burning or shorts; check gears for evidence of binding. (A small amount of backlash indicates the absence of binding.) If visual checks fail to isolate the cause of trouble, perform the trouble-shooting procedures of table LVIII.

NOTE

The procedures of table LVIII are an extension of the minimum performance checks (paragraph 6-125). Both sets of procedures should be used to isolate a trouble. Set the function switch to T/R and perform the procedures of table LVIII. Reference is made to the handbook of overhaul instructions to remedy troubles listed in table LVIII, excepting the relay adjustment (paragraph 6-127).

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

6-127. RELAY ADJUSTMENT. The following procedure is used to remove and realign relay K1201, K1202, or K1203.
a. Loosen the mounting screws that secure the relay to the module proper.
b. Hold the pawl fully seated in a stop-wheel notch, and rotate the relay clockwise about the mounting screws so the relay frame and armature contacts the pawl projection to eliminate all lost motion in the relay. Tighten the relay mounting screws in this position. Check the adjustment of relay travel and contact spacing by steps c and d.
c. Depress the relay clapper and verify that the pawl lifts clear of the notch to allow free rotation of the stop-wheel. The pawl should clear the stop-wheel teeth by about 1/64 inch. If the clearance is more than 1/32 inch, it indicates excessive relay travel with a corresponding loss of power. If necessary, the relay travel may be adjusted by loosening the two screws near the relay hinge, and sliding the hinge plate up or down slightly as required.
d. The motor operating contacts on the relay should be adjusted to maintain contact when the pawl is resting on top of a stop-wheel tooth between positions with the relay de-energized. This procedure ensures that the motor will continue to drive until the pawl engages the proper notch, which opens the contacts at least 0.025 inch. If necessary, the contacts may be adjusted by bending the stationary contact arm.

6-128. SWITCH CIRCUITS. Tables LIX through LXII indicate the control wires which are grounded in each position of the corresponding seeking and selector switches. Grounded wires are indicated with an x. All ungrounded wires on each switch are connected in parallel.
a. Switches S1201, S1202, and S1203 are the seeking switches used in conjunction with the 10-mc increment selector in the radio set control. S1201 has 18 positions and makes two revolutions per cycle. On the second revolution, 18 positions are unused. Auxiliary seeking switch S1204 has 36 positions, but is used only to differentiate between the two groups of 18 positions. The purpose of this switch is to select the proper revolution of the main selector switch and block off the unused positions. In table LIX, the 0 indicates positions where S1204 short-circuits the control wire of relay K1201 to ground.
b. Switches S1205 and S1206 are seeking switches used in conjunction with the 1-mc increment selector in the radio set control. Switch S1206 also has 12 contacts, 2 of which are not used. The contacts indexed in half-position steps provide a total of 24 positions, 4 remaining unused. Table LX indicates grounded wires for each switch position.
c. Switch S1207 is a 10-position switch. It is the seeking switch used in conjunction with the 0.1-mc increment selector in the radio set control. Switch S1208 acts to provide 0.5-mc tuning of the 20- to 30-mc i-f amplifier by alternating the electrical ground of switch S1206 every half megacycle. Tables LXI and LXII indicate the grounded wires in each of the switch positions.

6-129. RELAY UNIT.

6-130. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table LXIII provide indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures of table LXIV. If the module does check out, no further maintenance is necessary. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

TABLE LIX. MECHANICAL TUNING UNIT. S1202 AND S1203 SWITCH CONNECTION CHART

Switch Position			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Freq (X 10 mc)			22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	← UNUSED →																	
*Wires	U	10-1**				x					x					x								x					x					x				
	V	10-2**					x					x					x								x					x					x			
	W	10-3**	x					x					x					x			x					x					x					x		
	n	10-4**		x					x					x					x			x					x					x					x	
	p	10-5**			x					x					x					x			x					x					x					x
	m	10-LH**	x	x	x						x	x	x	x	x						x	x	x						x	x	x	x	x					
	k	2-3**	x	x	x	x	x	x	x	x											x	x	x	x	x	x	x	x										
S1204																					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Letter symbols correspond to Z1401 filter connections for each wire.
**Number symbols identify decade system function of each wire.

TABLE LX. MECHANICAL TUNING UNIT. S1205 AND S1206 SWITCH CONNECTION CHART

Switch Position			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Freq (X 1mc)			0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	← UNUSED →			
*Wires	a	1-1**	x	x									x	x									x	x	x	x
	b	1-2**			x	x									x	x							x	x	x	x
	c	1-3**					x	x									x	x					x	x	x	x
	d	1-4**							x	x									x	x			x	x	x	x
	e	1-5**									x	x									x	x	x	x	x	x
	q	1-LH**	x	x	x	x	x	x	x	x	x	x														
Within Mech Drive	Lo			x		x		x		x		x		x		x		x		x		x		x		x
	Hi		x		x		x		x		x		x		x		x		x		x		x		x	

*Letter symbols correspond to Z1401 filter connections for each wire.
**Number symbols identify decade system function of each wire.

TABLE LXI. MECHANICAL TUNING UNIT, S1207 SWITCH CONNECTION CHART

Switch Position			1	2	3	4	5	6	7	8	9	10
Frequency (X 0.1 mc)			0	1	2	3	4	5	6	7	8	9
*Wires	f	0.1-1**	x					x				
	g	0.1-2**		x					x			
	h	0.1-3**			x					x		
	i	0.1-4**				x					x	
	j	0.1-5**					x					x
	r	0.1-LH**	x	x	x	x	x					

*Letter symbols correspond to Z1401 filter connections for each wire.
**Number symbols identify decade function of each wire.

TABLE LXII. MECHANICAL TUNING UNIT, S1208 SWITCH CONNECTION CHART

Switch Position	1	2	3	4	5	6	7	8	9	10
Frequency (X 0.1 mc)	0	1	2	3	4	5	6	7	8	9
LO						x	x	x	x	x
HI	x	x	x	x	x					

6-131. TROUBLE SHOOTING. Check all detail parts for evidence of burning or shorts. Visual checks and procedures contained in table LXIV supplement the minimum performance check chart (table LXIII). Both tables should be used to isolate a trouble.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

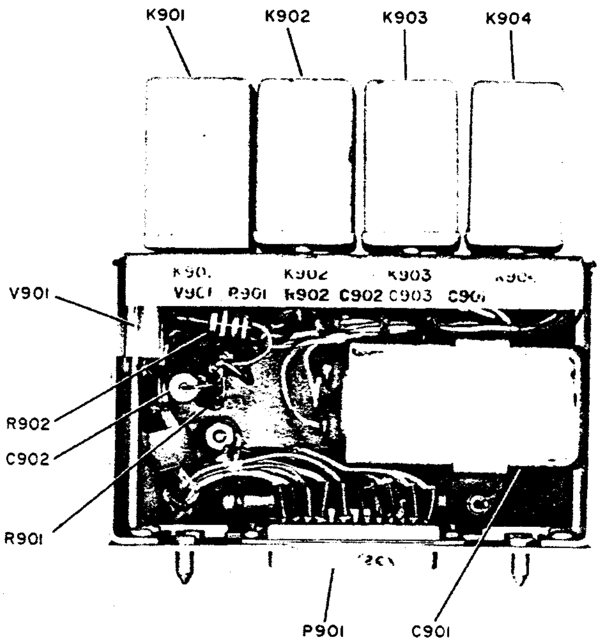


Figure 6-39. Relay Unit, Rear View

TABLE LXIII. RELAY UNIT, MINIMUM PERFORMANCE CHECKS

NOTE

The following minimum performance checks are performed with the relay unit connected to the main chassis by an extension cable. Unless otherwise specified, maintain function switch at T/R.

TEST POINT	TO CHECK	TEST CONDITIONS AND STANDARDS
J1509-16 (figure 5-13 or 5-14)	T/R relay K901 (figure 6-39).	With mike press-to-talk switch actuated, vtvm indicates +425 volts; with switch released, vtvm indicates 0 volt.
J1509-18 (figure 5-13 or 5-14)	T/R relay K901 (figure 6-39).	With mike press-to-talk switch actuated, vtvm indicates +130 volts; with switch released, vtvm indicates 0 volt.
J1509-15 (figure 5-13 or 5-14)	T/R relay K901 (figure 6-39).	With mike press-to-talk switch actuated, vtvm indicates +225 volts; with switch released, vtvm indicates 0 volt.

TABLE LXIII. RELAY UNIT, MINIMUM PERFORMANCE CHECKS (Cont)

TEST POINT	TO CHECK	TEST CONDITIONS AND STANDARDS
J1509-3 (figure 5-13 or 5-14)	Disable relay K902 (figure 6-39).	Channel radio set. During channeling interval, vtvm indicates -27.5 volts; with channeling completed, vtvm indicates 0 volt in receive condition or -22.5 volts in transmit condition.
J1509-22 (figure 5-13 or 5-14)	Disable relay K902 (figure 6-39).	Channel radio set. During channeling interval, ohmmeter indicates zero; with channeling completed, ohmmeter indicates 2700 ohms.
J1509-24 (figure 5-13 or 5-14)	Guard relay K903 (figure 6-39).	With function switch at T/R-G, vtvm indicates +130 volts. With function switch at T/R, vtvm indicates 0.
J1509-20 (figure 5-13 or 5-14)	Tone relay K904 (figure 6-39).	With tone switch actuated, vtvm indicates -130 volts; with switch released, vtvm indicates 0.

TABLE LXIV. RELAY UNIT, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
+425-volt, +130-volt, and -225-volt outputs of T/R relay K901 not present.	Defective relay K901.	Replace relay.
Transmission and reception not muted during channeling.	Defective relay K902.	Replace relay.
+130-volt output to guard receiver not present.	Defective guard relay K903.	Replace relay.
+130-volt output to modulation tone oscillator not present.	Defective tone relay K904.	Replace relay.

NOTE

All detail parts of the relay unit are removed and replaced following conventional maintenance procedures.

6-132. RECTIFIER UNIT. (RT-332/ARC-52 only.)

6-133. MINIMUM PERFORMANCE CHECKS. Minimum performance checks of table LXV provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures of table LXVI. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

NOTE

Refer to table XII for procedures applicable to the rectifier unit test point check.

6-134. TROUBLE SHOOTING. Check all detail parts for evidence of burning or shorts. Visual checks and trouble-shooting procedures contained in table LXVI supplement the minimum performance check chart (table LXV). Both tables should be used to isolate a trouble. Refer to table LXVII for output voltage checks.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

NOTE

All detail parts of the rectifier unit are removed and replaced following conventional maintenance procedures.

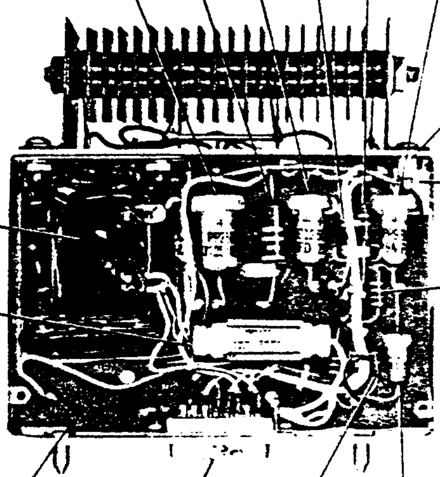


Figure 6-40. Rectifier Unit, Rear View

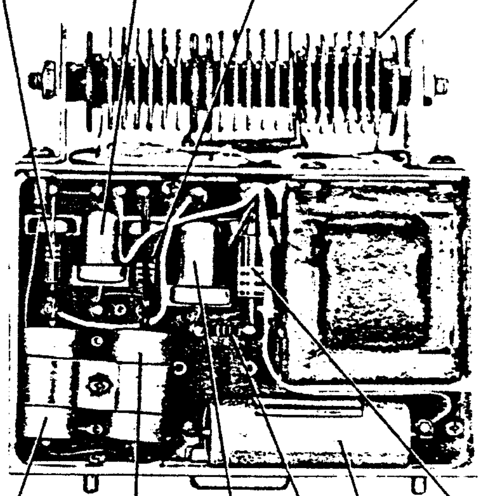


Figure 6-41. Rectifier Unit, Front View

TABLE LXV. RECTIFIER UNIT, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITION AND STANDARDS
Ⓔ J1001 (figure 6-40)	Rectifier unit.	-130-volt plate supply.	With radio set energized, vtvm indicates -128 volts to -138 volts.
Ⓕ J1002 (figure 6-40)	Rectifier unit.	-15-volt bias supply.	With radio set energized, vtvm indicates -13.5 volts to -15.0 volts.
J1510-10 (figure 5-13 or 5-14)	Main chassis.	-225-volt adf supply.	With radio set energized, vtvm indicates +210 volts to +230 volts.

TABLE LXVI. RECTIFIER UNIT, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
In normal operating condition, vtvm fails to measure +128 volts at test point Ⓔ.	Rectifier CR1001 (figure 6-41) defective.	Replace rectifier CR1001.
	Defective filter detail part.	Check resistors R1001, R1002, R1009, capacitors C1001, C1002, C1003, and inductor L1001. Replace defective part.
In normal operating condition, vtvm fails to measure +225 volts at terminal 10 of plug P1001.	Diode CR1002 or CR1003 (figure 6-41) defective.	Replace diode CR1002 or CR1003.
	Power supply detail part defective.	Check capacitors C1004 through C1007, and resistors R1003 through R1005. Replace defective part.

TABLE LXVI. RECTIFIER UNIT, TROUBLE-SHOOTING CHART (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
In normal operating condition, vtvm fails to measure -15 volts at test point (F).	Diode CR1004 (figure 6-40) defective.	Replace diode CR1004.
	Power supply detail part defective.	Check resistors R1006 through R1008 and capacitor C1008. Replace defective part.
	Diode CR701 (figure 6-27) defective.	Replace defective crystal diode.

TABLE LXVII. RECTIFIER UNIT, OUTPUT VOLTAGES

PLUG P1001 PINS	RECEIVER OPERATION (volts)	TRANSMITTER OPERATION (volts)	RIPPLE (volts)	PLUG P1001 PINS	RECEIVER OPERATION (volts)	TRANSMITTER OPERATION (volts)	RIPPLE (volts)
4	115,400 cps	115,400 cps	---	9	-15 dc	-15 dc	0.5 rms or less
5	115,400 cps	115,400 cps	---	10	-225 dc	---	5.0 rms or less
6	115,400 cps	115,400 cps	---	8	-130 dc	-130 dc	0.35 rms or less
12	---	---					

NOTE

Voltages are taken with rectifier unit connected to the main chassis through an extension cable.

TABLE LXVIII. A-C POWER UNIT, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
(A) J1405 (figure 5-1)	Right front gusset plate.	Relay K1101 (figure 6-42).	With radio set energized, vtvm indicates -27.0 to -28.0 volts.
(S) Fuse board E1501 (figure 5-13 or 5-14)	Main chassis.	425-volt plate supply.	With radio set energized and mike press-to-talk switch actuated, vtvm indicates between -415 volts and +440 volts.
6.3 V ac filament tie point (figure 5-13 or 5-14)	Main chassis.	6.3-volt filament supply.	With radio set energized, vtvm indicates 6.3 volts ac.
26.5 V ac filament tie point (figure 5-13 or 5-14)	Main chassis.	26.5-volt filament supply.	With radio set energized, vtvm indicates 26.5 volts ac.

TABLE LXIX. A-C POWER UNIT, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Radio set dead.	Defective coil of relay K1101 figure 6-42).	Replace relay.
	Dirty contacts of relay K1101 (figure 6-42).	Check relay and replace if necessary.
No mechanical drive throughout system.	Dirty contacts of relay K1101 (figure 6-42).	Check relay and replace if necessary.
+425-volt output to relay unit unavailable.	Defective transformer T1102 (figure 6-42).	Check voltages and replace transformer if necessary.
	Defective power supply detail part.	Check diodes CR1101 through CR1109, resistor R1101, capacitors C1101, C1102, and choke L1101 (figure 6-43). Replace defective part.
N ilament voltages.	Defective transformer. T1101 (figure 6-42)	Check voltages and replace transformer if necessary.

6-135. A-C POWER UNIT. (RT-332/ARC-52 only.)

6-136. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table LXVIII provide the indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures listed in table LXIX. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for the over-all radio set (section V).

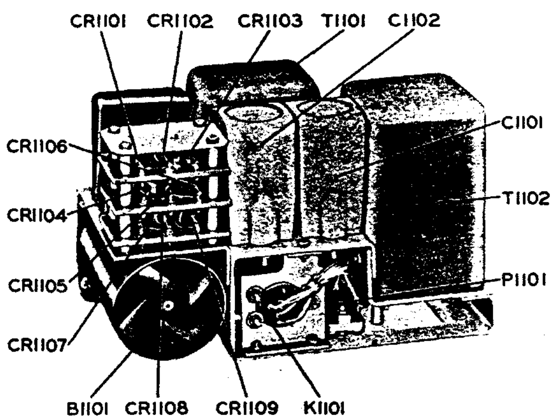


Figure 6-42. A-C Power Unit, Front View

6-137. TROUBLE SHOOTING. Check all detail parts for evidence of burning or shorts. Visual checks and trouble-shooting procedures in table LXIX supplement the minimum performance check chart (table LXVII). Both tables should be used to isolate a trouble. Refer to table LXX for voltage checks.

TABLE LXX. A-C POWER UNIT, INPUT AND OUTPUT VOLTAGES

INPUTS		OUTPUTS	
TEST POINT	VOLTAGE	TEST POINT	VOLTAGE
P1101-1	115V ac, phase 3	P1101-2	115V ac, phase 3
P1101-3	115V ac, phase 2	P1101-4	115V ac, phase 2
P1101-5	115V ac, phase 1	P1101-6	115V ac, phase 1
P1101-17	27.5V dc	P1101-7	27.5V dc
P1101-8	0 (ground)	P1101-9	0 (ground)
P1101-15	0 (ground)	P1101-12	26.5V ac
P1101-20	0 (ground)	P1101-19	26.5V ac
		P1101-14	6.3V ac
		P1101-16	6.3V ac
		P1101-13	425V dc

NOTE

Voltages are taken with a-c power unit connected to the main chassis through an extension cable.

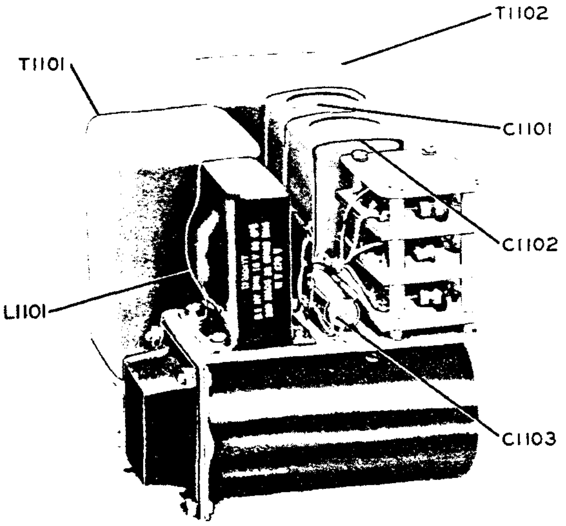


Figure 6-43. A-C Power Unit, Left Rear View

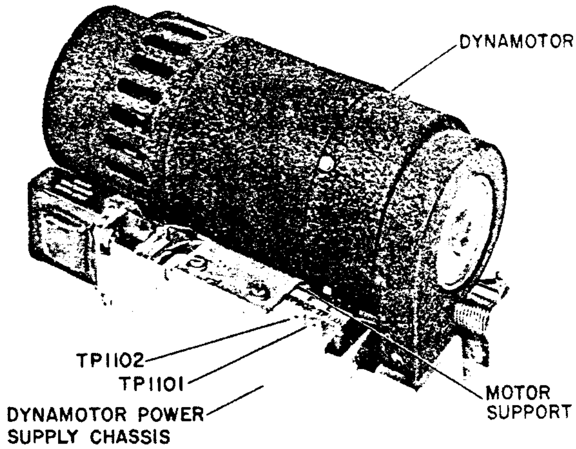


Figure 6-44. Dynamotor Power Supply Unit, Top View

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

NOTE

All detail parts of the a-c power unit are removed and replaced following conventional maintenance procedures.

6-138. DYNAMOTOR POWER SUPPLY UNIT. RT-424/ARC-52X only.)

NOTE

Differences in units manufactured under Contracts NOw 60-0089-A and NOw 61-0785 and all other units may be seen by comparing figures 7-19 and 7-20.

6-139. MINIMUM PERFORMANCE CHECKS. Minimum performance checks in table LXXI provide indications by which maintenance personnel can determine that a repaired module meets the minimum standards of performance. If the module fails to check out, perform the trouble-shooting procedures listed in table LXXII. If the module does check out, no further maintenance is required. When a repaired module has been returned to a tactical radio set, perform the minimum performance checks for over-all radio set (section V).

6-140. TROUBLE SHOOTING. Check all detail parts (figure 6-45) for evidence of burning or shorts. Visual checks and trouble-shooting procedures in table LXXII supplement the minimum performance check chart (table LXXI). Both tables should be used to isolate a trouble. Refer to table LXXIII for voltage checks and table LXXIV for voltage and resistance checks.

CAUTION

Whenever power is applied to an abnormally functioning module, check for signs of burning or shorts. If such an indication is present, immediately rotate the function switch to OFF.

WARNING

Voltages dangerous to life are developed by the dynamotor. Be exceedingly careful when measuring dynamotor voltages.

TABLE LXXI. DYNAMOTOR POWER SUPPLY UNIT, MINIMUM PERFORMANCE CHECKS

TEST POINT	LOCATION	TO CHECK	TEST CONDITIONS AND STANDARDS
(E) TP1101	Dynamotor unit module (figure 6-44)	130-volt plate supply.	With radio set energized, vtvm indicates +128 to -138 volts.
(F) TP1102	Dynamotor unit module (figure 6-44)	Minus 15-volt bias supply.	With radio set energized. vtvm indicates -13.5 to -15.0 volts.

TABLE LXXII. DYNAMOTOR POWER SUPPLY UNIT, TROUBLE-SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
Radio set dead.	Defective coil of relay K1101 (figure 6-45).	Replace relay.
	Dirty contacts of relay K1101 (figure 6-45).	Check relay. Replace if necessary.
	Defective power supply detail part.	Check capacitor C1102 and inductor L1101. Replace if necessary.
No mechanical drive throughout system.	Dirty contacts of relay K1101 (figure 6-45).	Check relay. Replace if necessary.
+425-volt output to relay unit unavailable.	Defective dynamotor.	Check voltages and replace dynamotor is necessary.
	Defective power supply detail part.	Check capacitor C1105 and resistor R1108. Replace if necessary.
-225-volt output to ADF B- circuits unavailable.	Defective voltage regulator tube V1102.	Replace tube V1102.
-130-volt output to B+ circuits unavailable.	Defective coil L1102.	Replace coil L1102.
Minus 15-volt bias unavailable.	Defective oscillator tube V1101.	Replace tube V1101.
	Defective oscillator circuit detail part.	Check resistors R1102 through R1107; inductors L1103, L1104; capacitors C1103, C1104, C1106, C1107; and diode CR1101. Replace if necessary.
Improper filament supply voltages.	Defective resistor R1101.	Replace resistor R1101.

6-141. REMOVAL AND REPLACEMENT. To uncover detail parts on the dynamotor power supply chassis, the dynamotor must be separated from the chassis. Remove two screws from top of motor support (figure 6-45) and two screws from bottom of motor mount. (Insert screwdriver from beneath the power supply chassis.) The dynamotor may then be separated for a distance limited by the length of the connecting wires from its chassis. To replace dynamotor on power supply chassis, reverse this procedure.

6-142. MAIN CHASSIS COMPONENTS.

6-143. GENERAL. All minimum performance checks and trouble-shooting procedures applicable to the main chassis are based on continuity checks. Test points for these checks may be selected arbitrarily by referring to figures 7-1, 7-2, and 7-3, receiver-transmitter schematic diagram.

6-144. Overhaul procedures for mechanical detail parts of the main chassis are described in the handbook of overhaul instructions for Radio Set AN/ARC-52. Performance of separate sections of filter Z1401 (figure 5-7), as well as of the electrical detail parts of the main chassis (figures 5-13 and 5-14), is evaluated as part of the maintenance and trouble-shooting procedures for the modules with which the particular filter sections or electrical detail parts are used. To aid in locating main chassis detail parts, see figure 5-7, rear view of front panel; figure 5-13 or 5-14, bottom view of main chassis; and figure 6-46, top view of main chassis with modules removed.

6-145. RADIO SET CONTROL C-1607/ARC-52.

6-146. GENERAL. All minimum performance checks and trouble-shooting procedures applicable to the radio set control are based on continuity checks. Check points are given in tables LXXV and LXXVI. Perform the following procedures prior to making the checks.

CAUTION

If the radio set control has failed to operate on any preset channel frequency, do not disturb the preset channel frequency adjustments until they have been recorded or until the source of trouble has been detected.

TABLE LXXIII. DYNAMOTOR POWER SUPPLY UNIT, INPUT AND OUTPUT VOLTAGES

INPUTS		OUTPUTS	
TEST POINT	VOLTAGE	TEST POINT	VOLTAGE
P1101-17	27.5V dc	P1101-2	27.5V dc
P1101-9	0 (ground)	P1101-7	27.5V dc
		P1101-18	27.5V dc
		P1101-19	27.5V dc
		P1101-13	425V dc
		P1101-20	0 (ground)
		P1102-9	-15V dc
		P1102-8	130V dc
		P1102-10	225V dc
		P1102-11	225V dc
		P1102-15	0 (ground)

NOTE

Voltages are taken with dynamotor power supply unit connected to the main chassis by an extension cable.

TABLE LXXIV. DYNAMOTOR POWER SUPPLY UNIT, VOLTAGE AND RESISTANCE CHART

TUBE	PIN	VOLTAGE	RESISTANCE
V1101 (JAN5840)	1	-1.2	27.1 k
	2	5.0	1 k
	3	18.9	∞
	4	5.0 (n.c.)	1 k
	5	90.0	7 k
	6	25.2	∞
	7	90.0	7 k
	8	5.0 (n.c.)	1 k
V1102 (JAN5644)	1	225	∞
	2	130	37
	3	n.c.	-
	4	130	37
	5	n.c.	-
	6	n.c.	-
	7	n.c.	-
	8	130	37

NOTES

1. Voltage measurements are taken from tube terminal to ground with a vtvm.
2. All voltages are volts dc (positive) unless otherwise noted.
3. Resistance measurements are taken with the module removed from the main chassis.
4. No connection indicated by n.c.

