UNCLASSIFIED

# TECHNICAL MANUAL

*for*

TEST PROCEDURE

FOR

MODEL AN/FRT-52A

RADIO TRANSMITTERS

SPEC.-681

MAY 24, 1962


THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

The AN/FRT-52A (TMC Model GPT-10KT) consists of a number of components to comprise the system, including the following Main Components, separately tested and identified:

| | |
|---|---|
| SBE-3 | AN/URA-28A, Modulator-Power Supply |
| VOX-5 (2 each) | 0-330B/FR, Oscillator, RF |
| TTG-2 | 0-579A/FRT, Generator, Signal |
| RFC-1 | AM-2103A/URT, Amplifier, RF |

The AN/FRT-52A (TMC Model GPT-10KT) includes its own built-in Spectrum Analyzer for system testing, and requires in addition only the following:

Simpson 260 Volt-Ohm Millimeter

Measurements 71 Square Wave Generator

Dummy Load, 10K, 600 ohm balanced, TMC Model TER-5000(600)

Dummy Load, 10K, 70 ohm unbalanced, TMC Model TER-5000(70)

# TEST PROCEDURE

# FOR

# MODEL AN/FRT-52A

# RADIO TRANSMITTERS

## PART I - AUXILLIARY FRAME

## PART II - 10 KW AMPLIFIER

# PART I

## AUXILLIARY FRAME

All units in the auxiliary rack must be tested and approved separately before installation as a system. After installation, all units must be checked for proper interconnection and proper terminations of inputs and outputs.

## MECHANICAL INSPECTION

Give the rack a good visual inspection. Check routing of cable to see that no strain exists when units are pulled out and tilted. Check slides for ease of operation.

## PRELIMINARY ELECTRICAL INSPECTION

Circuit breaker CB-3000, located on the rear of the center shield panel applies 220VAC to the primary circuit of T3000. This is regulated step-down transformer whose output is 115VAC. Upon turning on CB-3000, front fan B3000 must start operating. Removal of F-3000, must stop the fan. Turn all the power switches located on the various units to the ON position. After approximately ten minutes of operation, the SBE (Side Band Exciter) and the two 0-330B/FR (Variable Frequency Oscillator) ovens must cycle.

## PRELIMINARY ELECTRICAL TEST

Spectrum Analyzer (FSA)

1. Check to make sure the RF output of the top 0-330B/FR in the auxiliary rack terminates at the common terminal of S303, VOX RF out. The XFK which is normally used is replaced by a second 0-330B/FR, the output of which terminates at the FSA VFO IN.
2. Check FSA scope display circuits to see that intensity, focus, horizontal and vertical adjustments manipulate the scope trace.
3. After completion of step 2. Set up FSA.

| | |
|---|---|
| A) I.F. Attenuation | 20 DB |
| B) Sweep | 7.5 KC |
| C) AMP Scale | Log |
| D) Gain | Max. |
| E) Cal. Osc. | OFF |
| F) AFC | OFF |

## 0-330B/FR CHECK AFTER HALF HOUR WARM-UP

Check the 2 and 4 MCS ends for Calibration. If necessary adjust the high and low end trimmers to bring the ends on frequency. Check the HFO output on each band from 2 -64MC. Check the zero beat indicator for proper operation both visual and audible.

## M.C.P.

The MCP is a switch panel that switches the Audio and RF Exciter Circuits, keying modes, testing, and distortion analysis.

SBE VMO INPUT S304

This connects the SBE INPUT to the output of top 0-330B/FR, or to external input.

VOX RF OUTPUT S303

This connects the top 0-330B/FR RF output only to the SBE VMO INPUT and EXT. position.

ANALYZER MONITOR S302

This connects the signal input of the FSA to the SBE, IPA or PA output monitors.

MODE SWITCH S305

This unit switches AK100 (isolation keyer) to the keyline of the SBE for contact keying of the SBE in CW position and shorts the keyline for single sideband operation.

CHANNEL 1, CHANNEL 2 SWITCHES

Audio (600 ohm balanced or unbalanced) inputs to the SBE from external line or tone input from the TTG. (Two Tone Generator)

SIDEBAND LEVEL MONITOR

The SLM measures audio levels at the output of the sideband filters of the SBE.
The only controls on the SLM are the LSB and USB calibrate adjust. The SLM is calibrated by setting the SBE meter to zero DB in the LSB and USB positions and adjusting the calibrate controls in the SLM to read the same as the SBE meter.

SBE

1. Check all knobs, switches and the output tuning dial for proper alignment. Place the following crystals in the MF crystal oven:

| | | |
|---|---|---|
| M.F. xtal Pos. 1 | 2250 | KC |
| M.F. xtal Pos. 2 | 3250 | KC |
| M.F. xtal Pos. 3 | 4250 | KC |

2. Switch the meter switch to the calibrate position and zero the meter.
3. Place M.F. xtal SW. in position 3 and turn carrier insertion to approximately 5.
4. Turn exciter switch ON and set meter SW. to M.F. position.
5. Tune the M.F.Tuning for a peak on the meter. The M.F. dial reading must correspond to the xtal frequency.
6. Repeat this procedure for 2250 MC and 3250 MC to check each xtal and the dial calibration.
7. Switch meter switch to R.F.

8. Rotate the output control to full clockwise. Check following frequencies using the tune-up procedure for the SBE:

A) 4 MC
B) 8 MC
C) 16 MC
D) 28 MC

FINAL ELECTRICAL TEST

A. FSA Distortion Test Using TTG
1. Set the 0-330B/FR to 2.5 MC and adjust output level to .1 volt.
2. Set the TTG for two tone RF out.
3. Set the MCP analyzer monitor to TEST
4. Place the FSA input attenuators in the up position and the IF attenuator to the 20 DB position.
5. By slightly varying the 0-330B/FR output frequency two tones will appear on FSA scope.
6. Set the levels of the two tones to 0 DB on the FSA calibrated graph by using the input attenuators. For fine adjustment use the gain control on the FSA. Since the two R.F. tones are 1999 and 2001 KC with a separation of 2 KC they should be checked on the FSA 7 KC sweep. By slightly varying the 0-330B/FR to place the tones directly in the center of the FSA scope, the 2KC separation of the tones can be checked.
7. Set IF attenuator to the 0 DB position.
8. The distortion products of the two R.F. tones must be 60 DB or better.
9. Input Attenuator check.
a) Set IF Attenuator to 20 DB position..
b) Set the level of the tones (R.F.) to 0 DB on the FSA scope by using the input attenuator switches and fine adjustment.
c) Switching one attenuator at a time should move the tone levels up or down number of DB's as marked near the Attenuator selected.
d) The I.F. Attenuator must raise or lower the tone levels 20 DB.

SBE DISTORTION TEST

A. TTG

1. Turn the R.F. tones to OFF position.
2. Turn the audio tone selector to the two tone position.
3. Turn the audio output level adjust to the midway position.

B. MCP

1. Set the SBE VMO to OFF position.
2. Set the mode switch to SSB.
3. Set the analyzer monitor to SBE.
4. Set channel 1 and 2 to tone input

C. SBE

1. Set the LSB SW to Channel 1; set the LSB Audio Gain Control to the midway position.
2. Set the meter switch to the LSB position.
3. Check for sideband reversal by switching R.F. Band from the 2-4 to the 4-8 bands. The USB and LSB Audio levels on the SLM must reverse.
4. Turn the LSB switch to OFF; set the USB switch to channel 2; turn the USB Audio Gain Control to the midway position; turn the meter SW to USB.
5. Set the USB audio level to 0 DB and turn the SBE output control midway. Tune the SBE for output of 2.0 MC., tune the 0-330B/FR to 2.5 MC. Adjust the 0-330B/FR output for approximately .1 volt.
6. Adjust the frequency of the 0-330B/FR to place the two tones in the center of the FSA scope; set IF Attenuator switch to 20 DB. Adjust the level with the input Attenuator to 0 DB. Equalize the tone levels with the TTG audio level controls.

SBE EXTERNAL VMO

On the MCP switch VOX OUT to SBE; switch the SBE VMO input to VOX; set the VOX R.F. output to 2.250 MC; by adjusting M.F. dial to 2.250 the M.F. meter must peak.

SBE CW KEYING

1. Tune SBE to any output frequency
2. Connect output of a square wave generator to terminals 5 and 6 of terminal board E 3000 on the rear center shield panel.
3. Set the AK-100 located on the top rear of the auxilliary frame in 50 v keying position.
4. Set mode switch on the MCP to SBE CW.
5. Increase the output of the square wave generator to 50 V.
6. The RF output level of the SBE should vary with a variation of frequency of the square wave generator.

EXTERNAL CONNECTION ON REAR PANEL OF AUXILIARY FRAME

1. Connect an audio generator set to 2000 cycles to terminals 28 and 30 on terminal board E-3000. By placing channel 1 on the MCP to line 1 check for an audio indication on SBE channel 1, USB and LSB.
2. Connect audio generator output to terminal 32 and 34 on terminal board E-3000. Check for an audio indication on SBE channel 2, LSB and USB.
3. Push to talk terminal 21 on terminal board E-3000 should read approximately 820 ohms to ground.
4. Squelch terminal 26 on terminal board E-3000 should read 5000 ohms to ground.
5. Xmtr ON-OFF terminal 25 on terminal board E-3000 should be grounded with operation of the Xmtr ON-OFF switch on the SBE.

FUSE PROTECTION

In every fused unit in aux. rack pull out fuses one at a time and check to see each unit is de-activated and that fuses are of proper rating.

# TEST SHEET

| | ACCEPT |
|---|---|
| 1. MECHANICAL INSPECTION | |
| 2. AC POWER AND FAN CHECK | |
| 3. FSA CHECK | |
| 4. O-330B/FR | |
| 5. MCP CHECK | |
| 6. SLM CHECK | |
| 7. SBE OUTPUT CHECK | |
| 8. SBE DISTORTION CHECK | |
| 9. SBE CARRIER REJECTION CHECK | |
| 10. TTG TONES CHECK(AUDIO AND R.F.) | |
| 11. SIDEBAND REVERSAL CHECK | |
| 12. MODE SWITCH KEYING CHECK | |
| 13. EXTERNAL CONNECTIONS CHECK | |
| 14. FUSE PROTECTION CHECK | |

TESTER _____

INSPECTORS _____

FINAL APPROVAL _____

DATE _____

# PART II

# 10 KW AMPLIFIER

MECHANICAL INSPECTION

1. Check all switches on the PA frame for proper operation.
2. Check PA tune, PA load, output load and output balance controls for a counter reading of 000 corresponding to minimum capacitance.
3. Check to see that band switch counter reading corresponds to proper bandswitch position.
4. Carefully inspect the IPA and PA bandswitches for good mechanical fit.
5. Check for loose fuse holders.
6. In the IPA and PA sections check for obvious miswiring and loose connections.
7. Check the power supply for loose connections and correct value of parts.

