DATE: [illegible]/53	TMC SPECIFICATION NO. S -783	0
SHEET 1 OF [illegible]		
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APPROVED [illegible]		

PRODUCTION TEST PROCEDURE FOR MAIN CHASSIS
ASSEMBLY AX-418

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. STOCK NO. 439M

DATE 8/10/63 SHEET ii OF 27	TMC SPECIFICATION NO. S 783	0
RK COMPILED / RON KOHN 9/12/63 CHECKED	TITLE: PRODUCTION TEST PROCEDURE FOR MAIN CHASSIS	
APPROVED	ASSEMBLY AX-418	

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I. INTRODUCTION

Main Chassis Assembly AX-418 is the major section of the TTR-10 transmitter-receiver and is used on all models of that unit. The AX-418 contains both the receiver audio and IF printed circuit cards and transmitter audio and IF printed circuit cards in addition to Intermediate Power Amplifier, Power Amplifier, switching circuitry and front panel controls.

II EQUIPMENT REQUIRED

1. Simpson 260 VOM.
2. Power Supply, TMC model AX-413.
3. Line cord, TMC model CA-555-4.
4. Schematic Diagrams, CK-693, CK-694, CK-659.
5. Metered VARIAC, model W10MT3W or equivalent.
6. Soldering iron and solder.
7. Small piece of #22 buss-bar.
8. Assorted tools, alignment tools.
9. Resistors, 22K and 47 ohms, 600 ohms. All 5%.
10. TMC model PTE-3 spectrum analyzer.
11. Ballantine AC VTVM, model 314.
12. Heathkit model AG-8 Audio Oscillator or equivalent.
13. Hewlett Packard model 524C Frequency Counter.
14. Hewlett Packard model 606A Signal Generator.
15. Hewlett Packard model 410 AC VTVM.
16. Power Amplifier Module, TMC model TTRA-4.
17. Dummy load, 50 ohm±5%. 100 watts minimum dissipation, non-inductive.
18. 1.75MC Test Jig.
19. Panoramic Sonic Analyzer model LP-1A or equivalent.
20. Assorted jumper wires with clip leads, at least six inches long
21. Assorted coaxial cables, 50 ohms impedance. RG-174/U and RG-58/U are recommended with RG-58/U being used for transmitter output to dummy load.

III PROCEDURE

The AX-418 assembly should be thoroughly inspected for wiring errors before continuing further. Particular attention should be paid to the high voltage wiring to the PA and IPA circuits. High voltage leads should be inspected for fraying and pinched wires. The power supply, TMC model AX-413, and Power Amplifier Module TTRA-4 should be fully tested and accepted by the Test Department before installation. Do not install the power supply or PA plug-in module until told to do so.

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III A. General

1. Remove the four screws located below the terminal boards on the rear of the main chassis. This will allow the printed circuit board assemblies to swing out on their hinges. Check for easy swing of each assembly.
2. Certain resistance and continuity measurements can now be made. Using the Simpson 260 make the measurements required on CHART 1, sheet 7 . The mode switch on the front panel should be in the CW position and the power switch in the XMIT/REC position.
3. Place the RECEIVER CHANNEL switch in channel 1 position.
4. Place the probes of the meter between the center conductor on RCVR ANT jack J1502 and pin 6 of J1514, the receiver module jack for channel 1. The meter should read zero ohms.
5. Set the RECEIVER CHANNEL switch to position T and the TRANSMITTER CHANNEL switch to channel 1, The meter should read zero ohms.
6. Repeat steps 3,4, and 5 for channels 2, 3, and 4.
7. Place the TRANSMITTER CHANNEL switch in channel 1 position.
8. Place the probes of the meter between the green lead of T1500 and pin 3 on J1510, the transmitter exciter module jack for channel 1. The meter should read zero ohms.
9. Repeat steps 7 and 8 for channels 2, 3, and 4.
10. Place the probes of the meter between pins 23 and 24 on J1500. The meter should read ∞.
11. The meter should read ∞ also between either 23 and 24 to ground.

III B. Voltage Checks and Panel Switches

1. Replace a mounting screw in each printed circuit assembly to hold them in place and set the unit top up on bench.
2. Install power supply, TMC model AX-413. Be sure all mounting screws are tight and that the power connectors mate easily.
3. Connect W900 on the rear of the power supply to RCVR ANT. jack J1502. The other end of W900 should be connected through a right angle adapter to J902 on the power supply.
4. Connect W901 from the antenna relay on the power supply to XMTR OUTPUT J1501 on the main chassis.
5. Be sure that the jumper is connected between terminals 8 and 9 on TB1501.
6. Set the LINE-MIKE switch to LINE.
7. Set PA Ib ADJ. potentiometer maximum clockwise.
8. Set the OVEN VOLTAGE switch on the power supply to OFF.
9. Remove the mounting screws so that the printed circuit assemblies will hinge out as before.

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III B cont'd.

10. Set VOLUME control on front panel maximum clockwise.
11. Set PA METER switch to the Ib position.
12. Set the RCVR sideband selector to the USB/REMOTE position.
13. Set the SIMPLEX-DUPLEX switch to SIMPLEX.
14. Set the SQUELCH control maximum clockwise.
15. Set the PTT-VOX switch to PTT.
16. Set the XMTR sideband selector to the USB/REMOTE position.
17. Set XMTR AF GAIN maximum clockwise.
18. Set the PA OVLD circuit breaker lever to the up position.
19. Set the power switch to OFF.
20. Set the LINE switch on the VARIAC to OFF and connect the VARIAC to bench outlet.
21. Connect the line cord from the power supply J900, AC INPUT jack to the VARIAC.
22. Set the RANGE switch on the VARIAC to LOW.
23. Set the LINE switch to ON and adjust for 115 VOLTS.
24. Set power switch on front panel to REC position. The red POWER lamp should light. VARIAC wattmeter should read approximately 10 watts.
25. Using the Simpson 260, connect the common lead to the chassis.
26. Set the meter to read +DC volts on the 50V scale.
27. Connect the (+) probe to terminal 7 on the RECEIVER IF printed circuit board. The meter should read 12 $\pm$ 5% volts. Remove meter.
28. Repeat step 27 at terminal 3.
29. Set the RCVR sideband selector to the LSB position.
30. Repeat step 27 at terminal 4.
31. Reset sideband selector to USB/REMOTE position.
32. Ground terminal 10 on TB1501 and repeat step 27 at terminal 4 on RECEIVER IF board. Grounding terminal 10 should produce a clicking sound due to energization of K1501. Unground terminal 10 and remove meter.
33. Set the meter to read - DC volts and repeat step 27 at terminal 8.
34. Place probe on terminal 14 of RECEIVER AF printed circuit board. Meter should read 12 $\pm$ 5% volts. Remove meter.
35. Set meter to read + DC volts and place probe on terminal 11. Meter should read 12 + 5% volts. Remove meter.
36. Place meter probe on terminal 8 of the CW OSC. printed circuit board. The meter should read 12 $\pm$ 5% volts. Leave meter connected.

III B cont'd.