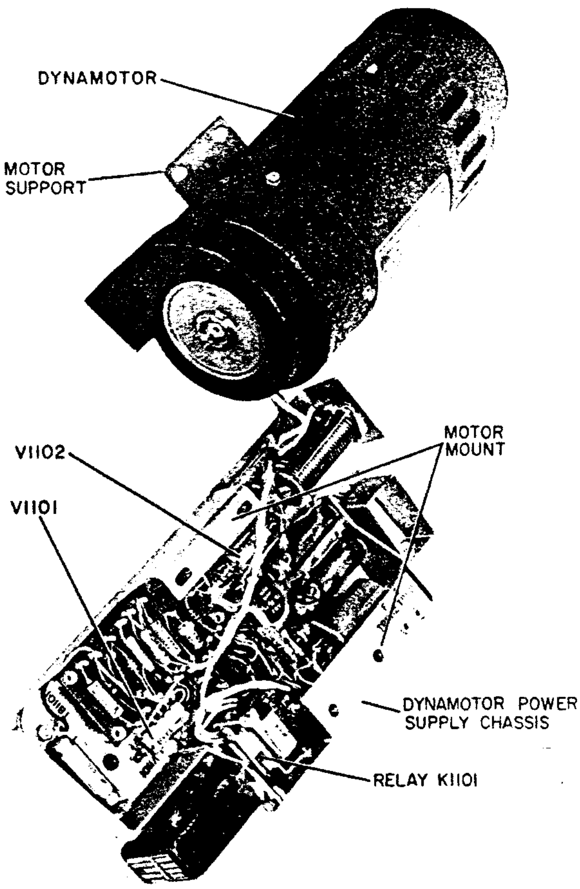


Figure 6-45. Dynamotor Power Supply Unit, Dynamotor Removed

a. Remove all power from the equipment.
b. Disconnect plug P1801 from jack J1801 at the rear of the radio set control (figure 6-51).
c. Remove the dust cover by removing the two fastener screws on the back side of the cover.
d. Make a thorough visual inspection of all parts and wiring to detect broken connections, dirty switch contacts, or burned wiring. In probing, take care not to dislodge wires or create short circuits by excessive bending.
e. If one or more channels perform improperly, make continuity checks of the unit. In performing these checks, refer to tables LXXV and LXXVI, and see figures 6-47 through 6-51, and 7-1, 7-2, and 7-3.

NOTE

Refer to the handbook of overhaul instructions for the complete disassembly and reassembly procedures for the radio set control.

6-147. RADIO SET CONTROL C-2791/ARC.

6-148. GENERAL. All minimum performance checks and trouble-shooting procedures applicable to the C-2791/ARC are based on continuity checks. Check points are given in tables LXXVII and LXXVIII. Perform the following procedures prior to making the checks.

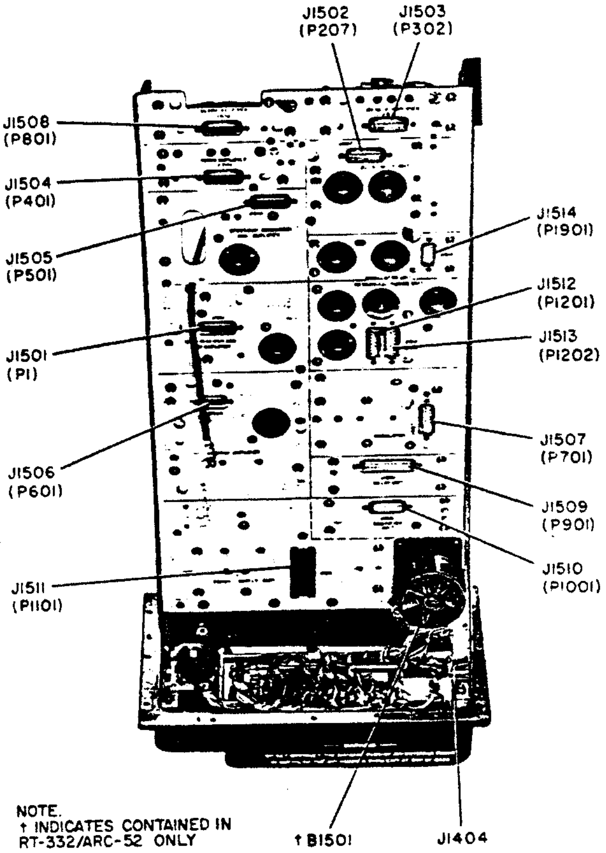


Figure 6-46. Main Chassis, Top View, Modules Removed

CAUTION

If the C-2791/ARC has failed to operate on any preset channel frequency, do not disturb the preset channel frequency adjustments until they have been recorded or until the source of trouble has been detected.

a. Remove all power from the equipment.

b. Disconnect plug P2101 from jack J2101 at the rear of the C-2791/ARC (figure 6-52).

c. Remove the dust cover by removing the two fastener screws on the back side of the cover.

d. Make a thorough visual inspection of all parts and wiring to detect broken connections, dirty switch contacts, or burned wiring. In probing, take care not to dislodge wires or create short circuits by excessive bending.

e. If one or more channels perform improperly, make continuity checks on the unit. In performing these checks, refer to tables LXXVII and LXXVIII and see figures 6-52 through 6-54 and figure 3-8.

NOTE

Refer to the handbook of overhaul instructions, NAVWEPS 16-30ARC52-503, for the complete disassembly and reassembly procedures for the C-2791/ARC.

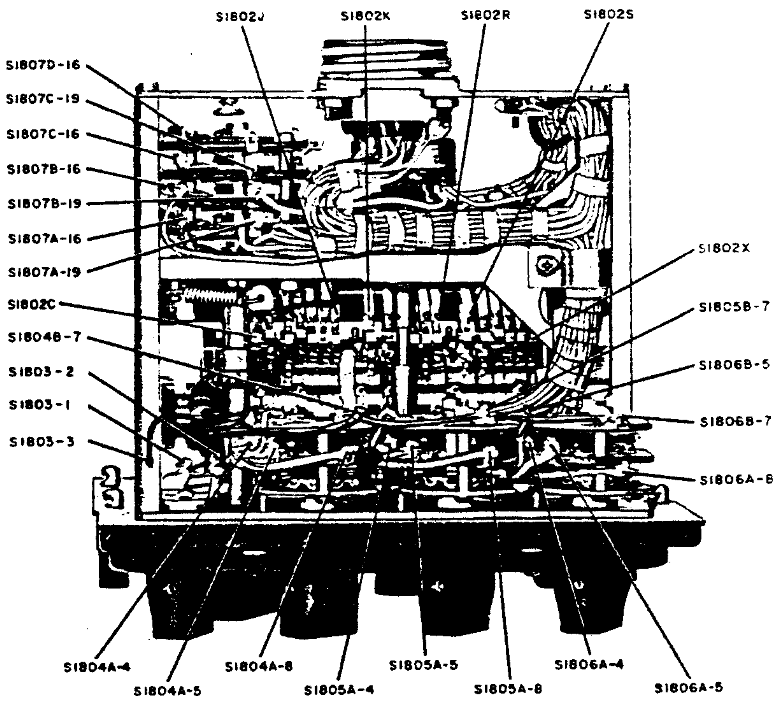


Figure 6-47. Radio Set Control C-1607 ARC-52, Top View, Cover Removed

TABLE LXXV. RADIO SET CONTROL C-1607 ARC-52. CONTINUITY CHECKS (TO JACK J1801)

NOTE

Set CHAN selector switch to position M and all other controls fully counterclockwise

J1801 PIN	RADIO SET CONTROL INTERNAL CONNECTION	J1801 PIN	RADIO SET CONTROL INTERNAL CONNECTION
A	S1801-5	R	S1802S-center and lower
B	No connection	S	S1802K-center
C	S1801-3	T	S1805A-5 to S1802R-bottom
D	S1801-2	U	S1804A-1 to S1802E
E	R1803A/R1801 junction	V	S1804A-2 to S1802F-center and top
F	S1803A/R1802 junction	W	S1804A-3 to S1802G
H	S1801-8	X	S1804A-4 and 11, to S1802H
J	S1801-9	Y	S1806A-5 to S1802X-bottom
K	S1807A-14 and 16	Z	S1804A-5 to S1802J-bottom
L	S1801-10	a	S1805A-1 to S1802L
M	S1802D-top and bottom	b	S1805A-2 to S1802M-top and bottom
N	To solder lug, to S1807B-19, 16 and 14, to S1807C-19, 16 and 14, to S1807D-16 and 14, to S1803-2, S1804B-7, S1805B-7, S1806B-7, S1807A-19, R1803B, S1801-7 and 4.	c	S1805A-3 to S1802N
		d	S1805A-4 and 11 to S1802P
		f	S1806A-1 to S1802T
		g	S1806A-2 to S1802U-top and bottom
P	XI1802, to XI1801	h	S1806A-3 to S1802V
		i	S1806A-4 and 11 to S1802W

TABLE LXXVI. RADIO SET CONTROL C-1607/ARC-52, CONTINUITY CHECKS (EXCLUSIVE OF JACK J1801)

NOTE

Set CHAN selector switch to position M and all other controls fully counterclockwise.

SWITCH CONTACT	TERMINATING POINT	SWITCH CONTACT	TERMINATING POINT
S1807D-11	S1806A-8	S1807A-11	S1804B-2
S1807D-9	S1802X-top	S1807A-9	S1802B-top and bottom
S1807O-1	S1806B-5	S1807A-4 and 6	S1802D-top and bottom
S1807C-11	S1805A-8	S1802B	S1802D and F
S1807C-9	S1802R-top	S1802K-top	S1802M-bottom
S1807C-4 and 6	S1802S-top and bottom	S1802A and C	S1802F-top and center
S1807B-1	S1805B-5	S1802S-top	S1802U-bottom
S1807B-11	S1804A-8	S1806A-12	S1806B-12
S1807B-9	S1802J-top	S1805A-12	S1805B-12
S1807B-4 and 6	S1802K-top and bottom	S1804B-4	S1803-2
S1807A-1	S1804B-5	S1804A-12	S1804B-12 and 1, S1803-3

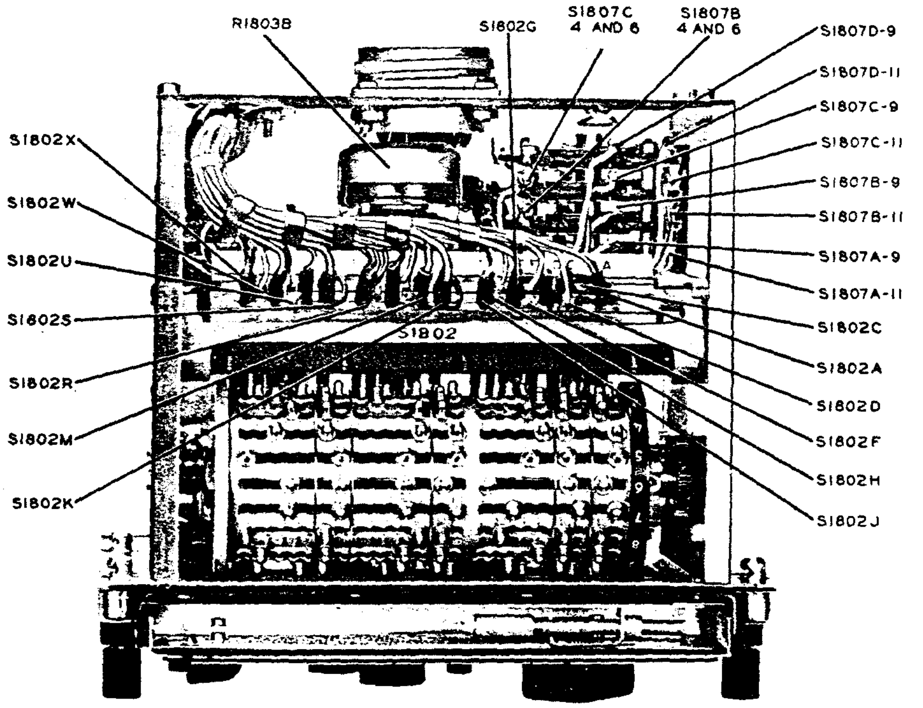


Figure 6-48. Radio Set Control C-1607/ARC-52, Bottom View, Cover Removed

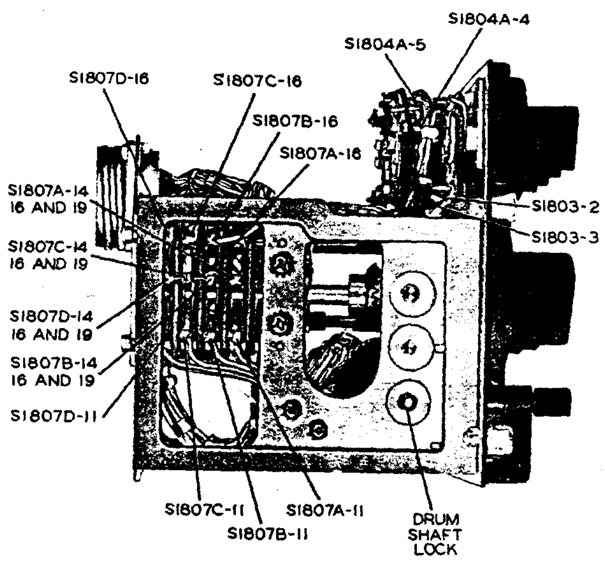


Figure 6-49. Radio Set Control C-1607/ARC-52, Left Side View, Cover Removed

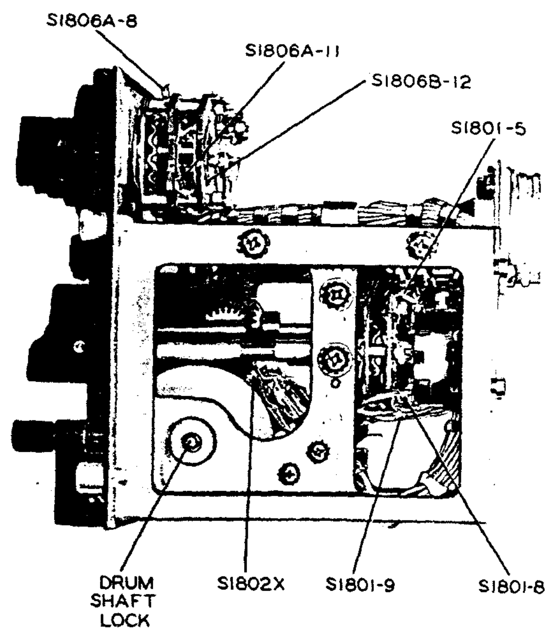


Figure 6-50. Radio Set Control C-1607/ARC-52, Right Side View, Cover Removed

TABLE LXXVII. RADIO SET CONTROL C-2791 ARC. CONTINUITY CHECKS (TO JACK J2101)

NOTE

Set CHAN selector switch to position M and all other controls fully counterclockwise.

J2101 PIN	RADIO SET CONTROL INTERNAL CONNECTION
A	S2101-5
C	S2101-3
D	S2101-2
E	R2103A/R2101 junction
F	R2103A/R2102 junction
K	S2107A-14 and 16
L	S2101-9
M	S2102D-top and bottom
N	solder lug, S2101-4 and 6; S2103-1; S2104B-7; S2105B-7; S2105B-7; S2106B-7; S2107A-19; S2107B-14, 16, and 19; S2107C-14, 16, and 19; S2107D-14 and 16; R2103B
P	XDS2101, XDS2102
R	S2102S-top and bottom
S	S2102K-top and bottom
T	S2105A-5 to S2102R
U	S2104A-1 to S2102E
V	S2104A-2 to S2102F
W	S2104A-3 to S2102G-top
X	S2104A-4 and 11 to S2102H-top
Y	S2106A-5 to S2102X-top
Z	S2104A-5 to S2102J-top
a	S2105A-1 to S2102L
b	S2102M
c	S2105A-3 to S2102N-top
d	S2105A-4 and 11 to S2102P-top
f	S2106A-1 to S2102T
g	S2106A-2 to S2102U
h	S2106A-3 to S2102V-top
i	S2106A-4 and 11 to S2102W-top
j	J2101-pin r
m	S2101-11
p	J2101-pin q, S2101-8 (if no continuity, reverse test leads)
s	K2103 open relay contact
t	J2101-pin u, S2101-8 (if no continuity, reverse test leads)
v	J2101-pin w
x	R2105/R2106 junction
y	K2103 open relay contact

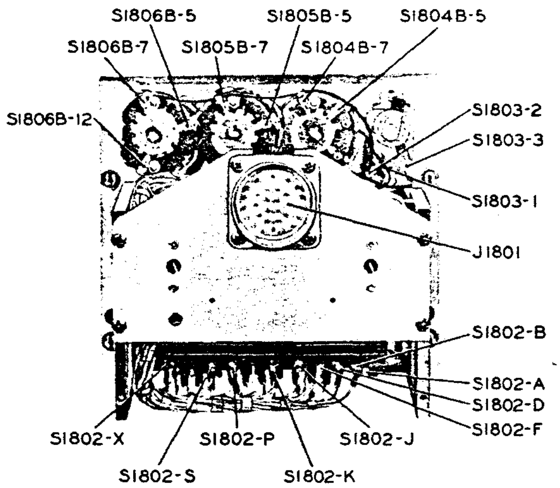


Figure 6-51. Radio Set Control C-1607/ARC-52, Rear View, Cover Removed

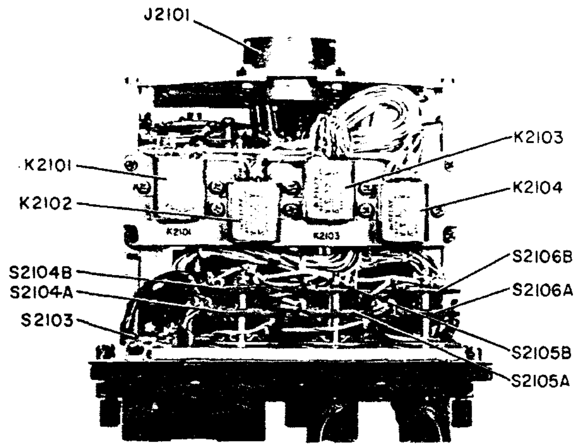


Figure 6-52. Radio Set Control C-2791/ARC, Top View, Cover Removed

TABLE LXXVIII. RADIO SET CONTROL C-2791 ARC, CONTINUITY CHECKS (EXCLUSIVE OF JACK J2101)

NOTE

Set CHAN selector switch to position M and all other controls fully counterclockwise.

SWITCH CONTACT	TERMINATING POINT	SWITCH CONTACT	TERMINATING POINT
S2107D-11	S2106A-8	S2107A-11	S2104B-2
S2107D-9	S2102X-top	S2107A-9	S2102B-top and bottom
S2107C-1	S2106B-5	S2107A-4 and 6	S2102D-top and bottom
S2107C-11	S2105A-8	S2102B	S2102D and F
S2107C-9	S2102R-top	S2102K-top	S2102M-bottom
S2107C-4 and 6	S2102S-top and bottom	S2102A and C	S2102F-top and center
S2107B-1	S2105B-5	S2102S-top	S2102U-bottom
S2107B-11	S2104A-8	S2106A-12	S2106B-12
S2107B-9	S2102J-top	S2105A-12	S2105B-12
S2107B-4 and 6	S2102K-top and bottom	S2104B-2	S2103-2
S2107A-1	S2104B-5	S2104A-12	S2104B-1 and 12, S2103-3

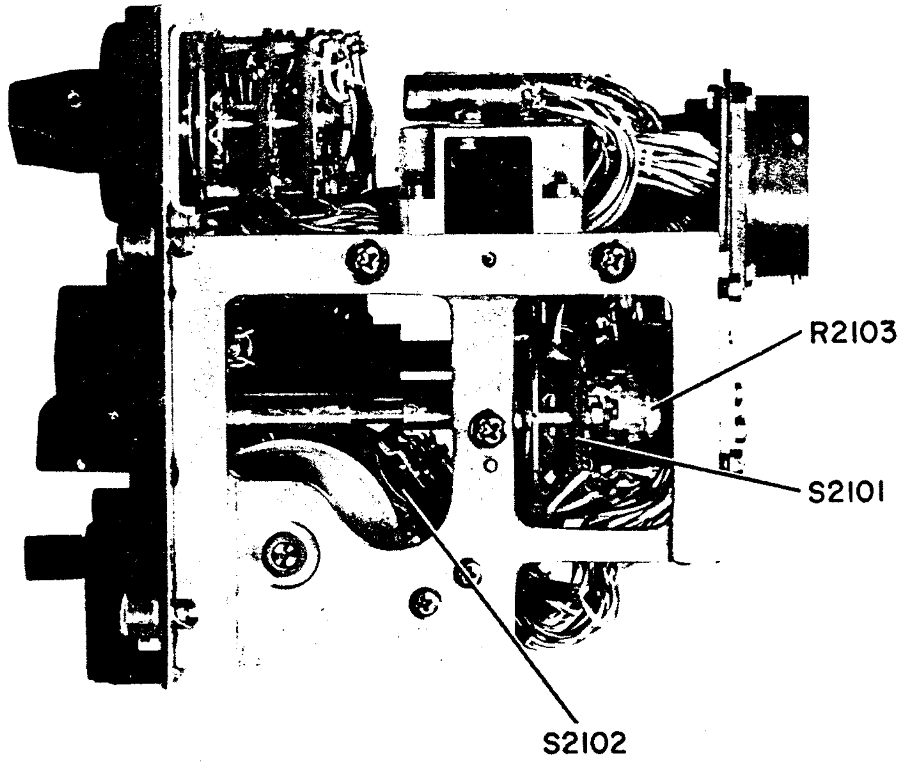


Figure 6-53. Radio Set Control C-2791 ARC, Right Side View, Cover Removed

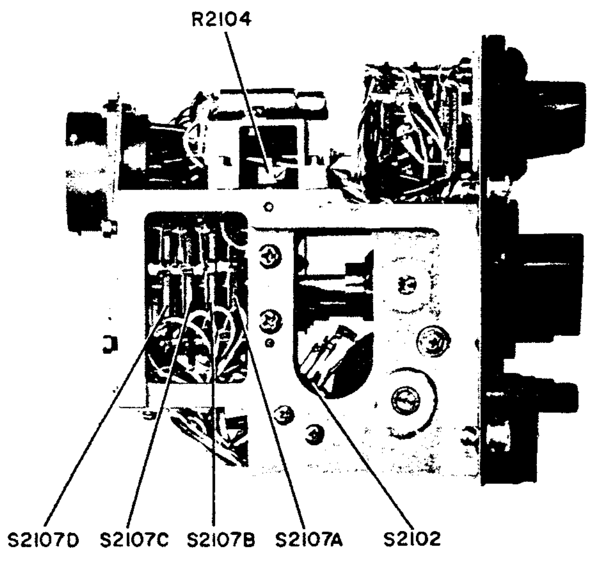


Figure 6-54. Radio Set Control C-2791/ARC, Left Side View, Cover Removed

SECTION VII
DIAGRAMS

7-1. GENERAL.

7-2. This section contains complete schematic diagrams of the radio set and of all its individual modules. The diagrams are presented in the order indicated in the list of illustrations and are applicable to all radio sets produced under all contracts previously referenced. Figures 7-1, 7-2, and 7-3 are the over-all schematic diagram of the receiver-transmitter showing the interrelation of all modules and the main chassis and radio set control. The complete schematics of the individual modules and the radio set controls are given in figures 7-4 through 7-24. Voltage and resistance diagrams are included in figures 7-25 through 7-36.

NOTE

All voltages and resistances listed in figures 7-25 through 7-36 are subject to variations from unit to unit. Measurements given were obtained from a typical unit using the test equipment specified in table VII. Measurements obtained upon other units using different test equipment can be expected to vary accordingly. The following information is therefore given only as a guide in locating trouble in the unit and is not to be confused with minimum performance standards tests outlined in section VI.

Figure 7-37 shows the r-f interconnecting cabling, and figures 7-38 and 7-39 are schematic diagrams of the filament circuits. Although special jigs are needed for checking coupler positioning, figure 7-40 is included to help the technician check the main chassis gearplate. This checking is done at 220.0 mc with all the modules removed.

7-3. SCHEMATIC SYMBOLS.

7-4. All schematic symbols used to represent electrical and electronic components in the diagrams of this section are defined and explained in MIL-STD-15, Electrical and Electronic Symbols.

7-5. WIRING CODES.

7-6. The wiring of the radio set is color coded in accordance with MIL-STD-12, Color Code for Chassis Wiring of Electronic Equipment. Resistors and capacitors are marked for identification of electrical values in accordance with MIL-STD-174, Colors for Coding Electronic Parts, and MIL-STD-221, Color Code for Resistors.

7-7. HISTORY OF MODIFICATIONS.

7-8. The following information describes modifications to Radio Receiver-Transmitters RT-332/ARC-52 and RT-424/ARC-52X. Modifications to this equipment delivered under Contracts NOas 57-478, NOas 59-0165, NOw 60-0089-a, and NOw 61-0785 are covered as completely as possible by the serial number effectivity listed on the individual simplified module schematics and complete module schematics listed in sections 4 and 7 respectively. Later modifications covered in the history of modifications are specified by MCN (manufacturing control number) effectivity. MCN and serial numbers appear on all modules and on the front panel in later modules of this equipment. Modifications for Radio Receiver-Transmitters RT-332/ARC-52 and RT-424/ARC-52X are covered in tables LXXIX through XCIII.

TABLE LXXIX. FACTORY CHANGES TO RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER

MCN	CHANGE
550	R19 (220 ohm s) was 82 ohms.
550	R21 (330K) was 1 meg.
550	R22 (56 ohms) added.
642	L25 was L24.
1549	L24 (2.2 uh) added.
1549	R24 (12 ohms) added.
1549	C61 (0.05 uf) added.
1549	CR1 (USN1N483B) added.
1549	R25 (12 ohms) added.
1549	R20 (18 meg) added.
	Tubes types changed to JAN.
	C1, C2, C3, C4, C5, C6, C7. (0.75-3pf) were 0.6-3pf.

TABLE LXXIX. FACTORY CHANGES TO RECEIVER R-F AMPLIFIER AND TRANSMITTER PREAMPLIFIER (Cont)

MCN	CHANGE
Serial no. 13773 to 13810	R23 (270 ohms), R24 (12 ohms), and L24 (2.2 h) on contract NOw 60-0089.
Serial no. 250 to 510	R23 (270 ohms), R24 (12 ohms), and L25 (2.2 h) on contract NOw 61-0785.
	Added parasitic suppressor at R24.

TABLE LXXX. FACTORY CHANGES 20- TO 30-MC I-F AMPLIFIER

MCN	CHANGE
557	R211 (2.2K) was 8.2K.
557	R219 (22K) was 10K.
557	R230 (68K) added.
1340	R207 (180 ohms) was 330 ohms.
›erial no. 480 to 510	All tube types were changed to JAN. On contract NOw 61-0785, R210 (680 ohms) was 390 ohms.
Serial no. 50	On contract NOas 59-0165, V203 (6205) was 6021.
	C206 (6 pf) was 4 pf.
	R210 (390 ohms) on RT-332/ARC-52 and RT-424/ARC-52X.
	L208 (220 h) on RT-332/ ARC-52 and 200 h on RT-424/ARC-52X.
	C234 (220 uuf) was 15 uuf.

TABLE LXXXI. FACTORY CHANGES TO 1.85-MC I-F AMPLIFIER

MCN	CHANGE
2021	L313 (500 uh) was 650 uh.
2121	C326, C327, and C328 (10 uf) were 18 uf.
2311	K332 (22K) was 27K.
2311	R333 (20K) was 27K.
4211	CR301 and CR302 (USN1N483B).
	All tubes changed to JAN type.
	C337 (0.02 uf) was 0.001 uf.
	CR303 (USN1N251) was HD 6616.
	C309 thru C321, and C361 (4700 pf) were 5000 pf.
	C360 (5000 pf), except on RT-332/ARC-52 units of contracts NOw 60-0089A and NOw 61-0785 where it has a value of (4700 pf).
	C339 and C340 (0.8-8.5 pf) were 0.5-4.5 pf.
	CR303 (USN1N3070) was USN1N251.
10820	C312 (4700 pf) deleted.
	C334 (100 pf) was 150 pf. R304 (150 ohms) was 1K. R333 (18K) was 20K.
11830	C311 (4700 pf) deleted.
	R311 connection to C324 changed to R311 to ground.

