SECTION II

MAINTENANCE

2.1 GENERAL

This section includes second-line and third-line maintenance. Second-line maintenance (paragraph 2.2) includes preventive maintenance for Radio Set AN/PRC-515 and testing/troubleshooting of the receiver-transmitter group, the receiver-transmitter, the amplifier-coupler, and the generator. The second-line maintenance concept for the receiver-transmitter group (including the receiver-transmitter and the antenna-coupler) is to isolate a fault to a second-line replaceable item, replace the faulty item with a good operating item, and direct the faulty item to the third-line maintenance function. Second-line replaceable items for the receiver-transmitter group are listed in table 2-1.

Third-line maintenance (paragraph 2.3) includes testing/troubleshooting of subassemblies in the receiver-transmitter group. The third-line maintenance concept is to isolate a fault within a third-line maintenance item and repair it by making use of information in the testing/troubleshooting tables, the schematic diagrams, and the parts list.

This section also includes disassembly procedures for the receiver-transmitter group (paragraph 2.4) and the generator (paragraph 2.5) and reassembly procedures for the receiver-transmitter group (paragraph 2.6) and the generator (paragraph 2.7).

2.2 SECOND-LINE MAINTENANCE

2.2.1 Preventive Maintenance

Preventive maintenance is the systematic care, inspection, and servicing performed to maintain the equipment in proper operating condition. To ensure that the equipment is always ready for operation, it must be inspected and serviced systematically so that defects and deterioration may be discovered and corrected before they result in serious damage or equipment failure. Defects or deterioration detected during operation or testing should be noted for corrective action to be taken as soon as operation has ceased. Stop operation immediately if any condition indicates that the equipment may be damaged by continued operation.

2.2.2 Inspection

Perform the following visual and mechanical inspections on a periodic schedule or if the operational status of a radio set is unknown. Take corrective action as described.

a. Inspect cables and connectors and verify that all connectors are locked in place.
b. The pins in the two audio connectors on the control are spring loaded. When depressed and released each pin should freely spring back to its fully extended position. If faulty, replace the control.
c. The whip antenna switch (located on top of the whip antenna connector of the amplifier-coupler) is spring loaded. The switch plunger should freely spring back to its fully extended position when depressed and released. If faulty, replace the amplifier-coupler.

ITEM	COLLINS PART NUMBER
Receiver-Transmitter Control C-5310/URC	622-2553-003
Radio Receiver-Transmitter RT-5047/URC	622-2148-002
Amplifier-Coupler AM-5280/URC	622-2149-001
Radio Receiver-Transmitter RT-5047/URC subassemblies:	
Chassis A1A1	629-3406-001
Mixer A1A2	629-3403-001
Broadhand amplifier A1A3	601-3671-001
Power Supply A1A4	601-3670-001
If/Af amplifier A1A5	629-3405-001
If/af A1A5A1	601-3668-001
Logic/tx A1A5A2	601-3669-001
Frequency synthesizer A1A6	629-3402-002
Frequency standard A1A6A1A1	601-3877-001
Fixed frequency divider A1A6A1A2	601-3876-002
Voltage regulator A1A6A2A1	601-3874-002
Variable frequency divider A1A6A2A2	601-3875-002
Hf phase-lock loop A1A6A2A3	635-8154-001
Lf phase-lock loop A1A6A1A3	601-3879-001
Frequency converter A1A6A1A4	601-3878-001
Amplifier-Coupler AM-5280/URC subassemblies:	
Servo amplifier A3A1	601-3673-001
Control logic A3A2	601-3672-001
Rf subassembly A3A4A1	623-7287-001
Bias/control A3A4A1	623-3675-001
Bandswitch A3A5	629-3414-001
Discriminator A3A6	629-3409-001
Tuning capacitor A3A7	629-3412-001
Tuning coil A3A8	629-3413-001
Autotransformer A3A9	629-3407-001

Table 2-1. Receiver-Transmitter Group Second-Line Replaceable Items

d. Intermittent operation usually indicates a faulty connector. If the audio in the earpiece is intermittently received, inspect all connectors for signs of corrosion or pin misalignment. If a faulty connector is detected and cleaning or realignment of pins doesn't clear the trouble, replace the handset or headset. If trouble persists, refer to the troubleshooting procedures for the receiver-transmitter group.

e. Inspect the generator/battery as follows:

1. When the generator is not connected to a battery or to the receiver-transmitter group (no lead) it should crank freely without supplying any current. While turning the crank, verify smooth cranking operation with no binding or grating and observe that the indicator lamps are not lit.

CAUTION

Never short the generator output terminals when it is latched to a battery because the battery will be damaged. Also, do not apply excessive force to obtain high cranking speed when the generator outputs are shorted, as damage to the gearbox may result.

2. With the generator output terminals shorted together, maximum rotational restance should be felt and the indicator lamps should not light when the generator is cranked. If abnormal indications are detected in this step, refer to test/troubleshooting procedures for the generator in this section.
3. If the generator indications are normal in step (2), but turns freely (and indicator lamps on generator don't light) when cranked with a battery attached, an open circuit between generator output terminals is indicated. Verify that the connections between generator and battery are clean and properly engaged. If trouble persists, replace battery.
4. The generator alone will not power the receiver-transmitter group (a good battery must be attached to the receiver-transmitter group). But, with only the generator attached to the receiver-transmitter group, the operator should be able to illuminate the panel lamps on the control by cranking the generator while holding the lamp switch down. If the panel lamps do not light and the green indicator lamp on the generator also does not light (indicating that the generator is not supplying current), check the following for faults:

(a) The connector between the generator and the receiver-transmitter group (bad connection).
(b) Fuse A3A3A1F1 (blown).
(c) Generator (defective).

2.2.3 Cleaning

Cleaning procedures consist of using a dry soft-bristled brush to remove dust and lint and a soft rag moistened with a mild detergent solution to remove marks, smudges, and oil film deposits. Regular cleaning is limited to the exterior of the receiver-transmitter group.

2.2.4 Test Equipment Requirements

Table 2-2 lists the test equipment, or equivalent, required to perform receiver-transmitter group second-line maintenance procedures. Common general purpose tools and materials that are readily available are not included. Also, most cables, adapters, T-connectors, etc required for the test equipment setups are not identified in the test equipment table or on the test setup diagrams.

ITEM	RECOMMENDED TYPE
Radio Test Set AN/PRM-501	AN/PRM-501
Ac vtvm	Hewlett-Packard 400E
Attenuator, rf (20-dB/20-watt/50-ohm) (2 required)	Weinschel 9214-20
Attenuator, Audio	Hewlett-Packard 350B
Attenuator, 6-dB	Measurements 80-ZH3
Digital voltmeter	Fluke 8000A
Distortion analyzer	Hewlett-Packard 333A
Frequency counter	Fluke 1920A
Handset	Handset-Microphone H-5016/PRC-515
Isolation transformer, 600-ohm	Hewlett-Packard 11005A
Mixer-attenuator, 600-ohm	Customer supplied, refer to figure 2-31 for schematic diagram
Multimeter	Hewlett-Packard 410C
Oscillator (2 required)	Hewlett-Packard 204C
Oscilloscope	Tektronix 464
Power divider	Weinschel 1506A
Power supply, 22-30-V dc (5 amp)	Hewlett-Packard 6266B
Probe coaxial T connector	Hewlett-Packard 11042A
Receiver-transmitter control	Receiver-Transmitter Control C-5310/URC

Table 2-2. Receiver-Transmitter Group, Second-Line Maintenance Test Equipment Required.

ITEM	RECOMMENDED TYPE
Signal generator (2 required)	Hewlett-Packard 8650B with option 001 and option 003 or fuseholder 11509A
Spectrum analyzer	Hewlett-Packard 141T with 8552B if section and 8553B rf section (1-KHz to 110MHz)
Voltage divider capacitive (100:1)	Hewlett-Packard 11040A
Wave analyzer	Hewlett-Packard 3581A
Whip antenna	Antenna AS-5093/PRC-515

Table 2-2. Receiver-Transmitter Group, Second-Line Maintenance Test Equipment Required (cont)

Table 2-3 lists the test equipment, or equivalent, required to perform generator second-line maintenance procedures.

2.2.5 Receiver-Transmitter Group Minimum Performance Test

Table 2-4 is a minimum performance test for the receiver-transmitter group. Perform test steps in the order presented in the PROCEDURE column. Results in the MINIMUM PERFORMANCE STANDARD column will be obtained if the receiver-transmitter group is operating properly. If these results are not obtained, perform the procedure described in the IF INDICATION IS ABNORMAL column and repeat the minimum performance test. The corrective procedure in the IF INDICATION IS ABNORMAL column is primarily substitution of "known good units" (receiver-transmitter, control, or amplifier-coupler) in the sequence specified until the faulty unit is identified (the fault is cleared). When a faulty receiver-transmitter A1 is identified, perform testing/troubleshooting procedures in table 2-5. When a faulty antenna-coupler A3 is identified, perform testing/troubleshooting procedures in table 2-6. When a faulty control A2 is identified, it is directed to third-line maintenance. If receiver-transmitter A1 or antenna coupler A3 is identified as faulty, substitution of second-line replaceable subassemblies (see table 2-1) may isolate the fault to a defective subassembly which is directed to third-line maintenance. Refer to disassembly and reassembly procedures in this section to remove and replace units and to the schematics section for electrical interconnection of units.

NOTE

For receiver tests, if local interference or receiver internal spurious responses are encountered, the tests may be performed at frequencies 10 kHz higher than those specified.

ITEM	RECOMMENDED TYPE
Ammeter, 0-500 ma	Hallmark Standards MPFB
Battery, 25.2 V dc	Storage Battery BB-706/U
Multimeter	Hewlett Packard 410C
Power Supply, 40-100 V dc (2 amp at 40 V dc and 200 ma at 100 V dc)	

Table 2-3. Generator, Second-Line Maintenance Test Equipment Required

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Power check	Connect test equipment as shown in figure 2-1, test setup A. On control A2, set MEGAHERTZ KILOHERTZ to 02.000, POWER/ PUISSANCE to ⊓ , OFF/ FERMÉ to maximum clockwise, and MODE to USB.		
	Adjust 22-30 V dc power supply for 25.2 ±0.1 V dc. Set the test set PWR to ON and observe line current indication on the 22 - 30 V dc power supply ammeter.	55-75 ma	Replace, in order, amplifier coupler, receiver-transmitter, and control. If replacing the amplifier-coupler corrects the fault, check fuse A3A3A1F1. If replacing the receiver-transmitter corrects the fault, replace, in order, power supply A1A4 and chassis A1A1.
2 Lamp test	On control A2, press ⍾ button and observe MEGAHERTZ KILOHERTZ switches.	A11 switches light.	Replace lamp for any unlit switch. If all lamps are unlit, replace, in order, control and amplifier-coupler.
3 Receive audio	a. With MODE switch on control A2 set to USB and handset connected to A2J1, listen to handset.	Hiss is heard in earpiece.	Connect handset to A2J2 on control A2. Replace, in order, handset, control, receiver-transmitter, and amplifier-coupler. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies (except A1A3) listed in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	b. On control A2, set MODE switch to AM and listen to handset.	Hiss is heard in earpiece.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
4 Receive audio level	While listening to hiss in earpiece turn OFF/FERMÉ control from maximum clockwise to maximum counterclockwise (but not to off).	Hiss decreases to low level.	Replace receiver-transmitter. If Replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
5 Receive audio tune	On Control A2, set MODE switch to USB and OFF/FERMÉ control to maximum clockwise.		
	a. Set signal generator for 2.0010 MHz at a level of 10,000 uV.	1000-Hz tone will be heard in earpiece.	Replace, in order, amplifier-coupler, receiver-transmitter, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
	b. On control A2, set MODE switch to AM. Set signal generator for 2.0000 MHz at a level of 10,000 uV, modulated 30% with 1,000 Hz.	1000-Hz tone will be heard in earpiece.	Same as above

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 Transmit tune	Connect test equipment as shown in figure 2-2 test setup A. Connect the handset to A2J2. On audio adapter, set PTT and CW KEY switches to OFF. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000, POWER/PUISSANCE TO ⊏⊐, OFF/FERMÉ to mid-range, and MODE to USB.		
	Momentarily press ptt switch on the handset and listen to handset and observe rf output on the multimeter.	Tuning cycle is initiated as indicated by a 2000-Hz tone in the earpiece for duration of tune cycle.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace one at a time, the subassemblies listed in table 2-1.
		Rf output power appears on the multimeter and falls to zero when tuning is complete.	Replace, in order amplifier-coupler, receiver-transmitter, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
7 Transmit low voltage fault	Reduce power supply voltage 1 or 2 volts, press ptt switch on the handset, and listen to the handset. Repeat, if necessary, until a clicking sound is heard in the headset. When the clicking sound is obtained, observe the 22-30 V dc power supply output voltage. Readjust power supply output for 25.2 ±0.1 V dc output.	20-22 V dc	Replace, in order receiver-transmitter and amplifier-coupler. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 Transmit power output	Momentarily press ptt switch on the handset and observe rf output on the multimeter. Repeat the procedure for each of the following frequency settings on control A2: 03.0000, 04.0000, 06.0000, 08.0000, 12.0000, 16.0000, 24.0000, and 29.9000 MHz.	26-35 V ac	Replace, in order, amplifier-coupler, receiver-transmitter, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
8.1 Whip antenna tuning	On control A2, set MEGAHERTZ KILOHERTZ to 02.0000. Connect the antenna simulator to A3J4 as shown in figure 2-2 test setup B. Momentarily press ptt switch on the handset and listen to handset for 1 minute. Repeat the procedure for each of the following frequency settings on control A2: 03.0000, 04.0000, 06.0000, 08.0000, 12.0000, 16.0000, 24.0000, and 29.9000 MHz. Disconnect antenna simulator after completion of test.	Tuning cycle is initiated as indicated by a 2000-Hz tone in the earpiece for duration of tune cycle, and pulsed tune fault tone will not be heard after ptt switch is pressed.	Replace antenna-coupler.
9 Transmit tune fault	On control A2, set MEGAHERTZ KILOHERTZ to 25.0000. Disconnect all test equipment at A3J3 (presents open circuit). Momentarily press ptt switch on the handset and listen to the handset.	Pulsed tune fault tone will be heard 15-36 seconds after the ptt switch is pressed.	Repeat at another frequency in 20.0000-29.9999 MHz range. If normal indication is not obtained, replace, in order, amplifier-coupler, receiver-transmitter and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 Receive sensitivity	Connect test equipment as shown in figure 2-1 test setup B. (Use 3 rf attenuators: two 20 dB and one 6 dB.) On control A2, set MEGAHERTZ KILOHERTZ to 02.0000, POWER/PUISSANCE to ⊟, OFF/FERMÉ to mid-range, and MODE to USB. On audio adapter, set PTT to MOM.		
	a. On signal generator, set AM modulation to OFF. Set signal generator for 2.0010 MHz at a level of 100 uV. On the distortion analyzer, measure the signal-plus-noise to noise ratio ((S+N)/N) by nulling out the 1000-Hz audio.	Not less than 10 dB.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
	b. On control A2, set MODE to AM. Set signal generator for 2.0000 MHz modulated 30% at 1000 Hz at a level of 350 uV. Measure the (S+N)/N ratio by turning off the AM modulation.	Not less than 10 dB.	Same as above.
	c. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000 and MODE to USB. On audio adapter, set PTT to MOM. Set signal generator for 16.0010 MHz at a level of 100 uV. Measure the (S+N)/N ratio as in step a.	Not less than 10 dB.	Same as above.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 (cont)	d. On control A2, set MODE to AM. Set signal generator for 16.0000 MHz, modulated 30% at 1000 Hz at a level of 350 uV. Measure the (S+N)/N ratio as in step b.	Not less than 10 dB.	Same as above.
	e. On control A2, set MEGAHERTZ KILOHERTZ to 29.0000 and MODE to USB. On audio adapter, set PTT to MOM. Set signal generator for 29.0010 MHz at a level of 100 uV. Measure the (S+N)/N ratio as in step a.	Not less than 10 dB.	Same as above.
	f. On control A2, set MODE to AM. Set signal generator for 29.0000 MHz, modulated 30% at 1000 Hz at a level of 350 uV. Measure the (S+N)/N ratio as in step b.	Not less than 10 dB.	Same as above.
11 Receive harmonic distortion	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to [=], OFF/FERMÉ to maximum clockwise, and MODE to USB. NOTE Disconnect signal generator prior to setting PTT to MOM position to avoid possible damage to signal generator. On the audio adapter, set PTT switch in MOM position until the coupler has tuned (should complete in 7 seconds maximum).		

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	a. Reconnect signal generator and set for 16.0010 MHz at a level of 100,000 uV. Adjust the OFF/FERMÉ control for a receiver output of 10 dBm on the distortion analyzer. On the distortion analyzer, measure the harmonic distortion.	Less than 10%.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
	b. On control A2, set MODE to AM. Set signal generator for 16,0000 MHz, modulated 90% at 1000 Hz at a level of 100,000 uV. Adjust the OFF/FERMÉ control for a receiver output of 10 dBM on the distortion analyzer. On the distortion analyzer, measure harmonic distortion.	Less than 10%.	Same as above.
12 Receive volume range	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to [=], OFF/FERMÉ to maximum clockwise, and MODE to USB. Set signal generator for 16.0010 MHz at a level of 100,000 uV. Adjust the OFF/FERMÉ control for a receiver output of 10 dBm on the distortion analyzer (establishes a 0 dB reference point). Adjust OFF/FERMÉ for maximum counterclockwise (but not off) and measure the dB change in receiver output on the distortion analyzer.	30 dB minimum.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.
13 Receive agc	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE TO [=], OFF/FERMÉ to mid-range, and MODE to USB. Connect the signal generator and 6-dB attenuator to A3J3 (removes the two rf	Less than 3 dB.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault,

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
13 (cont)	attenuators). Set signal generator for 16.0010 MHz at a level of 100 uV. Record the receiver output on the distortion analyzer (establishes a 0 dB reference point). Measure the dB change in receiver output on the distortion analyzer while changing the signal generator to several output levels between 3 uV and 100 uV. Measure the dB change in receiver output on the distortion analyzer while changing the signal generator to several output levels between 100 uV and 100,000 uV.		replace, one at a time, the subassemblies listed in table 2-1.
14 Receive selectivity	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/ PUISSANCE to [=], OFF/ FERMÉ to mid-range, and MODE to USB. Connect the two rf attenuators between the 6-dB attenuator and A3J3.		
	a. Set signal generator for 16.0010 MHz at a level of 100 uV. Adjust signal generator frequency for maximum receiver output on the distortion analyzer. Record the receiver output on the distortion analyzer (establishes a reference level). Increase signal generator output level to 200 uV. Set the signal generator to 16.00035 MHz and observe the receiver output on the distortion analyzer. Set signal generator to 16.0032 MHz and observe the receiver output on the distortion analzyer.	Equal to or greater than reference level.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace one at a time, the subassemblies listed in table 2-1.
	b. On control A2, set MODE to AM. Set signal generator for 16.0000 MHz, modulated 30%	0 to -9 dB of the reference level for 2750-Hz	Same as above.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14 (cont)	at 1000 Hz at a level of 100,000 uV. Record the receiver output on the distortion analyzer (establishes a reference level). On the signal generator, increase the modulation frequency to 2750 Hz, then decrease it to 2000 Hz. Observe the receiver output on the distortion analyzer for both modulation frequencies.	modulation frequency and 0 to -3 dB of the reference level for 2000-Hz modulation frequency.	
15 Receive if and image rejection	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/ PUISSANCE to [=], OFF/FERMÉ to mid-range, and MODE to USB.		
	NOTE Disconnect signal generator prior to setting PTT to MOM position to avoid possible damage to signal generator.		
	On the audio adapter, set PTT switch in MOM position until the coupler has tuned (should complete in 7 seconds maximum).		
	Reconnect signal generator and set for 16.0010 MHz at a level of 100 uV. Record the receiver output on the distortion analyzer (establishes a reference level).		
	a. Set signal generator to 4.9990 MHz (2nd if) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 70 dB above the reference level.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies, listed in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
15 (cont)	NOTE The two rf attenuators may be removed in order to obtain the required level in step a, b, c, and d.		
	b. Set signal generator to 114.9990 MHz (1st if) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 70 dB above the reference level.	Same as above.
	c. Set signal generator to 245.9990 MHz (1st if image) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 60 dB above the reference level.	Same as above.
	d. Set signal generator to 25.9990 MHz (2nd if image) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 60 dB above the reference level.	Same as above.
16 Transmit power output	Connect test equipment as shown in figure 2-2 test setup A. On audio adapter, set PTT and CW KEY to OFF. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000, POWER/PUISSANCE to ⊓, OFF/FERMÉ to mid-range, and MODE to USB.		
	a. Set oscillator for 1000 Hz, and an input level to the receiver-transmitter group of -26 dBm measured on the ac vtvm. On the audio adapter, set PTT switch to MOM and, using the multimeter, observe the receiver-transmitter group rf output.	26.6-35.1 V ac after tuning is complete.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
16 (cont)	b. On control A2, change the frequency to 2.99 MHz, set PTT switch on the audio adapter to MOM, and observe the rf output.	26.6-35.1 V ac after tuning is complete.	Same as above.
	c. Repeat step b for the following frequencies: 3.0, 3.99, 4.0, 5.99, 6.0, 7.99, 8.0, 11.99 12.0, 15.99, 16.0, 23.99, 24.0, and 29.99 MHz.	26.6-35.1 V ac after tuning is complete.	Same as above.
	d. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000 and POWER/PUISSANCE to [=] . Check that the 1000-Hz input level to the receiver-transmitter group is -26 dBm. On the audio adapter, set PTT switch to MOM and observe the rf output.	8.6-15.0 V ac after tuning is complete.	Same as above.
	e. On control A2, change the frequency to 2.99 MHz, set the PTT switch on the audio adapter to MOM, and observe the rf output.	8.6-15.0 V ac after tuning is complete.	Same as above.
	f. Repeat step e for the following frequencies: 3.0, 3.99, 4.0, 5.99, 6.0, 7.99, 8.0, 11.99, 12.0, 15.99, 16.0, 23.99, 24.0, and 29.99 MHz.	8.6-15.0 V ac after tuning is complete.	Same as above.
17 Transmit AM modulation	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to [ ] , OFF/FERMÉ to mid-range and MODE to AM. Set oscillator for 1000 Hz and an input level to the receiver-transmitter group of -54 dBm measured on the ac vtvm when transmitter is keyed.		

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17 (cont)	a. On the audio adapter, set PTT switch to MOM and observe carrier and sideband on the spectrum analyzer. Adjust the 1000-Hz audio input frequency to locate the peak sideband level.	Amplitude of sideband and carrier are within ± 2 dB of each other.	Replace, in order, receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies, listed in table 2-1.
	b. On oscillator, set input level to the receiver-transmitter.group for -26 dBm. Repeat step a.	Amplitude of sideband and carrier a are within ±2 dB of each other.	Same as above.
18 Transmit carrier suppression	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to ⊓, OFF/FERMÉ to mid-range, and MODE to USB. Set oscillator for 1000 Hz and an input level to the receiver-transmitter group of -54 dBm measured on the ac vtvm. On the audio adapter, set PTT switch to MOM and observe the carrier suppression. NOTE If necessary to locate the carrier, set MODE switch on control A2 to AM, disconnect oscillator, and set PTT switch on the audio adapter to MOM.	-50 dB minimum	Replace, in order receiver-transmitter, amplifier-coupler, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.

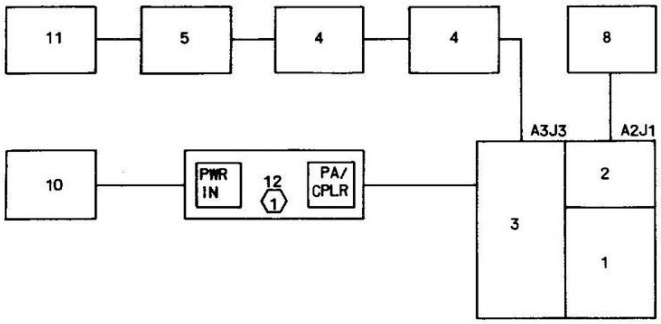
Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19 Transmit inter-modulation distortion	Connect the test equipment as shown in figure 2-2, test setup B. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000, POWER/PUISSANCE to ⊓, OFF/FERMÉ to mid-range, and MODE to USB. On mixer-attenuator, set AUDIO LOAD/ OSC 1 IN to OSC 1 IN and AUDIO LOAD/ OSC 2 IN to AUDIO LOAD. Set oscillator No. 1 for 1000 Hz and an input level to the receiver-transmitter group of -32 dBm measured on the ac vtvm. Set AUDIO LOAD/OSC 1 IN to AUDIO LOAD and AUDIO/OSC 2 IN to OSC 2 IN. Set oscillator No. 2 for 1600 Hz and an input level to the receiver-transmitter group of -32 dBm measured on the ac vtvm. Set AUDIO LOAD/OSC 1 IN to OSC 1 IN (both oscillators will now be connected to the input of the receiver-transmitter group). a. On the audio adapter, set PTT switch to MOM and observe the third and fifth order intermodulation products on the spectrum analyzer.	-25 dB minimum relative to the 2-tone signal.	Replace, in order amplifier-coupler, receiver-transmitter, and control. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies listed in table 2-1.

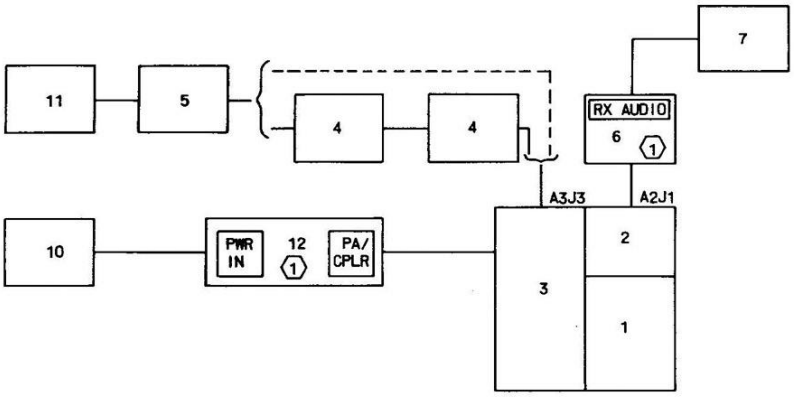
Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19 (cont)	b. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000. Repeat step a.	-25 dB minimum relative to the 2-tone signal.	Same as above.
	c. On control A2, set MEGAHERTZ KILOHERTZ to 29.0000. Repeat step a.	-25 dB minimum relative to the 2-tone signal.	Same as above.
20 Transmit cw operation	Connect the test equipment as shown in figure 2-2, test setup A. Connect the oscilloscope in place of the spectrum analyzer. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to ⊓, OFF/FERMÉ to mid-range, and MODE to USB. On the audio adapter, set CW KEY switch to MOM and note that cw side-tone is heard. Measure the cw hang time on the oscilloscope from the point the switch is closed to the point where the rf first appears.	0.75-1.25 seconds hang time.	Replace receiver-transmitter. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies in table 2-1.
21 Transmit alc attack time	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000, POWER/PUISSANCE to ⊓, OFF/FERMÉ to mid-range, and MODE to USB. On the audio adapter, set CW KEY switch to MOM to trigger the oscilloscope. On the audio adapter, set CW KEY switch to MOM and measure alc attack time on the oscilloscope from the first appearance of output to the point where the output is within 3 dB of its final value.	15 milliseconds maximum.	Replace, in order, receiver-transmitter, and amplifier-coupler. If replacing the receiver-transmitter corrects the fault, replace, one at a time, the subassemblies in table 2-1.

Table 2-4. Receiver-Transmitter Group Minimum Performance Test (cont)



TEST SETUP A



TEST SETUP B

1. RECEIVER-TRANSMITTER A1
2. CONTROL A2
3. AMPLIFIER-COUPLER A3
4. ATTENUATOR, RF (2 REQUIRED)
5. ATTENUATOR, 6-dB
6. AUDIO ADAPTER
7. DISTORTION ANALYZER
8. HANDSET
9. ISOLATION TRANSFORMER
10. POWER SUPPLY, 22-30 V DC
11. SIGNAL GENERATOR
12. TEST FIXTURE

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-501.

(2) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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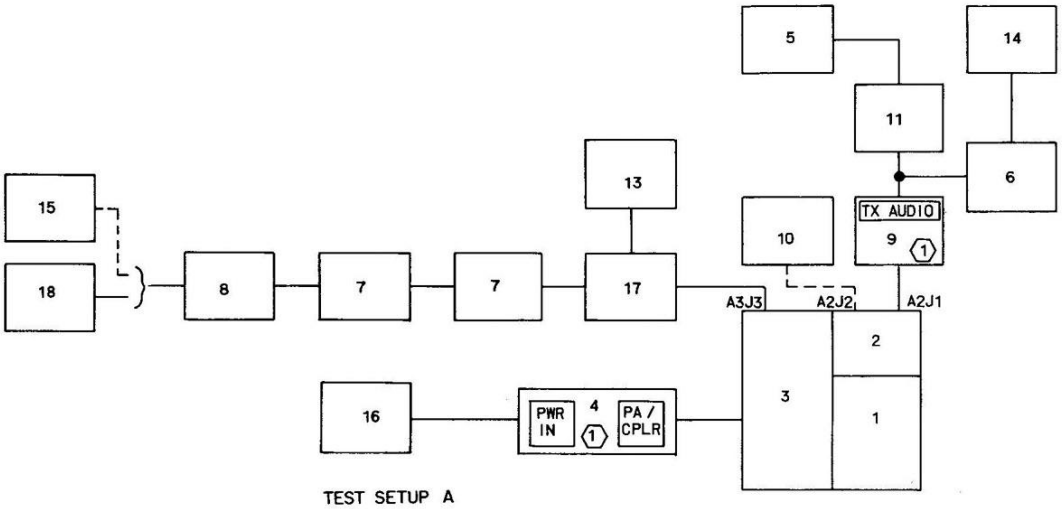
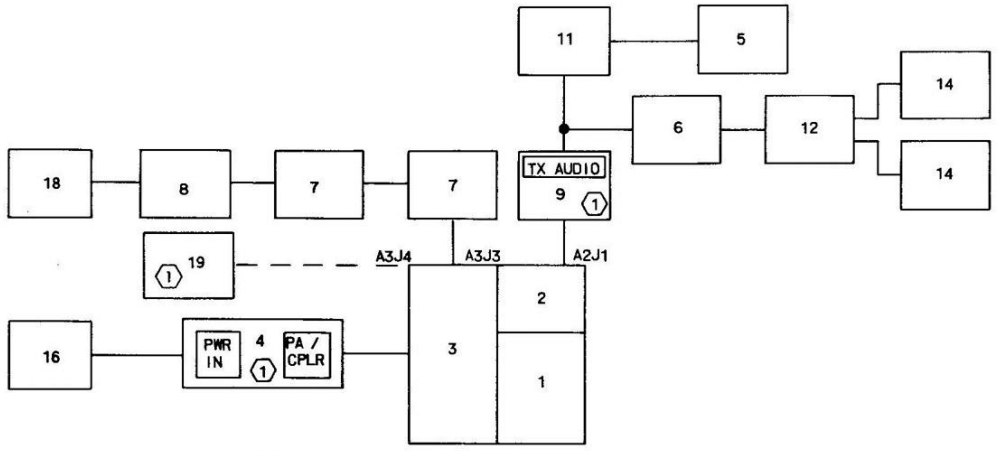
Figure 2-1. Receiver-Transmitter Group, Receive Test Setup



TEST SETUP A



TEST SETUP B

1. RECEIVER-TRANSMITTER A1
2. CONTROL A2
3. AMPLIFIER-COUPLER A3
4. TEST FIXTURE
5. AC VTVM
6. ATTENUATOR, AUDIO
7. ATTENUATOR, RF (2 REQUIRED)
8. ATTENUATOR, 6 dB
9. AUDIO ADAPTER
10. HANDSET
11. ISOLATION TRANSFORMER, 600 OHM
12. MIXER-ATTENUATOR, 600 OHM
13. MULTIMETER
14. OSCILLATOR (2 REQUIRED)
15. OSCILLOSCOPE
16. POWER SUPPLY, 22-30 V DC
17. PROBE COAXIAL T CONNECTOR
18. SPECTRUM ANALYZER
19. ANTENNA SIMULATOR

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-501.

(2) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED

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Figure 2-2. Receiver-Transmitter Group, Transmit Test Setup

2.2.6 Receiver-Transmitter A1, Testing/Troubleshooting

2.2.6.1 Test Equipment Required

The following test equipment items from table 2-2 are required to perform the procedures in table 2-5.

Radio Test Set AN/PRM-501	Mixer-attenuator, 600-ohm (refer to figure 2-31)
Receiver-transmitter control	Multimeter
	Oscillator (2 required)
A c vtvm	Power supply, 22-30 V dc
Attenuator, audio	
Attenuator, rf (20 dB/20 watt/ 50-ohm)	Probe coaxial T connector
Attenuator, 6 dB	
Digital voltmeter	Signal generator (2 required)
Distortion analyzer	
Frequency counter	Spectrum analyzer (if section and 1-kHz to 110-MHz rf section)
Handset	
Isolation transformer, 600-ohm	Wave analyzer