37. Setting the mode switch on the front panel to SSB,-20DB CARRIER, or AM should remove the voltage from terminal 8. Setting the switch to MCW should reapply the voltage. Remove meter and set mode switch to SSB.
38. Place meter probe on terminal 21, TRANSMITTER AF printed circuit board. The meter should read 12 ± 5% volts. Remove meter.
39. Set meter to read - DC volts and place meter on terminal 16. Meter should read 12 ± 5% volts. Remove meter.
40. Place meter on terminal 7 on TRANSMITTER IF printed circuit board. Meter should read zero volts. Leave meter connected.
41. Ground terminal 8 on TB1500,. Meter should read 12 ± 5% volts. Remove meter and unground terminal 8 on TB1500.
42. Set meter to read + DC volts and place probe on terminal 5 of TRANSMITTER IF board. Meter should read zero volts.
43. Repeat step 41.
44. Place meter on terminal 4. Meter should read 12 ± 5% volts. Remove meter.
45. Set XMTR sideband selector to the LSB position.
46. Place meter probe on terminal 6. Meter should read 12 ± 5% volts. Remove meter, and reset switch to USB/REMOTE.
47. Ground terminal 10 on TB1500. A clicking sound due to energization of K1502 should be heard. Remove ground.
48. Set the power switch on the front panel to XMIT/REC.
49. Set the TRANSMITTER CHANNEL switch to channel 1.
50. Place the meter probe on pin 7 of J1510. J1510 is the transmitter module jack for channel 1.
51. Ground terminal 8 of TB1500. The meter should read -36 ± 10% volts. Leave meter connected and terminal 8 grounded.
52. Set power switch on front panel back to REC. position. Meter should read zero volts. Remove meter and unground terminal 8 on TB1500.
53. Install POWER AMPLIFIER MODULE TMC model TTRA-4 in channel 1.
54. Set the Simpson 260 meter to read 500MA. Place the probes between terminals 3 and 4 on the CW OSC. printed circuit board. Use clip leads to firmly attach the probes, with the (-) or common probe on terminal 4 and the (+) probe on terminal 3. Maintain clearance between probe clips and chassis.

CAUTION: THE NO LOAD VOLTAGE AT THESE TERMINALS MAY EXCEED 800 VOLTS WHEN TRANSMITTER IS TURNED ON.

III B cont'd.

55. Turn on the HP-410 VTVM and allow to warm up.
56. Set power switch on front panel to XMIT/REC. No changes should occur.
57. Set PA OVLD circuit breaker level to down position. A click should be heard due to the energization of the high voltage relay in the power supply. The filaments of both the IPA and PA tubes should light and the wattmeter on the VARIAC should read approximately 90 watts.

WARNING: ALL TRANSMITTER VOLTAGES ARE NOW PRESENT. CONTACT WITH THESE VOLTAGES CAN BE FATAL. USE EXTREME CAUTION WHEN PERFORMING STEPS 58 THROUGH 67.

58. Set the HP-410 VTVM to read +DC volts on the 1000 volt scale.
59. Connect the common meter lead to chassis ground.
60. Measure the voltage present on each plate cap of the power amplifier. This voltage should be 820 volts.
61. Measure the voltage present at pin 3 of the power amplifier tube socket. This voltage should be 320 + 5% volts.
62. Set the meter to measure -DC volts on the 300 volt range measure the voltage at pin 6 of the power amplifier tube socket. The voltage should be 105 + 5% volts.
63. Set the meter to read +DC volts on the 1000 volt range.
64. Measure the voltages at pins 7 and 8 on the IPA tube socket. The voltage should be 300 + 10% volts.
65. Ground terminal 8 on TB1500. A loud click should be heard due to the energization of the antenna relay in the power supply. Leave terminal 8 grounded.
66. Using a screwdriver, rotate the PA Ib ADJ potentiometer to obtain 50MA on the Simpson 260. Lock the potentiometer at the setting obtained. Let set run for about 5 minutes and readjust if required.
67. Set the PA OVLD breaker lever to the up position. The antenna relay and high voltage relay will de-energize and the current indicated on the Simpson 260 will drop to zero. Remove meter.
68. Solder a piece of #22 buss-bar between terminals 3 and 4 on the CW OSC. printed circuit board.
69. Reset PA OVLD breaker lever to the downward position and allow the unit to run for about 5 minutes.
70. Adjust calibrating potentiometer R1507, using an insulated screwdriver, for a reading of 50MA on the black meter scale on the front panel. A reading of 50MA is indicated by the heavy black line labeled Ib ADJ.

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III B cont'd.

71. Set the TRANSMITTER CHANNEL selector switch to channel 2. The antenna and HV relays should de-energize and the Ib indicated on the panel meter should drop to zero.
72. Set the PA OVLD breaker lever to the upward position and remove the ground from terminal 8 and TB1500.

73. Set the SQUELCH control maximum clockwise.

74. Connect the Simpson between terminal 1 on the RECEIVER audio printed circuit board and ground. The meter should read +1.7±.3 volts.

75. Set the SQUELCH control maximum counter-clockwise. The meter should read 6.5±.5 volts. Remove meter.

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TMC SPECIFICATION NO. S 783

0

RK COMPILED | RON KOHN 9-12-63 CHECKED

TITLE: CHART 1

APPROVED

RESISTANCE & CONTINUITY MEASUREMENTS **

FROM	TO	VALUE	CHECK
Plate caps, V1501	Ground	∞	
Pin 1 & 7, V1501	Ground	0	
Pins 2 & 6, V1501	Ground	∞	
Pin 3, V1501	Ground	∞	
Pin 4, V1501	Ground	0	
Pin 1, V1500	Ground	180 ohms	
Pin 2, V1500	Ground	10K	
Pins 3, 4, 9, V1500	Ground	0	
Pin 7, V1500	Ground	∞	
Pin 8, V1500	Ground	∞	
Term 3, A-3278	Ground	∞	
Plate caps, V1501	Term 4, A-3278	0	
Term 16, A-3221 *	Ground	50Ω	
Term 21, A-3221 *	Ground	250Ω	
Pin 9, J1500	Ground	∞	

NOTE: A-3278 IS THE CW OSC. PRINTED CIRCUIT BOARD
A-3221 IS THE XMTR AF PRINTED CIRCUIT BOARD

* WITH XMTR SIDEBAND AND RCVR SIDEBAND SWITCHES IN THE USB/REMOTE POSITION.

** WITH (-) METER LEAD GROUNDED

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III C Transmitter Audio Alignment

1. Set the XMTR MODE switch on the front panel to SSB position.
2. Check to see that S1504 on the rear of the unit is in the LINE position.
3. Connnect the output of the TTG two tone generator within the PTE between terminal 6 on TB 1500 and ground.
4. Set the TTG AUDIO TONE SELECTOR to TONE 1
5. Connect the Ballantine AC Voltmeter between terminal 6 of TB1500 and ground and set the AUDIO OUTPUT control on the TTG for a deflection of 14.0MV.
6. Move the Ballantine to terminal 1 and ground on the TRANSMITTER AUDIO printed circuit board. The deflection should be 46MV with the XMTR AF GAIN control maximum clockwise. Rotating the XMTR AF GAIN control maximum counter-clockwise should reduce the signal to approximately 3.5MV.
7. Rotate the XMTR AF GAIN control maximum clockwise.
8. Connect the output of the TTG between terminals 1 and 3 on TB1500. Using the Ballantine AC Voltmeter, set the output of the TTG at 77.5MV.
9. Connect the Ballantine between terminal 1 and ground on the XMTR AF printed circuit board.
10. Adjust R1718 for a deflection of 46MV. Remove meter.
11. Reduce the TTG output to zero.
12. Connect the Ballantine between terminal 6 on the XMTR AF printed circuit board and rotate the VOX GAIN and ANTI-VOX controls on the front panel maximum clockwise.
13. Set the PTT-VOX switch to VOX.
14. Connect the TTG output between terminal 6 of TB1500 and ground
15. Increase the TTG output until the TRANSMIT-RECEIVE relay K1500 trips. The value of audio voltage required to trip the relay should be between 40 and 50MV as indicated on the Ballantine.
16. Rotate the VOX GAIN control maximum counter clockwise. The TRANSMIT-RECEIVE relay should de-energize. Remove meter and TTG input connections.
17. Set the PTT-VOX switch to PTT.
18. Connect a jumper between terminal 8 on TB1500 and ground. The TRANSMIT-RECEIVE relay should energize. Proceed with I.F. alignment.