PRELIMINARY ELECTRICAL INSPECTION ( UTILIZING SIMPSON 260 VOM)

1. Check for short circuits to ground at Power Transformer.
   a) 3 input phases should read open circuit to ground.
   b) B+ to ground should be approximately 100,000 ohms.
2. The following units must be checked for proper termination.
   a) Relay panel
   b) Bias drawer
   c) I.P.A. driver
3. Check complete unit for proper fusing.
4. Strap the PA output circuit for unbalanced output.
5. TURN ON main power: The main power indicator light must go on.
   a) Check for proper rotation of the main blower and the rear fan.
   b) Remove the rear fan fuse, the fan must go off.
   c) Remove any two main blower fuses simultaneously, the main blower must go off.
   d) Removal of the PA filament fuse must remove the PA filament voltage.
   e) Removal of the timer fuse must de-activate the timer.
   f) Removal of the six (6) high voltage rectifier filament fuses must remove filament voltage.
   g) Removal of the I.P.A. blower fuse must stop the blower.
   h) Removal of the I.P.A. filament fuse must remove filament voltage from the PL 172.
   i) Removal of the I.P.A. L.V. fuse must remove A.C. power from the low voltage power supply.
   j) Removal of the I.P.A. bias fuse must remove the bias voltage and de-activate the I.P.A. bias relay.
   k) Removal of the B+ fuse must remove the I.P.A. high voltage.
   l) The filament primary meter must read the A.C. filament primary voltage and the filament adj. control must vary this reading.
   m) The P.A. bias meter must read between -200 to -300 volts DC and be adjustable by use of the P.A. bias adjust control on the relay panel.
   n) Unlatch the following relays:
      1) PA Plate
      2) PA screen
      3) IPA Plate
      4) IPA screen

      The corresponding indicator lights must light. By pushing the reset button on main control panel the lights must go out and the relays must reset.

o) The tune-operate light must correspond to the position of the tune-operate switch; also the tune-operate relay on the relay panel must energize and de-energize.
p) Activating the PA screen switch must turn on and off the PA screen relay.
q) The filament elapsed time meter must indicate when filaments are on.
r) Check the time delay for proper operation and interval, between 3-5 Min.
s) The plate elapsed time meter must work only when the high voltage is on.
t) With the alarm switch on the alarm must sound except when the high voltage is on.

INTERLOCK SYSTEM

1. The interlock indicator and switch are connected in such a manner that the indicator will be on if all interlocks are energized. To find an open interlock always turn interlock switch to extreme counter-clockwise position (I.P.A. Band Switch); rotate in clockwise direction to the position where the indicator light goes out. This is the open interlock. In cases where there is more than one interlock open, the above procedure must be repeated until all interlocks are energized.

The external jumper on rear panel of the auxilliary frame must be connected from the Common Terminal to N.O. (Term E-3000) to complete the interlock circuits.

The I.P.A. drawer interlock indicator works separately and must light only when drawer is not closed properly. When all interlock circuits are operating properly the high voltage shorting relay should open.

2. Each interlock must be checked individually by opening and observing the following things:
a) The shorting relay must be released.
b) The high voltage must go off.
c) The interlock indicator must go out.

HIGH VOLTAGE CHECK

1. Check for shorts from high voltage to ground. Should read approximately 100,000 ohms to ground, from C800 of High Voltage Rectifier Drawer to GND.
2. Check the high voltage AC contactor timer for three (3) seconds time delay.
3. Adjust the bias at final tube, to -230 vdc using the PA bias adjustment on the relay panel.
4. Adjust the I.P.A. bias to -80 vdc using the I.P.A. bias adjustment on the driver drawer.
5. The high voltage mercury rectifiers and the 4CX5000 final tube must have a minimum of one half hour warm-up before applying high voltage.
6. Turn the high voltage breaker on. The high voltage light on the front panel must go on. PA plate voltage must be approximately 5 KV until the second contactor kicks in at which time the PA plate voltage meter must read approximately 7.5 KV.

7. The PA screen voltage must read approximately 1200 V in the Operate position and approximately 600 V in the tune position.
8. Switching the screen switch to the off position must remove the screen voltage indication.
9. The I.P.A. screen voltage must change from 400 V to 200 V corresponding to the position of the tune-operate switch.
10. Place the Tune-operate switch in the Operate position.
11. Place the screen voltage on-off switch to the on position.
12. Adjust the P.A. bias on the relay panel to a plate current reading of .5 amperes.
13. Adjust the I.P.A. bias for an I.P.A. current of 200 ma.
14. Place the alarm switch on the relay panel to the ON position.
15. Mechanically de-activate the following relays:
    a) P.A. Plate overload
    b) P.A. Screen overload
    c) Zener Protect overload
    d) I.P.A. Plate overload
    e) I.P.A. Screen overload
    f) Bias relays (by removal of respective bias fuses). In de-activation of each of the above relays the high voltage must go off and the alarm must sound
16. The plate elapsed time meter must be indicating.
17. Turn the high voltage switch to the OFF position.

PARASITIC CHECK

1. Set the I.P.A. and P.A. band switches to the 24-28 mc band.
2. Set the P.A. loading capacitor to 000.
3. With no drive, turn on the high voltage.
4. Rotate the P.A. tune capacitor from 000 to maximum capacitance, there must be no indication on the P.A. plate R.F. meter.
5. Turn H.V. off.

OVERLOADS

1. P.A. Plate Overload
    a) Tune the transmitter to full output on 2.0 MC as per the tuning chart.
    b) Overload the transmitter output by increasing the output loading.
    c) Retune the P.A. and increase the SBE output.
    d) Adjust the P.A. plate overload adjust to trip at 2 amperes. Record this reading.
2. I.P.A. Screen Overload
    a) Tune the transmitter to full output.
    b) Under-load transmitter by decreasing the P.A. output loading.
    c) Increase the output of the SBE to increase the screen current.
    d) Adjust the screen overload to trip at 80 ma.
3. I.P.A. Plate Overload
    a) Adjust to trip at 600ma by using the same procedure as for the P.A. Plate overload.
4. I.P.A. Screen Overload
    a) Adjust to trip at 30 ma by using the same procedure as for the P.A. Screen overload.

5. With the GPT-40K fully loaded turn on the Automatic Load and Drive Control. The transmitter output must decrease with an increase in A.L.D.C. control voltage without degradation of the distortion specifications over the full range of the A.L.D.C. control.

DISTORTION CHECK

This check must be made at each frequency indicated on the tuning chart for balanced and unbalanced operation.

1. Switch the analyzer to the I.P.A. position and check the dis tortion.
   Note: By slight reloading and retuning of the I.P.A. and P.A. the distortion can be improved.
2. Switch the analyzer to the P.A. position and check the distortion.

DISTORTION SPECIFICATIONS

Balanced output two tone test:

1. Full power 2.9 amps. into 600 ohm load
2. Half power 2.1 amps.into 600 ohm load
3. Full power distortion 35 db.
4. Half power distortion 40 db.

Unbalanced output two tone test:

1. Full power 8 amps. into 70 ohm load
2. Half power 6 amps. into 70 ohm load
3. Full power distortion 35 db.
4. Half power distortion 40 db.

TUNING PROCEDURE

1. Connect the transmitter output to a 70 ohm unbalanced load.
2. Tune the SBE and analyzer in the auxiliary frame to 2.0 mc.
3. Set the transmitter tuning and loading controls as per the tuning chart.
   Note: Figures may vary from transmitter to transmitter due to lead length, minimum capacitance setting and various other settings. The chart serves as only a tuning aid for the tester and/or operator.
4. Reduce the SBE output to minimum to prevent the screen overload from activating.
5. The P.A. tube must never be driven beyond .75 amps. plate current unless plate circuit is tuned with an indication of P.A. plate R.F.
6. The I.P.A. plate current must never be driven beyond 300 ma unless the I.P.A. plate circuit is tuned.

## INTERMEDIATE POWER AMP TUNING

1. Switch the high voltage off.
2. Set the multimeter switch to the 1st. Amplifier position.
3. Advance the SBE output control approximately one-quarter turn.
4. Vary the 1st. Amplifier tuning for a peak on the multimeter.
5. Set the multimeter to the I.P.A. E.G. position.
6. Vary the I.P.A. Grid tuning for a peak on the multimeter.
7. Reduce the SBE output to minimum.

## OUTPUT TUNING

1. Turn the high voltage on.
2. Advance the SBE output to a point where the I.P.A. Plate current is approximately 200 ma.
3. Vary the I.P.A. tune control for a dip in the I.P.A. plate current.
4. The above step must increase the P.A. plate current.
5. Vary the P.A. tune control for a dip in P.A. plate current.
6. Advance the SBE output to a P.A. plate current of 1.4 amperes. Reload and retune the I.P.A. for a plate current of 300 ma.
7. Retune and reload the P.A. for a reading of 8 amperes on the R.F. output meter.
8. The P.A. screen current is a good tuning indicator:
   a) Transmitter under-loaded. Screen current is over 10 ma.
   b) Transmitter over-loaded. Screen current will show little or no indication.
   c) Proper tuning and loading is indicated when screen current is approximately 10 ma for full output.
9. The normal indications of a properly loaded transmitter at full output are:
   a) P.A. plate R.F. 3.0 to 5.5 KV
   b) P.A. plate current 1.2 to 1.5 amperes.
   c) P.A. screen current 10 ma.
   d) R.F. output 8 amperes.
   e) P.A. plate voltage 6.5 to 7.5 KV.
   f) P.A. screen voltage 1200 VDC.
   g) I.P.A. plate current 250-350 ma.
10. Check all test frequencies on the tuning chart and record all information.
11. Turn the high voltage off.

## BALANCED OPERATION

1. Strap the P.A. output circuit for 600 ohm balanced output.
2. Connect the transmitter to a 600 ohm balanced load.
3. The tuning procedure is the same as for a 70 ohm unbalanced load except for the balance and the control which equalizes the line currents and the output load control which are necessary for impedance matching.
4. Record all information on the tuning chart.