2.2.6.2 Testing/Troubleshooting

Perform the procedures in the following table to isolate a fault to a replaceable subassembly or to verify proper operation of receiver-transmitter A1. When a defective subassembly is replaced, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Test Setup	a. Connect the test equipment as shown in figure 2-3 test setup A. b. On test fixture, set controls as follows: PWR to OFF CPLR PWR to R/E R/E PWR to EXT C/H-004 to OFF BAND INFO to R/E AUX AF to OFF RF GAIN control (ADJUST to maximum counterclockwise) RF GAIN switch to disable (down position) ALC switch to EXT EXT ALC switch to +13V EXT ALC control (ALC ADJ) to maximum counterclockwise AM-USB-LSB to USB KEY, PTT, CWK, ST, FLT, RCL, TIP, RX MUTE, and LP to disable (down position) RX ONLY to ENABLE NOTE L and C switches have no affect and can be in any position. On audio adapter, set PTT and CW KEY to OFF. C. On control A2, set MEGA-HERTZ KILOHERTZ to 02.0000, POWER/PUISSANCE to [=], OFF/FERMÉ to maximum counterclockwise (but not to off), and MODE to USB. On test fixture, set PWR to ON.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 Power check	a. Adjust 22-30 V dc power supply for 25.2 ±0.1 V dc and observe line current reading on 22-30 V dc power supply ammeter.	55-70 mA	If less than 55 mA, perform step b. If greater than 70 mA, replace, in order, power supply A1A4, logic/tx A1A5A2, if/af A1A5A1, mixer A1A2, frequency synthesizer A1A6, and broadband amplifier A1A3.
	b. Measure voltage at 24V test point on test fixture.	+25.0 to +25.4 Vdc	Replace, in order, power supply A1A4, broadband amplifier A1A3, and chassis A1A1.
	c. Measure voltage at +13V test point on test fixture	+12.9 to +13.1 Vdc	Replace, in order, power supply A1A4, logic/tx A1A5A2, if/af A1A5A1, and frequency synthesizer A1A6.
	d. Measure voltage at +5V test point on test fixture.	+5.1 to +5.3 Vdc	Same as above.
	e. On test fixture, set $\overline{\text{CWK}}$ to ENABLE and observe line current reading on 22-30 Vdc power supply ammeter. Return $\overline{\text{CWK}}$ to down position.	55 to 75 mA.	Replace logic/tx A1A5A2. Check chassis A1A1 wiring.
	f. On test fixture, set $\overline{\text{RX ONLY}}$ to down position and $\overline{\text{CWK}}$ to ENABLE and observe line current reading on 22-30 V dc power supply ammeter. Return $\overline{\text{RX ONLY}}$ to ENABLE and $\overline{\text{CWK}}$ to down position.	235 to 280 mA.	Replace, in order broadband amplifier A1A3 and logic/tx A1A5A2. Check chassis A1A1 wiring.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 Tune start	On control A2, change each digit of the MEGAHERTZ KILOHERTZ control one digit at a time, and observe line current reading on 22-30 V dc power supply ammeter. Return MEGAHERTZ KILOHERTZ to 02.0000.	Current rises to 130 to 190 mA for approximately 3 seconds after each frequency change.	Replace frequency synthesizer A1A6. Check chassis A1A1 wiring.
4 Receive audio	On control A2, set OFF/FERMÉ to maximum clockwise and listen to handset.	Hiss is heard in earpiece.	Replace, in order, mixer A1A2 and if/af A1A5A1. Check chassis A1A1 wiring.
5 Receive audio tone	Set signal generator for 2.0010 MHz at a level of 5000 uV and listen to handset.	1000-Hz tone is heard in earpiece.	Replace, in order, mixer A1A2, if/af A1A5A1, and frequency synthesizer A1A6. Check chassis A1A1 wiring.
6 Receive audio level	a. While listening to 1000-Hz tone in earpiece, turn OFF/FERMÉ from maximum clockwise to maximum counterclockwise (but not to off). b. Set OFF/FERMÉ to mid-range.	1000-Hz tone heard in earpiece decreases to low level.	Replace if/af A1A5A1 Check chassis A1A1 wiring.
7 Receive rf gain	a. Connect multimeter (dc probe) to RF GAIN test point (VOLTS) on the test fixture. On test fixture, set RF GAIN switch to ENABLE and turn RF GAIN control (ADJUST) from maximum counterclockwise to maximum clockwise while monitoring the handset and the multimeter. Disconnect multimeter. On test fixture, set RF GAIN switch to down position and RF GAIN control to maximum counterclockwise.	1000-Hz tone heard in earpiece decreases and multimeter indicates a voltage change.	Replace if/af A1A5A1. Check chassis A1A1 wiring.
8 Receive mute	On test set, set $\overline{\text{RX MUTE}}$ to ENABLE while monitoring the handset.	The 1000-Hz tone is not heard in earpiece.	Replace if/af A1A5A1. Check chassis A1A1 wiring.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 (cont)	b. On test set, set RX MUTE to down position.		
9 Receive agc	Remove the rf attenuator between the signal generator and the R/E connector (BNC) on the test fixture. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000. Set signal generator for 16.0010 MHz at a level of 100 uV. Record the receiver output on the distortion analyzer (establishes a 0 dB reference point). Measure the dB change in receiver output on the distortion analyzer while changing the signal generator to several output levels between 3 uV and 100 uV and between 100 uV and 100,000 uV. Replace the rf attenuator between the signal generator and the R/E connector on the test fixture.	Less than 3 dB.	Replace, in order, if/af A1A5A1, mixer A1A2, and frequency synthesizer A1A6. Check chassis A1A1 wiring.
10 Receive sensitivity	a. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000. Set signal generator for 2.0010 MHz at a level of 10 uV. On the distortion analyzer, measure the signal-plus-noise to noise ratio ((S+N)/N) by nulling out the 1000-Hz audio.	Not less than 10 dB.	Replace, in order, mixer A1A2, if/af A1A5A1, frequency synthesizer A1A6, and power supply A1A4.
	b. On control A2, set MODE to AM. Set signal generator for 2.0000 MHz, modulated 30% at 1000 Hz at a level of 35 uV. Measure the (S+N/N ratio by turning off the AM modulation.	Not less than 10 dB.	Same as above.
	c. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000 and MODE to USB. Set signal generator for 16.0010 MHz at a level of 10 uV. Measure the (S+N)/N ratio as in step a.	Not less than 10 dB.	Same as above.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	d. On control A2, set MODE to AM. Set signal generator for 16.0000 MHz, modulated 30% at 1000 Hz at a level of 35 uV. Measure the (S+N)/N ratio as in step b.	Not less than 10 dB.	Same as above.
	e. On control A2, set MEGAHERTZ KILOHERTZ to 29.0000 and MODE to USB. Set signal generator for 29.0010 MHz at a level of 10 uV. Measure the (S+N)/N ratio as in step a.	Not less than 10 dB.	Same as above.
	f. On control A2, set MODE to AM. Set signal generator for 29.0000 MHz, modulated 30% at 1000 Hz at a level of 35 uV. Measure the (S+N)/N ratio as in step b.	Not less than 10 dB.	Same as above.
11 Receive if and image rejection	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000 and MODE to USB. Set signal generator for 16.0010 MHz at a level of 10 u V. Record the receiver output on the distortion analyzer (establishes a reference level).		
	a. Set signal generator to 4.9990 MHz (2nd if) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 60 dB above the reference level.	Replace, in order, mixer A1A2 and if/af A1A5A1.
	b. Set signal generator to 114.9990 MHz (1st if) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 60 dB above the reference level.	Same as above.
	c. Set signal generator to 245.9990 MHz (1st if image) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 50 dB above the reference level.	Same as above.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	d. Set signal generator to 25.9990 MHz (2nd if image) and adjust the output level until the reference level is obtained on the distortion analyzer.	At least 50 dB above the reference level.	Same as above.
12 Receive harmonic distortion	Set signal generator for 16.0010 MHz at a level of 10,000 uV. On control A2, adjust the OFF/FERMÉ control for a receiver output of +10 dBm on the distortion analyzer. On the distortion analyzer, measure the harmonic distortion .	Less than 10%.	Replace, in order, if/af A1A5A1, mixer A1A2, frequency synthesizer A1A6, and power supply A1A4.
13 Receive selectivity	a. Set signal generator for 16.0010 MHz at a level of 10 uV. Adjust signal generator frequency for maximum receiver output on the distortion analyzer (establishes a reference level). Increase signal generator output level to 20 uV. Change the signal generator to the reference frequency plus 350 Hz and observe the receiver output on the distortion analyzer. Change the signal generator to the reference frequency plus 3200 Hz and observe the receiver output on the distortion analyzer.	Equal to or greater than the reference level.	Replace, in order, if/af A1A5A1, mixer A1A2, and frequency synthesizer A1A6.
	b. Increase signal generator output level to 10,000 uV. Change the signal generator to the frequency for maximum receive output on the distortion analyzer. Record the receiver output on the distortion analyzer (establishes a reference level). Change the signal generator to the reference frequency plus 6700 Hz and observe the receiver	Equal to or less than the reference level.	Same as above.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
13 (cont)	output on the distortion analyzer. Change the signal generator to the reference frequency minus 300 Hz and observe the receiver output on the distortion analyzer. c. On control A2 set MODE to AM (frequency 16.0000 MHz), set signal generator to 16.0000 MHz, 1000 uV modulated 30% at 1000 Hz. d. Adjust modulation frequency for maximum receive output on distortion analyzer (establishes a reference level). e. Increase modulation frequency to 2750 Hz and measure receive output.	Within ±4.5 dB of reference step d.	Same as step a.
14 Receive in-band intermodulation	a. Connect test equipment as shown in figure 2-3 test setup B. Set controls as specified in step 1.b. On control A2, set MEGAHERTZ KILOHERTZ to 2.0000, POWER/PUISSANCE to [=], OFF/FERMÉ to mid-range, and MODE to USB. On test fixture set PWR to ON. b. Set one signal generator to 2.00100 MHz and the other signal generator to 2.00111 MHz with an output level of 200 mV from each signal generator. Observe the third-order intermodulation products on the wave analyzer.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
14 (cont)	c. Tune the wave analyzer to obtain peak response near 890 Hz and 1200 Hz.	No less than -30 dB.	Replace, in order, if/af A1A5A1 and mixer A1A2.
15 Receive front-end intermodulation	a. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000. On test fixture, disconnect jumper cable connected to R/E. Connect one of the signal generators to the R/E connector. Set this signal generator for 16.0010 MHz at a level of 2 uV. Observe the receiver output on the wave analyzer (establishes a reference level). Return test setup to the original configuration.		
	b. Set one signal generator to 7.0000 MHz and the other signal generator to 9.0010 MHz with an output level of 2000 uV from each rf signal generator. Observe the receiver output on the wave analyzer.	Less than the reference level.	Replace, in order, if/af A1A5A1 and mixer A1A2.
	c. Set one signal generator to 10.0000 MHz and the other signal generator to 13.0005 MHz with an output level of 2000 uV from each signal generator. Observe the receiver output on the wave analyzer.	Less than the reference level.	Same as above.
16 Receive desensitization	Disconnect the wave analyzer from the isolation transformer and connect the distortion analyzer in its place. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
16 (cont)	a. Set one signal generator to 2.0010 MHz at an output level of 2 uV and the other signal generator to 2.0500 MHz at an output level of 2 uV.		
	b. Increase the output level on the signal generator tuned to 2.0500 MHz by 70 dB (to 6320 uV). Measure the signal-plus-noise to noise ratio (S+N)/N) by nulling out the 1000-Hz audio.	Not less than 7 dB.	Replace, in order, mixer A1A2, if/af A1A5A1, mixer A1A2, frequency synthesizer A1A6, and power supply A1A4.
	c. On the signal generator tuned to 2.0500 MHz, set the frequency for 1.9500 MHz with the same output level as in step b. Measure the (S+N)/N ratio as in step b.	Not less than 7 dB.	Same as above.
17 Receive discrete single signal spurious	On control A2, set MEGAHERTZ KILOHERTZ to 16.0000. Set one signal generator to off. Set the other signal generator to 16.0010 MHz at a level of 2 uV. Observe the receiver output on the distortion analyzer (establishes a reference level). Set the signal generator to 16.1010 MHz at a level of 2000 uV. Observe the receiver output on the distortion analyzer.	Less than the reference level.	Replace, in order, if/af A1A5A1, mixer A1A2, frequency synthesizer A1A6, and power supply A1A4.
18 Receive cross modulation	On control A2, set MODE to AM. Set one signal generator to off. Set the other signal generator to 16.0000 MHz modulated 30% at 1000 Hz at a level of 20 uV. Observe the receiver output on the distortion analyzer (establishes a reference level).		
	Remove the 1000 Hz modulation. Turn on the other signal generator and set it for 14.4000 MHz modulated 30% at 1000 Hz at a	Not less than 10 dB below the reference level.	Replace, in order, if/af A1A5A1, mixer A1A2, frequency synthesizer

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18 (cont)	level of 200 mV. Observe the receiver output on the distortion analyzer.		A1A6, and power supply A1A4.
19 Transmit sidetone and power output	a. Connect test equipment as shown in figure 2-4 test setup A, except connect the frequency counter to the 20 dB attenuator instead of the spectrum analyzer. b. On test fixture, set controls as follows: PWR to OFF CPLR PWR to R/E R/E PWR to EXT C/H-004 to OFF BAND INFO to R/E AUX AF to OFF RF GAIN control (ADJUST) to maximum counterclockwise RF GAIN switch to disable (down position) ALC switch to EXT EXT ALC switch to +13V EXT ALC control (ALC ADJ) to maximum countercloskwise AM-USB-LSB to USB $\overline{\text{KEY}}$, $\overline{\text{PTT}}$, $\overline{\text{CWK}}$, ST, FLT, $\overline{\text{RCL}}$, $\overline{\text{TIP}}$, $\overline{\text{RX ONLY}}$, $\overline{\text{RX MUTE}}$, and LP to disable (down position). NOTE L and C switches have no affect and can be in any position. On audio adapter, set PTT and CW KEY to OFF. On test fixture, set PWR to ON.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19 (cont)	c. On test fixture, set $\overline{\text{TIP}}$ to ENABLE and listen to hand set.	2,000-Hz tone heard in earpiece.	Replace, in order, broadband amplifier A1A3, logic/tx A1A5A2, if/af A1A5A1, mixer A1A2, frequency synthesizer A1A6. Check chassis A1A1 wiring.
	d. Measure rf voltage output level on the multimeter.	3.5-4.7 Vrms	Same as above.
20 Transmit fault	a. On test fixture, leave $\overline{\text{TIP}}$ set to ENABLE and set FLT to ENABLE. Measure rf voltage output level on the multimeter.	Rf voltage output level falls to zero.	Replace logic/tx A1A5A2.
	b. On test fixture, set $\overline{\text{TIP}}$ to down position while listening to the handset. On test fixture, set FLT to down position.	Pulsed tune fault tone (beeping) in the earpiece.	Same as above.
21 Transmit frequency	a. On control A2, set MEGA-HERTZ KILOHERTZ to 29.9999, POWER/PUISSANCE to ⏻, OFF/FERMÉ to mid-range, and MODE to AM. On test fixture, set AM-USB-LSB to AM and $\overline{\text{PTT}}$ to ENABLE. Observe the frequency output on the frequency counter.	29.999876-29.999924 MHz	Replace, in order, frequency synthesizer A1A6, if/af A1A5A1, mixer A1A2, and broadband amplifier A1A3. Check +25.2-V dc filtered circuits on chassis A1A1.
	b. Repeat step a for the following frequencies: 18.8888, 7.7777, and 2.0000 MHz. On test fixture, set $\overline{\text{PTT}}$ to down position. Disconnect the frequency counter from the rf attenuator and connect the spectrum analyzer in its place.	18.888780-18.888820 MHz, 7.777690-7.777710 MHz, and 1.999995-2.000005 MHz.	Same as above.
22 Transmit CW key and sidetone	a. On test fixture, set $\overline{\text{CWK}}$ to ENABLE. Observe rf output on the multimeter.	Rf output present	Replace, in order, broadband amplifier A1A3, logic/tx A1A5A2, mixer A1A2, and frequency synthesizer A1A6. Check chassis A1A1 wiring.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
22 (cont)	b. On test fixture, set ST to ENABLE. Monitor sidetone on the headset.	2000-Hz tone heard in the headset.	Replace, in order, logic/tx A1A5A2 and frequency synthesizer A1A6. Check chassis A1A1 wiring.
	c. On test fixture, set ST and $\overline{\text{CWK}}$ to down position.		
23 Transmit frequency response	a. On control A2, set MEGAHERTZ KILOHERTZ to 02.0000 and MODE to USB.		
	b. Set oscillator for 1000 Hz, and an input to the receiver-transmitter of -20 dBm measured on the ac vtvm. On test fixture, set $\overline{\text{PTT}}$ to ENABLE and AM/USB/LSB to USB. Establish an rf output reference on the spectrum analyzer.		
	NOTE The spectrum analyzer BANDWIDTH, SCAN WIDTH, and SCAN TIME PER DIV must be the same for all frequencies.		
	c. Repeat step b for the following frequencies on control A2: 15.0000 MHz, 24.0000 MHz, and 29.9000 MHz.	Not more than 5 dB variation in the readings for the four frequencies.	Replace, in order, broadband amplifier A1A3, mixer A1A2, logic/tx A1A5A2, frequency synthesizer A1A6, if/af A1A5A1, and power supply A1A4.
	d. On test fixture, set $\overline{\text{PTT}}$ to down position.		
24 Transmit intermodulation distortion	Connect test equipment as shown in figure 2-4 test setup B. On control A2 set MEGAHERTZ KILOHERTZ to 02.0000.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
24 (cont)	On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to OSC 1 IN and AUDIO LOAD/ OSC 2 IN to AUDIO LOAD. Set oscillator No. 1 for 1000 Hz and an input level to the receiver-transmitter group of -32 dBm measured on the ac vtvm. Set AUDIO LOAD/OSC 1 IN to AUDIO LOAD and AUDIO LOAD/OSC 2 IN to OSC 2 IN. Set oscillator No. 2 for 1600 Hz and an input level to the receiver-transmitter group of -32 dBm measured on the ac vtvm. Set AUDIO LOAD/OSC 1 IN to OSC 1 IN (both oscillators will now be connected to the input of the receiver-transmitter group). a. On test fixture, set $\overline{\text{PTT}}$ to ENABLE and EXT ALC control (ALC ADJ) for 3.5 V rms on the multimeter. NOTE EXT ALC switch must be set to +13V and ALC switch must be set to EXT.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
24 (cont)	b. Observe the third order intermodulation products on the spectrum analyzer.	-33 dB minimum	Replace in order, broadband amplifier A1A3, mixer A1A2, if/af A1A5A1, logic/tx A1A5A2, frequency synthesizer, A1A6, and power supply A1A4.
	c. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000. Check that oscillators have -32 dBm outputs and ALC ADJ on the test fixture is set for 3.5 Vrms on the multimeter. Observe the third order intermodulation products on the spectrum analyzer.	-33 dB minimum	Same as above.
	d. Repeat step e for 29.9000 MHz.	-33 dB minimum	Same as above.
	e. On test fixture, set $\overline{\text{PTT}}$ down.	-33 dB minimum	Same as above.
25 Transmit carrier and opposite sideband suppression	a. Connect test equipment as shown in figure 2-4A. On control A2, set MEGAHERTZ KILOHERTZ to 16.0000.		
	b. On test fixture, set $\overline{\text{CWK}}$ to ENABLE and observe the carrier and lower sideband suppression on the spectrum analyzer.	-55 dB minimum	Replace if/af A1A5A1.
	c. On test fixture, set $\overline{\text{CWK}}$ down.		
	NOTE If necessary to locate the carrier, set MODE switch on control A2 and AM-USB-LSB on the test fixture to AM.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
26 Transmit modulation and audio compression	a. On control A2, set MODE to AM. On test fixture, set AM-USB-LSB to AM.		
	b. Set oscillator for 1000 Hz and an input level to the receiver-transmitter of -54 dBm.		
	c. On test fixture, set $\overline{\text{PTT}}$ to ENABLE and observe the carrier and sideband levels on the spectrum analyzer. Adjust the oscillator frequency for peak output level of the sideband on the spectrum analyzer.	Carrier and sideband levels nearly equal (±2 dB).	Increase audio oscillator output level to -53 dBm and repeat step c. If the correct indication is still not obtained, replace in order, if/af A1A5A1 and logic/tx A1A5A2.
	d. Repeat step b and c with an oscillator input level to the receiver-transmitter of -26 dBm.	Carrier and sideband levels nearly equal (±2 dB).	Same as above.
	e. On test fixture, set $\overline{\text{PTT}}$ down.		
27 Transmit second harmonic and spurious	a. On control A2, set MEGA-HERTZ KILOHERTZ to 02.0000 and MODE to USB. On test fixture, set AM-USB-LSB to USB.		
	b. On test fixture, set $\overline{\text{CWK}}$ to ENABLE and EXT ALC control (ALC ADJ) for 3.5 Vrms on the multimeter.		
	c. Observe the second harmonic on the spectrum analyzer.	-25 dB minimum	Replace in order, frequency synthesizer A1A6, if/af A1A5A1, logic/tx A1A5A2, mixer A1A2, broadband amplifier A1A3, and power supply A1A4.

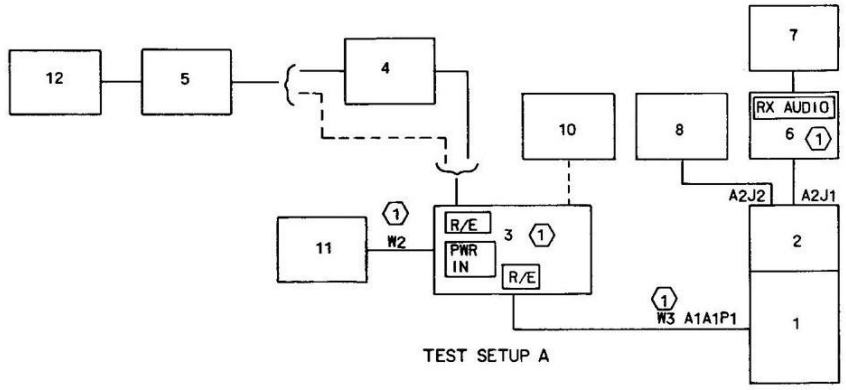
Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

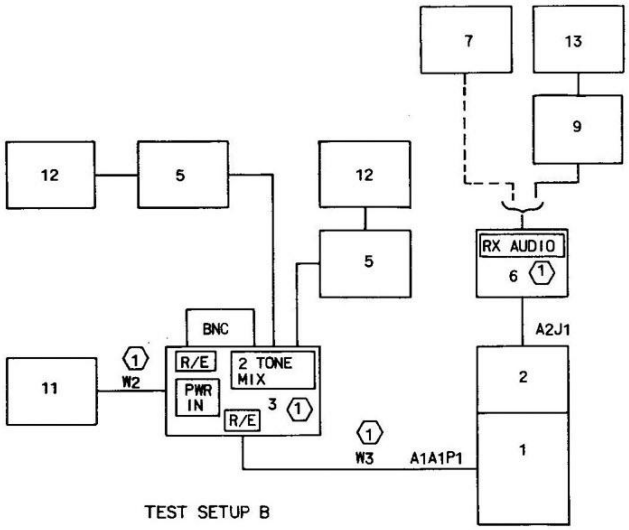
STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
27 (cont)	d. On control A2, set MEGA-HERTZ KILOHERTZ to 16.0000. Check that ALC ADJ on test fixture is set for 3.5 Vrms on the multimeter. Observe the second harmonic on the spectrum analyzer.	-25 dB minimum	Same as above.
	e. Repeat step d. for a frequency of 29.9000 MHz.	-25 dB minimum	Same as above.
	f. On control A2, set MEGA-HERTZ KILOHERTZ to 02.0100 and repeat step b.		
	g. Observe spurious outputs at 10 kHz (SB), 100 kHz (SB), 1 MHz, and 7 MHz on the spectrum analyzer. Tune spectrum analyzer to 1 MHz and 7 MHz to observe spurious outside (if any) at those frequencies.	-50 dB minimum	Replace in order, frequency synthesizer A1A6, if/af A1A5A1, mixer A1A2, broadband amplifier A1A3, logic/tx A1A5A2, and power supply A1A4.
	h. On control A2, set MEGA-HERTZ KILOHERTZ to 16.0000 and repeat step b.		
	i. Observe spurious outputs at 100 kHz, 5 MHz, and 21 MHz in same manner as step g.	-50 dB minimum	Same as above.
	j. On control A2, set MEGA-HERTZ KILOHERTZ to 29.9000 and repeat step b.		
	k. Observe spurious outputs at 100 kHz and 34.9 MHz in same manner as step g.	-50 dB minimum	Same as above.
	l. On test fixture, set $\overline{\text{CWK}}$ to down position and ALC ADJ to maximum counterclockwise position.		

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
28 Transmit alc	a. Set oscillator for 1000 Hz and input level to the receiver-transmitter of -20 dBm. b. On test fixture, set $\overline{\text{PTT}}$ to ENABLE and observe the rf output on the spectrum analyzer (establishes a reference level). c. Adjust EXT ALC control (ALC ADJ) for +6 V dc at ALC test point (VOLTS). Observe the rf output on the spectrum analyzer.	Not less than 30 dB below the reference level.	Replace in order, broadband amplifier A1A3, mixer A1A2, if/af A1A5A1, and power supply A1A4.

Table 2-5. Receiver-Transmitter A1, Testing/Troubleshooting (cont)





1. RECEIVER-TRANSMITTER A1
2. CONTROL A2
3. TEST FIXTURE
4. ATTENUATOR, RF
5. ATTENUATOR, 6 dB
6. AUDIO ADAPTER
7. DISTORTION ANALYZER
8. HANDSET
9. ISOLATION TRANSFORMER
10. MULTIMETER
11. POWER SUPPLY, 22-30 V DC
12. SIGNAL GENERATOR (2 REQUIRED)
13. WAVE ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-501.

(2) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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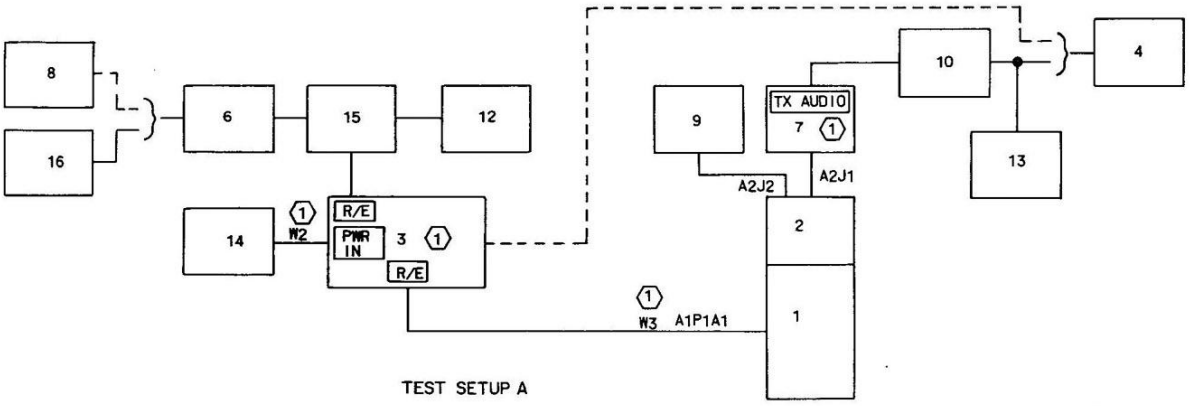
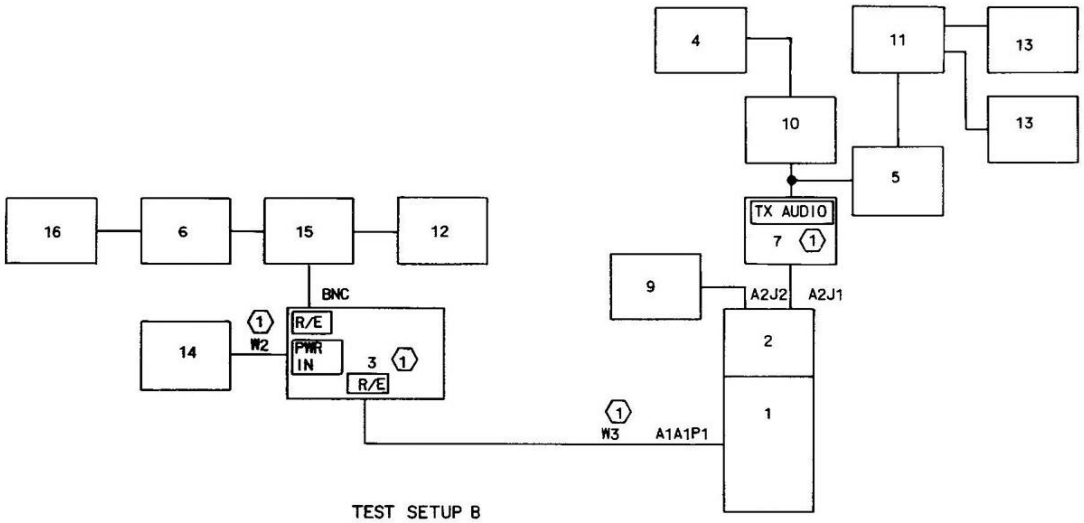
Figure 2-3. Receiver-Transmitter A1, Receive Test Setup



TEST SETUP A



TEST SETUP B

1. RECEIVER-TRANSMITTER A1
2. CONTROL A2
3. TEST FIXTURE
4. AC VTVM
5. ATTENUATOR, AUDIO
6. ATTENUATOR, RF
7. AUDIO ADAPTER
8. FREQUENCY COUNTER
9. HANDSET
10. ISOLATION TRANSFORMER, 600Ω
11. MIXER ATTENUATOR, 600Ω
12. MULTIMETER
13. OSCILLATOR (2 REQUIRED)
14. POWER SUPPLY, 22-30 V DC
15. PROBE COAXIAL T CONNECTOR
16. SPECTRUM ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-501.

(2) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-4. Receiver-Transmitter A1, Transmit Test Setup

2.2.7 Amplifier-Coupler A3, Testing/Troubleshooting

2.2.7.1 Test Equipment Required

The following test equipment items from table 2-2 are required to perform the procedures in table 2-6:

- Radio Test Set AN/PRM-501
- Attenuator, rf (20 dB/20 watt 50 ohm) (2 required)
- Digital voltmeter
- Multimeter
- Power Divider
- Power supply, 22-30 V dc
- Probe coaxial T connector
- Signal generator (2 required)
- Spectrum analyzer (if sectional and 1-kHz to 110-MHz rf section required)
- Voltage divider, capacitive (100:1)

2.2.7.2 Testing/Troubleshooting

Perform the procedures in the following table to isolate a fault to a replaceable subassembly or to verify proper operation of amplifier-coupler A3. When a defective subassembly is replaced, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Test setup	a. Connect test equipment as shown in figure 2-5 test setup A. b. On test fixture, set controls as follows: PWR to OFF CPLR PWR to EXT BAND INFO to TESTER AUX AF to OFF ALC to PA/C L to MIN C to MIN AM-USB-LSB to USB $\overline{\text{KEY}}$, $\overline{\text{PTT}}$, $\overline{\text{CWK}}$, $\overline{\text{ST}}$, FLT, $\overline{\text{RCL}}$, $\overline{\text{TIP}}$, RX $\overline{\text{ONLY}}$, $\overline{\text{RX MUTE}}$, and $\overline{\text{LP}}$ to disable (down position). NOTE R/E PWR, C/H-004, RF GAIN, and EXT ALC controls have no affect and can be in any position. On test fixture, set PWR to ON. Adjust 22-30 V dc power supply for 25.2 ±0.1 V dc at 24V test point on test fixture.		
2 High voltage switch alignment	a. On test fixture, set $\overline{\text{MHZ}}$ to 020 (2 MHz) and set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position. Switch should operate. If not, set $\overline{\text{MHZ}}$ to 030 (3 MHz) and set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position. Inspect high voltage switch A3A9S1A rear rotor contact.	Refer to figure 2-6. Contact should engage high voltage segment by approximately 1.2 mm (0.047 in).	If switch did not operate, check fuse A3A3A1F1 and replace if necessary. Replace, in order, bandswitch A3A5, control logic A3A2, and autotransformer A3A9.

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)	b. On test fixture, set MHz to 250 (25 MHz). Set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position. Inspect high voltage switch A3A9S1A rear rotor contact.	Refer to figure 2-6. Contact should engage 24-30 MHz segment.	Same as above.
	c. On test fixture, set MHz to 080 (8 MHz). Set $\overline{\text{RCL}}$ to ENABLE, then to down position. Inspect high voltage switch A3A9S1A rear rotor contact.	Refer to figure 2-6. Contact should engage 8-12 MHz segment.	Same as above.
3 Receive only	a. On text fixture, set MHz to 080 (8 MHz) and $\overline{\text{RX ONLY}}$ to ENABLE. Set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position. When element stops running, inspect tuning coil A3A8L1 and tuning capacitor A3A7C1 position.	Tuning coil A3A8L1 and tuning capacitor A3A7C1 both run to maximum position.	If both elements fail to operate, replace control logic A3A2. If A3A8L1 fails to operate, replace tuning coil A3A8. If A3A7C1 fails to operate, replace tuning capacitor A3A7.
	b. On test fixture, set MHz to 120 (12 MHz). Set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position.	Tuning capacitor A3A7C1 remains at maximum position and tuning coil A3A8L1 runs to mid position.	Same as above.
4 Keying current demand	On test fixture, set $\overline{\text{RX ONLY}}$ to down position and $\overline{\text{KEY}}$ to ENABLE and observe current on the 22-30 V dc power supply ammeter. On test fixture, set $\overline{\text{KEY}}$ to down position.	Current will rise to 300 to 460 mA when switch is enabled.	Replace in order, control logic A3A2 and servo amplifier A3A1. Check chassis A3A3 wiring.
5 Fault	On test fixture, set $\overline{\text{KEY}}$ to ENABLE and monitor the elapsed time between the $\overline{\text{KEY}}$ switch being set to ENABLE and a logic 1 voltage appearing at FLT test point as measured on the digital voltmeter.	10-36 seconds	Replace in order, control logic A3A2 and servo amplifier A3A1. Check chassis A3A3 wiring.

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	On test fixture, set $\overline{\text{KEY}}$ to down position.		
6 Power Check	a. On test fixture, set MHz to 020 (2 MHz) and set $\overline{\text{RCL}}$ to ENABLE momentarily, then to down position. Set signal generator for 2.0 MHz.		
	b. On test fixture, set $\overline{\text{KEY}}$ to ENABLE and adjust signal generator output for 31.6 Vrms on multimeter. Observe line current reading on power supply ammeter. CAUTION Do not allow power supply ammeter reading to exceed 4 amps.	Less than 2.6 amps	Replace in order, control logic A3A2, servo amplifier A3A1, power amplifier A3A4, bandswitch A3A5, discriminator A3A6, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
	c. On test fixture, set MHz to 299 (29.9 MHz) and $\overline{\text{KEY}}$ to down position. Reduce signal generator output to minimum and set for 29.9 MHz.		
	d. Repeat step b.	Less than 2.9 amps	Same as above.
	e. On test fixture, set $\overline{\text{KEY}}$ to down position. Reduce signal generator output to minimum. WARNING High rf voltage is present in amplifier coupler when keyed. Use caution when performing step 7.		

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 High voltage fault	a. On test fixture, set MHZ to 080 (8 MHz). Set signal generator for 8.0 MHz. Disconnect probe coaxial T connector at A3J3 on amplifier-coupler A3 (leave A3J3 open circuit). On test fixture, momentarily set $\overline{\text{RCL}}$ to ENABLE and set $\overline{\text{KEY}}$ to ENABLE. Increase the signal generator output until amplifier-coupler A3 tunes.		
	b. Connect the multimeter with the capacitive voltage divider to the output end of L1 of tuning coil A3A8. Slowly increase signal generator output and monitor the voltage on the multimeter until the voltage indication is approximately 6.7 V rms (670 V rms equivalent with 100:1 divider).	Amplifier-coupler A3 faults.	If fault does not occur at 670 V rms, adjust A3A3A2R1 for fault. If this does not produce the NORMAL INDICATION, replace over-voltage detector A3A3A2.
	c. On test fixture, set $\overline{\text{KEY}}$ to down position. Reduce signal generator output to minimum. Reconnect probe coaxial T connector at A3J3 on amplifier-coupler A3. Reconnect the multimeter, without the capacitive voltage divider, to the probe coaxial T connector.		
8 Power output	a. On test fixture, set MHZ to 020 (2 MHz). Set signal generator for 2.0 MHz. On test fixture, momentarily set $\overline{\text{RCL}}$ to ENABLE and set $\overline{\text{KEY}}$ to ENABLE. Increase the signal generator output until amplifier-coupler A3 tunes.		

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 (cont)	b. Observe voltage on digital voltmeter at ALC test point (VOLTS) on test fixture just before the coupler advances to operate mode (monitor multimeter at rf output).	Alc voltage is negative and rf output is 21.2 to 27.4 Vrms just before coupler advances to operate.	Replace in order, power amplifier A3A4, control logic A3A2, bandswitch A3A5, discriminator A3A6, servo amplifier A3A1, tuning capacitor A3A8 and autotransformer A3A9. Check chassis A3A3 wiring.
	c. Increase signal generator output until -2.0 to -3.0 V dc is obtained on digital voltmeter at ALC test point (VOLTS) on the test fixture. Observe rf output on the multimeter. Reduce signal generator output to minimum. On test fixture set $\overline{\text{KEY}}$ to down position.	26.6 to 35.0 Vrms.	Same as above.
	d. Repeat step a for 8 MHz, then repeat step c.	26.6 to 35.0 Vrms.	Same as above .
	e. Repeat step a for 16 MHz, then repeat step c.	26.6 to 35.0 Vrms.	Same as above.
	f. Repeat step a for 29.9 MHz, then repeat step c.	26.6 to 35.0 Vrms.	Same as above.
	g. On test fixture, set $\overline{\text{LP}}$ to ENABLE and repeat steps a and c.	8.6 to 15.0 Vrms.	Same as above.
	h. Repeat step a for 8 MHz, then repeat step c.	8.6 to 15.0 Vrms.	Same as above.
	i. Repeat step a for 16 MHz, then repeat step c.	8.6 to 15.0 Vrms.	Same as above.
	j. Repeat step a for 29.9 MHz, then repeat step c.	8.6 to 15.0 Vrms.	Same as above.
	k. On test fixture, set $\overline{\text{LP}}$ to down position.		

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9 Intermodulation distortion	a. Connect test equipment as shown in figure 2-5 test setup B. Repeat step 1.b.		
	b. On test fixture, set MHZ to 020 (2 MHz). Set both signal generators for 2.0000 MHz. Turn off signal generator no. 2. On test fixture, set $\overline{\text{KEY}}$ to ENABLE.		
	c. Adjust signal generator no. 1 output for an amplifier-coupler A3 rf output of 16.0 Vrms on the multimeter. Turn off signal generator No. 1. Turn on signal generator no. 2 and adjust the output for an amplifier-coupler A3 rf output of 16.0 Vrms on the multimeter. Turn on signal generator no. 1 and monitor the amplifier-coupler A3 rf output on the multimeter.	Approximately 32 Vrms.	
	NOTE If the multimeter indicates the presence of oscillations, connect the TIME BASE connectors of the signal generators together. This will place them in phase coincidence with each other.		
	d. Adjust one of the signal generators for a frequency difference between the two signal generator outputs of 1600 Hz.		
	e. Observe the third and fifth order intermodulation products on the spectrum analyzer. Reduce the	-25 dB minimum	Replace in order, power amplifier A3A4, bandswitch A3A5, discriminator A3A6, tuning

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9 (cont)	output for both signal generators to minimum. NOTE Reference level is the rf input from one of the signal generators. f. On test fixture, set MHz to 150 (15 MHz). Set both signal generators for 15.0000 MHz. Turn off signal generator no. 2.		capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
	g. Repeat step c.	Approximately 32 Vrms.	Adjust both signal generators for an rf output of 32 Vrms.
	h. Adjust one of the signal generators for a frequency difference between the two signal generator outputs of 1600 Hz.		
	i. Repeat step e.	-25 dB minimum	Replace in order, power amplifier A3A4, bandswitch A3A5, discriminator A3A6, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
	j. On test fixture, set MHZ to 299 (29.9 MHz). Set both signal generators for 29.9000 MHz. Turn off signal generator no. 2.		
	k. Repeat step c.	Approximately 32 Vrms.	Adjust signal generators for an rf output of 32 Vrms.

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9 (cont)	1. Repeat step h and e.	-25 dB minimum	Replace in order, power amplifier A3A4, bandswitch A3A5, discriminator A3A7, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
10 Harmonic suppression	a. Turn off signal generator no. 2.		
	b. On test fixture, set MHZ to 022 (2.2 MHz). Set signal generator no. 1 for 2.2000 MHz. Adjust the signal generator output for an amplifier-coupler A3 rf output of 31.6 Vrms on the multimeter.		
	c. Observe the second and third harmonic outputs on the spectrum analyzer referenced to the fundamental (signal generator frequency).	-40 dB minimum	Replace in order, power amplifier A3A4, bandswitch A3A5, discriminator A3A6, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
	d. Repeat steps b and c for the following frequencies: 2.7 MHz, 3.5 MHz, 5.0 MHz, 7.0 MHz, 10.0 MHz, 14.0 MHz, 20.0 MHz, and 27.0 MHz.		
11 Tune time	a. Connect test equipment as shown in figure 2-5 test setup A. Repeat step 1.b.		
	b. On test fixture, set MHz to 020 (2 MHz). Momentarily set $\overline{\text{RCL}}$ to ENABLE and		

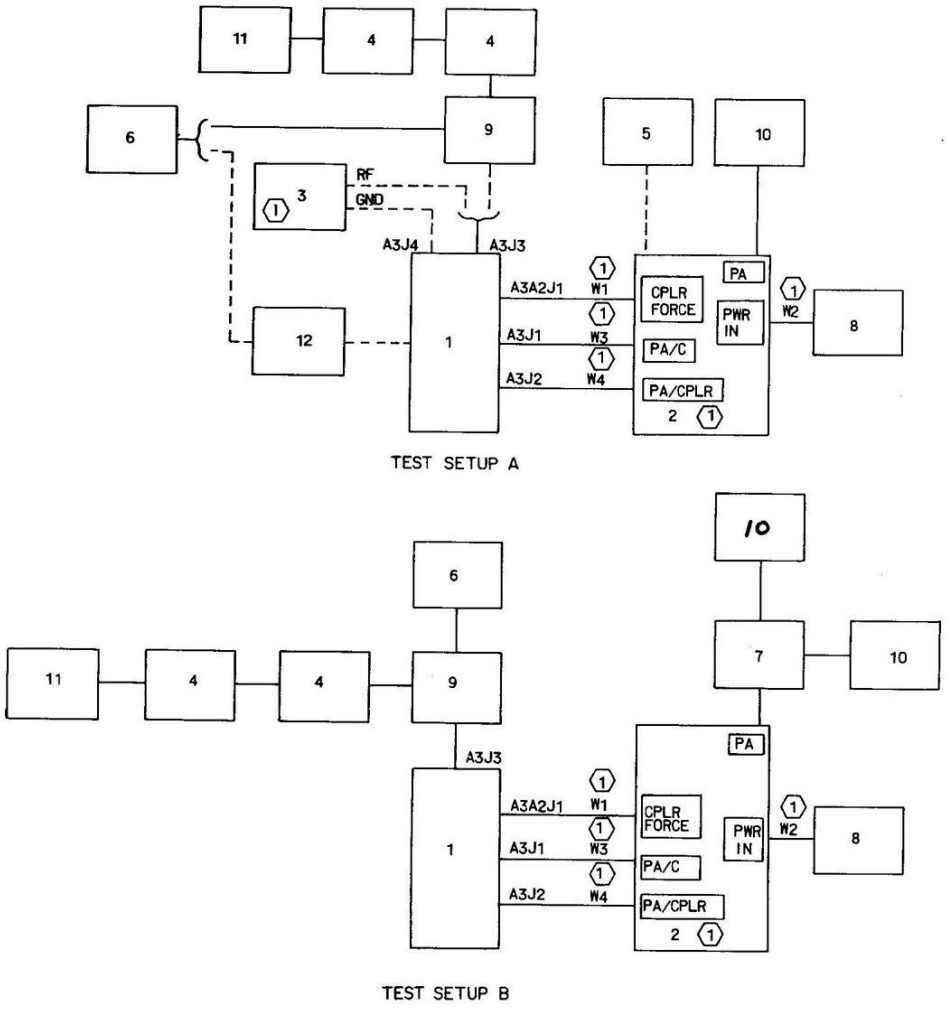
Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	set $\overline{\text{KEY}}$ to ENABLE. Set signal generator for 2.0 MHz. Adjust signal generator output for an amplifier-coupler A3 rf output of 31.6 Vrms on the multimeter. On test fixture, set $\overline{\text{KEY}}$ to down position, then set MHZ to 299 (29.9 MHz).		
	c. Set signal generator for 29.9 MHz. On test fixture, momentarily set $\overline{\text{RCL}}$ to ENABLE and momentarily set $\overline{\text{KEY}}$ to ENABLE. Observe time required for amplifier-coupler A3 to tune up. Reduce signal generator output to minimum.	7 seconds maximum	Replace in order, control logic A3A2, servo amplifier A3A1, power amplifier A3A4, bandswitch A3A5, discriminator A3A6, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
	d. Repeat steps b and c for the following frequency combinations: 29.9 MHz to 2.0 MHz 2.0 MHz to 12.0 MHz 12.0 MHz to 22.0 MHz 22.0 MHz to 2.0 MHz	7 seconds maximum	Same as above.
	e. Remove the probe coaxial T connector at A3J3 and connect the antenna simulator as shown in figure 2-5 test setup A.		
	f. Repeat steps b, c, and d.	7 seconds maximum	Same as above.
	g. Remove the antenna simulator and connect the probe coaxial T connector as shown in figure 2-5A.		

