TYPE L3 CARRIER SYSTEM
TELEVISION TRANSMISSION
T3 TRANSMITTING TERMINALS
R3 RECEIVING TERMINALS

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Note: Tests marked with an asterisk should be made once a week until operating experience indicates otherwise.

1. GENERAL

1.01 This section describes the methods and the requirements for making tests and adjustments of the T3 transmitting and R3 receiving television terminals. Initially, these tests should be made in the order in which they are listed. The tests listed in Parts 3 through 22 should be made at subsequent specified intervals in accordance with the E24 series. Tests marked with an asterisk should be made once a week until operating experience indicates otherwise. Individual equipment panel tests and adjustments listed in Parts 23 through 32 should be made as required for location of trouble or transmission deviations except for Part 25(B) which should be made once each month.

1.02 This issue replaces Issue 4 and is reissued to include numerous changes in the procedures and requirements. In addition, a procedure for adjusting 323A equalizers has been added. Due to the extent of the revisions, the use of arrows to indicate them has been omitted.

1.03 All tests should be made on an out-of-service basis after the proper releases have been obtained. At completion of tests the terminal should be placed in normal operating condition.

1.04 The metal covers over the equipment panels should always be in place, unless otherwise stated, while the tests are being made. Replace any covers that have been removed after the completion of the test requiring removal.

1.05 The apparatus lists will show a P2AW cord as a single plug coaxial cord, and a P3AH cord as a double plug coaxial cord. Testing apparatus should be arranged to permit use of cords 6 feet or less in length.

1.06 The term "less" or "greater" is used to indicate the requirement for some tests. For example, "−60 dbm or less" would indicate that a level of −70 dbm would be satisfactory.

1.07 General instructions on the maintenance and handling of electronic equipment involving hazardous voltages as contained in Section E38.001 should be observed.

2. TESTING APPARATUS

2.01 This section specifies the use of the 56A oscillator and the 73A milliwatt power meter which are mounted in a sending console coded J68827A. The 37B transmission measuring set is mounted in a receiving console coded J68827B. Accessory test equipment is also mounted on the jack panel of these consoles. Instructions covering use of the consoles are contained in Section E40.264. The 61C signal generator and the 70B power meter are usually specified for video tests on balanced 124-ohm circuits and equipment. Sections E47.410 and E47.411, respectively, cover this test equipment. Test equipment should be calibrated in accordance with BSP instructions to insure accurate measurements.

2.02 The J44104R vacuum tube test set is used as a filament activity test set on certain portions of the terminals. It measures the per-

centage change in bias due to a 6.5 per cent reduction in heater voltage. A receptor is provided on each panel to be tested and a cord connects the test set to the receptor.

2.03 The 1AL power test set is used to measure rectifier power voltage and high-frequency (L3 flat gain) amplifier tube bias and activity. This set is described in Section E40.652.

2.04 Whenever impedance matching coils are specified in the circuit, the coil loss is included in the test limit requirements.

3. POWER SUPPLY TESTS — T3, R3 TERMINALS

3.01 Hazardous voltages of 230 volts ac and 190 and 315 volts dc exist in the power supply units. Proper care and precaution should be taken against accidental shock. The T3 and R3 terminals are powered from either a 115-volt or a 230-volt 60-cycle source which feeds a line voltage regulator circuit in the terminal bay. This line regulator provides 230 volts ac which drive the metallic selenium rectifiers to furnish 190 and 315 volts dc for plate and screen voltages. The regulated ac also supplies a variable autotransformer which is used for adjusting the input voltage to the heater transformers.

(A) AC Voltage Measurements

3.02 ***Apparatus:***

73A Power Meter

1 — Single Plug Coaxial Cord

3.03 ***Procedure:***

(1) Calibrate 73A power meter. SCALE key set to 0.01 db/div.

(2) Connect power meter to AC TST jack in the equalizer panel.

Requirement: Meter shall read −0.05 dbm for terminals in which the electron tube heaters are wholly supplied by 2008A transformers stamped with a date of 9/54 or later. This reading is equivalent to 230 volts ac at the regulator output.

Meter shall read +0.10 dbm for terminals in which the electron tube heaters are wholly or partially supplied by 2008A transformers stamped with a date prior to 9/54. This reading is equivalent to 234 volts ac at the regulator output.

Note: Selection of the above requirements would be based only on the electron tube heater transformers and not on the crystal oven heater transformers.

