

DATE 6/5/64
SHEET COVER OF

TMC SPECIFICATION NO. S - 835

A

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TITLE:

APPROVED

TEST PROCEDURE
FOR
MODEL RFD-2

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1. INTRODUCTION:

- A. The TMC Model RFD-2 is a conservatively rated multi band general purpose transmitter providing 1000 watts PEP over the frequency range of 1.75-32 MC.
- B. The RFD-2 uses a TV-100 (PL8295/PL172) tube as power amplifier. Operated Class AB for linear operation. It is coupled to a pi network providing an unbalanced output of 50 ohms to 600 ohms. This stage is neutralized to provide stable operation throughout complete frequency range.
- C. The TV-100 is preceded by two Class A amplifier stages. A 6146 is used to provide drive for TV-100. This stage is also neutralized for stable operation.
- D. The first amplifier is a 5763 tube, its grid is terminated into a low impedance input jack (J201) 70 ohms.
- E. Feedback is used internally from TV-100 to cathode of 6146 to decrease 3rd order distortion by another -10 db.
- F. An effective ALDC (Automatic Load and Drive Control) system has been included to limit high drive peaks or load changes.
- G. The amplifier stages are divided into five bands:
- | | |
|----------|-----------|
| Band I | 1.75-3.4 |
| Band II | 3.3-6.4 |
| Band III | 6.3-12.3 |
| Band IV | 12.2-24.5 |
| Band V | 22-32.0 |
- H. The Pi tank is divided into nine bands:
- | | | | |
|----------|----------|-----------|-------|
| Band I | 1.75-2.5 | Band VI | 8-12 |
| Band II | 2.5-3 | Band VII | 12-16 |
| Band III | 3-4 | Band VIII | 16-22 |
| Band IV | 4-6 | Band IX | 22-32 |
| Band V | 6-8 | | |

TEST EQUIPMENT REQUIRED:

1. Measurements Corp. Model 82 RF Signal Generator
2. TMC model SBE-6.
3. Vacuum Tube Voltmeter (Hewlett Packard 410 or equivalent).
4. TMC model PTE-3.
5. 52 ohm dummy load.
6. TMC model VOX-5.
7. TMC model P.S.-4A.
8. TMC model P.S.-5.

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PRELIMINARY TEST:

1. Inspect entire unit for bad solder connections and loose hardware.
2. Check counters and see that variable capacitors are fully meshed, when counter indicates 000.
3. Check entire unit for mechanical imperfections.
4. Check entire unit for electrical imperfections.
5. Take continuity measurements between ground and various high voltage B+ points to insure there are no shorts to ground. Remove TV-100 from its socket.
6. Turn on A.C. switch and observe direction of blower rotation. Air should blow through TV-100 socket.
7. Measure A.C. filament voltage at TV-100 socket. Voltage should be 6 VAC \pm 5%.
8. Turn internal voltmeter switch to "PA BIAS" position and adjust bias control (R703) in PS-4A for - 100 volt indication. Recheck this voltage at TV-100 socket with VTVM to insure application of bias directly to TV-100 tube.
9. Shut off A.C. power and reinsert TV-100 tube in its socket.
10. Turn A.C. power "on" and set the TRANSMITTER VOLTAGES switch and FINAL VOLTAGES switch on P.S. -4A to "ON".
11. After the required 3 minutes time delay, adjust PA plate current for 22 OMA. By adjusting R 703 in the P.S. -4A.
12. Set FINAL VOLTAGE switch on P.S. -4A to OFF.
13. Connect RF signal generator to input jack J 201.

ALIGNMENT OF R.F. TUNED CIRCUITS:

1.75-3.4 MC BAND:

1. Set RF signal generator to 1.75 megacycles and adjust output for .5 VRF at J 201.
2. Set driver band switch (S 201) to position #1 (1.75-3.4 MC Band).
3. Adjust trimmer capacitor (C 202) to approximately half capacity.
4. Set 1st amplifier tuning capacitor (C 203 and 232) to 0.5 on front panel. Turn meter switch (S 204) to position 5 (1st amplifier plate)

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and tune L 201 for maximum meter deflection.

5. Turn meter switch (S 204) to position 6 (PA grid). Set PA grid tuning capacitor (C 231) to number 1 on front panel and tune L 219 for maximum meter deflection. Return meter switch to position 5 (1st Ampl. plate).