TABLE LXXXII. FACTORY CHANGES TO AUDIO AMPLIFIER

MCN	CHANGE
1816	R417 was removed.
2800	CR405 (USN1N755A) added.
2800	CR404 (JAN1N198) added.
2800	R440 (220 ohms) added.
2800	CR402 (USN1N483B) added.
2800	CR403 (JAN1N198) added.

TABLE LXXXII. FACTORY CHANGES TO AUDIO AMPLIFIER (Cont)

MCN	CHANGE
2800	CR406 (USN1N968B) added.
2800	R408 (560K) was 220K.
2800	R405 was removed.
2800	C403 (0.033 uf) was 0.056 uf.
2800	CR401 and CR402 changed to USN1N483B.
	CR404 (USN1N933) was JAN 1N198.
3397	CR404 (USN1N483B) was USN1N933.
	All tubes changed to JAN type.
	CR407(1N647) added.
	CR403(1N933) was 1N198.
	On contracts NOas 57-478 and NOas 59-0165, C415 (10 uf) was 8 uf.
Serial no. 1	On contract NOas 59-0165, R428 (15K) was 22K.
Serial no. 350 to 510	On contract NOw 61-0785, C402 (+.% UF) was 2 uf.
Serial no. 16829 to 16955	On contract NOw 60-0089, C402 (2.5 uf) was 2 uf.
	CR403 (USN1N483B) was 1N933.
	CR406 (USN1N968B) deleted on contract N383(19-383)77603A.
	CR403 (USN1N483B) deleted on contract N383(19-383)77603A.
	R412(82K) deleted on contract N383(19-383)77603A.
	CR405 (USN1N755A) deleted on contract N383(19-383)77603A.
	CR404 (USN1N483B) deleted on contract N383(19-383)77603A.
	R440 (220 ohms) deleted on contract N383(19-383)77603A.

TABLE LXXXII. FACTORY CHANGES TO AUDIO AMPLIFIER (Cont)

MCN	CHANGE
	C408 (3 uf) was 4 uf.
	C406 (4700 uuf) was 5000 uf.
	R425 (550K) was 550K.
1950	The following components were deleted on contract N383(19-383)88769A: CR403, CR404, CR405, CR406, R412, and R440.

TABLE LXXXIII. FACTORY CHANGES TO GUARD RECEIVER

MCN	CHANGE
5125	C845 (2 uf) changed from 4 uf.
4306	C802 (3 uuf) changed from 1.5 uf.
4306	C803 (7 uuf) changed from 5 uuf.
4306	C804 (12 uuf) changed from 33 uuf.
2750	C803 (5 uuf) changed from 2 uuf.
2750	C855 (0.22 uf) added.
1617	C854 (1 uuf) added.
1617	C801 (12 uuf) changed from 10 uuf.
1617	C816 (33 uuf) changed from 30 uuf.
	C821 (33 uuf) changed from 12 uuf.
	C833 (2000 uuf) was added on early model.
4306	C854 (1.0 pf) deleted.

TABLE LXXXIII. FACTORY CHANGES GUARD RECEIVER (Cont)

MCN	CHANGE
	CR801 and CR802 (USN1N3070) changed from HD 6616.
3020	CR803, CR803, and CR805 (USN1N483B) changed from JAN1N457.
	R815 (100K) changed from 120K.
3111	R821 (selected in test) changed from 68K.
Serial no. 430 to 510	On contract NOw 61-0785, C812 (24 uuf) was 33 uuf, and C813 (33 uuf) was 18 uuf.
4775	CR801 and CR802 (USN1N3070) changed from PS7112.
4690	Parasitic suppressor added at V803-1.
	CR801 and CR802 changed to PS7112 in early production.
	CR803, CR804, and CR805 changed to USN1N483B in early production.
3206	C826 10 uuf changed from 12 uuf.

TABLE LXXXIV. FACTORY CHANGES TO SPECTRUM GENERATOR

MCN	CHANGE
2903	C517, C522, and C526 (2-10 uf) were 0.75-3 pf.
	All tube types changed to JAN.
6413	C539 (470 uuf) added.
6413	C540 (470 uuf) added.
6413	C541 (470 uuf) added.
Serial no. 393 to 510	On contract NOw 61-0785 L530 (0.68 h) was 1 h.

TABLE LXXXIV. FACTORY CHANGES TO SPECTRUM GENERATOR (Cont)

MCN	CHANGE
	C504 (500 uuf) was 470 uuf.
	L522 (0.68 uh) was 1 uh.
	C506 (0.6-3 pf) was 0.75-3 pf before contract N383(19-383)73759A.
	C508 (0.6-3 pf) was 0.75-3 pf before contract N383(19-383)73759A.
Serial no. 1 and 2	On contract NOas 57-478, R507 was 1800 ohms. R507 was changed to 3300 ohms on all other units.

TABLE LXXXV. FACTORY CHANGES TO OSCILLATOR

MCN	CHANGE
2865	L1911, L1912, C1904, and C1905 deleted.
Serial no. 1461 to 1497	Contract NOw 60-0089, L1911, L1912, C1904, and C1905 deleted.
Serial no. 350 to 510	Contract NOw 61-0785, L1911, L1912, C1904, and C1905 deleted.
	On contract N383(19-383) 77603A, L1911, L1912, C1904, and C1905 added again.
7353	Terminal board change resulted in value change of C1901 (5 uuf), was 6 uuf.

TABLE LXXXVI. FACTORY CHANGES TO MODULATOR

MCN	CHANGE
1054	CR701 (USN1N965B) was 1N718A.
	C704 (1000 pf) was 470 pf.
	R708 (220K) was 215K.

TABLE LXXXVI. FACTORY CHANGES TO MODULATOR (Cont)

MCN	CHANGE
	C709 (240 pf) was 220 pf.
	C710 (80 to 330 pf selected values) was 270 pf.
Serial no. 430 to 510	On contract NOw 61-0785, R705 (270K) was 270K and C704 (910 pf) was 470 pf.
	C710 (270 pf) was 80 to 330 selected values.
	C709 (240 pf) was 270 pf.
	R706 (680 ohms) was 820 ohms.
	R709 (3300 ohms) was 4700 ohms.
	R716 (1200 ohms) was 3900 ohms.
6476	C707 (680 pf) was 330 pf.
	C708 (680 pf) was 270 pf.
	C709 (680 pf) was 270 pf.
	C710 (680 pf) was 270 pf.
	R705 (390K) was 270K.
	R712 (270K) was 680K.
	R713 (160K) was 470K.
	R714 (130K) was 470K.
	R715 (220K) was 470K.
	R716 deleted, was 1200 ohms from V705-2, 4, 8 to ground.
	R718 (220K) was 390K.
	R719 (220K) was 215K.

TABLE LXXXVII. FACTORY CHANGES TO POWER AMPLIFIER

MCN	CHANGE
709	636 (470 uuf) added.
1000	R613 (250K) added.
1000	R611 (27K) added.
1656	V603 changed to USN7609.
2743	C635 (1 uuf) added.
2743	R614 (56 ohms) added.
2743	R612 (82 ohms) was 1K.
2743	L607 and L606 (0.47 mh) were 0.15 mh.
2743	C631 and C628 were deleted.
	C619 (2700 uuf) was 2500 uuf.
	C609 (0.75-3 pf) was 0.6-3 pf.
	R604 (82 ohms)was 8200 ohms.
	C627 (0.6-3 pf) was 0.5-6 pf.
	C619 (2700 pf) was 2500 pf
9346	R605 (3,300 ohms) was 7500 ohms.

TABLE LXXXVIII. FACTORY CHANGES TO A-C POWER SUPPLY

MCN	CHANGE
	L1101 (0.5 h).
	C1103 (0.1 uf) was 0.01 uf

TABLE LXXXIX. FACTORY CHANGES TO RECTIFIER UNIT

MCN	CHANGE
	C1008 (1.7 uf) was 1.5 uf.
	CR1004 (JAN1N459) was USN1N483B.
	R1009 (12 ohms) was 27 ohms.

TABLE XC. FACTORY CHANGES TO DYNAMOTOR POWER SUPPLY

MCN	CHANGE
	V1101 (JAN5840) was 5840.
	C1106 (1.7 uf) was 1.5 uf.
	C1109 (4700 uuf) was 8.2 uf.

TABLE XCI. FACTORY CHANGES TO RELAY UNIT

MCN	CHANGE
	C902 (1.75 uf) was 1.5 pf.
3001	C902 (4.7 uf) was 1.75 uf.

TABLE XCII. FACTORY CHANGES TO ANTENNA RELAY

MCN	CHANGE
103, 105, 107, 116 and up	R1407 (22K), R1408 (2200), and CR1402 (USN1N933) were added to RT-424/ARC-52X. L1401 (12 h) deleted.
163	R1401 (22 pf) was 0.3 uf on RT-424/ARC-52X.
163	R1403(100K) was 15K on RT-424/ARC-52X.

TABLE XCII. FACTORY CHANGES TO ANTENNA RELAY (Cont)

MCN	CHANGE
163	C1402 (22 pf) was 100 pf on RT-424/ARC-52X.
272, 372, 317, and up	R1407 (22K), R1408 (2200 ohms), and CR1402 (USN1N933) were added to RT-332/ARC-52. L1401 (12 h) deleted.
366	C1401 (22 pf) was 0.3 uf on RT-332/ARC-52.
366	R1403 (100K) was 15K on RT-332/ARC-52.
366	C1402 (22 pf) was 100 pf on RT-332/ARC-52.
	R1401 (25K) was 5K.
	R1404 (10K) was 12K.
	R1405 (68K) was 33K.
	R1406 (100K added.
546	R1403 (27K) was 100K on RT-424/ARC-52X.
1852	R1403 (27K) was 100K on RT-332/ARC-52.

TABLE XCIII. FACTORY CHANGES TO MAIN CHASSIS

MCN	CHANGE
	C1516 (0.02 uf) added to J1503, pin 12.
	C1514 (180 pf) was 220 pf.

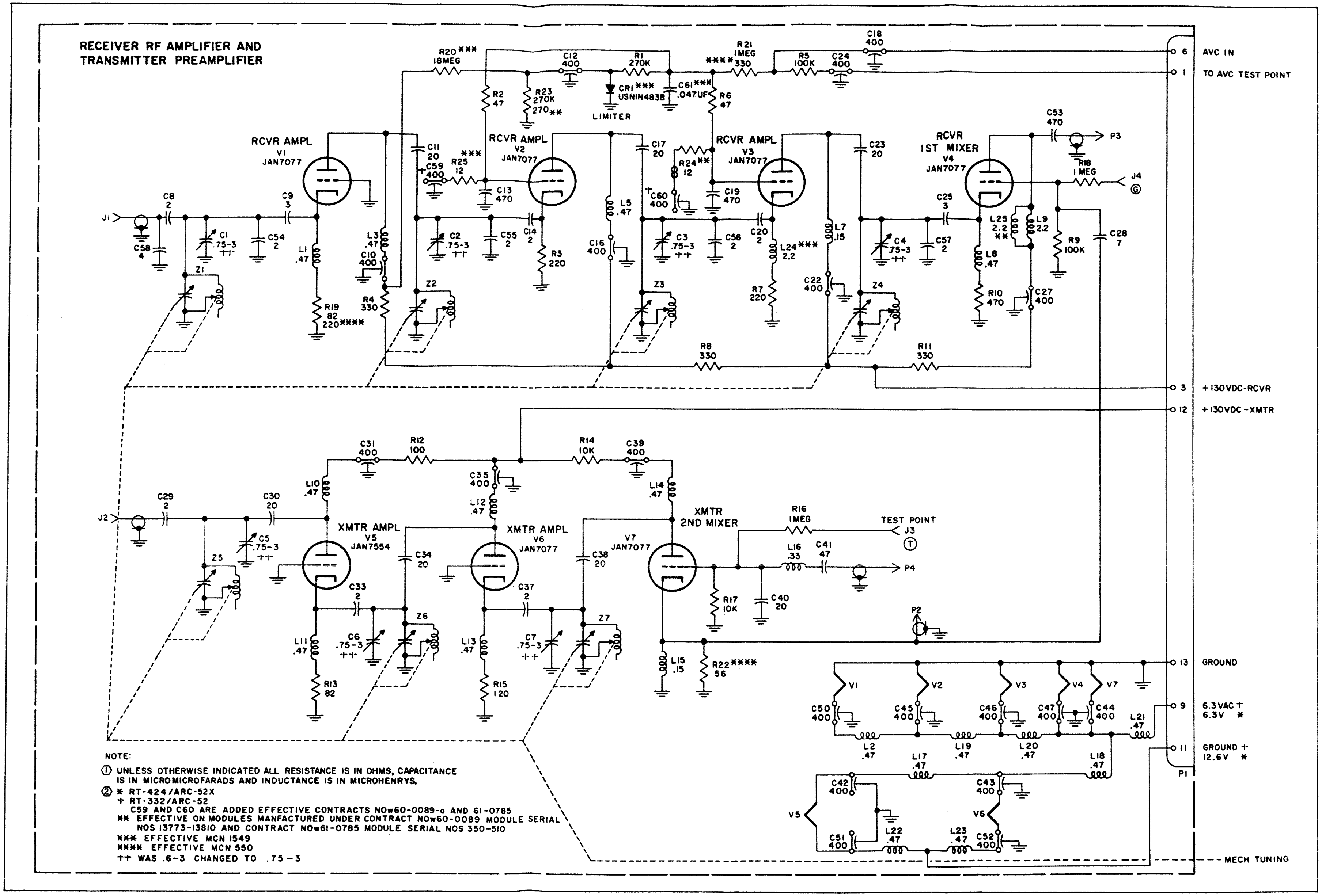


Figure 7-4. Receiver R-F Amplifier and Transmitter Preamplifier, Schematic Diagram

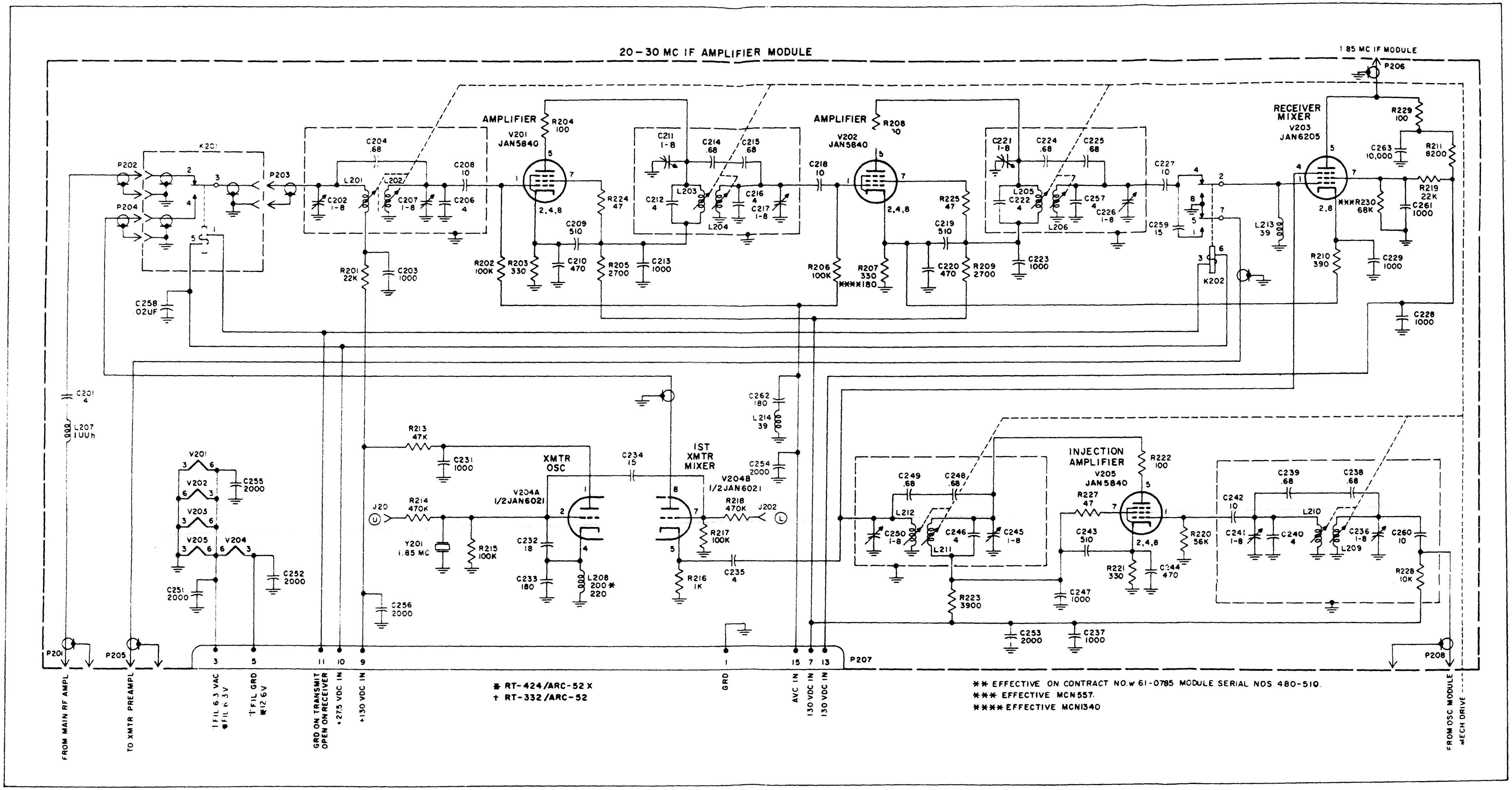
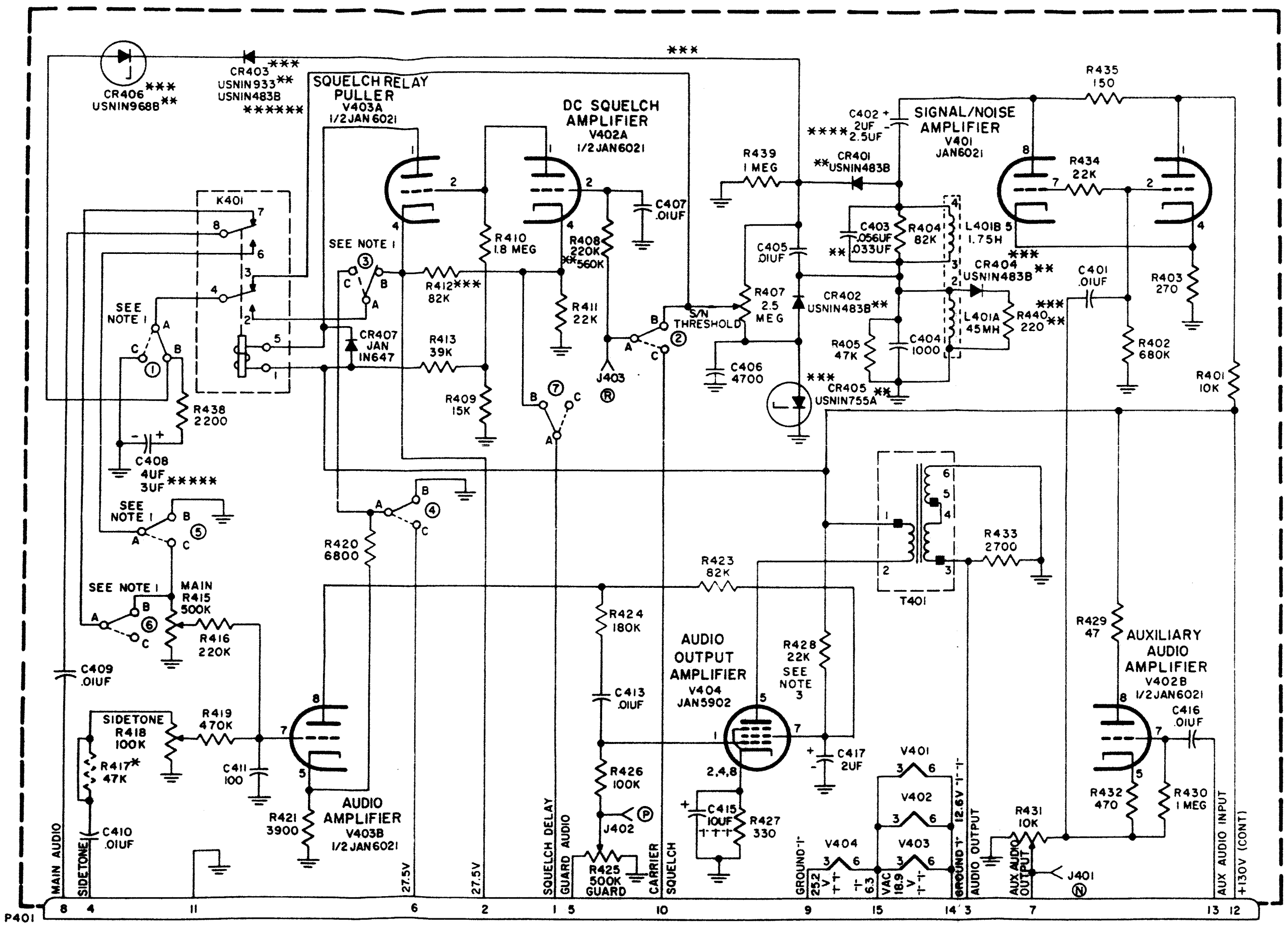


Figure 7-6. 20- to 30-Mc I-F Amplifier, Schematic Diagram



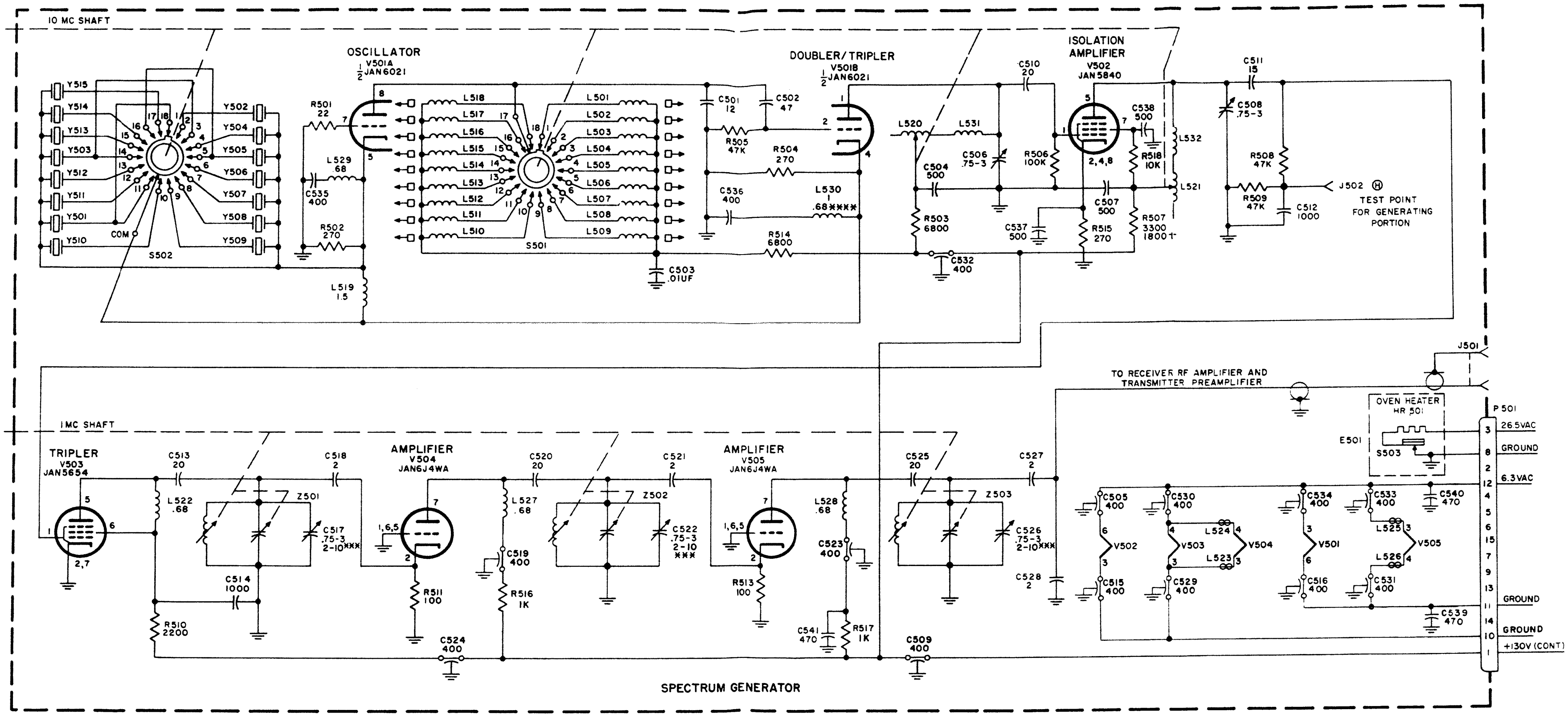
****** EFFECTIVE MCN3397

* DELETED EFFECTIVE MCN 1816.
** EFFECTIVE MCN 2800.
*** DELETED EFFECTIVE CONTRACT N383 (19-383) 77603A
-|- RT-332/ARC-52
-|-|- RT-424/ARC-52X
-|-|-|- 8UF ON UNITS MANUFACTURED UNDER CONTRACTS NOas57-478 AND 59-0165.
**** EFFECTIVE ON CONTRACT NOw61-0785 ONLY
***** EFFECTIVE MCN4790

NOTES:
1. WHEN CONNECTED AS SHOWN BY SOLID LINE, SQUELCH OPERATES FROM THE SIGNAL/NOISE (S/N) RATIO. WHEN CONNECTED BY DASHED LINE, SQUELCH OPERATES FROM CARRIER VOLTAGE. NUMERALS ARE FOR CIRCUIT REFERENCE.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRYS.
3. R428 CHANGED TO 15K, EFFECTIVE SERIAL NO. 1, CONTRACT NOas 59-0165.
4. COMPONENTS DELETED ON CONTRACT N383(19-383)77603A ARE DELETED EFFECTIVE CONTRACT N383(19-383)88769A.