III.D Transmitter IF Alignment

1. Connect the frequency counter to the arm of potentiometer R1742 on the XMTR IF printed circuit board. The arm of R1742 is accessible through the rear of the printed circuit assembly The counter should register a frequency of 250KC ± 50cps. Remove counter.

III D cont'd.

2. Set XMTR sideband switch to USB/REMOTE.
3. Connect counter to the emitter lead of Q1715 and adjust C1749 for a frequency of 1.5MC + 2cps as registered on the counter.
4. Set the XMTR sideband switch to LSB.
5. Leave counter connected to the emitter lead of Q1715 and adjust C1746 for a frequency of 2.0MC ± 2cps as registered on the counter.
6. Set the Ballantine to the 1 volt scale and measure the voltages between the R1742 side of C1718 and ground and also between the R1742 side of C1719 and ground. If the two voltages are not equal, adjust R1742 to obtain the closest reading to equality.
7. Tack a 47 ohm, ½ watt, 5% resistor across terminals 9 and 10 of the XMTR IF printed circuit board.
8. Connect the Ballantine between the collector of Q1711 and ground (terminal 10 on printed circuit board).
9. Adjust R1748 for a null reading on the 100MV scale.
10. Connect the Ballantine AC VTVM across the 47 ohm resistor with the ground lead at terminal 10. Use 1 volt scale.
11. Set the MODE switch on the front panel to AM position.
12. Adjust C1725 and C1730 for a peak indication on the meter.
13. Set the MODE switch on the front panel to SSB position.
14. Connect the TTG between terminal 6 on TB-1500 and ground.
15. Connect the Ballantine between terminal 6 on TB1500 and ground and adjust the TTG output for a 14MV reading on the meter.
16. Connect the Ballantine across the 47 ohm resistor with the ground lead at terminal 10.
17. Adjust, C1762 and C1763 for a peak indication on the meter. The maximum voltage reading on the meter should be approximately 45MV. Remove meter.
18. Connect the SIGNAL INPUT jack on the PTE-3 analyzer across the 47 ohm resistor on the printed circuit board.
19. Set the PTE-3 to accept an input signal of 1.75MC. A single tone should appear on the screen with possible distortion indicated -40db below tone level.
20. Adjust capacitor C1715 for minimum distortion level. Minimum distortion level should fall between -45 and -50db below tone level.
21. Locate the carrier by increasing the analyzer gain 20db. The carrier signal should appear to the right of the audio tone in the LSB position of the XMTR sideband switch and to the left of the audio tone in the USB/REMOTE position. Reducing the audio input from the TTG to zero will leave only the carrier signal on the screen.
22. With the audio input at zero readjust R1742 for a minimum carrier amplitude on the analyzer screen.
23. Reapply signal at 14MV. The carrier level should be at least 50db below the audio tone level.

III D cont'd.

24.. Set the transmitter mode switch to the -20DB CARRIER position. The carrier signal should reappear on the screen 25db ± 2db below the audio tone level.

25.. Set the transmitter mode switch to the AM position. The carrier signal should be 8db + 2db above the audio tone.

26.. Set the transmitter mode switch to the CW position. The audio tone and carrier signal should disappear from the analyzer screen. Reduce TTG output to zero.

27.. Connect a short jumper between terminals 11 and 12 on TB1501 a single tone should appear on the screen. Distortion products will appear also.

28.. Connect the Ballantine AC Voltmeter between terminal 10 on the CW OSC. printed circuit board and ground.

29.. Adjust R1533 on the CW OSC. board for a reading of 14MV on the meter. Remove meter.

30.. A second harmonic distortion siganl should appear in addition to the audio tone from the CW OSCILLATOR. This distortion level should be more than 30db below the audio oscillator tone.

31.. Set the transmitter mode switch on the front panel to the MCW position. A carrier signal should appear on the analyzer screen in addition to the audio tone from the CW OSCILLATOR. The carrier signal should be 8db + 2db above the audio tone. The second harmonic of the audio tone should be 42db +2db below the carrier signal level. Lock R1533 in the set position.

32.. Set the transmitter mode switch to the SSB position. The audio tone and carrier signals, including distortion, should disappear from the analyzer screen.

33.. Increase the TTG output to obtain 14MV at terminal 6 of TB1500 as measured on the Ballantine AC Voltmeter. Audio tone should appear on analyzer screen.

34.. Check the TTG on TONE 2. The meter should still read 14MV at terminal 6, TB1500. Remove meter.

35.. Set the TTG AUDIO TONE SELECTOR to the TWO TONE position. Two tones should appear on the analyzer screen. Third order distortion should be more than 45db below the level of each tone.

36.. Disconnect analyzer and TTG.

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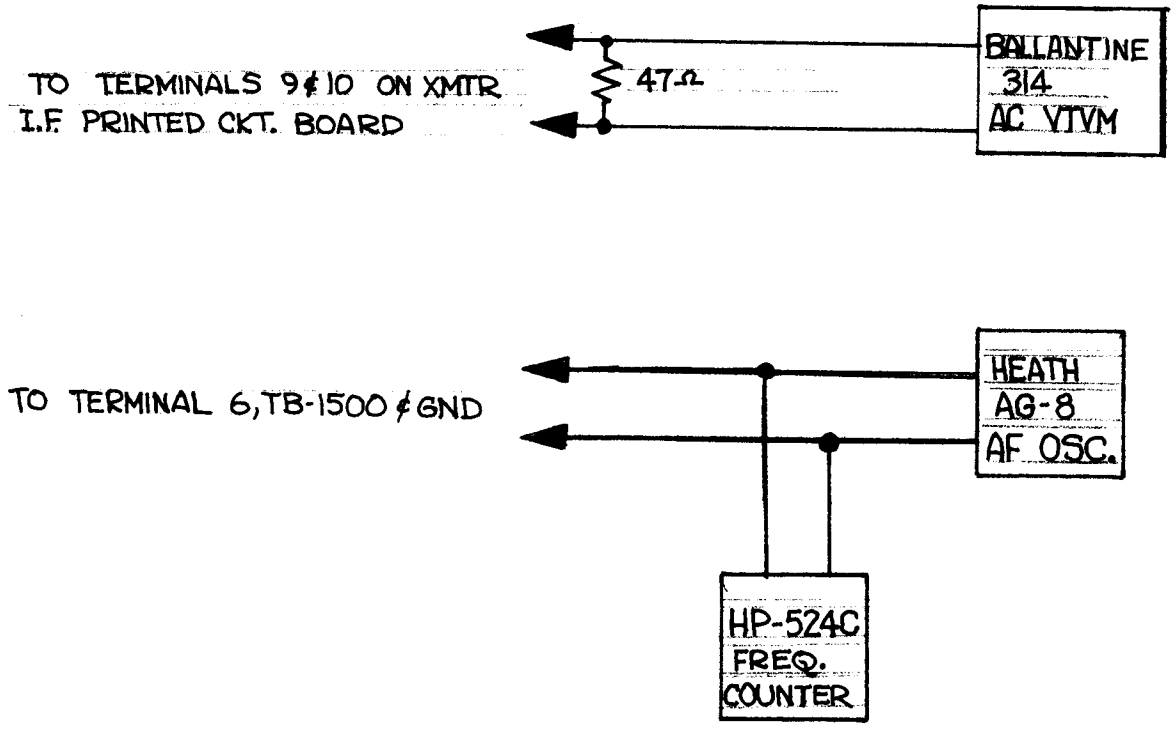
III E Transmitter Audio and I.F. Bandwidth Check