# TEST SHEET

| | | ACCEPT |
|---|---|---|
| I. | MECHANICAL INSPECTION | |
| | A. Band Switch contacts | _____ |
| | B. Counters | _____ |
| | C. Knobs | _____ |
| | D. Fuse Holder | _____ |
| | E. Hardware | _____ |
| | F. Mode Switch (Applies to 10K driver only) | _____ |
| II. | ELECTRICAL INSPECTION | |
| | A. Fuse Check | _____ |
| | B. Lights | _____ |
| | C. Filament Time Meter | _____ |
| | D. Plate Time Meter | _____ |
| | E. Alarm | _____ |
| | F. Interlock System | _____ |
| | G. Drawer Interlock | _____ |
| | H. Shorting Relay | _____ |
| | I. Time Delay | _____ |
| | J. Reset Button | _____ |
| | K. Fil. Adj. | _____ |
| III. | METER INDICATORS | |
| | A. Input Line voltage | _____ VAC |
| | B. P.A.Screen voltage - Tune | _____ VDC |
| | -Oper. | _____ VDC |
| | C. I.P.A. Screen voltage- Tune | _____ VDC |
| | - Oper. | _____ VDC |
| | D. P.A. Plate voltage | _____ VDC |
| | E. I.P.A. Plate voltage | _____ VDC |

IV. PROTECTION CIRCUITS

| | ADJUST TO |
|---|---|
| A. P.A. Plate Overload | _____ Amps. |
| B. P.A. Screen Overload | _____ M.A. |
| C. I.P.A. Plate Overload | _____ M.A. |
| D. I.P.A. Screen Overload | _____ M.A. |
| | ACCEPT |
| E. I.P.A. Bias Relay | _____ |
| F. P.A. Bias Relay | _____ |
| G. Screen ON-OFF Relay | _____ |
| H. Tune-Oper. Relay | _____ |
| I. A.L.D.C. | _____ |
| Plate time | _____ hrs. |
| Fil. Time | _____ hrs. |

APPROVAL

_____

INSPECTOR

_____

FINAL APPROVAL

_____

DATE

_____

# TEST PROCEDURE FOR TMC MODEL VOX-5

| DATE 7-26-61 SH 1 OF 10 COMPILED BY J.D. | TMC SPECIFICATION NO. S-590 | |
|---|---|---|
| | TITLE: TEST PROCEDURE FOR TMC MODEL VOX-5 | JOB |
| APPROVED | | |

STEP

I. POWER SUPPLY:

A. PRELIMINARY PROCEDURE

1. Inspect power supply for any electrical or mechanical imperfections.

2. Check correctness of METER knob indication.

3. Check power supply for proper insertion of tubes, capacitor and fuses.

4. If there are any errors in the above, return the power supply to production for correction.

5. With the power supply removed from the VOX-5, connect all cables as shown in FIGURE 1.

6. Insert a 455KC xtal in each BFO xtal socket (Y101 and Y102).

7. Connect a 1000 ohm load to the BFO output jack (J102 or J103 or J104).

8. Connect power supply line cord to a 115VAC power source.

9. Turn POWER switch ON.

10. Remove POWER fuse (F102). All lamps on the front panel of the VOX-5 should go out, indicating no power. Replace fuse. Record result on test data sheet.

11. Remove OVEN fuse (F101). The two oven lamps on the front panel of the VOX-5 should go out. This indicates proper fusing of the VOX-5 ovens. Replace fuse. Record result on test data sheet.

B. POWER SUPPLY VOLTAGE CHECK

NOTE: All voltages taken to ground with a HEWLETT PACKARD VTVM MODEL 410B.

1. B+ SUPPLY:

a. +300 VDC between pin 5 of C102A and ground.
b. +150 VDC between pin 1 of V102 and ground.

2. FILAMENT:

a. 6.3 VAC between pin 3 of V103 and ground $\pm$ 10%.
b. 6.3 VAC between pin 4 of V104 and ground $\pm$ 10%.
c. 6.3 VAC between pin 3 of V105 and ground $\pm$ 10%.

3. BALLAST:

a. 12 VAC between pin 2 of R119 and ground ± 10%.
b. 6.2 VAC between pin 8 of R119 and ground ± 10%.

4. If all voltages are correct, indicate this by placing a check mark in the space provided on the test data sheet.

II. ALIGNMENT OF BFO:

A. BFO switch ON.

B. METER switch in BFO position.

C. BFO XTAL SW in Y101 position.

D. Adjust R116 for a reading of 0.32 MA. on the front panel meter.

E. Set BFO XTAL SW in Y102 position.

F. Meter reading should be approximately 0.32 MA.

G. Connect the 1000 ohm load across each BFO output jack in turn and monitor the output with the VTVM. This procedure will insure that proper electrical connection is made to each output jack.

H. Record result of test in the space provided on the test data sheet.

III. ALIGNMENT OF HFO:

A. PRELIMINARY PROCEDURE

1. Check correctness of all knobs, being sure they indicate correctly.

2. Insert a 2 MC xtal in Y204 xtal socket (XTAL switch position NO. 1).

3. Insert a 4 MC xtal in Y203 xtal socket (XTAL switch position NO. 2).

4. Set METER switch in HFO position.

5. Place HFO switch ON.

6. Set XTAL FREQ control in 0 position.

7. Turn OUTPUT control fully clockwise.

8. Connect a 70 ohm load across HFO output jack. (J208 or J209 or J210).

9. Connect the A.C. probe of the VTVM across the 70 ohm load.

10. Set trimmers C235, C232, C227 and C224 to their mid capacity range.

11. Place XTAL switch to position NO. 1.

12. Set TUNING control to 2 mcs.

13. Adjust XTAL FREQ control to maximum output.

14. Align low end of band as per TABLE I in the order given.

B. ALIGNMENT PROCEDURE

TABLE I

ALIGNMENT OF LOW END OF BANDS

| STEP | BAND-MCS POSITION | FREQ. MC. | PEAK | VTVM RF VOLTS | PANEL METER MA. |
|---|---|---|---|---|---|
| 1 | 2-4 | 2 | L203 | 13 | 0.7 |
| 2 | 4-8 | 4 | L205 | 9 | 0.5 |
| 3 | 8-16 | 8 | L206 | 8 | 0.4 |
| 4 | 16-32 | 16 | L207 | 7 | 0.35 |
| 5 | 32-64 | 32 | L208 | 6 | 0.25 |

1. Repeat the above until proper alignment of the low end is assured. Record readings obtained on test data sheet.

2. Place XTAL switch to position NO. 2.

3. Set TUNING control to 4 mcs.

4. Align high end of band as per TABLE II in the order given.

TABLE II

ALIGNMENT OF HIGH END OF BANDS

| STEP | BAND-MCS POSITION | FREQ. MC. | PEAK | VTVM RF VOLTS | PANEL METER MA. |
|---|---|---|---|---|---|
| 1 | 2-4 | 4 | C224 | 12 | 0.7 |
| 2 | 4-8 | 8 | C224 | 6 | 0.3 |
| 3 | 8-16 | 16 | C227 | 8 | 0.4 |
| 4 | 16-32 | 32 | C232 | 10 | 0.5 |
| 5 | 32-64 | 64 | C235 | 9 | 0.4 |

Record readings obtained, on test data sheet.

5. Repeat the above until proper alignment of the high end is assured.

6. Check that the TUNING control peaks on 2 MC and 4 MC, on all positions of the BAND-MCS switch and also all positions of the XTAL switch.

7. If TUNING control does not peak on 2 MC and 4 MC for all positions mentioned above, repeat alignment procedure.

8. Insert the 2 MC xtal in Y202 xtal socket (XTAL switch position NO. 3).

9. Place XTAL switch to position NO. 3.

10. Set tuning control to 2 MC and observe output. This procedure insures proper operation of Y202.

11. As a final check of the HFO, connect the 70 ohm load across each HFO output connector in turn and meter each output. This procedure will show that proper electrical connection is made to each output jack.

## IV. ALIGNMENT OF IFO

### A. PRELIMINARY PROCEDURE

1. Insert a 3.5 MC xtal in Y201 xtal socket.
2. Connect a 70 ohm load across IFO output jack (J205 or J206 or J207).
3. Place the AC probe of the VTVM across the 70 ohm load.
4. Place IFO switch ON.
5. Place METER switch to IFO position.

### B. ALIGNMENT PROCEDURE

1. Tune L201 for maximum output.
   a. RF OUTPUT --3.5 VOLTS.
   b. PANEL METER - 0.3 MA.
   c. Record results in the space provided on the test data sheet.
2. As a final check of the IFO output, connect the 70 ohm load across each IFO output connector in turn and meter the output. This procedure will insure that proper electrical connection is made to each output jack.

### C. 3.5 MC OSCILLATOR CHECK

1. Connect a RF jumper between J205 and J203.
2. Place BAND-MCS switch to 2-4 MCS position.
3. Place METER switch to HFO position.
4. Place IFO switch ON.
5. Place HFO switch ON.
6. Place XTAL switch to VMO position.
7. Vary TUNING control for a peak on panel meter. Peak should occur at 3.5 MC indicated by TUNING control. Record result of test by entering a check mark in the space provided on the test data sheet.

V. CALIBRATION CHECK OF MASTER OSCILLATOR

A. PROCEDURE

1. Place XTAL switch in VMO position.
2. Place METER switch in HFO position.
3. Place BEAT switch in ON position.
4. Turn MO dial for ZERO BEAT and measure output voltage at phone jack with VTVM (18 to 24V).
5. Place BAND-MCS switch in 4-8 MC position.
6. Set TUNING control to 2.5 MC.
7. Tune a receiver for WWV (5 MC).
8. Monitor frequency with a HEWLETT PACKARD FREQUENCY COUNTER.
9. Set MO dial for 2.5 MC and zero beat on the receiver. This can be observed by the fluctuations of the S-meter at the difference frequency.
10. Plug in ear phones (J106) and adjust C311 for a zero beat.
11. Set MO dial to 2000 KC. Adjust CALIBRATE control for zero beat.
12. Set MO dial to 4000 KC. Adjust trimmer through hole near CALIBRATE dial for zero beat. (use a receiver to make sure that it is 4 MC).
13. Repeat steps 11 and 12 as many times as is necessary until the 2 MC and 4 MC positions on the dial are exactly on frequency.
14. The amount of error at every 100 KC on the dial between 2 MC and 4 MC, should not exceed 200 cycles between any two adjacent check points. Record cycles deviation for every 100 KC between 2 MC and 4 MC in the space provided on the test data sheet.