6. Set RF signal generator to 3.4 megacycles. Set 1st amplifier tuning capacitor to number 9.5 on front panel. Tune C 202 for peak indication. Turn meter switch to position 6 (PA grid) and tune PA grid tuning capacitor for maximum meter deflection. Pointer should be at #9.5 on front panel.

7. If this is not true, low end of band (1.75 MC) must be returned after adding or removing capacity from C 231 or C 203 and C 232 by changing initial setting on front panel.

8. Proper meter readings at 1.75 megacycles

1st AMPLIFIER Ep	5.5 V
PA GRID Eg	85 V

Proper meter readings at 3.4 megacycles

E INPUT	
1st AMPLIFIER Ep	4 V
PA GRID Eg	105 V

3.3-6.4 MC BAND:

1. Set signal generator on 3.3 mcs. Set 6146 (V 202) neutralizing capacitor (C 229) to approximately 1/4 capacity.

2. Set driver bandswitch (S 201) to position number 2 (3.3-6.4 Mc Band).

3. Set 1st Amplifier Tuning Capacitor pointer to 0.5 on front panel. Set PA grid tuning capacitor to 0.5 on front panel. Turn meter switch to position 5 (1st Amplifier plate) and tune L 202 for maximum meter deflection.

4. Turn meter switch to position 6 (PA grid) and tune L 220 for maximum meter deflection.

5. Set RF signal generator to 6.4 megacycles. Tune 1st amplifier tuning capacitor to high end of band. Tune to peak and note pointer. Pointer should be at approximately number 9 on front panel. Tune PA grid tuning capacitor to peak indication. This pointer should also point to number 9 on front panel. If one or both pointers do not point

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to number 9, the low end (3.3 Mc) will have to be RETUNED after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L 202 and L 220. Check high end of band again.

6. Proper meter readings at 3.3 megacycles

E INPUT
1st AMPLIFIER Ep 5 V
PA GRID Eg 79 V

Proper meter readings at 6.4 megacycles

E INPUT
1st AMPLIFIER Ep 7 V
PA GRID Eg 128 V

6.3-12.3 MC BAND:

1. Set signal generator on 6.3 mcs. Set driver band switch (S 201) to position number 3 (6.3-12.3 Mc Band).

2. Set 1st amplifier tuning capacitor pointer to 0.5 on front panel. Turn meter switch to position 5 (1st amplifier plate) and tune L 209 for maximum meter deflection.

3. Set PA grid tuning capacitor to .5 on front panel. Turn meter switch to position 6 (PA grid) and tune L 223 for maximum deflection.

4. Set RF signal generator to 12.3 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be at approximately 9 on front panel.

5. Tune PA Grid Tuning Capacitor to peak indication. Pointer should be at approximately 9 on front panel. If pointers do not point to 9, the low end (6.3 Mc) of the band will have to be returned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Returning consists of peaking L 209 and L 223. Check high end of band again and if not yet satisfactory repeat compensation process until band is tracking properly.

6. Proper meter readings at 6.3 megacycles

E INPUT
1st AMPLIFIER Ep 3 V
PA GRID Eg 50 V

Proper meter readings at 12.3 megacycles

E INPUT
1st AMPLIFIER Ep 4.5 V
PA GRID Eg 95 V

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12.2-24.5 MC BAND:

1. Set Signal Generator on 12.2 mcs. Set driver bandswitch to position 4.
2. Set 1st Amplifier Tuning Capacitor pointer to 1 on front panel. Turn meter switch to position 5 (1st Amplifier plate) and tune L 210 for maximum meter deflection.
3. Set PA grid tuning capacitor to .5 on front panel. Turn meter switch to position 6 (PA grid) and tune L 224 for maximum deflection.
4. Set RF signal generator to 24.5 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be at approximately 9 on front panel.
5. Tune PA grid tuning capacitor to peak indication. Pointer should be at approximately 9 on front panel. If pointers do not point to 9, the low end of the band (12.2) will have to be retuned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L 210 and L 224. Check high end of band again and if not yet satisfactory repeat compensation process until band is tracking properly.
6. Proper meter readings at 12.2 megacycles

E INPUT

1st AMPLIFIER Ep	3 V
PA GRID Eg	21 V

Proper meter readings at 24.5 megacycles

E INPUT

1st AMPLIFIER Ep	4 V
PA GRID Eg	50 V

22-32 MC BAND:

1. Set Signal Generator on 20 mcs. Set driver bandswitch to position 5.
2. Set 1st Amplifier Tuning Capacitor pointer to approximately 3 on front panel. Turn meter switch to position 5 (1st Amplifier plate) and tune L 211 for maximum deflection at 20 Mc.
3. Set PA grid tuning capacitor to 2 on front panel. Turn meter switch to position 6 (PA grid) and tune L 225 for maximum deflection.
4. Set RF signal generator to 32.0 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be approximately 6 on front panel.