C395-72-5

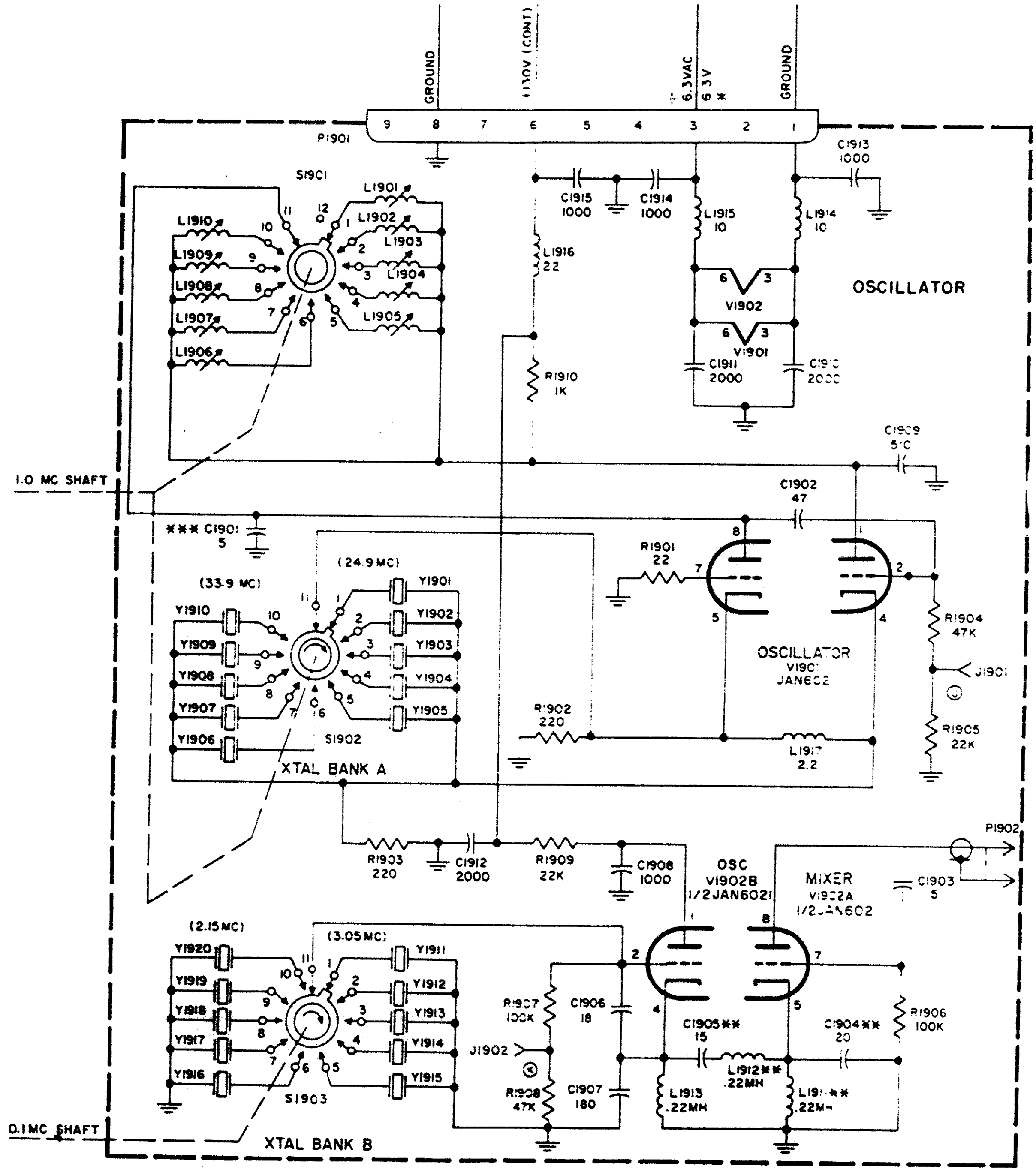
Figure 7-9. Audio Amplifier, Schematic Diagram



NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICROFARADS(UUF), AND INDUCTANCES ARE IN MICROHENRIES(UH).
2. R518 AND C538 ADDED EFFECTIVE SERIAL 35 CONTRACT NO.57478. C507 CHANGED FROM 150UUF TO 500UUF EFFECTIVE SERIAL 70 CONTRACT NO. 57478.
3. C504 CHANGED FROM 470UUF TO 500UUF EFFECTIVE SERIAL NO. 70 CONTRACT NOas 57-478.
4. CONTRACT KEYING:
   ** EFFECTIVE BEGINNING CONTRACT N383(19-383)73759A
   *** EFFECTIVE MCN 2903
   **** EFFECTIVE ON CONTRACT NOw 61-0785, MODULE SERIAL NO. 393-510
   + EFFECTIVE SERIAL NO. 1 AND 2 ONLY OF CONTRACT NOas 57-478.

C395-74-5

Figure 7-11. Spectrum Generator and Amplifier, Schematic Diagram

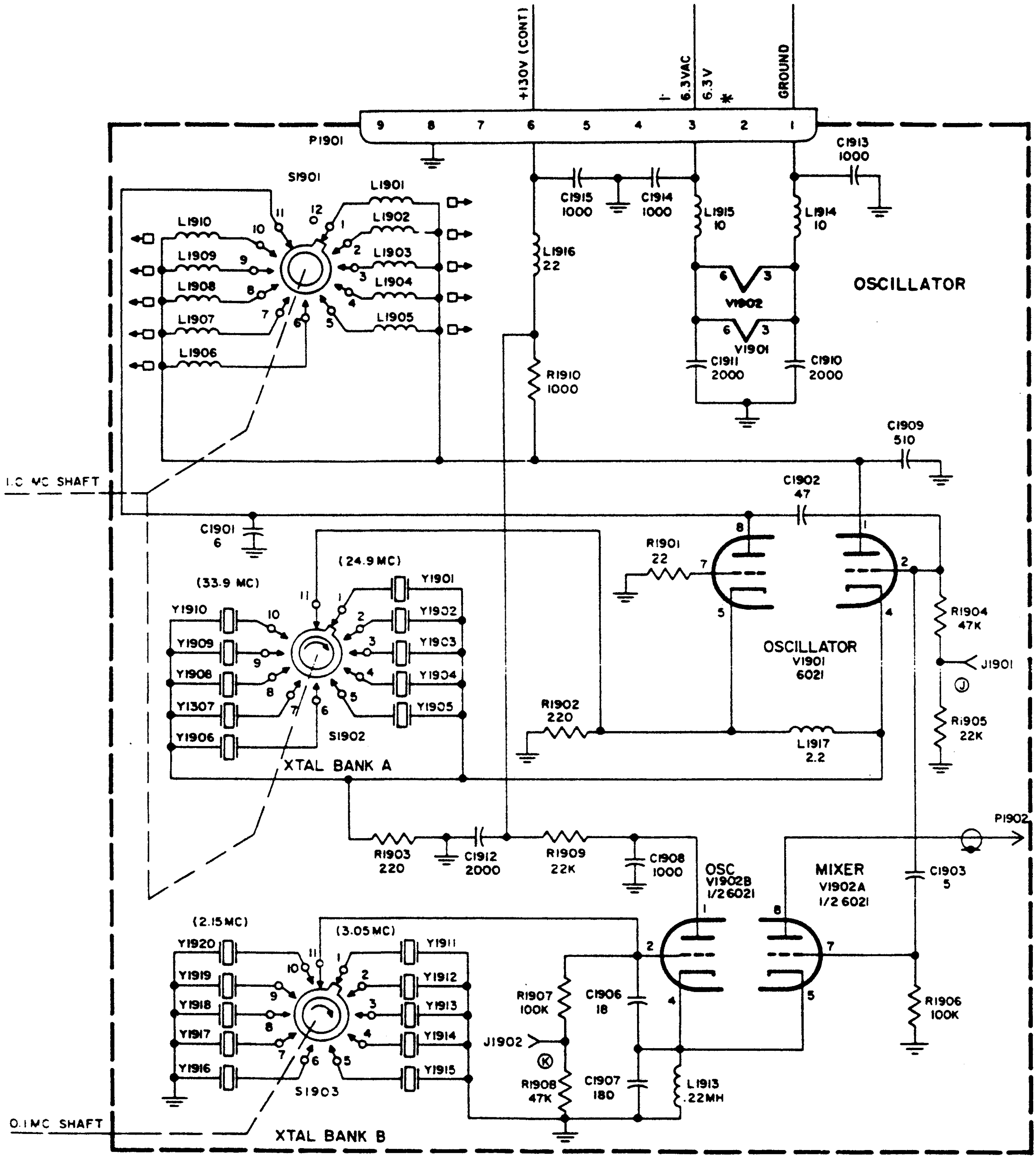


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICRO-FARADS AND INDUCTANCES ARE IN MICROHENRIES.

+ RT-332/ARC-52
* RT-424/ARC-52X
** DELETED EFFECTIVE CONTRACT NOw 60-0089, MODULE SERIAL NUMBERS 1461 TO 1497 AND CONTRACT NOw 61-0785, MODULE SERIAL NUMBERS 350 TO 510. THESE WERE ADDED AGAIN ON CONTRACT N383(19-383)77603A.
***SEE HISTORY OF MODIFICATIONS.

Figure 7-12. Oscillator, Schematic Diagram



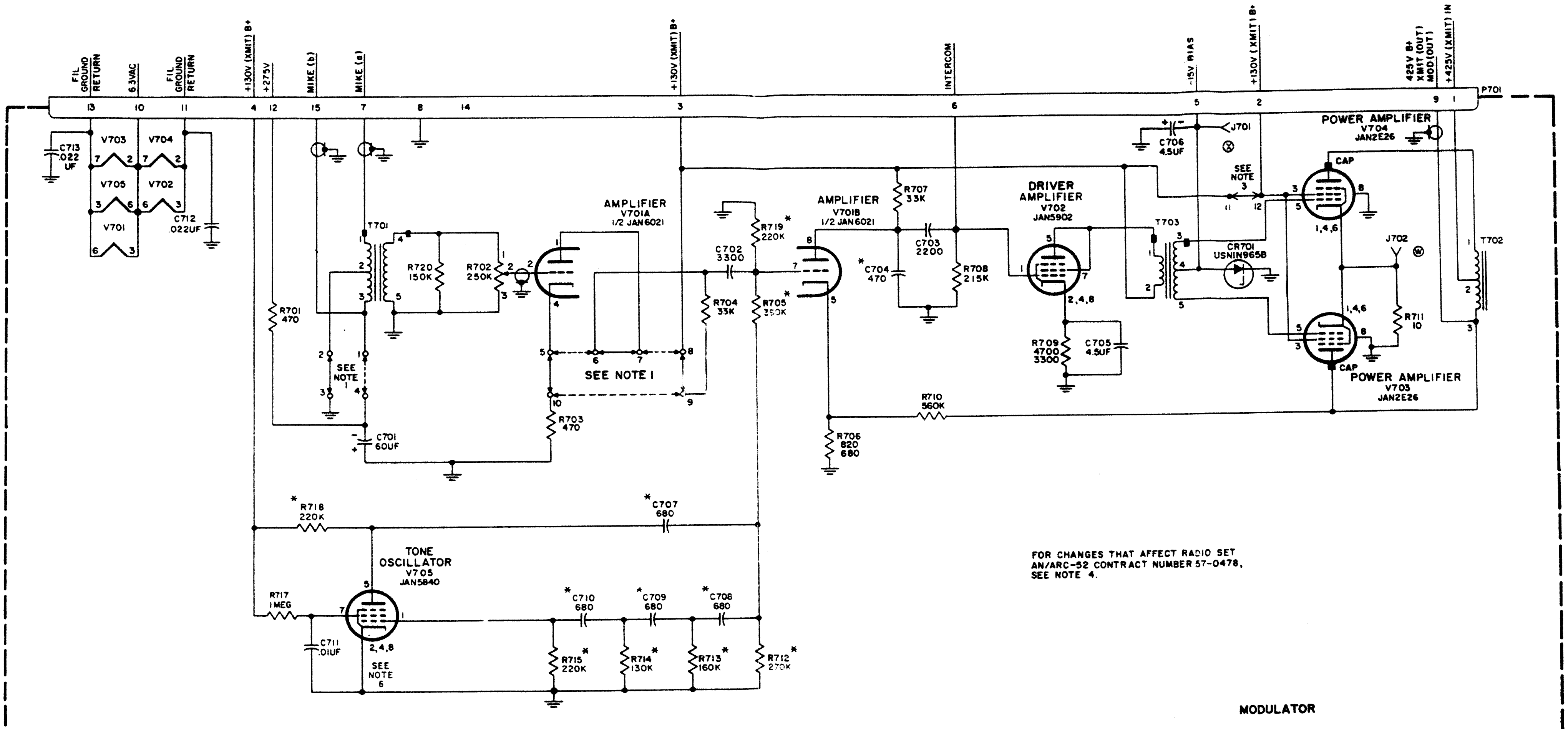
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICRO-FARADS (UUF), AND INDUCTANCES ARE IN MICROHENRIES (UH).

† RT-332/ARC-52

* RT-424/ARC-52X

Figure 7-13. Oscillator, Schematic Diagram (Effective on Contract NOw 61-0785, Module Serial Numbers 350 and 510 and Contract NOw 60-0089, Module Serial Numbers 01461-01497)



FOR CHANGES THAT AFFECT RADIO SET AN/ARC-52 CONTRACT NUMBER 57-0478, SEE NOTE 4.

MODULATOR

NOTES:

1. ⟷ DENOTES CONNECTION FOR DYNAMIC MIKE
   ⟵ - - ⟶ DENOTES CONNECTION FOR CARBON MIKE
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICROFARADS (UUF), AND INDUCTANCES ARE IN MICROHENRIES (UH).
3. REMOVE JUMPER WIRE FOR INTERCOM OPERATION.
4. R712=470K, C702=2200, C703=.01 UF, R708=470K, R705=470K.
5. *SEE HISTORY OF MODIFICATIONS.
6. EFFECTIVE THRU MCN 6475, R716(1200 OHMS) CONNECTED BETWEEN V705-2,4,8 AND GROUND.

Figure 7-14. Modulator, Schematic Diagram

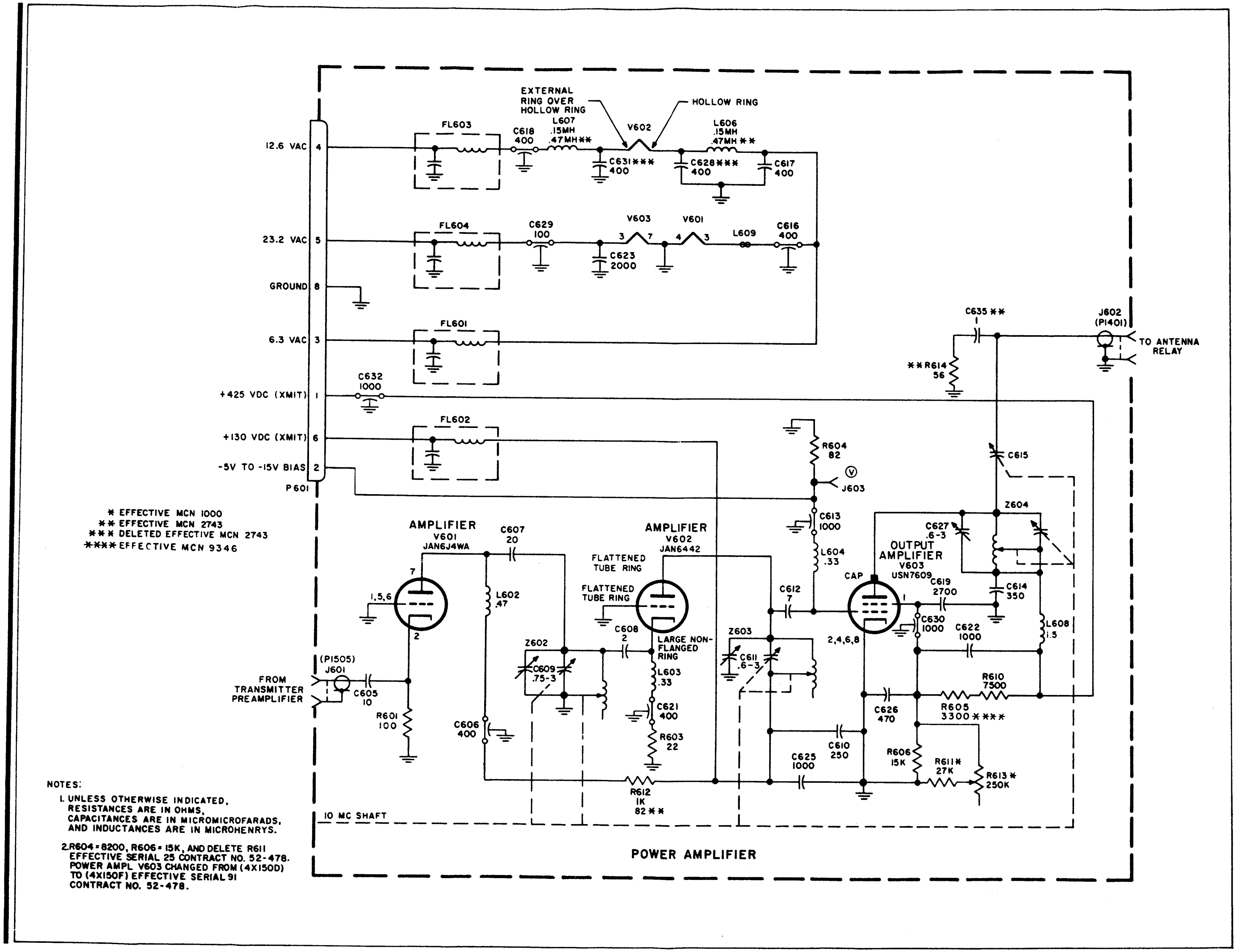
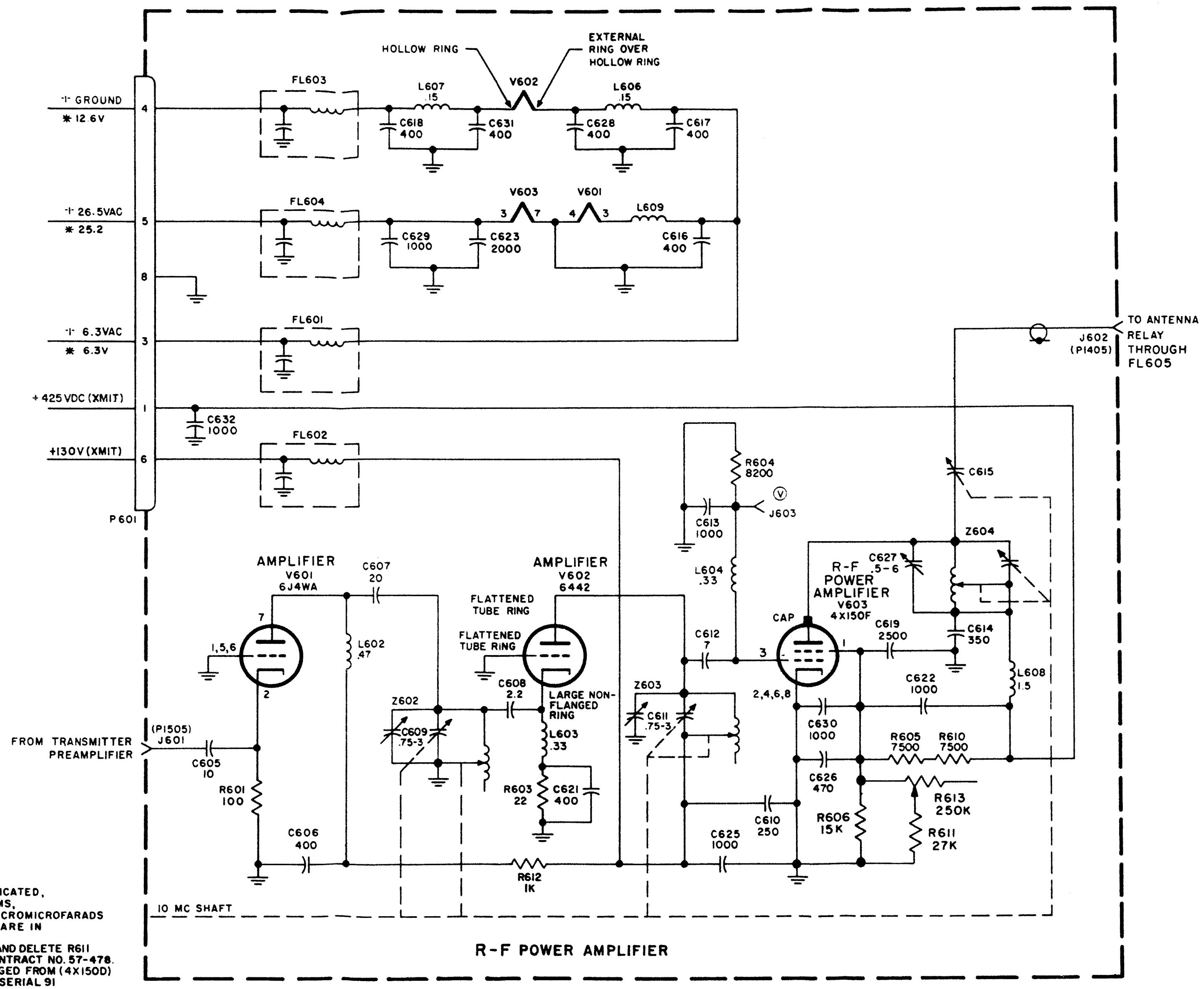


Figure 7-15. Power Amplifier, Schematic Diagram



-!- RT-332/ARC-52
✱ RT-424/ARC-52X

NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN MICROMICROFARADS (UUF), AND INDUCTANCES ARE IN MICROHENRIES (UH).
2. R604 = 8200, R606 = 15K, AND DELETE R611 EFFECTIVE SERIAL 25 CONTRACT NO. 57-478. POWER AMPL V603 CHANGED FROM (4X150D) TO (4X150F) EFFECTIVE SERIAL 91 CONTRACT NO. 57-478.

Figure 7-16. Power Amplifier, Schematic Diagram (Effective on Contract NOw 61-0785 Module Serial No. 510 and 511)