1. Using the frequency counter, adjust the variable audio oscillator output for 1KC.
2. Connect the variable audio oscillator to terminal 6 on TB1500.
3. Connect the Ballantine AC Voltmeter across the 47 ohm resistor with the ground lead on terminal 10.
4. Set the variable audio oscillator output for a reading of 315 MV across the 47 ohm resistor as read on the Ballantine meter.
5. Using the graph on sheet 12 as a guide and the 315 MV indicated on the meter as the 0db reference, vary the frequency of the audio oscillator. Compare the output change in db with the graph. The overall response must be better than ± 3 db from 300 to 3300 cps above and below 1.75MC.

TEST CIRCUIT



S783

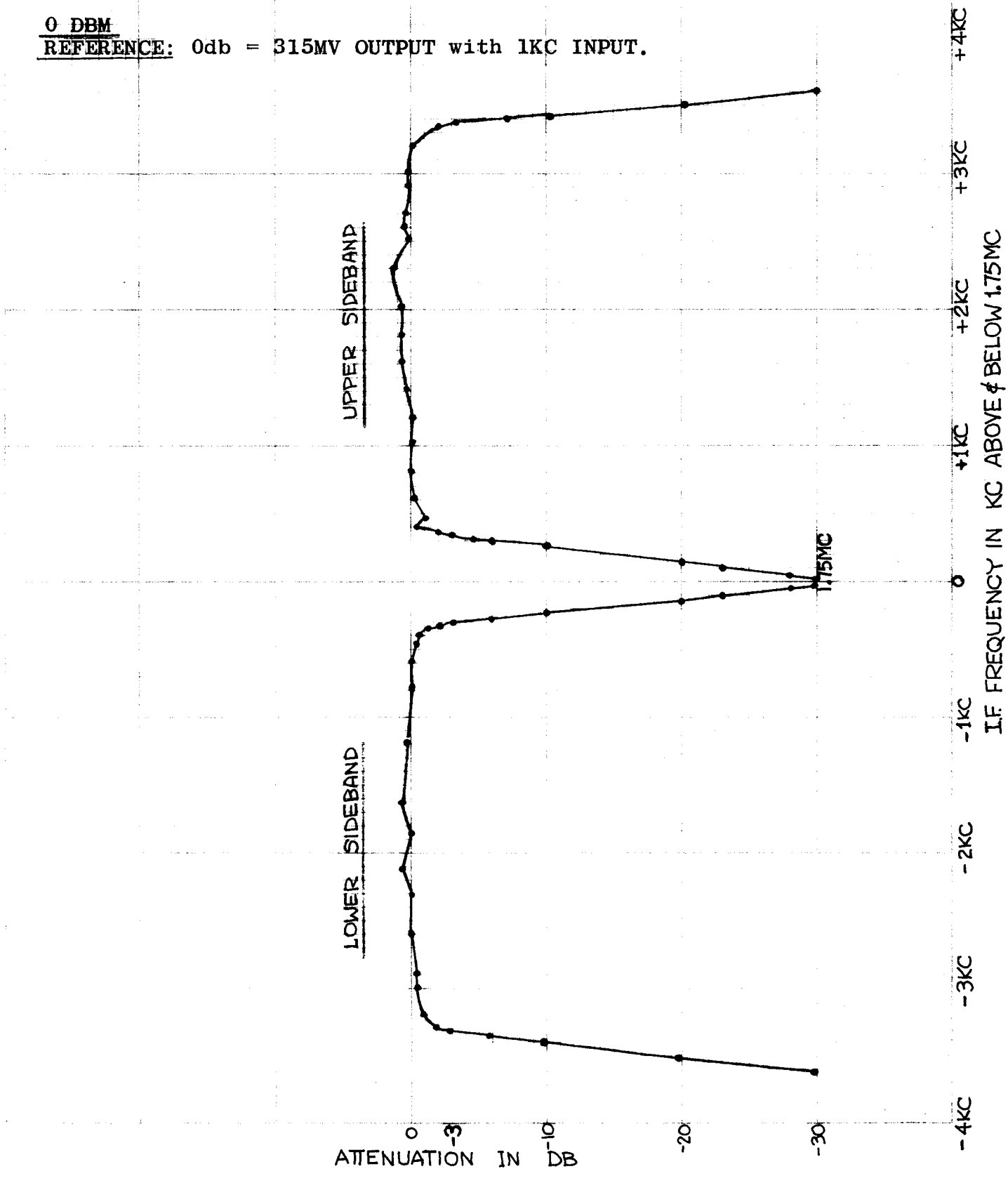
PRODUCTION TEST PROCEDURE
FOR MAIN CHASSIS ASSEMBLY AX-418

TYPICAL TRANSMITTER AUDIO AND L.F. BANDWIDTH CURVES, AX-418/TTR-10

INPUT: Terminal 6, TB-1500 to GND (LO-Z MIKE)

OUTPUT: Terminals 9 and 10, XMTR IF PRINTED CKT. BOARD with 47 ohm ½ Watt terminating resistor.

0 DBM REFERENCE: 0db = 315MV OUTPUT with 1KC INPUT.



III F. Transmitter IPA and PA Operational Check

1. Disconnect all test equipment from the XMTR IF and AF printed circuit board assemblies and fasten assemblies using the mounting screws.
2. Remove ground from terminal 8, TB-1500.
3. Unsolder the 47 ohm terminating resistor between terminals 9 and 10 on the XMTR IF board.
4. Set up the HP-606A signal generator at 32MC and 3 volt output range. Set the red output voltage knob maximum counter clockwise to obtain minimum output from the generator.
5. Set the generator MODULATION SELECTOR to CW and the CRYSTAL CALIBRATOR to OFF.
6. Connect the RF OUTPUT of the generator between the GREEN lead on T1500 and ground. T1500 is located within the lower IPA/PA section in front of V1500.
7. Connect the dummy load to ANTENNA jack on the power supply.
8. It is absolutely required to have the AX-418 in the normal operating position while tuning the IPA and PA circuits. This may be accomplished by mounting the unit in a rack. If the unit has been provided with slide tracks, it should be extended outward to facilitate adjustments. If the unit does not have tracks, a rack with sufficient working space under the equipment should be used. At no time should the unit be placed on the bench so that air convection around the PA is impeded. With the unit mounted as noted above, proceed to step 9.
9. Set the TRANSMITTER CHANNEL selector to CHANNEL 1.
10. Set the PA OVL'D circuit breaker to the downward position. A click should be heard due to the energization of the HV RELAY within the power supply.
ALLOW THE UNIT TO WARM UP FOR APPROXIMATELY THREE MINUTES.

WARNING: HIGH VOLTAGES ARE NOW PRESENT THROUGHOUT THE EQUIPMENT, PROCEED WITH CAUTION.