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5. Tune PA grid tuning capacitor to peak indication. Pointer should be approximately 10 on **front** panel. If pointers do not point to 6+10 the low end of the band (20 mc) will have to be retuned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L 211 and L 225. Check high end of band again and if not yet satisfactory repeat compensation process until band is tracking properly.

6. Proper meter readings at 19.5 megacycles

E INPUT

1st AMPLIFIER Ep 2 V

PA GRID Eg 10 V

Proper meter readings at 32.0 megacycles

E INPUT

1st AMPLIFIER Ep 3 V

PA GRID Eg 15 V

PART-3.

PA NEUTRALIZATION

1. Connect the 52 ohm dummy load to J 203 on the RFD-2.
2. Set the ALDC switch S 209, located on the rear plate of the RFD-2, to the EXT position.
3. Connect the HP 410 VTVM across the PA tank circuit.
4. With the FINAL VOLTAGES switch in the OFF position, tune the first and second amplifiers at 8 Mc.
5. Adjust PA NEUTRALIZING capacitor C 255 for a minimum reading on the VTVM. Remove the VTVM.
6. Reduce drive signal to zero.
7. Set FINAL VOLTAGES switch on the P.S.-4A to the ON position.
8. Tune the RFD-2 at 8 Mc, maintaining about 350 Ma PA plate current at resonance. Reduce drive to zero.
9. Set the FINAL VOLTAGES switch to OFF.
10. Re-connect the VTVM across the PA tank circuit.

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11. Increase drive and readjust C 255 for a minimum reading on the VTVM.

12. Repeat ~~Steps~~ 3 through 11 at 30 Mc. If the settings of C 255 differ, a compromise setting must be used to maintain low VTVM readings at both 8 Mc and 30 Mc. If take-off is experienced at any of the frequencies covered in PART 4, the PA should be neutralized at that frequency.

PART-4.