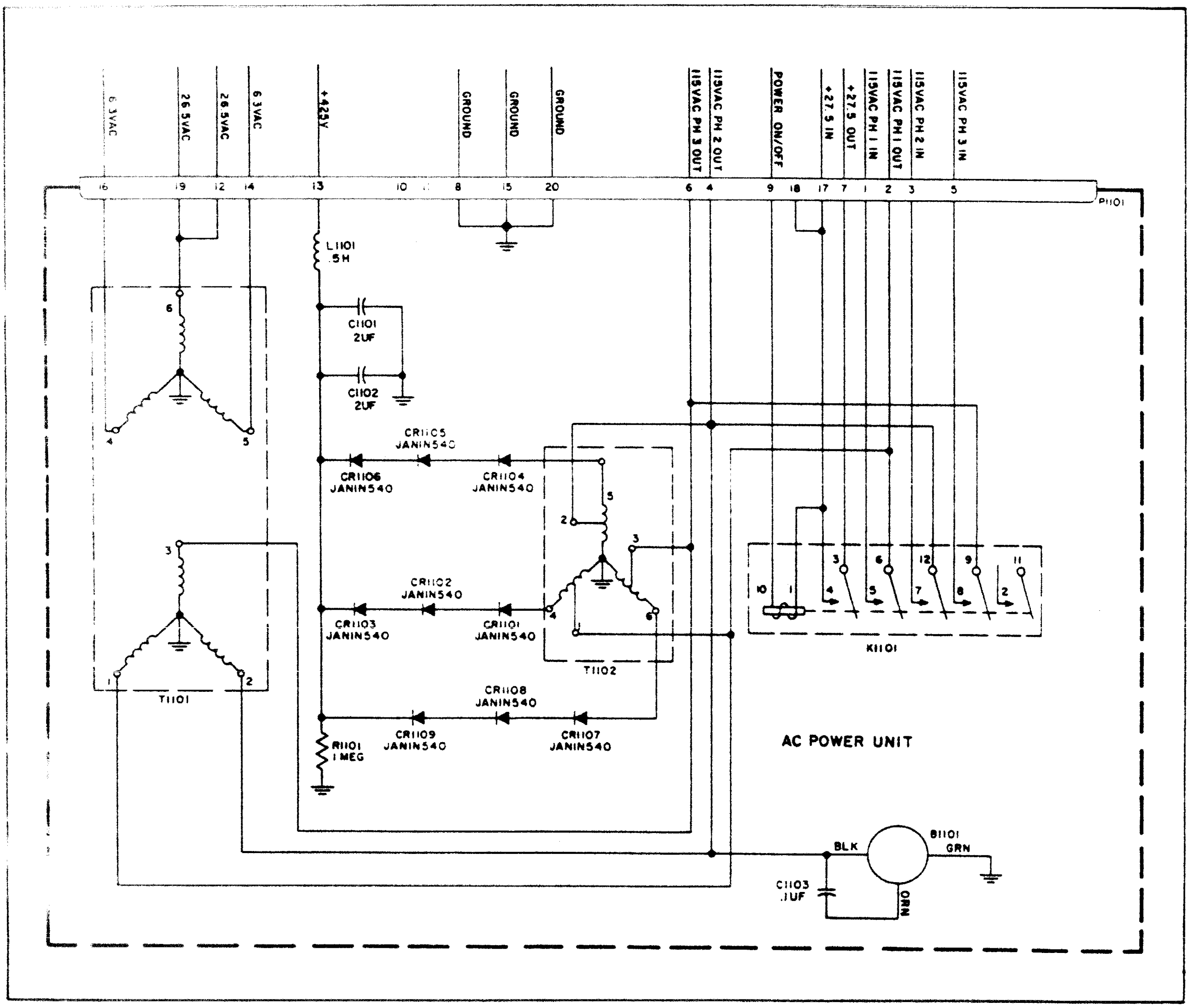


Figure 7-17. A-C Power Unit, Schematic Diagram

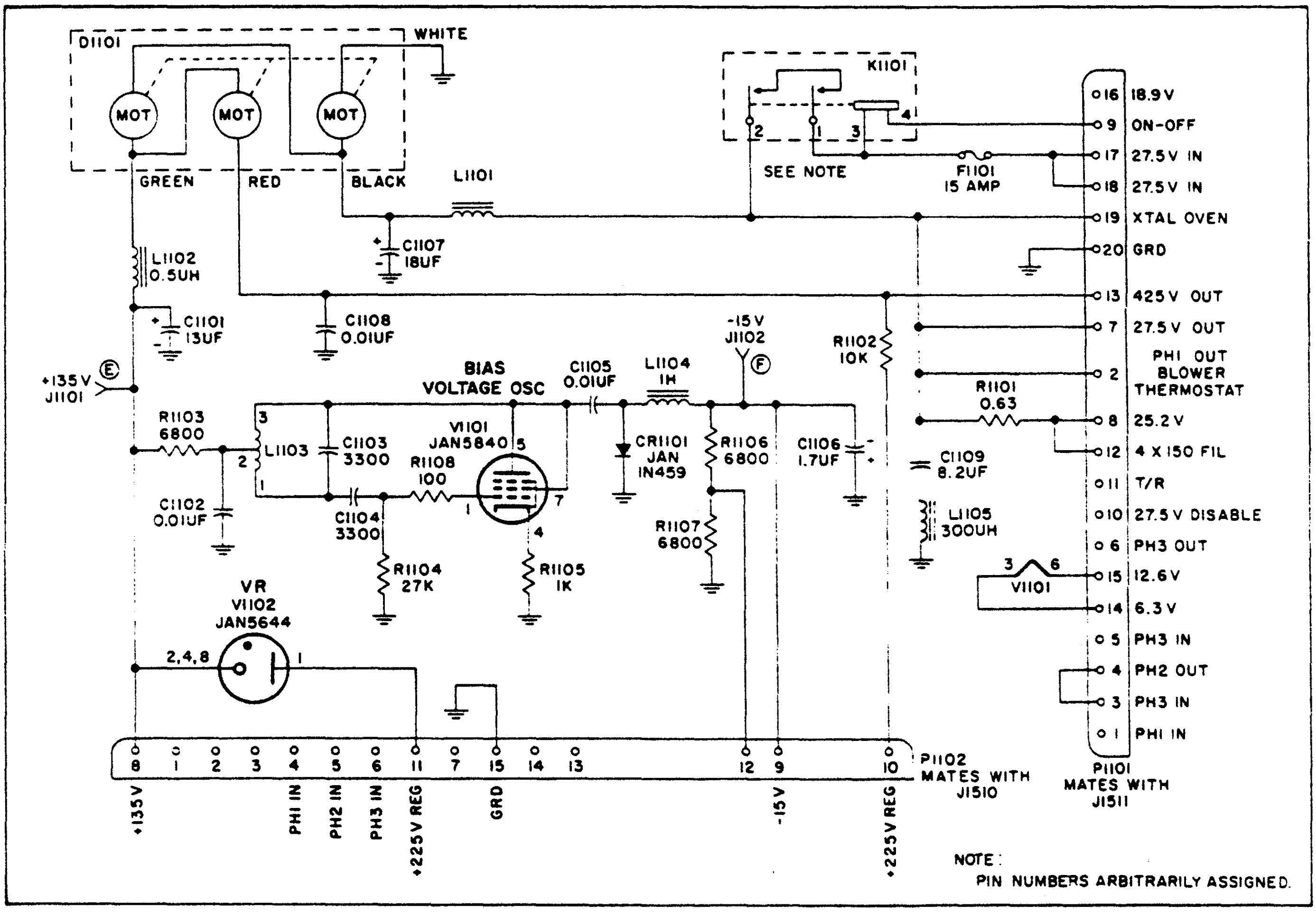


Figure 7-19. Dynamotor Power Supply Unit, Schematic Diagram

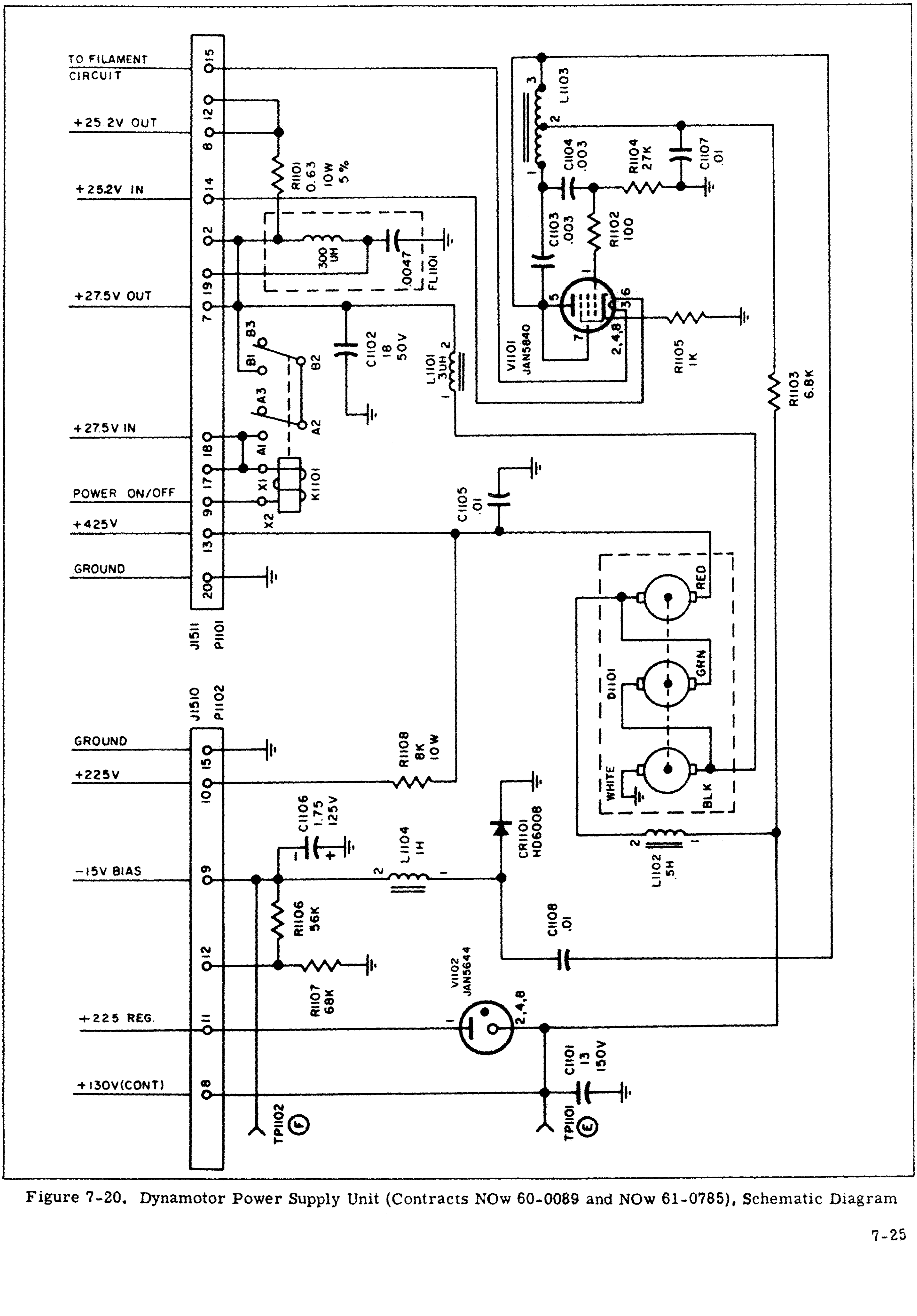


Figure 7-20. Dynamotor Power Supply Unit (Contracts NOw 60-0089 and NOw 61-0785), Schematic Diagram

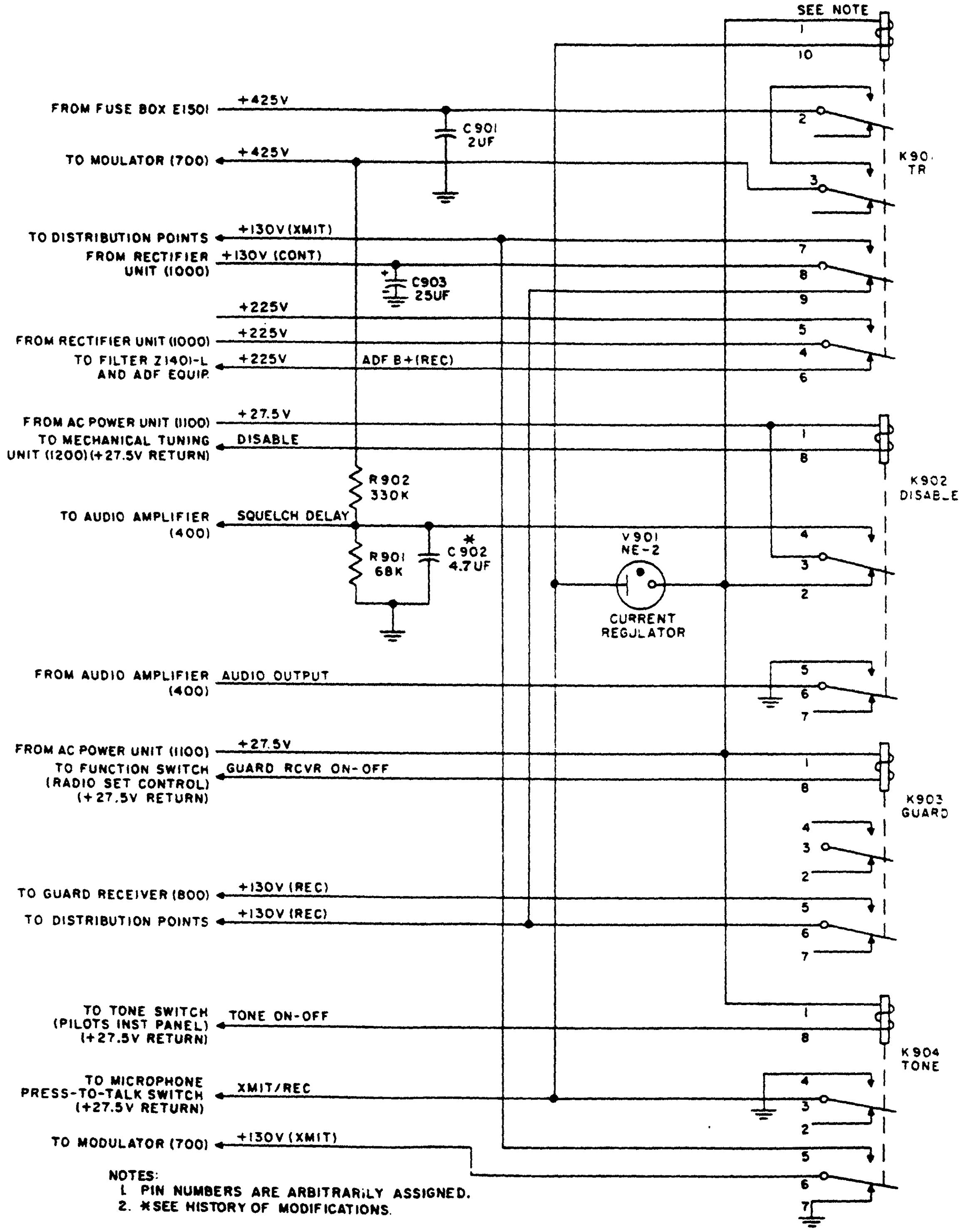


Figure 7-21. Relay Unit, Schematic Diagram

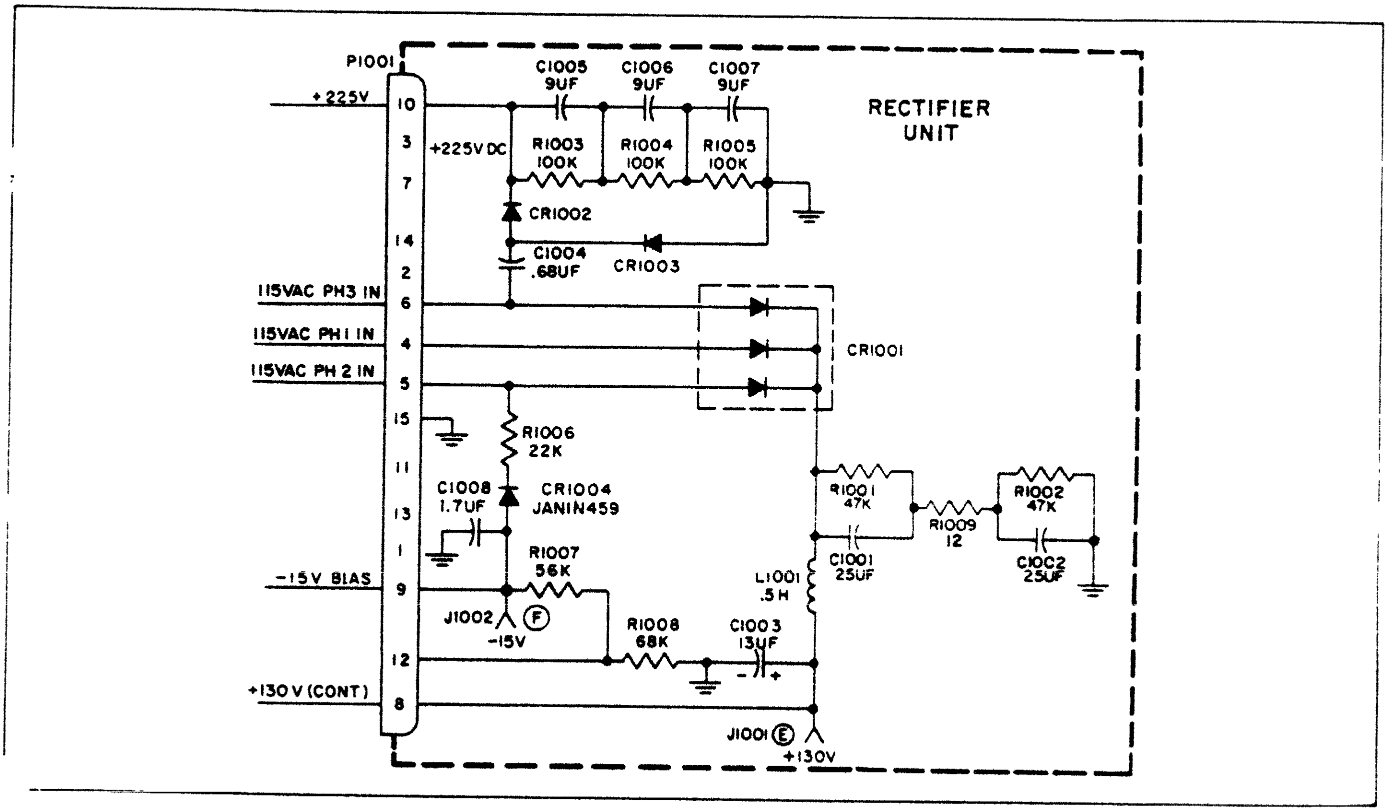


Figure 7-18. Rectifier Unit, Schematic Diagram

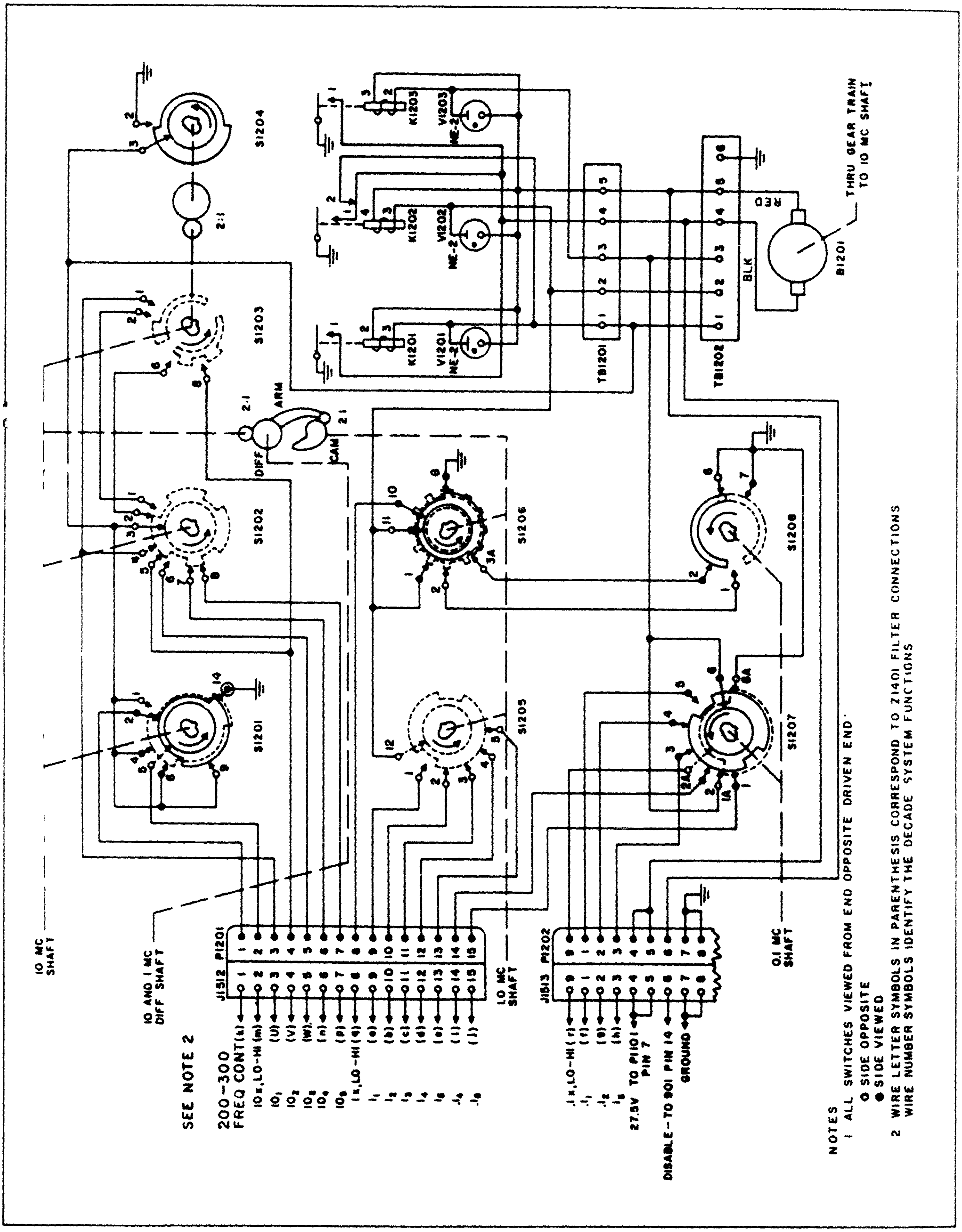
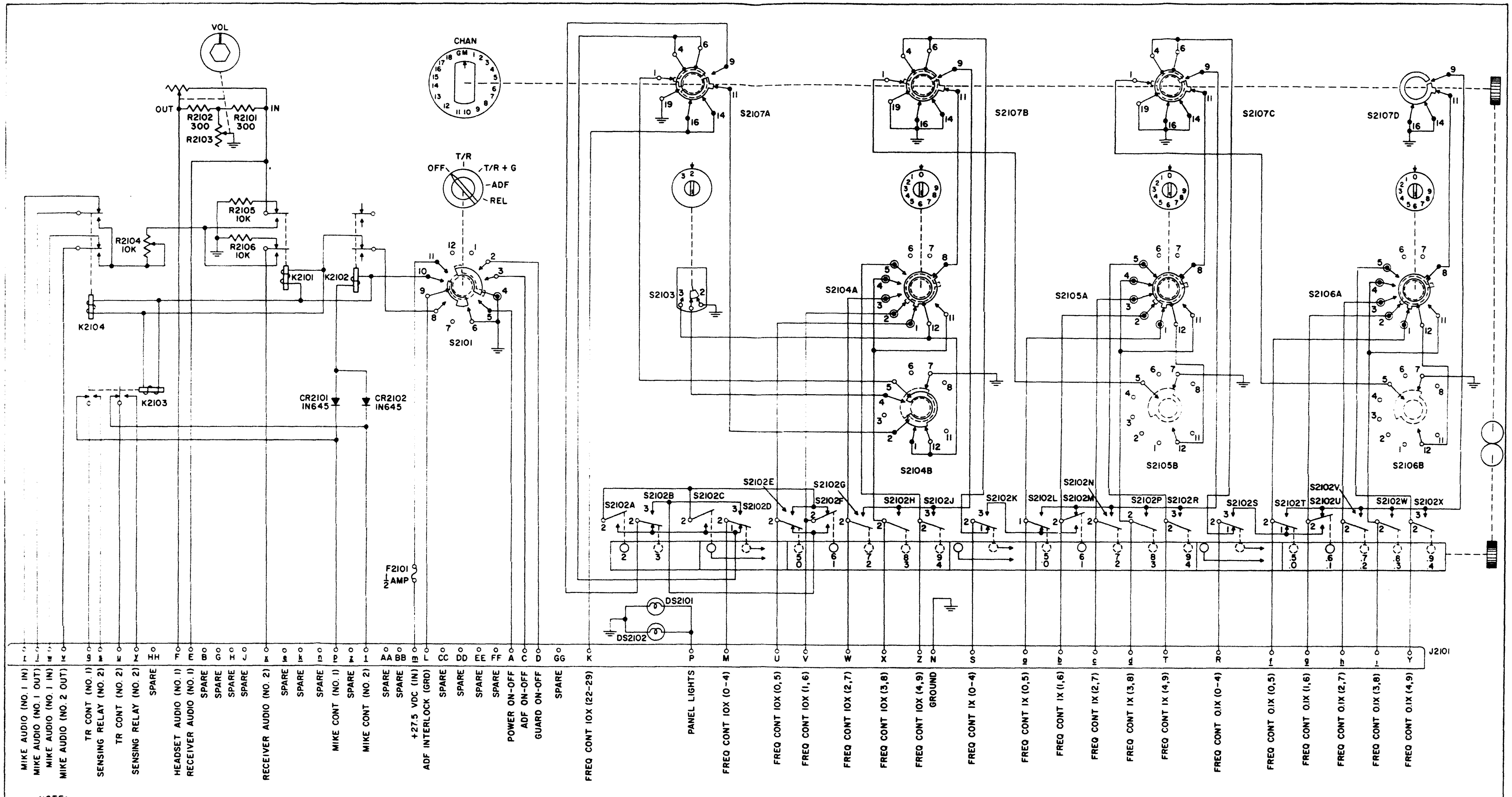


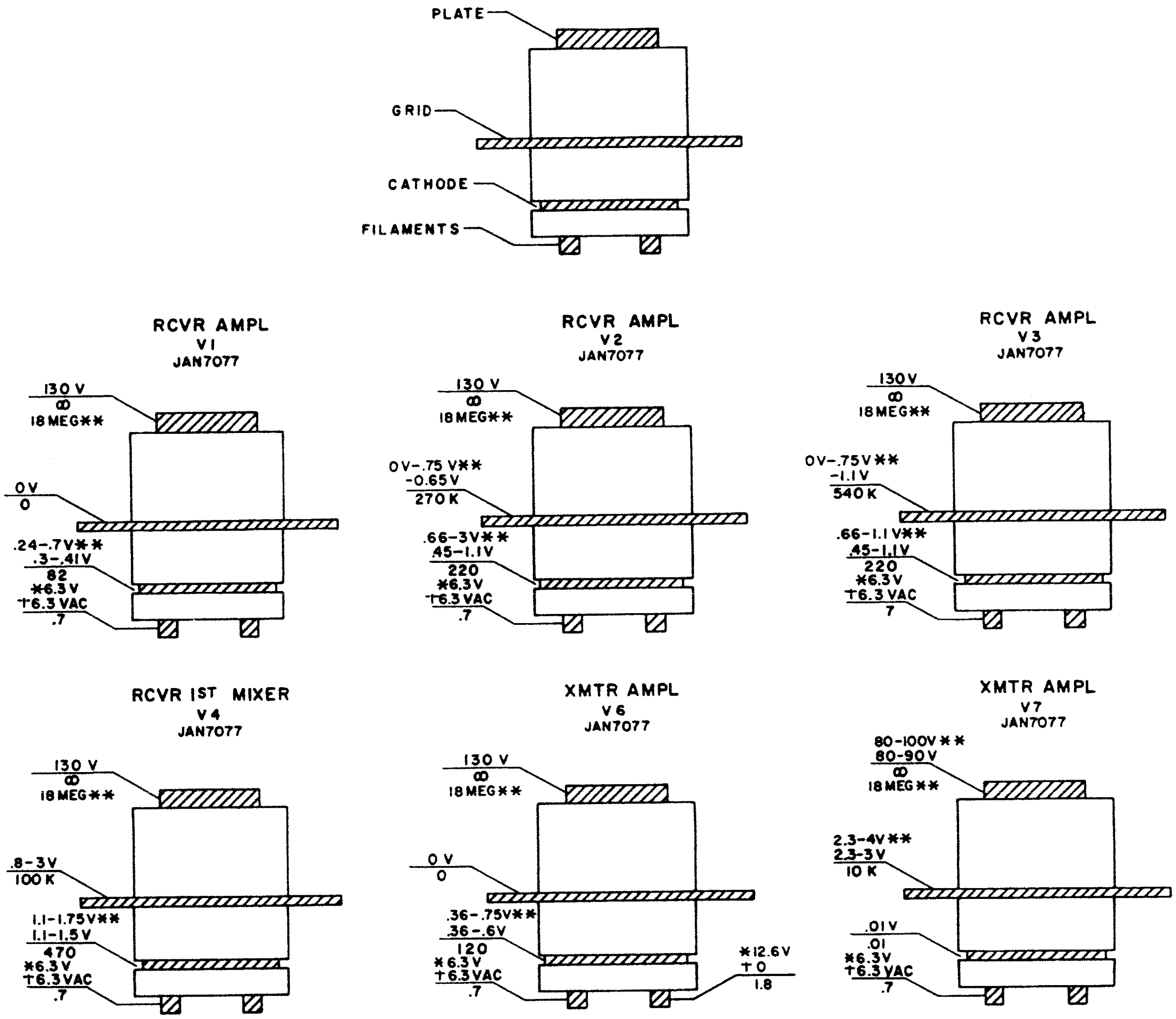
Figure 7-22. Mechanical Tuning Unit, Schematic Diagram

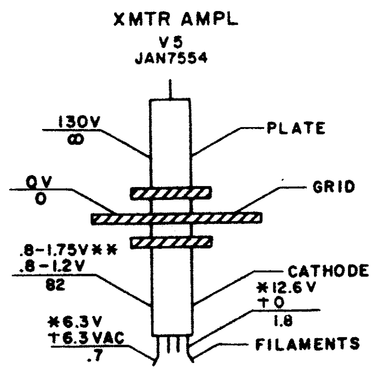


NOTE:
1. SWITCH CONTACT KEY
- ● FRONT CONTACT
- ○ REAR CONTACT
- ◉ FRONT AND REAR CONTACT ELECTRICALLY CONNECTED

2. WHEN REFERRING TO IDENTIFYING NO, SPECIFY DWG NO. & APPLICABLE DASH NO.

Figure 7-24. Radio Set Control C-2791/ARC
Schematic Diagram

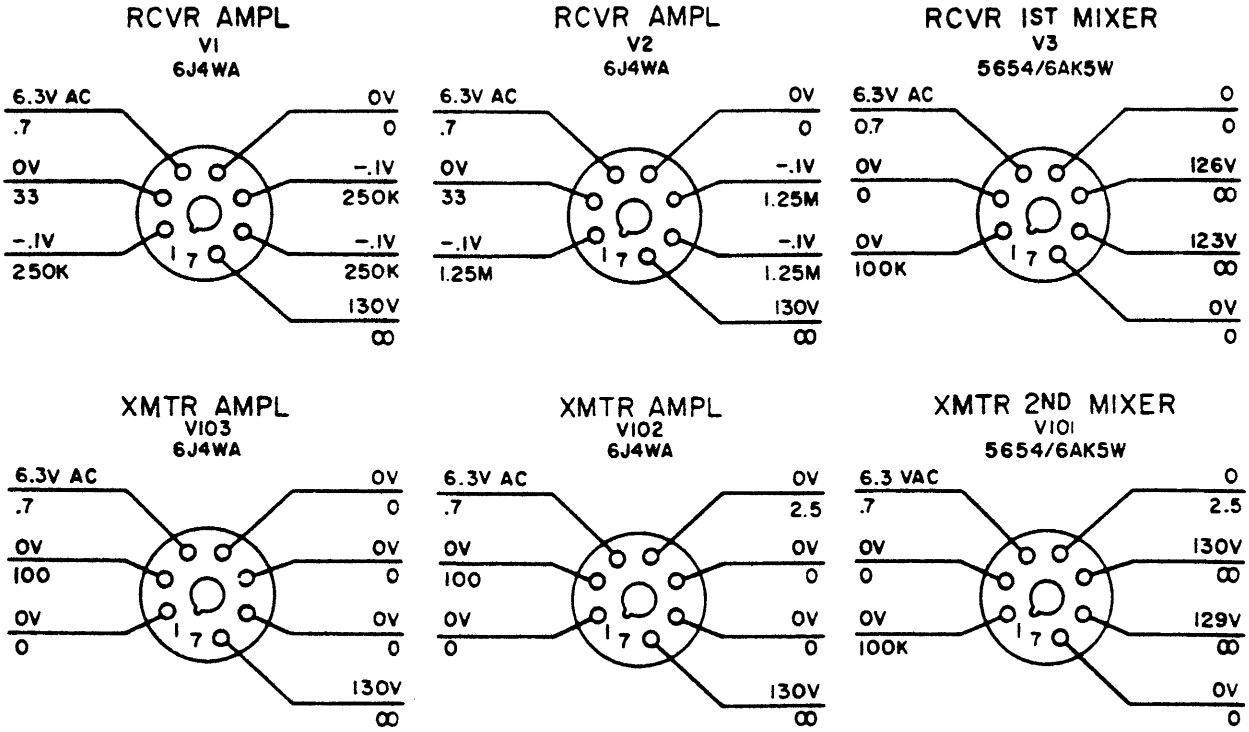




1. VOLTAGE READINGS FOR V5, V6, AND V7 ARE MEASURED WITH RADIO SET AT TRANSMIT.
2. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND, WITH NO SIGNAL INPUT AND WITH TUBE IN SOCKET.
3. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
4. RESISTANCE READINGS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS AND ALL RF CONNECTORS DETACHED.
5. GRID VOLTAGE AT TUBES V2, V3, AND V4 MEASURED WITH MAIN SENS POTENTIOMETER R1401 TURNED MAXIMUM CLOCKWISE.