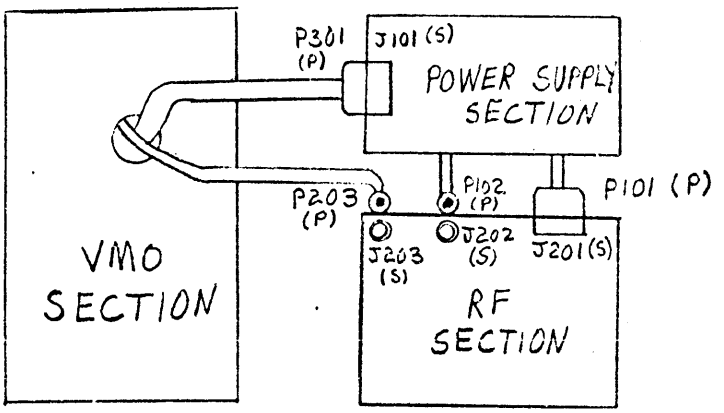


FIGURE 1

CABLE CONNECTIONS

| DATE 7-26-61 SH. 8 OF 10 COMPILED BY | TMC SPECIFICATION NO. S-590 | |
|---|---|---|
| | TITLE: VOX-5 TEST DATA SHEET | JOB |
| APPROVED | POWER SUPPLY CHASSIS | |

VOX SERIAL NO. _____

POWER SUPPLY NO. _____

| STEP | TEST | |
|---|---|---|
| I - A10 | POWER FUSE _____ | OK |
| I - A11 | OVEN FUSE _____ | OK |
| I - B | POWER SUPPLY VOLTAGES _____ | OK |
| II | BFO ALIGNMENT _____ | OK |

DATE _____

TESTED BY _____

| DATE 7-26-61 SH. 9 OF 10 COMPILED BY | TMC SPECIFICATION NO. S-590 | |
|---|---|---|
| | TITLE: VOX-5 TEST DATA SHEET | JOB |
| APPROVED | RF CHASSIS | |

VOX SERIAL NO. _____

RF CHASSIS NO. _____

| STEP | TEST |
|---|---|
| III - B | MULTIPLIER OUTPUT (HFO) |

| BAND | FREQ. MC | RF OUTPUT VOLTS | PANEL METER MA |
|---|---|---|---|
| 2-4 | 2 | _____ | _____ |
| 4-8 | 4 | _____ | _____ |
| 8-16 | 8 | _____ | _____ |
| 16-32 | 16 | _____ | _____ |
| 32-64 | 32 | _____ | _____ |
| 2-4 | 4 | _____ | _____ |
| 4-8 | 8 | _____ | _____ |
| 8-16 | 16 | _____ | _____ |
| 16-32 | 32 | _____ | _____ |
| 32-64 | 64 | _____ | _____ |

IV - B1 IFO OUTPUT

RF OUTPUT _____ RF VOLTS

PANEL METER _____ MA

IV - C7 3.5 MC OSCILLATOR CHECK _____ OK

DATE _____

TESTED BY _____

| DATE 7-26-61 SH. 10 OF 10 COMPILED BY | TMC SPECIFICATION NO. S -590 | |
|---|---|---|
| | TITLE: VOX-5 TEST DATA SHEET | JOB |
| APPROVED | MASTER OSCILLATOR | |

VOX SERIAL NO. _____

CONDENSER NO. _____

| STEP | TEST | |
|---|---|---|
| V - A4 | ZERO BEAT INDICATION _____ | OK |
| | AUDIO OUTPUT _____ | AC VOLTS |

V - A14 CALIBRATION

| FREQUENCY KC | CYCLES DEVIATION |
|---|---|
| 2000 | _____ |
| 2100 | _____ |
| 2200 | _____ |
| 2300 | _____ |
| 2400 | _____ |
| 2500 | _____ |
| 2600 | _____ |
| 2700 | _____ |
| 2800 | _____ |
| 2900 | _____ |
| 3000 | _____ |
| 3100 | _____ |
| 3200 | _____ |
| 3300 | _____ |
| 3400 | _____ |
| 3500 | _____ |
| 3600 | _____ |
| 3700 | _____ |
| 3800 | _____ |
| 3900 | _____ |
| 4000 | _____ |

DATE _____

TESTED BY _____

| DATE 1-5-61 SH. ____ OF ____ COMPILED BY | TMC SPECIFICATION NO. S -515 | |
|---|---|---|
| | TITLE: | JOB |
| APPROVED R Kohn | | |

TEST PROCEDURE FOR MODEL RFC-1

| DATE 1-5-61<br>SH. 1 OF 8<br>COMPILED BY | TMC SPECIFICATION NO. S-515 | |
|---|---|---|
| | TITLE: TEST PROCEDURE FOR MODEL RFC-1 | JOB |
| APPROVED RK | | |

1. INTRODUCTION:

A. The TMC Model RFC-1 is a conservatively rated multi band general purpose transmitter providing 1000 watts PEP over the frequency range of 2-28 Mc.

B. The RFC-1 uses TV-100 (PL-172) ceramic tube as power amplifier. Operated Class AB for linear operation. It is coupled to a pi network providing an unbalanced output of 50 Ω. This stage is neutralized to provide stable operation throughtout complete frequency range.

C. The TV-100 (PL-172) is preceeded by two Class A amplifier stages. A 6146 is used to provide drive for TV-100 (PL-172). This stage is also neutralized for stable operation.

D. The first amplifier is a 6CL6 tube, its grid is terminated into a low impedance input jack (J201) 70Ω. This tube requires approximately .5 volts for full output.

E. Feedback is used internally from TV-100 (PL-172) 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. This can be connected externally or internally by connecting jumper (on E201).

G. The amplifier stages are divided into five bands:

| | |
|---|---|
| Band 1 | 2.4- . |
| Band 11 | 4-8 |
| Band 111 | 8-16 |
| Band 1V | 16-20 |
| Band V | 20-28 |

H. The Pi tank is divided into nine bands:

| | | | |
|---|---|---|---|
| Band 1 | 2.0-2.5 | Band V1 | 8-12 |
| Band 11 | 2.5-3 | Band V11 | 12-16 |
| Band 111 | 3-4 | Band V111 | 16-20 |
| Band 1V | 4-6 | Band 1X | 20-28 |
| Band V | 6-8 | | |

| DATE 1-5-61 SH. 2 OF 8 COMPILED BY | TMC SPECIFICATION NO. S-515 | |
|---|---|---|
| | TITLE: TEST PROCEDURE FOR MODEL RFC-1 | JOB |
| APPROVED RK | | |

TEST EQUIPMENT REQUIRED:

1. Measurements Corp. Model 82 RF Signal Generator.
2. Vacuum Tube Voltmeter (Hewlett Packard or Equivalent).
3. Spectrum Analyzer TMC Model PTE-3

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 (PL-172) from its socket.
6. Turn on A.C. switch and observe direction of blower rotation. Air should blow through TV-100 (PL-172) socket.
7. Measure A.C. filament voltage at TV-100 (PL-172) socket. Voltage should be 63VAC $\pm$ 5%.
8. Turn internal voltmeter switch to "IPA BIAS" position and adjust bias control for -100 volt indication. Recheck this voltage at TV-100 (PL-172) socket with VTVM to insure application of bias directly to TV-100 (PL-172) tube.
9. Shut off A.C. power and reinsert TV-100 (PL-172) tube in its socket.
10. Connect RF signal generator to input jack (J201).
11. Turn A.C. power ON.

ALIGNMENT OF R.F. TUNED CIRCUITS:

2-4 Mc BAND:

1. Set RF signal generator to 4.0 megacycles and adjust output for 1.0 VRF at J201.
2. Set driver band switch (S201) to position #1 (2-4 Mc Band).
3. Adjust trimmer capacitor (C202) to approximately half capacity.
4. Set 1st amplifier tuning capacitor (C203 and 232) to 0.5 on front panel. Turn meter switch (S204 to position 5 (1st amplifier Ep.) and tune L201 for maximum meter deflection.
5. Turn meter switch (S204) to position 6 (IPA Eg.). Set IPA grid tuning capacitor (C231) to number 1 on front panel and tune L219 for maximum meter deflection. Return meter switch to position 5 (1st Ampl, Ep).
6. Set RF signal generator to 4.0 megacycles. Set 1st amplifier tuning capacitor to number 9 on front panel. Tune C202 for peak indication. Turn meter switch to position 6 (IPA Eg) and time IPA grid tuning capacitor for maximum meter deflection. Pointer should be at # 9 on front panel.
7. If this is not true, low end of band (2.0 Mc) must be returned after adding or removing capacity from C231 or C203 and C232 by changing initial setting on front panel.
8. Proper meter readings at 2.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | Min. 24.0 VRF |
| IPA GRID Eg | Min. 130 VRF |

Proper meter readings at 4.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 22.0 VRF Min. |
| IPA GRID Eg | 140 VRF Min. |

4-8 Mc BAND:

1. Set 6146 (V202) neutralizing capacitor (C229) to approximately 1/4 capacity.
2. Set driver bandswitch (S201) to position number 2 (4-8 Mc Band).
3. Set 1st Amplifier Tuning Capacitor pointer to 0.5 on front panel. Set IPA grid tuning capacitor to 0.5 on front panel. Turn meter switch to position 5 (1st Amplifier Ep) and tune L202 for maximum meter deflection.
4. Turn meter switch to position 6 (IPA Eg) and tune L220 for maximum deflection.
5. Set RF signal generator to 8.0 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 IPA 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 to number 9, the low end (4.0 Mc) will have to be RETUNED after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L202 and L220. Check high end of band again.
6. Proper meter readings at 4.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 12.0 VRF Min. |
| IPA GRID Eg | 120 VRF Min. |

Proper meter readings at 8.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 18.0 VRF Min. |
| IPA GRID Eg | 160 VRF Min. |

8-16 Mc BAND:

1. Set driver band switch (S201) to position number 3 (8-16 Mc Band).
2. Set 1st amplifier tuning capacitor pointer to 0.5 on front panel. Turn meter switch to position 5 (1st amplifier Ep) and tune L209 for maximum meter deflection.
3. Set IPA grid tuning capacitor to 0.5 on front panel. Turn meter switch to position 6 (IPA Eg) and tune L223 for maximum deflection.
4. Set RF signal generator to 16.0 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be at approximately 8 on front panel.
5. Tune IPA Grid Tuning Capacitor to peak indication. Pointer should be at approximately 8 on front panel. If pointers do not point to 8, the low end (8.0 Mc) of the band will have to be retuned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L209 and L223. Check high end of band again and if not yet satisfactory repeat compensation process until band is tracking properly.
6. Proper meter readings at 8.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER | 7.0 VRF Min. |
| IPA GRID Eg | 78.0 VRF Min. |