RFD-2 POWER OUTPUT AND DISTORTION

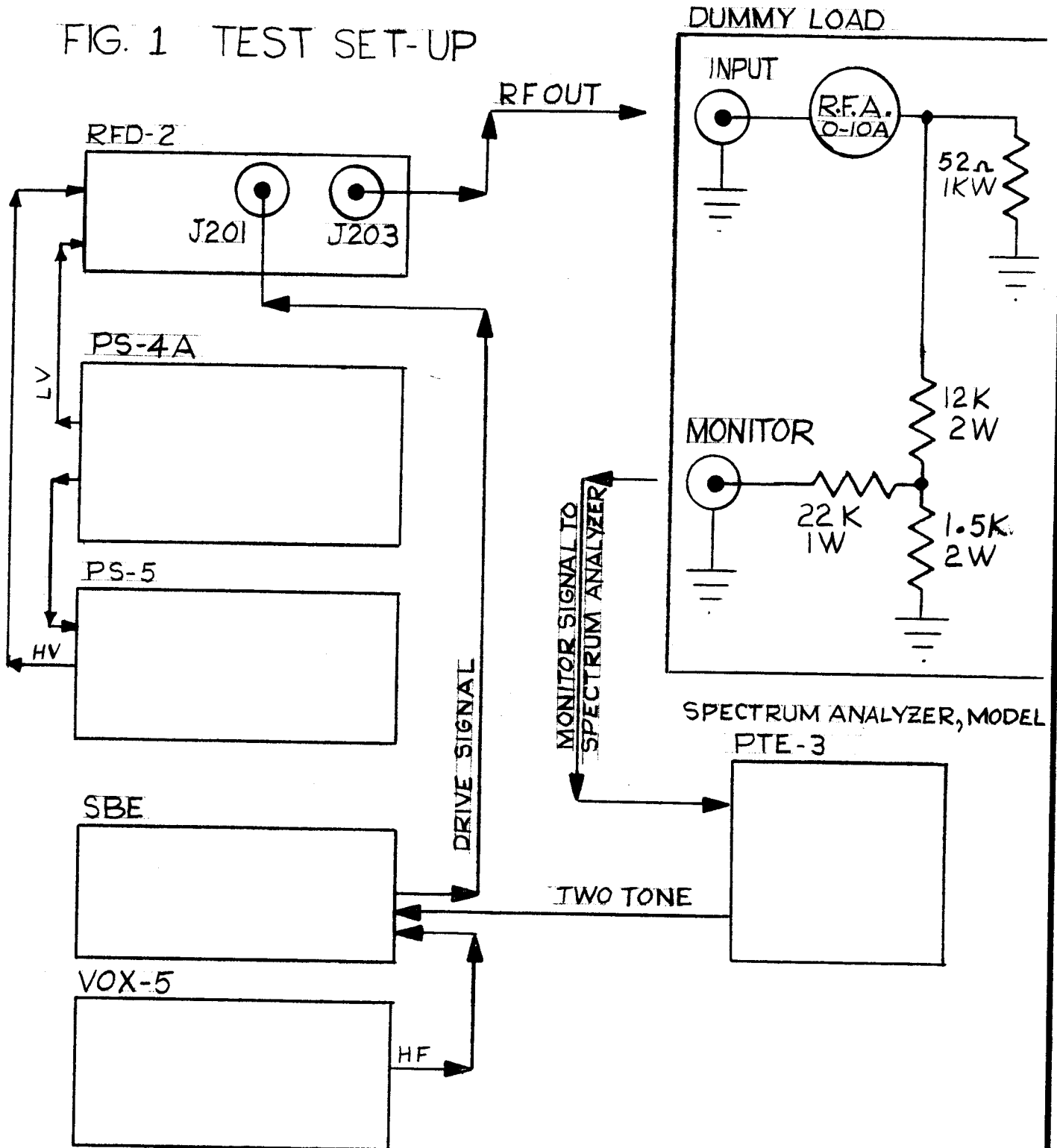
1. Place the VTVM across the dummy load.
2. Tune the RFD-2 for 1 KW, CW, at the alignment frequencies noted in PART-2. 1KW, CW, is 225V RMS as read on the HP 410 VTVM across the 52 ohm load.
3. Shut the transmitter down and remove the signal generator.
4. Connect the output of the SBE to the RFD-2 input.
5. Connect the PTE signal input jack to the MONITOR jack on the dummy load. See Fig. 1 for test set-up.
6. Using the VOX-5 as the VFO for the SBE, tune the RFD-2 for 1KW, PEP, at the alignment frequencies noted in PART-2. 1KW, PEP, is 225V RMS as read on the HP 410 meter. Using the spectrum analyzer on the PTE-3, check for third and fifth order distortion. Distortion should be less than -40db at frequencies below 22 Mc and less than -35db from 22 Mc to 32 Mc. Spurious outputs can be checked by varying the PTE oscillator frequency.
7. Set ALDC switch S 209 On the RFD-2 to the INT. position.
8. Rotate ALDC knob on the front panel of the RFD-2. The output of the unit should decrease above some setting of this knob and an increase in drive should cause little increase in output beyond this point. Reduce drive to zero.
9. Set the FINAL VOLTAGES switch on the P.S.-4A to OFF.
10. With the VTVM set to measure + D.C. voltage, place the VTVM between the arm of R 201 on the RFD-2 and ground. Adjust the ALDC knob on the front panel for a maximum positive reading.
11. Shut down the transmitter and remove all test equipment and power supplies. This completes testing of TMC model RFD-2.

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FIG. 1 TEST SET-UP



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TEST DATA SHEET

1. Gen rel Insp ction.....
2. Alignment of Center Is & Kn bs.....
3. Alignment of RF Circuits.....
4. Neutralization.....
5. ALDC Check.....
6. Power output & S/D Test; Reqmt: At least 40db below 1st r tone & a 2 tone test at 1KW PEP from 1.75 to 22 Mc and 35 db from 22 to 32 Mc.

F	Driver BAND	IPA BAND	Grid TUN'G	1st AMF TUN'G	IPA TUN'G	IPA LOAD'G	IPA LOAD SW	IPA EPDC V	IPA IP MA	IPA RP	IPA RF V	1 KW PEP S/D (db)
1.75	1.75-3.4	1.75-2.5										
3.4	1.75-3.4	3-4										
3.3	3.3-6.4	3-4										
6.4	3.3-6.4	6-8										
6.3	6.3-12.3	6-8										
12.3	6.3-12.3	12-16										
12.2	12.2-24.5	12-16										
24.5	12.2-24.5	22-32										
22	22-32	22-32										
32	22-32	22-32										

Note: One (1) KW PEP with 2 tones obtained with: 3.15 amperes RF thru a 50 Ohm Load, 225 V RMS Across a 50 Ohm Load or 405 W with Bird Wattmeter Mod 143.

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