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12 Automatic retune	a. On test fixture, set MHZ for 240 (24 MHz) and momentarily set $\overline{\text{RCL}}$ to ENABLE and set $\overline{\text{KEY}}$ to ENABLE. Set signal generator for 24.0 MHz. Increase the signal generator output until amplifier-coupler A3 tunes. On test fixture, set $\overline{\text{KEY}}$ to down position.		
	b. Set signal generator for 29.9 MHz. On test fixture set $\overline{\text{KEY}}$ to ENABLE and observe time required for amplifier-coupler A3 to tune up.	7 seconds maximum	Replace in order, control logic A3A2, servo amplifier A3A1, power amplifier A3A4, bandswitch A3A5, discriminator A3A7, tuning capacitor A3A7, tuning coil A3A8, and autotransformer A3A9.
13 Sidetone	a. On test fixture, set MHZ to 160 (16 MHz) and momentarily set $\overline{\text{RCL}}$ to ENABLE. Set signal generator for 16.0 MHz. Adjust signal generator output for an amplifier-coupler A3 rf output of 31.6 Vrms on the multimeter. Set $\overline{\text{KEY}}$ to up position.		
	b. Using digital voltmeter, monitor the voltage at test point ST on the test fixture. On test fixture, set ST to up position.		
	c. Reduce the signal generator output until the voltage at test point ST rises to approximately + 5 Vdc. Observe the rf output on the multimeter.	Approximately 28 Vrms.	Replace in order, power amplifier A3A4, control logic A3A2, discriminator A3A6, servo amplifier A3A3, and bandswitch A3A5.

Table 2-6. Amplifier-Coupler A3, Testing/Troubleshooting (cont)



1. AMPLIFIER-COUPLER A3
2. TEST FIXTURE
3. ANTENNA, SIMULATOR
4. ATTENUATOR, RF
5. DIGITAL VOLTMETER
6. MULTIMETER
7. POWER DIVIDER
8. POWER SUPPLY, 22-30 V DC
9. PROBE COAXIAL T CONNECTOR
10. SIGNAL GENERATOR (2 REQ)
11. SPECTRUM ANALYZER
12. VOLTAGE DIVIDER, CAPACITIVE

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-501.

(2) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED

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Figure 2-5. Amplifier-Coupler A3, Test Setup

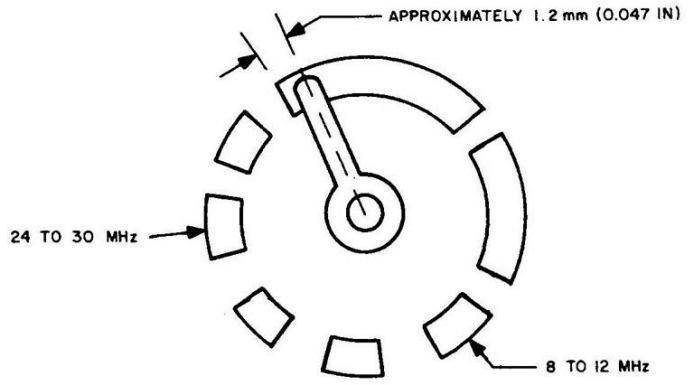

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Figure 2-6. Amplifier-Coupler A3, High Voltage Switch A3A9S1A Rear Rotor Contact

2.2.8 Generator Minimum Performance Test

The second-line maintenance concept for the generator is to isolate a fault to a second-line replaceable item and replace the faulty item with a good operating item. Second-line replaceable items for the generator are listed in table 2-7.

Table 2-8 is a minimum performance test for the generator. Perform test steps in the order presented in the PROCEDURES column. Results in the NORMAL INDICATION column will be obtained if the generator is operating properly. If these results are not obtained, perform the procedure described in the IF INDICATION IS ABNORMAL column and repeat the minimum performance test. Refer to disassembly and reassembly procedures in this section to remove and replace items.

The following test equipment items from table 2-3 are required to perform the procedures in table 2-8:

Power supply, 40-100 V dc

Ammeter

Multimeter

Battery, 25.2 V dc

ITEM	COLLINS PART NUMBER
Circuit board A1	629-5777-001
Power supply generator	635-4868-001
Capacitor A2C1	913-5019-200
Indicator lamps DS1 and DS2	262-2171-040
Lamp socket with green lens XDS1	262-1385-030
Lamp socket with red lens XDS2	262-1385-010
Case	629-5772-002
Cover	629-5784-001

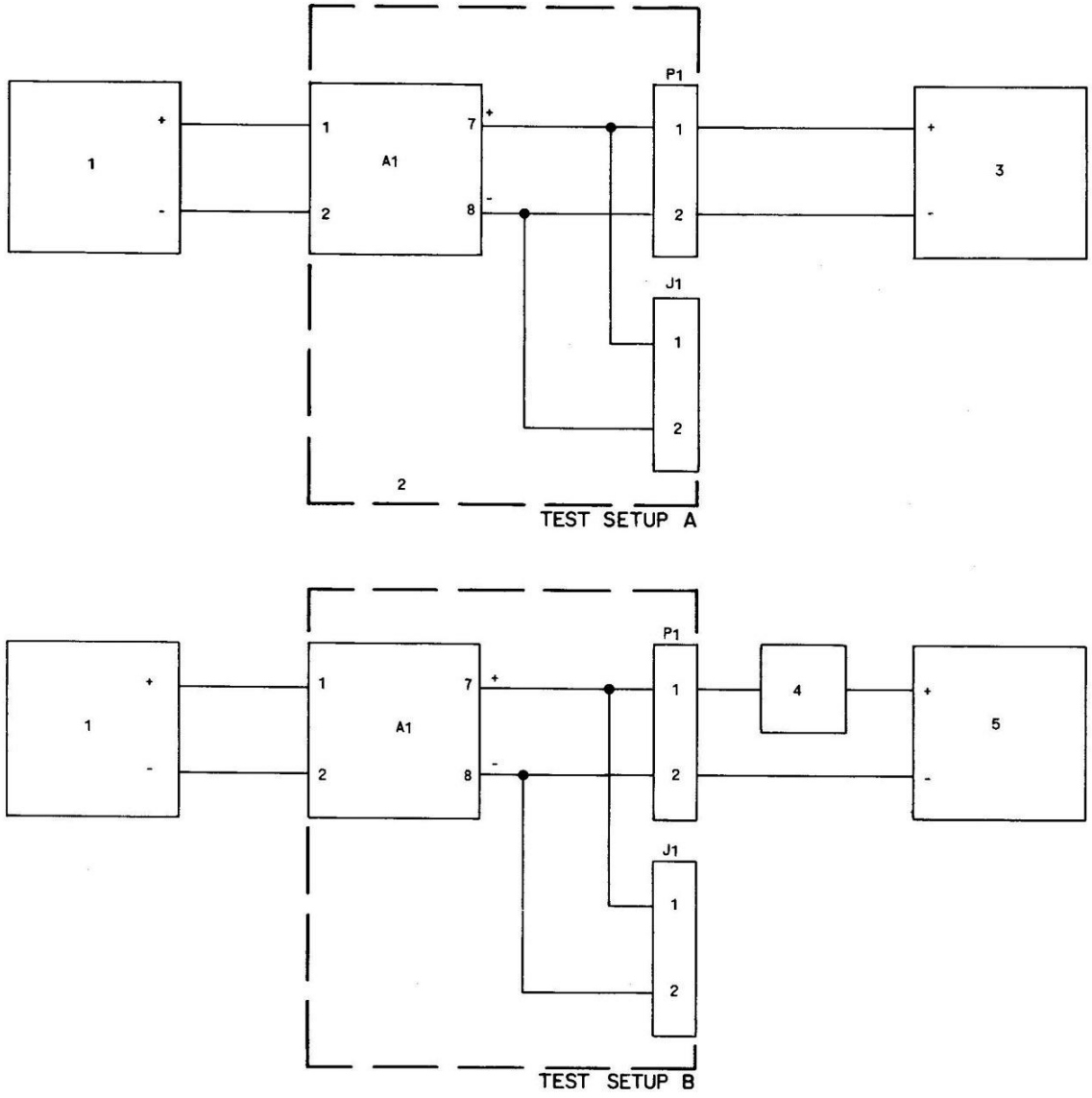
Table 2-7. Generator Second-Line Replaceable Items

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1	Remove cover from generator (refer to paragraph 2.5) and visually inspect subassemblies for signs of wear or deformation. Crank generator and verify movement.	Handle turns freely with no binding, grating, etc.	Replace power supply generator.
2	Measure resistance between chassis and positive terminal of both connectors on the generator case (negative lead of ohmmeter must be connected to chassis ground).	5 megohms minimum	Replace circuit board A1. Locate and correct short circuit condition.
3	Verify continuity between connectors (refer to schematic diagram).	+ battery connector, + radio connector, and pin 7 of A1 are common. - battery connector, - radio connector, pin 8 of A1, and the chassis are common.	Correct faulty wiring in the chassis.
4	Disconnect the leads from the power supply generator to pins 1 and 2 of A1 and connect test equipment as shown in figure 2-7 test setup A. Turn on 40-100 V dc power supply and adjust output from 40 to 100 V dc while monitoring regulator output on the multimeter. Turn off 40-100 V dc power supply.	30 - 32 V dc over entire 40 to 100 V dc input range.	Replace A1.
5	Reverse the output leads from the 40-100 V dc power supply (+ connected to pin 2 of A1, - connected to pin 1 of A1). Turn on 40-100 V dc power supply and adjust output from 40 to 100 V dc while monitoring regulator output multimeter. Turn off 40-100 V dc power supply.	30 - 32 V dc over entire 40 to 100 V dc input range.	Replace A1.

Table 2-8. Generator Minimum Performance Test

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6	Remove the multimeter from the test setup and connect ammeter and battery as shown in figure 2-7 test setup B. Turn on 40-100 V dc power supply and adjust the current limit on the 40-100 V dc power supply to 300 mA. Increase the 40-100 V dc power supply output voltage very slowly until the green lamp on the generator lights. Note the output current when green lamp lights.	40 - 80 mA	Replace DS1. If DS1 is good, but lamp does not light, replace A1.
7	Increase voltage slowly until red lamp lights. Note the output current when the red lamp lights. Turn off 40-100 V dc power supply.	150 - 250 mA	Replace DS2. If DS2 is good, but lamp does not light, replace A1.
8	Remove the 40-100 V dc power supply from the test setup of figure 2-7 test setup B (leave ammeter and battery connected as shown) and solder generator leads to circuit board A1. NOTE Polarity of leads is of no consequence because of bridge rectifier.		
	Crank the generator and slowly increase speed until green indicator lights. Note the output current when the green lamp lights.	40 - 150 mA	Replace power supply generator.
9	Slowly increase cranking speed until the red indicator lamp lights. Note the output current when the red lamp lights.	150 - 300 mA	Replace power supply generator.
10	Slowly increase cranking speed while monitoring the output current. Note maximum output current.	400 mA minimum	Replace power supply generator

Table 2-8. Generator Minimum Performance Test (cont)



1. POWER SUPPLY, 40-100 V DC

2. GENERATOR

3. MULTIMETER

4. AMMETER

5. STORAGE BATTERY BB-706/U

TPA-0195-014

Figure 2-7. Generator, Test Setup

2.3 THIRD-LINE MAINTENANCE

2.3.1 General

When a second-line replaceable item is received, testing/troubleshooting procedures are performed to locate a fault. After a faulty item has been repaired, install it in a receiver-transmitter group and test in accordance with the second-line minimum performance test of paragraph 2.2.5.

2.3.2 Test Equipment Requirements

The following table lists all the test equipment or equivalent required to perform third-line maintenance procedures. Common general purpose tools and materials that are readily available are not included. Also, some cables, adapters, T-connectors, etc. required for the test equipment setups are not identified in the test equipment table or on the test setup diagrams. A list of only the test equipment required to perform testing/troubleshooting of a specific third-line maintenance item is located just prior to that procedure.

2.3.3 Power Supply A1A4, Testing/Troubleshooting

Perform the procedures in table 2-10 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagrams and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-10.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug In Unit TS-5110/PRM-502 (power supply test adapter)
Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Oscilloscope

Resistor decade box (2 required)

ITEM	RECOMMENDED TYPE
Radio Test Set AN/PRM-502	Radio Test Set AN/PRM-502
Attenuator, audio (0-110 dB/5-watt/ 600-ohm)	Hewlett-Packard 350D
Attenuator, rf (20 dB/20 watt/50-ohm) (2 required)	Weinschel 9214-20
Attenuator, 6-dB (2 required)	Measurements 80-ZH3
Digital voltmeter	Fluke 8000A
Distortion analyzer	Hewlett-Packard 333A
Frequency counter If load, 500-ohm	Fluke 1920A Fabricate locally, refer to item 9 Fig 2-18.
Impedance bridge	Hewlett-Packard 4260A
Isolation transformer, 600-ohm	Hewlett-Packard 11005A
Load, 50-ohm	Bird 8085
Mixer-attenuator, 600-ohm	Customer supplied, refer to Figure 2-31 for schematic diagram
Multimeter	Hewlett-Packard 410C
Oscillator (2 required)	Hewlett-Packard 204C
Oscilloscope	Tektronix 464 or Hewlett-Packard 1741A
Power divider	Weinschel 1506A
Power supply, 0-40 V dc (0.5 amp)	Hewlett-Packard 6102A
Probe coaxial T connector	Hewlett-Packard 11042A
Resistor decade box, 0-100,000 ohms (2 required)	Clarostat 240C
Rms voltmeter	Hewlett-Packard 3400A
Rf vector impedance meter	Hewlett-Packard 4815A
Rf voltmeter, with 50 ohm adapter	Boonton 92C, includes 50 ohm adapter model 91-8B

Table 2-9. Third-Line Maintenance Test Equipment Required

ITEM	RECOMMENDED TYPE
Voltage divider, (100:1)	Boonton 91-7C
Selective voltmeter/wave analyzer	Hewlett-Packard 3581C
Signal generator (2 required)	Hewlett-Packard 8640B with option 001 and option 003 or fuseholder 11509A
Spectrum analyzer	Hewlett-Packard 141T with 8552B if section, 8553B rf section, and 8554B rf section

Table 2-9. Third-Line Maintenance Test Equipment Required (Cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF		
	b. Install power supply A1A4 on test adapter and connect power supply and the digital voltmeter as shown in figure 2-8.		
	c. On power supply, set POWER to ON. On test adapter, set POWER to ON, LOAD +5.2V to OPEN, LOAD +13V to OPEN, and DVM SELECT to +25.2V. On power supply, adjust OUTPUT VOLTAGE control for +25.2 V dc on the digital voltmeter.		
2 +13 V output voltage	a. On test adapter, set LOAD +13V to 270 OHMS and DVM SELECT to +13V.		
	b. Observe voltage on digital voltmeter at DVM test points.	+12.9 to +13.1 V dc	Check the following: Q6/Q7, Q4/Q5, VR4/VR2, CR1, Q1/Q3, R9 (Refer to step 13 of this procedure.) C5/C6.
3 +5.2V output voltage	a. On test adapter, set LOAD +13V to OPEN, LOAD +5.2V to 100 OHMS, and DVM SELECT to +5.2V.		
	b. Observe voltage on digital voltmeter at DVM test points.	+5.1 to +5.3 V dc	Check the following: Q8/Q9, Q11/Q12, Q10 VR6 C13/C14 R23 (Refer to step 13 of this procedure.)

Table 2-10. Power Supply A1A4, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 +25.2 V current	a. On test adapter, set LOAD +5.2V to OPEN and ensure that LOAD +13V is set to OPEN.		
	b. Set DVM SELECT to +25.2V CUR .1 MA/MV.		
	c. Hold 25.2 V CURRENT in MONITOR position while observing current on digital voltmeter at DVM test points.	50 mV (5 mA) maximum	Check the following: Q2, Q1/Q3, VR2, VR4, VR6, Q8/Q9, Q13/Q14, CR1, C7/C8, C13/C14 R9/R23 (Refer to step 13 of this procedure.)
5 +13V operating period	a. Connect the oscilloscope to the collector of A1A4Q1 (casing).		
	b. On test adapter, set LOAD +13V to 270 OHMS. Observe the operating period (time for one switching cycle) on the oscilloscope.	14 μsec to 35 μsec on time of Q1.	Check the following: C15 L1 R14 CR1 Q1 Q4/Q5
6 +5.2 V operating period	a. Connect the oscilloscope to collector of A1A4Q8 (casing).		
	b. On test adapter, set LOAD +5.2V to 100 OHMS. Observe the operating period (time for one switching cycle) on the oscilloscope.	13 μsec to 35 μsec on time of Q8.	Check the following: C13 L4 R31 Q8 CR5 Q11/Q12
7 +13V ripple	a. Connect the oscilloscope to +13V connector on test adapter.		

Table 2-10. Power Supply A1A4, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 (cont)	b. On test adapter, ensure that LOAD +13V is set to 270 OHMS. Observe the peak-to-peak ripple voltage on the oscilloscope.	15 mV peak-to-peak maximum	Check the following: L1/C5 L2/C6 VR2 VR4 CR1
8 +5.2V ripple	a. Connect the oscilloscope to +5.2V connector on test adapter.		
	b. On test adapter, ensure that LOAD +5.2V is set to 100 OHMS. Observe peak-to-peak ripple voltage on the oscilloscope.	20 mV peak-to-peak maximum	Check the following: L4/C13 L5/C14 CR5 VR6 L3 C12
9 +13V regulation	a. On test adapter, set DVM SELECT to +13V and LOAD +13V to 270 OHMS. Observe voltage on digital voltmeter.		
	b. On test adapter, set LOAD +13V to 560 OHMS. Observe voltage on digital voltmeter.	No more than 0.05 V dc variation between readings of steps a and b.	Check the following: Q6/Q7 Q4/Q5 Q3 VR4 C9 CR1 Q1
10 +5.2V regulation	a. On test adapter, set DVM SELECT to +5.2V and LOAD +5.2V to 15 OHMS. Observe voltage on digital voltmeter.		
	b. On test adapter, set LOAD +5.2V to 100 OHMS. Observe voltage on digital voltmeter.	No more than 0.08 V dc variation between readings of steps a and b.	Check the following: Q11/Q12 Q9/Q10 VR6 C12 CR5

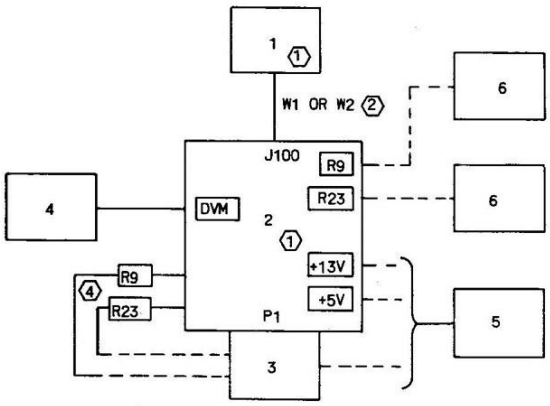
Table 2-10. Power Supply A1A4, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 +5.2V over-current protection	a. On test adapter, set DVM SELECT to I SHORT CIRCUIT 10 MA/MV.		
	b. Hold SHORT CIRCUIT CURRENT in +5.2V position while observing current on digital voltmeter at DVM test points.	65 mV (650 mA) maximum	Check the following: Q11/Q12 Q13/Q14 C11/VR6
	c. Repeat step 3.	+5.1 to +5.3 V dc	Same as for step 3.
12 +13V over-current protection	a. On test adapter, set DVM SELECT switch to I SHORT CIRCUIT 10 MA/MV.	30 mV (300 mA) maximum	Check the following: Q2 C4 C2 Q4/Q5 Q3/Q1
	b. Hold SHORT CIRCUIT CURRENT in +13V position while observing digital voltmeter at DVM test points.		
	c. Repeat step 2.	+12.9 to +13.1 V dc	
	NOTE Step 13 is the procedure for adjusting +5.2V dc and +13V dc output. Perform this procedure only when referenced in steps 2 through 4.		
13 Resistor R9 and R23 test selection	a. On test adapter, set POWER to OFF, 25.2 V CURRENT to MONITOR, LOAD +13V to OPEN, LOAD +5.2V to OPEN, SHORT CIRCUIT CURRENT to center position, and DVM SELECT to +25.2V.		
	b. Remove R9 and R23 from power supply A1A4.		
	c. Connect one resistor decade box to TEST SELECT R9 jacks on test adapter and set for 100 K ohms. Connect		

Table 2-10. Power Supply A1A4, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
13 (cont)	pendant test leads, labelled R9 across resistor mounting terminals on A1A4.		
	d. Connect second resistor decade box to TEST SELECT R23 jacks on test adapter and set for 100 K ohms. Connect pendant test leads, labelled R23 across resistor mounting terminals on A1A4.		
	e. On test adapter, set DVM SELECT to +25.2V CUR .1MA/MV and POWER to ON. Hold 25.2V CURRENT in the MONITOR position and observe input current with digital voltmeter.	50 mV (5 mA) maximum	
	f. On test adapter, set LOAD +13V to 270 OHMS and DVM SELECT to +13V.		
	g. Select the R9 resistance value on resistor decade box that provides a reading of +13 $\pm$0.1 V dc on digital voltmeter.	+12.9 to +13.1 V dc	Replace R9 with test value selected on decade box.
	h. Set LOAD +13V to OPEN, LOAD +5.2V to 100 OHMS, and DVM SELECT to +5.2V.		
	i. Select R23 resistance value on resistance decade box for a +5.2 $\pm$0.1 V dc reading on the digital voltmeter.	+5.1 to +5.3 V dc	Replace R23 with test value selected on decade box.

Table 2-10. Power Supply A1A4, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. POWER SUPPLY TEST ADAPTER
3. POWER SUPPLY A1A4
4. DIGITAL VOLTMETER
5. OSCILLOSCOPE
6. RESISTOR DECADE BOX (2 REQUIRED)

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

(4) PENDANT TEST LEADS, PART OF POWER SUPPLY TEST ADAPTER.

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Figure 2-8. Power Supply A1A4, Test Setup

2.3.4 Broadband Amplifier A1A3, Testing/Troubleshooting

Perform the procedures in table 2-11 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-11.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5111/PRM-502 (broadband amplifier test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Attenuator, 6-dB (2 required)

Digital voltmeter

Power divider

Rf voltmeter

Signal generator (2 required)

Spectrum analyzer (if section and 1-kHz to 110-MHz if section required)

Voltage Divider 100:1

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER and KEY to OFF. b. Install broadband amplifier A1A3, on test adapter and connect power supply as shown in figure 2-9. c. On power supply set POWER to ON. Connect digital voltmeter (H) to I MON MA/MV, (L) to GND test points. d. On test adapter, set POWER to ON. e. On power supply adjust OUTPUT VOLTAGE control for +25.2 Vdc on the digital voltmeter.		
2 Keyline open	On test adapter connect digital voltmeter to I MON MA/MV test points and observe voltage (1 mV equals 1 mA).	0 mV (O mA)	Check the following: K1, Q4, C9-C11 and C17.
3 Keyline close	On test adapter, set KEY to ON. Observe voltage on digital voltmeter. Set KEY to OFF.	170 to 210 mV (170 to 210 mA)	Check the following: Q4, VR2, Q1-Q3 and Q5.
4 Gain	a. On test adapter, connect rf voltmeter, with 50 ohm adapter to RF OUT connector and signal generator (through 6-dB attenuator) to RF IN connector. b. On test adapter, set KEY to ON. c. Set signal generator for 15.0 MHz, unmodulated, at -14 dBm		

Table 2-11. Broadband Amplifier A1A3, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 (cont)	d. Measure rf output on rf voltmeter.	+21 to +25 dBm (gain equals 41 to 46 dB)	Check the following: VR1, C1-C3, CR1, CR2, CR7 and CR12.
5 Frequency response	a. Set signal generator for 2.0 MHz and adjust for +20 dBm output measured on the rf voltmeter.	Reference	
	b. Change signal generator frequency to 15.0 MHz (do not change its output level). Measure rf output on rf voltmeter.	Not less than +19.5 dBm	Check the following: C1-C3, L1, L2, CR1, CR2, CR7, CR12, and Q1-Q5.
	c. Change signal generator frequency to 30.0 MHz. Measure rf output on rf voltmeter.	Same as step a.	Same as above.
	d. Change signal generator frequency to 115.0 MHz. Measure rf output on rf voltmeter.	Not less than 50 dB down from output measured in step 4d.	Same as above.
	e. Disconnect signal generator and on test adapter set POWER and KEY to OFF.		
6 Intermodulation distortion	a. Connect two signal generators (through 6-dB attenuators) and power divider to RF IN connector on test adapter.		
	b. On test adapter, set POWER and KEY to ON.		
	c. Adjust the two signal generators for 1-kHz separation at 2.0 MHz and an output from each signal generator of +5 dBm.		
	d. Disconnect rf voltmeter and connect spectrum analyzer to RF OUT connector on test adapter.		

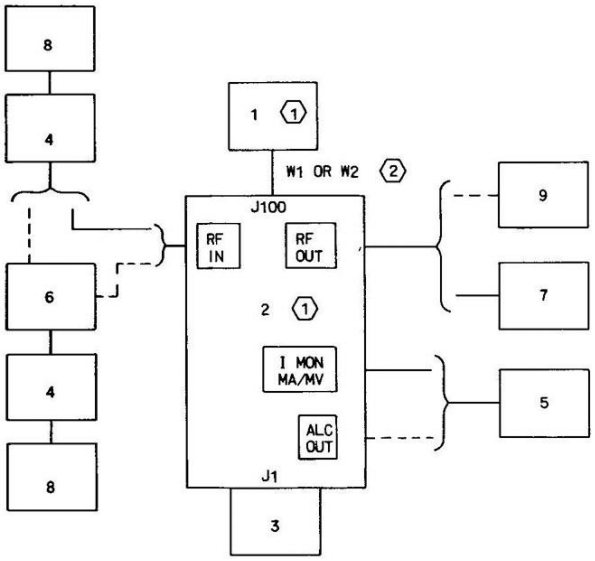
Table 2-11. Broadband Amplifier A1A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	e. Use the rf input with the highest frequency tone as the reference. Measure third order intermodulation product in dB below the reference.	No less than 40 dB down.	Check the following: C1-C3, L1, L2, CR1, CR2, CR7, CR12 and Q1-Q5.
	f. Repeat steps c and e at 15.0 and 30.0 MHz.	No less than 30 dB down.	Same as above.
	g. Disconnect spectrum analyzer, two signal generators and power divider from test adapter.		
	h. On test adapter, set POWER and KEY to OFF.		
7 Harmonic output	a. Connect signal generator (through 6-dB attenuator) to RF IN connector on test adapter.		
	b. Connect rf voltmeter, with 50 ohm adapter, to RF OUT connector on test adapter.		
	c. On test adapter, set POWER and KEY to ON.		
	d. Set signal generator for 2.0 MHz and adjust for a +20-dBm output measured on the rf voltmeter.		
	e. Disconnect rf voltmeter and connect spectrum analyzer to RF OUT connector on test adapter.		
	f. Measure second and third order harmonics with spectrum analyzer.	Second order: No less than 25 dB down. Third order: No less than 35 dB down.	Check the following: C1-C3, L1, L2, CR1, CR2, CR7, CR12 and Q1-Q5.

Table 2-11. Broadband Amplifier A1A3, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 (cont)	g. Disconnect spectrum analyzer and connect rf voltmeter to RF OUT connector on test adapter.		
	h. Repeat steps d through g at 15.0 and 30.0 MHz.	Same as step f.	Same as above.
8 ALC	a. Connect rf voltmeter through 100:1 divider and 50-ohm adapter to RF OUT connector on test adapter.		
	b. Set signal generator for 15.0 MHz and adjust for 50 mV (equivalent to 5 V rms) measured on rf voltmeter.		
	c. With digital voltmeter, measure dc voltage at ALC OUT test point.	-1.4 to -1.9 V dc	Check the following: VR2, CR8, C13 and Q4.

Table 2-11. Broadband Amplifier A1A3, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. BROADBAND AMPLIFIER TEST ADAPTER
3. BROADBAND AMPLIFIER A1A3
4. ATTENUATOR, 6 dB (2 REQUIRED)
5. DIGITAL VOLTMETER
6. POWER DIVIDER
7. RF VOLTMETER
8. SIGNAL GENERATOR (2 REQUIRED)
9. SPECTRUM ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY

(3) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-9. Broadband Amplifier A1A3, Test Setup

2.3.5 Discriminator A3A6, Testing/Troubleshooting

Perform the procedures in table 2-12 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-12.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5112/PRM-502 (discriminator test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Attenuator, 6-dB

Digital voltmeter

Multimeter

Signal generator

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set UNIT POWER and FAN to OFF. b. Install discriminator A3A6 on test adapter and connect power supply as shown in figure 2-10. c. On power supply set POWER to ON. Connect digital voltmeter (H) to CURRENT MON 10 MA/MV, (L) to GND. On test adapter, set UNIT POWER and FAN to ON. On power supply adjust OUTPUT VOLTAGE control for +25.2 V dc on the digital voltmeter.		
2 Input current	a. Connect both digital voltmeter leads to CURRENT MON 10 MA/MV test points. b. Observe voltage on digital voltmeter. CAUTION Dc input not to exceed 250 mV (2.5 A) monitored with digital voltmeter at CURRENT MON 10 MA/MV test points. CAUTION Signal generator rf output must be turned OFF when switching circuit select or BAND MHZ selectors.	250 mV (2.5A) maximum	Check power supply and test adapter.

Table 2-12. Discriminator A3A6, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 Phasing alignment	a. Set BAND MHZ to 14 and circuit select to TRACK. b. Adjust signal generator for 14.0 MHz, unmodulated. c. Connect multimeter with straight high impedance probe to monitor RF POWER test point. Observe multimeter and adjust signal generator for 31.6 volts (20 W) output at RF POWER test point. NOTE It may be necessary to remove the 6 dB attenuator from the signal generator output to obtain the specified output. d. Connect digital voltmeter to PHASING test point and observe voltage on digital voltmeter. e. Set BAND MHZ to 26-29.9. f. Adjust signal generator to 29.999 MHz, unmodulated. Observe multimeter and adjust signal generator for 31.6 V (20 W) at RF POWER test point. g. Observe voltage on digital voltmeter at PHASING test point.	No more than ±50 mV. No more than ±120 mV. (tracking signal).	Adjust A3A6A3R5. Adjust A3A6A3R5 for no more than ±120 mV.

Table 2-12. Discriminator A3A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	h. Set circuit select to 29.99 MHZ (sense). Do not readjust signal generator output level. Observe voltage on digital voltmeter at monitor PHASING test point. Record voltage deviation from tracking error and compute sensitivity. Sensitivity is defined as the absolute value of the algebraic differences between sense and tracking voltage levels.	Sensitivity (sense minus tracking error level) should be no less than 100 mV.	Readjust A3A6A3 R5 to reduce tracking error to minimum. Check the following: A3A6A2T1, T2 A3A6A3T3 A3A6A2CR1, CR2, CR3 A3A6A2L3 A3A6A3CR5, CR6
	i. Repeat step h for each of the following frequencies (select applicable bands):		
	2.0 MHz	Tracking error no more than ± 65 mV. Sensitivity no less than 60 mV.	Adjust A3A6A3R5 and recheck error at 29.99 MHz. Note: Position of components on phasing board will affect this adjustment.
	4.0, 8.0, and 14.0 MHz	Tracking error no more than ±50 mV. Sensitivity no less than 100 mV.	Same as step h.
	20.0 MHz	Tracking error no more than ±100 mV. Sensitivity no less than 100 mV.	Same as step h.
	26.0 MHz	Tracking error no more than ±120 mV. Sensitivity no less than 100 mV.	Same as step h.

Table 2-12. Discriminator A3A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 Loading alignment	a. Complete steps 3a through 3c.		
	b. Connect digital voltmeter to LOADING test point. Observe digital voltmeter and adjust A3A6A2C15 for zero volts.		
	c. Switch BAND MHZ from 14 to 26- 29.9 and perform step 3.f. Observe digital voltmeter to measure tracking error at LOADING test point.	Tracking error no more than ±150 mV.	Balance tracking error between 14.0 and 29.9 MHz by adjusting A3A6A2C15. Replace loading board A3A6A2.
	d. Switch circuit select from TRACK to LOAD. Measure sense voltage at LOADING test point and calculate sensitivity (absolute value of the algebraic difference between sense and tracking voltages).	Sensitivity not less than 250 mV.	Adjust A3A6A2C15. Check the following: A3A6A2T1, T2. A3A6A3T3 A3A6A2CR1, CR2, CR3 A3A6A2L1 Replace loading board A3A6A2.
	e. Repeat steps b through d for the following frequencies (make applicable band selections):		
	2.0 MHz	Tracking error no more than ±150 mV. Sensitivity no less than 250 mV.	Same as above.
	4.0, 8.0, 20.0, and 26.0 MHz	Same as 2.0 MHz.	Same as above.
5 Forward power	a. Set circuit select to TRACK and BAND MHZ to 26-29.9.		
	b. Adjust signal for 29.999 MHz unmodulated. Observe multimeter and adjust signal generator for 31.6 V (20 W) at RF POWER test point.		

Table 2-12. Discriminator A3A6, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	c. Connect digital voltmeter to FWD. PWR test point and observe digital voltmeter.	2.3 to 2.4 V dc.	Adjust A3A6R12 for 2.35 V dc. Replace A3A6R12 if found to be defective. Replace loading board A3A6A2.
	d. Repeat steps a through c for following frequencies (with proper band selections):		
	2.0, 4.0, 8.0, 14.0, 20.0, and 26.0 MHz	2.0 to 2.3 V dc.	Same as above.
6 Reflected power	a. Perform steps 5.a and 5.b.		
	b. Connect digital voltmeter to REFL. PWR test point and observe voltage on digital voltmeter.	No more than 50 mV.	Adjust A3A6A2C14 for less than 50 mV. Change A3A6A2L8 with test select value listed in Parts List (Section III) (readjust A3A6A2C14 to obtain null after A3A6A2L8 is changed).
	c. Set BAND MHZ to 2 and signal generator to 2.0 MHz, unmodulated. Observe multimeter and adjust generator for 31.6 V (20 W) at RF POWER test point (tracking).		
	d. Observe digital voltmeter at REFL.PWR test point (tracking).	Not more than 200 mV.	Adjust A3A6A2C14 for no more than 200 mV. Change A3A6A2R3 with test select value listed in Parts List (Section III) (readjust A3A6A2C14 after A3A6A2R3 is changed).

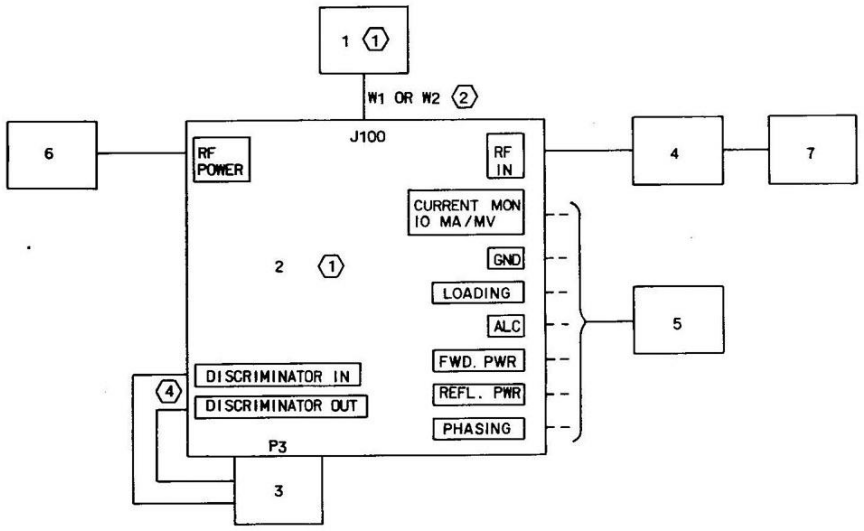
Table 2-12. Discriminator A3A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	e. Switch circuit select from TRACK to LOAD. Observe voltage on digital voltmeter at REFL. PWR test point (sense) and compute sensitivity (sense voltage minus tracking voltage) f. Repeat steps a through e for each of the following frequencies (with proper band selections):	Tracking no more than 200 mV. Sensitivity no less than 250 mV.	Replace loading board A3A6A2. Replace phasing board A3A6A3.
	4.0, 8.0, 14.0, and 20.0 MHz	Tracking no more than 200 mV. Sensitivity no less than 250 mV.	Replace loading board A3A6A2. Replace phasing
	26.0 MHz	Tracking no more than 200 mV. Sensitivity no less than 100 mV.	Same as above.
	29.9 MHz	Tracking no more than 50 mV. Sensitivity no less than 100 mV.	Same as above.
7 ALC	a. Set circuit select to TRACK and BAND MHZ to 2.		
	b. Adjust signal generator to 2.0 MHz, unmodulated. Observe multimeter and adjust signal generator for 10.0 volts (2W) measured at RF POWER test point.		
	c. Connect digital voltmeter to ALC test point and observe digital voltmeter.	3.95 to 4.05 V dc	Adjust A3A6R11 for 3.95 to 4.05 V dc. Remove power, check the following: A3A6R11, R13, R10, CR7, VR1, C18.

Table 2-12. Discriminator A3A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 (cont)	d. Repeat steps a through c for each of the following frequencies:		
	4.0, 8.0, 14.0, 20.0, 26.0, and 29.9 MHz. Maintain voltage output at RF POWER test point at 10.0 volts.	3.3 to 4.1 V dc	Same as above.
	e. Repeats steps a through d for 22.36 V (10 W) at RF POWER test point. Maintain voltage output at RF Power test point at 22.36 volts.	7.0 to 8.0 V dc for all frequencies listed.	Same as above.

Table 2-12. Discriminator A3A6, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. DISCRIMINATOR TEST ADAPTER
3. DISCRIMINATOR A3A6
4. ATTENUATOR, 6-dB
5. DIGITAL VOLTMETER
6. MULTIMETER
7. SIGNAL GENERATOR

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINES ARE ALTERNATE CONNECTIONS DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

(4) PENDANT CABLES, PART OF A3A6.

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Figure 2-10. Discriminator A3A6, Test Setup

2.3.6 Tuning Capacitor A3A7, Testing/Troubleshooting

Perform the procedures in table 2-13 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-13.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5113/PRM-502 (tuning capacitor/ tuning coil test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Impedance bridge

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF. b. Install tuning capacitor A3A7 on test adapter and connect power supply as shown in figure 2-11. c. Connect digital voltmeter to DVM test points. d. On test adapter, set DVM SELECT to VOLTAGE, MOTOR VOLTAGE to 25.2 V, UNIT to CAP, MOTOR DIRECTION to OFF and POWER to ON. e. On power supply set POWER to ON and adjust output for 25.2 V dc indication on digital voltmeter.		
2 Motor run voltage	a. On test adapter, set MOTOR VOLTAGE to 2-10 V VAR and adjust VAR ADJ for minimum voltage on the digital voltmeter at DVM (+) (-) test points.		
	b. On test adapter, set MOTOR DIRECTION to MAX or MIN and adjust VAR ADJ until capacitor just begins to run. Observe dc voltage on digital voltmeter.	Not more than 7 V dc	Check the following: C2, B1, and C1 drive assembly.
	c. On test adapter, set MOTOR DIRECTION to OFF.		
3 Motor minimum	a. On test adapter, set MOTOR VOLTAGE to 25.2 V, MOTOR DIRECTION to MIN. When motor stops, set MOTOR DIRECTION to OFF.	Switch S1 wafer turns in a clockwise direction as viewed in figure 2-12.	Check the following: S1, CR4 and CR1.

Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	b. On test adapter, connect digital voltmeter to MAX RUN and MIN RUN test points (negative lead of voltmeter to MAX RUN). Measure resistance on digital voltmeter, while manually rotating capacitor gear-train, at motor shaft, toward maximum until the motor minimum tab on switch S1 (figure 2-12) just makes contact with the switch wafer.	Resistance will show a single diode drop when contact is made.	Same as above.
	c. On test adapter, set POWER to OFF. NOTE Rock gears to eliminate backlash and ensure contact just makes.		
	d. Disconnect tuning capacitor A3A7 from test adapter. Connect capacitor C1 to impedance bridge and measure capacitance of C1.	23 pf max.	Loosen two setscrews in the capacitor and drive hub and rotate the capacitor, without turning the gears, until the normal indication is obtained. Retighten setscrews. If desired results cannot be obtained replace capacitor C1.
	e. Reconnect tuning capacitor A3A7 to test adapter and set POWER to ON.		

Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 Motor maximum	a. On test adapter, set MOTOR DIRECTION to MAX. When motor stops, set MOTOR DIRECTION to OFF.	Switch S1 wafer turns counter-clockwise as viewed in figure 2-12.	Check the following: S1, CR2 and CR3.
	b. On test adapter, connect digital voltmeter to MAX RUN and MIN RUN test points (positive lead to MAX RUN).		
	c. Measure resistance on digital voltmeter while manually rotating capacitor gear train, at motor shaft, toward minimum until motor maximum tab on switch S1 (figure 2-12) just contacts the switch wafer.	Resistance will show a single diode drop when contact is made.	Same as above.
	d. Rotate capacitor gear train, at motor shaft, toward maximum until the digital voltmeter just indicates an open.		
	e. On test adapter, set POWER to OFF.		
	f. Disconnect tuning capacitor A3A7 from test adapter. Connect capacitor C1 to impedance bridge and measure capacitance of C1. Reconnect tuning capacitor A3A7 to test adapter and set POWER to ON.	Not less than 975 pf.	Replace capacitor C1.
5 Logic maximum	a. On test adapter, if MAX LIMIT lamp is lit, set MOTOR DIRECTION to MIN until lamp goes out then return to OFF.		

Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	b. On test adapter, set MOTOR DIRECTION to MAX until the MAX LIMIT lamp lights, then return to OFF. Set POWER to OFF. Disconnect tuning capacitor A3A7 from test adapter.	MAX LIMIT lamp lights before the maximum contact of switch S1B opens.	Check the following: C1 and S1.
	c. Connect capacitor C1 to impedance bridge and measure capacitance of capacitor C1. Reconnect tuning capacitor A3A7 to test adapter.	Not less than 930 pf.	Replace C1.
6 Logic minimum	a. On test adapter, set POWER to ON. If MIN LIMIT lamp is lit, set MOTOR DIRECTION to MAX until MIN LIMIT lamp goes out then return to OFF.		
	b. On test adapter, set MOTOR DIRECTION to MIN until MIN LIMIT lamp lights then return to OFF. Set POWER to OFF. Disconnect tuning capacitor A3A7 from test adapter.		
	c. Connect capacitor C1 to impedance bridge and measure capacitance of capacitor C1. Reconnect tuning capacitor A3A7 to test adapter.	145 to 275 pf	Check the following: S1 and C1.
7 Minimum brake	a. On test adapter, set POWER to ON and MOTOR DIRECTION to MIN. When motor stops set POWER to OFF.		
	b. Manually rotate capacitor gear-train, at motor shaft, until the motor minimum brake tab on switch S1 (figure 2-12) just contacts the switch wafer.		

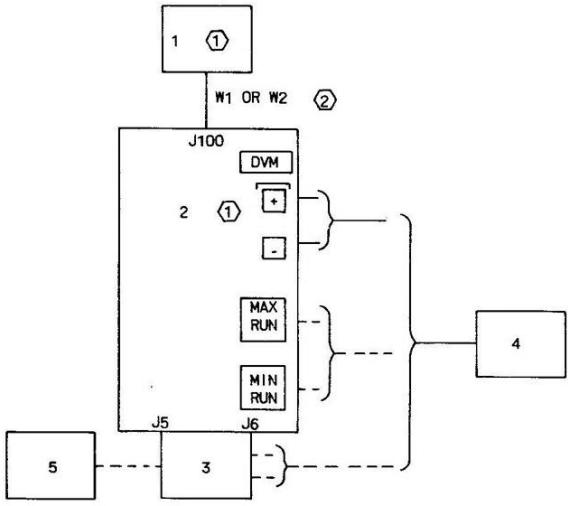
Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 (cont)	c. With digital voltmeter measure resistance between the motor minimum brake tab (- lead) and the motor black-dot tab (+ lead).	Resistance equal to short circuit.	Replace S1.
	d. Manually rotate capacitor gear-train, at motor shaft, until the motor minimum brake tab on S1 (figure 2-12) breaks contact with the switch wafer. Measure resistance as in step c.	Resistance equal to one diode drop plus motor resistance.	Replace S1.
	e. Reverse leads of digital voltmeter and measure resistance.	Resistance equal to open circuit.	Replace S1.
8 Maximim brake	a. On test adapter, set POWER to ON and MOTOR DIRECTION to MAX. When motor stops, set POWER to OFF.		
	b. Manually rotate capacitor gear-train at motor shaft, until the motor maximum brake tab on switch S1 (figure 2-12) just contacts the switch wafer.		
	c. With digital voltmeter measure resistance between the motor maximum brake tab (- lead) and the motor black-dot tab (+ lead).	Resistance equal to short circuit.	Replace switch S1.
	d. Manually rotate capacitor gear-train, at motor shaft, toward minimum until the motor maximum brake tab on switch S1 (figure 2-12) breaks contact with the switch wafer. Measure resistance as in step c.	Resistance equal to open circuit.	Replace switch S1.

Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 (cont)	e. Reverse leads of digital voltmeter and measure resistance.	Resistance equal to one diode drop plus motor resistance.	Replace switch S1.

Table 2-13. Tuning Capacitor A3A7 Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. TUNING CAPACITOR/TUNING COIL TEST ADAPTER
3. TUNING CAPACITOR A3A7
4. DIGITAL VOLTMETER
5. IMPEDANCE BRIDGE

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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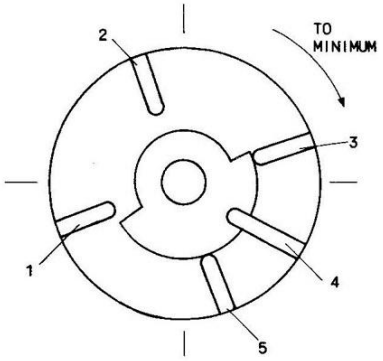
Figure 2-11. Tuning Capacitor A3A7, Test Setup



1. MOTOR MINIMUM BRAKE TAB (GRAY)

2. MOTOR MAXIMUM BRAKE TAB (BROWN)

3. MOTOR MINIMUM TAB (PURPLE)

4. MOTOR BLACK-DOT TAB (WHITE)

5. MOTOR MAXIMUM TAB (BLUE)

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Figure 2-12. Switch S1, Tuning Capacitor A3A7

2.3.7 Tuning Coil A3A8, Testing/Troubleshooting

Perform the procedures in table 2-14 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-14.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5113/PRM-502 (tuning capacitor/tuning coil test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Rf vector impedance meter

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF.		
	b. Install tuning coil A3A8 on test adapter and connect power supply as shown in figure 2-13.		
	c. Connect digital voltmeter to DVM test points.		
	d. On test adapter, set DVM SELECT to VOLTAGE, MOTOR VOLTAGE to 25.2 V, UNIT to COIL, MOTOR DIRECTION to OFF and POWER to ON.		
	e. On power supply set POWER to ON and adjust output for 25.2 V dc indication on digital voltmeter.		
2 Motor run voltage	a. On test adapter set MOTOR VOLTAGE to 2-10 V VAR and adjust VAR ADJ for minimum voltage on the digital voltmeter.		
	b. Manually position the grounding roller at the minimum end of coil L1 (figure 2-14).	The minimum limit switch activated, MIN LIMIT lamp lights.	Check S2.
	c. On test adapter set MOTOR DIRECTION to MAX and adjust VAR ADJ until the grounding roller just begins to move. Observe dc voltage on digital voltmeter.	Not more than 7 V dc.	Check the following: C1, B1, and L1 drive assembly.
	d. On test adapter, set DVM SELECT to CURRENT 10 MA/MV. Observe current on digital voltmeter.	Not more than 25 mV (250 mA).	Same as above.

Table 2-14. Tuning Coil A3A8, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)	e. On test adapter, set MOTOR DIRECTION to OFF and DVM SELECT to VOLTAGE. Adjust VAR ADJ for minimum voltage indication on digital voltmeter.		
	f. Manually position the grounding roller under the 12-30 MHz limit bar (figure 2-14).	POSITION lamp lights.	
	g. Repeat steps c and d.	Same as steps c and d.	Same as step c.
	h. Manually position the grounding roller at the maximum end of coil L1 (figure 2-14).	Maximum limit switch activated. MAX LIMIT lamp lights.	Check maximum limit switch.
	i. On test adapter, set DVM SELECT to VOLTAGE, MOTOR DIRECTION to MIN and adjust VAR ADJ until the grounding roller just starts to move. Observe dc voltage on digital voltmeter.	Same as step c.	Same as step c.
	j. Repeat step d.	Same as step d.	Same as step d.
	k. On test adapter, set MOTOR DIRECTION to OFF and DVM SELECT to VOLTAGE.		
3 Limit switch	a. Manually position the grounding roller near the minimum end of coil L1 (figure 2-14).		
	b. On test adapter, set MOTOR DIRECTION to MAX. Adjust VAR ADJ until grounding roller starts to move, and observe the POSITION	POSITION lamp lights just as the grounding roller touches the 12-30 MHz limit bar	Check the following: maximum limit switch, 12-30 MHz limit bar, and coil L1 drive assembly.

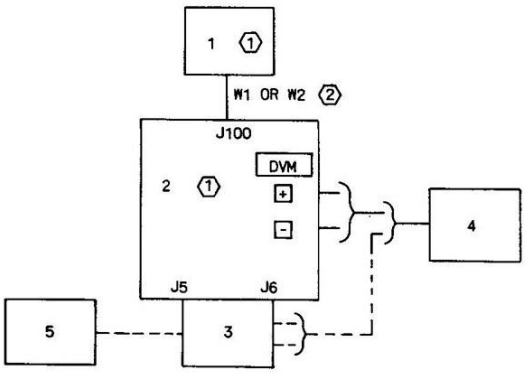
Table 2-14. Tuning Coil A3A8, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	and MAX LIMIT lamps. When motor stops set motor DIRECTION to OFF.	(figure 2-14). MAX LIMIT lamp lights when the grounding roller touches the maximum limit switch (figure 2-14).	
	c. On test adapter, set MOTOR DIRECTION to MIN and observe the MIN LIMIT lamp. When motor stops set MOTOR DIRECTION to OFF.	MIN LIMIT lamp lights when grounding roller touches the minimum limit switch (figure 2-14).	Check minimum limit switch.
	d. Check continuity with a digital voltmeter, between rf input terminal and the 12-30 MHz band wire at maximum end of coil L1 shaft (figure 2-14).	Continuity	Replace coil L1.
4 Coil coast	a. On test adapter, ensure that MOTOR DIRECTION is set to OFF. Set DVM SELECT to VOLTAGE and MOTOR VOLTAGE to 30 V (two switches).		
	b. Manually position the grounding roller at the maximum end of coil L1 (figure 2-14).		
	c. On test adapter, set MOTOR DIRECTION to MIN and observe where grounding roller stops.	Grounding roller stops (coil shaft does not turn) approximately 1/8 to 1/4 turn from minimum end of coil L1.	Check the following: L1 drive assembly and minimum limit switch.

Table 2-14. Tuning Coil A3A8, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 (cont)	d. On test adapter, set MOTOR DIRECTION to MAX and observe where grounding roller stops.	Grounding roller stops approximately 1/8 turn from maximum end of coil L1.	Check the following: maximum limit switch and L1 drive assembly.
5 Inductance	a. On test adapter, set MOTOR VOLTAGE to 25.2 V and MOTOR DIRECTION to MIN. When motor stops, set MOTOR DIRECTION to MAX. When motor stops, set MOTOR DIRECTION to OFF. NOTE In the following step, ensure that a good ground is obtained for rf vector impedance meter probe.		
	b. With rf vector impedance meter set at 2 MHz, measure the impedance (inductance) of coil L1 at the minimum frequency end (where screw attaches coil to insulator, figure 2-14).	Not less than 198.5 ohms (15.8 mH).	Replace coil L1.

Table 2-14. Tuning Coil A3A8, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. TUNING CAPACITOR/TUNING COIL TEST ADAPTER
3. TUNING COIL A3A8
4. DIGITAL VOLTMETER
5. RF VECTOR IMPEDANCE METER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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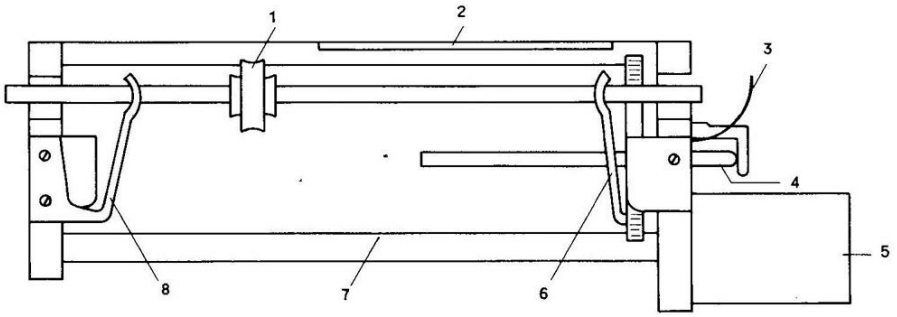
Figure 2-13. Tuning Coil A3A8, Test Setup



1. GROUNDING ROLLER
2. 12-30 MHz LIMIT BAR
3. WIRE GROUNDED BY BANDSWITCH (12-30 MHz)
4. CENTER TAP
5. MOTOR
6. MAXIMUM LIMIT SWITCH
7. COIL L1
8. MINIMUM LIMIT SWITCH

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Figure 2-14. Tuning Coil A3A8

2.3.8 Autotransformer A3A9, Testing/Troubleshooting

Perform the procedures in table 2-15 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-15.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5114/PRM-502 (autotransformer test adapter)

Rf vector impedance meter

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On autotransformer A3A9 to be tested, verify that the bandswitch high voltage wafer S1A is in line with the centering mark on contact. The centering mark is provided on the 2 MHz position to aid in adjustment. If contact is not in correct position, rotate switch shaft until above conditions are met.		
	b. On test adapter, set BAND (MHZ) to 2.0- 2.39 and install and connect autotransformer A3A9 on test adapter. Connect mechanical linkage to switch S1 and tighten setscrew.		
	c. Connect rf vector impedance meter as shown in figure 2-15.		
2 Whip	a. On test adapter, set BAND (MHZ) to some other position, then back to 2.0-2.39 and check high voltage contact.	High voltage contact of switch S1A aligns with printed marking.	Check S1.
	b. Set frequency on rf vector impedance meter to 2.0 MHz.		
	c. On rf vector impedance meter, measure impedance and phase angle for 2.0 MHz.	390-500 ohms /-84° to -89°	Refer to schematic and determine applicable components. Check and replace as necessary.

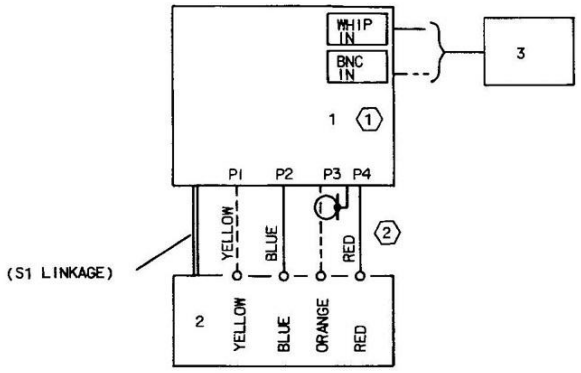
Table 2-15. Autotransformer A3A9, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)	d. Repeat steps a through c for the following bands and frequencies:		
	Band 2.4-2.9 — Frequency 2.4 MHz	230-280 ohms /-84° to -89°	
	3.0-3.9 — 3.0 MHz	350-410 ohms /-84° to -89°	
	4.0-5.9 — 4.0 MHz	490-570 ohms /-84° to -89°	
	6.0-7.9 — 6.0 MHz	290-340 ohms /-84° to -89°	
	8.0-11.9 — 8.0 MHz	510-570 ohms /84° to -89°	
	12.0-15.9 — 12.0 MHz	340-380 ohms /-84° to -89°	
	16.0-23.9 — 16.0 MHz	240-280 ohms /-84° to -89°	
	24.0-29.0 — 24.0 MHz	200-235 ohms /-84° to -89°	
	e. Disconnect rf vector impedance meter probe from WHIP IN on test adapter.		
	f. Disconnect red and blue leads from test adapter to terminals of the autotransformer.		
3 BNC	a. Connect rf vector impedance meter probe to BNC IN on test adapter.		
	b. Connect yellow lead on test adapter to yellow terminal on the autotransformer and the coaxial cable to orange terminal.		
	c. On test adapter set BAND (MHZ) to 2-2.39.		
	d. Set frequency on rf vector impedance meter to 2.0 MHz.		

Table 2-15. Autotransformer A3A9, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	e. On rf vector impedance meter measure impedance and phase angle for 2.0 MHz.	110-130 ohms /-61° to -69°	Refer to schematic and determine applicable components. Check and replace faulty component.
	f. Repeat steps c through e for the following bands and frequencies:		
	Band 2.4-2.9 — Frequency 2.4 MHz	95-115 ohms /-58° to -66°	
	3.0-3.9 — 3.0 MHz	80-100 ohms /-54° to -62°	
	4.0-5.9 — 4.0 MHz	140-160 ohms /-70° to -80°	
	6.0-7.9 — 6.0 MHz	95-115 ohms /-61° to -69°	
	8.0-11.9 — 8.0 MHz	70-90 ohms /-51° to -59°	
	12.0-15.9 — 12.0 MHz	120-140 ohms /-70° to -80°	
	16.0-23.9 — 16.0 MHz	165-185 ohms /-75° to -85°	
	24.0-29.9 — 24.0 MHz	70-90 ohms /-60° to -70°	

Table 2-15. Autotransformer A3A9, Testing/Troubleshooting (cont)



1. AUTOTRANSFORMER TEST ADAPTER
2. AUTOTRANSFORMER A3A9
3. RF VECTOR IMPEDANCE METER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PENDANT TEST LEADS, PART OF AUTOTRANSFORMER TEST ADAPTER.

(3) DASHED LINES ARE ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-15. Autotransformer A3A9, Test Setup

2.3.9 Control Logic A3A2, Testing/Troubleshooting

Perform the procedures in table 2-16 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-16.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5115/PRM-502 (control logic test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set all switches in either OFF, O, or GND position.		
	b. Install control logic card A3A2 and connect power supply and digital voltmeter as shown in figure 2-16.		
	c. On Power supply, turn power to ON. Turn on test equipment and allow sufficient time for warmup.		
	d. On test adapter, set POWER switches and 25.2 V SWITCH to ON.		
	e. Measure voltage at 25.2 V test point on test adapter.	25.2 V dc	Adjust 22 V-32 V OUTPUT VOLTAGE potentiometer on power supply.
	f. Measure voltage at 5.2V test point on test adapter.	5.2 V dc	Check power supply.

Table 2-16. Control Logic A3A2, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 (cont)	NOTE (Applicable to steps 2, 3, and 4) Initially all switches except for POWER are either OFF, in O, or GND position. Perform the tests in the sequence shown. Restart the test, if an error is made, at the start of that section or at the restart position noted. If the TEST ADAPTER SWITCH SETTING entry is blank, leave the corresponding switch in its previous setting. For each switch setting, observe only those 'outputs' indicated in the NORMAL INDICATION column.		

Table 2-16. Control Logic A3A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE										NORMAL INDICATION									IF INDICATION IS ABNORMAL
2. BAND DECODER ①	TEST ADAPTER SWITCH SETTINGS ②										TEST ADAPTER INDICATOR STATUS ②③									CHECK THE FOLLOWING COMPONENTS:
	4 PI-6 (S3)	8 PI-5 (S4)	1 PI-4 (S5)	2 PI-3 (S6)	4 PI-8 (S7)	8 PI-7 (S8)	10 PI-1 (S9)	20 PI-2 (S10)			2-2.39 P2-13 (DS1)	2.4-2.9 P2-9 (DS2)	3-3.9 P2-10 (DS3)	4-5.9 P2-25 (DS4)	6-7.9 P2-11 (DS5)	8-11.9 P2-28 (DS6)	12-15.9 P2-26 (DS7)	16-23.9 P2-20 (DS8)	24-29.9 P2-27 (DS9)	
a	0	0	0	0	0	0	0	0			1	0	0	0		0				C3, C4, C49, CR24, U2, U3, U7
b	1										0	1								C5, C48, CR23, U2, U3, U8
c	0	1									0	1								C5, C48, CR23, U2, U3, U8
d		0	1								0		1							C5, C47, CR22, U1, U2, U3, U4
e			0		1						0		0	1	0		0			C6, C46, CR21, U1, U4, U5
f					0	1					0					1			0	C8, C44, C19, U1 THRU U5
g						0	1				0					1	0			C9, C10, C44, CR19, U1 THRU U5
h				1													1			C6, C43, CR15, CR18, U1 THRU U9
i							0	1			0									C10, U3, U8
j			1										0					1	0	C10, C42, CR17, U1, U2, U6, U7, U8
k	1							0				0			0					U1, U2, U4, U8
l			0		1							0		0	1					C7, C45, CR20, U4, U5
m					0	1						0				0				C8, C44, CR19, U2, U3, U5, U8
n						0	1					0								C9, C48, CR23, U3, U4, U8
o							0	1				0								C10, U4, U8
p			1				1	0					0					0		C5, C9, U1, U3, U4
q						1	0						0							U3, U4, U5
r				0	1									0		0				CR19, CR21, U2, U4, U5
s						0	1							0			1	0		C43, CR18, U1, U3, U4, U6, U9
t							0	1						0						U4, U5
u				1		1		0							0					CR20, U4, U5
v						0	1								0		0	1		C42, CR17, U1, U2, U6, U7
w							0	1							0			0	1	C10, C41, CR16, U1, U2, U6, U7, U8, U10
x				0	0	1	1									0		1	0	C42, CR17, U1, U2, U6, U7, U8
y							0									0		0		U3, U4, U5, U6
z				1		0	1										0			U1, U3, U5, U6, U9
aa						1											1	0	1	CR16, CR17, U1, U3, U5, U6, U10
ab				0	1														1	C41, CR16, U1, U2, U6, U7, U8, U10
ac					0		0												1	C41, CR16, U1, U2, U6, U7, U8, U10
ad				1	1	0	1												0	U6, U7, U10

① READ NOTE FOLLOWING STEP 1.

② COMPONENT REFERENCE DESIGNATORS ARE SHOWN IN ( ). REFER TO TEST ADAPTER SCHEMATIC DIAGRAM.

③ 1 = LOGIC 1 AND INDICATOR ON TEST ADAPTER IS LIT.
0 = LOGIC 0 AND INDICATOR ON TEST ADAPTER NOT LIT.

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Table 2-16. Control Logic A3A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE																NORMAL INDICATION												IF INDICATION IS ABNORMAL
3. ⟨1⟩ TUNE STEPS	TEST ADAPTER SWITCH SETTINGS ⟨2⟩																TEST ADAPTER INDICATOR STATUS ⟨2⟩ ⟨3⟩												CHECK THE FOLLOWING COMPONENTS
	1 PI-4 (S5)	2 PI-3 (S6)	4 PI-8 (S7)	8 PI-7 (S8)	10 PI-1 (S9)	20 PI-2 (S10)	KEY PI-17 (S11)	RECHAN PI-26 (S12)	RCV PI-27 (S13)	HV DET PI-32 (S20)	ADV TO OPR P3-10 (S21)	LI POS P3-6 (S14)	SERVO ENBL P3-17 (S22)	BANDSWITCH COMPL P2-14 (S19)			BANDSWITCH J1-10 (DS21)	STANDBY J1-9 (DS22)	TUNE J1-8 (DS23)	OPERATE J1-4 (DS24)	KEY J1-7 (DS25)	TIP J1-22 (DS12)	TUNE FAULT P1-24 (DS13)	KEY P1-17 (DS14)	PA KEY P1-11 (DS15)	TIP P2-18 (DS11)			
a	0	0	0	0	0	1	OC	G	OC	0	0	OC	1	G			1	0	0	0		OC	0			OC			U20, U21
b								OC						OC			0	1	0	0	0	OC	0		OC	OC			U20, U21
c							G	G				G		G			1	0	0	0	0								U20, U21
d					1	0	OC	OC									1	0	0	0									U20, U21
e														OC			0	1	0	0	0				OC				U20, U21
f							G																						U20, U21
g							OC										0	0	1	0	1	G		G	G	G			U18
h														G															U20, U21
i								G									1	0	0	0	0			OC		OC			U20, U21
j							G	OC						OC					1		1								U14, U17, U18, U20, U21
k										1							0	0	0	1	1	OC							U14, U17, U18, U20, U21
l							OC														0								
m														G															
* n								G									1	0	0	0									U20, U21
o								OC		1							0	0	0	0									
p								G		0																			
q								OC						OC			0	1	0	0									U20, U21
r										1	0						0	0	0	0			1						U20, U22
s							G	G		0																			
t								OC									0	0	1	0	1								U11, U14, U17, U18, U20, U21
u										1							0	0	0	0	0								
v								G		0	1																		
w								OC									0	0	0	1	1								U11, U14, U17, U18, U20, U21
x										1				G			0	0	0	0	0								
y					0	1	OC	G						OC			1	0	0	0					OC				U20, U21

* TEST MAY BE RESTARTED AT THIS POINT.

⟨1⟩ READ NOTE FOLLOWING STEP 1.

⟨2⟩ COMPONENT REFERENCE DESIGNATORS ARE SHOWN IN ( ). REFER TO TEST ADAPTER SCHEMATIC DIAGRAM.

⟨3⟩ 1 = LOGIC 1 AND INDICATOR ON TEST ADAPTER IS LIT.
G = GROUND AND INDICATOR ON TEST ADAPTER IS LIT.
0 = LOGIC 0 AND INDICATOR ON TEST ADAPTER NOT LIT:
OC = OPEN CKT AND INDICATOR ON TEST ADAPTER NOT LIT.

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Table 2-16. Control Logic A3A2, Testing/Troubleshooting (cont)

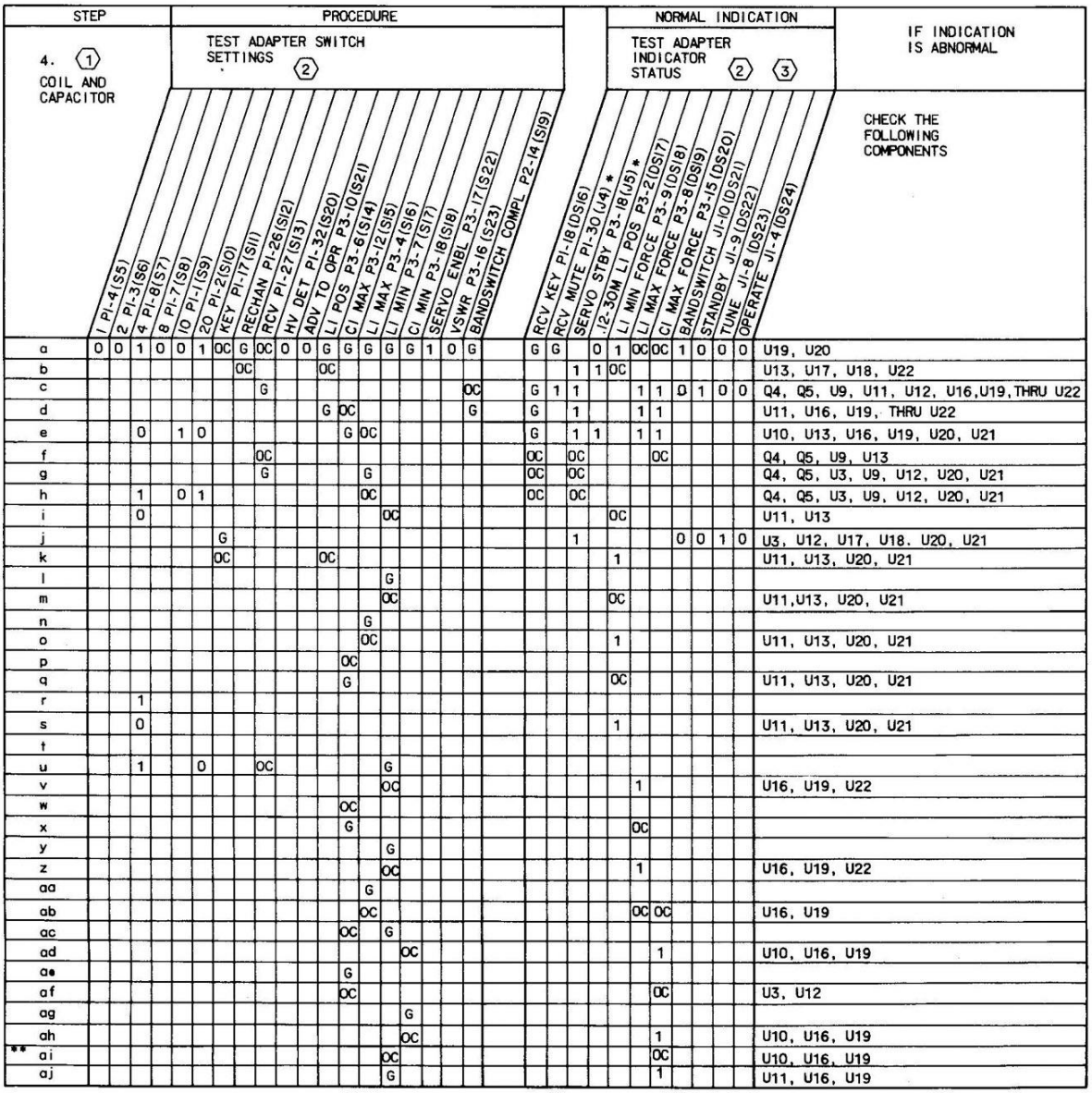

Table 2-16. Control Logic A3A2, Testing/Troubleshooting (cont)

STEP		PROCEDURE																				NORMAL INDICATION										IF INDICATION IS ABNORMAL
		TEST ADAPTER SWITCH SETTINGS (2)																				TEST ADAPTER INDICATOR STATUS (2) (3)										
4. (1) COIL AND CAPACITOR (CONT)		1 P1-4 (S5)	2 P1-3 (S6)	4 P1-8 (S7)	8 P1-7 (S8)	10 P1-1 (S9)	20 P1-2 (S10)	KEY P1-17 (S11)	RECHAN P1-26 (S12)	RCV P1-27 (S13)	HV DET P1-32 (S20)	ADV TO OPR P3-10 (S21)	LI POS P3-6 (S14)	CI MAX P3-12 (S15)	LI MAX P3-4 (S16)	LI MIN P3-7 (S17)	CI MIN P3-18 (S18)	SERVO ENBL P3-17 (S22)	VSWR P3-16 (S23)	BANDSWITCH COMPL P2-14 (S19)	RCV KEY P1-18 (DS16)	RCV MUTE P1-30 (J4) *	SERVO STBY P3-18 (J5) *	12-30M LI POS P3-2 (DS17)	LI MIN FORCE P3-9 (DS18)	LI MAX FORCE P3-8 (DS19)	CI MAX FORCE P3-15 (DS20)	CI MIN FORCE JI-10 (DS21)	BANDSWITCH JI-9 (DS22)	STANDBY JI-8 (DS23)	TUNE JI-4 (DS24)	OPERATE	CHECK THE FOLLOWING COMPONENTS
	ak														G																		
	al														OC										1								U9, U16, U19
***	am							G																	OC	1	0	0	0	0			U20, U21
	an						G	OC											OC							0	0	1	0				U14, U15, U18
	ao						OC						G						G					1		0	0	1	0				U10, U16, U17, U18, U19
	ap							G																OC		1	0	0	0				U20, U21
	aq						G	OC						G	OC				OC				1			0	0	1	0				U13, U17, U18
	ar																		G														
	as							G															OC			1	0	0	0				U20, U21
	at							OC			1								OC							0	0	0	1				U14, U17
	au												OC						G				1	OC									U11
	av														G																		
	aw														OC								OC	1									U16, U19, U22
	ax					1						G											1	OC									U13, U16, U19, U22
	ay													G																			
	az												OC										1	OC									U16, U19, U22
	ba											OC											OC	OC									U3, U11, U12, U20, U21
	bb														G	G									OC								U11, U16, U19
	bc					0																			1								U7, U9, U16, U19
	bd					1																			1								U7, U9, U16, U19
	be												G											1									U3, U12
	bf												OC											0									U3, U12
	bg												G										1	1									U3, U10, U11, U12, U13, U16

* FOR INDICATIONS AT P1-30 (J4) AND P3-18 (J5), USE DIGITAL VOLTMETER.
1 = +2.5 TO +5.2 V DC; G = CHASSIS GROUND; OC = OPEN CIRCUIT.

** DELAY 5 SECONDS BEFORE PROCEEDING TO NEXT STEP.

*** TEST MAY BE RESTARTED AT THIS POINT.

(1) READ NOTE FOLLOWING STEP 1.

(2) COMPONENT REFERENCE DESIGNATORS ARE SHOWN IN ( ).
REFER TO TEST ADAPTER SCHEMATIC DIAGRAM.

(3) 1 = LOGIC 1 AND INDICATOR ON TEST ADAPTER IS LIT.
G = GROUND AND INDICATOR ON TEST ADAPTER IS LIT
0 = LOGIC 0 AND INDICATOR ON TEST ADAPTER NOT LIT.
OC = OPEN CIRCUIT AND INDICATOR ON TEST ADAPTER NOT LIT.

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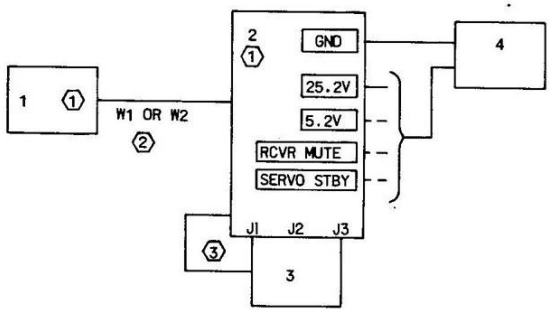
Table 2-16. Control Logic A3A2, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. CONTROL LOGIC TEST ADAPTER
3. CONTROL LOGIC A3A2
4. DIGITAL VOLTMETER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) PENDANT CABLE, PART OF CONTROL LOGIC TEST ADAPTER.