11. Connect a jumper between terminal 8 on TB1500 and ground. A loud cleck should be heard due to the energization of the ANTENNA RELAY in the power supply. A PA plate current of 50MA should be read on the panel meter with the PA METER switch in the Ib (black dot) position. The VARIAC should read a power of approximately 150 watts.

III F cont'd

12. Connect the HP-410 VTVM across the dummy load and set VTVM to read AC volts on the 100 volt scale..
13. Set the PA LOAD and PA TUNE switches on the TTRA-4 IPA/PA plug-in module maximum clockwise. These switches are accessable through the right sideplate.
14. Set the IPA TUNING and PA LOADING capacitors on the TTRA-4 maximum COUNTER CLOCKWISE but avoid too tight a mesh.
15. Increase the signal generator output till an increase in PA plate current is observed.
16. Using an insulated alignment tool, adjust the IPA TUNING capacitor for a PEAK reading of PA plate current. Reduce the signal generator output if required so as to never exceed 125MA peak reading.
17. Adjust the PA TUNING capacitor for a dip in plate current.
18. Increase the signal generator output to obtain approximately 150MA of plate current. The VTVM connected across the dummy load should read between 45 and 50 volts. If the results noted are not obtained, refer to S-786 for PA tuning and loading procedures.
19. Proper tuning and loading should be obtained when 2.7 volts or less output of the signal generator yields 50 volts across the dummy load at a PA plate current of approximately 155MA.
20. Set the PA METER switch to the E$_c$RF position. The meter should indicate some voltage.
21. Using an insulated screwdriver, adjust R1511 on the CW OSC. circuit board to obtain a reading on the RED PA meter scale equal to the voltage read across the dummy load. For ease of calibration, the output of the signal generator may be reduced to obtain a whole number reading across the load. A reading of 40 volts is a good calibration level. Lock R1511 after adjusting.
22. Reduce signal generator output to zero.
23. Remove ground from terminal 8, TB1500.
24. Set PA OVLD breaker to UP position.
25. Remove the HP-410 VTVM from across the load and connect it between pin 2 or 6 on the PA tube socket and ground. Set the meter to the 30 volt scale.
26. Set PA OVLD breaker to the down position and allow set to warm up for approximately 3 minutes.
27. Connect a jumper between terminal 8, TB1500, and ground.
28. Increase signal generator output for a reading of 20 volts on the VTVM.

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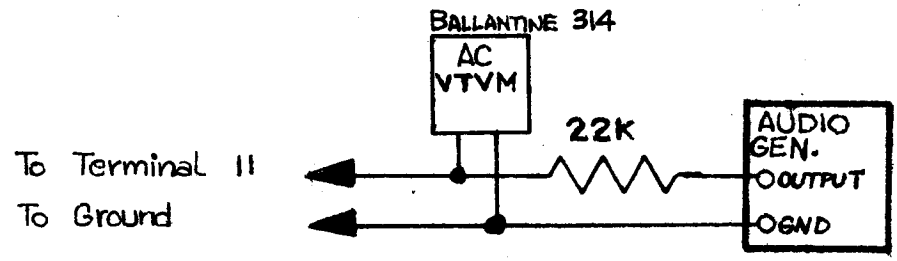
III F. cont'd

29. Set the PA METER switch to the EgRF position (green). Some voltage indication should appear on panel meter.
30. Adjust R-1509 on the CW OSC. board for a reading of 20 volts on the green meter scale. Lock R1509.
31. Set PA METER switch to the Ib position.
32. The following steps should be performed rather quickly to avoid over dissipation of the PA tube. Locate the PA OVLD ADJ. potentiometer on the rear of the power supply. The potentiometer should be maximum counter clockwise.
33. Increase the output from the signal generator till a reading of 180MA is obtained. Slowly rotate the PA OVLD ADJ. potentiometer until the PA OVLD circuit breaker trips.
34. Remove the ground from terminal 8, TB1500.
35. Reduce signal generator output to zero.
36. Reset PA OVLD circuit breaker and allow unit to warm up.
37. Ground terminal 8, TB1500.
38. Increase signal generator output slowly till plate current on PA METER reads slightly over 180MA. After a slight delay the PA OVLD breaker should trip.
39. Repeat steps 34 thru 37.
40. Set the signal generator output so as to obtain 175MA on the PA METER. Let the set run for 30 seconds or so to determine if the PA OVLD breaker will trip. If the PA OVLD trips, another setting of the PA OVLD ADJ. potentiometer slightly more counter clockwise than the initial setting will have to be tried. The object is to obtain continuous operation at 175MA with the PA OVLD breaker tripping at a current over 180MA but as close to 180MA as possible. Lock the PA OVLD ADJ. potentiometer after the proper settings have been obtained.
41. Remove ground from terminal 8, TB1500.
42. Set PA OVLD circuit breaker to the UP position.
43. Disconnect all test equipment except Variac.

III G. Receiver Audio Check

1. Set the VOLUME control on the front panel maximum clockwise.
2. Set the power switch to the REC position.
3. Set the SQUELCH control maximum clockwise.
4. Connect a 600 ohm ½ watt resistor between terminals 1 and 2 on TB1501.
5. Swing out the RECEIVER IF and AF circuit board assembly.
6. Set the AUDIO SIGNAL GENERATOR at 1KC and connect to the RECEIVER IF board as shown below with generator output at zero and AC VTVM across input to board.



7. Increase the AUDIO GENERATOR output till a 1KC tone is heard thru the speaker.
8. Rotate the SQUELCH control maximum counter clockwise, the tone should abruptly disappear.
9. Set the AUDIO GENERATOR output for a 10MV reading on the BALLANTINE AC VTVM. Remove meter.
10. Connect the BALLANTINE across terminals 1 and 3 on TB-1501. The meter should read approximately 780MV.
11. Connect the BALLANTINE across terminals 1 and 2 on TB1501. The meter should read exactly half the voltage obtained in step 10. Remove meter.
12. Connect the BALLANTINE across R1660 on the RCVR AF printed circuit board. The meter should read approximately 1.4 volts Leave meter connected.
13. Rotate the VOLUME control counter clockwise. The voltage across R1660 should drop proportionately with rotation of the VOLUME control knob. Reset the VOLUME control maximum clockwise and remove the BALLANTINE AC VTVM.

III H. Receiver IF Alignment.

1. Connect the frequency counter to the arm of potentiometer R1663 on the RCVR IF printed circuit card. The arm of R1663 is accessible through the rear of the printed circuit assembly. The counter should register a frequency of 250KC ± 50cps. Remove counter.