(3) If the requirement is not met, adjust the variable autotransformer (AC ADJ) for a reading of −0.05 dbm or +0.10 dbm on the power meter.

(B) Rectifier Voltage Adjustments

3.04 ***Apparatus:***

J64001AL Power Test Set

3.05 ***Procedure:***

(1) Set the METER switch to PLT 1.

(2) Connect the voltage test cord to the receptor on the 190-volt rectifier panel.

(3) Check that the 190-volt circuit breaker is thrown to the ON position. Measure voltage and turn the panel ADJ VOLT control, if necessary, to obtain 190 volts. (Full scale reading of the meter equals 400 volts.)

Requirement: 190 volts output.

(4) Set the METER switch to PLT 2 and connect the voltage test cord to the receptor on the 315-volt rectifier panel.

(5) Check that the 315-volt circuit breaker is thrown to the ON position. Measure voltage and turn the panel ADJ VOLT control, if necessary, to obtain 315 volts. (Full scale reading of the meter equals 400 volts.)

Requirement: 315 volts output.

(6) Remove the voltage test cord.

(C) Alarm Circuit Operations

3.06 Power alarm circuits are designed to operate whenever the circuit breaker opens or a dc fuse is blown. The functioning of the alarm circuits is tested by pressing the AC ALM TST button on the fuse and alarm panel.

Requirement: Alarm relays operate and the ALM lamp lights.

4. TUBE BIAS AND FILAMENT ACTIVITY TESTS — T3, R3 TERMINALS

4.01 Filament activity tests are made only on the electron tubes listed. A periodic check of the other electron tubes is not necessary because of the normally low filament operating temperature. Each equipment panel or amplifier case having an electron tube circuit has a receptor on the front of the unit which contains test points to permit testing electron tubes without removing them from the socket. Tube bias (a combination of fixed and self bias) is measured in some instances. Tube activity is tested with the aid of a filament activity key which is located on the jack field panel. This key lowers the ac voltage from 230 volts ac to 215 volts ac when it is operated to TST position. The cords of the test set are plugged into the receptor of each unit being tested. These tests are made for the purpose of locating tubes having low emission, so that they can be replaced before service is affected. The sets measure the percentage change in grid bias, resulting from a fixed change in the heater voltage. This procedure should be performed only when power supply voltages meet their requirements.

4.02 ***Apparatus:***

J44104R Vacuum Tube Test Set

J64001AL Power Test Set

Test Set Cord

4.03 ***Procedure for HF Amplifiers:***

(1) Check that the FIL ACT key is in normal position.

(2) Connect the tube test cord of the 1AL power test set to the TEST plug of the amplifier under test. The plug is mounted under a hinged spring loaded cover.

(3) Measure bias on tubes V1 through V5.

Requirement: The bias voltage should be between 0.5 and 3.5 volts.

(4) Arrange the test set for measurement of activity, and adjust to obtain zero per cent reading for each tube. Where it is impossible to reach zero per cent reading in the case of V4 or V5, adjust the set to give an initial reading of 1 volt on the 4-volt scale.

(5) Set the FIL ACT key to the TST position. After the tube V1 reading has stabilized, measure the activity for each tube.

Requirement: If initial adjustment was to zero per cent, the requirement is a reading of zero to 40 per cent. If the initial adjustment was to 1 volt, the requirement is a reading of 0.6 to 1 volt.

(6) Record the measured values of bias and percentage activity on the office record. If any requirement is not met, the amplifier should be replaced and the tests repeated on the new unit.

4.04 ***Procedure for Panels Other than HF Amplifier:***

(1) Check that the FIL ACT key is in normal position.

(2) Plug the J44104R test cord connector into the first panel to be tested.

(3) Set switch S1 of the J44104R vacuum tube test set to the first tube position shown in the requirement table for the panel being tested. Position V1 is the first position for all panels except the polarizer panel. Adjust the potentiometer, associated with the tube position being tested, to obtain zero reference reading in the center of the per cent scale.

(4) Repeat this test and adjustment for each tube by turning the test switch to V2, V3A, etc, positions and adjusting the potentiometer for each position to obtain zero reading.

(5) Set the FIL ACT key to the TST position and allow 2 minutes for the electron tube cathodes to adjust to the lower temperature.

(6) Turn the test set switch S1 to each tube position (V1, V2, etc) for the panel being tested and record the meter reading of the per cent scale.