(4) DASHED LINES ARE ALTERNATE CONNECTIONS DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-16. Control Logic A3A2, Test Setup

2.3.10 Servo Amplifier A3A1, Testing/Troubleshooting

Perform the procedures in table 2-17 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-17.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5116/PRM-502 (servo amplifier test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Oscilloscope

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set switches and controls to the following positions: POWER switches to OFF, FORCE switches (C MAX, C MIN, L MAX, and L MIN) to OPEN, TIP to OPEN, LOW PWR to OPEN, PA LOW PWR to OPEN, 12-30 MHZ to 5.2V, SERVO RCV to 5.2V, C RUN LOAD to center position, L RUN LOAD to center position, INTCON CHECK to center position, REFLD PWR to OPEN, and DVM SELECT to ALC DET.	NOTE Unless otherwise specified, all voltage measurements are stated with reference to chassis ground (GND test point on test fixture).	
	b. Install servo amplifier A3A1 on test adapter and connect power supply as shown in figure 2-17.		
	c. On power supply, set POWER to ON. Connect digital voltmeter to +25.2 V. On test adapter, set POWER switches (2) to ON. On power supply, adjust OUTPUT VOLTAGE control for +25.15 to 25.25 V dc on digital voltmeter.	+25.15 to +25.25 V dc.	Check power supply and test adapter power input circuit.
	d. Connect digital voltmeter to +13V test point.	+12.90 to +13.10 V dc.	Same as c.
2 Input Voltages			

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2.1 -12 Vdc (25.2V SW ON)	a. Connect digital voltmeter to DVM test points.		
	b. Set DVM SELECT to -12V and observe digital voltmeter.	-10.8 to -12.5 V dc.	Check the following: C-38-41, C49; CR9-11; Q11, Q14, Q15, Q26; R70-75, R79; U7, VR4, and VR5.
2.2 +13 Vdc SW (25.2V SW ON)	a. Set DVM SELECT to +13V SW and observe digital voltmeter.	+12.3 to +13.1 V dc	Check the following: Q27, R68, and R69.
2.3 +13 V dc (25.2 V SW OFF)	a. Set 25.2 V SW to OFF and observe digital voltmeter.	Less than +1.0 Vdc	Check power supply and test adapter power input circuit.
2.4 -12Vdc (25.2 V SW OFF)	a. Set DVM SELECT to -12V and observe digital voltmeter.	Less than +2.0 Vdc	Same as above.
	b. Set 25.2V SW to ON.		
3 ALC adjustments			
3.1 ALC detector (tune)	a. Set TIP to GND.		
	b. Set DVM SELECT to FWD PWR and connect digital voltmeter to DVM test points.		
	c. Observe digital voltmeter and adjust FWD PWR for +1.15 to 1.25 V dc on digital voltmeter.		
	d. Set DVM SELECT to ALC DET.		
	e. Observe digital voltmeter and adjust ALC DET for +9.30 to 10.0 V dc on digital voltmeter. Record voltage level.		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3.1 (cont)	f. Repeat steps b and c. g. Connect digital voltmeter to ALC test connector. h. On servo amplifier A3A1, adjust R34 until ALC level on digital voltmeter just begins to go negative from zero V dc.		
3.2 Forward power (operate)	a. Set TIP to OPEN. b. Set DVM SELECT to FWD PWR and connect digital voltmeter to DVM test points. c. Observe digital voltmeter and adjust FWD PWR for +1.9 to 2.1 V dc on digital voltmeter. d. Set DVM SELECT to ALC DET. e. Observe digital voltmeter and adjust ALC DET for +9.9 to 10.1 V dc on digital voltmeter. f. Connect digital voltmeter to ALC test connector. g. On servo amplifier A3A1, adjust R35 until ALC level on digital voltmeter just begins to go negative from zero V dc.		
3.3 Low power (low pwr gnd)	a. Set LOW PWR to GND. b. Connect digital voltmeter to DVM test points and set DVM SELECT to FWD PWR.		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3.3 (cont)	c. Observe digital voltmeter and adjust FWD PWR for +0.3 to +0.5 V dc on digital voltmeter. d. Set DVM SELECT to ALC DET. e. Observe digital voltmeter and adjust ALC DET for +3.95 to 4.05 V dc on digital voltmeter. f. Connect digital voltmeter to ALC test connector. g. On servo amplifier A3A1, adjust R35 until ALC level on digital voltmeter just begins to go negative from zero V dc.		
3.4 Low power (low power open)	a. Set PA LOW PWR to GND and LOW PWR to OPEN. b. Repeat steps 2.3b through g.		
3.5 ALC final adjustment	a. Repeat steps 2.2, 2.3, and 2.4 until the ALC voltage on the digital voltmeter is slightly negative without adjusting R34 or R35. (Set PA LOW PWR to OPEN before repeating step 2.2.) b. Repeat steps 2.1a through h until the ALC voltage on the digital voltmeter is slightly negative without adjusting R34.		Repeat steps 2.1a through 2.1d. Set the ALC DET voltage at a higher level than recorded in step 2.1e. Repeat steps 2.1g and h.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 ALC 4.1 ALC detector (Tune)	a. Set PA LOW PWR to OPEN, LOW PWR to OPEN, and TIP to GND.		
	b. Connect digital voltmeter to DVM test points.		
	c. Set DVM SELECT to FWD PWR.		
	d. Adjust FWD PWR for +1.15 to +1.25 V dc on digital voltmeter.		
	e. Set DVM SELECT to ALC DET.		
	f. Adjust ALC DET for +9.5 to +9.7 V dc on digital voltmeter.		
	g. Set DVM SELECT to FWD PWR and readjust FWD PWR for +1.15 to +1.25 V dc on digital voltmeter.		
	h. Connect digital voltmeter to ALC test connector and observe SIDETONE indicator. Adjust ALC DET until digital voltmeter indication just begins to go negative from zero.	SIDETONE indicator should be off.	Check the following: C9, CR1-2, CR6, Q10, Q17, U5B, VR2, and VR3.
	(1) Connect digital voltmeter to DVM test points.		
	(2) Set DVM SELECT to ALC DET and observe digital voltmeter.	+9.3 to 10.0 V dc	Same as above.
	i. Connect digital voltmeter to ALC test connector and measure voltage while monitoring SIDETONE indicator.	SIDETONE indicator should be lit when ALC reaches -1.0 V dc.	Check the following: CR3, Q10, U5B, and VR3.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4.1 (cont)	Continue adjusting ALC DET until -5.5 to -6.5 V dc is read on digital voltmeter.		
	j. Transfer digital voltmeter to DVM test points and observe ALC DET voltage on digital voltmeter.	When -6 V dc is indicated at ALC, ALC DET voltage should be 9.8 to 10.8 V dc.	Check the following: CR3, CR12, Q17, U5B, and VR3.
4.2 Forward power (operate)	a. Set TIP to OPEN and repeat steps 4.1a through 4.1c.		
	b. Adjust FWD PWR for +2.0 to +2.2 V dc on digital voltmeter.		
	c. Set DVM SELECT to ALC DET and adjust ALC DET for +9.9 to +10.1 V dc on digital voltmeter.		
	d. Connect digital voltmeter to ALC test connector.		
	e. Observe both SIDETONE indicator and digital voltmeter, and adjust FWD PWR until ALC voltage just begins to go negative.	SIDETONE indicator should	Check the following: CR3, Q10, Q17, U5B and VR3.
	(1) Connect digital voltmeter to DVM test points		
	(2) Set DVM SELECT to FWD PWR and observe digital voltmeter.	1.9 to 2.1 V dc.	Same as above.
	f. Reconnect digital voltmeter to ALC test connector and continue to vary FWD PWR until ALC voltage on digital voltmeter is -5.5 to -6.5 V dc.		
	g. Connect digital voltmeter to DVM test points and set DVM SELECT to FWD PWR. Observe digital voltmeter.	+2.0 to 2.4 V dc	Same as above.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4.3 Low power	a. Set test adapter switches to the following positions: PA LOW PWR to OPEN, LOW PWR to GND, TIP to OPEN, REFLD PWR to OPEN.		
	b. Set DVM SELECT to ALC DET and adjust ALC DET for +4.0 V dc on digital voltmeter.		
	c. Set DVM SELECT to FWD PWR and adjust FWD PWR for +0.3 to +0.5 V dc.		
	d. Connect digital voltmeter to ALC test connector and adjust ALC DET until voltage at ALC just begins to go negative. Set DVM SELECT to ALC DET and connect digital voltmeter to DVM test points. Observe ALC DET voltage on digital voltmeter.	+3.9 to +4.2 V dc.	Check the following: CR3, CR12, Q17, U5B, and VR3.
	e. Set LOW PWR to OPEN and PA LOW PWR to GND and repeat steps b. through d.	+3.9 to +4.2 V dc.	Same as above.
4.4 Reflected power	a. Set PA LOW PWR to OPEN, and ensure that LOW PWR and TIP are set to OPEN.		
	b. Set DVM SELECT to FWD PWR and adjust FWD PWR to +0.95 to +1.05 V dc.		
	c. Set REFLD PWR to VAR ADJ.		
	d. Connect digital voltmeter to ALC test connector and adjust REFLD PWR until ALC voltage begins to go negative from zero.		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4.4 (cont)	e. Set DVM SELECT to REFLD PWR.		
	f. Connect digital voltmeter to DVM test points and observe REFLD PWR voltage on digital voltmeter.	+1.4 to +1.8 V dc.	Check the following: CR3, CR12, Q17, U5, and VR3.
	g. Connect digital voltmeter to ALC test connector and adjust REFLD PWR for -5.5 to -6.5 V dc.		
	h. Connect digital voltmeter to DVM test points.		
	i. Observe REFLD PWR voltage on digital voltmeter.	+1.8 to +2.2 V dc.	Same as above.
5 VSWR detector	a. Ensure that test adapter switches are set to the following positions: PA LOW PWR to OPEN, LOW PWR to OPEN, TIP to OPEN, REFLD PWR to VAR ADJ.		
	b. Set DVM SELECT to FWD PWR.		
	c. Adjust FWD PWR for +2.4 to +2.6 V dc on digital voltmeter.		
	d. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for zero volts on digital voltmeter.		
	e. Set DVM SELECT to FWD PWR and adjust FWD PWR for +2.4 to +2.6 V dc on digital voltmeter.		
	f. Set DVM SELECT to ADV TO OPR and observe digital voltmeter.	No less than 3.5 V dc (logic 1).	Check the following: C37, CR4, CR5, U5, U6, VR6, and VR7.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	g. Set DVM SELECT to VSWR and observe digital voltmeter.	No less than 4.0 V dc.	Check the following: C14, C17, CR5, CR14, U4, and VR6.
	h. Adjust REFLD PWR slowly until VSWR voltage is less than 0.1 V dc and ADV TO OPR voltage is less than 0.5 V dc (logic zero).		
	i. Set DVM SELECT to REFLD PWR and observe digital voltmeter.	+0.7 to +0.85 V dc.	Check the following: Q17 and VR2.
6 Forward power detector	a. Ensure that test adapter switches are set to the following positions: PA LOW PWR to OPEN, LOW PWR to OPEN, TIP to OPEN, REFLD PWR to VAR ADJ.		
	b. Set DVM SELECT to FWD PWR and adjust FWD PWR for zero volts on digital voltmeter.		
	c. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for zero volts on digital voltmeter.		
	d. Set DVM SELECT to ADV TO OPR and observe digital voltmeter.	Less than +0.5 V dc (logic zero).	Check the following: C37, CR4, CR5, U4, U6, VR6, and VR7.
	e. Observe digital voltmeter and adjust FWD PWR slowly to increase FWD PWR voltage until ADV TO OPR voltage on digital voltmeter goes to +3.5 V dc (logic 1).		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	f. Set DVM SELECT to FWD PWR and observe digital voltmeter.	+0.35 to +0.5 V dc	Check the following: C16, C37, CR4, U4, U6 and VR7.
7 Servo enable	a. Ensure that test adapter switches are set to same positions noted in step 6.		
	b. Set DVM SELECT to FWD PWR and adjust FWD PWR for +1.9 to +2.1 V dc on digital voltmeter.		
	c. Set DVM selector to REFLD PWR and adjust REFLD PWR to +0.9 to +1.1 V dc on digital voltmeter.		
	d. Set DVM SELECT to VSWR and observe digital voltmeter.	Less than +1.0 V dc.	Check the following: C15, CR5, U4B, and VR6.
	e. Connect oscilloscope vertical input to SERVO ENABLE test connector and trigger input to VSWR test connector.		
	f. Set DVM SELECT to REFLD PWR.		
	g. Ensure that SERVO RCV is set to 5.2 V. Observe SERVO ENABLE voltage on oscilloscope and short DVM (+) (-) test points.	Less than +0.2 V dc (logic zero).	Check the following: C15, C52, CR5, CR6, U4, and U6.
	h. Set SERVO RCV to GND. Remove short from DVM (+) (-) test points (step f) and note elapsed time for SERVO ENABLE voltage to go from +4.5 (high) to +0.2 V dc (low).	1.0 to 1.8 seconds	Check the following: C36; CR7; R44, R45, and VR6.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 (cont)	i. Wait 10 seconds then short DVM (+) (-) test points. Note elapsed time for SERVO ENABLE voltage to go from +0.2 (low) to +4.5 V dc (high).	0.5 to 1.5 seconds	Check the following: C15, U4, U6, and R80.
8 Advance to operate	a. Ensure that test adapter switches are set to the following positions: PA LOW PWR to OPEN, LOW PWR to OPEN, TIP to OPEN, REFLD PWR to VAR ADJ.		
	b. Set DVM SELECT to FWD PWR and connect digital voltmeter to DVM test points.		
	c. Adjust FWD PWR for +1.9 to +2.1 V dc on digital voltmeter.		
	d. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for +0.9 to 1.1 V dc on digital voltmeter.		
	e. Set DVM SELECT to ADV TO OPR and observe digital voltmeter.	Less than 0.2 V dc (logic zero).	Check the following: CR5, U4, U6, and VR6.
	f. Connect oscilloscope vertical input to ADV TO OPR test connector and trigger input to VSWR test connector.		
	g. Observe ADV TO OPERATE voltage on oscilloscope, set DVM SELECT to REFLD PWR and short DVM (+) (-) test points. Observe time it takes ADV TO OPERATE voltage to go from low to high (to +4.5 V dc).	1.0 to 2.0 seconds	Check the following: C37, CR5, CR8, R41, U4, U6, and VR6.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9 Interconnect lines	a. Ensure that test adapter switches are set to the following positions: PA LOW PWR to OPEN, LOW PWR to OPEN, TIP to OPEN, REFLD PWR to VAR ADJ.		
	b. Observe INTCON CHECK indicator.	Indicator not lit.	Check applicable wiring.
	c. Set INTCON CHECK switch to NO. 1 and observe INTCON CHECK indicator.	Indicator lit.	Same as above.
	d. Set INTCON CHECK switch to NO. 2 and observe INTCON CHECK indicator.	Indicator lit.	Same as above.
	e. Set INTCON CHECK switch to mid-position and observe INTCON CHECK indicator.	Indicator not lit.	Same as above.
10 Loading servo amplifier	a. Connect digital voltmeter to DVM test points.		
	b. Ensure that 12-30 MHZ is set to 5.2 V.		
	c. Set DVM SELECT to FWD PWR and adjust FWD PWR for +1.9 to +2.1 V dc on digital voltmeter.		
	d. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for zero volts on digital voltmeter.		
	e. Set DVM SELECT to LOADING and SERVO RCV to 5.2 V. Adjust LOADING for +0.110 to +0.130 V dc.		
	f. Set DVM SELECT to L RUN and observe voltage on digital voltmeter.	+18 to +22.0 V dc.	Check the following: C11, Q18, Q19, Q22, Q23, U1, and U2.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 (cont)	g. Set L RUN LOAD to FULL for 15 seconds and observe digital voltmeter.	+18 to +22.0 V dc.	Same as above.
	h. Set DVM SELECT to LOADING and adjust LOADING for -0.110 to -0.130 V dc. Repeat steps f and g.	-18 to -22.0 V dc.	Same as above.
	i. With LOADING adjusted for -0.110 to -0.130 V dc, set 12-30 MHZ to GND, DVM SELECT to L RUN, and L RUN LOAD to HALF.	-0.2 to -2.5 V dc.	Same as above.
	j. Set 12-30 MHZ to 5.2 V, adjust LOADING to +0.5 V dc, and set L MAX to 5.2 V. Observe digital voltmeter.	-20 to -22.5 V dc.	Same as above.
	k. Set DVM SELECT to LOADING and adjust LOADING for -0.5 V dc. Set DVM SELECT back to L RUN. Set L MIN to 5.2 V and observe L RUN voltage on digital voltmeter.	+20 to +22.5 V dc.	Same as above.
	l. Set SERVO RCV to GND, and ensure that 12-30 MHZ is set to 5.2 V. Set L MAX to 5.2 V and observe L RUN voltage on digital voltmeter.	-2.0 to +2.0 V dc.	Check the following: C27, C50, Q1, Q2, Q5, Q6, Q9, Q13, Q18, Q19, Q23 and U6.
	m. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for +1.0 V dc. Set DVM SELECT to SERVO ENBL and observe SERVO ENBL voltage for low logic state.	-0.6 to +0.6 V dc	
	n. Set DVM SELECT to L RUN.		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 (cont)	o. Set L MAX to 5.2 V and observe L RUN voltage on digital voltmeter.	-20 to -22.5 V dc	Check the following: C11, Q18, Q19, Q22, Q23, U1, U2, U4, and U6.
11 Phasing servo amplifier	a. Ensure that REFLD PWR is set to VAR ADJ.		
	b. Set DVM SELECT to FWD PWR and adjust FWD PWR for +1.9 to +2.1 V dc on digital voltmeter.		
	c. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for zero volts on digital voltmeter.		
	d. Set SERVO RCV to 5.2 V and DVM SELECT to PHASING. Adjust PHASING for +0.085 to +0.115 V dc on digital voltmeter.		
	NOTE Looking at card on test adapter, J2 is the 5 rows of pins (4 pins each) in the upper middle of the card. J2-16 is the extreme left pin in the center row.		
	e. On servo amplifier A3A1, connect digital voltmeter to J2-16. Observe digital voltmeter.	+3.0 to +5.5 V dc	Check the following: CR16, U5, and VR8.
	f. Connect digital voltmeter to DVM test points, set DVM SELECT to C RUN, and observe digital voltmeter.	+14.0 to +20.0 V dc	Check the following: C31, C32, C46, Q3, Q4, Q7, Q8, Q20, Q21, Q24, Q25, and U3.

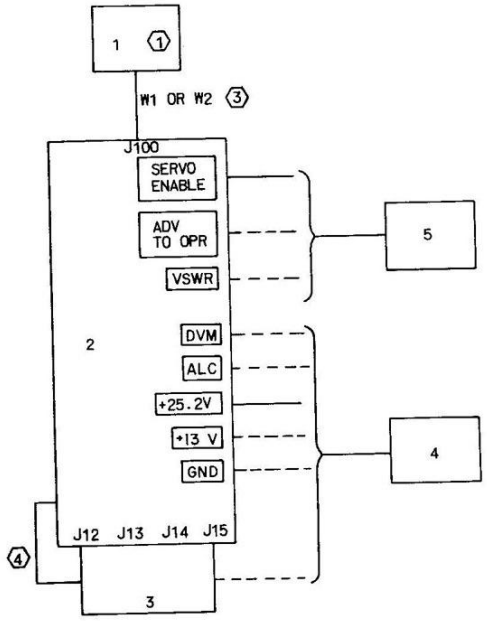
Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	g. While monitoring C RUN voltage on digital voltmeter, set C RUN LOAD to FULL for 15 seconds. Note voltage during FULL setting.	+14.0 to +18.0 V dc.	Same as above.
	h. Set DVM SELECT to PHASING and adjust PHASING for -0.085 to -0.115 V dc on digital voltmeter and repeat steps e, f, and g.	a. Voltage at A3A1 J2-16 should be -0.6 to +0.6 V dc.	Check the following: CR16, U5, and VR8.
		b. Voltage determined by step f. should be -14.0 to -20.0 V dc.	Check the following: C31, C32, C46, Q3, Q4, Q7, Q8, Q20, Q21, Q24, Q25, and U5.
		c. Voltage determined by step g. should be -14.0 to -18.0 V dc.	Same as above.
	i. Set DVM SELECT to PHASING and adjust PHASING for +0.5 V dc.		
	j. Set DVM SELECT to C RUN and set C MAX to 5.2 V. Observe voltage on digital voltmeter.	-20.0 to -22.5 Vdc.	Check the following: C31, C32, Q3, Q4, Q7, Q8, Q20, Q21, Q24, Q25, and U1.
	k. Set DVM SELECT to PHASING and adjust PHASING for -0.5 ±0.01 V dc.		
	l. Set DVM SELECT to C RUN and set C MIN to 5.2 V. Observe digital voltmeter.	+20 to +22.5 V dc.	Same as above.
	m. Set SERVO RCV to GND and ensure that 12-30 MHZ is set to 5.2 V.		

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	n. Set C MAX to 5.2 V. Observe digital voltmeter.	-2.0 to +2.0 V dc.	Same as above.
	o. Set SERVO RCV to 5.2, 12-30 MHZ to GND, and ensure that REFLD PWR is set to VAR ADJ.		
	p. Set DVM SELECT to REFLD PWR and adjust REFLD PWR for +1.0 V dc on digital voltmeter.		
	q. Set DVM SELECT to SERVO ENABLE. Observe digital voltmeter.	Less than +0.2 V dc (logic 0).	Check the following: U6C, U6D, VR6, and VR7.
	r. Set DVM SELECT to C RUN and switch C MAX to 5.2 V. Observe digital voltmeter.	-20.0 to -22.5 V dc.	Check the following: C31, C32, Q3, Q4, Q7, Q8, Q20, Q21, Q24, Q25, U1 and U3.

Table 2-17. Servo Amplifier A3A1, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. SERVO AMPLIFIER TEST ADAPTER
3. SERVO AMPLIFIER A3A1
4. DIGITAL VOLTMETER
5. OSCILLOSCOPE

NOTES:

① PART OF RADIO TEST SET AN/PRM-502.

② DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

③ PART OF POWER SUPPLY.

④ PENDANT CABLE, PART OF SERVO AMPLIFIER TEST ADAPTER.

TP5-4803-014

Figure 2-17. Servo Amplifier A3A1, Test Setup

2.3.11 If /Af A1A5A1, Testing/Troubleshooting

Perform the procedures in table 2-18 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-18.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5117/PRM-502 (if/af test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Electrical Frequency Synthesizer 0-5122/PRM-502 (electrical frequency synthesizer)

Attenuator, audio

Attenuator, 6-dB (2 required)

Digital voltmeter

Distortion analyzer

Frequency counter

If load, 500 ohm (0.1-uf cap. and 500-ohm resistor)

Isolation transformer

Mixer-attenuator, 600 ohms (refer to figure 2-31)

Oscillator (2 required)

Oscilloscope (storage function required)

Power divider

Power supply, 0-40 V dc

Rms voltmeter

Rf voltmeter

Signal generator (2 required)

Spectrum analyzer (if section and 1-KHz to 110-MKz rf section required)

Wave analyzer

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter set POWER to OFF. b. Install If/Af A1A5A1 on test adapter and connect power supply as shown in figure 2-18 test setup A. c. On power supply, set power to ON; on test adapter set AGC to ATTACK, +25 VDC control fully clockwise, AM-SSB to SSB, VOICE-DATA to DATA, POWER to ON, AGC to ENBL, all other switches to DSBL and RF GAIN control to maximum clockwise position. d. Connect digital voltmeter to +25 VDC P1-20 test point on test adapter and adjust the power supply OUTPUT VOLTAGE for 26 V dc indication on digital voltmeter. e. On test adapter adjust +25 VDC control for a +25.2 V dc indication on digital voltmeter. f. On frequency synthesizer, set POWER to ON and connect to 5 MHZ injection jack on test adapter.		
2 SSB receive audio	a. On test adapter, connect signal generator to IF IN/OUT jack and rms voltmeter to RCV AUDIO test points. b. Adjust signal generator for 4.9990 MHz to 100 uV and measure RCV AUDIO on rms voltmeter.	720 to 840 mV rms	Adjust A1A5A1R150 (figure 3-5, sheet 3) Check the following: Q26-Q28, Q21-Q24, and U2, and U3.

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)	c. Connect rms voltmeter to AUX AUDIO test point on test adapter and measure audio level.	700 to 860 mV rms	Check Q36 and associated components
3 AM receive audio	a. On test adapter, set AM-SSB to AM, disconnect 5 MHZ injection (from frequency synthesizer test set) and connect rms voltmeter to RCV AUDIO jacks.		
	b. Adjust signal generator for 5.0 MHz, 100 uV modulated 100% at 1000 Hz applied to IF IN/OUT jack on test adapter.		
	c. Measure RCV AUDIO with rms voltmeter.	720 to 840 mV rms	Adjust A1A5A1R151 (figure 3-5 sheet 3) Check the following: Q21-Q24, Q25, U2, U3, and Q29-Q32.
4 Receive sensitivity	a. Adjust signal generator for 5.0 MHz, 3.5 uV, modulated 30% at 1000 Hz applied to IF IN/OUT jack on test adapter.		
	b. Connect distortion analyzer to RCV AUDIO test point on test adapter and measure the signal-plus-noise to noise ratio ((S+N)/N) by turning off the AM modulation.	Not less than 11 dB.	Check the following Q2, FL1, U2, U3, Q21-Q25, and Q19
	c. On test adapter, set AM-SSB to SSB, reconnect the 5 MHz injection from frequency synthesizer to 5 MHZ jack.		
	d. Adjust signal generator for 4.9990 MHz, 1.0 uV applied to IF IN/OUT jack on test adapter.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 (cont)	e. Measure the signal-plus-noise (S+N)/N ratio by nulling out the 1000-Hz audio.	Not less than 11 dB.	Check the following: Q1, FL2, Q26-Q28, U2, U3, and Q20-Q24.
5 Audio volume control	a. On test adapter, set VOICE-DATA to VOICE. Connect rms voltmeter to RCV AUDIO jack and set VOLUME control fully clockwise.		
	b. Adjust signal generator for 4.9999 MHz at 100 uV, applied to IF IN/OUT jack on test adapter and measure RCV AUDIO with rms voltmeter.	Not less than 2.8 Vrms.	Check the following: U3 and U2
	c. On test adapter, set VOLUME control fully counterclockwise and measure RCV AUDIO with rms voltmeter.	Not more than 27 mV rms.	Check the following: U3 and U2.
	d. On test adapter, set RCV MUTE to ENBL, VOLUME control fully clockwise and measure RCV AUDIO with rms voltmeter.	Not more than 3 mV rms.	Check U3.
6 SSB receive distortion	a. On test adapter, set RCV MUTE to DSBL and connect distortion analyzer to RCV AUDIO jack.		
	b. Adjust signal generator for 4.9990 MHz at 100 uV applied to IF IN/OUT on test adapter and adjust VOLUME control for 2.7 Vrms audio output at RCV AUDIO jack on test adapter (use rms voltmeter portion of distortion analyzer).		
	c. With distortion analyzer, measure the percent of distortion of the audio output at the RCV AUDIO jack.	Not more than 1 percent.	Check the following: Q21, Q24, U2, and Q26-28.

Table 2-18. If/Af A1A5A1, Testing/Troubleshooring (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
7 AM receive distortion	a. On test adapter, set AM-SSB to AM and disconnect the 5 MHz injection signal from the 5 MHZ jack.		
	b. Adjust signal generator for 5.0 MHz, 100 uV, modulated 100% at 1000 Hz; applied to IF IN/OUT jack on test adapter. Adjust VOLUME control for 2.7 Vrms audio output at RCV AUDIO jack on test adapter (use rms voltmeter portion of distortion analyzer).		
	c. With distortion analyzer measure percent of distortion of the audio output at the RCV AUDIO jack.	Not more than 7 percent	Check the following: Q21-Q24, U2, and Q25.
8 Receive intermodu- lation	a. On test adapter, set AM-SSB to SSB, connect the 5 MHz injection signal from the frequency synthesizer to 5 MHZ jack. Connect rms voltmeter to RCV AUDIO test point.		
	b. Connect two signal generators through 6 dB attenuators and power divider to IF IN/OUT jack on test adapter as shown in figure 2-18 test setup A.		
	c. Turn one signal generator OFF and adjust the other for 4.99900 MHz at 10 mV.		
	d. On test adapter, adjust VOLUME control for 2.0 Vrms measured with rms voltmeter connected to RCV AUDIO.		
	e. Turn on the other signal generator and turn first one OFF, adjust second signal generator 4.99889 MHz at 10 mV.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 (cont)	f. Turn on both signal generators and connect wave analyzer to RCV AUDIO test point on test adapter.		
	g. Measure the distortion products below the 1000 and 1110 Hz tones on the wave analyzer.	110 Hz-Not less than 38 dB 890 Hz-Not less than 38 dB 1220 Hz-Not less than 38 dB	Check the following: Q26-Q28, U3, and U2.
9 SSB bandpass	a. On test adapter, set AGC to DSBL and reconnect the rms voltmeter to RCV AUDIO test point.		
	b. Disconnect the two signal generators from test adapter and connect one signal generator through the 6-dB attenuator to IF IN/OUT jack on test adapter.		
	c. Adjust signal generator for 4.999 MHz, 3 uV applied to IF IN/OUT jack on test adapter.		
	d. Vary frequency of signal generator for peak audio output on rms voltmeter and note as reference (both frequency and voltage).	Reference	
	e. Increase signal generator frequency until the audio out (measured on rms voltmeter) decreases to the 2 dB point of the reference frequency.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	f. Disconnect rms voltmeter and connect frequency counter to RCV AUDIO test point on test adapter and measure audio frequency. Disconnect frequency counter and reconnect rms voltmeter to RCV AUDIO test point.	Not more than 600 Hz.	Check the following: FL2, Q21-Q24, Q26-Q28, and U2.
	g. Increase signal generator frequency until audio out (measured on rms voltmeter) decreases to the 3.5 dB point of the reference frequency, then repeat step f.	Not more than 300 Hz.	Same as step f.
	h. Readjust signal generator to the reference frequency then decrease frequency until audio out (measured on rms voltmeter) decreases to the 2 dB point of the reference frequency.		
	i. Repeat step f.	Not less than 2700 Hz.	Check the following: FL1, Q21-Q24, and Q25.
	j. Decrease signal generator frequency until audio out (measured on rms voltmeter) decreases to the 3.5 dB point, then repeat step f.	Not less than 3200 Hz.	Same as step i.
10 AM bandpass	a. On test adapter, set AM-SSB to AM, AGC to ENBL and disconnect 5 MHz injection from the 5 MHZ jack.		
	b. Adjust signal generator for 5.0000 MHz, 100 uV, modulated 5% at 1000 Hz.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 (cont)	c. Vary the 1000 Hz modulating frequency for peak audio OUTPUT at RCV AUDIO test point on test adapter (measured on rms voltmeter). Note both modulating frequency and audio out as reference. NOTE If necessary use frequency counter to measure modulating frequency (audio).	Reference	
	d. Increase modulating frequency on signal generator until audio out (measured on rms voltmeter) decreases to 2 dB point from reference. Note audio frequency.	Not less than 2000 Hz.	Check the following: FL1, Q21-Q24, and Q25.
	e. Continue to increase modulating frequency until audio output (measured on rms voltmeter) decreases to 5.0 dB point from reference. Note audio frequency.	Not less than 2750 Hz or more than 3200 Hz.	Same as step d.
11 Audio rise	a. On test adapter, set AM-SSB to SSB, VOICE-DATA to DATA and connect 5 MHz injection frequency (from the frequency synthesizer) to the 5 MHZ jack.		
	b. Adjust signal generator for 4.9990 MHz at 10 uV applied to IF IN/OUT jack on test adapter.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
11 (cont)	c. With rms voltmeter measure level at RCV AUDIO jack on test adapter.	Not less than 600 mV.	Check the following: Q25, Q6-Q8, and Q29-Q32.
	d. Adjust signal generator for 4.9990 MHz at 100 uV and repeat step c.	720 to 840 mV	Same as step c.
	e. Adjust signal generator for 4.9990 MHz at 10 mV and repeat step c.	Not more than 950 mV.	Same as step c.
12 AGC attack/decay	a. Ensure that signal generator is adjusted for 4.9990 MHz at 10 mV, applied to IF IN/OUT jack on test adapter.		
	b. On test adapter, connect oscilloscope to RCV AUDIO jack and synchronize oscilloscope with the output of the SYNC jack.		
	c. On test adapter, set AGC to DECAY then to ATTACK (repeat as necessary) and on oscilloscope measure the time required for RCV AUDIO output to be within 3 dB of final level (agc attack time).	Not more than 4 milliseconds.	Check the following: Q29-Q32, C51-C53, and Q25.
	d. On test adapter, set AGC to ATTACK then to DECAY (repeat as necessary to sync oscilloscope and obtain measurement) and on oscilloscope measure the time required for RCV AUDIO output to be within 3 dB of final value (agc decay time).	40 to 100 milliseconds.	Same as step c.
	e. On test adapter, set DATA-VOICE to VOICE and repeat step d.	250 to 750 milliseconds.	Same as step c.

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
13 Rf gain	a. On test adapter set DATA-VOICE to DATA and AGC to ATTACK and adjust signal generator for 4.9990 MHz and -10 dBm (1000 Hz tone) indicated on rms voltmeter at RCV AUDIO test point.	250 to 750 milli-seconds.	Same as step c.
	b. Adjust RF GAIN on test adapter for maximum RCV AUDIO output, then readjust signal generator level for -10 dBm RCV AUDIO output. Note signal generator output level for reference.		
	c. Reduce RF GAIN on test adapter to obtain minimum RCV AUDIO output.		
	d. Increase signal generator output to obtain -10 dBm RCV AUDIO output and observe dB increase of signal generator output level.	Not less than 30 dB.	Check the following: Q33, and Q34.
14 Receive currents	a. On test adapter disconnect signal generator from IF IN/OUT jack and connect digital voltmeter to CURRENT MONITOR MV/MA +5.2 V test points and measure voltage (current).	Not more than 7.5 mV (7.5 mA)	check the following: L4 and C72, then check +5.2 V dc distribution in A1A5A1.
	b. On test adapter, connect digital voltmeter to CURRENT MONITOR MV/MA + 13 V test points and measure voltage (current).	Not more than 25 mV (25 mA).	Check the following: L5 and C65, then check +13 V dc distribution in A1A5A1.
15 Transmit output level	a. On test adapter, set AGC to DSBL and connect oscillator through isolation transformer to TX AUDIO and connect rf voltmeter		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
15 (cont)	across a 500 ohm load to IF IN/OUT jacks (as shown in figure 2-18 test setup B).		
	b. Adjust oscillator for 1000 Hz at 120 mV.		
	c. On test adapter, set PTT to ENBL and measure output at IF IN/OUT jack on rf voltmeter. Set PTT to DSBL.	45 to 75 mV.	Check the following: Q13-Q14, U1, Q12, Q15, Q11, and U8.
16. Transmit carrier reinsert	a. On test adapter, set AM-SSB to AM and connect spectrum analyzer across a 500 ohm load to IF IN/OUT jack.		
	b. Adjust oscillator for 1000 Hz at 120 mV, set PTT to ENBL and measure the dB difference between the carrier and the 1000 Hz sideband. Set PTT to DSBL.	Not more than 0.5 dB.	Adjust A1A5A1 R149 (figure 3-5, sheet 1) Check the following: Q4, CR1, Q3, and C3.
	NOTE For steps 17 and 18, if necessary to locate the carrier, set AM/SSB to AM, disconnect oscillator and set PTT to ENBL.		
17 Opposite sideband suppression	a. On test adapter, set AM-SSB to SSB and adjust oscillator for 400 Hz at 120 mV applied to TX AUDIO test point.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
17 (cont)	b. On test adapter, set PTT to ENBL and measure the level of the opposite sideband in dB down from the desired sideband at IF IN/OUT jack on the spectrum analyzer. Set PTT to DSBL.	Not less than 60 dB down.	Check the following U1, FL2, Q5, C1-C2, C4 and Q1.
18 Carrier suppression	a. Adjust oscillator for 1000 Hz at 12 mV applied to TX AUDIO test points on test adapter.		
	b. On test adapter, set PTT to ENBL and measure in dB the carrier level below the lower sideband on spectrum analyzer connected to IF IN/OUT jack. Set PTT to DSBL.	Not less than 50 dB down.	Adjust A1A5A1R30 and A1A5A1R154 as many times as necessary (figure 3-5, sheet 2). Check the following: U1, FL2 and Q5.
19 Transmit intermodulation	a. Connect 2 oscillators through the mixer attenuator, 600 ohm and connect mixer output to TX AUDIO jack on test adapter as shown in figure 2-18 test setup B.		
	b. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to OSC 1 IN and AUDIO LOAD/OSC 2 IN to AUDIO LOAD. Set oscillator No. 1 for 1000 Hz and an input level to the TX AUDIO jack of 60 mV (use the rms voltmeter to measure at the TX AUDIO jack).		
	c. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to AUDIO LOAD. Set AUDIO LOAD/OSC 2 IN to OSC 2 IN. Set oscillator No. 2 for 1150 Hz and an input level to the TX AUDIO jack of 60 mV.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
19 (cont)	d. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to OSC 1 IN (both oscillators will now be connected to the TX AUDIO jack on the test adapter).		
	e. Connect spectrum analyzer through 500-ohm load (item 9, figure 2-18) to IF IN/OUT jack on test adapter. Set PTT to ENBL.		
	f. Measure the level of the 850- and 1300-Hz products in dB below the desired tones. On test adapter, set PTT to DSBL.	850 and 1300 Hz not less than 45 dB down.	Same as test 17 step b.
20 Sidetone	a. On test adapter, set SDT to ENBL, connect rms voltmeter to RCV AUDIO test points. Connect oscillator to TX AUDIO test point and adjust for 1000 Hz at 120 mV input to TX AUDIO test point.		
	b. On test adapter, set PTT to ENBL and measure RCV AUDIO on rms voltmeter. Set PTT to DSBL.	-4.8 to -7.2 dBm.	Check the following: U2 and C76.
21 Low voltage fault	a. On test adapter, set SDT to DSBL, VOICE-DATA to DATA, disconnect oscillator from TX AUDIO test point, connect digital voltmeter to +25 VDC P1-20 test point.		
	b. On test adapter, set PTT to ENBL and reduce +25 V dc control to +20 V dc indicated on digital voltmeter. Monitor RCV AUDIO on rms voltmeter. Set PTT to DSBL and readjust +25	-7.0 to -11 dBm	Check the following: U2 and C76.

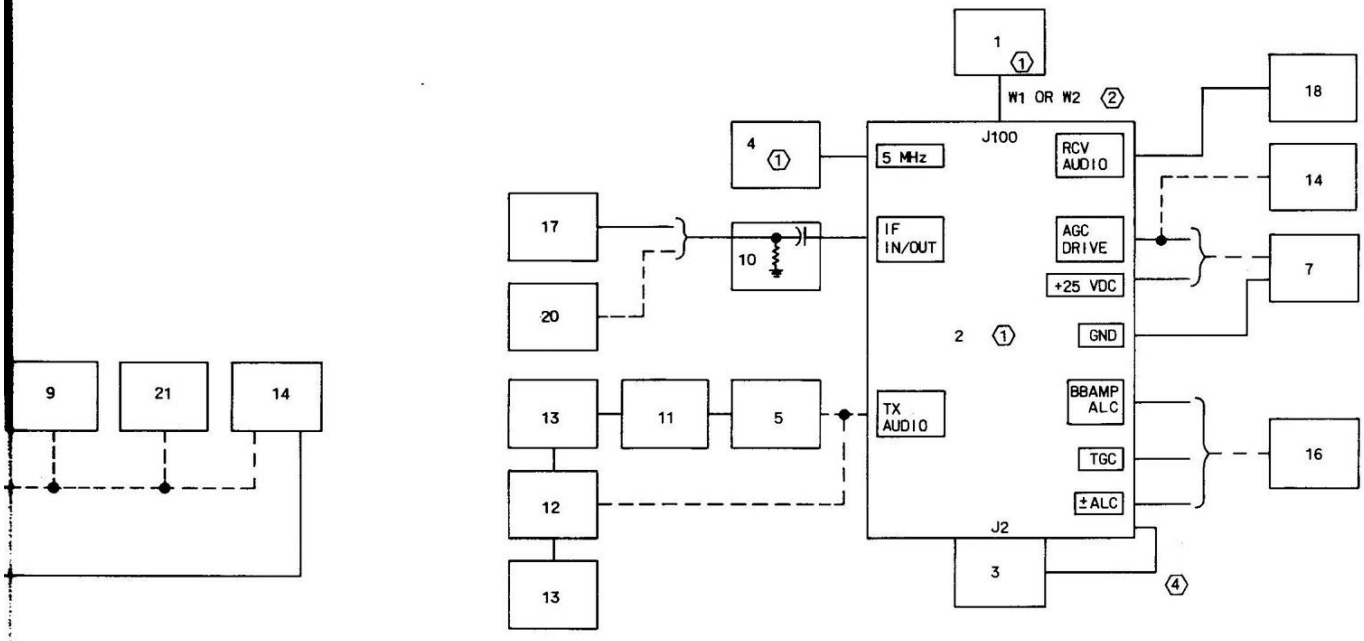
Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 21 (cont)	V dc control for 25 V dc indicated on digital voltmeter.		
22 ALC	a. On test adapter, connect digital voltmeter with negative lead to AGC DRIVE and positive lead to AGC COM test points .Connect 0-40 V dc power supply with negative lead to BB AMP-ALC and positive lead to GND test points. Measure the voltage at AGC DRIVE test point with O V dc applied to BB AMP-ALC test point.	Reference	
	b. On test adapter, set PTT and TGC to ENBL. Adjust 0-40 V dc power supply for -1.5 V dc applied to BB AMP-ALC test point. Measure the voltage increase at AGC DRIVE test point.	Not less than 0.65 V dc.	Check the following: Q16, Q18, Q6, Q11, Q9, Q10, C22, and CR16.
	c. On test adapter, set TIP to ENBL and connect 0-40 V dc power supply to TGC (negative terminal) and GND (positive terminal) test points. Adjust 0-40 V dc power supply output for +0.3 V dc indication on digital voltmeter. Note the 0-40 V dc power supply voltage output.	-2.9 to -4.2 V dc	Check the following: Q18, CR5, Q6, Q8, Q13, C22, Q10, Q9 and CR16.
	d. Adjust 0-40 V dc power supply output for 0.65 V dc output indicated on digital voltmeter, note 0-40 V dc power supply voltage.	-4.6 to -5.9 V dc.	Same as step c.
	e. Connect oscilloscope to AGC DRIVE test point.		

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
22 (cont)	f. Adjust 0-40 V dc power supply to apply a -5.0 V dc to TGC test point on test adapter and note AGC DRIVE output on oscilloscope for reference.		
	g. Set TIP to DSBL and measure the time for the output to decrease to within 10 percent of final value (TIP decay time).	0.2 to 0.6 seconds.	Same as step c.
	h. Connect 0-40 V dc power supply to ±ALC (negative terminal) and GND (positive terminal) test points on test adapter. Connect digital voltmeter as in step d.		
	i. Adjust 0-40 V dc power supply for a 0.3 V dc AGC DRIVE voltage indicated on digital voltmeter. Adjust 0-40 V dc power supply to increase voltage applied to +ALC test point by -2 V dc and note AGC DRIVE voltage on digital voltmeter.	Not more than -0.65 V dc.	Same as step c.
	j. Adjust 0-40 V dc power supply to increase voltage applied to ±ALC test point by an additional -1.0 V dc and note AGC DRIVE voltage on digital voltmeter.	Not less than 0.65 V dc.	Same as step c.