* RT-424/ARC-52X
† RT-332/ARC-52
** EFFECTIVE MCN 1549

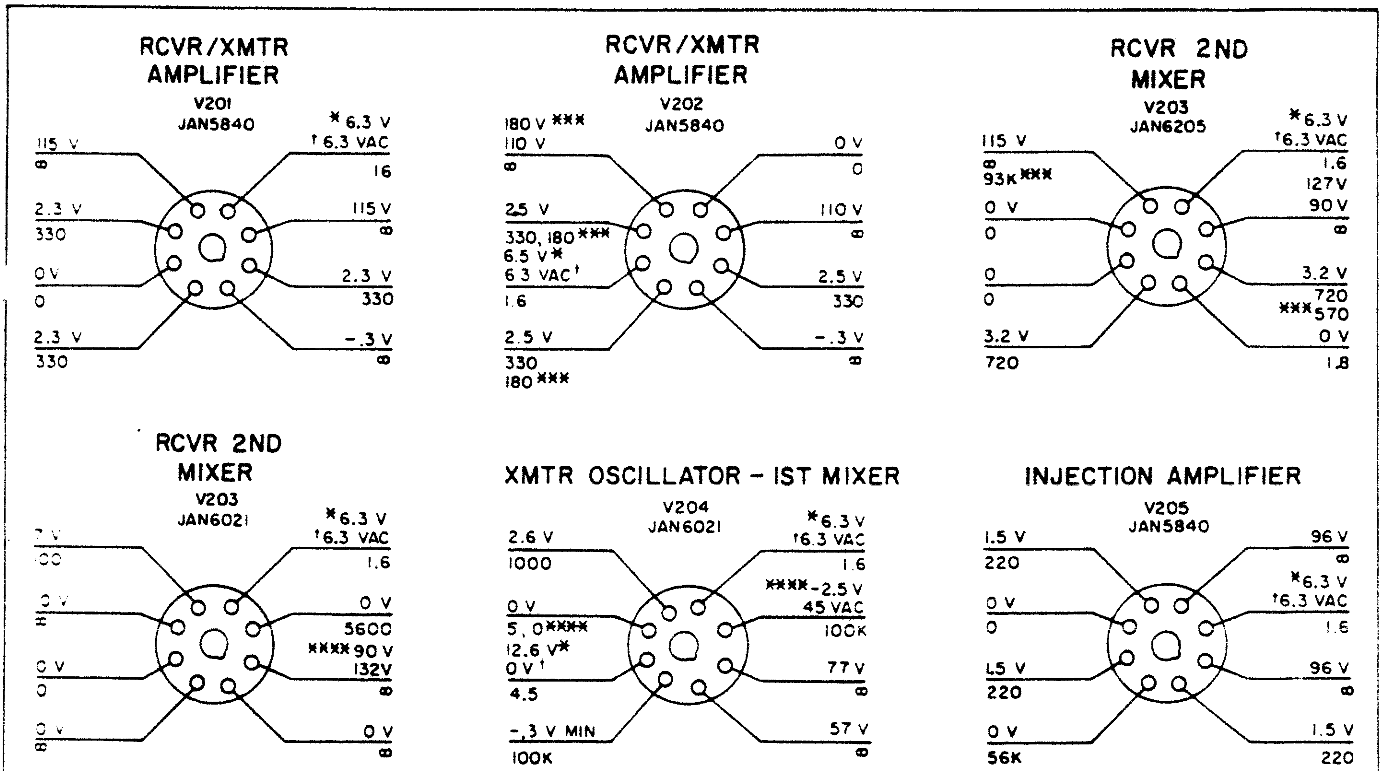
Figure 7-25. Receiver R-F Amplifier and Transmitter Preamplifier, Voltage and Resistance Diagram



NOTES:

1. VOLTAGE READINGS FOR V101, V103 AND V103 ARE MEASURED WITH RADIO SET AT TRANSMIT.
2. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND, WITH NO SIGNAL INPUT AND WITH TUBE REMOVED.
3. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
4. RESISTANCE READINGS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS AND ALL R-F CONNECTORS DETACHED.

Figure 7-26. Receiver R-F Amplifier and Transmitter Preamplifier (Contract NOas 57-478, Serial Numbers 1 - 90), Voltage and Resistance Diagram

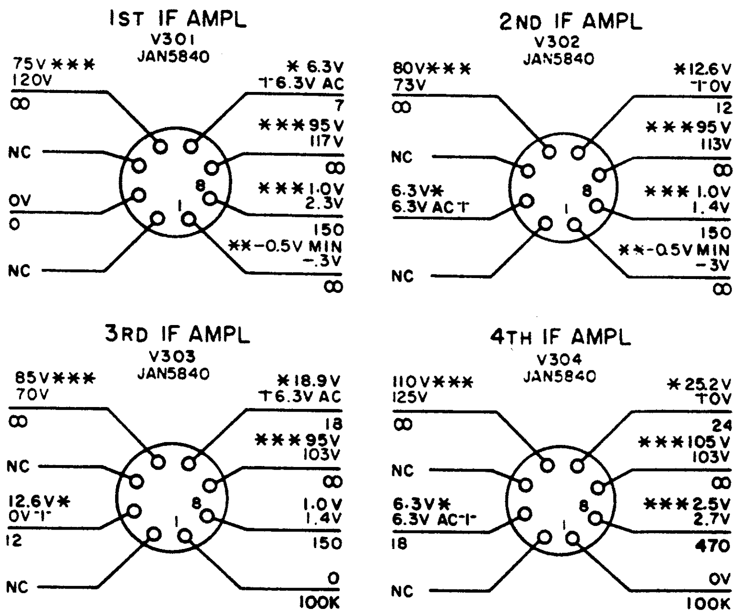


NOTES:

1. VOLTAGE MEASUREMENTS FOR V204 TAKEN WITH RADIO SET AT TRANSMIT.
2. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND, WITH NO SIGNAL INPUT.
3. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
4. RESISTANCE MEASUREMENTS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS WITH ALL RF CONNECTORS DETACHED.

† RT-332/ARC-52
* RT-424/ARC-52
** CONTRACT NOas 59-0165, SERIAL NUMBERS 1-49 AND PRIOR UNITS.
*** EFFECTIVE MCN 1340

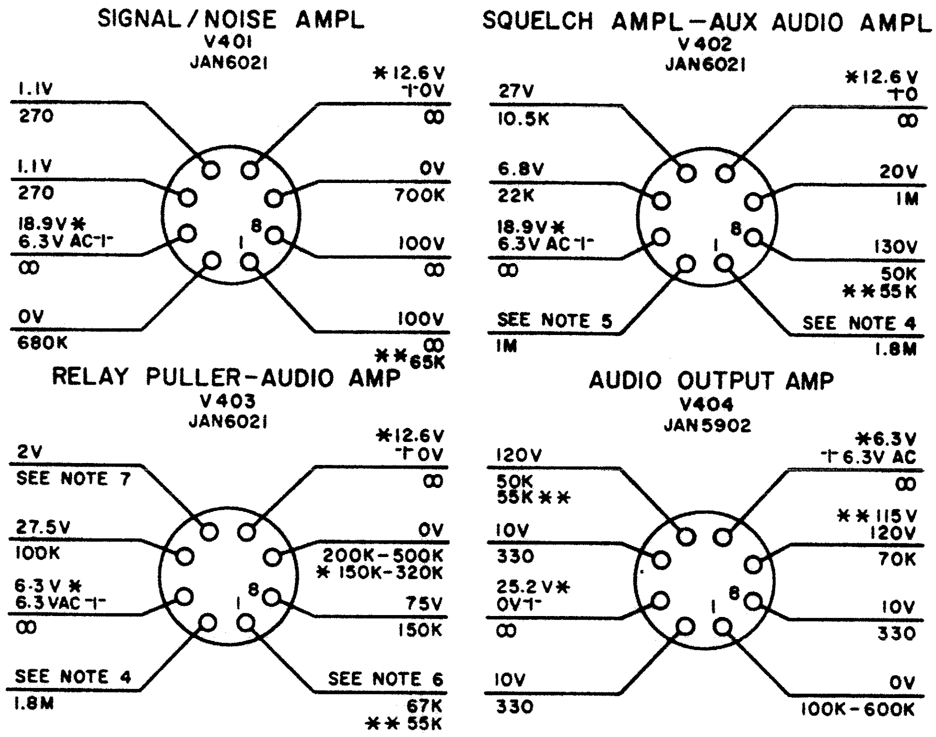
Figure 7-27. 20- to 30-Mc I-F Amplifier, Voltage and Resistance Diagram



1. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE TERMINAL TO GROUND EXCEPT GRID VOLTAGES (PIN 1), OF V301, V302 AND V303—THESE ARE MEASURED BEYOND RESPECTIVE 100-K ISOLATING RESISTOR.
2. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
3. RESISTANCE READINGS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS AND ALL R-F CONNECTIONS DETACHED.

✱ RT-424/ARC-52X
⊤ RT-332/ARC-52
✱✱ -0.5V WITH MAIN SENS (R1401) MAXIMUM CW, -3.1V WITH MAIN SENS (R1401) MAXIMUM CCW
✱✱✱ EFFECTIVE ON CONTRACTS NOW60-0089-A AND NOW61-0785.

Figure 7-28. 1.85-Mc I-F Amplifier, Voltage and Resistance Diagram

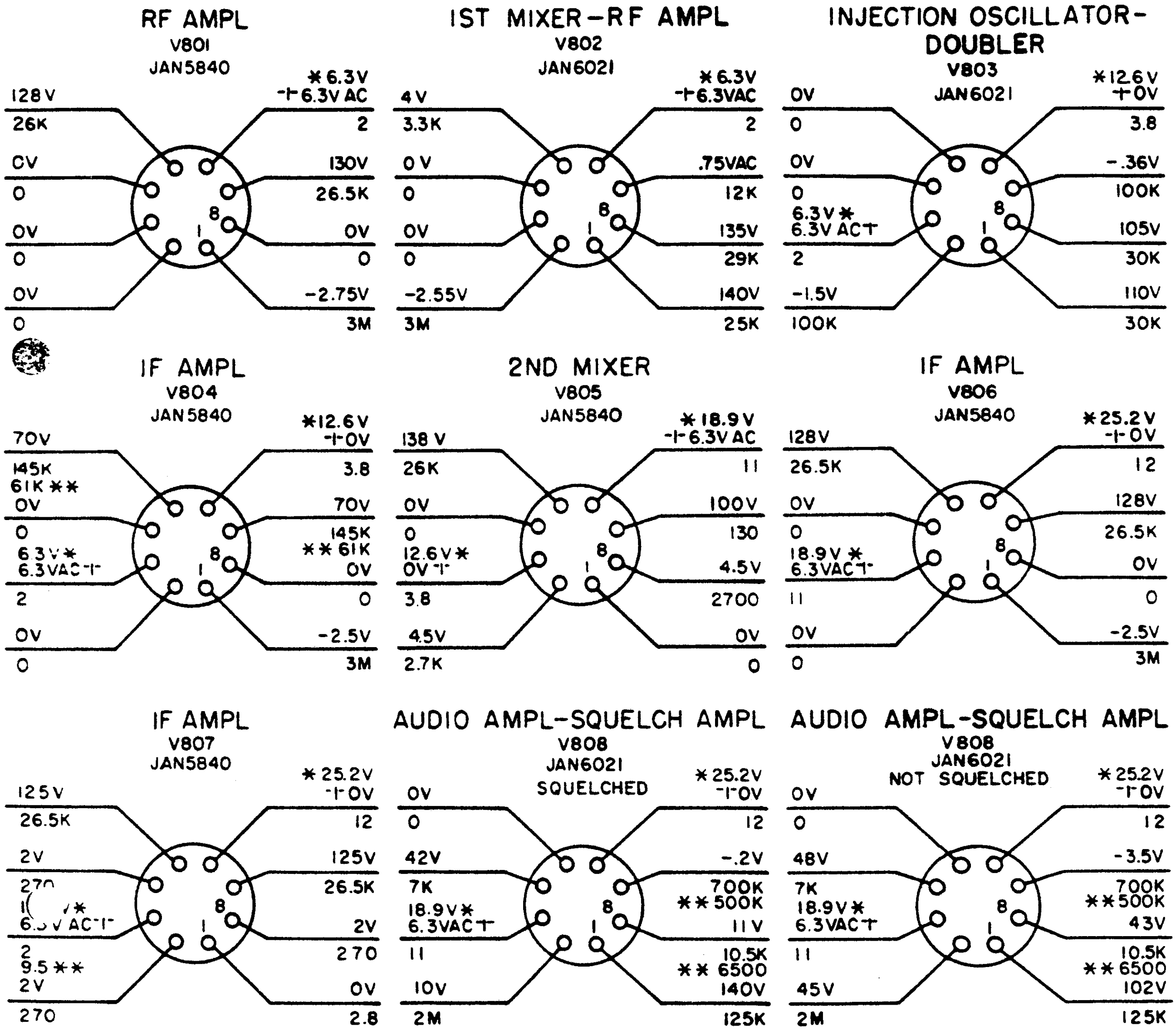


NOTES:

1. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND WITH MODULE DISCONNECTED FROM RADIO SET.
2. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
3. RESISTANCE READINGS MEASURED FROM TUBE PIN TO GROUND.
4. WITH TUBE V402A CUT OFF, 25 VOLTS; WITH TUBE CONDUCTING, 10 VOLTS.
5. DETERMINED BY S/N THRESHOLD CONTROL R407 SETTING AND SIGNAL INPUT. VOLTAGE LIMITS ARE 0 TO 5 VOLTS.
6. WITH TUBE CUT OFF, 90 VOLTS; WITH TUBE CONDUCTING, 130 VOLTS.
7. RESISTANCE IS 2500 OHMS WHEN CONNECTED FOR SIGNAL PLUS NOISE—TO—NOISE SQUELCH; 3900 OHMS WHEN CONNECTED FOR CARRIER SQUELCH.

✱ RT-424/ARC-52X.
-I- RT-332/ARC-52.
✱✱ EFFECTIVE ON CONTRACTS NOw 60-0089-A AND NOw 61-0785 ONLY.

Figure 7-29. Audio Amplifier, Voltage and Resistance Diagram



NOTES:

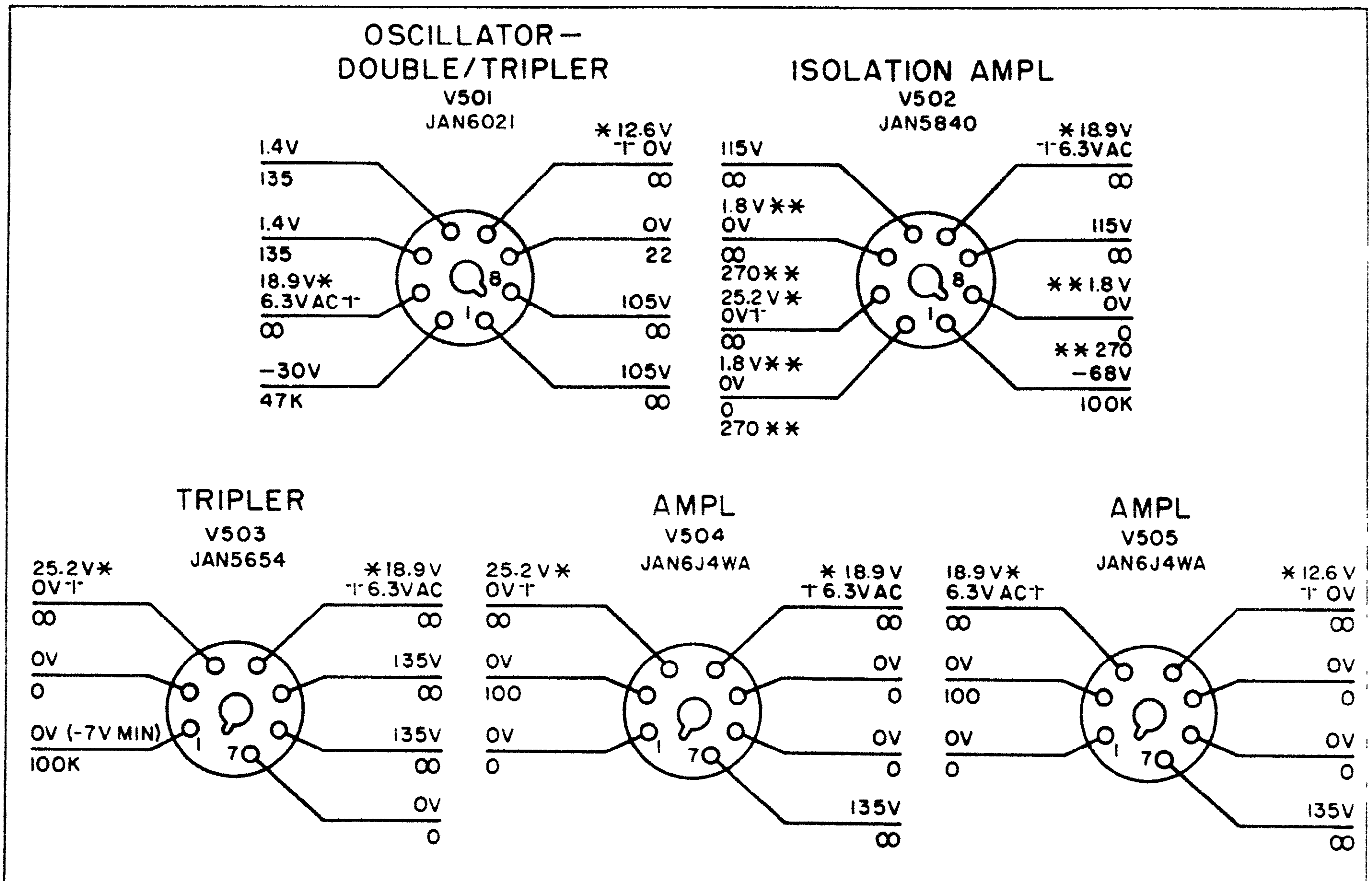
1. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND, WITH NO SIGNAL INPUT AND GUARD SENS CONTROL R1402 FULLY CLOCKWISE.
2. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
3. RESISTANCE READINGS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS.

* RT-424/ARC-52X

-|- RT-332/ARC-52

** EFFECTIVE ON CONTRACTS NOW60-0089-A AND NOW61-0785 ONLY.

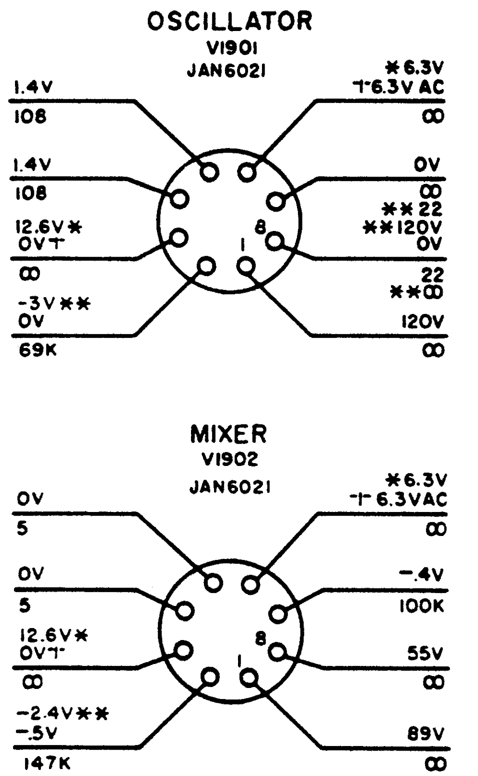
Figure 7-30. Guard Receiver, Voltage and Resistance Diagram



NOTES:
1. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND WITH V503, V504 AND V505 REMOVED.
2. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
3. RESISTANCE READINGS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS WITH ALL R-F CONNECTORS DETACHED.

✱ RT-424/ARC-52X.
⫟ RT-332/ARC-52.
✱✱ EFFECTIVE ON CONTRACTS NOw 60-0089-A AND NOw 61-0785 ONLY.

Figure 7-31. Spectrum Generator and Amplifier, Voltage and Resistance Diagram



NOTES:

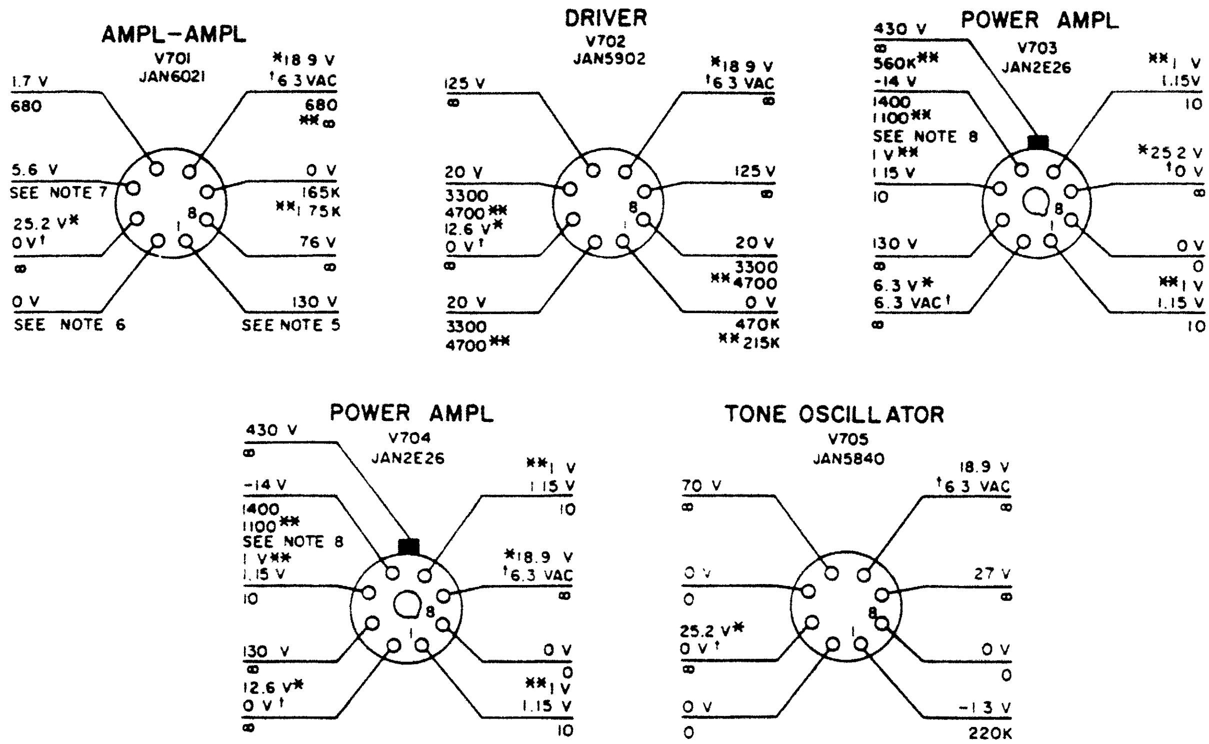
1. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND.
2. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
3. ALL RESISTANCE MEASUREMENTS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS WITH ALL R-F CONNECTORS DETACHED.

* RT-424/ARC-52X

-I- RT-332/ARC-52

** EFFECTIVE ON CONTRACTS NOW60-0089-A AND NOW61-0785 ONLY.

Figure 7-32. Oscillator, Voltage and Resistance Diagram

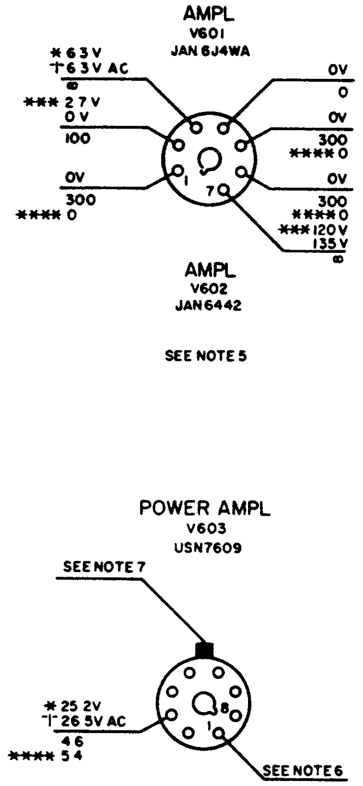


NOTES.

1. VOLTAGE MEASUREMENTS ARE TAKEN WITH RADIO SET AT TRANSMIT.
2. ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND.
3. ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
4. RESISTANCE MEASUREMENTS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS WITH ALL RF CONNECTORS DETAILED.
5. RESISTANCE MEASURES ∞ WITH MODULE CONNECTED FOR CARBON MICROPHONE, 33K WITH MODULE CONNECTED FOR DYNAMIC MICROPHONE.
6. WITH MOD GAIN CONTROL R702 FULLY CLOCKWISE, RESISTANCE IS 250K.
7. RESISTANCE MEASURES 3.4K WITH MODULE CONNECTED FOR CARBON MICROPHONE, 470 WITH MODULE CONNECTED FOR DYNAMIC MICROPHONE.
8. RESISTANCE MEASURED WITH NEGATIVE PROBE GROUNDED.