III H. cont'd

2. Set the RCVR sideband switch to USB/REMOTE.
3. Connect the counter to emitter lead of Q1602 and adjust C1629 for a frequency of 1.5 ± 2cps as registered on the counter. Leave counter connected.
4. Set the RCVR sideband switch to LSB.
5. Adjust C1631 for a frequency of 2.0MC ± 2cps as registered on the counter. Remove counter.
6. Connect the BALLANTINE AC VTVM between the collector of Q1610 and ground.
7. Adjust R1663 for a minimum (null) reading on the BALLANTINE. Remove meter.
8. Connect the SIMPSON 260 between terminal 9 on the RCVR IF printed circuit board and ground. The meter should read approximately + 2.8 volts DC. Remove meter.
9. Set the RCVR sideband switch to USB/REMOTE and remove the 1.5MC crystal Y1603.
10. Connect the BALLANTINE between the base of Q1602 and ground.
11. Connect the HP606A RF GENERATOR between terminals 1 and 2 on the RCVR IF board with the generator's output control at zero.
12. Set potentiometer R1612 on the RCVR IF board maximum counter-clockwise.
13. Set the generator frequency at 1.75MC using the frequency counter and increase the generator output to approximately 1.0MV. The Ballantine should indicate some voltage present at the base of Q1602.
14. Adjust C1602 for a peak indication on the Ballantine meter. Peak reading should be approximately 25MV.
15. Reduce generator output to zero and remove meter.
16. Replace the 1.5MC crystal, Y1603.
17. Connect the BALLANTINE across terminals 10 and 11 on the RCVR IF board.
18. Set the HP-606A RF GENERATOR to 1.75MC + 1KC as indicated on the frequency counter.
19. Check that the SQUELCH control on the front panel is maximum counter clockwise.
20. Increase the SIGNAL GENERATOR output for an indication on the BALLANTINE. Use the 10MV scale on the meter.
21. Adjust C1655 and C1656 for a peak indication on the meter. Do not allow the meter reading to exceed 10MV.
22. Set the SIGNAL GENERATOR output at 260 microvolts and adjust R1612 for a reading of 10MV on the BALLANTINE. Remove meter.
23. Connect the BALLANTINE across terminals 1 and 2 on TB1501. The met r should read 390MV with the VOLUME control maximum clockwise. Readjust R1612 to obtain this reading if necessary. Remove meter.
24. Set the VOLUME control maximum counter-clockwise and the SQUELCH control maximum clockwise.

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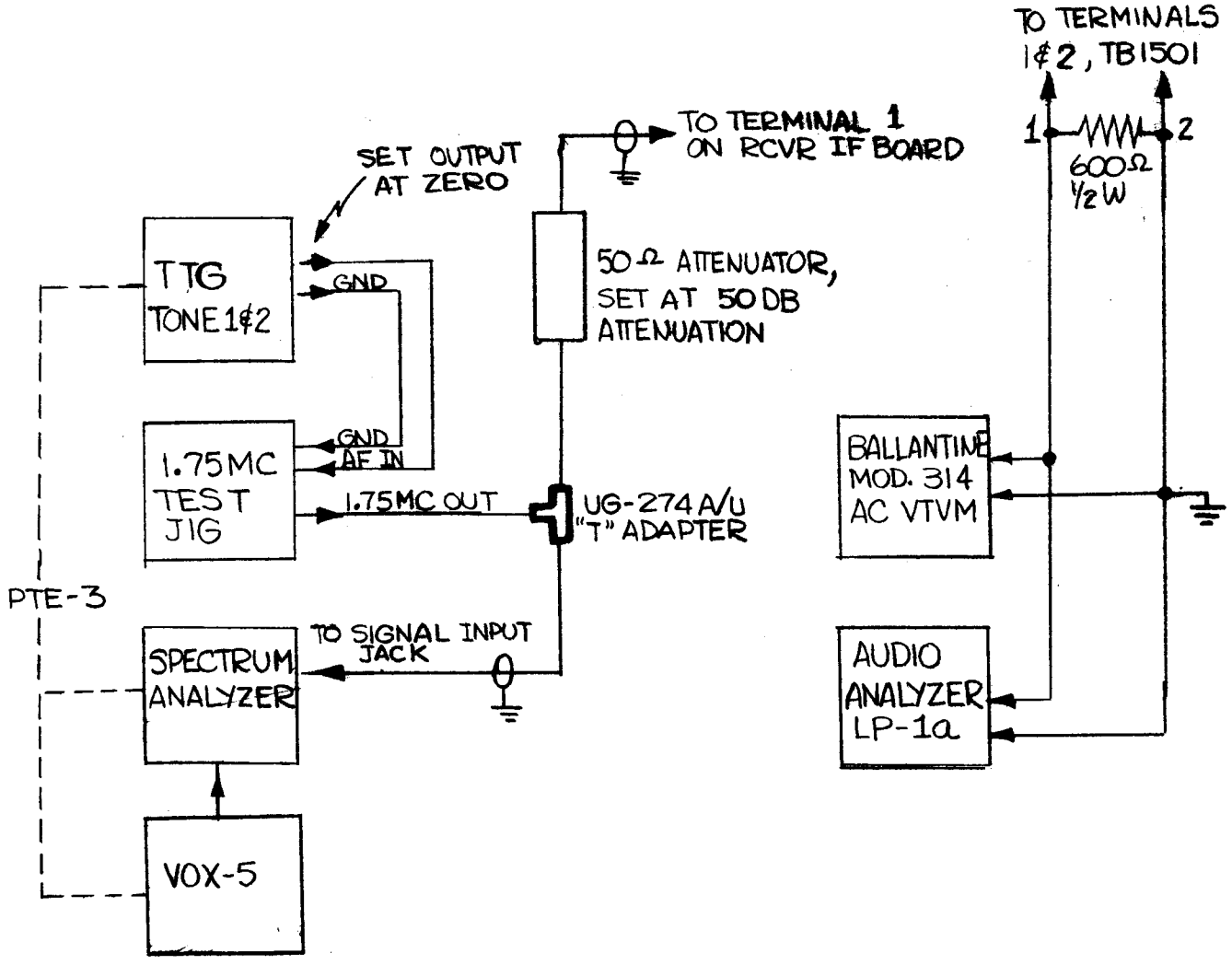
III H. cont'd

25.. Slowly rotate the VOLUME control clockwise. A 1KC note should be heard through the front panel speaker.
26. Remove the SIGNAL GENERATOR input connections.

III J. RECEIVER AUDIO AND I.F. BANDWIDTH AND INTERMODULATION DISTORTION CHECK

1. Connect the test equipment to the TTR-10 main chassis as shown b low.



III J. cont'd

2. Set the knob on the front of the 1.75MC TEST JIG to USB.
3. Set the INPUT ATTENUATOR on the spectrum analyzer of the PTE-3 at 15db attenuation and the GAIN control at 8.5.
4. Set up the VOX-5 in the PTE-3 for a 1.75MC input to the spectrum analyzer. (Approx. 2250KC)
5. Rotate the AUDIO OUTPUT control on the TTG clockwise and obtain a two tone test signal indication on the PTE-3 spectrum analyzer. A combination of tones should be heard on the speaker and some voltage indicated on the Ballantine AC VTVM.
6. Rotate the VOLUME control on the TTR-10 to reduce the tone amplitude.
7. Increase the TTG output for a reading of 390 MV on the Ballantine.
8. The output of the 1.75MC TEST JIG should be two tones of equal amplititude with distortion products not less than 50db below the peak of either tone. Tone amplitudes may be adjusted within the TTG unit.
9. Set up the AUDIO ANALYZER to obtain a two tone test signal. Some recommended settings on the AUDIO ANALYZER are:

CONTROL	SETTING
Vert. Calib. Selector	DB
Scale Selector	2.5
Center Frequency	1KC
Sweep Range Selector	20KC LOG
Input Multiplier	X1
Input Pot.	Approximately .5

The intermodulation distortion present should not be less than 29db below the amplitude of TONE 1(Approx. 900 c.p.s.)

10. Set the Simpson 260 to read (+) DC VOLTS on the 10 volt range and connect between terminal 9 on the RECEIVER IF printed circuit board. The meter should read between 5 and 6 volts. Remove meter.
11. Slowly rotate the VOLUME control on the TTR-10 until a tone of easily audible amplitude is heard.
12. Slowly rotate the SQUELCH control counterclockwise to the point where the audio tone abruptly disappears.
13. Remove 1db of attenuation from the attenuator box between the 1.75MC TEST JIG and the RECEIVER IF board.