Table 2-18. If/Af A1A5A1, Testing/Troubleshooting (cont)



TEST SETUP B

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Figure 2-18. If/Af A1A5A1, Test Setup

2.3.12 Bandswitch A3A5, Testing/Troubleshooting

Perform the procedures in table 2-19 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-19.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5118/PRM-502 (bandswitch test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Attenuator, Rf, 20-dB (2 required)

Digital voltmeter

Load, 50 ohm

Multimeter

Probe coaxial T connector

Rf vector impedance meter

Signal generator

Spectrum analyzer (IF section and 1-KHz to 110 MHz rf section required)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter set UNIT POWER to OFF, FAN to OFF and TIP to OPEN.		
	b. Install bandswitch A3A5 to test adapter and connect test equipment as shown in figure 2-19.		
	c. Set UNIT POWER and FAN to ON.		
	d. Measure dc voltage between either red CURRENT MONITOR or 10 MA/MV test point and GND test point.	25.2 V dc	On the power supply, adjust OUTPUT VOLTAGE potentiometer for 25.2 V dc.
2 Current demand	a. Connect digital voltmeter leads to CURRENT MONITOR 10 MA/MV BANDSWITCH test points.		
	b. Monitor CURRENT MONITOR 10 MA/MV BANDSWITCH test points while cycling BAND SELECT switch from 1A to 8.	20 mV (200 mA) maximum during cycling.	If current is excessive on all channels check for high friction in gears, shafts or wafer switches. If current is excessive on only one channel, check components applicable to the faulty channel.
	c. Return BAND SELECT to 1A.		
3 Bandswitch complete	a. While observing SWITCHING indicator, slowly cycle BAND SELECT from 1A to 8.	When switching is complete, SWITCHING indicator goes out. While bandswitching occurs, SWITCHING indicator is lit.	Check following: S1, Q1, K1, and B1.
	b. Return BAND SELECT to 1A.		

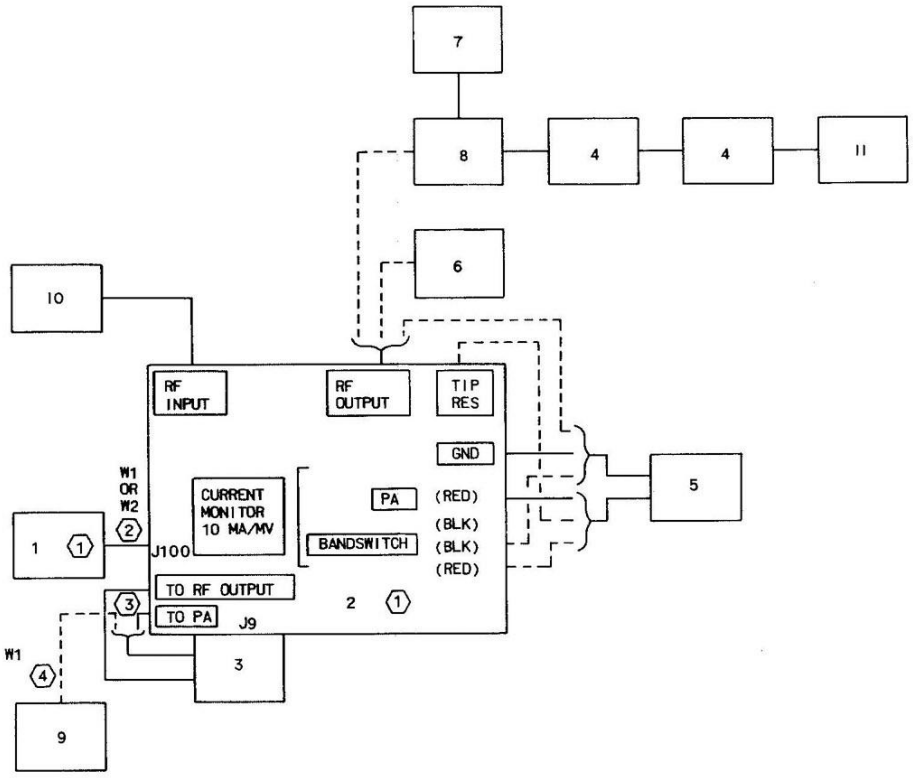
Table 2-19. Bandswitch A3A5, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
4 Varicoil center-tap	a. While observing COIL CENTER TAP indicator, rotate BAND SELECT from 1A through 8.	COIL CENTER TAP indicator is off for positions 1A through 5 and on for positions 6 through 8.	Check S2.
	b. Return BAND SELECT to 1A.		
5 Tune in progress (TIP)	a. Set TIP PA switch to GND.		
	b. Connect digital voltmeter between RF OUTPUT and TIP RES test point. Check for continuity.	Continuity between RF OUTPUT and TIP RES test point.	Check following: K2 and S2.
	c. Disconnect digital voltmeter.		
	d. Set TIP PA switch to OPEN.		
6 Band impedance	a. Connect 50-ohm load to RF OUTPUT as shown in figure 2-19. NOTE Distance from rf vector impedance meter probe to bandswitch input must be not more than 4 inches. (Use cable CPN 630-1789-001.)		
	b. Connect rf vector impedance meter to bandswitch input A3A5J1.		

Table 2-19. Bandswitch A3A5, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	c. Measure impedance for the following bands/frequencies: BAND — FREQUENCY 1 — 2.0 MHz, 2.99 MHz 2 — 3.0 MHz, 3.99 MHz 3 — 4.0 MHz, 5.99 MHz 4 — 6.0 MHz, 7.99 MHz 5 — 8.0 MHz, 11.99 MHz 6 — 12.9 MHz, 15.99 MHz 7 — 16.9 MHz, 18.0 MHz, 23.99 MHz 8 — 24.0 MHz, 26.0 MHz, 27.0 MHz, 28.0 MHz, 29.99 MHz	60 ohms maximum	1. Perform filter board adjustments. Refer to paragraph 2.8. 2. Replace appropriate filter board.
	d. Disconnect rf vector impedance meter and reconnect to PA pendant cable to bandswitch.		
7 Filter operation	a. Connect signal generator, multimeter, and spectrum analyzer as shown in figure 2-19. Connect digital voltmeter to CURRENT MONITOR 10 MA/MV PA test points.		
	b. Adjust the signal generator for 33V rf output from filter network and measure harmonic attenuation and current demand for each of the frequencies listed in Test 6 step b.	The harmonic attenuation should be not less than -40 dB. The current demand should be not more than 2.5 amp (250 mV) on multimeter.	1. Perform filter board adjustments. Refer to paragraph 2.8. 2. Replace appropriate filter board.

Table 2-19. Bandswitch A3A5, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. BANDSWITCH TEST ADAPTER
3. BANDSWITCH A3A5
4. ATTENUATOR, 20 dB, (2 REQUIRED)
5. DIGITAL VOLTMETER
6. LOAD, 50 OHM
7. MULTIMETER
8. PROBE COAXIAL T CONNECTOR
9. RF VECTOR IMPEDANCE METER
10. SIGNAL GENERATOR
11. SPECTRUM ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) PENDANT CABLES, PART OF BANDSWITCH TEST ADAPTER.

(4) PART OF BANDSWITCH TEST ADAPTER

(5) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-19. Bandswitch A3A5, Test Setup

2.3.13 Power Amplifier A3A4, Testing/Troubleshooting

Perform the procedures in table 2-20 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-20.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5119/PRM-502 (power amplifier test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Attenuator, rf, 20-dB (2 required)

Attenuator, 6-dB (2 required)

Digital voltmeter

Load, 50-ohm

Multimeter

Power divider

Probe coaxial T connector

Signal generator (2 required)

Spectrum analyzer (if section and 100-KHz to 1250-MHz rf section required).

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set UNIT POWER, KEY and FAN to OFF.		
	b. Install power amplifier A3A4 on test adapter and connect power supply as shown in figure 2-20.		
	c. On power supply, set POWER to ON. On test adapter, connect digital voltmeter (H) to CURRENT MON 10 MA/MV red test point and (L) to chassis ground. Set UNIT POWER (1A and 3A), KEY and FAN to ON.		
	d. On power supply, adjust OUTPUT VOLTAGE for 25.2 V dc on digital voltmeter.	Output voltage 25.2 V dc. Both UNIT POWER and FAN indicators will light.	Check power supply and test adapter.
	e. Adjustments (1) On test adapter, set KEY to OFF, BAND to 8, and connect digital voltmeter to CURRENT MON 10 MA/MV test points.		
	(2) On test adapter, set KEY to ON.		
	(3) Operate A3A4A2R12 (see figure 3-21) through its range and observe digital voltmeter. Set R12 for 20 mV (200 mA) indication on digital voltmeter.	Voltage (current) should vary between 7 and 30 mV (70 and 300 mA)	
	(4) On test adapter, set KEY to OFF.		

Table 2-20. Power Amplifier A3A4, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 (cont)	(5) On test adapter, connect multimeter and 50-ohm load to RF OUT FULL PWR test point as shown in figure 2-20. Connect signal generator, through the 6-dB attenuator, to RF IN. (6) On test adapter, set KEY to ON. (7) Set signal generator for 29.9999 MHz and adjust output for 31.6 V rms measured on multimeter. NOTE It may be necessary to remove the 6 dB attenuator in order to obtain 31.6 V rms. (8) Adjust A3A4A2R22 (see figure 3-21) counterclockwise until rf output just begins to decrease then turn R22 6.5 turns clockwise from this point. (9) On test adapter, set KEY to OFF.		
2 CW power output	a. On test adapter, set BAND to 1. Set signal generator rf output to minimum and frequency to 2.0 MHz.		
	b. On test adapter, set KEY to ON and increase signal generator drive while monitoring voltage/current (power amplifier current demand) on digital voltmeter at CURRENT MON 10 MA/MV test points. Make	Signal generator output is not more than 2.5 V rms. Power output indication on multimeter is 31.6 V rms.	Replace following subassemblies: A3A4A1 A3A4A2

Table 2-20. Power Amplifier A3A4 Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)	sure current demand on digital voltmeter never exceeds 250 mV (2500 mA) while adjusting signal generator drive for a 31.6 Vrms power output indication on the multimeter. c. On test adapter, set KEY to OFF. d. Repeat steps a through c with the signal generator set to the following frequencies and the BAND set to the proper band. 3.5 MHz BAND 2 5.0 MHz BAND 3 7.0 MHz BAND 4 10.0 MHz BAND 5 15.0 MHz BAND 6 20.0 MHz BAND 7 29.9 MHz BAND 8	Same as step b.	Same as step b.
3 PEP power output and intermodulation	a. On test adapter, set BAND to 1. Connect two signal generators through 6-dB attenuators and power divider to RF IN jack as shown in figure 2-20. b. On test adapter set KEY switch to ON and turn on one signal generator, assure other signal generator is off. Tune signal generator for 2.0 MHz and adjust the rf output for 16 volts on multimeter across the 50-ohm load. Turn rf signal generator off.		

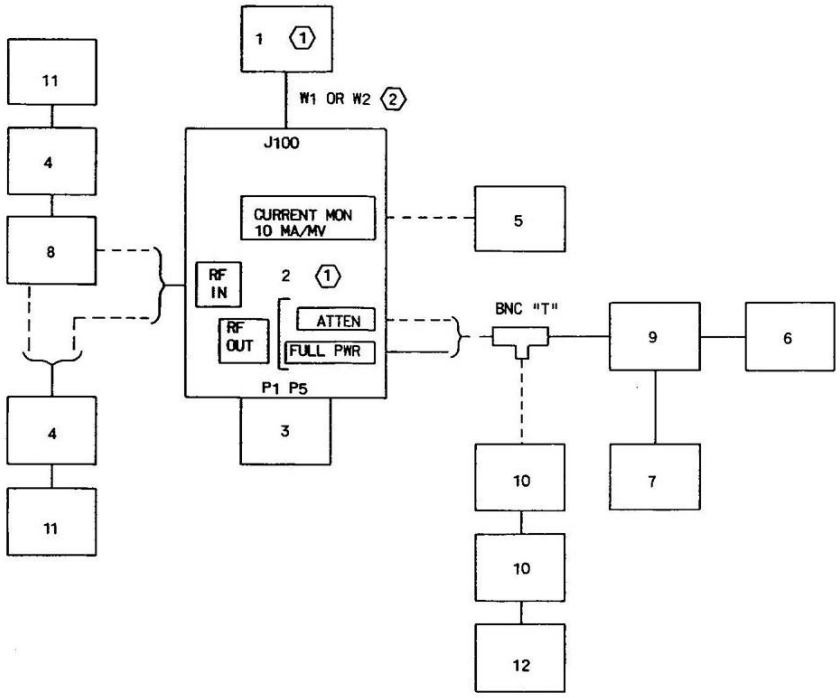
Table 2-20. Power Amplifier A38A4, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	NOTE It may be necessary to remove the 6 dB attenuators in order to obtain 16 volts.		
	c. Turn second signal generator on and repeat step b for same frequency and voltage level.		
	d. Turn both signal generators on and measure the voltage on multimeter across the 50-ohm load. NOTE If the multimeter indicates the presence of oscillations, connect the TIME BASE connectors of the signal generators together. Set one to EXT. This will place them in phase coincidence with each other.	Approximately 33 volts.	Adjust both generators to obtain approximately 33 volts across 50-ohm load. Replace following assemblies: A3A4A1 A3A4A2
	e. Measure voltage/current (current demand) on digital voltmeter at CURRENT MON 10MA/MV test points.	No more than 200 mV (2000 mA).	Repeat adjustments test 1 steps e (5) through (9). Replace following subassemblies: A3A4A1 A3A4A2
	f. On test adapter, connect spectrum analyzer through two 20-dB rf attenuators to the BNC T connector as shown in figure 2-20.		

Table 2-20. Power Amplifier A3A4, Testing/Troubleshooting (cont)

STEP	PRODEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	g. Increase frequency of first signal generator by 1600 Hz. With first signal generator set for 2.00160 MHz and second signal generator set for 2.0010 MHz monitor the rf output with the spectrum analyzer.	Third-order and fifth order intermodulation products not less than -25 dB.	Repeat adjustments test 1e (1) through (4) and reset A3A4A2R12 for minimum intermodulation distortion. Replace the following subassemblies: A3A4A1 A3A4A2 (do not exceed 250 mA with no drive)
	h. Repeat steps d. through g. for the following frequencies, switching BAND selector to applicable frequency band. 8.0 MHz (band 5) 12.0 MHz (band 6) 24.0 MHz (band 8) 29.99 MHz (band 8)	Same as step g.	Same as step g.

Table 2-20. Power Amplifier A3A4, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. POWER AMPLIFIER TEST ADAPTER
3. POWER AMPLIFIER A3A4
4. ATTENUATOR, 6-dB (2 REQUIRED)
5. DIGITAL VOLTMETER
6. LOAD, 50-OHM
7. MULTIMETER
8. POWER DIVIDER
9. PROBE COAXIAL T CONNECTOR
10. RF ATTENUATOR (2 REQUIRED)
11. SIGNAL GENERATOR (2 REQUIRED)
12. SPECTRUM ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-20. Power Amplifier A3A4, Test Setup

2.3.14 Control A2, Testing/Troubleshooting

Perform the procedures in table 2-21 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-21.

Radio Test Set AN/PRM-502 items:

Control Test Set TS-5120/PRM-502 (control test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Oscilloscope

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set switches as follows: POWER to ON REMOTE-OPERATE to OFF.		
	b. Install control A2 on test adapter and connect power supply as shown in figure 2-21.		
	c. On control A2, set switches as follows: POWER/PUISSANCE to ⊓ MODE to USB	NOTE Unless otherwise stated, switch settings will remain as noted in step 1a.	
	d. On power supply set POWER to ON. Connect digital voltmeter to 25 V. On power supply adjust OUTPUT VOLTAGE control for +25.15 to +25.25 V dc on digital voltmeter.		
2 Frequency select	a. On control A2, set MEGA-HERTZ KILOHERTZ selectors to 100000.		
	b. Observe the FREQUENCY DECODE-MHZ display on test adapter for correct readout.	100000 should be displayed.	Check the following: components: Switches A2S1 through S6, corresponding to the improper readout.
	c. Perform steps a. and b. for the frequencies listed below: 111111 222222 233333 244444 255555 266666 277777 288888 299999		

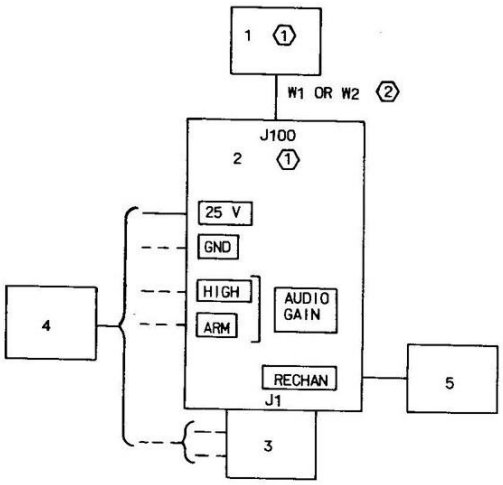
Table 2-21. Control A2, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 Rechannel pulse	a. Connect oscilloscope input lead and external trigger lead to RECHAN jack on test adapter.		
	b. Adjust oscilloscope for negative slope.		
	c. On control A2, switch 100 Hz (extreme right hand frequency selector) from 0 through 9 while observing the oscilloscope.	RECHANNEL output should be grounded for at least one millisecond between each digit selected.	Check switch A2S6.
	d. Repeat step c. for each of the remaining five MEGAHERTZ KILOHERTZ frequency selectors on control A2.	RECHANNEL output should be grounded for at least one millisecond between each digit selected.	Check the applicable switch.
	e. Disconnect oscilloscope.		
4 24V switched	a. Rotate OFF/FERMÉ clockwise past detent while observing 24V SWITCH indicators.	Both indicators should be lit.	Check A2R1 switch contacts.
	b. Rotate OFF/FERMÉ control on control A2 maximum counterclockwise while observing 24V SWITCH indictators.	Both indicators should go out.	Same as above.
5 Transmit power control	a. On control A2, set POWER/PUISSANCE TO [=] and observe LOW POWER indicator on test adapter.	LOW POWER indicator should be lit.	Check switch A2S9.
	b. On control A2, set POWER/PUISSANCE TO [ ] and observe LOW POWER indicator.	LOW POWER indicator should go out.	Same as above.

Table 2-21. Control A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	a. On control A2, depress and hold ⍝ switch and observe the frequency selector switches.	All six switches are lit.	Check applicable switches. If no lights are lit, check A2S7.
	b. Release ⍝ switch.	Lamps of all six switches go out.	Same as step a, except lamps remain lit.
7 Mode selection	a. On control A2, set MODE to AM and observe AM indicator on test adapter.	AM indicator is lit.	Check switch A2S8.
	b. On control A2, set MODE to USB and observe AM indicator.	AM indicator is off.	Check switch A2S8.
8 Af gain control	a. Connect digital voltmeter (set to ohms) to AUDIO GAIN HIGH test point and GND test point on test adapter.		
	b. Observe digital voltmeter.	800 to 1200 ohms	Replace A2R1
	c. Connect digital voltmeter to AUDIO GAIN HIGH and ARM test points.		
	d. Observe digital voltmeter while varying OFF/FERMÉ control on control A2 from maximum counterclockwise to maximum clockwise.	Varies smoothly from less than 10 ohms to 1,200 ohms.	Replace A2R1.
9 Continuity	a. With digital voltmeter, check continuity between corresponding pins of A2J1 and A2J2.	Resistance between corresponding pins should be no more than 5 ohms.	Check A2J1, A2J2 and wiring.

Table 2-21. Control A2, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. CONTROL TEST ADAPTER
3. CONTROL A2
4. DIGITAL VOLTMETER
5. OSCILLOSCOPE

NOTES:

① PART OF RADIO TEST SET AN/PRM-502.

② PART OF POWER SUPPLY.

③ DASHED LINE IS A ALTERNATE CONNECTION IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-21. Control A2, Test Setup

2.3.15 Frequency Synthesizer A1A6, Testing/Troubleshooting

Perform the procedures in table 2-22 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Test cables W1, W2 and W3 are supplied as part of test adapter TS-5121 and are provided as aids in troubleshooting the unit, they are not required to perform the test procedures. Cables W1 and W2 interconnect subassemblies A6A1 and A6A2 when they are separated and cable W3 allows circuit card A6A2A2 to be extended from subassembly A6A2 for easy access to components.

Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-22.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-in Unit Test Set TS-5121/PRM-502 (frequency synthesizer test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Digital voltmeter

Frequency counter

Rf voltmeter

Selective voltmeter/Wave analyzer

Spectrum analyzer (if section and 100-KHz to 1250-MHz rf section required).

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF.		
	b. Install frequency synthesizer A1A6 on test adapter and connect power supply as shown in figure 2-22. Connect J15 pendant cable to J1 on A1A6. Connect J1 pendant cable to the longer of the two frequency synthesizer cables. Connect the shorter of the two synthesizer cables to J2.		
	c. On power supply set POWER to ON. On test adapter connect digital voltmeter (H) to CURRENT MONITOR 24V test point and (L) to GND test point. Set POWER to ON. On power supply adjust OUTPUT VOLTAGE for 24 V dc indication on digital voltmeter.		
	d. On test adapter, move the positive lead of digital voltmeter to CURRENT MONITOR 13V test point and measure voltage.	13 ± 0.5 V dc	Adjust 13 volt circuit in power supply.
	e. On test adapter, move the positive lead of digital voltmeter to CURRENT MONITOR 5V test point and measure voltage.	5.2 ± 0.2 V dc	Adjust 5.2 volt circuit in power supply.
2 +5V current	a. On test adapter, set MODE to USB/110, RECHANNEL to OFF. Connect digital voltmeter to CURRENT MONITOR 5V 10 MA/MV test points and measure voltage/current.	3 to 4 mV (30 to 40 mA)	Replace the following: Frequency standard A1A6A1A1 Fixed frequency divider A1A6A1A2

Table 2-22. Frequency Synthesizer A1A6, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
2 (cont)			Frequency converter A1A6A1A4 Voltage regulator A1A6A2A1 Variable frequency divider A1A6A2A2.
	b. On test adapter hold RECHANNEL in MNL ON position and measure voltage/current. Return RECHANNEL to OFF.	Same as step a.	Replace the following: Voltage regulator A1A6A2A1 Variable frequency divider A1A6A2A2.
3 +13V current	a. On test adapter connect digital voltmeter to CURRENT MONITOR 13V 1 MA/MV test points.		
	b. Measure voltage/current on digital voltmeter.	30 to 50 mV (30 to 50 mA).	Replace the following: Lf phase-lock loop A1A6A1A3 Frequency converter A1A6A1A4 Voltage regulator A6A1A2A1.
4 24V current	a. On test adapter connect digital voltmeter to CURRENT MONITOR 24V 1 MA/MV test points.		
	b. Measure voltage/current on digital voltmeter.	4 to 6 mV (4 to 6 mA).	Replace voltage regulator A1A6A2A1.
5 117-145 MHz output	a. On test adapter set RECHANNEL to AUTO, connect frequency counter to 117-145 MHz test point.		
	b. On test adapter select 29.9999 MHz with FREQUENCY CONTROL-MHZ.	TX INHIBIT lamp lights momentarily while selecting frequency.	Check test adapter.

Table 2-22. Frequency Synthesizer A1A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	c. Measure output frequency at 117-145 MHZ test point on frequency counter.	144.9999 MHz ± 116 Hz.	Replace the following: Hf phase-lock loop A1A6A2A3 Variable frequency divider A1A6A2A2 Voltage regulator A1A6A2A1.
	d. Repeat step b. and c. for the following frequencies:		
	18.8888 MHz	133.8888 MHz ± 106 Hz	Same as step c.
	7.7777 MHz	122.7777 MHz ± 97 Hz	Same as step c.
	2.0000 MHz	117.0000 MHz ± 93 Hz.	Same as step c.
	1.5000 MHz	TX INHIBIT indicator is lit.	Replace variable frequency divider A1A6A2A2.
	e. On test adapter connect rf voltmeter through 50-ohm adapter to 117-145 MHz test point. Select 29.9999 MHz with FREQUENCY CONTROL-MHZ and measure rf level at 117-145 MHz test point on rf voltmeter.	+3 dBm ± dB.	Replace hf phase-lock loop A1A6A2A3.
	f. Repeat step e. for the following frequencies:		
	18.8888 MHz	Same as step e.	Same as step e.
	7.7777 MHz	Same as step e.	Same as step e.
	2.0000 MHz	Same as step e.	Same as step e.
6 117-145 MHz spectral purity	a. On test adapter, connect spectrum analyzer to 117-145 MHz test point, select 16.0000 MHz with FREQUENCY CONTROL-MHZ, and measure 100-kHz sideband.	No less than 60 dB.	Replace hf phase-lock loop A1A6A2A3.

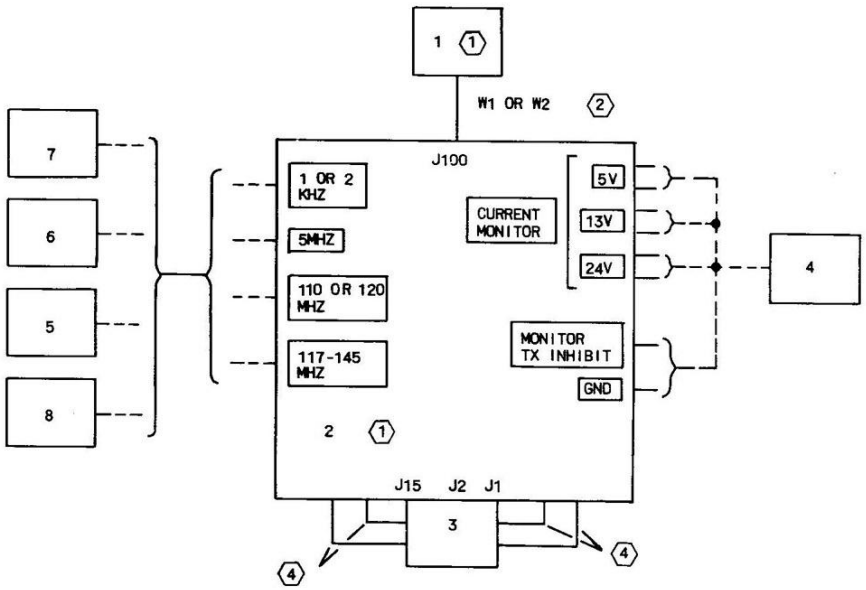
Table 2-22. Frequency Synthesizer A1A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
6 (cont)	b. On test adapter, select 2.0010 MHz with FREQUENCY CONTROL-MHZ and measure 10-kHz sideband.	No less than 50 dB.	Replace frequency converter A1A6A1A4.
7 110/120 MHz output	a. On test adapter, set RECHANNEL to OFF and connect frequency counter to 110 OR 120 MHZ test point.		
	b. Measure the frequency on frequency counter. Ensure that MODE is set to USB/110.	110 MHz ± 88 Hz.	Replace frequency standard A1A6A1A1.
	c. On test adapter connect rf voltmeter to 110 OR 120 MHZ test point and measure rf level.	+1 dBm ± 3 dB.	Same as step b.
	d. On test adapter connect frequency counter to 110 OR 120 MHZ test point, set MODE switch to LSB/120. Measure frequency.	120 MHz ± 96 Hz	Same as step b.
	e. Repeat step c.	Same as step c.	Same as step b.
8 110/120 MHz spectral purity	a. On test adapter set RECHANNEL to AUTO, MODE to USB/110 and connect spectrum analyzer to 110 OR 120 MHZ test point.	Same as step c.	Same as step b.
	b. Measure 120-MHz output on spectrum analyzer.	Not less than 60 dB down.	Replace frequency standard A1A6A1A1.
	c. On test adapter set MODE to LSB/120 and measure 110-MHz output.	Not less than 60 dB down.	Same as step b.
9 2-KHz output	a. On test adapter set MODE to USB/110 and connect frequency counter to 1 OR 2 KHZ jack.		

Table 22. Frequency Synthesizer A1A6, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
9 (cont)	b. Measure output frequency on frequency counter.	2 kHz.	Replace the following: Fixed frequency divider A1A6A1A2 Frequency standard A1A6A1A1.
	c. On test adapter connect selective voltmeter to 1 OR 2 KHZ jack and measure output level.	+ .125 V ± 2 dB.	Replace fixed frequency divider A1A6A1A2.
10 5-MHz output	a. On test adapter set 5 MHZ to ON/SSB and connect frequency counter to 5 MHZ test jack.		
	b. Measure output on frequency counter.	5 MHz ± 4 Hz.	Replace the following: Fixed frequency divider A1A6A1A2 Frequency standard A1A6A1A1.
	c. On test adapter connect rf voltmeter (unterminated) to 5 MHZ test jack and measure output level.	0.04V ±1 dB	Same as step b.
	d. On test adapter set 5MHZ to OFF/AM.		
	e. On test adapter connect rf voltmeter to 5 MHZ test point and measure output level.	No more than 1.0 mV	Same as step b.

Table 2-22. Frequency Synthesizer A1A6, Testing/Troubleshooting (cont)



1. POWER SUPPLY
2. FREQUENCY SYNTHESIZER TEST ADAPTER
3. FREQUENCY SYNTHESIZER A1A6
4. DIGITAL VOLTMETER
5. FREQUENCY COUNTER
6. RF VOLTMETER
7. SELECTIVE VOLTMETER
8. SPECTRUM ANALYZER

NOTES:

⟨1⟩ PART OF RADIO TEST SET AN/PRM-502.

⟨2⟩ PART OF POWER SUPPLY.

⟨3⟩ DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

⟨4⟩ PENDANT CABLES, PART OF FREQUENCY SYNTHESIZER TEST ADAPTER.

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Figure 2-22. Frequency Synthesizer Test Setup

2.3.16 Mixer A1A2, Testing/Troubleshooting

Perform the procedures in table 2-23 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-23.

Radio Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5122/PRM-502 (mixer test adapter)
Power Supply PP-5290/PRM-502 (power supply)

Electrical Frequency Synthesizer 0-5122/PRM-502 (electrical frequency synthesizer)

Attenuator, 6-dB (2 required)

Digital voltmeter

Distortion analyzer

Power divider

Rf voltmeter, with 50 ohm adapter

Signal generator (2 required)

Spectrum analyzer (if section and 1-kHz, to 110 MHz rf section required)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF. b. Install mixer A1A2 on test adapter and connect power supply as shown in figure 2-23, test setup A. Set power supply POWER to ON. c. On test adapter, set MODE to RCV, AGC to OFF and POWER to ON. d. On electrical frequency synthesizer, set POWER to ON, MODE to SSB and USB. and FREQUENCY SELECT-MHZ to 15.0000 MHz. e. Receive adjustments (1) On test adapter, connect signal generator through 6-dB attenuator to RF IN/OUT test point and connect rf voltmeter to MIXER OUTPUT LOAD RF OUT test point as shown in figure 2-23, test setup A. Connect rf jumper cable between MIXER IN/OUT and MIXER OUTPUT LOAD RF IN test points. NOTE Hard volts is defined as open circuit voltage obtained by adding the 6-dB attenuator in series with the signal generator rf output. Unless otherwise noted, hard volts will be used for these procedures.		

Table 2-23. Mixer A1A2, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 (cont)	(2) Set signal generator for 15.0 MHz at a level of 10 mV. (3) Monitor rf out on rf voltmeter and adjust A1A2C10, C30 and C35 (see figure 3-15, sheet 1) for maximum rf output.		
2 Receive gain	a. Set signal generator for 15.0 MHz, 10 mV output and measure rf out on rf voltmeter connected to MIXER OUTPUT LOAD RF OUT test point.	60 ± 20 mV	Check the following: Q1, Q2, T1, Q11, Q12, T5, FL1, T6, CR7.
	b. Repeat step b at 2.0 MHZ and 29.999 MHz, set the electrical frequency synthesizer to the required frequency (2.0 or 29.999 MHz) for each test.	Same as step b.	Same as step b.
3 Receive bandpass	a. Set signal generator for 15.0 MHz at 10 mV output (applied to RF IN/OUT test point on test adapter) and set electrical frequency synthesizer to 15.0000 MHz.		
	b. Measure rf output on rf voltmeter connected to MIXER OUTPUT LOAD RF OUT test point. Note level as reference.	Reference	
	c. On signal generator increase output level to raise rf output by 0.6 dB, then increase signal generator frequency to obtain voltage reference level noted in step b (measured on rf voltmeter). Note frequency variation above 15.000 MHz.	No less than 3.0 kHz.	Check the following: FL1, Q1-Q2, Q11-Q12, L1-L2, and C1-C2.

Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	d. Repeat steps a, b, and c for frequency variation below 15.0000 MHz.	Same as step c.	Same as step c.
4 Receive sensitivity	a. On test adapter, connect distortion analyzer to RCVR AF OUT test point as shown in figure 2-23, test setup A. Disconnect rf jumper from MIXER OUTPUT LOAD RF IN test point and connect to IF IN/OUT test point.		
	b. Set signal generator for 15.0010 MHz, 0.7 uV, applied to RF IN/OUT test point on test adapter.		
	c. On the distortion analyzer measure the signal-plus-noise to noise ratio ((S+N)/N) by nulling out the 1000-Hz audio.	Not less than 12 dB.	Check the following: Q1-Q2, T1, Q11-Q12, T5, FL1, T6, CR7.
	d. Set electrical frequency synthesizer for 2.000 MHz and adjust signal generator for 2.0010 MHz, 0.7-uV output and repeat step c.	Same as step c.	Same as step c.
	e. Set electrical frequency synthesizer for 29.9990 MHz and adjust signal generator for 30.0000 MHz and repeat step c.	Same as step c.	Same as step c.
5 Receive AGC	a. Set electrical frequency synthesizer for 15.0000 MHz and adjust signal generator for 15.0010-MHz, 0.7 -uV output applied to RF IN/OUT test point on test adapter.		

Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
5 (cont)	b. Set reference on distortion analyzer (RCVR AF OUT test point).	Reference	
	c. On test adapter, set AGC to ON.		
	d. Increase output level of signal generator until reference level, step b, is obtained on distortion analyzer. Measure increase in signal generator output level.	45 ± 5 dB above reference.	Check the following: CR7, Q1-Q2, T1-T2, Q11-Q12, T5-T6, CR3, CR5, CR6 and CR9.
6 Receive if rejection	a. On test adapter, set AGC to OFF.		
	b. Set signal generator for 15.0010 MHz, 1.0 uV, applied to RF IN/OUT test point on test adapter.		
	c. Set reference on distortion analyzer (RCVR AF OUT test point).	Reference	
	d. Reset signal generator for 114.9990 MHz, then increase output level of signal generator until reference level, step c, is obtained on distortion analyzer. Measure increase in signal generator output level.	Not less than 38 dB above reference.	Check the following: FL1, Q1-Q2, Q11-Q12, T1-T2, T5-T6, CR3, and CR6.
7 Receive current	a. On test adapter connect digital voltmeter to T/R CURRENT MV/MA test points and set AGC to ON.		
	b. Measure dc voltage (current) on digital voltmeter.	Not more than 13 mV (13 mA).	Check the following: L1, R1, C6, R3, C15, L9, C28, CR7, L16, C27, L8, R4, C14, and L4.

Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 Transmit gain	a. On test adapter, set MODE to XMT and assure that AGC is OFF. On electrical frequency synthesizer assure that POWER is ON, MODE is in SSB and USB, and FREQUENCY SELECT-MHZ is set to 15.0000 MHz. b. On test adapter, connect signal generator through 6-dB attenuator to MIXER INPUT LOAD RF IN test point. Refer to figure 2-23, test setup B. Disconnect the rf jumper and connect between MIXER INPUT LOAD RF OUT and MIXER IN/OUT test points. c. Transmit Adjustments (1) Connect rf voltmeter (unterminated) to MIXER INPUT LOAD MV IN test point. (2) Set signal generator for 5.0000 MHz and adjust output for 60 mV measured on rf voltmeter. (3) Remove rf voltmeter from MIXER INPUT LOAD MV IN test point and connect thru the 50-ohm BNC adapter, to RF IN/OUT test point. (4) Monitor rf voltmeter and adjust A1A2C25, C44, and C47 (see figure 3-15, sheet 1) for maximum rf output. d. Measure rf output at RF IN/OUT test point on rf voltmeter.	70 ± 20 mV.	Check the following: Q15-Q17, T8, Q5-Q6, T3, FL1, T7, CR9 and CR5.

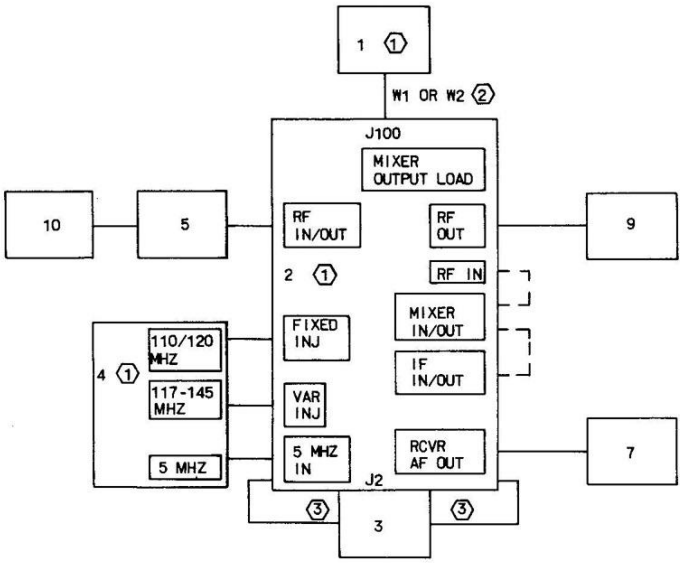
Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 (cont)	e. Set electrical frequency synthesizer to 2.0000 MHz. (signal generator remains at 5.0000 MHz at 60 mV output applied to MIXER IN/OUT test point on test adapter).		
	f. Repeat step d.	Same as step d.	Same as step d.
	g. Repeat step d with electrical frequency synthesizer set to 29.9999 MHz.	Same as step d.	Same as step d.
9 TGC	a. Set electrical frequency synthesizer FREQUENCY SELECT-MHZ to 15.0000 MHz and assure that signal generator is at 5.0000 MHz, 60 mV output.		
	b. On test adapter connect spectrum analyzer to RF IN/OUT jack. Measure output for reference.	Reference.	
	c. On test adapter, set AGC to ON and measure output on spectrum analyzer. Set AGC to OFF.	Not less than 30 dB or more than 45 dB down from reference, step b.	Same as test 7 step b.
10 Transmit intermodulation	a. On test adapter, connect two signal generators through 6-dB attenuators and power divider to MIXER INPUT LOAD RF IN test point. Connect spectrum analyzer to RF IN/OUT test point.		
	b. With one signal generator off, set the other for 5.0000 MHz and adjust output for 30 mV measured on rf voltmeter (unterminated) connected to MIXER		

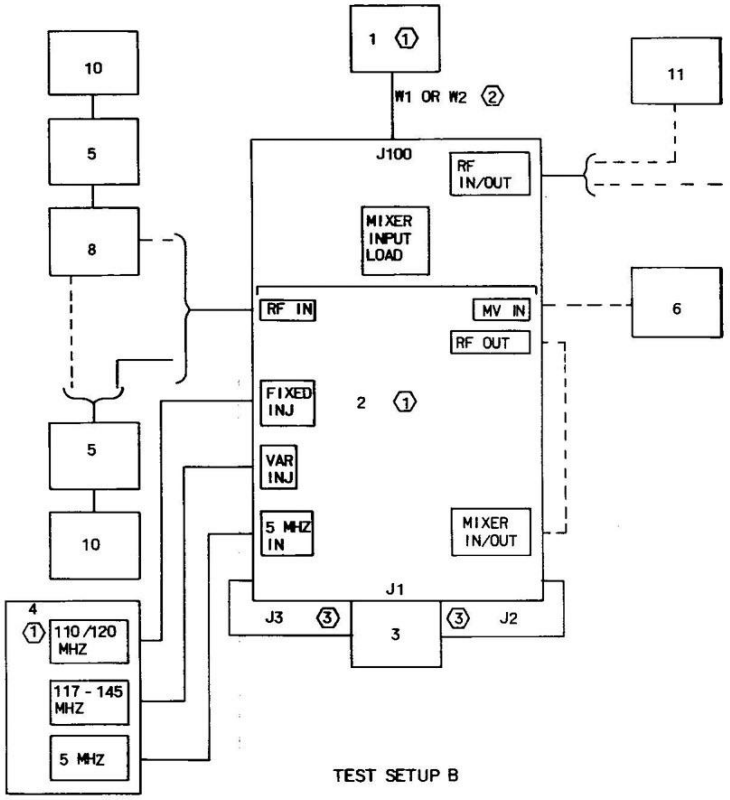
Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
10 (cont)	INPUT LOAD MV IN test point on test adapter. Set signal generator to OFF.		
	c. Turn on the other signal generator and set for 5.00011 MHz and output for 30 mV measured on rf voltmeter (unterminated). Turn on the first signal generator.		
	d. Measure the third order products on the spectrum analyzer.	No less than 40 dB.	Check the following: Q15-Q16, Q5-Q6, Q10, Q14.
11 Transmit Current	a. On test adapter, connect digital voltmeter to T/R CURRENT MV/MA test points and disconnect signal generators.		
	b. On test adapter, set AGC to ON and measure voltage (current) on digital voltmeter. Set AGC to OFF.	Not more than 16.5 mV (16.5 mA).	Same as test 7, step b.