Proper meter readings at 16.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 13.0 VRF Min. |
| IPA GRID Eg | 110 VRF Min. |

16-20 Mc BAND:

1. Set driver band switch to position 4.
2. Set 1st Amplifier Tuning Capacitor pointer to 4 on front panel. Turn meter switch to position 5 (1st Amplifier Ep) and tune L210 for maximum meter deflection.
3. Set IPA grid tuning capacitor to 8 on front panel. Turn meter switch to position 6 (IPA Eg) and tune L224 for maximum deflection.
4. Set RF signal generator to 20.0 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be at approximately 8 on front panel.
5. Tune IPA grid tuning capacitor to peak indication. Pointer should be at approximately 8 on front panel. If pointers do not point to 8 , the low end of the band (16 Mc) will have to be retuned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L210 and L224. Check high end of band again anf if not yet satisfactory repeat compensation process until band is tracking properly.
6. Proper meter readings at 16.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 10.0 VRF Min. |
| IPA GRID Eg | 84.0 VRF Min. |

Proper meter readings at 20.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 11.5 VRF Min. |
| IPA GRID Eg | 95.0 VRF Min. |

20-28 Mc BAND:

1. Set driver band switch to position 4.
2. Set 1st Amplifier Tuning Capacitor pointer to 4 on front panel. Turn meter switch to position 5 (1st Amplifier Ep) and tune L211 for maximum meter deflection.
3. Set IPA grid tuning capacitor to 7 on front panel. Turn meter switch to position 6 (IPA Eg) and tune L225 for maximum deflection.
4. Set RF signal generator to 28.0 megacycles. Tune 1st amplifier tuning capacitor to peak at high end of band. Pointer should be at approximately 8 on front panel.
5. Tune IPA grid tuning capacitor to peak indication. Pointer should be at approximately 8 on front panel. If pointers do not point to 8, the low end of the band (20.0 Mc) will have to be retuned after either increasing or decreasing the capacity of the 1st amplifier tuning capacitor. Retuning consists of peaking L211 and L225. Check high end of band again and if not yet satisfactory repeat compensation process until band is tracking properly.
6. Proper meter readings at 20.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 7.2 VRF Min. |
| IPA GRID Eg | 68.0 VRF Min. |

Proper meter readings at 28.0 megacycles

| | |
|---|---|
| E INPUT | 1.0 Volts |
| 1st AMPLIFIER Ep | 8.5 VRF Min. |
| IPA GRID Eg | 65.0 VRF Min. |

| DATE 1-5-61 SH. 8 OF 8 COMPILED BY | TMC SPECIFICATION NO. S -515 | |
|---|---|---|
| | TITLE: PRODUCTION TESTING OF MODEL RFC-1 | JOB |
| APPROVED RK | | |

## TEST REPORT SHEET

| PART 1 POWER AMPLIFIER WIRING | ACCEPT |
|---|---|
| TEST A: General Inspection | _____ |
| TEST B: Continuity Test | _____ |
| TEST C: Safety Switch | _____ |
| TEST D: Filaments & Blower | _____ |

| PART 2 RFC-1 ALIGNMENT | |
|---|---|
| TEST A: General Inspection | _____ |
| TEST B: Alignment of Knobs | _____ |
| TEST C: Alignment of 1st & Second Amplifier | _____ |

| PART 3 RFC-1 NEUTRALIZATION | |
|---|---|
| TEST A: Neutralizing P.A. | _____ |

| PART 4 RFC-1 OUTPUT | |
|---|---|
| TEST A: Spurious, P.A. | _____ |
| TEST B: P.A. Efficiency | _____ |
| TEST C: Distortion (2 tone 40 db or better) | _____ |

Serial Number _____

Date _____

Accepted _____

Tested By _____

# PRODUCTION TESTING OF TMC MODEL TTG-2

S-558

| DATE 5/4/61 SH. 1 OF 5 COMPILED BY A.R. Faiola | TMC SPECIFICATION NO. S558 | A |
|---|---|---|
| | TITLE: Production Testing of TMC Model TTG-2.. | JOB |
| APPROVED A.K.F. | | |

1. INTRODUCTION:

A. The TTG is a Tone Generator designed to generate Audio and R.F. signals. For test purposes, it may be divided into two sections.

1. The Audio Oscillator and Amplifier Section.
2. The R.F. Oscillator and Amplifier Section.

B. The Audio Oscillator and Amplifier Section:

This section generates two audio tones at approximately 935 and 2805 cps. These tones may be used separately or together as the operator desires. Switching the tones OFF or ON is accomplished by removing or applying plate voltage to the amplifier stages following the oscillators. The oscillators, are of the Wein Bridge type and the frequency of the oscillation is determined by frequency determining networks, which are an integral part of the oscillator circuit. The output of each tone amplifier is coupled to a filter, whose bandpass frequency is 935 cps for tone #1 and 2805 cps for tone #2. These filters insure a relatively distortion free audio tone. The overall output, after the tones are combined (if a two tone test signal is used), is controlled by a 600 ohm "T" pad. The output impedance will be 600 ohms at all times.

C. The R.F. Oscillator and Amplifier Section:

This section generates two R.F. tones at 1.999 kcs and 2.001 kcs. These two tones may also be used independently or together as in the audio section. The

C. Measure B+ at pin 6 of V500 and V501. Voltage must fall between 150V and 175V.

D. Observe whether B+ drops out at terminal 2 of T504 when "Audio Tone Selector" switch (S502) is in the "Tone 1" position.

E. Observe whether B+ drops out at terminal 2 of T503 when S502 is in the "Tone 2" position.

F. With S502 in "Two Tone" position B+ should be present at Terminal 2 of both T503 and T504.

G. With S502 in "OFF" position, no B+ should appear at either T503 or T504.

H. With S502 in "Tone 1" position, measure B+ at top end of R527. Reading should be 160 VDC. Check top end of R528. No B+ should be present. Change S502 to "Tone 2" position and measure B+ at top end of R528. Reading should be 160 VDC. Check top end of R527. No B+ should be present.

I. Place ground lug on terminal 3 for unbalanced output connection. Connect AC VTVM and Panoramic Sonic Analyzer (LP-1a) to output terminal strip E500, terminals 1 and 3; set R524 and R518 to maximum, S502 to "Tone 1" position and adjust degeneration control, (R501) until an indication is observed on VTVM.

NOTE: It may be necessary to try several BI-102-3's,* before the oscillator will perform properly.

Adjust control on NF-104-935(Z500)** for peak indication on VTVM. Observe analyzer and adjust R501 for

* Lamp

** Frequency Determining Element

minimum second harmonic distortion without affecting oscillator "starting." This distortion, as viewed on the analyzer, should be at least -55 db down. Recheck Z500 for peak on VTVM. Adjust Tone 1 level control (R518) for 1 VAC on VTVM. Tighten lock on R501 and R518. Remove ground lug from terminal 3 on E500 and place on terminal 2 for balanced output connection. Place the ground lead of the VTVM on terminal 2 of E500. A voltage of .5 VAC should be observed on terminal 1 and 3.

J. Place ground lug on terminal 3 for unbalanced output connection. Connect AC VTVM and panoramic Sonic Analyzer (LP-1a) to output terminal strip E500, terminals 1 and 3; set R519 to maximum, S502 to "Tone 2" and adjust degeneration control (R513) until an indication is observed on VTVM. Adjust control on NF-104-2805(Z501)* for peak indication on VTVM. Observe ANALYZER and adjust R513 for minimum second harmonic distortion without affecting oscillator "Starting". The note in set "J" applied to this step also. The distortion shouldbe at least -60 db down. Recheck Z501 for peak on VTVM. Adjust tone 2 level control (R519) for 1.0 VAC on VTVM. Tighten lock on R513 and R519.

*Frequency Determining Element

K. Set S502 on "Two Tone" position and recheck distortion on analyzer.

PART 3. R.F. OSCILLATOR AND AMPLIFIER SECTION TEST.

A. Connect R.F. VTVM to the R.F.output jack(J501). Set "RF Tone Selector"switch(S501) to "Tone 1" position and measure B+ voltage on Pin 1 of V504. Voltage should be 160 VDC

switching is accomplished in the same manner. The oscillator is a Modified Pierce type. The output amplitude of these oscillators is adjusted by variable coupling capacitor between the oscillator and amplifier of each stage. The level is set so that both outputs are equal in amplitude after the plate of each amplifier is tuned to resonance. This tuning is done by L-502 for tone #1, and L-503 for tone #2. After alignment, the level controls should not be touched again as the output of these oscillators are required to have a fixed output amplitude.

2. TEST INSTRUCTIONS:

A. Proceed as outlined in Test Sequence and Procedure below.

B. Fill in blanks on report sheet, rejecting those units that do not meet the specifications.

3. TEST SEQUENCE AND PROCEDURE:

PART 1. MECHANICAL INSPECTION.

A. Inspect the unit for obvious mechanical imperfections.

B. Inspect the unit for obvious electrical errors.

C. Carefully inspect the unit for loose screws at critical points. Most carefully inspect for loose screws on grounding points such as tube socket nut straps and ground lugs.

PART 2. PRELIMINARY TEST AND AUDIO SECTION TEST:

A. Connect unit to power line and energize the set.

B. Observe: All filaments and pilot lamp illuminated.

Check pin 1 of V505. No voltage should be present. Set C520 to maximum and tune L502 for maximum reading on RF VTVM. Tighten lock nut on L502 slug. Set C520 for 1.5 VRF output.

B. Set S501 to "Tone 2" position and measure B+ voltage on pin 1 of V505. Voltage should be 160 VDC. Check pin 1 of V504. No voltage should be present. Set C521 to maximum and tune L503 for maximum reading on RF VTVM. Tighten lock nut on L503 slug. Set C521 for 1.5 VRF output. Connect analyzer with mixer, to R.F. output jack and examine tones. Distortion products should be at least 60 db below tones.

# REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S-558

MODEL _____ PROJECT NO _____

| DATE | REV. | PAGE | EMN# | DESCRIPTION | CHK. | APP. |
|---|---|---|---|---|---|---|
| 5-22-61 | A | ALL | 4940 | On "SPEC. TITLE" & all pages , chg. "TTG-1A' to "TTG-2". | | |
| 5-22-61 | A | 4 | 4940 | Chg. letter "J" to letter "I". | | |
| | | " | " | Chg. Sheet no. from 4 to 3. | | |
| 5-22-61 | A | 4 | 4940 | Chg. letter "K" to letter "J", | | |
| | | " | " | Che. letter "L" to letter "K". | | |

| DATE 11-12-59 SH. ____ OF ____ COMPILED BY T. G. | TMC SPECIFICATION NO. S- 465 | |
|---|---|---|
| | TITLE: PRODUCTION TESTING OF TMC MODEL SBE-3 | JOB |
| APPROVED AG. | | |

COMPLETE INSTRUCTIONS

FOR THE

PRODUCTION TESTING

OF THE

TMC MODEL SBE-3

| DATE 11-12-59 SH. 1 OF 14 COMPILED BY T.G. | TMC SPECIFICATION NO. S 465 | |
|---|---|---|
| | TITLE: PRODUCTION TESTING OF MODEL SBE-3 | JOB |
| APPROVED | | |

I. INTRODUCTION:

A. The SBE is a Single Sideband Exciter. For test purposes, it may be divided into 4 sections.

1. The Modulator Section

2. The Harmonic Generator Section

3. The Linear Amplifier Section

4. The Power Supply

B. THE L.F. MODULATOR SECTION:

This section heterodynes the audio input to the desired output frequency which is brought to the desired level by the linear amplifier. For example, a 1000 cps audio tone combines with a 250 Kc oscillator to produce upper and lower sidebands (USB, LSB) at 251 Kc and 249 Kc each sideband is selected by the proper filters (FX-158, FX-160) which attenuates the undesired sideband. The two sidebands are combined at the output of the filters and the resultant passed throught a carrier suppression filter which serves to further attenuate the 250 Kc carrier so it is at lease 50 db below the sideband signal Further combination with a second oscillator in the 2-4 Mc range then produces a frequency in the 1.75-3.75 Mc range, which is heterodyned to the final frequency by combination with the output of the harmonic generator. On the 2-4 band no heterodyning is necessary but it will be noted that an 18 Mc Oscillator is injected. This is merely to prevent the diodes in A-2107 from varying impedance at the 1.75-3.75 Mc level and thus cause distortion.

C. LINEAR AMPLIFIER SECTION:

A four band amplifier operating between 2 and 32 Mc to raise the level of the signal from Z107 to the desired output

D. HARMONIC GENERATOR SECTION:

Supplies the proper high frequency injection to the final modulator (Z107) frequency range from 8 to 34 Mcs either fundamental or harmonic.

E. The Power Supply is conventional.

II. TEST EQUIPMENT REQUIRED:

A Audio Generator (Heathkit #AG8)

B. Counter Berkeley (IMC)

C. R.F VTVM (Boonton Electronics Corp , Mod 91-A)

D. Dumount Scope, Type -304A

E. R.F. Generator Measurements Model 82

F. Heathkit AC VTVM (Model AV2)

G. 70 Ω non-inductive resistance.

H. Spectrum Analyzer, TMC Model FSA

I. Two Tone Generator, TMC Model TTG

J. TMC MODEL Vox-5 Variable Frequency Oscillator

K. Ballantine (Model - 314 Electronic Volt Meter

III. PRELIMINARY

A. Inspect the unit for mechanical imperfections and for proper placement of filters.

B. Inspect for obvious wiring errors.

C. Check oven heaters by measuring heater resistance pins D and E of 101 this would be approximately 200 Ω.

D. Check for B+ shorts with Ω meter.

E. Attach jumper pins 2 & 3 of E101.

F. Connect 70 Ω load to J103.

G. Set bandswitch to 2-4 Mc.

H. Attach cable from power supply to exciter. Turn AC power ON Oven indicator should light and cycle.

IV. TEST OF AUDIO SECTION AND 250 KC MODULATOR

After a brief warm-up period set meter zero by adjusting R135

V. A. Check frequency at output of Z103, pin 8. This should be 250 KC

B. Check the voltage at pin 8 of Z103. This should be .9-1 volts If the frequency is not 250 Kc, then adjust C120 until the correct frequency appears on the counter.

VI ALIGNMENT OF T125

A Set Audio Generator to 3KC with .05 output.

B Feed this into channel 1, Terminal 6 and 8 of E101.

C. Place probe of Balantine on Plate (pin 6) of IF Amplifier V124

D. Tune bottom slug for maximum indication on meter. Repeat for top slug. Touch up bottom slug again.

VII. ALIGNMENT OF T126

A. Same as for T125

B. Same as for T125

C. Place probe of Balantine on Plate (pin 6) of IF Amplifier V125

D. Same as for T125.

VIII. 250 KC CARRIER BALANCE

A. Turn carrier insert to zero.

B. Turn both audio channels to OFF.

C. Place scope lead at junction R256 and R257.

D. Alternately adjust USB and LSB balance pots for minimum output

E. Trace on scope should virtually disappear at maximum sensitivity

F. Lock balance pots.

Set up an audio level to 100 on the meter CH-2. Voltage at pin 1 V124 should be +2.5 volts ± 2.
If difficulty is encountered in this stage, check the following points:

| | |
|---|---|
| Junction of R256 - R257 | .022 volts |
| Pin 6 of V125 | .27 volts |
| Pin 6 of V124 | .3 volts |

With 250 Kc injection shorted, voltages at secondary of T125 and T126 should be .006 volts. Remove short from 250 Kc injection

IX. RETOUCHING OF T125 AND T126

Repeat procedure #2 peaking these two transformers.

X. CHECK FOR BANDWIDTH

A. Connect an audio oscillator across a 600 ohm resistor to terminal 6 and 8 of E101.

B Set the oscillator to have an output of 05 volts.

C Set the USB selector switch to OFF

D. Set the LSB selector switch to Channel 1.

E. Use Meter in SBE-3 (M101).

F. Connect counter to junction of C163 & C164.

G. Vary the audio generator between 350 - 7500 cycles to get the peak reading on the meter. Full scale. This will appear at approximately 1500 cycles.

H. Vary audio generator towards 350 cps and note and record the frequency when meter indicates a reduction of 1 db, 2 db and 3 db. Now tune the generator towards 7500 cps and again note record second frequency at 1 db, 2 db and 3 db. While tuning generator to 7500 cycles from 350 cps, watch meter for any variation greater than 3 db below the point which has been set as a reference point.

I. Subtract the two frequencies at the 3 db points. This should be greater than 7.5 Kc.

XI. TUNING OF T127

A. Put probe at pin 2, V113A tune top slug for a dip, then peak bottom slug. Dip the top slug again.

B. Put probe at pin 7, V113B tune top slug for a dip, then peak bottom slug. Dip the top slug again.

XII. MICROPHONE INPUT

A. Connect an audio oscillator thru a 470 K resistor to microphone jack J101.

B. Set oscillator to 1000 cycles.

C. Set USB and LSB selector switches to OFF.

D. Check 250 Kc injection at arm of R265 and R266-.8 to 1.2 volts.

E. Alternately set a sensitive meter at the outputs of FX-158 and FX-160 and balance out the 250 Kc carrier by adjusting R265 and R266.

F. Set RF bandswitch to 2-4 Mc.

G. Adjust level of audio oscillator to .007 volts.

H. Turn LSB selector switch to MIKE, LSB gain control to maximum.

CHECK:

| | |
|---|---|
| Meter reading on LSB | 100 |
| Meter reading on USB | 0 |
| Output of FX-158 | 09- 1 |

I Switch bandswitch thru the other three bands, and note that the

output has been transferred to FX-158. Return bandswitch to 2-4 Mc band.

If the above results are not obtained, check the following points (short arm of 250 Kc balance pots to ground until checking output of filters FX-158 and FX-160.

| | |
|---|---|
| Pin 6, V101 | .0035 V |
| Pin 1, V101 | .06 V |
| Pin 7, V122A or Pin 7, V123A | .034 V |
| Pin 6, V122A or Pin 6, V123A | .052 V |
| Pin 4 & 7 of T103-4 | .05 V |
| Pin 2 of V122B or Pin 2 of V123B | .034 V |
| Pin 1 of V122B or Pin 1 of V123B | .1 V |
| Across C153 or C158 | .21 V |
| Pin 2 of V112 | .21 V |

Remove short on 250 Kc injection to obtain output from filters.

XIII. CHECK OF 600 Ω INPUTS:

CHANNEL 1

A. Connect audio oscillator thru 600 Ω resistor to terminal 6 of E101.

B. Ground terminal 8.

C. Set audio oscillator level to .12 volts.

D. Output condition should be the same as per microphone check

E. Note that rear terminal nomenclature and front panel marking correlate.

CHANNEL 2

A. Same as per channel 1 connecting audio oscillator to pins 10 and 12 of E101

XIV. FINAL CHECK OF LOCATION OF USB AND LSB FILTER

A. Set RF bandswitch 2-4 Mc range. Alternately set 1000 cycle note in LSB and USB 1000 level. With lissajous pattern, note frequency

| | |
|---|---|
| LSB | 251 Kc |
| USB | 249 Kc |

XV. M.F. ALIGNMENT

A. MID FREQUENCY ALIGNMENT

It has been explained that at the mixer grid of V113 there may appear two frequencies, a 250 Kc frequency (carrier inserted) and a VMO injection frequency. At the band extremes the following table applies.

| XTAL OR VMO | DIAL READING | IF | RESULTING FREQ |
|---|---|---|---|
| 2000 Kc | 2.0 Mc | 250 Kc | 1.75 Mc |
| 4000 Kc | 4.0 Mc | 250 Kc | 3.75 Mc |

The MID FREQUENCY is aligned so that the proper product is chosen when the dial is set to the VMO or XTAL frequency, that is, when a 2000 Kc xtal is injected, the MF dial is set to 2.0 Mc but the actual frequency is 1.75 Mc which is the difference between the 2000 Kc xtal and the 250 Kc IF. With this in mind, preliminary alignment may be accomplished by using the 2000 Kc and 4000 Kc xtals (or VMO).

Before aligning the MF, see that the tuning condensers are full mesh when the dial is set to the marker on the MF dial.

Remove P107 from J110 on Z107. Connect sensitive RF voltmeter to CW terminal of output potentiometer R205. Unbalance injection by R130.

Select xtal position 1 (2000 Kc). Set MF dial to 2.25 Mc Tune T109 and T110 for maximum output.