† RT-332/ARC-52
* RT-424/ARC-52X
** EFFECTIVE ON CONTRACTS NOw60-0089-A AND NOw61-0785 ONLY

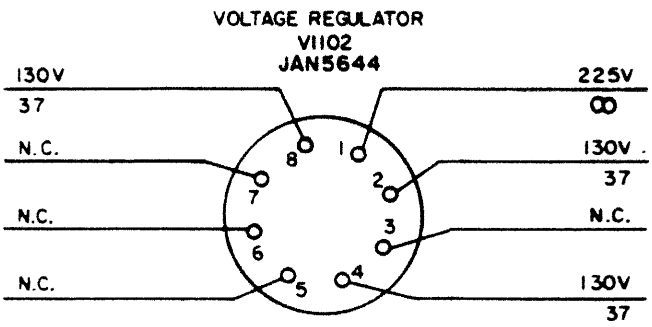
Figure 7-33. Modulator, Voltage and Resistance Diagram

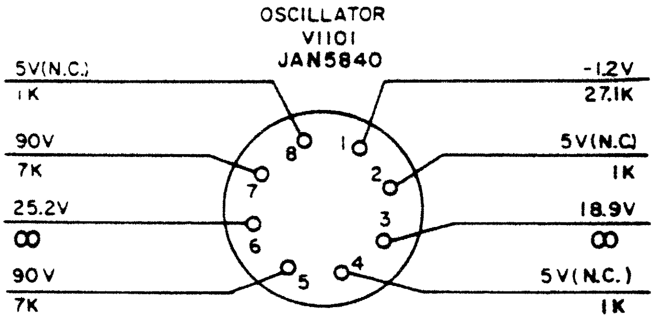


NOTES
1 VOLTAGE MEASUREMENTS TAKEN WITH RADIO SET AT TRANSMIT
2 ALL VOLTAGE MEASUREMENTS TAKEN WITH A VTVM FROM TUBE SOCKET TO GROUND, UNLESS OTHERWISE NOTED.
3 ALL VOLTAGES DC UNLESS OTHERWISE NOTED
4 RESISTANCE MEASUREMENTS TAKEN WITH MODULE REMOVED FROM MAIN CHASSIS WITH ALL R-F CONNECTORS DETACHED.
5 V602 PLATE VOLTAGE IS 135 VOLTS AS MEASURED ON INDUCTANCE RING OF Z603; RESISTANCE IS ∞. V602 GRID VOLTAGE IS 0 VOLTS, AS MEASURED AT GRID-FLANGE AT CHASSIS WALL, RESISTANCE IS 0. V602 CATHODE (BOTTOM SECTION) IS .7 VOLTS; RESISTANCE IS 22 OHMS. V602 FILAMENT (TOP SECTION) IS 0 VOLTS, RESISTANCE IS ∞. V602 FILAMENT (CENTER SECTION) IS 6.3V AC, RESISTANCE IS ∞.
6 V603 SCREEN VOLTAGE (PIN 1) IS 131 VOLTS, AS MEASURED AT JUNCTION OF R605 AND R606; RESISTANCE IS 12K.
7 V603 PLATE VOLTAGE (CAP) IS 350 VOLTS, AS MEASURED AT JUNCTION OF R605 AND R610; RESISTANCE IS 26K.

-|- RT-332/ARC-52
* RT-424/ARC-52X
** ON CONTRACT NOw 61-0785 MODULE SERIAL NUMBERS 510 AND 511, RESISTANCE IS ADJUSTABLE WITH R613
*** EFFECTIVE MCN 1000
**** EFFECTIVE ON CONTRACTS NOw 60-0089-A AND NOw 61-0785 ONLY

Figure 7-34. Power Amplifier, Voltage and Resistance Diagram





NOTES:

1. VOLTAGE MEASUREMENTS ARE TAKEN FROM TUBE TERMINAL TO GROUND WITH A VTVM.
2. ALL VOLTAGES ARE VOLTS DC(POSITIVE) UNLESS OTHERWISE NOTED.
3. RESISTANCE MEASUREMENTS ARE TAKEN WITH THE MODULE REMOVED FROM THE MAIN CHASSIS.
4. NO CONNECTION INDICATED BY N.C.

Figure 7-35. Dynamotor Power Supply Unit, Voltage and Resistance Diagram

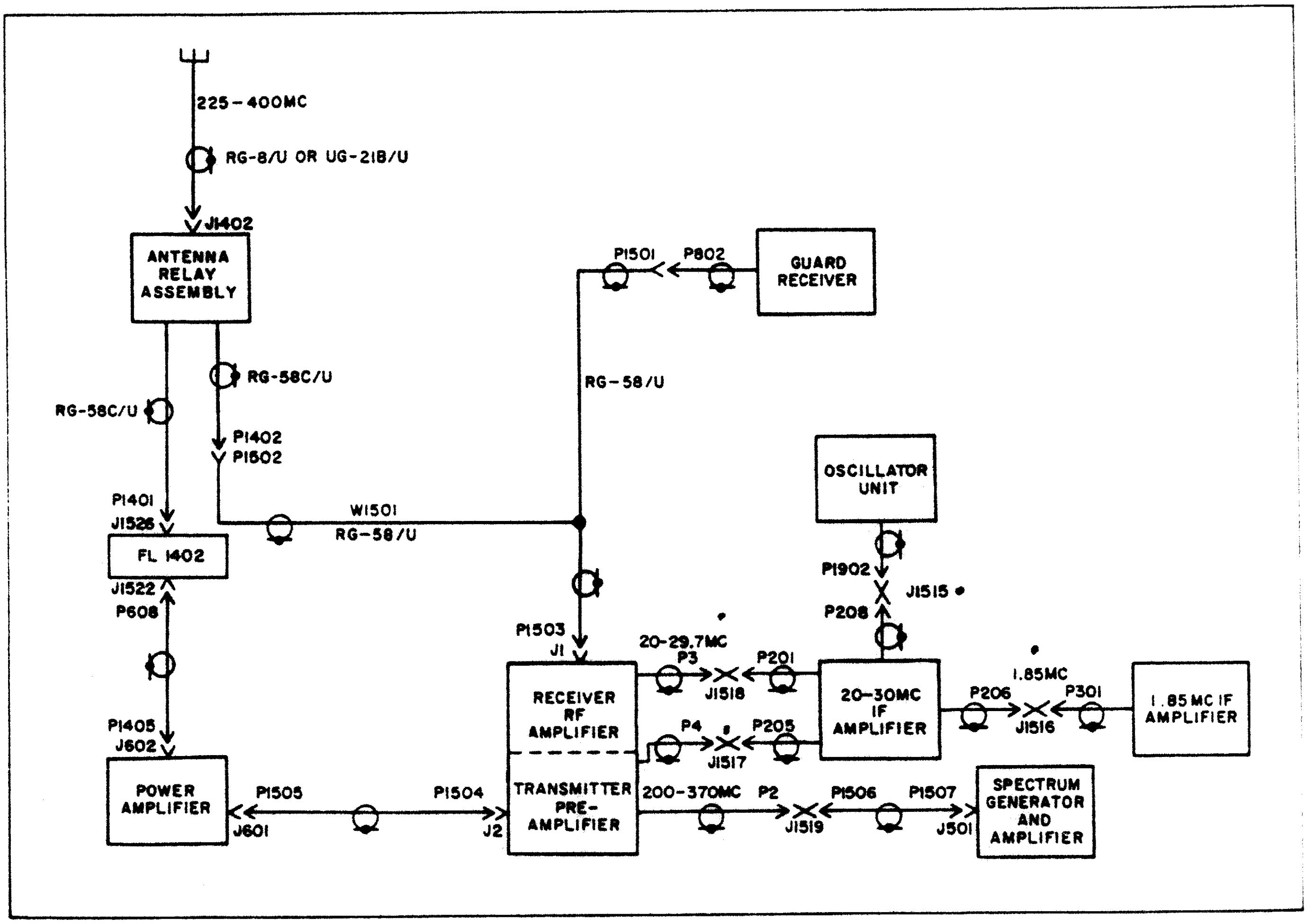


Figure 7-37. Receiver-Transmitter, R-F Interconnection Diagram

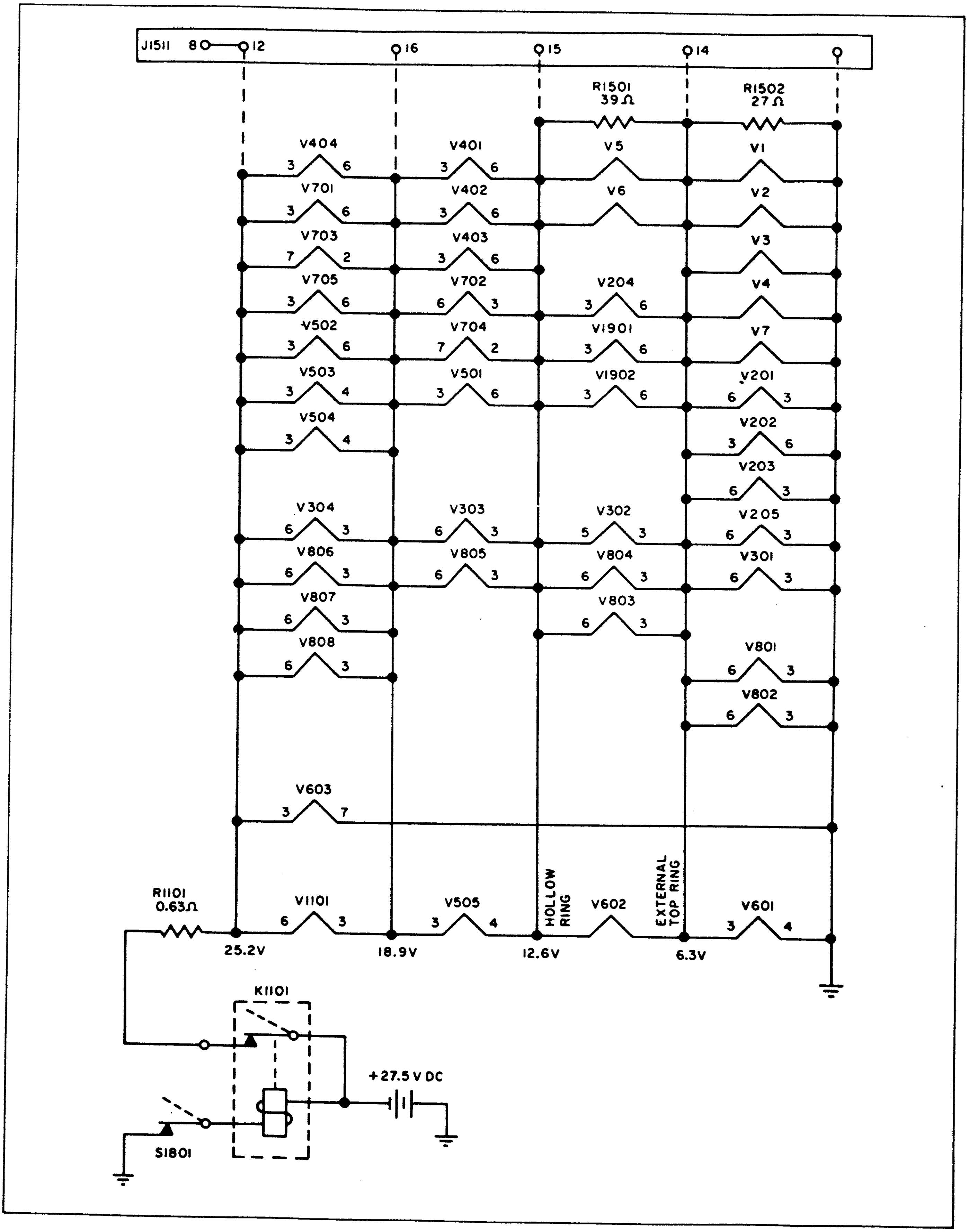


Figure 7-38. Receiver-Transmitter RT-332/ARC-52X, Filament Circuits, Simplified Schematic Diagram

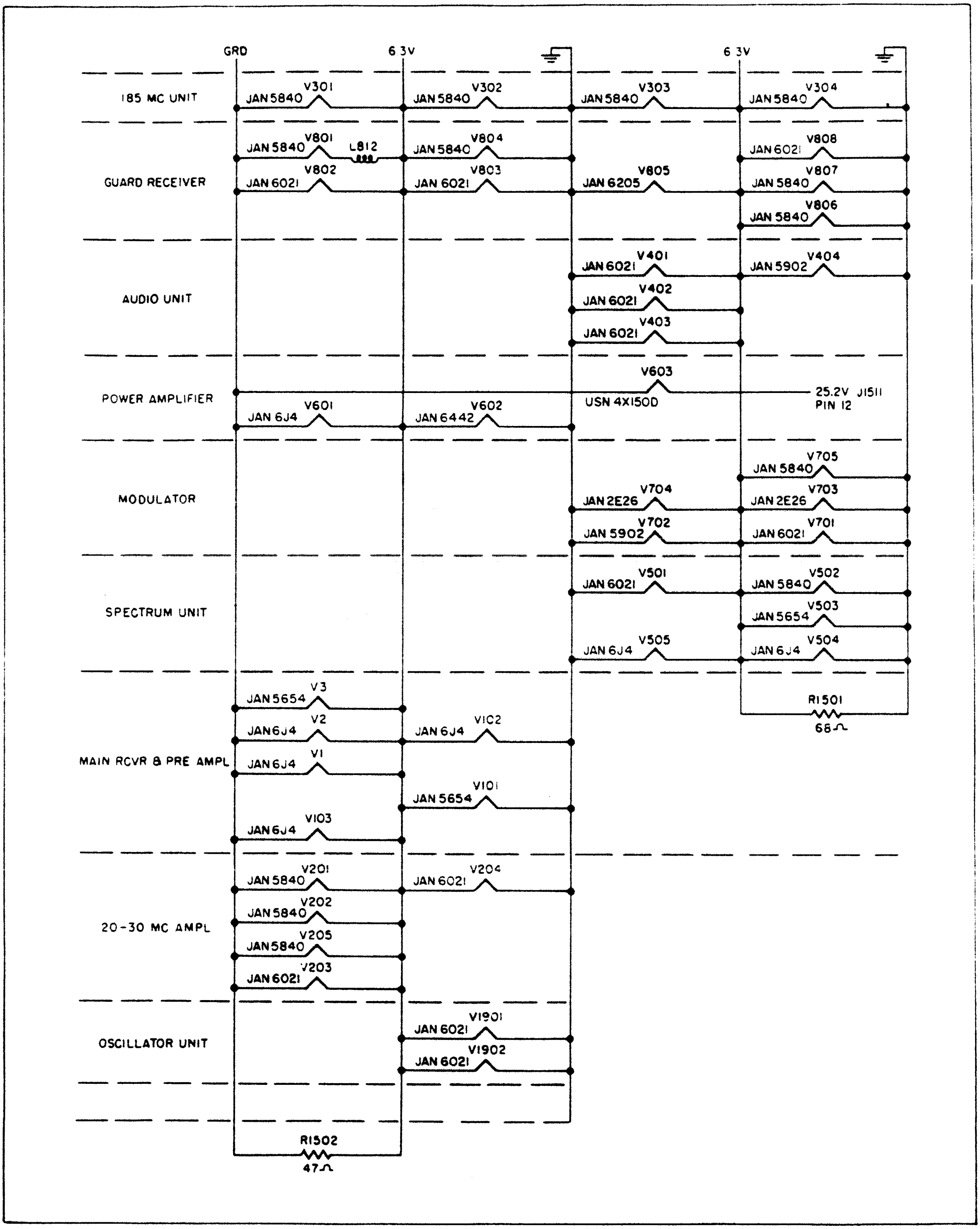


Figure 7-39. Receiver-Transmitter RT-332 ARC-52, Filament Circuits, Simplified Schematic Diagram

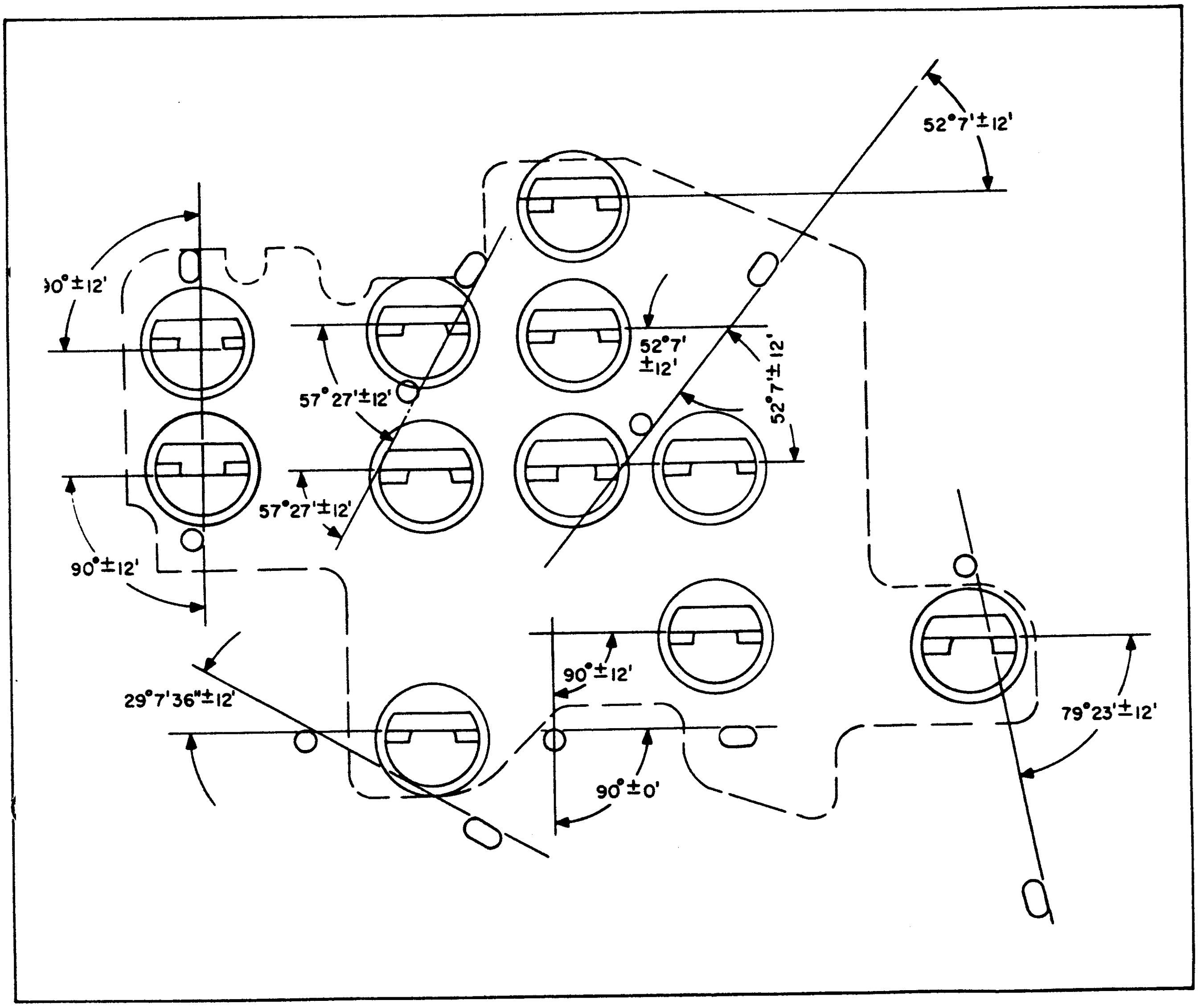


Figure 7-40. Main Chassis Gear Plate, Coupler Positioning Diagram

SECTION VIII
DIFFERENCE DATA SHEETS

8-1. INTRODUCTION.

8-2. Service instructions for the models included in this section are the same as the procedures for Radio Sets AN/ARC-52 and AN/ARC-52X except for the specific differences noted by the applicable difference data sheet. Sections I through VII contain complete service instruction information for Radio Sets AN/ARC-52 and AN/ARC-52X.

INDEX OF MODELS COVERED BY DIFFERENCE DATA SHEETS

RADIO RECEIVER-TRANSMITTER RT-332B/ARC-52 **COLLINS PART NO. 522-4813-001**

RADIO RECEIVER-TRANSMITTER RT-424A/ARC-52X **COLLINS PART NO. 522-4812-001**

THE INSTRUCTIONS CONTAINED IN PRECEDING SECTIONS OF THIS HANDBOOK APPLY EXCEPT FOR THE DIFFERENCES LISTED IN THIS DATA SHEET.

INTRODUCTION.

This difference data sheet covers Radio Receiver-Transmitter RT-332B/ARC-52 and Radio Receiver-Transmitter RT-424A/ARC-52X Service instructions for the RT-332/ARC-52 apply to the RT-332B/ARC-52 except as noted in this difference data sheet Service instructions for the RT-424/ARC-52X apply to the RT-424A/ARC-52X except as noted in this difference data sheet. Differences between the RT-332/ARC-52 and the RT-332B/ARC-52 and between the RT-424/ARC-52X and the RT-424A/ARC-52X are identical; therefore, all the references to the RT-332B/ARC-52 apply equally to the RT-424A/ARC-52X

PURPOSE AND USE OF EQUIPMENT.

The RT-332B/ARC-52 and the RT-424A/ARC-52X provide Juliet-28 compatibility for the AN/ARC-52 and AN/ARC-52X radio sets, respectively.

EQUIPMENT REQUIRED BUT NOT SUPPLIED.

An additional control unit, Radio Set Control C-8057/ARC, is required for secure communications operation.

DESCRIPTION OF MAJOR COMPONENTS.

The RT-332B/ARC-52 is identical to the RT-332/ARC-52 except for the following differences.

a The modulator module was replaced with a similar modulator module with increased audio bandwidth

b The 1 85-mc i-f amplifier module was replaced with a similar module which provides increased i-f bandwidth and contains two wide-band emitter follower stages to provide low output impedance of the auxiliary audio.

c An auxiliary guard audio channel, which bypasses the audio amplifier module, was provided. This channel is fed through a separate auxiliary guard audio amplifier which is mounted on the main chassis

d Slight changes were made to the main chassis wiring The audio output of the guard receiver is fed to the input of the auxiliary guard audio amplifier, and the resulting amplified output is fed to a pin on the front connector. Positive 130 volts dc is fed as B+ to the auxiliary guard audio amplifier The auxiliary (wide-band) audio output from the 1 85-mc i-f amplifier is fed directly to a pin on the front connector

LEADING PARTICULARS.

ELECTRICAL CHARACTERISTICS.

Electrical characteristics listed in table III apply to the RT-332B/ARC-52 and RT-424A/ARC-52X except as noted in table XCIV.

TABLE XCIV. ELECTRICAL CHARACTERISTICS

(FOR THE RT-332B/ARC-52 AND RT-424A/ARC-52X)

Auxiliary audio output	When a 1000-microvolt signal modulated 30 percent at 1000 cps is applied, the output shall be at least 0.25 volt. When the modulation frequency is varied from 70 to 20,000 cps, the output for this frequency range shall not vary more than +4 to -4 db from the output obtained at 1000 cps.
Auxiliary audio sensitivity .	When an r-f input of 5 microvolts (open circuit) modulated 30 percent at 1000 cps is applied, the signal-plus-noise to noise ratio shall be not less than 3.0 db.
Auxiliary guard audio. . . .	When an r-f input of 5 microvolts (open circuit) modulated 30 percent at 1000 cps is applied, the signal-plus-noise to noise ratio shall be not less than 6.0 db.

ELECTRICAL CHARACTERISTICS (Cont)

(FOR THE RT-332B/ARC-52 AND RT-424A/ARC-52X)

Auxiliary guard audio output	0.15 to 0.45 volt (loaded with 600 ohms).	
Transmitter frequency response	150 to 20,000 cps.	
Fidelity	As follows	
	Frequency (cps)	Response Flat Within (db)
	150	-5 or lower
	300	±4
	600	±3
	1000	0 (ref level)
	3000	±2
	6000	±3
	10,000	±4
	15,000	±4
	20,000	±4

TRANSISTOR COMPLEMENT.

Table XCV lists the transistor complement for the RT-332B/ARC-52 and RT-424A/ARC-52X.

TUBE AND DIODE COMPLEMENT.

The tube and diode complement listed in table IV is applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X. Table XCVI lists additional diodes used only in the RT-332B/ARC-52 and RT-424A/ARC-52X.

TEST EQUIPMENT AND SPECIAL TOOLS.

Information provided in section II is applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X. In addition, slight modification to the J-995/ARM-38 Distribution Box is necessary to achieve complete test capability of the RT-332B/ARC-52 and RT-424A/ARC-52X units. This modification consists of replacing the existing auxiliary audio wiring with shielded wiring and adding a test jack for auxiliary guard audio test. The addition of a guard audio test jack

TABLE XCV. TRANSISTOR COMPLEMENT

REFERENCE DESIGNATION	TRANSISTOR TYPE	FUNCTION
1.85-Mc I-F Amplifier		
Q301	2N2222	Wide-band audio amplifier
Q302	2N2222	Wide-band audio amplifier
Main Chassis		
A1551 (encapsulated amplifier circuit)	350-0011-010	Auxiliary guard audio amplifier

TABLE XCVI. DIODE COMPLEMENT

REFERENCE DESIGNATION	DIODE TYPE	FUNCTION
Main Chassis		
CR1551	USN 1N972B	Regulator diode

consists of mounting a phone jack (J120) (part no. JJ-034) on the J-995/ARM-38 front panel, removing the wire connection between J2002-M and J2001-N, adding shielded wire between J2002-M and J120, and adding two 1200-ohm impedance matching resistors (R109, R110) between J120 and ground. Due to the simplicity of the modification, detailed instructions are not given. Figure 8-1 shows the electrical relationship of the added circuitry and is provided as a guide for modification.

PREPARATION FOR USE AND RESHIPMENT.

Instructions provided in section III are applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X with the exception of equipment interconnection. Figure 8-2 illustrates interconnecting wiring for single unit Juliet-28 operation. Figure 8-3 illustrates interconnecting wiring for automatic relay Juliet-28 operation.

THEORY OF OPERATION.

The theory of operation presented in section III is applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X with the following minor exceptions.

GENERAL SYSTEM THEORY.

Juliet-28 compatibility required the following receiver-transmitter design changes: The auxiliary audio channel provides a wide-band audio output to Juliet-28 equipment, an auxiliary guard audio channel enables guard monitoring during Juliet-28 operation, and increased bandwidth through the modulator module provides Juliet-28 transmission capability.

1.85-MC I-F AMPLIFIER MODULE. (See figure 8-4.)