Table 2-23. Mixer A1A2, Testing/Troubleshooting (cont)



TEST SETUP A



TEST SETUP B

1. POWER SUPPLY
2. MIXER TEST ADAPTER
3. MIXER A1A2
4. ELECTRICAL FREQUENCY SYNTHESIZER
5. ATTENUATOR, 6-dB (2 REQUIRED)
6. DIGITAL VOLTMETER
7. DISTORTION ANALYZER
8. POWER DIVIDER
9. RF VOLTMETER
10. SIGNAL GENERATOR (2 REQUIRED)
11. SPECTRUM ANALYZER

NOTES:

(1) PART OF RADIO TEST SET AN/PRM-502.

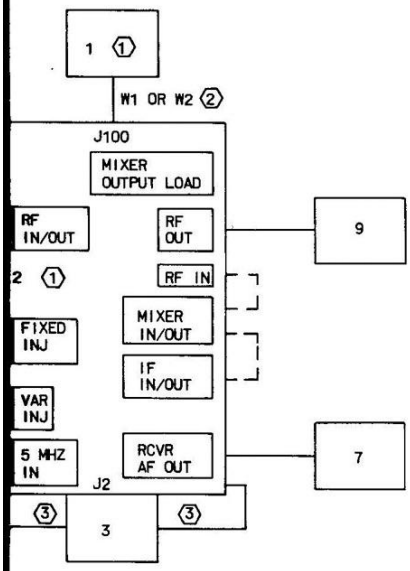
(2) PART OF POWER SUPPLY.

(3) PENDANT CABLE, PART OF MIXER TEST ADAPTER.

(4) USE 50-OHM BNC ADAPTER.

(5) DASHED LINE IS ALTERNATE CONNECTION DESCRIBED IN A PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

Figure 2-23. Mixer A1A2,



ST SETUP A

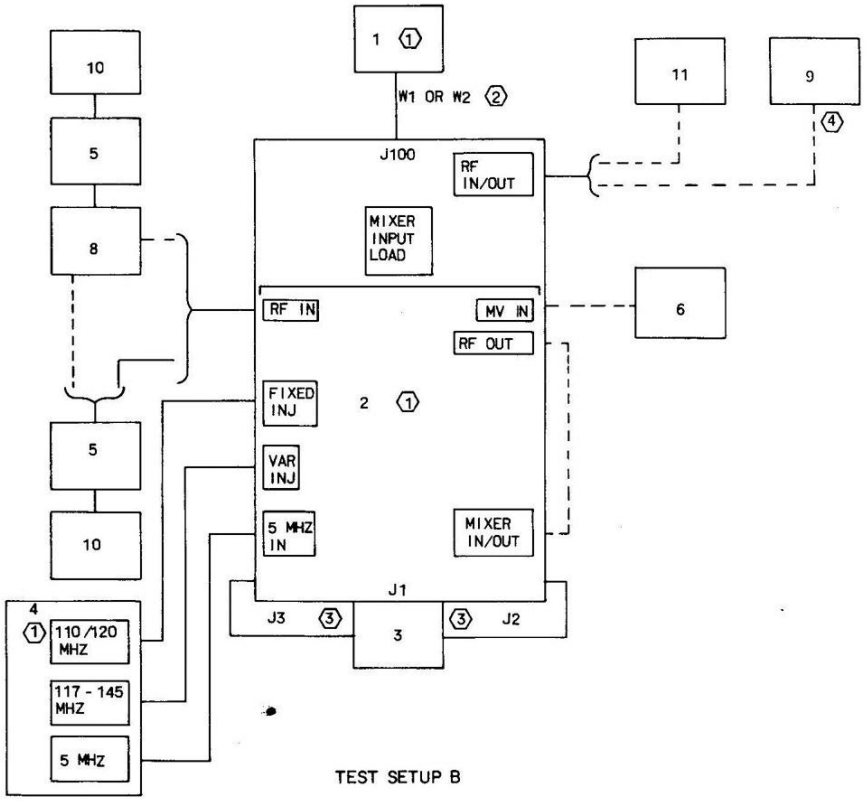
NTHESIZER
UIRED)

UIRED)

N/PRM-502.

IXER TEST ADAPTER.

CONNECTION DESCRIBED
NOT MAKE THIS CONNECTION



TEST SETUP B

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Figure 2-23. Mixer A1A2, Test Setup

2.3.17 Logic/Tx A1A5A2, Testing/Troubleshooting

Perform the procedures in table 2-24 to isolate a fault to the lowest replaceable subassembly or component or to verify proper operation of the unit. Refer to the schematic diagram and to the illustrated parts list for information on circuit configuration and component location and description. When a defective subassembly has been repaired, the procedures should be repeated to verify all faults have been corrected.

The procedures are to be performed in the sequence given. If an individual test is to be performed, review prior tests to ensure proper test setup and control settings.

The following test equipment items from table 2-9 are required to perform the procedures in table 2-24.

Radio Set Test Set AN/PRM-502 items:

Electronic Circuit Plug-In Unit Test Set TS-5123/PRM-502 (logic/tx test adapter)

Power Supply PP-5290/PRM-502 (power supply)

Attenuator, Audio

Digital voltmeter

Isolation transformer, 600-ohm

Mixer-attenuator, 600 ohm (refer to figure 2-31)

Oscillator (2 required)

Oscilloscope (storage function required)

Rms voltmeter

Selective Voltmeter/Wave Analyzer

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1 Preliminary setup	a. On test adapter, set POWER to OFF. b. Install logic/tx A1A5A2 on test adapter and connect power supply as shown in figure 2-24, test setup A. c. On power supply set POWER to ON. On test adapter, connect digital voltmeter to 25 VDC P1-25 test point and rotate the 25 VDC adjust fully clockwise. d. On test adapter, set POWER to ON, $\overline{SK}$ +40 V to OFF, SET to DIRECT, R/C TRIGGER to OFF, STD, PTT, TIP, CWK, RCV ONLY, AM, VOICE, and TX INHIBIT to DSBL. e. On power supply, adjust OUTPUT VOLTAGE for 26 Vdc indication on digital voltmeter. f. On test adapter adjust 25 VDC control for 25.2 Vdc indication on digital voltmeter.		
2 $\overline{TX}$, TX logic with functions disabled	a. Measure voltage at $\overline{TX}$ test point on test adapter with digital voltmeter. b. Measure voltage at TX test point.	Not less than +4.5 Vdc (logic 1) Not more than +0.5 Vdc (logic 0)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10. Same as step a.
3 $\overline{TX}$, TX logic with PTT enabled	a. On test adapter, set PTT to ENBL and measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not more than +0.5 Vdc (logic 0)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
3 (cont)	b. Measure voltage at TX test point.	Not less than +4.5 Vdc (logic 1)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10.
4 $\overline{TX}$, TX logic with TIP enabled	a. On test adapter, set PTT to DSBL and TIP to ENBL. Measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not more than +0.5 Vdc (logic 0)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10.
	b. Measure voltage at TX test point.	Not less than +4.5 Vdc (logic 1).	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10.
5 $\overline{TX}$, TX logic with PTT, RCV ONLY enabled	a. On test adapter, set TIP to DSBL and PTT and RCV ONLY to ENBL. Measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not less than +4.5 Vdc (logic 1).	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U7, CR2
	b. Measure voltage at TX test point.	Not more than +0.5 Vdc.	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10, U7.
6 $\overline{TX}$, TX logic with PTT and TX INHB enabled	a. On test adapter, set RCV ONLY to DSBL and TX INHB to ENBL. Measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not less than +4.5 Vdc (logic 1)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U7, CR2.
	b. Measure voltage at TX test point.	Not more than +0.5 Vdc (logic 0)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10, U7.
7 $\overline{TX}$, TX logic with PTT and FAULT enabled	a. On test adapter, set TX INHB to DSBL and FAULT to ENBL. Measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not more than +4.5 Vdc (logic 1)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10.
	b. Measure voltage at TX test point.	Not more than +0.5 Vdc (logic 0)	Check the following: U3, Q9, U5-U6, Q7-Q8, C10, U2, Q10.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
8 $\overline{TX}$, TX logic with CWK enabled	a. On test adapter, set PTT and FAULT to DSBL. Set CWK to ENBL and measure voltage at $\overline{TX}$ test point with digital voltmeter.	Not more than +0.5 Vdc.	Check the following: U6, U3, Q7-Q8-Q9, C10.
	b. Measure voltage at TX test point.	Not less than +4.5 Vdc.	Check the following: U6, U2, U3, Q7, Q8-Q10, C11.
9 $\overline{TX}$, TX logic switching CWK from ENBL to DSBL	a. On test adapter, connect oscilloscope input to $\overline{TX}$ jack and trigger with signal from $\overline{CWK}$ test point. Switch CWK from ENBL to DSBL and monitor $\overline{TX}$ output with digital voltmeter and oscilloscope.	Output stays below +1.0 V dc 0.6 to 1.3 seconds then rises to not less than +4.5 Vdc (logic 1).	Check the following: C1, R4, CR1.
	b. Measure voltage at TX test point.	Not more than +0.5 V dc (logic 0).	Check the following: U6, U2, U3, Q7-Q8, Q10, C11.
10 RCV.AM $\overline{RCV.AM}$ logic with switches disabled	a. On test adapter, set CWK to DSBL and measure voltage at RCV•AM test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check the following: U3, U4, U5, U2, Q7-Q8.
	b. Measure voltage at $\overline{RCV.AM}$ test point.	Not less than +4.5 V dc (logic 1)	Check the following: U3, U4, U5, U2, Q7-Q8.
11 RCV.AM, $\overline{RCV.AM}$ logic with PTT enabled	a. On test adapter, set PTT to ENBL, and measure voltage at RCV.AM test point with digital voltmeter.	Not more than +0.5 V dc (logic 0)	Check the following: U3, U4, U5, U2, Q7-Q8.
	b. Measure voltage at $\overline{RCV.AM}$ test point.	Not less than +4.5 V dc (logic 1)	Check the following: U3, U4, U5, U2, Q7-Q8.
12 RCV.AM $\overline{RCV.AM}$ logic with AM enabled	a. On test adapter, set PTT to DSBL and set AM to ENBL. Measure voltage at RCV.AM test point with digital voltmeter.	Not less than +4.5 V dc (logic 1)	Check U4.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
12 (cont)	b. Measure voltage at $\overline{\text{RCV.AM}}$ point.	Not more than +0.5 V dc (logic 0).	Check U4, U2.
13 TX.AM. $\overline{\text{TIP}}$ logic with switches disabled	a. On test adapter, set AM to DSBL and measure voltage at TX.AM.$\overline{\text{TIP}}$ test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.
14 TX.AM. $\overline{\text{TIP}}$ logic with PTT enabled	a. On test adapter, set PTT to ENBL.		
	b. Measure voltage at TX.AM. $\overline{\text{TIP}}$ test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.
15 TX.AM. $\overline{\text{TIP}}$ with PTT and AM enabled	a. On test adapter, Set AM to ENBL.		
	b. Measure voltage at TX.AM. $\overline{\text{TIP}}$ test point with digital voltmeter.	Not less than +4.5 V dc (logic 1).	Check U1, U2, U3.
16 TX.AM. $\overline{\text{TIP}}$ with AM. TIP enabled	a. On test adapter set TIP to ENBL and PTT to DSBL.		
	b. Measure voltage at TX.AM. $\overline{\text{TIP}}$ test point with digital voltmeter.	Not more than 0.5 V dc (logic 0).	Check U1, U2, U3.
17 RCV.$\overline{\text{AM}}$, RCV.$\overline{\text{AM}}$ logic with switches disabled	a. On test adapter, set TIP and AM to DSBL and measure voltage at RCV.$\overline{\text{AM}}$ test point with digital voltmeter.	Not less than +4.5 V dc (logic 1).	Check U1, U3.
	b. Measure voltage at $\overline{\text{RCV.AM}}$ test point.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
18 RCV.$\overline{AM}$, RCV.$\overline{AM}$ logic with PTT enabled	a. On test adapter, set PTT to ENBL and measure voltage at RCV.$\overline{AM}$ test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.
	b. Measure voltage at $\overline{RCV.\overline{AM}}$ test point.	Not less than +4.5 V dc (logic 1)	Check U2.
19 RCV.$\overline{AM}$, RCV.$\overline{AM}$ logic with AM enabled	a. On test adapter, set PTT to DSBL and AM to ENBL.		
	b. Measure voltage at RCV.$\overline{AM}$ test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.
	c. Measure voltage at $\overline{RCV.\overline{AM}}$ test point.	Not less than +4.5 V dc (logic 1).	Check U2.
20 RCV.$\overline{AM}$ RCV.$\overline{AM}$ logic with PTT and AM enabled	a. On test adapter, set PTT and AM to ENBL and measure voltage at RCV.$\overline{AM}$ test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1, U2, U3.
	b. Measure voltage at $\overline{RCV.\overline{AM}}$ test point.	Not less than +4.5 V dc (logic 1).	Check U2.
21 ST (sidetone) logic with switches disabled	a. On test adapter, set PTT and AM to DSBL.		
	b. Measure voltage at ST test point on test adapter with digital voltmeter.	Not less than +4.5 V dc (logic 1).	Check the following: U1, U6, C3, U2.
22 ST logic with TIP enabled	a. On test adapter, set TIP to ENBL.		
	b. Measure voltage at ST test point on test adapter with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U2, U1.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
23 ST logic with fault enabled	a. On test adapter, set TIP to DSBL and FAULT to ENBL.		
	b. Measure voltage at ST test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U1.
24 ST logic with STD enabled	a. On test adapter, set FAULT to DSBL and STD to ENBL.		
	b. Measure voltage at ST test point with digital voltmeter.	Not more than +0.5 V dc (logic 0).	Check U6, CR3.
25 ST logic with STD switched from ENBL to DSBL (ST delay	a. On test adapter, connect oscilloscope to ST test point and trigger oscilloscope from $\overline{\text{STD}}$ test point.		
	b. Monitor ST output and switch STD from ENBL to DSBL. Measure time in seconds ST stays below 1.0 V dc.	1.0 to 2.0 seconds.	Check the following: R14, C3, CR3.
26 LVI-fault	a. On test adapter, set STD to DSBL. Connect oscilloscope to LVI test point.		
	b. Monitor LVI while decreasing voltage with 25 V DC control until LVI signal appears.	LVI ouput is a square wave, 5 V peak-to-peak.	Check the following: U7, Q1-Q2, U4.
	c. On test adapter measure voltage at 25 VDC P1-25 test point with digital voltmeter.	P1-25 output 20.5 to 22.5 V dc.	Check the following: U7, Q1-Q2, U4.
	d. On test adapter, set FAULT to ENBL.	Oscilloscope displays not less than +4.5 V dc (logic 1).	Check the following: U4, U3.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
27 AF compressor logic	a. On test adapter, set FAULT to DSBL. Readjust 25 VDC control for +25.2 V dc at P1-25 test point. Set PTT to ENBL and ensure SET is set to DIRECT.		
	b. On test adapter, connect oscillator to TX AUDIO IN and the rms voltmeter to TX AUDIO OUT jacks.		
	c. Set oscillator for 1000 Hz at +10 dBm input to TX AUDIO IN and measure audio output level with rms voltmeter at TX AUDIO OUT.	110 to 131 mV	
	d. On test adapter, set TIP to ENBL and measure audio level at TX AUDIO OUT test jack with rms voltmeter.	Not more than 0.5 mV.	Check the following: Q13-Q14, U8, Q15-Q12, U7.
	e. On test adapter, set TIP to DSBL and CWK to ENBL. Measure audio at TX AUDIO OUT with rms voltmeter.	Not more than 0.5 mV.	Check U6, U7.
	f. On test adapter, set PTT and CWK to DSBL. Measure audio at TX AUDIO OUT with rms voltmeter.		
28 System key	a. On test adapter, set $\overline{SK}$ +40 V to ON and measure voltage at $\overline{SK}$ P1-16 test point with digital voltmeter.	+34 to +38 V dc.	Check Q7-Q8, VR1.
	b. On test adapter, set PTT to ENBL and measure voltage at $\overline{SK}$ P1-16 test point with digital voltmeter.	Not more than 0.3 V dc.	Check U3, U5.
29 Rechannel pulse	a. On test adapter set PTT to DSBL and $\overline{SK}$ +40V to OFF. Connect oscilloscope to R/C		

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
29 (cont)	OUT test point and synchronize the oscilloscope with signal from R/C SYNC test jack.		
	b. On test adapter, set R/C TRIGGER momentarily to ON and measure the delay and pulse width of R/C OUT signal.	Delay: 5 to 15 milliseconds Pulse Width: 50 to 150 milliseconds.	Check: Q3, R18-19, C4. check: Q4, C24-R69
30 Voice mode gain	a. On test adapter, set PTT and VOICE to ENBL. Ensure SET is set to DIRECT.		
	b. Set oscillator for 1000 Hz at -26 dBm input to TX AUDIO IN jack and measure output at TX AUDIO OUT jack with rms voltmeter.	110 to 130 mV.	Check the following: U8, Q13-Q14, Q12-Q15, C12, C13.
	c. Adjust oscillator to apply a 1000-Hz tone at -46 dBm to TX AUDIO IN jack and measure TX AUDIO OUT with rms voltmeter.	108 to 128 mV.	Check the following: U8, Q13-Q14, Q12-Q15, C12, C13.
	d. Adjust oscillator to apply a 1000-Hz tone at -60 dBm to TX AUDIO IN jack and measure TX AUDIO OUT with rms voltmeter.	65 to 95 mV.	Check the following: U8, Q13-Q14, Q12-Q15, C12, C13.
31 CW Key mode	a. On test adapter, set PTT and VOICE to DSBL and CWK to ENBL.		
	b. Connect oscillator through isolation transformer to 1 OR 2 KHZ jack on test adapter and adjust oscillator for 1000 Hz at 100-mV input to 1OR 2 KHZ jack.		

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
31 (cont)	c. Measure audio output at TX AUDIO OUT jack with rms voltmeter.	90 to 110 mV	Check the following: U8, Q5-Q6, C9, C17
	d. Adjust oscillator for 2-kHz at 100 mV to 1 OR 2 KHZ jack and measure TX AUDIO OUT on rms voltmeter.	87 to 107 mV.	Check the following: U8, Q5-Q6, C9, C17.
	e. Adjust oscillator for 3-kHz at 100 mV to 1 OR 2 KHZ jack and measure TX AUDIO OUT on rms voltmeter.	Not more than 35 mV.	Check the following: U8, Q5-Q6, C9, C17.
32 Fault pulse	a. On test adapter set CWK to DSBL.		
	b. Adjust oscillator for 1000 Hz at 100 mV to 1 OR 2 KHZ jack.		
	c. On test adapter, connect oscilloscope to TX AUDIO OUT test jack.		
	d. While monitoring TX AUDIO OUT on oscilloscope, set test adapter FAULT switch to ENBL and measure pulse width (on time) of TX AUDIO OUT signal.	60 to 120 milliseconds.	Check the following: R22, C5, U4, Q16, C17.
33 Compression amplifier	a. On test adapter, set FAULT to DSBL, PTT and VOICE to ENBL and SET to ATTACK.		
	b. Adjust oscillator for 1000 Hz at -26 dBm to TX AUDIO IN test jack.		
	c. On test adapter connect TX/AF SYNC jack to trigger the oscilloscope connected to TX AUDIO OUT jack. Positive trigger for		

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
33 (cont)	attack and negative trigger for decay. NOTE INITIATE switch should be left in DECAY for 15 seconds between each positioning of INITIATE switch in ATTACK direction.		
	d. On test adapter, move INITIATE switch in direction of ATTACK arrow and measure the attack time (time from application of signal until TX AUDIO OUT reaches 3 dBm of final value) on oscilloscope.	No more than 8 milliseconds.	Check the following: U8, Q12-Q15, C21, Q13-Q14.
	e. On test adapter, place SET switch to DECAY and move INITIATE switch in DECAY direction. Measure decay time of TX AUDIO OUT signal, time from a 30-dB decrease (-26 dBm to -56 dBm due to 30 dB attenuation in test adapter) in TX AUDIO IN until TX AUDIO OUT has recovered to within 3 dBm of final level.	No less than 500 milliseconds.	Check the following: U8, Q12-Q15, C21, Q13-Q14.
34 Intermodulation	a. On test adapter place SET to DIRECT.		
	b. Connect two oscillators through the mixer-attenuator and connect mixer output to TX AUDIO IN jack on test adapter as shown in figure 2-24 test setup B.		

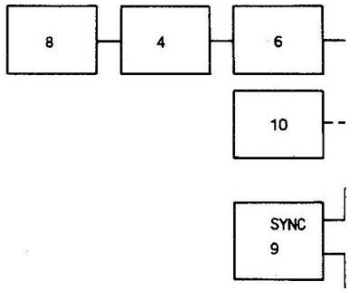
Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
34 (cont)	c. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to OSC 1 IN and AUDIO LOAD/OSC 2 IN to AUDIO LOAD. Set oscillator No. 1 for 1000 Hz and an input level to the TX AUDIO IN jack of -32 dBm.		
	d. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to AUDIO LOAD and AUDIO LOAD/OSC 2 IN to OSC 2 IN. Set oscillator No. 2 for 1300 Hz and an input level to the TX AUDIO IN jack of -32 dBm.		
	e. On mixer-attenuator, set AUDIO LOAD/OSC 1 IN to OSC 1 IN (both oscillators will now be connected to the TX AUDIO IN jack on the test adapter).		
	f. On test adapter, connect wave analyzer to TX AUDIO OUT jack and measure the products in dB below the desired tones.	700 and 1600 Hz not less than 34 dB down.	Check the following: U8, Q13, Q14, Q15, Q12.
35 Power require-ments	a. On test adapter, disconnect oscillators and set switches as outlined in test 1 step d and connect digital voltmeter to CURRENT MONITOR MV/MA +13V test points.		
	b. On test adapter, set PTT to ENBL and measure dc voltage (current) on digital voltmeter.	Not more than 2.5 mV (2.5 mA).	Check the following: C22, R64, and +13 volt circuit.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)

STEP	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
35 (cont)	c. On test adapter, set PTT to DSBL, RCV ONLY to ENBL, and measure dc voltage (current) on digital voltmeter.	Not more than 2.5 mV (2.5 mA).	Check the following: C22, R64, and +13 volt circuit
	d. On test adapter, connect digital voltmeter to CURRENT MONITOR MV/MA +5.2V test points. Measure dc voltage (current) on digital voltmeter.	Not more than 5.5 mV (5.5 mA).	Check the following: C18, L1, and +5.2 volt circuit.
	e. On test adapter, set RCV ONLY to DSBL and PTT to ENBL and measure dc voltage (current) on digital voltmeter.	Not more than 25 mV (25 mA).	Same as above.

Table 2-24. Logic/Tx A1A5A2, Testing/Troubleshooting (cont)



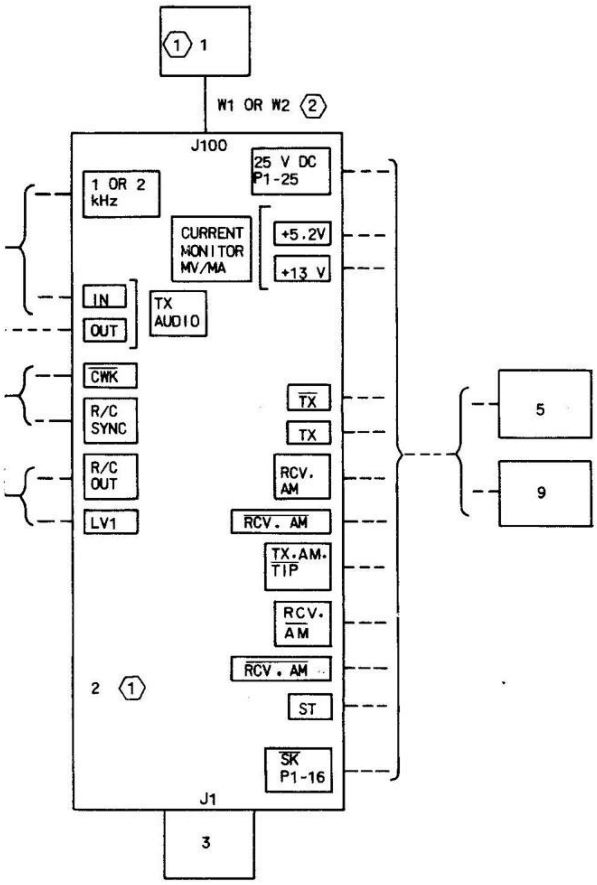
1. POWER SUPPLY
2. LOGIC/TX TEST ADAPTER
3. LOGIC/TX A1A5A2
4. ATTENUATOR, AUDIO
5. DIGITAL VOLTMETER
6. ISOLATION TRANSFORMER, 600 OHM
7. MIXER-ATTENUATOR, 600 OHMS
8. OSCILLATOR (2 REQUIRED)
9. OSCILLOSCOPE
10. RMS VOLTMETER
11. WAVE ANALYZER

NOTES:

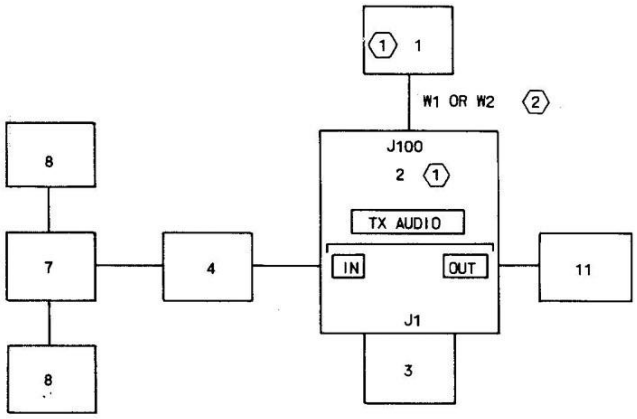
(1) PART OF RADIO TEST SET AN/PRM-502.

(2) PART OF POWER SUPPLY.

(3) DASHED LINE IS ALTERNATE CONNECTION
DO NOT MAKE THIS CONNECTION UNTIL SI



TEST SETUP A



TEST SETUP B

DESCRIBED IN A PROCEDURE STEP.
) INSTRUCTED.

TP5-4810-014

Figure 2-24. Logic/Tx A1A5A2, Test Setup

2.3.18 Receiver-Transmitter Chassis A1A1, Troubleshooting

Troubleshooting of chassis A1A1, consists of performing continuity checks between pins on connectors A1A1J1, A1A1J2, A1A1J3, A1A1J4, A1A1J5, A1A1J6, A1A1J7, and A1A1P1 as listed in table 2-25. If continuity is not obtained between all pins listed on a horizontal grid of table 2-25, locate and repair or replace the defective wire between the associated pins. Refer to the schematic diagram for information on circuit configuration.

The only test equipment item from table 2-9 required to perform the continuity checks is a multimeter.

A1A1J1	A1A1J2	A1A1J3	A1A1J4	A1A1J5	A1A1J6	A1A1J7	A1A1P1
1					26		18
2					25		17
3					24		16
4					23		15
5					22		14
6					21		13
7					20		12
8					19		11
9					18		10
10					17		9
11					16		8
12					15		7
13					14		6
14						10	5
15						9	4
16						8	3
17						7	2
18						6	1
19				17			49
20				15			51
21				14			35
22				6			
23				8			31
24							30
25							29

Table 2-25. Receiver-Transmitter Chassis A1A1, Continuity

A1A1J1	A1A1J2	A1A1J3	A1A1J4	A1A1J5	A1A1J6	A1A1J7	A1A1P1
26							28
27							27
28							26
29							25
30							24
31						1	23
32						2	22
33						3	21
34						4	20
35						5	19
36		3	5	20			48
37				19			47
38				22			
39				23			46
40				26			45
41			7	27	4		43
42				28			
43				34			
44		1	1	33	12	11	41
45				35			40
46				37			39
47				40			
48				42			38
49				20			
	2			2			

Table 2-25. Receiver-Transmitter Chassis A1A1, Continuity (cont)

A1A1J1	A1A1J2	A1A1J3	A1A1J4	A1A1J5	A1A1J6	A1A1J7	A1A1P1
	5			38			
	6			11			
	9			13			
	10			7			
	14	2					
		7		12			33
		9		36			
		12					36
				4	6		
				9	3		34
				10			32
				18			50
				21	7		
				24		13	
				25			44
				31			42
				32	13		

Table 2-25. Receiver-Transmitter Chassis A1A1, Continuity (cont)

2.3.19 Amplifier-Coupler Chassis A3A3, Troubleshooting

Troubleshooting of chassis A3A3 consists of performing continuity checks between pins on connectors A3J1, A3A3A1J1, A3A3A1J2, and A3J2 as listed in table 2-26. It is noted in table 2-26 where there is an inductor and/or diode in the circuit that would provide a resistance measurement. If not noted, the circuit consists only of interconnecting wire. If continuity is not obtained between all pins listed on a horizontal grid of table 2-26, locate and repair or replace the defective wire and/or component between the associated pins. Refer to the schematic diagram for information on circuit configuration when performing the continuity checks of table 2-26 and when troubleshooting the following: circuits between A3A9 and A3, A3J4 and antenna switch on A3; circuit between antenna switch on A3 and A3A3A2 and A3A3A2.

The only test equipment item from table 2-9 required to perform the continuity checks is a multimeter.

A3J1	A3A3A1J1	A3A3A1J2	A3J2	A3A3A1K1	A3A3A2	COMPONENT IN CIRCUIT
1	1					Inductor
2	5					Inductor
3	6					Inductor
19	2					Inductor
20	4					Inductor
21	3					Inductor
22	8					Inductor
23	7					Inductor
24 (1)	21		1	4/8/1 (4)		Inductor between A3J1-24 and A3A3A1J1-21. Fuse between A3J2-1 and A3A3A1J1-21 and A3A3A1K1-1/4/8. Diode between A3A3A1J1-21 (cathode) and A3J2-2 (anode).
25 (2)	9/16/28/29	7	2			
26 (2)						
27	19					Inductor
28 (2)						
29 (2)						
30 (1)						
32	24					Inductor
33	17			5 (4)		Inductor between A3J1-33 and A3A3A1J1-17. Diode between A3A3A1J1-17 (cathode) and A3A3A1K1-5 (anode).

Table 2-26. Amplifier-Coupler A3A3, Continuity

A3J1	A3A3A1J1	A3A3A1J2	A3J2	A3A3A1K1	A3A3A2	COMPONENT IN CIRCUIT
34	26					Inductor
35	27					Inductor
36		1				
37		1				
41	14					Inductor
42	23					Inductor
43	15					Inductor
45	30					Inductor
47	25					Inductor
48	20					Inductor
50	22					Inductor and diode (anode connected to inductor and cathode connected to A3A3A1J1-22).
		3		7		
	10	4				
	11	5				
	12	6				
		8 (3)				
	13			3	U1-8/R3 junction	
	18			5 (4)		Diode (cathode connected to A3A3A1J1-18 and anode connected to A3A3A1K1-5).
	32				R5/R6/C6 junction	

(1) A3J1-24 and A3J1-30 are common.

(2) A3J1-25, A3J1-26, A3J1-28, and A3J1-29 are common ground.

(3) No circuit connection (spare).

(4) Diode connected across A3A3A1K1 terminals 1 (cathode) and 5 (anode).

Table 2-26. Amplifier-Coupler A3A3, Continuity (cont)

2.4 RECEIVER-TRANSMITTER GROUP DISASSEMBLY

2.4.1 Disconnection of Major Units

Figure 2-25 shows the receiver-transmitter group assembled.

2.4.1.1 Receiver-Transmitter A1/Amplifier-Coupler A3 Disconnection

NOTE

If there is a possibility that bandswitch A3A5 might be removed, tune the receiver-transmitter group to 8 MHz.

NOTE

If there is a possibility that autotransformer A3A9 might be removed, tune the receiver-transmitter group to 2 MHz.

NOTE

Be sure that the battery is removed before proceeding with disconnection procedures.

a. First release the two bottom quick-release latches and then the two top ones that connect amplifier-coupler A3 to receiver-transmitter A2.
b. Carefully pull the two units apart until the connectors are separated.

2.4.1.2 Control A2 Removal

a. With control A2 cover up, locate and loosen the four hold-down screws.
b. Carefully lift control A2 straight up until disconnected from receiver-transmitter A1 connector.

2.4.2 Amplifier-Coupler A3 Disassembly

2.4.2.1 Power Amplifier A3A4 Removal

NOTE

Matching surfaces of the power amplifier and the amplifier-coupler are sealed with a heat-sinking compound. Care should be exercised during removal of the power amplifier to prevent damage to the ridge formed by the sealing compound.

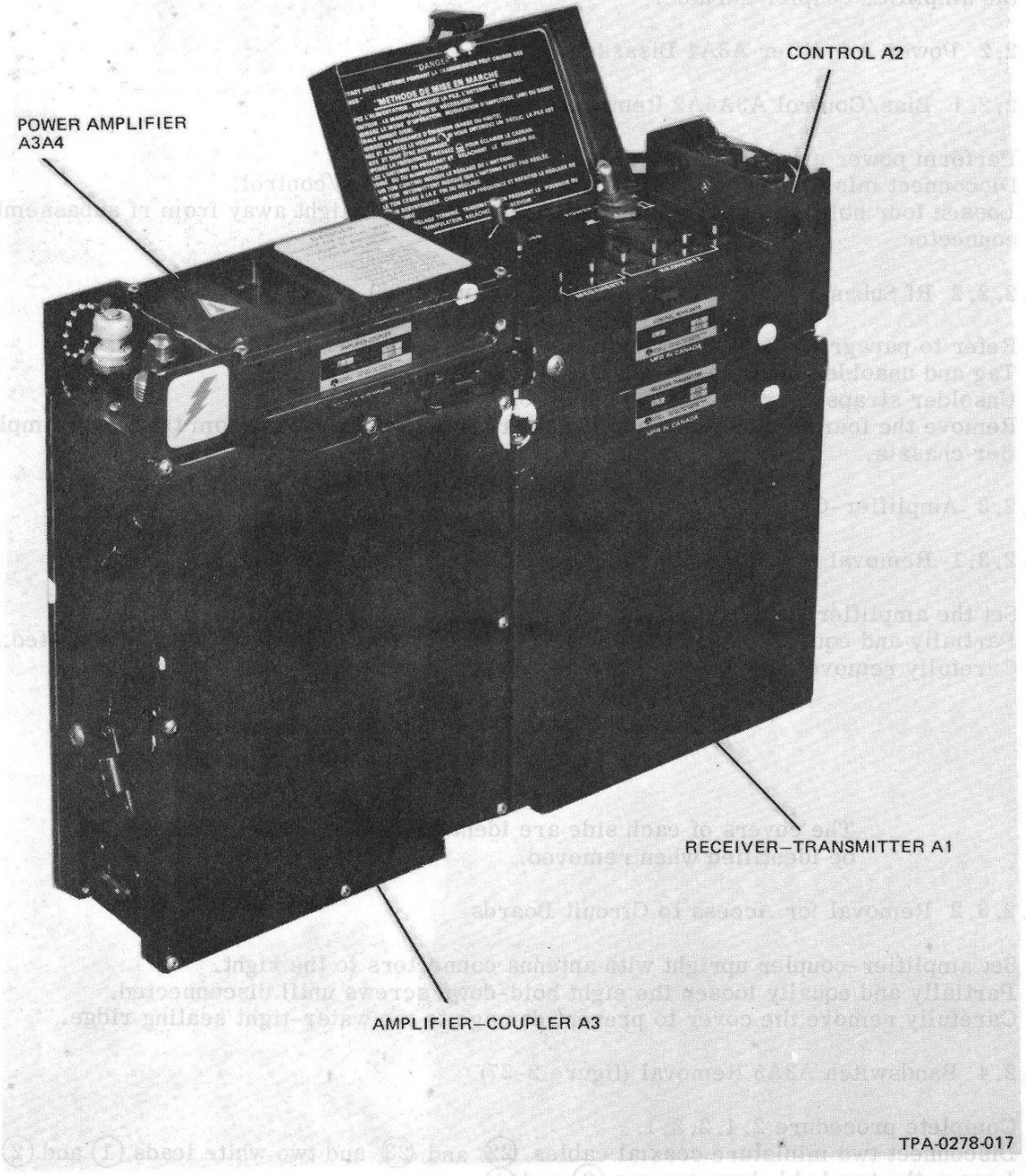


Figure 2-25. Receiver-Transmitter Group, Assembled.

a. Refer to figure 2-25. Partially and equally loosen the four hold-down screws until the screws are disconnected.
b. Carefully lift the power amplifier straight up until the connectors of the power amplifier and amplifier-coupler are disengaged and the sealing compound ridge is clear of the amplifier coupler surface.

2.4.2.2 Power Amplifier A3A4 Disassembly

2.4.2.2.1 Bias/Control A3A4A2 Removal (figure 2-26)

a. Perform power amplifier removal procedure.
b. Disconnect miniature coax cable from connector on bias/control.
c. Loosen four hold-down screws and lift bias/control straight away from rf subassembly connector.

2.4.2.2.2 Rf Subassembly A3A4A1 Removal (figure 2-26)

a. Refer to paragraph 2.4.2.2.1 and remove bias/control A3A4A2.
b. Tag and unsolder leads to Q3 and Q4.
c. Unsolder straps of transistors Q5 and Q6.
d. Remove the four corner posts and lift the rf subassembly away from the power amplifier chassis.

2.4.2.3 Amplifier-Coupler Cover Removal

2.4.2.3.1 Removal for Access to Electromechanical Subassemblies

a. Set the amplifier-coupler upright with the antenna connectors at the left.
b. Partially and equally loosen the eight hold-down screws until they are disconnected.
c. Carefully remove the cover to prevent damage to the water-tight sealing ridge.

NOTE

The covers of each side are identical. They do not need to be identified when removed.

2.4.2.3.2 Removal for Access to Circuit Boards

a. Set amplifier-coupler upright with antenna connectors to the right.
b. Partially and equally loosen the eight hold-down screws until disconnected.
c. Carefully remove the cover to prevent damage to the water-tight sealing ridge.

2.4.2.4 Bandswitch A3A5 Removal (figure 2-27)

a. Complete procedure 2.4.2.3.1.
b. Disconnect two miniature coaxial cables (22) and (23) and two white leads (1) and (2).
c. Loosen the two hold-down screws (3) and (4).
d. If necessary, loosen the autotransformer to allow end play of mechanical linkage to the bandswitch.
e. To remove, lift the bandswitch straight up until clear of adjacent components on chassis (drive coupling, part of amplifier-coupler, is removed with the bandswitch).