Select xtal position 2 (4000 Kc). Set MF dial to 4.25 Mc Tune trimmers C140 and C141 for maximum output.

This preliminary alignment will ensure subsequent selection of the proper mixer product from the MF meter.

Insert full carrier Select xtal position 1 (2000 Kc) Set MF dial to 2 0 Mc Tune T109 and T110 fro maximum output Select xtal position 2 (4000) kc Set MF dial to 4 0 Mc. Tune C140 and C141 for maximum output in each case reduce the carrier to ensure that proper mixer product has been selected R peat until

band is tracked. Lock slugs with special tool.

XVI. MID FREQUENCY CRYSTAL OR VMO INJECTION:

A. Connect a PMO to VMO input J104 (maintain a 1.5 volt level at all subsequent tests).

B. Install a 2000 Kc xtal in position #1

C. Install a 4000 Kc xtal in position #2

D. Install a 2250 Kc xtal in position #3

E. Set an R.F. voltmeter at the junction of C163 and C164 and measure the following voltages.

| | | |
|---|---|---|
| Position 1 | (2000 Kc) | 2.5 V |
| Position 2 | (4000 Kc) | 1.2 V |
| VMO | (2000 Kc) | 2.5 V |
| VMO | (4000 Kc) | 1.4 V |

XVII. MID FREQUENCY CARRIER BALANCE

A. Select xtal position 1 (2000 Kc).

B. MF dial to 2.25 Mc.

C. Balance out carrier by means of R130.

D. Lock potentiometer.

If the unit has been aligned properly, with the carrier inserted and xtal position 1, a signal will be picked up at 2.0 Mc and 2.50 Mc.

XVIII. FINAL AMPLIFIER:

FINAL AMPLIFIER ALIGNMENT:

A. Before alignment, check full mesh capacitor setting against dial marking.

B. Remove HF injection from Z107.

C. Zero carrier insertion.

D. Audio channels OFF.

E Connect R.F signal generator to grid side of L116 terminating generator with 47 Ω

F Terminate SBE output with 70 Ω, 5 watt load

G. Monitor output voltage with RF voltmeter.

H. Monitor input with RF voltmeter.

IXX. 2-4 MC BAND ALIGNMENT:

A. Set RF band switch to 2-4 Mc band.

B. Set dial and generator to 2 Mc.

C. Tune T116 and T120 for maximum output.

D. Repeat steps until band is aligned.

E. Check sensitivity at each end of band for 14 volt output

| | INPUT | METER READING |
|---|---|---|
| 2.0 Mc | .15 | plus 2 db |
| 4.0 Mc | .05 | " 2 db |

If difficulty is encountered in this test, the following stage gains should be checked

| | 2.0.Mc | 4.0 Mc |
|---|---|---|
| Gen. Out. | .15 | .05 |
| Plate 6AH6 | .3 | .15 |
| Grid 6CL6 | .3 | .15 |
| Plate 6CL6 | 25.0 | 24.0 |
| Grid 6146 | 9.0 | 9.3 |
| Plate 6146 | 80.0 | 81.0 |
| Output Tap | 14 | 14 |

In taking these measurements, meter capacity must be compensated

XX. 4-8 MC BAND ALIGNMENT

A. Set RF bandswitch to 4-8 Mc band.

B. Set dial and generator to 4 Mc.

C. Tune T113, T117 and T121 for maximum output

D. Set dial and generator to 8 Mc.

E. Tune C203, C192 and C180 for maximum output.

F. Repeat until ends of band track.

G Lock slugs.

H When aligned check RF sensitivity for 14 volt output

| | INPUT | METER READING |
|---|---|---|
| 4.0 | .055 v. | plus 2 db |
| 8.0 | .0065 v. | plus 2 db |

If difficulty is encountered in this test, the following stage gains should be checked.

| | 4.0 Mc | 8.0 Mc |
|---|---|---|
| Gen. Out | .055 | .0065 |
| Plate 6AH6 | 4.0 | 2.0 |
| Grid 6CL6 | .86 | .52 |
| Plate 6CL6 | 34 | 19 |
| Grid 6146 | 11 | 10 |
| Plate 6146 | 70 | 78 |
| Output Tap | 14 | 14 |

In taking these measurements, the meter capacity must be compensated.

X XI- 8-16 MC BAND ALIGNMENT:

1. Set RF Bandswitch to 8-16 Mc Band.
2. Set dial and generator to 8 Mc.
3. Tune T115, T119, and T122 for maximum output.
4. Set dial and generator to 16 Mc.
5. Tune C202, C190 and C178 for maximum output.
6. Repeat until ends of band are aligned.
7. Check RF sensitivity.

| | INPUT | METER READING |
|---|---|---|
| 8.0 Mc. | .05 | plus 2 db |
| 16.0 Mc. | .03 | plus 2 db |

If difficulty is encountered in this test, the following stage gains should be checked.

| | 8.0<br>4.0 Mc | 16.0 |
|---|---|---|
| Gen. Out | .05 | .03 |
| Plate 6AH6 | 2.2 | 2.0 |
| Grid 6CL6 | 1.2 | .92 |
| Plate 6CL6 | 32 | 30 |
| Grid 6146 | 12 | 15 |
| Plate 6146 | 75 | 80 |
| Output Tap | 14 | 14 |

XXII- 16-32 MC. BAND ALIGNMENT:

1. Set RF bandswitch to 16-32 Mc.
2. Set dial and generator to 15 Mc.
3. Tune T114, T118, and T112 for maximum output.
4. Set dial and generator to 32 Mc.
5. Tune C201, C189 and C177 for maximum output.
6. Repeat until ends of band are tracked.
7. When aligned, check RF sensitivity.

| | INPUT | METER READING |
|---|---|---|
| 16 Mc. | .09 | plus 2 db |
| 32 Mc. | .06 | plus 2 db |

If difficulty is encountered in this test, the following stage gains should be checked.

| | 16 Mc. | 32 Mc. |
|---|---|---|
| Gen Out. | .09 | .06 |
| Plate 6AH6 | 2.0 | 1.2 |
| Grid 6CL6 | 1.25 | .73 |
| Plate 6CL6 | 25.0 | 13 |
| Grid 6146 | 14.0 | 8.6 |
| Plate 6146 | 72.0 | 83 |
| Output Tap | 14.0 | 14 |

XXII*B H.F. MODULATOR Z107

A. In the 18 mcs. xtal position #9.

B Place an AC probe to input of R205.

C. Balance out to .3 v. R.F.

XXIII -- CHECK CARRIER AT FX-159

A. Shut off audio input. Both Channels

B. Connect Balantine to output of FX-159.

C. The carrier should be 60 db below output voltage of FX-159, with one channel turned on and set to 100% on meter.

D. Carrier re-insertion should be fully counter clockwise during this test.

XXIV -- CARRIER RE-INSERTION:

Place meter at pin V124, insert full carrier level. Reading should be 2.5 volts. If Kc output voltage is high. this reading might increase by 50%.

VOX SQUELCH:

A. Place ohm meter from terminal 4 of E101 to ground.

B. With VOX gain at maximum, turn transmitter switch OFF, and reduce carrier insertion to zero.

C. Connect audio oscillator to MIKE input.

D. Turn EXCITER switch to stand-by.

E. Raise AUDIO gain switch control until exciter light goes on indicating that relay K101 has closed.

F. Check level at pin 2 V110 - .16 volts.

G. When the relay **closes** terminal 4 should short to ground. When the transmitter switch is thrown to ON, terminal 4 should again short to ground with no audio input.

If difficulty is encountered in this stage, check the following voltages.

Set audio input to .16 volts at pin 2 of V110

| | |
|---|---|
| Pin 2 V111 | 5.5 volts |
| Pin 5 V111 | plus 8.0 volts |
| Pin 2 V109A | plus 6.2 volts |
| Pin 3 V109A | plus 5.0 volts (no audio input or carrier) |

H Connect audio oscillator to terminal 13 and ground on E101.

I. Reduce output to zero.

J. Set squelch gain to maximum.

K. Insert carrier until VOX circuit is activated.

L. VOX gain at maximum.

M. Increase output from signal generator until the VOX is disabled as indicated by the exciter light.

N. Check voltage at Pin 9 V110 -.6 volts

If difficulty is encountered in this stage, check the following voltages. Reduce carrier insert to zero.

Set voltage at pin 9 V110 to .6 Volts

| | | |
|---|---|---|
| Pin 1 V111 | | 14 v. |
| Pin 7 V111 | minus | 17 v. |
| Pin 2 V109A | minus | 2.5 v. |

XXV PUSH TO TALK:

By pushing the mike PTT lever or grounding terminal 1 of E101. Relay K101 should be activated.

XXVI AMPLITUDE MODULATION SIMULATION TEST:

A. Connect a scope to pin 2 or 7 of V113.

B. Set a 1000 cycle note at minus 10 db level on both upper and lower sideband.

C. A clean two tone test signal should be observed on the scope.

D. Adjust gain of one sideband until the tones are equal.

E. Insert carrier for 100% modulation. scope should confirm such a a signal. If picture is distorted (modulation envelope looks like a distorted sine wave.)

F. Reverse leads on terminals 2 and 3 of one of the filters.

XXVII - FINAL TEST:

A. Reconnect HF oscillator injection to Z107

B. Set audio level to 100.

C. Balance HF carrier.

D. Mc band to 2-4.25 Mc. (0).

E. Set xtal selector switch to position 9 (250 Kc.)

F. Tune Mid Frequency.

G. Set RF bandswitch to 2-4 Mc. range. Tune output amplifier to 2 Mc.

H. Check for 10 volt output.

This procedure will be repeated in two megacycles steps through 32 Mc., each time checking that the 14 volt output is obtained.

| R. F. BAND | MC BAND | FREQUENCY |
|---|---|---|
| 4-8 | 4 | 6 |
| 8-16 | 5 | 8 |
| 8-16 | 6 | 10 |
| 8-16 | 7 | 12 |
| 8-16 | 8 | 14 |
| 8-16 | 9 | 16 |
| 16-32 | 10 | 18 |
| 16-32 | 11 | 20 |
| 16-32 | 12 | 22 |
| 16-32 | 13 | 24 |
| 16-32 | 14 | 26 |
| 16-32 | 15 | 28 |
| 16-32 | 16 | 30 |
| 16-32 | 17 | 32 |
| 16-32 | 20 | |

In checking these points, see that dial calibration is adequate if not, the bands should be aligned on the crystal frequencies.