Requirement: The change in per cent scale reading for zero reference shall be within the value indicated in the center column of the heading "Limit — Per Cent Variation." When it is necessary to use −50 or +50 for reference, the change in per cent scale reading shall be within the limits given for these references in the "Limit — Per Cent Variation" columns.

T3 TRANSMITTING TERMINAL

PANEL	TUBE DESIGNATION	LIMIT — PER CENT VARIATION FOR —50, 0, +50 REFERENCE		
Clipper	V1, V2, V3A, V5, V6, V9	−50 ± 10	0 ± 20	+50 ± 30
* Carr Lev Cont	V1, V2, V3A, V4 to V9	−50 ± 10	0 ± 20	+50 ± 30
Video Amp	V1, V2, V3A, V4 to V6		0 ± 20	
Carr Harm Supp	V1, V2	−50 ± 10	0 ± 20	+50 ± 30
Carr Supp	V1, V2	−50 ± 10	0 ± 20	+50 ± 30

* For tests on the CARR LEV CONT panel, operate carrier level control key to OPR position. V10 is a gas tube and can not be tested in the panel by the vacuum tube test set.

R3 RECEIVING TERMINAL

* Polarizer	V2, V3A, V3B, V5, V6, V8, V9	−50 ± 10	0 ± 20	+50 ± 30
* Carr Freq Cont	V1, V2, V3A, V3B, V6 to V9	−50 ± 10	0 ± 20	+50 ± 30
Video Amp	V1, V2, V3A, V4 to V6		0 ± 20	
Carr Harm Supp	V1, V2	−50 ± 10	0 ± 20	+50 ± 30
Carr Supp	V1, V2	−50 ± 10	0 ± 20	+50 ± 30

* Tube V4 in the polarizer and tubes V4 and V5 in the carrier frequency control can not be tested in the panel by the vacuum tube test set.

(7) Replace any electron tubes not meeting the above requirements and test the filament activity of the replacing tube. Replace any electron tube that can not be initially adjusted to a reference value on the per cent scale by varying the potentiometer. Whenever electron tubes are replaced in the clipper circuit, check the THRESHOLD control setting by making the tests of Part 9.

T3 TRANSMITTING TERMINAL — LINE-UP PROCEDURE

These tests and adjustments listed under LINE-UP PROCEDURE are to be made on a routine basis. When the requirements for these tests can not be met, additional tests are specified under "OTHER TESTS" (Parts 23 through 25). Also included in the "OTHER TESTS" portion are adjustment tests of relatively stable circuit controls such as the clipper BAL and pilot suppression filter FREQ ADJ.

5. CARRIER OSCILLATOR LEVELS

5.01 The modulator in the T3 terminal is driven by 4.139 mc and 12.417 mc oscillators. The output level of each oscillator is measured at a test jack as outlined in this test procedure.

5.02 ***Apparatus:***

73A or 70B Power Meter

1 — Single Plug Coaxial Cord

5.03 ***Procedure:***

(1) Calibrate and connect the power meter to the CARR TST jack on the carrier supply panel. If the 73A power meter is used, set the SCALE key to 0.1 db/div.

Requirement: Power meter shall read −1 ± 1 dbm.

(2) Calibrate and connect the power meter to the CARR HRM TST jack on the carrier harmonic supply panel. If the 73A power meter is used, set the SCALE key to 0.1 db/div.

Requirement: Power meter shall read −1 ± 1 dbm.

*** 6. GAIN ADJUSTMENT**

6.01 This test procedure will check the over-all gain of the T3 terminal and adjust it to the required value.

6.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

6.03 Calibrate Procedure for 37B TMS

(1) In Fig. 1 patch directly from ATT C to the 37B set. The frequency of the 56A oscillator and the setting of ATT C will be stated as part of subsequent measurements. For example: "Calibrate the 37B TMS for −15 dbm at 5.139 mc."

(2) Set 56A oscillator for the frequency of measurement and adjust for 0 db output on the 73A power meter.

(3) Tune the 37B TMS for maximum reading on expanded scale meter. Adjust SENS 1 and 2 to maintain approximate midscale indication. Adjust CAL control of the TMS for a reading of zero on the expanded scale meter.

6.04 ***Measurement Procedure:***

(1) Set up the test arrangement shown in Fig. 1. This will send −9 dbm level to the TRS IN jacks of the T3 terminal.

(2) Set the key on carrier level control panel to BAL position.