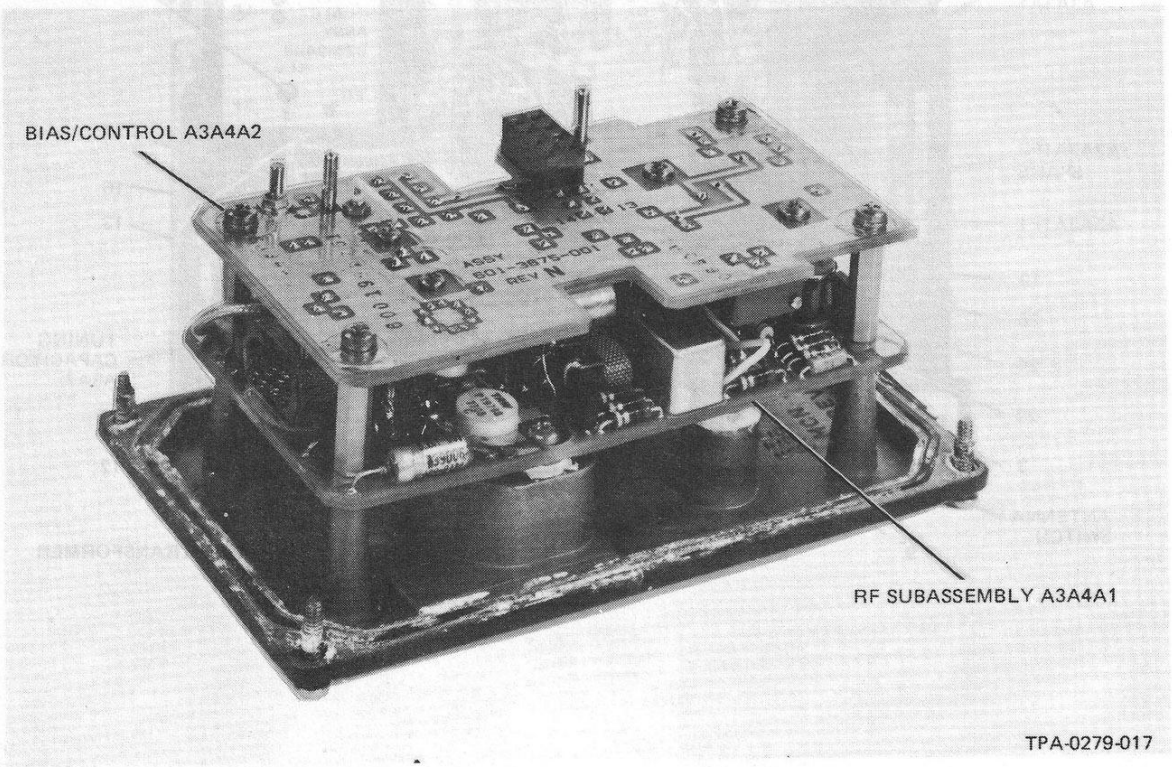


Figure 2-26. Power Amplifier A3A4, Subassembly Location

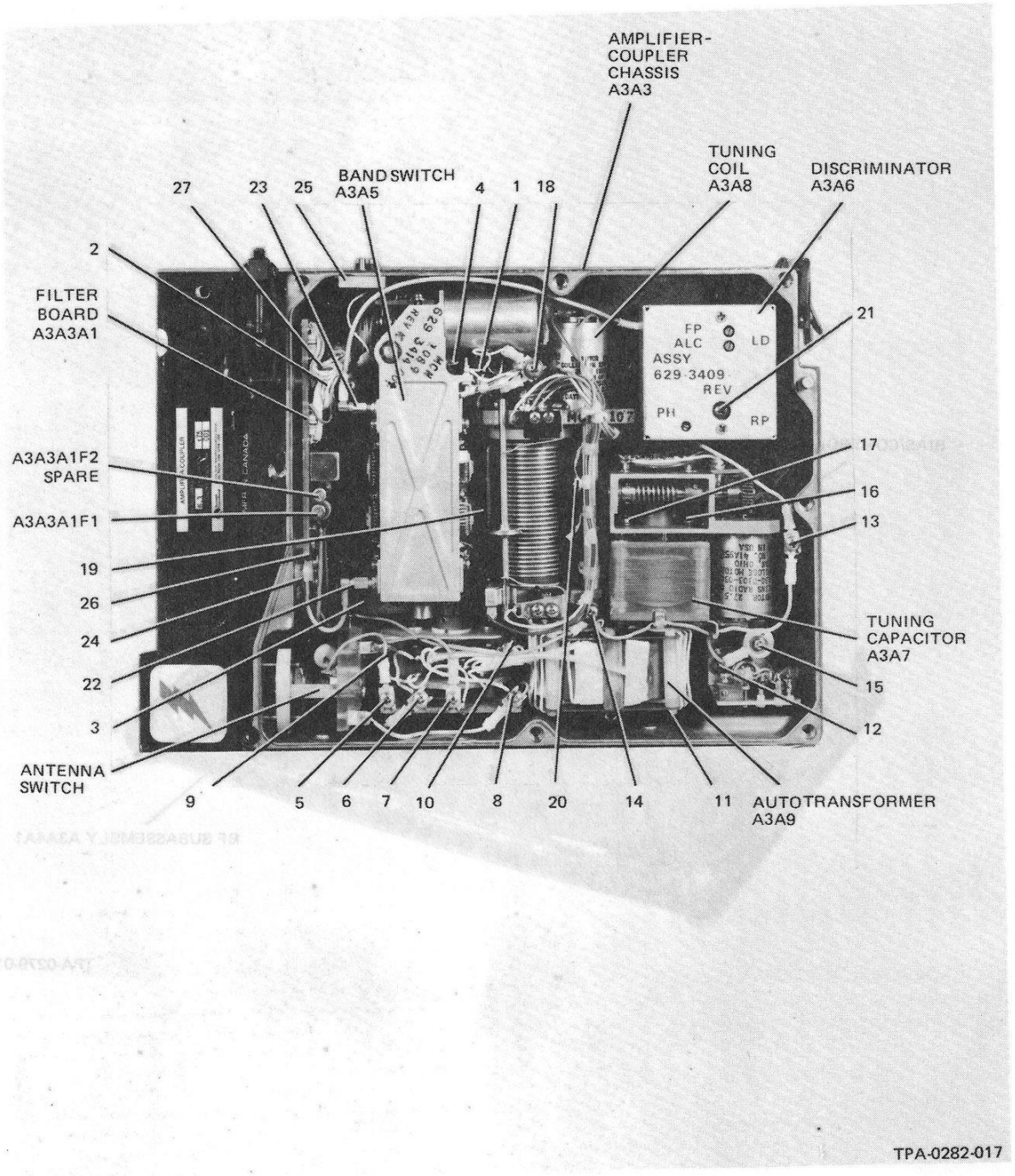


Figure 2-27. Amplifier-Coupler A3, Electromechanical Subassembly Location

2 4.2.5 Autotransformer A3A9 Removal (figure 2-27)

a. Complete procedure 2.4.2.3.1.

NOTE

Observe and diagram if necessary the position and dress of the red, orange, blue, and yellow leads before disconnecting them. Duplicating the dress and position during reassembly is required to ensure frequency stability.

b. Loosen the screws and free the red lead (5), the orange lead (6), the blue lead (7), and the yellow lead (8).
c. Loosen the four hold-down screws (9), (10), (11), and (12).
d. Carefully lift the autotransformer straight up from the chassis. Ensure that the drive coupling (part of the amplifier-coupler) on the bandswitch remains in place and maintains its original position, slot vertical.

2.4.2.6 Discriminator A3A6 Removal (figure 2-27)

a. Complete procedure 2.4.2.3.1.
b. Disconnect miniature coaxial cable from bandswitch (23).
c. Loosen the screw and free the orange lead (13).
d. Loosen the hold-down screw (21) and carefully lift the discriminator straight out.

2.4.2.7 Tuning Capacitor A3A7 Removal (figure 2-27)

a. Complete procedure 2.4.2.3.1.
b. Loosen the screws and disconnect the orange lead (13), the green lead (14), and the blue lead (15).
c. Loosen the hold-down screws (16) and (17).
d. Pull the tuning capacitor assembly straight out.

2.4.2.8 Tuning Coil A3A8 Removal (figure 2-27)

a. Complete procedure 2.4.2.3.1.
b. Loosen screws (14) and (18) and free the green and purple leads respectively.
c. Loosen the two hold-down screws (19) and (20).
d. Pull the tuning coil straight out.

2.4.2.9 Filter A3A3A1 Removal (figure 2-27)

a. Complete procedures 2.4.1.1, 2.4.2.3.1., and 2.4.2.3.2.
b. Remove bandswitch, servo amplifier, and control logic.
c. Unsolder two red leads and the orange lead.
d. Disconnect miniature coaxial cable by first unsnapping the plastic lock (24) and then disconnecting the coaxial connector.

NOTE

Chassis water-tight sealing will be destroyed when connector A3A3A1J1 is loosened. Connector must be resealed when replaced.

e. Loosen the two hold-down screws on connector A3A3J1 and pull connector from chassis mount.
f. Loosen the two hold-down screws (26) and (27) and carefully lift filter away from chassis.

2.4.2.10 Fuse A3A3A1F1 Removal (figure 2-27)

a. With cover removed (procedure 2.4.2.3.1.), locate fuse A3A3A1F1 and pull out of fuseholder.
b. If replacement fuse is required, remove spare fuse A3A3A1F2 from spare fuseholder and push into A3A3A1F1 fuseholder.
c. Be sure to replace spare fuse with another fuse.

2.4.2.11 Control Logic A3A2 Removal (Refer to figure 2-28).

a. Complete procedures 2.4.2.3.2.
b. Remove the four hold-down screws.
c. Carefully lift the upper right hand corner to loosen connector P1. Maintain the circuit board flat and carefully loosen the remaining connectors from the underlying board (servo amplifier).
d. Lift the control logic by the plastic handles attached to each side.

2.4.2.12 Servo Amplifier A3A1 Removal (Refer to figure 2-28).

a. Complete procedures 2.4.2.3.1 and 2.4.2.11.
b. Loosen the five hold-down screws.
c. Carefully disconnect the servo amplifier from the chassis connectors and remove.

2.4.3 Receiver-Transmitter A1 Disassembly

2.4.3.1 Dust Cover Removal

a. Perform procedure 2.4.1.1 and 2.4.1.2.
b. Place the receiver-transmitter in an upright position. Locate the four countersunk hold-down screws on top of the case.

NOTE

The case is sealed for water tightness. Care must be exercised during removal of dust cover to prevent damage to the ridge formed by the sealing compound.

c. Remove the hold-down screws. Hold the dust cover in one hand, grasp the top part of the chassis with the other hand, and carefully pull the receiver-transmitter out of the case.

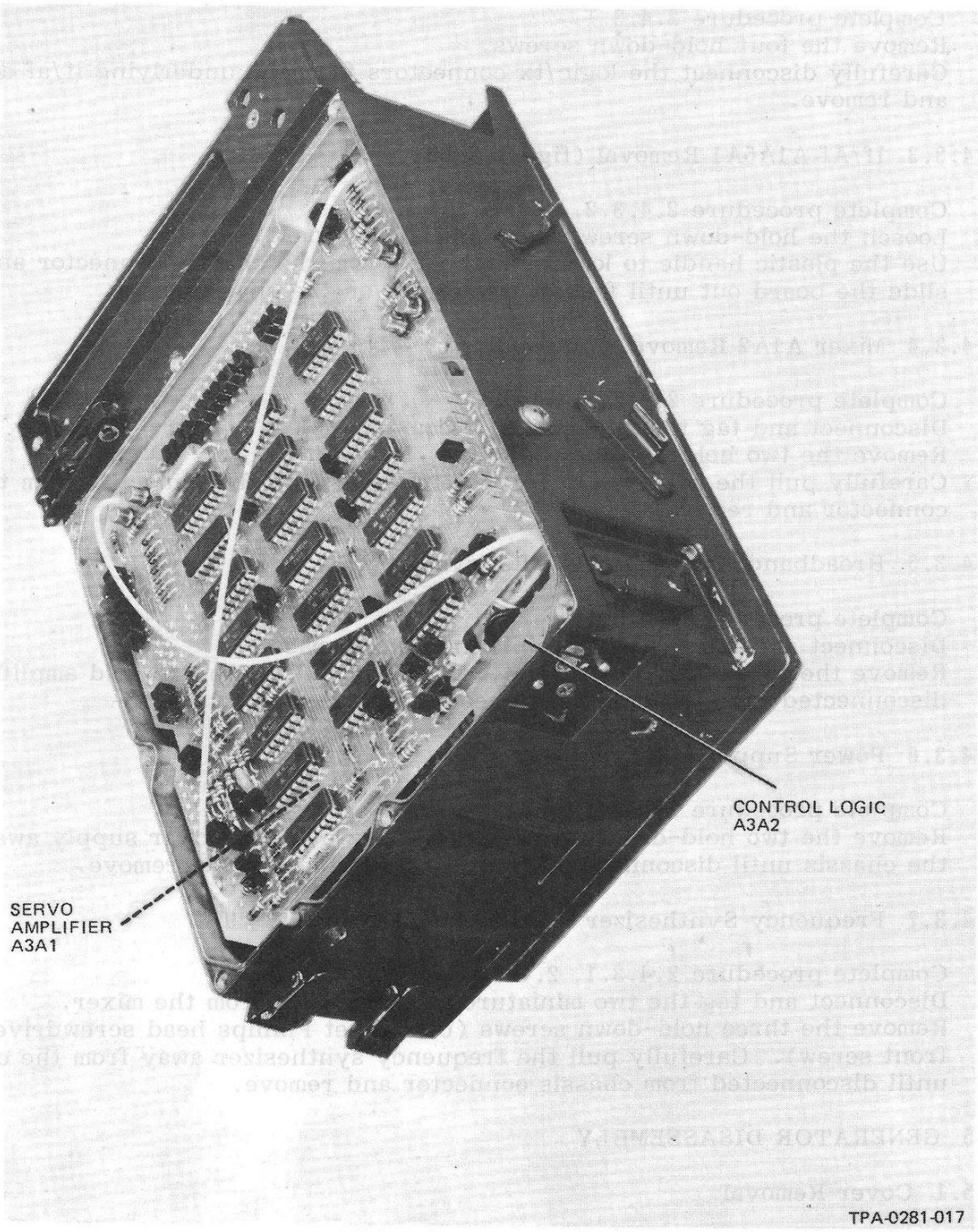


Figure 2-28. Amplifier-Coupler A3, Circuit Board Location

2.4.3.2 Logic/Tx A1A5A2 Removal (figure 2-29)

a. Complete procedure 2.4.3.1.
b. Remove the four hold-down screws.
c. Carefully disconnect the logic/tx connectors from the underlying if/af connectors and remove.

2.4.3.3 If/Af A1A5A1 Removal (figure 2-29)

a. Complete procedure 2.4.3.2.
b. Loosen the hold-down screw at the end of the board.
c. Use the plastic handle to loosen the board from the chassis connector and to slide the board out until free of the guides on the chassis.

2.4.3.4 Mixer A1A2 Removal (figure 2-29)

a. Complete procedure 2.4.3.1.
b. Disconnect and tag the two miniature coaxial cables.
c. Remove the two hold-down screws.
d. Carefully pull the mixer away from the chassis until disconnected from the chassis connector and remove.

2.4.3.5 Broadband Amplifier A1A3 Removal (2-29)

a. Complete procedure 2.4.3.1.
b. Disconnect and tag the mixer miniature coaxial cables.
c. Remove the two hold-down screws. Carefully pull the broadband amplifier until disconnected from the chassis connector and remove.

2.4.3.6 Power Supply A1A4 Removal (figure 2-29)

a. Complete procedure 2.4.3.1.
b. Remove the two hold-down screws. Carefully pull the power supply away from the chassis until disconnected from chassis connector and remove.

2.4.3.7 Frequency Synthesizer A1A6 Removal (figure 2-29)

a. Complete procedure 2.4.3.1, 2.4.3.2, and 2.4.3.3.
b. Disconnect and tag the two miniature coaxial cables from the mixer.
c. Remove the three hold-down screws (Use offset Phillips head screwdriver on front screw). Carefully pull the frequency synthesizer away from the chassis until disconnected from chassis connector and remove.

2.5 GENERATOR DISASSEMBLY

2.5.1 Cover Removal

NOTE

The generator is sealed for water tightness. Care should be exercised during removal of the cover to prevent damage to the ridge formed by the sealing compound.

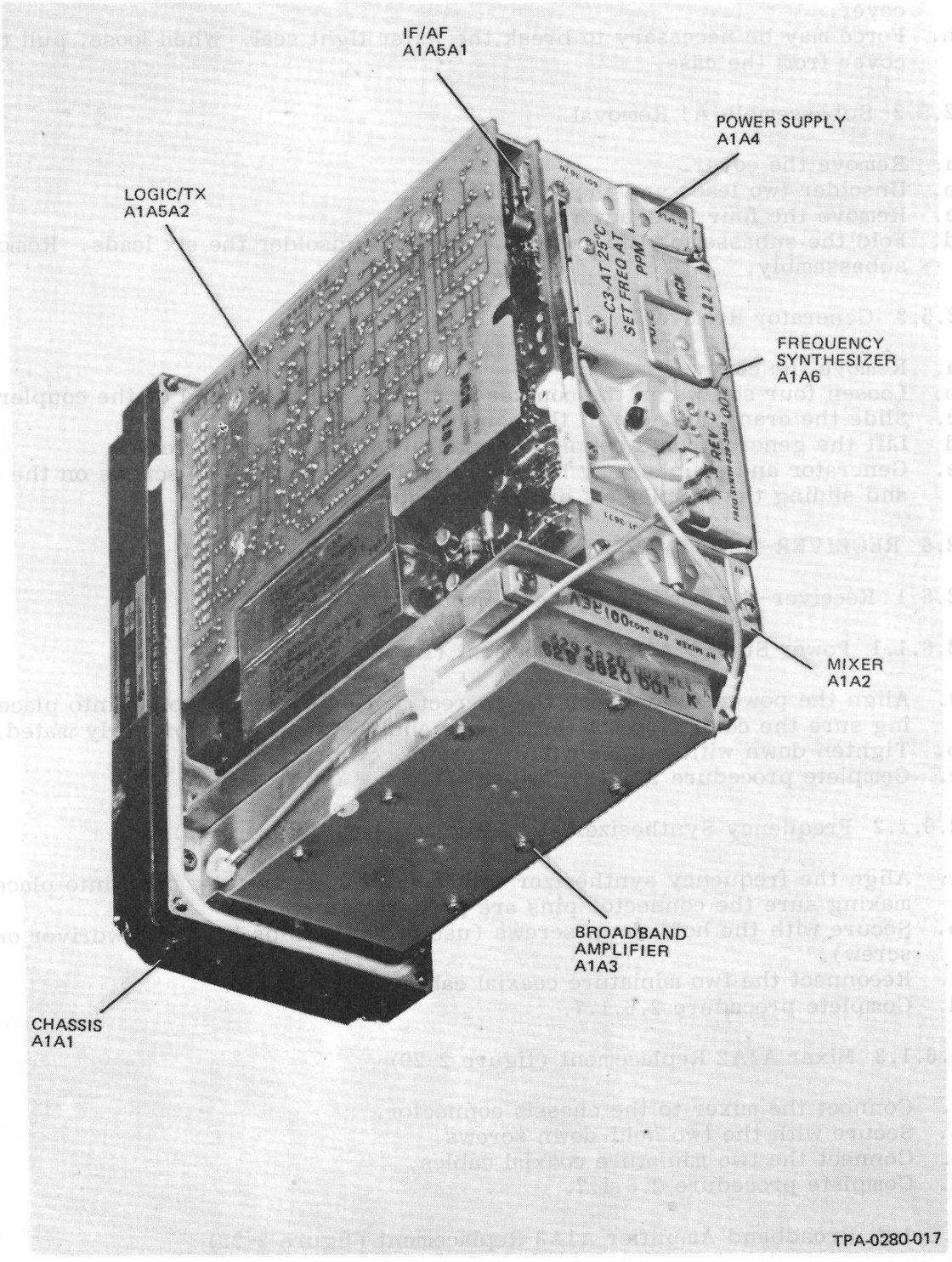


Figure 2-29. Receiver-Transmitter A1, Subassembly Location

a. Remove the eighteen screws (seven on each side and two on each end) from the cover.
b. Force may be necessary to break the water tight seal. When loose, pull the cover from the case.

2.5.2 Subassembly A1 Removal

a. Remove the cover.
b. Unsolder two leads and their shields.
c. Remove the four hold-down screws.
d. Fold the subassembly up and out. Tag and unsolder the six leads. Remove the subassembly.

2.5.3 Generator Removal

a. Remove the cover.
b. Loosen four screws on the coupler located at the crank end of the coupler.
c. Slide the crankshaft out of the coupler and case.
d. Lift the generator and coupler up and out of the generator case.
e. Generator and coupler may be separated by loosening four screws on the coupler and sliding the coupler off of the generator shaft.

2.6 RECEIVER-TRANSMITTER GROUP REASSEMBLY

2.6.1 Receiver-Transmitter A1 Reassembly

2.6.1.1 Power Supply A1A4 Replacement (figure 2-29)

a. Align the power supply with the correct slot and carefully push into place, making sure the connectors of the chassis and the supply are properly mated.
b. Tighten down with two hold-down screws.
c. Complete procedure 2.6.1.7.

2.6.1.2 Frequency Synthesizer A1A6 Replacement (figure 2-29)

a. Align the frequency synthesizer with its slot and carefully push into place, making sure the connector pins are properly mated.
b. Secure with the hold-down screws (use offset Phillips head screwdriver on front screw).
c. Reconnect the two miniature coaxial cables to the mixer.
d. Complete procedure 2.6.1.7.

2.6.1.3 Mixer A1A2 Replacement (figure 2-29)

a. Connect the mixer to the chassis connector.
b. Secure with the two hold-down screws.
c. Connect the two miniature coaxial cables.
d. Complete procedure 2.6.1.7.

2.6.1.4 Broadband Amplifier A1A3 Replacement (figure 2-29)

a. Align the broadband amplifier with its slot and carefully push into place, making sure the connector pins are properly mated.

b. Secure with two hold-down screws.
c. Reconnect the two miniature coaxial cables to the mixer.
d. Complete procedure 2.6.1.7.

2.6.1.5 If/Af A1A5A1 Replacement (figure 2-29)

a. Using the plastic handle on the end of the board, align the if/af with the guides on the sides of the chassis slot. Push the board until the connector pins are properly mated with the chassis connector.
b. Secure with the single hold-down screw.

2.6.1.6 Logic/Tx A1A5A2 Replacement (figure 2-29)

a. Align the logic/tx connector pins with the connectors on the if/af and carefully press the board until the pins are properly seated.
b. Secure with the four hold-down screws.
c. Complete the next procedure.

2.6.1.7 Dust Cover Replacement

a. Hold the receiver-transmitter dust cover in an upright position (open end at the top).

NOTE

If water tight seal ridge has been damaged, repair with DOW RTV 3145 or equivalent.

b. Align the receiver-transmitter with the cover opening and slide into place.
c. Secure with the four hold-down screws replaced in the countersunk holes in the top of the chassis.

2.6.2 Amplifier-Coupler A3 Reassembly

2.6.2.1 Power Amplifier A3A4 Reassembly

2.6.2.1.1 Rf Subassembly A3A4A1 Replacement (figure 2-26)

a. Align the four corner holes with chassis posts and secure with four corner posts.
b. Resolder straps to Q5 and Q6.
c. Resolder tagged leads to Q3 and Q4.

2.6.2.1.2 Bias/Control A3A4A2 (figure 2-26)

a. Align the four hold-down screw holes with the four posts on the rf subassembly, ensuring that the pins of the connectors are properly inserted.
b. Secure with the four hold-down screws.
c. Connect the miniature coaxial cable.

2.6.2.1.3 Power Amplifier A3A4 Replacement

NOTE

If heat-sinking ridge (beading) is damaged, repair with DOW RTV 3145 compound (or equivalent) before connecting units together.

a. Refer to figure 2-25. Align the four hold-down screws of the power amplifier with the holes in the top of the amplifier-coupler chassis, using the two dowels as alignment guide.
b. Press the units together and secure with the four hold-down screws.

2.6.2.1.4 Servo Amplifier A3A1 Replacement (figure 2-28)

a. Carefully align the connector pins of the servo amplifier with the amplifier-coupler chassis connector.
b. When the servo amplifier pins are properly pressed into place, the five hold-down screw holes should be aligned with the chassis holes. Secure with the five hold-down screws.
c. Complete procedure 2.6.2.1.5 and 2.6.2.1.11.

2.6.2.1.5 Control Logic A3A2 Replacement (figure 2-28)

a. Position the control logic hold-down screw holes with the four stand-off posts on the servo amplifier. Proper hole alignment should ensure proper control logic pin alignment with the servo connectors.
b. Carefully press the control logic pins into place and secure with the four hold-down screws.
c. Perform procedure 2.6.2.1.11.

2.6.2.1.6 Tuning Coil A3A8 Replacement

a. Position the tuning coil as shown in figure 2-27.
b. Secure with the two hold-down screws (19) and (20) .
c. Connect the green lead to (14) and the purple lead to (18) .
d. Complete procedure 2.6.2.1.11.

2.6.2.1.7 Tuning Capacitor A3A7 Replacement

a. Position the tuning capacitor as shown in figure 2-27.
b. Secure with the two hold-down screws (16) and (17) .
c. Connect the orange lead to (13) , the green lead to (14) , and the blue lead to (15) .
d. Perform procedure 2.6.2.1.11.

2.6.2.1.8 Discriminator A3A6 Replacement (figure 2-27)

a. Position the discriminator as shown in figure 2-27.
b. Secure with hold-down screw (21) .
c. Connect the orange lead to (13) .

d. Connect the miniature coaxial cable to the bandswitch at (23) .
e. Perform procedure 2.6.2.1.11.

2.6.2.1.9 Autotransformer A3A9 Replacement (figure 2-27)

NOTE

As noted in the disconnection procedure 2.4.1.1, the receiver-transmitter should be tuned for 2 MHz. If not, the bandswitch must be removed before replacing the autotransformer so that the drive coupling (part of amplifier-coupler) slots can be matched up. Also, ensure that the flat edge of the drive coupling is toward the dogged end of the drive.

a. Observe the slot of the drive coupling on the bandswitch to be vertical (2 MHz position). If not, refer to procedure 2.6.2.1.10.
b. Position autotransformer as shown in figure 2-27, making sure that the slot of the drive coupling and the autotransformer driveshaft are properly aligned.
c. Secure with the four hold-down screws (9) , (10) , (11) , and (12) .
d. Refer to the note in procedure 2.4.2.5. Connect the red lead to (5) , the orange lead to (6) , the blue lead to (7) , and the yellow lead to (8) , while maintaining as near as possible the original position and dress of the leads.
e. Complete procedure 2.6.2.1.11.

2.6.2.1.10 Bandswitch A3A5 Replacement (figure 2-27)

NOTE

Autotransformer A3A9 must be installed in the amplifier-coupler before bandswitch A3A5 can be replaced. The autotransformer driveshaft must be vertical with the dogged end toward the bottom of the amplifier-coupler chassis. The driveshaft can be rotated by hand to the correct position.

NOTE

Bandswitch A3A5 must be set to the 8 MHz position before it is installed in the amplifier-coupler. This is necessary to permit proper mechanical coupling between autotransformer A3A9 and bandswitch A3A5. The gear-train in the bandswitch cannot be rotated by hand. The bandswitch must be set to the 8 MHz position using the test adapter. Refer to table 2-19.

a. Ensure that bandswitch A3A5 is set to 8 MHz (refer to above notes).
b. Install the drive coupling (part of the amplifier-coupler) on the bandswitch spur gear (the slot of the drive coupling must be vertical to accept the raised portion of the autotransformer driveshaft).
c. Carefully install the bandswitch into the amplifier-coupler as shown in figure 2-27.
d. Secure with the two hold-down screws (3) and (4).
e. Connect miniature coaxial cables (22) and (23), taking care not to overtighten the coaxial connectors.
f. Connect white leads (1) and (2).
g. Perform procedure 2.6.2.1.11.

2.6.2.1.11 Amplifier-Coupler Cover Replacement

a. Check the water tight seal ridge along the edges of the cover for damage. If repair is required use DOW RTV 3145 or equivalent.
b. Either cover will fit either side of the coupler. Align the cover hold-down screws with the holes in the amplifier-coupler chassis. Partially and evenly tighten the eight hold-down screws until they are equally tight.

2.6.3 Reassembly of Major Units

Figure 2-25 shows the receiver-transmitter group assembled.

2.6.3.1 Control A2 Replacement

a. Align the connector pins of control A2 with receiver-transmitter A1 connector and press into place.
b. Lift the control cover and secure the control to the receiver-transmitter with the four hold down screws.

2.6.3.2 Receiver-Transmitter A1/Amplifier-Coupler A3 Reconnection

a. Align the connector pins of amplifier-coupler A3 with receiver-transmitter A1 connector and press into place.
b. Adjust the turnbuckle of the top fasteners on the amplifier-coupler (if necessary) to ensure a snug fit when fasteners are clamped shut. Close the top fasteners first, then the bottom fasteners.

2.7 GENERATOR REASSEMBLY

2.7.1 General

With the exception of cover replacement, reassembly of the generator is the reversal of the disassembly procedures in paragraph 2.5.

2.7.2 Cover Replacement

a. Check the water tight seal around the inside edge of the cover for damage. If repair of sealing edge is required, use DOW RTV 3145 or equivalent.
b. Press sealing compound (same as step a.) into all 18 pressed nuts from outside of the case.
c. Carefully place cover onto case, insert and evenly tighten the 18 hold-down screws.

2.8 RECEIVER-TRANSMITTER GROUP ALIGNMENT/ADJUSTMENTS

2.8.1 General

Alignment/adjustments for Receiver-Transmitter Group are required only in third-line maintenance and then only at the subassembly (module) level. There are no alignment/adjustment requirements at the second-line maintenance level. There are no alignment/adjustment requirements at the unit level for the following units: Receiver-Transmitter A1, Control A2, or Amplifier-Coupler A3.

The following paragraphs provide information on the subassemblies (modules) that require alignment/adjustment. Subassemblies not listed do not require alignment/adjustment.

2.8.2 Receiver-Transmitter A1

a. Mixer A1A2, adjustments are covered in testing/troubleshooting table 2-23.
b. Power Supply A1A4, resistors (R9 and R23) test selection is covered in test 13 of testing/troubleshooting table 2-10.
c. If/Af A1A5A1, adjustments are covered in testing/troubleshooting table 2-18.

2.8.3 Amplifier-Coupler A3

a. Servo Amplifier A3A1, adjustments are covered in testing/troubleshooting table 2-17.
b. Power Amplifier A3A4, adjustments are covered in testing/troubleshooting table 2-20.
c. Bandswitch A3A5, Filter Alignment

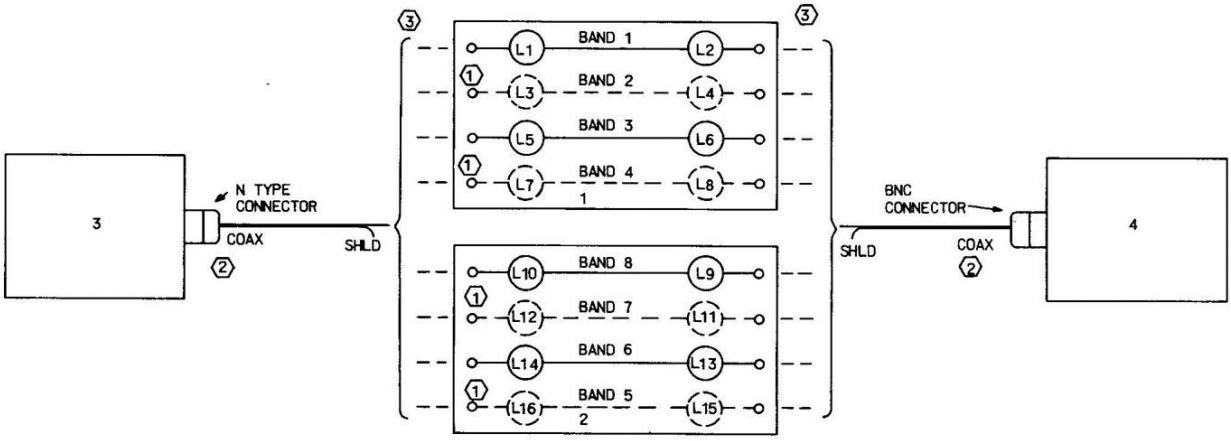
(1) Remove filter boards A3A5A2 and A3A5A3 from the unit under test.
(2) Inspect bandswitch A3A5 and filter boards for broken wire, spacing of coil wires, shorts and position of components.

NOTE

The input/output coaxial test cables must not exceed 15 inches in length. Solder the center conductor of coax cables to Band 1 input/output terminals and assure coax shields are grounded to the filter board. Also the signal generator and spectrum analyzer must be well grounded.

(3) Connect signal generator and spectrum analyzer to Band 1 input and output terminals on filter board No. 1, as shown in figure 2-30.

(4) Adjust signal generator for 6.48 MHz at 0.5 V ac and set reference level on spectrum analyzer.



1. FILTER BOARD NO 1 A3A5A2.
2. FILTER BOARD NO. 2 A3A5A3.
3. SIGNAL GENERATOR.
4. SPECTRUM ANALYZER.

NOTES:

(1) COMPONENTS ENCLOSED IN DASHED LINES ARE LOCATED ON OPPOSITE SIDE OF BOARD.

(2) TEST COAXIAL CABLES NOT MORE THAN 15 INCH LENGTH MAXIMUM. ONE CABLE TERMINATE WITH A N TYPE CONNECTOR ON ONE END. THE OTHER CABLE TERMINATED WITH A BNC CONNECTOR ON ONE END.

(3) DASHED LINES ARE ALTERNATE CONNECTIONS DESCRIBED IN PROCEDURE STEP. DO NOT MAKE THIS CONNECTION UNTIL SO INSTRUCTED.

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Figure 2-30. Filter Boards A3A5A2 and A3A5A3 Alignment, Test Setup

(5) Adjust input coil L1 on filter board No. 1, refer to figure 3-24, for transmission zero (indicated by an extreme dip on display of spectrum analyzer).
(6) Adjust signal generator for 4.19 MHz at 0.5 V ac and set reference level on spectrum analyzer.
(7) Adjust output coil L2 on filter board No 1, refer to figure 3-24, for transmission zero.
(8) Repeat steps (3) through (7) for bands 2, 3, and 4, using the following data:

BAND	INPUT COIL ZERO FREQ	ADJUST	BAND	OUTPUT COIL ZERO FREQ	ADJUST
2	10.35 MHz	L3	2	6.23 MHz	L4
3	12.39 MHz	L5	3	8.36 MHz	L6
4	17.48 MHz	L7	4	11.06 MHz	L8

(9) Repeat steps (3) through (8) for filter board No 2, bands 5 through 8 using the following data (refer to figure 3-25 for component location).

NOTE

BAND 7
No less than 18-dB attenuation at 32.00 MHz. Adjust L11 if necessary to comply.
BAND 8
No less than 13-dB attenuation at 48.00 MHz. Adjust L11 if necessary to comply.

BAND	INPUT COIL ZERO FREQ	ADJUST	BAND	OUTPUT COIL ZERO FREQ	ADJUST
5	32.90 MHz	L16	5	16.42 MHz	L15
6	34.39 MHz	L14	6	24.68 MHz	L13
7	51.05 MHz	L12	7	34.00 MHz	L11
8	82.85 MHz	L10	8	52.00 MHz	L9

(10) Disconnect signal generator and spectrum analyzer. Reinstall filter boards in unit under test.

d. Discriminator A3A6, adjustments are covered in testing/troubleshooting table 2-12.
e. Tuning Capacitor A3A7, adjustments are covered in testing/troubleshooting table 2-13.

2.9 REPAIR OF SOLID-STATE DEVICES AND CIRCUIT BOARDS

The general practices and precautions for printed circuits and microelectronic components apply to repair and replacement of components mounted on circuit cards. Use the procedures to remove or replace components or to make repairs. Use a 40-watt (maximum) soldering iron with a pointed tip and one flat side. Keep the tip well tinned at all times.

CAUTION

When unsoldering or soldering solid-state devices, attach a heat sink to the lead near the body of the device.

To unsolder connections at a terminal, use the flat side of the soldering iron tip to apply heat at the connection. Apply heat to the lead until the solder just melts; then use the tip or a pointed tool to separate the lead from the terminal. Exercise care to avoid overheating. Do not use force to pry the lead from the terminal.

CAUTION

Do not apply heat at a pad or thru hole for longer than 4 seconds.

To unsolder connections at a pad or thru hole, use the point of the soldering iron tip. Apply heat at the side opposite the component until the solder just melts; then use tweezers or needle-nose pliers to extract the lead from the thru hole. Exercise care to avoid overheating. Do not use force to remove the lead from the thru hole.

When the lead has been removed, allow the point to cool before reapplying heat. When the point has cooled, reheat the terminal or pad and remove all excess solder.

WARNING

Use cleaning solvent under a ventilated hood. Avoid breathing solvent vapor and fumes. Wear a suitable mask when necessary. Avoid continuous contact with solvent. Use goggles, gloves, and apron to prevent irritation from prolonged contact. Change clothing upon which solvents have been spilled. Observe all fire precautions for flammable materials. Use flammable solvents only in a well ventilated area, or in a hood provided with explosion-proof electrical equipment, and an exhaust fan with sparkproof blades. Warn other persons to keep away from hazardous area or working enclosure.

NOTE

When necessary to disturb dress of wiring and cables, note dress of wiring and cables and restore to dress after cleaning.

When connections have been unsoldered and the component has been removed, use a cotton swab or small brush dipped in solvent to clean the mounting area. Remove all flux residue, dirt, corrosion, and film deposits.

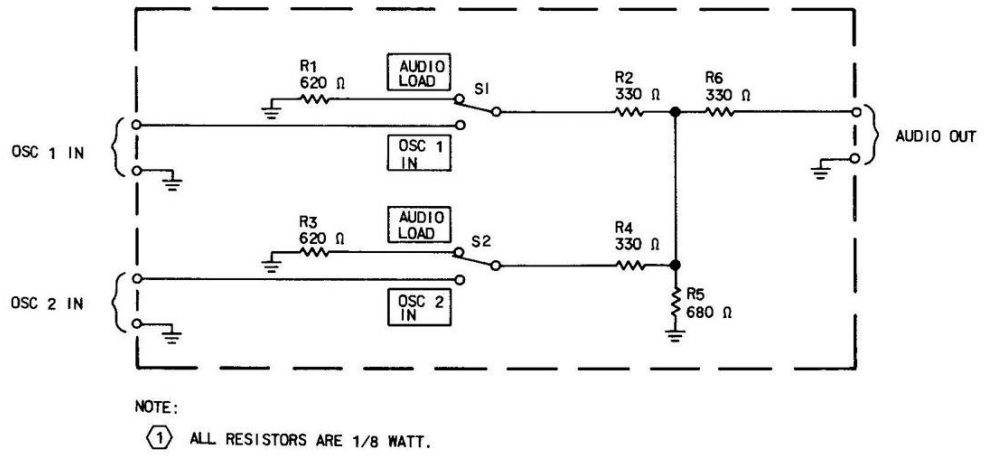

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Figure 2-31. Mixer Attenuator, 600 ohm, Schematic Diagram