1. Set unit up on any frequency and lay down flat on the table.

2. Raise front of unit about 4 feet from table and let drop several times.

Note any change in output. If output changes, investigate reason.

| DATE 11-12-59 SH. 14A OF 14A COMPILED BY T.G | TMC SPECIFICATION NO. S-465 | |
|---|---|---|
| | TITLE: PRODUCTION TESTING OF MODEL SBE-3 | JOB |
| APPROVED | | |

## SBE-3 TEST REPORT SHEET

| | ACCEPT | REJECT |
|---|---|---|
| 250 KC Oscillator | _____ | _____ |
| 250 KC Balance | _____ | _____ |
| Bandswitch USB-LSB | _____ | _____ |
| Microphone Input | _____ | _____ |
| 600 ohm Input | _____ | _____ |
| M.F. Alignment | _____ | _____ |
| M.F. Carrier Balance | _____ | _____ |
| M.F. Dial Calibration | _____ | _____ |
| H.F. Modulator | _____ | _____ |
| R.F. Dial Calibration | _____ | _____ |
| Carrier Insert | _____ | _____ |
| VOX | _____ | _____ |
| SQUELCH | _____ | _____ |
| Push to Talk | _____ | _____ |
| Remote Channel Operation | _____ | _____ |
| Output Control | _____ | _____ |
| Final Output Check | _____ | _____ |

DATE _____

SERIAL _____

TESTER _____ APPROVED _____

DATE 11-13-59
SH. ____ OF ____
COMPILED BY

# TMC SPECIFICATION NO. S 465

TITLE: PRODUCTION TESTING OF TMC MODEL SBE-3 | JOB

APPROVED

| TUBE | VOLTS | PIN 1 | PIN 2 | PIN 3 | PIN 4 | PIN 5 | PIN 6 | PIN 7 | PIN 8 | PIN 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| V101 | 6AB4 | 56V | NC | 0 | 6.3* | 150 | 0 | 1.3 | | |
| V122 | 12AT7 | 90 | 0 | 1.4 | 6.3* | 6.3* | 135 | 0 | 1 4 | 0 |
| V123 | 12AT7 | 90 | 0 | 1.4 | 6.3* | 6.3* | 135 | 0 | 1.4 | 0 |
| V124 | 6AB4 | 125 | NC | 0 | 6.3* | NC | 0 | .8 | - | - |
| V110 | 6UB | 5 | 0 | 25 | 6.3* | 0 | 275 | 1.8 | 1 | 0 |
| V111 | 6AL5 | 0 | 0 | 0 | 6.3* | 1 | NC | -1 | - | - |
| V127 | 6AB4 | 250 | NC | 0 | 6.3* | NC | .5 | 4 | - | - |
| V126 | 6AH6 | 0 | 0 | 0 | 6.3* | 270 | 125 | 1 | - | - |
| V125 | 6AB4 | 130 | NC | 0 | 6.3* | NC | 0 | .9 | - | - |
| V113 | 12AT7 | 170 | 0 | 2.1 | 6.3* | 6.3* | 170 | 0 | 2.1 | 0 |
| V114 | 6AH6 | 0 | 0 | 0 | 6.3* | 270 | 110 | 1 | - | - |
| V112 | 12AU7 | 230 | 0 | 4.1 | 0 | 0 | 230 | 0 | 3 9 | 6 3* |
| V115 | 12AU7 | 155V | 0 | 4.1 | 0 | 0 | 230 | 0 | 3 9 | 6 3* |
| V116 | 6CL6 | 6.0 | -16 | 150 | 0 | 6.3* | 210 | 6.0 | NC | -16 |
| V117 | 6U8 | NC | -10 | 115 | 0 | 6.3* | 220 | .1 | NC | NC |
| V118 | 6AH6 | 0 | 0 | 6.3* | 0 | 190 | 105 | 1.4 | - | - |
| V119 | 6CL6 | 3.7 | NC | 150 | 6.3* | 0 | 190 | 0 | - | 0 |
| V120 | 6LQ6 | 28 | 0 | 190 | - | 0 | 28 | 6.3* | 0 | 260 |
| V105 | 12AU7 | 250 | 8.5 | 6.3* | .25 | 150 | 0 | 0 | VAR | - |

NC - No connection

* - AC Voltages

# REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

SBE-3

MODEL _____ PROJECT NO _____

| DATE | REV. | PAGE | EMN# | DESCRIPTION | CHK. | APP. |
|---|---|---|---|---|---|---|
| 10-3-60 | | 2 | | On VI chg. to "Set Audio Generator to 3KC with .05 output. | | |
| 10-3-60 | | 4 | | On X, item E, chg. to, "Use Meter in SBE-3 (M101). | | |
| 10-3-60 | | 4 | | On X, item G, chg. to, "Connect Counter to Junction of | | |
| | | | | C163 & C164. | | |
| 10-3-60 | | 4 | | On X, item G, chg. to, "Vary the audio generator between | | |
| | | | | 350-7500 cycles to get the peak reading on the meter. | Full | |
| | | | | scale. This will appear at approximately 1500 cycles. | | |
| 10-3-60 | | 4 | | On XI, item A, chg. to, "Put probe at pin 2 V113A tune | | |
| | | | | top slug for a dip, then peak bottom slug. Dip the | | |
| | | | | top slug again. | | |
| 10-3-60 | | 4 | | On XI, item B, chg. to "Put probe at pin 7 V113B, tune | | |
| | | | | top slug for a dip, then peak bottom slug. Dip the | | |
| | | | | top slug again. | | |

IMC FORM 154-A

# TUNING CHART GPT-10K UNSYNTHESIZED

| SBE | | | IPA TUNING | | | | | | | | PA TUNING | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FREQ MC | SBE BAND | VOX | IPA BAND | DRIVER BAND | 1ST AMP TUNING | IPA GRID TUNING | IPA TUNING | IPA LOADING | IPA LOAD POS | IPA PLATE CURRENT | FINAL BAND | PA TUNE | PA LOADING | OUTPUT BAL | OUTPUT LOADING | 10 KW LOAD CURRENT | 10 KW S/D DB | 5 KW LOAD CURRENT | 5 KW S/D DB | DC PLATE CURRENT | DC SCREEN CURRENT | % OF UN/BAL | PA PLATE RF |
| 2 | 2-4 | 2500 | 2- 2.5 | 2-4 | | | | | | | 2-3 | | | | | | | | | | | | |
| 2.5 | 2-4 | 3000 | 2- 2.5 | 2-4 | | | | | | | 2-3 | | | | | | | | | | | | |
| 2.5 | 2-4 | 3000 | 2.5-3 | 2-4 | | | | | | | 2-3 | | | | | | | | | | | | |
| 3 | 2-4 | 3500 | 2.5-3 | 2-4 | | | | | | | 3-4 | | | | | | | | | | | | |
| 3 | 2-4 | 3500 | 3-4 | 2-4 | | | | | | | 3-4 | | | | | | | | | | | | |
| 4 | 2-4 | 2250 | 4-6 | 2-4 | | | | | | | 4-6 | | | | | | | | | | | | |
| 4 | 2-4 | 2250 | 4-6 | 4-8 | | | | | | | 4-6 | | | | | | | | | | | | |
| 4 | 4-8 | 2250 | 4-6 | 4-8 | | | | | | | 4-6 | | | | | | | | | | | | |
| 6 | 4-8 | 3250 | 4-6 | 4-8 | | | | | | | 4-6 | | | | | | | | | | | | |
| 6 | 4-8 | 3250 | 6-8 | 4-8 | | | | | | | 6-8 | | | | | | | | | | | | |
| 8 | 4-8 | 2125 | 6-8 | 4-8 | | | | | | | 6-8 | | | | | | | | | | | | |
| 8 | 4-8 | 2125 | 8-12 | 8-16 | | | | | | | 8-11 | | | | | | | | | | | | |
| 8 | 8-16 | 2125 | 8-12 | 8-16 | | | | | | | 8-11 | | | | | | | | | | | | |
| 11 | 8-16 | 2875 | 8-12 | 8-16 | | | | | | | 8-11 | | | | | | | | | | | | |
| 11 | 8-16 | 2875 | 8-12 | 8-16 | | | | | | | 11-15 | | | | | | | | | | | | |
| 12 | 8-16 | 3125 | 8-12 | 8-16 | | | | | | | 11-15 | | | | | | | | | | | | |
| 12 | 8-16 | 3125 | 12-16 | 8-16 | | | | | | | 11-15 | | | | | | | | | | | | |
| 15 | 8-16 | 3875 | 12-16 | 8-16 | | | | | | | 11-15 | | | | | | | | | | | | |
| 15 | 8-16 | 3875 | 12-16 | 8-16 | | | | | | | 15-19 | | | | | | | | | | | | |
| 16 | 8-16 | 2062.5 | 12-16 | 8-16 | | | | | | | 15-19 | | | | | | | | | | | | |
| 16 | 16-32 | 2062.5 | 16-20 | 16-20 | | | | | | | 15-19 | | | | | | | | | | | | |
| 19 | 16-32 | 2437.5 | 16-20 | 16-20 | | | | | | | 15-19 | | | | | | | | | | | | |
| 19 | 16-32 | 2437.5 | 16-20 | 16-20 | | | | | | | 19-24 | | | | | | | | | | | | |
| 20 | 16-32 | 2562.5 | 16-20 | 16-20 | | | | | | | 19-24 | | | | | | | | | | | | |
| 20 | 16-32 | 2562.5 | 20-28 | 16-20 | | | | | | | 19-24 | | | | | | | | | | | | |
| 20 | 16-32 | 2562.5 | 20-28 | 20-28 | | | | | | | 19-24 | | | | | | | | | | | | |
| 24 | 16-32 | 3062.5 | 20-28 | 20-28 | | | | | | | 19-24 | | | | | | | | | | | | |
| 24 | 16-32 | 3062.5 | 20-28 | 20-28 | | | | | | | 24-28 | | | | | | | | | | | | |
| 28 | 16-32 | 3562.5 | 20-28 | 20-28 | | | | | | | 24-28 | | | | | | | | | | | | |

TEST CONDITIONS:

LOAD

☐ 600 Ω BALANCED

☐ 70 Ω UNBALANCED

REMARKS:

_____

_____

_____

_____

_____

DATE _____

SERIAL NO. _____

TESTED BY _____

APPROVED BY _____

MODEL: _____

THE TECHNICAL MATERIEL CORP
MAMARONECK NEW YORK

CH-210