(3) Set the 56A oscillator for 1 mc and adjust for 0 dbm output on the 73A power meter.

(4) Calibrate per Paragraph 6.03 the 37B TMS for −15 ± 0 db at 5.139 mc. Tune the 37B TMS to 5.139 mc and measure level at the terminal TRS OUT jack.

Requirement: 37B shall read −15 ± 0.25 dbm.

(5) Adjust the SIG GAIN control to obtain an output of −15 ± 0.25 dbm. If this requirement can not be met, make the tests specified in Part 23.

(6) Remove the 1 mc input signal from the terminal, set the key on the carrier level control panel to OPR, and tune the 37B set to 4.139 mc. Calibrate per Paragraph 6.03 the 37B TMS for −13 ± 0 db at 4.139 mc before making measurement.

Requirement: 37B shall read −13 ± 0.1 dbm.

(7) If the reading is not within the above limit, adjust the CARR LEV control on the carrier level control panel. If this requirement can not be met, make the tests specified in Part 29.

7. MODULATOR BALANCE ADJUSTMENTS

(A) Carrier Balance

7.01 This test is for the purpose of adjusting the carrier balance controls. The signal path is opened at the input of the video amplifier to eliminate very low amplitude longitudinal power interference from the clipper.

7.02 ***Apparatus:***

37B TMS

1 — Single Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

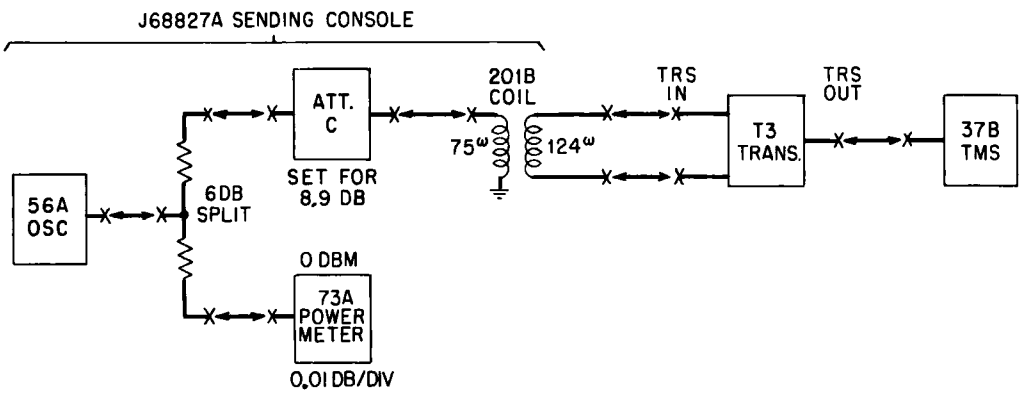


Fig. 1 – Test Arrangement for Gain, Signal Balance and Carrier Harmonic Phase

7.03 ***Procedure:***

(1) Remove patch plugs from CLPR OUT and AMP IN jacks on video amplifier.

(2) Set key on carrier level control panel to BAL position.

(3) Tune and calibrate per Paragraph 6.03 the 37B TMS to 4.139 mc and measure at TRS OUT jacks.

(4) Adjust CARR BAL 1 control on the carrier level control panel to obtain a minimum measurement.

Requirement: 37B shall read −64 dbm or less.

(5) If measurement exceeds −64 dbm, adjust CARR BAL 2 on the modulator panel to obtain a minimum measurement. When adjusting CARR BAL 2 use a nonmetallic screwdriver.

(6) Restore patch plug between CLPR OUT and AMP IN jacks on video amplifier.

*** (B) Signal Balance**

7.04 This test is for the purpose of adjusting the signal balance controls.

7.05 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

7.06 ***Procedure:***

(1) Set up the test arrangement as shown in Fig. 1.

(2) Set key on carrier level control panel to OPR position.

(3) Set the 56A oscillator for 4 mc and adjust for 0 dbm output on the 73A power meter.

(4) Tune the 37B TMS to 4 mc and measure at TRS OUT jacks.

(5) Adjust SIG BAL 1 control on the modulator panel to obtain a minimum measurement.

Requirement: 37B shall read −50 dbm or less.

(6) If measurement exceeds −50 dbm, adjust SIG BAL 2 control on the modulator panel to obtain a minimum measurement. When adjusting the SIG BAL 2 control use a nonmetallic screwdriver.

(7) Tune the 37B TMS to 4.278 mc and measure at TRS OUT jacks and readjust the SIG BAL 1 control for a minimum reading.