Receiver bandwidth is increased to approximately 20,000 cycles per second by component value changes in the selective filter and i-f amplifier stages of the 1.85-mc i-f amplifier module. The output of fourth i-f amplifier V304 is detected and fed through R382 to the base of Q301. Resistor R382 allows output level adjustment on the auxiliary audio channel. Emitter followers Q301 and Q302 provide a constant 600-ohm output impedance without loading the detector, CR303. The output off the emitter of Q302 is fed through pin 15 of P302/J1503 and filter Z1401 to pin K of J1401 where it is made available as the auxiliary (wide-band) audio output for use by Juliet-28 equipment. The detected output of V304 is also fed to the

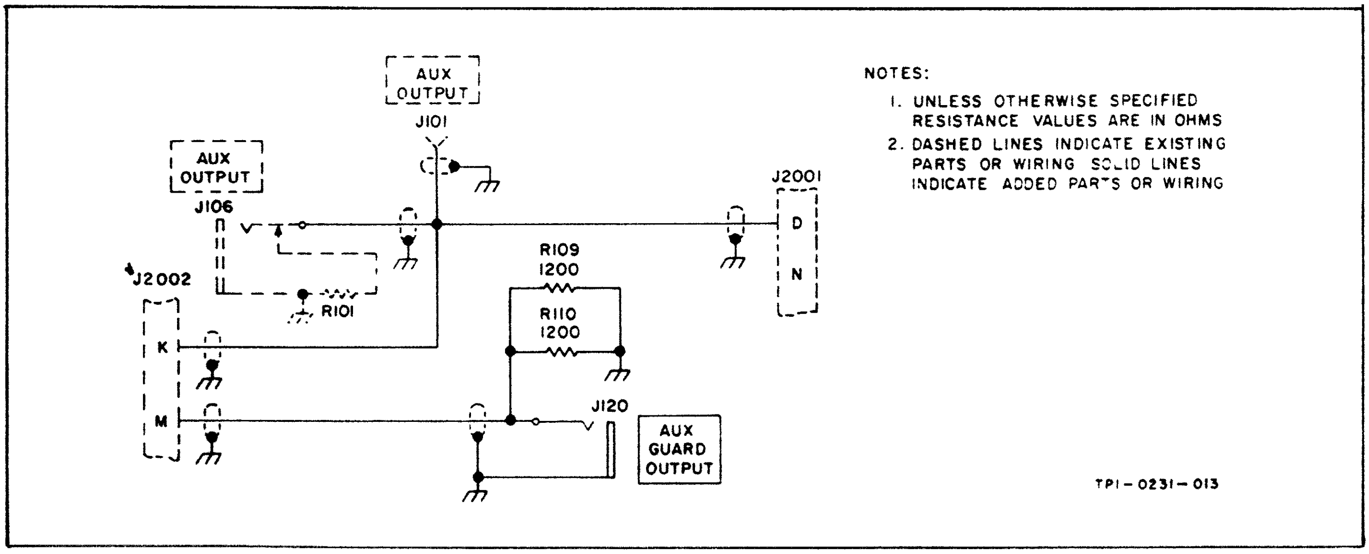


Figure 8-1. RT-332B/ARC-52 and RT-424A/ARC-52X, Compatibility Modification to Distribution Box J-995/ARM-38

audio amplifier module for signal/noise squelch operation.

AUXILIARY GUARD AUDIO AMPLIFIER TB1502. (See figure 8-6 or 8-7.)

To enable the continuous monitoring of the guard frequency, auxiliary guard audio amplifier TB1502 provides an additional guard audio channel for use during Juliet-28 operation. The audio output of the guard receiver is fed to terminal 14 of TB1502 (as well as being fed to the audio amplifier module). Operational amplifier A1551 amplifies the auxiliary guard audio before it is fed through Z1401 and made available at pin M of J1401. Zener diode CR1551 regulates the positive 130-volt supply voltage at the positive 28 volts required by A1551.

MODULATOR MODULE. (See figure 8-5.)

The audio frequency response of the modulator module is increased to approximately 20,000 cycles per second by adding one capacitor, C714, and changing the values of two others.

ORGANIZATIONAL MAINTENANCE.

Maintenance instructions contained in section V are applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X with the following exceptions.

MINIMUM PERFORMANCE STANDARDS CHECKS.

AUXILIARY AUDIO CHARACTERISTICS CHECK. To check characteristics of the auxiliary audio, connect an ME-6D/U a-c voltmeter to AUX OUTPUT jack J106 on Distribution Box J-995/ARM-38. Use all other connections shown in figure 5-4. Perform the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc, and rotate function switch to T/R.

b. At signal generator, set the frequency to 304.7 mc, with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the audio output measured on the ME-6D/U. The auxiliary audio indication should be at least 0.25 volt. (If output indication is less than 0.25 volt, adjust auxiliary audio adjust R382 for a 0.5-volt indication.)

c. At the audio oscillator, set the frequency at intervals between 70 to 20,000 cps while maintaining 30-percent modulation of the signal generator output. Record the auxiliary audio output reading on the ME-6D/U for each frequency. At all frequencies, the audio output should not vary more than +4 to -4 decibels from the 1000-cps reference level (0.25 volt).

d. At the radio set control, set MANUAL frequency controls for 225.0 mc.

e. Adjust the signal generator for 225.0 mc at 5-microvolt signal output modulated 30 percent with 1000 cps. Record the audio output indicated on the ME-6D/U.

f. Remove the modulation, and record the level of system noise indicated on the ME-6D/U. The signal-plus-noise to noise ratio should be 3.0 db or more.

AUXILIARY GUARD AUDIO CHARACTERISTICS CHECK. To check characteristics of the auxiliary guard audio, connect an ME-6D/U a-c voltmeter (utilizing cable assembly W-9/ARM-38) to AUX GUARD OUTPUT jack J120 (refer to section II for information concerning J120) on Distribution Box J-995/ARM-38. Use all other connections shown in figure 5-4. Perform the procedures given below.

a. At the radio set control, set MANUAL frequency controls for 304.7 mc, and rotate function switch to T/R + G.

b. At signal generator, set the frequency to 243.0 mc with an output level of 1000 microvolts, modulated 30 percent at 1000 cps. Record the audio output measured on the ME-6D/U. The auxiliary audio indication should be between 0.15 and 0.45 volt rms.

c. At the receiver-transmitter, rotate the GUARD SENS control R1402 fully clockwise.

d. Reduce the signal generator output to 5 microvolts, and record the indication on the ME-6D/U.

e. Remove the modulation, and record the level of system noise indicated on the ME-6D/U. The signal-plus-noise to noise ratio should be 6.0 db or more.

MODULATION FIDELITY CHECK. To check modulation fidelity, perform the procedures given in paragraph 5-24 substituting table XCVII for table XIII.

TABLE XCVII. MODULATION FIDELITY TEST READINGS

FREQUENCY (cps)	RELATIVE LIMITS (decibels)
150	-5 or lower
300	+4 to -4
600	+3 to -3
1000	0 (ref)
3000	+2 to -2
6000	+3 to -3
10,000	+4 to -4
15,000	+4 to -4
20,000	+4 to -4

SYSTEM TROUBLE ANALYSIS.

RT-332B/ARC-52 and RT-424A/ARC-52X system trouble analysis varies only slightly from that given for the RT-332/ARC-52 and RT-424/ARC-52X. During the performance standards test, if an auxiliary audio output is not present at J106 on J-995/ARM-38 and main receiver operation is normal, as determined by table XIV, replace the 1.85-mc i-f amplifier module. During the performance standards test, if auxiliary guard audio is not present at J120 on J-995/ARM-38 and main guard reception is normal, as determined by table XIV, replace TB1502 which is mounted on the main chassis.

FIELD MAINTENANCE.

Maintenance information provided in section VI is applicable to the RT-332B/ARC-52 and RT-424A/ARC-52X except as follows.

1.85-MC I-F AMPLIFIER MODULE BANDPASS CHECK.

To determine if the bandpass of the 1.85-mc i-f amplifier meets the equipment specifications, perform the procedures given in paragraph 6-43 with substitutions as follows:

a. In step f, the sum of the frequency changes should be not less than 80 kc.

b. In step g, the difference between frequency setting changes should not be more than 5 kc.

c. The maximum permissible displacement of the center frequency is 1.25 kc either side of 1.85 mc.

1.85-MC I-F AMPLIFIER MODULE TROUBLESHOOTING.

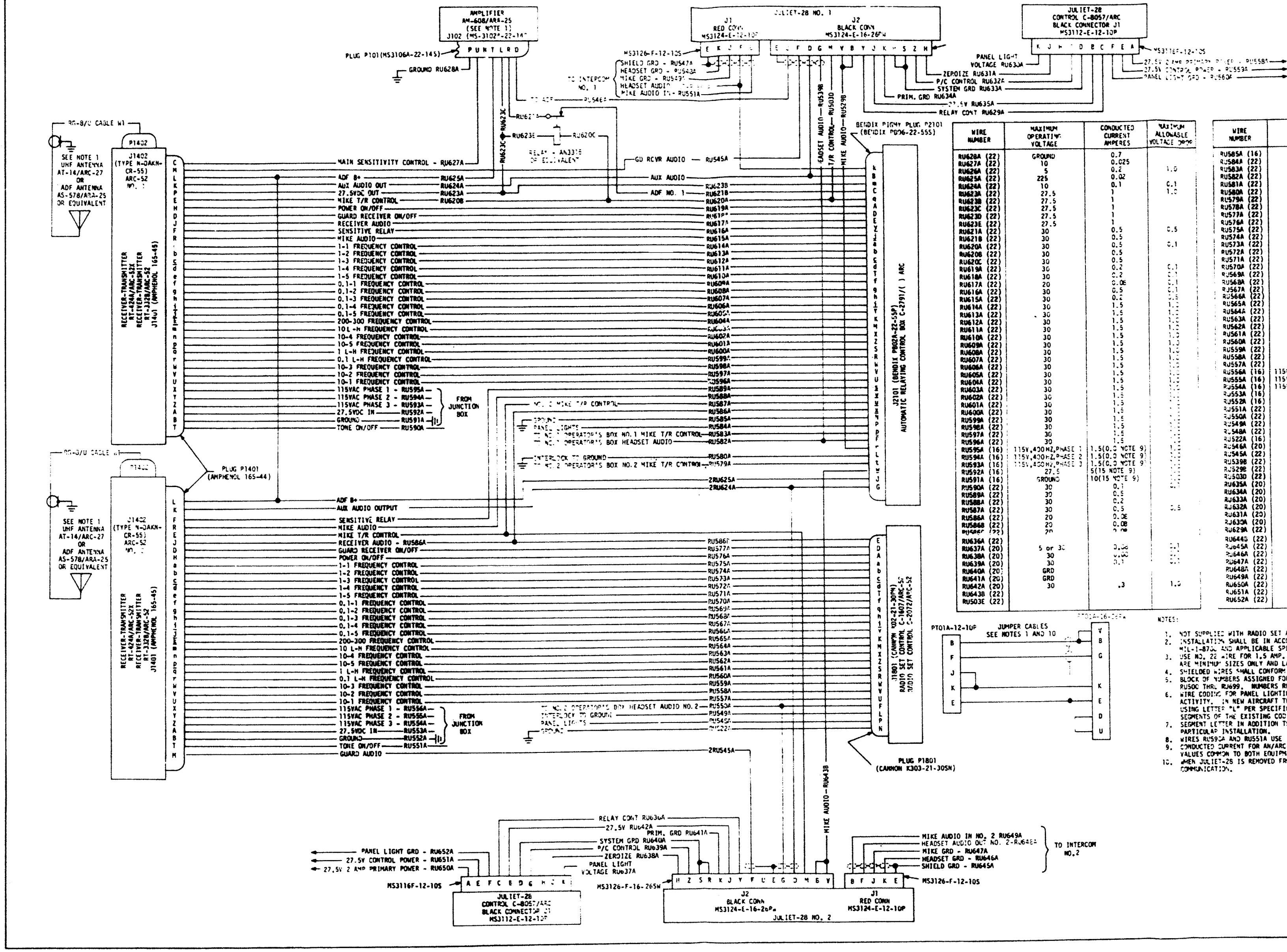
The addition of emitter followers Q301 and Q302 create the only troubleshooting differences for the 1.85-mc i-f amplifier module. If the main receiver is operating normally and the auxiliary audio is abnormal, make voltage and resistance checks at Q301 and Q302 leads, and replace the defective component. Differences in voltage and resistance data are given in table XCVIII.

TABLE XCVIII. 1.85-MC I-F AMPLIFIER VOLTAGE AND RESISTANCE CHART

COMPONENT	PIN OR LEAD	VOLTAGE	RESISTANCE
V303 (JAN5840)	1	*-0.5 to -3.1 (See note 1.)	∞
Q301 (2N2222)	Collector	19.5	2.9K
	Base	9.6	15K
	Emitter	9.2	5.3K
Q302 (2N2222)	Collector	19.5	2.9K
	Base	9.2	5.3K
	Emitter	8.6	1K

*-0.5 volt with MAIN SENS (R1401) maximum CW.
-3.1 volts with MAIN SENS (R1401) maximum CCW.

1. This measurement taken from low side of grid resistor to ground.



WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES	MAXIMUM ALLOWABLE VOLTAGE DROP
RU628A (22)	GROUND	0.7	
RU627A (22)	10	0.025	
RU626A (22)	5	0.2	1.0
RU625A (22)	225	0.02	
RU624A (22)	10	0.1	0.1
RU623A (22)	27.5	1	1.0
RU623B (22)	27.5	1	
RU623C (22)	27.5	1	
RU623D (22)	27.5	1	
RU623E (22)	27.5	1	
RU621A (22)	30	0.5	0.5
RU621B (22)	30	0.5	
RU620A (22)	30	0.5	0.1
RU620B (22)	30	0.5	
RU620C (22)	30	0.5	
RU619A (22)	30	0.2	0.1
RU618A (22)	30	0.2	0.1
RU617A (22)	20	0.08	0.1
RU616A (22)	30	0.5	0.1
RU615A (22)	30	0.2	0.5
RU614A (22)	30	1.5	1.0
RU613A (22)	30	1.5	1.0
RU612A (22)	30	1.5	1.0
RU611A (22)	30	1.5	1.0
RU610A (22)	30	1.5	1.0
RU609A (22)	30	1.5	1.0
RU608A (22)	30	1.5	1.0
RU607A (22)	30	1.5	1.0
RU606A (22)	30	1.5	1.0
RU605A (22)	30	1.5	1.0
RU604A (22)	30	1.5	1.0
RU603A (22)	30	1.5	[illegible]
RU602A (22)	30	1.5	[illegible]
RU601A (22)	30	1.5	[illegible]
RU600A (22)	30	1.5	[illegible]
RU599A (22)	30	1.5	[illegible]
RU598A (22)	30	1.5	[illegible]
RU597A (22)	30	1.5	[illegible]
RU596A (22)	30	1.5	[illegible]
RU595A (16)	115V,400HZ,PHASE 1	1.5(0.0 NOTE 9)	[illegible]
RU594A (16)	115V,400HZ,PHASE 2	1.5(0.0 NOTE 9)	[illegible]
RU593A (16)	115V,400HZ,PHASE 3	1.5(0.0 NOTE 9)	[illegible]
RU592A (16)	27.5	5(15 NOTE 9)	[illegible]
RU591A (16)	GROUND	10(15 NOTE 9)	[illegible]
RU590A (22)	30	0.1	[illegible]
RU589A (22)	30	0.5	
RU588A (22)	30	0.2	
RU587A (22)	30	0.5	0.5
RU586A (22)	20	0.08	
RU586B (22)	20	0.08	
RU586C (22)	20	0.08	
RU636A (22)			
RU637A (20)	5 or 30	0.08	0.1
RU638A (20)	30	0.08	[illegible]
RU639A (20)	30	0.1	[illegible]
RU640A (20)	GRD		
RU641A (20)	GRD		
RU642A (20)	30	.3	1.0
RU643B (22)			
RU503E (22)			

WIRE NUMBER	MAXIMUM OPERATING VOLTAGE	CONDUCTED CURRENT AMPERES	MAXIMUM ALLOWABLE VOLTAGE DROP
RU585A (16)	GROUND	2.5	
RU584A (22)	30	0.3	
RU583A (22)	30	0.5	
RU582A (22)	20	0.08	
RU581A (22)	30	0.2	
RU580A (22)	GROUND	0.5	
RU579A (22)	30	0.5	
RU578A (22)	30	0.2	
RU577A (22)	30	0.2	
RU576A (22)	30	0.2	
RU575A (22)	30	1.5	1.0
RU574A (22)	30	1.5	1.0
RU573A (22)	30	1.5	1.0
RU572A (22)	30	1.5	1.0
RU571A (22)	30	1.5	1.0
RU570A (22)	30	1.5	1.0
RU569A (22)	30	1.5	1.0
RU568A (22)	30	1.5	1.0
RU567A (22)	30	1.5	1.0
RU566A (22)	30	1.5	1.0
RU565A (22)	30	1.5	1.0
RU564A (22)	30	1.5	1.0
RU563A (22)	30	1.5	1.0
RU562A (22)	30	1.5	1.0
RU561A (22)	30	1.5	1.0
RU560A (22)	30	1.5	1.0
RU559A (22)	30	1.5	0.1
RU558A (22)	30	1.5	1.0
RU557A (22)	30	1.5	1.0
RU556A (16)	115V,400HZ,PHASE 1	1.5(0.0 NOTE 9)	1.0
RU555A (16)	115V,400HZ,PHASE 2	1.5(0.0 NOTE 9)	1.0
RU554A (16)	115V,400HZ,PHASE 3	1.5(0.0 NOTE 9)	1.0
RU553A (16)	27.5	5(15 NOTE 9)	1.0
RU552A (16)	GROUND	10(15 NOTE 9)	1.0
RU551A (22)	30	0.1	0.1
RU550A (22)	20	0.08	0.1
RU549A (22)	GROUND	[illegible]	0.1
RU548A (22)	30	[illegible]	
RU522A (16)	GROUND	2.5	[illegible]
RU546A (20)			
RU545A (22)			
RU539B (22)			
RU529B (22)			
RU503D (22)			
RU635A (20)	30	3	[illegible]
RU634A (20)	GROUND		
RU633A (20)	GROUND		
RU632A (20)	30	[illegible]	0.1
RU631A (20)	30	0.2	0.1
RU630A (20)	5 OR 30	0.08	0.1
RU629A (22)			
RU644B (22)			
RU645A (22)			
RU646A (22)			
RU647A (22)	GRD	0.5	[illegible]
RU648A (22)	[illegible]	0.08	[illegible]
RU649A (22)	30	0.1	[illegible]
RU650A (22)	30	1.5	[illegible]
RU651A (22)	30	1.5	[illegible]
RU652A (22)	30	1.5	[illegible]

NOTES:

1. NOT SUPPLIED WITH RADIO SET AN/ARC-52 OR AN/ARC-52X.
2. INSTALLATION SHALL BE IN ACCORDANCE WITH APPLICABLE ISSUE OF SPECIFICATIONS MIL-I-8700 AND APPLICABLE SPECIFICATIONS REFERENCED THEREIN.
3. USE NO. 22 WIRE FOR 1.5 AMP. NO. 16 FOR HIGHER CURRENTS. WIRE SIZES SHOWN ARE MINIMUM SIZES ONLY AND LARGER WIRES SHALL BE USED AS REQUIRED, PER MIL-W-5088.
4. SHIELDED WIRES SHALL CONFORM TO SPECIFICATIONS MIL-C-7078.
5. BLOCK OF NUMBERS ASSIGNED FOR USE WITH RADIO SET AN/ARC-52 AND AN/ARC-52X IS RU500 THRU RU699. NUMBERS RU548 THRU RU652 WERE USED.
6. WIRE CODING FOR PANEL LIGHTING WIRES SHALL BE ASSIGNED BY THE INSTALLING ACTIVITY. IN NEW AIRCRAFT THIS WILL BE AS SEGMENTS OF THE PANEL LIGHTING CIRCUIT USING LETTER "L" PER SPECIFICATION MIL-W-5088. FOR OLD AIRCRAFT THIS SHALL BE AS SEGMENTS OF THE EXISTING CODING ON WIRES AT THE POINT OF TIE-IN.
7. SEGMENT LETTER IN ADDITION TO THOSE SHOWN MAY BE USED AS IS NECESSARY TO FIT THE PARTICULAR INSTALLATION.
8. WIRES RU590A AND RU551A USE IS OPTIONAL.
9. CONDUCTED CURRENT FOR AN/ARC-52X. PRECEDING VALUE FOR AN/ARC-52. ALL OTHER VALUES COMMON TO BOTH EQUIPMENTS.
10. WHEN JULIET-28 IS REMOVED FROM SYSTEM, CONNECT JUMPER CABLES FOR NORMAL COMMUNICATION.

Figure 8-3. Radio Sets AN/ARC-52 and AN/ARC-52X, Auto Relay With Juliet-28 and Control Box, Wiring Diagram

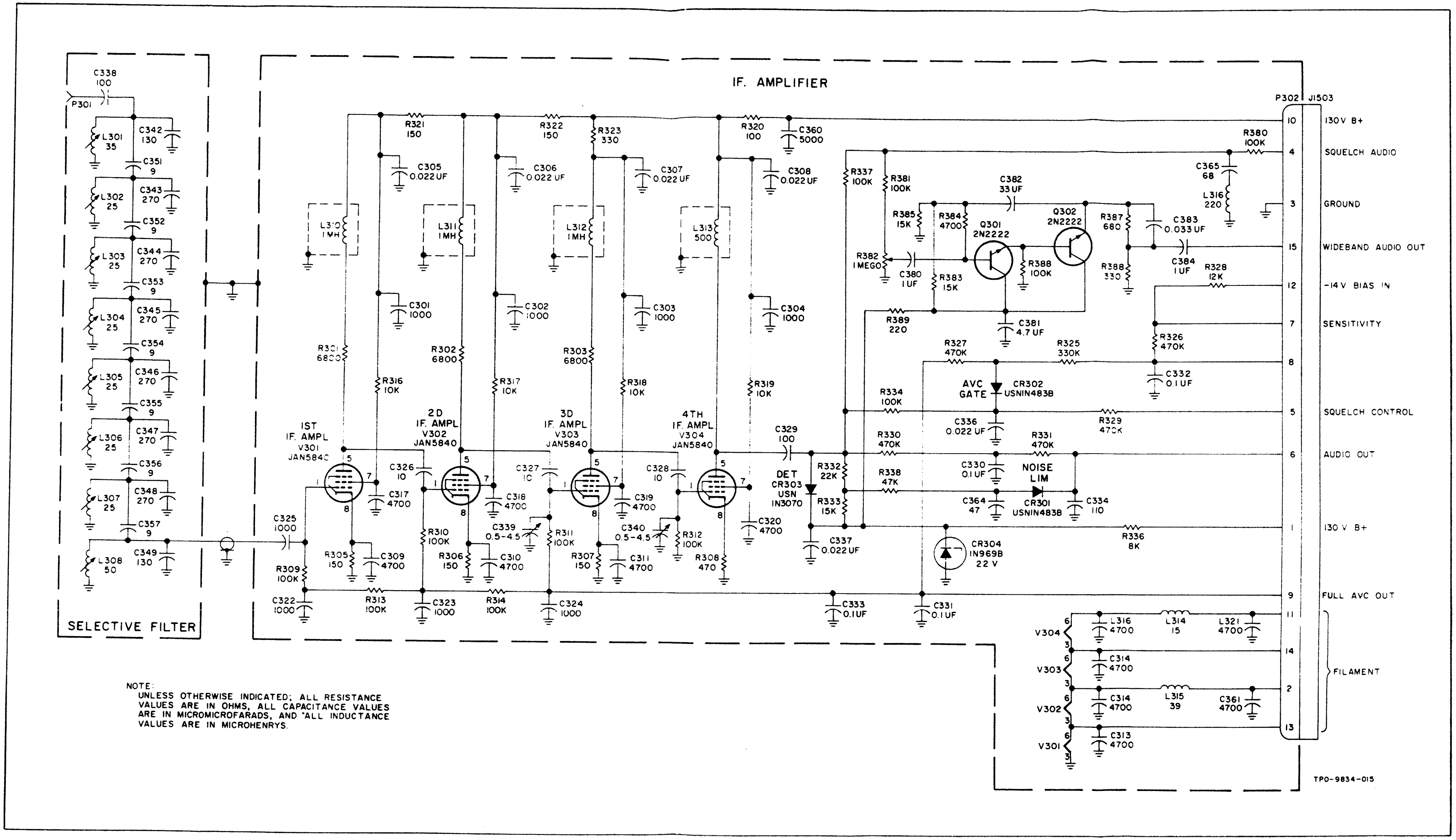


Figure 8-4. 1.85-Mc I-F Amplifier (RT-332B/ARC-52 and RT-424A/ARC-52X), Schematic Diagram

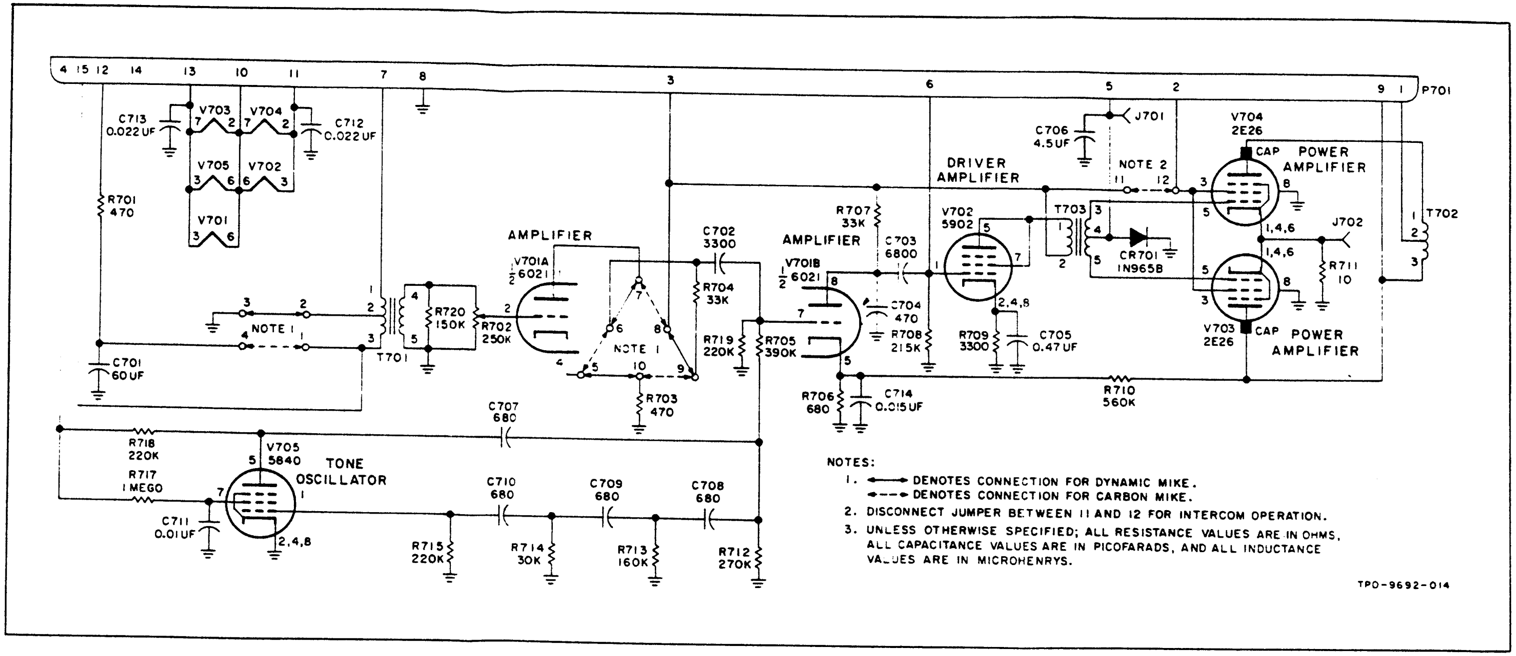


Figure 8-5. Modulator Module (RT-332B/ARC-52 and RT-424A/ARC-52X), Schematic Diagram

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