III J. 13. cont'd.
The audio tone should abruptly reappear.

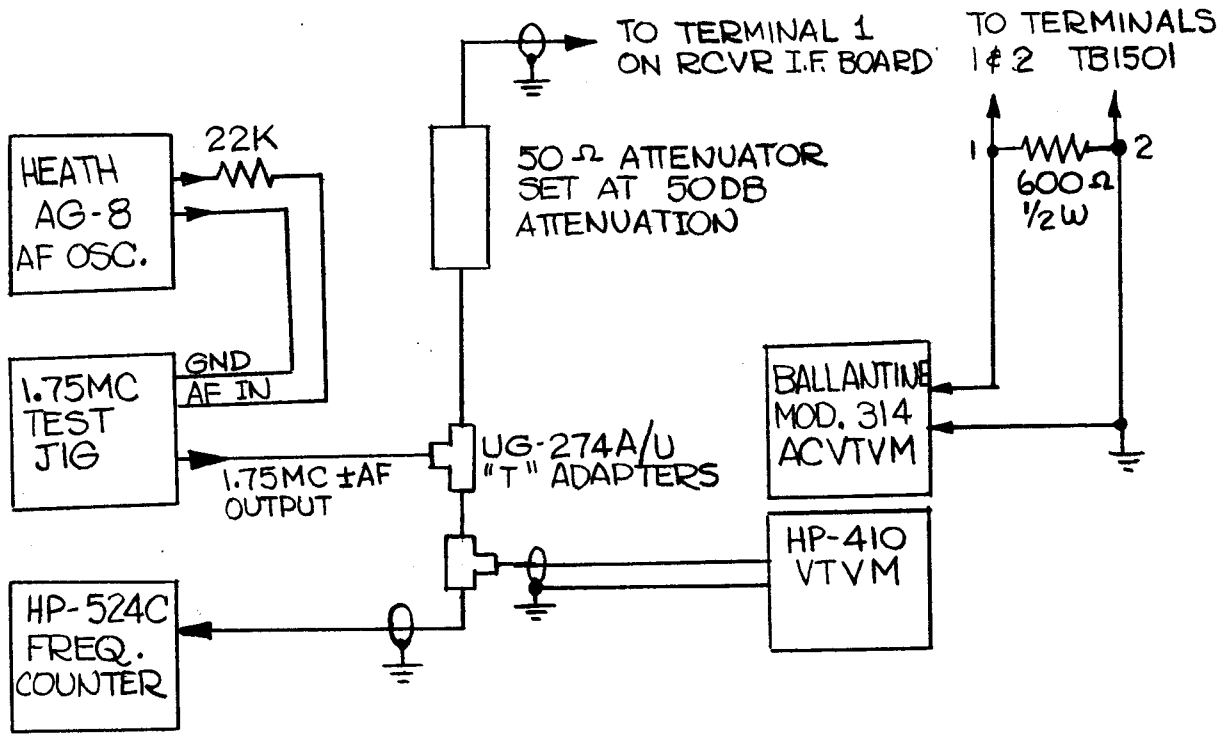
14. Reinsert the 1db of attenuation. After a slight time delay(approx. 2 to 3 seconds), the tone should abruptly disappear.

15. Reset the VOLUME control Maximum counterclockwise.

16. Remove the AUDIO ANALYZER but leave the Ballantine connected across terminals 1 and 2, TB-1501.

17. Remove the audio connections between the TTG and the 1.75MC TEST JIG.

18. Connect test equipment as shown below.



III J. 19. With the RCVR sideband selector set to USB/REMOTE, adjust the AUDIO OSCILLATOR output and frequency controls to obtain a 780MV reading on the Ballantine AC VTVM at an input I.F. frequency of 1.75MC+1KC as read on the FREQUENCY COUNTER. Note the reading on the HP-410 VTVM.

20. Using the graph on sheet 22 as a guide and the 390MV indicated on the Ballantine as the 0db reference, vary the AUDIO OSCILLATOR frequency. The I.F. input voltage as measured on the HP-410 VTVM should be maintained constant by adjusting the AUDIO OSCILLATOR output voltage control. Compare the output change as read on the Ballantine with the graph. The overall response must be better than ±3db from 300 to 3300 cps above and below 1.75MC. Be sure the sideband selector on the TTR-10(RCVR) and on the 1.75MC TEST JIG are both set to LSB when checking frequencies below 1.75MC.