Requirement: 37B shall read −66 dbm or less.

(8) The final setting of SIG BAL 1 control is a compromise adjustment since it is adjusted for both 4 mc and 4.278 mc. Hence, if SIG BAL 1 is readjusted for 4.278 mc, 4 mc should be remeasured to insure that it is within limits. Favor the 4.278 mc balance, making it as low as possible but being careful not to exceed the limit on the 4 mc product.

*** (C) Harmonic Phase**

7.07 This test is for the purpose of adjusting the phase control on the carrier harmonic supply panel. The function of this control is to set the phase of the 12.417 mc carrier with respect to the 4.139 mc carrier.

7.08 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

7.09 ***Procedure:***

(1) Set up the test arrangement shown in Fig. 1 with the carrier level control key in BAL position.

(2) Set the 56A oscillator for 4 mc and adjust for 0 dbm output on the 73A power meter.

(3) Tune the 37B TMS to 8.417 mc and measure level at TRS OUT jacks of the terminal.

(4) Adjust the CARR HRM PHASE control on the carrier harmonic supply panel to obtain a minimum measurement. When adjusting the CARR HRM PHASE control use a nonmetallic screwdriver.

Requirement: 37B shall read −45 dbm or less.

* 8. CARRIER FREQUENCY CALIBRATION

8.01 This test outlines a procedure for comparing the frequency of the carrier oscillator with the 4.139 mc reference frequency.

8.02 ***Apparatus:***

J68827B Receiving Console

5 — Single Plug Coaxial Cords

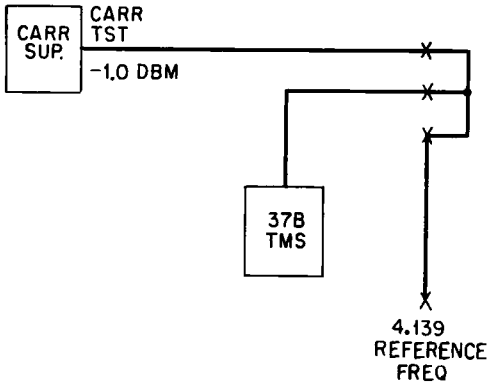


Fig. 2 – Test Arrangement for Calibration of Carrier Frequency Oscillator

8.03 ***Procedure:***

(1) Set up test arrangement shown in Fig. 2 using the multiple jacks in the jack panel of the receiving console. Tune the 37B set to 4.139 mc.

(2) Slowly change the FREQ ADJ control on the carrier supply panel until the db meter needle oscillates rapidly. Continue turning the FREQ ADJ control until needle has a very slow oscillating motion. Adjust the FREQ ADJ control for a zero beat between the reference frequency and the carrier supply.

(3) Remove test cords.

9. CLIPPER THRESHOLD ADJUSTMENT

9.01 The THRESHOLD control is adjusted so that the clipper circuit limits the video amplitude so that a level that is 3 db higher than the normal operating level will not be exceeded. This control setting should be checked whenever electron tubes are replaced in the clipper circuit. This test outlines a procedure for checking the THRESHOLD control setting using a synchronizing pulse signal. The THRESHOLD control may also be adjusted by using the 47A differential gain and phase measuring equipment as described in Paragraph 22.04 (7).

9.02 ***Apparatus:***

61C Signal Generator

J68827A Sending Console

KS-15512, L2, L3, L4, or L5 Oscilloscope

3 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

1 — 340C Plug

9.03 ***Procedure:***

(1) Set up test arrangement of Fig. 3.

(2) Set PICTURE WIDTH and AMPLITUDE controls maximum counterclockwise turns.

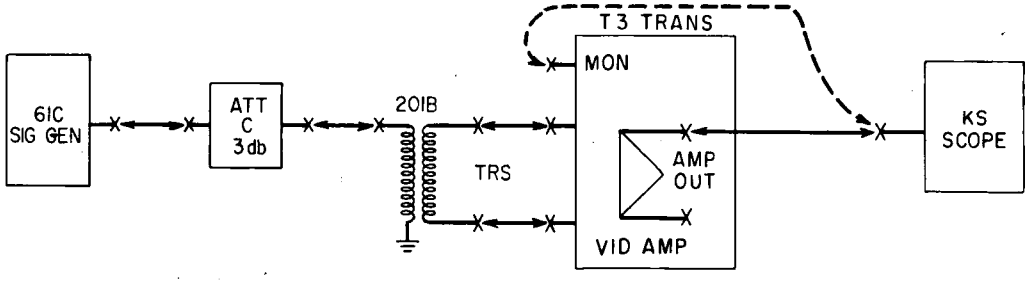


Fig. 3 – Test Arrangement for Clipper Threshold Control Adjustment — T3 Terminal

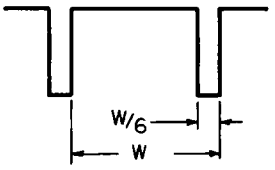


Fig. 3A

(3) Set the 61C signal generator controls as follows:

Connect to VIDEO OUT jacks

OUT 1 switch — Video and Sine

OUT 2 switch — Unmod

(4) Set the KS-15512 oscilloscope controls as follows:

Calibrate for 1 volt P/P equals 100 divisions

SYNC SELECTOR — Negative

SWEEP FREQ — HI

BANDWIDTH — 6 mc

INPUT — 1:1

(5) Connect the INPUT jack (INPUT MULT terminated) of the oscilloscope to the VIDEO OUT jack of the 61C. (If an L5 scope is used, insert a short-circuit plug in the right-hand input jack and a 75-ohm termination in the left-hand input multiple jack.) Adjust SYNC WIDTH and SYNC AMP to obtain a synchronizing pulse similar to Fig. 3A.

(6) Connect the VIDEO OUT jack of the 61C to the unbalanced side of the 201B coil through ATT C as shown in Fig. 3. Connect the balanced side of the 201B coil to TRS IN jacks of the T3 terminal. Set ATT C to 3 db.

(7) Connect the INPUT jack (INPUT MULT unterminated) of the oscilloscope to the top monitor jack of the TRS IN jacks in the jack field. Check that the sync pulse is negative.

(8) Adjust the SYNC AMP of signal generator to obtain 25 divisions (1/4 volt P/P) on the oscilloscope scale.

(9) Remove patch plugs between the AMP OUT and the MOD IN jacks on the video amplifier.

(10) Patch the INPUT jack of the oscilloscope to the top AMP OUT jack of the video amplifier. Adjust V gain of oscilloscope for 100 divisions.

(11) Turn the THRESHOLD control maximum counterclockwise first, then turn clockwise until the signal amplitude ***just begins*** to decrease.

(12) Set ATT C to 0 db and check that the amplitude of the pulse does not increase to more than 115 divisions.

(13) Restore patch plugs in the video amplifier and the jack field

10. OVER-ALL FREQUENCY CHARACTERISTIC

10.01 This test outlines a procedure to adjust the 226L equalizer and measure the frequency characteristic of the T3 terminal.

10.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

6 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

10.03 ***Procedure:***

(1) Set up test arrangement shown in Fig. 4 with ATT C set to 8.9 db.

(2) Set the carrier level control key to BAL position.

(3) Set the 56A oscillator for 900 kc and adjust output for 0 dbm on the 73A power meter.

(4) Calibrate the 37B TMS for −15 dbm at 5.039 mc per Paragraph 6.03. Measure the output of the terminal at 5.039 mc. It should be between −15 ±0.5 dbm. Read the output using the expanded scale.

(5) Repeat Steps (3) and (4) using an input of 3.6 mc with an output of 7.739 mc. Calibrate the 37B TMS for −15 dbm at 7.739 mc.

Requirement: The transmission at 3.6 mc should not differ from the transmission at 900 kc by more than 0.1 db.

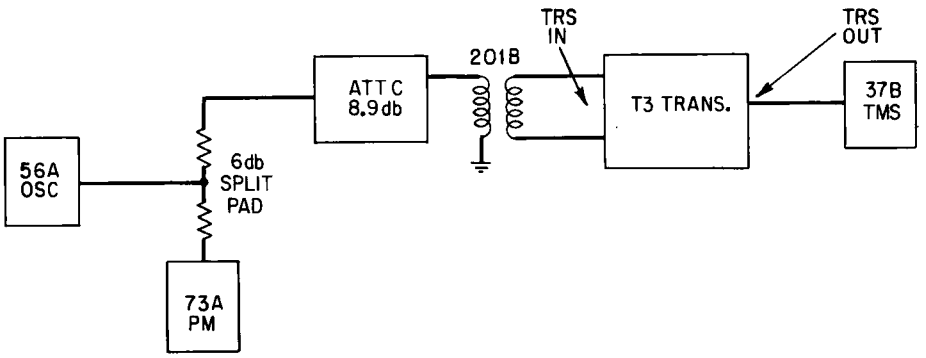


Fig. 4 – Test Arrangement for Measuring Frequency Characteristic of T3 Transmitting Terminal

(6) If this limit is exceeded, the 226L equalizer should be readjusted. Since the 226L equalizer affects transmission slightly at 900 kc, both 900 kc and 3.6 mc should be remeasured after the 226L equalizer has been adjusted to ascertain that the requirement is met.