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S-783

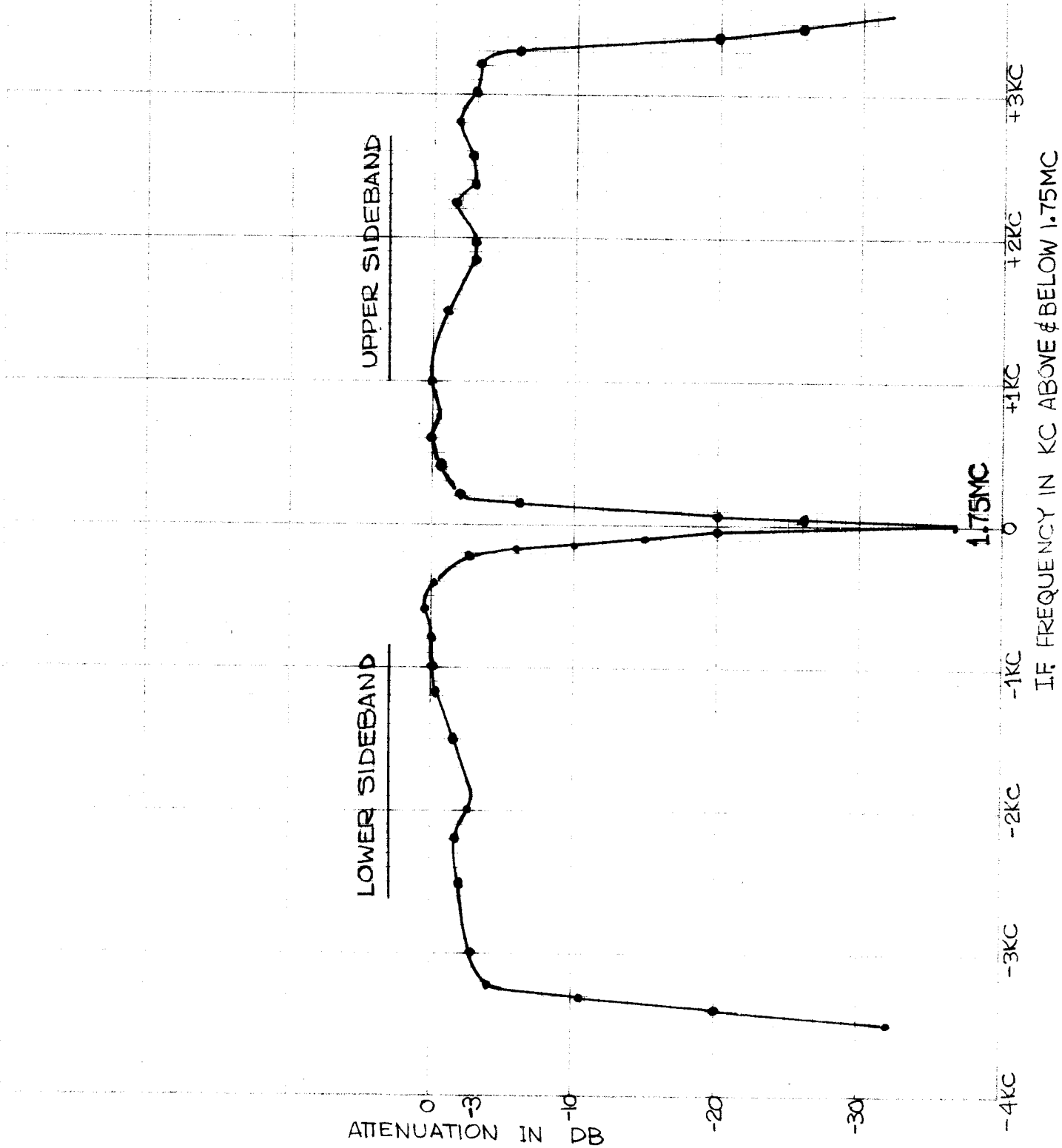
PRODUCTION TEST PROCEDURE
FOR MAIN CHASSIS ASSEMBLY AX-418

TYPICAL RECEIVER I.F. AND AUDIO BANDWIDTH CURVES, AX-418/TTR-10

INPUT: Terminals 1 and 2, Receiver I.F. printed circuit board.

OUTPUT: Terminals 1 and 2, TB-1501, with 600 ohm terminating resistor.

0 DBM
REFERENCE: 0db = 390MV OUTPUT with 1.75MC±1KC INPUT.



DATE 12/16/63 SHEET 23 OF 27	TMC SPECIFICATION NO. S-783	0
RK COMPILED / Ron Kohn CHECKED	TITLE: PRODUCTION TEST PROCEDURE FOR MAIN CHASSIS	
APPROVED	ASSEMBLY AX- 418	

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

AX-418: CHECK CHART

TTR-10(V) Serial No._____

TEST PERFORMED	REFERENCE SECTION	REFERENCE PAGE	REMARKS
GENERAL	III A	2	
VOLTAGE CHECKS & PANEL SWITCHES	III B	2	
TRANSMITTER AUDIO ALIGNEMENT	III C	8	
TRANSMITTER I.F. ALIGNMENT	III D	8	
TRANSMITTER AUDIO & IF. BANDWIDTH CHECK	III E	11	
TRANSMITTER IPA & PA OPERATIONAL CHECK	III F	13	
RECEIVER AUDIO CHECK	III G	16	
RECEIVER I.F. ALIGNMENT	III H	16	
RECEIVER AUDIO AND IF. BANDWIDTH AND INTERMODULATION DISTORTION CHECK	III J	18	

TESTED BY:_____

DATE:_____

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. STOCK NO. 439M

V. MAIN CHASSIS CIRCUITS, DC VOLTAGE CHART

NOTE: Voltages measured to chassis ground using 20K ohms-per-volt meter.

TRANSISTOR VOLTAGE CHART

SYMBOL	EMITTER	BASE	COLLECTOR	REMARKS
Q1701	-5.5	-5.6	-4.2	
Q1702	+.20	-.06	-9.0	
Q1703	+.16	0	-9.5	
Q1704	-1.6 to +1.6	-.15 to +.15	-12.5	
Q1705		-1.6 to +1.6		
Q1706	+.70 to -1.8	-2.0	+12.5	
Q1707	0	0	-12.5	Term. 8, TB1500 grounded
	0	-.22	0	Term. 8, TB1500 ungrounded
Q1708	0	-.30	0	Term. 8, TB1500 grounded and K1500 energized
	0	+.5	+12.5	K1500 de-energized
Q1709	+.15	0	-12.0	
Q1710	+.15	0	-12.0	
Q1711	+.30	0	-10.5	
Q1712	+.28	+.15	-6.0	
Q1713 Q1714	+.38	+.15	-8.0	
Q1715	+.18	0	-11.0	
Q1716	0	0	-6	K1502 energized
	0	0	-12.5	K1502 de-energized

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. STOCK NO. 430M

TMC SPECIFICATION NO. S-783

0

COMPILED | CHECKED: RK

TITLE: PRODUCTION TEST PROCEDURE FOR MAIN CHASSIS

APPROVED

ASSEMBLY AX-418

V. (continued)

TRANSISTOR VOLTAGE CHART

SYMBOL	EMITTER	BASE	COLLECTOR	REMARKS
Q1717	0	0	-6	K1502 de-energized
	0	0	-12.5	K1502 energized
Q1500	+1.1	+1.2	+9.4	S1505 set at CW or MCW
Q1601	+.27	+.02	-11.5	
Q1602	-.32	0	-11.0	
Q1603	+.14	0	-11.7	
Q1604	+.17	0	-5.9	
Q1605	+.12	+.12	-7.7	
Q1606	+.29	+.12	-5.7	
Q1607	+.01	0	-5.4	K1501 de-energized
	0	0	-12.5	K1501 energized
Q1608	+.01	0	-5.4	K1501 energized
	0	0	-12.5	K1501 de-energized
Q1609	+.05	0	-11.5	
Q1610	+.12	0	-11.3	
Q1611	+3.0	+3.1	+12.5	NO SIGNAL
Q1611	+5.6	+5.9	+12.5	1 MV Signal at Base of Q1601
Q1612	+2.6	+2.6	+12.5	NO SIGNAL
	+5.5	+5.6	+12.5	1 MV Signal at Base of Q1601
Q1613	+.25	+.12	-7.1	
Q1614	+.20	+.06	-12.3	

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TMC SPECIFICATION NO. S-783 0

COMPILED | CHECKED RK

APPROVED

TITLE: PRODUCTION TEST PROCEDURE FOR MAIN CHASSIS ASSEMBLY AX-418

V. (continued)

TRANSISTOR VOLTAGE CHART

SYMBOL	EMITTER	BASE	COLLECTOR	REMARKS
Q1615	+.14	0	-12.3	
Q1616 Q1617	+12.5	+12.5	-12.4	
Q1618	+.17	+.02	-10.0	
Q1619	+1.8	+1.65	-6.3	SQUELCH max. clockwise
	+5.1	+7.1	-12.6	SQUELCH max. counterclockwise
Q1620	+1.8	+2.8	-8.0	SQUELCH max. clockwise, NO SIGNAL
	+5.1	+2.8	+3.2	SQUELCH max. wise, NO SIGNAL
	+1.8	+5.0	-8.6	SQUELCH max. clockwise, 1 MV signal at base of Q1601
Q1621	-7.8	-8.0	-8.2	SQUELCH max. clockwise, NO SIGNAL K1601 energized
	0	+3.2	-12.6	SQUELCH max. counter clockwise, NO SIGNAL K1601 de-energized
	-8.4	-8.6	-8.5	SQUELCH max. clockwise, 1 MV signal at base. Q1601, K1601 nergized.

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V. (continued)

ELECTRON TUBE VOLTAGE CHART

SYMBOL	PLATE(S)	SCREEN	CONTROL GRID	CATHODE	FILAMENT
V1500	+300 pin 7	+300 pin 8	0 pin 2	+9 pin 1	6.3AC pin 5
V1501	+800 both caps	+320 pin 3	-50 to -30 pins 2 & 6 when keyed -105 when not keyed	0	6.3AC pin 5

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S-783 0
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
9/10/64		1 of 27		O= ORIGINAL RELEASE FOR PRODUCTION.	