(7) Repeat for each frequency listed below.

Requirement: Transmission of the T3 terminal shall be within the limits given below.

FREQUENCY — Mc	OUTPUT — Mc	DEVIATION FROM 0.9 Mc MEASURED VALUE
0.5	4.639	+0.05 ± 0.30
0.9	5.039	0
1.5	5.639	−0.05 ± 0.20
2.0	6.139	−0.05 ± 0.20
2.5	6.639	−0.05 ± 0.25
3.0	7.139	0 ± 0.25
3.5	7.639	0 ± 0.15
4.0	8.139	−0.05 ± 0.25
4.2	8.339	−0.45 ± 0.35

(8) Remove patch cords.

R3 RECEIVING TERMINAL — LINE-UP PROCEDURE

These tests and adjustments are to be made on a routine basis. Where requirements can not be met additional tests are specified in these practices under the heading of "OTHER TESTS." Several circuit adjustments requiring infrequent attention are also described in the "OTHER TESTS" (Parts 23 through 25).

11. CARRIER OSCILLATOR LEVELS

11.01 The demodulator in the R3 terminal is driven by 4.139 mc and 12.417 mc oscillators. The output level of each oscillator is measured at a test jack as outlined in this test procedure.

11.02 ***Apparatus:***

73A or 70B Power Meter
1 — Single Plug Coaxial Cord

11.03 ***Procedure:***

(1) Calibrate and connect the power meter to the CARR TST jack on the carrier supply panel. If the 73A power meter is used, set the SCALE key to 0.1 db/div.

Requirement: Power meter shall read −1 ± 1 dbm.

(2) Calibrate and connect the power meter to the CARR HRM TST jack on the carrier harmonic supply panel. If the 73A power meter is used, set the SCALE key to 0.1 db/div.

Requirement: Power meter shall read −1 ± 1 dbm.

* 12. GAIN ADJUSTMENT

12.01 This test outlines a procedure for measuring and adjusting the over-all gain of the R3 receiving terminal.

12.02 ***Apparatus:***

J68827A Sending Console
J68827B Receiving Console
2 — Single Plug Coaxial Cords
1 — Double Plug Coaxial Cord

12.03 ***Procedure:***

(1) Calibrate the 37B TMS for 0 dbm at 139 kc per Paragraph 6.03.

(2) Operate the POL DIS key located in the jack field to TST position.

(3) Set the 56A oscillator for 4 mc and adjust output for 0 dbm on the 73A power meter.

(4) Set up the test arrangement of Fig. 5 with the 37B connected to the REC OUT jacks through a 201B coil.

(5) Tune the 37B TMS to 139 kc and measure level at REC OUT jacks in jack field.

(6) Adjust the SIG GAIN control to obtain about 0 dbm level on the 37B TMS.

Requirement: 37B shall read 0 ± 0.25 dbm.

(7) If this requirement can not be met, make the tests of Part 24.

(8) Operate POL DIS key to NOR position.

13. DEMODULATOR BALANCE ADJUSTMENTS

* (A) Carrier Balance

13.01 This test outlines the procedure for adjusting the carrier balance controls.

13.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

13.03 ***Procedure:***

(1) Set up test arrangement as shown in Fig. 6, but ***omitting*** patch cord between ATT C and the receiver input.

(2) Tune the 37B TMS to 4.139 mc and adjust the CARR BAL control on the demodulator panel to obtain a minimum reading.

Requirement: 37B shall read −30 dbm or less.

(B) Longitudinal Balance

13.04 This test outlines the procedure for adjusting the LONG CARR BAL control of the demodulator.

13.05 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

13.06 ***Procedure:***

(1) Set up test arrangement as shown in Fig. 7. The multiple jacks are in the jack panel of the receiving console.

(2) Tune the 37B TMS to 4.139 mc and adjust the LONG CARR BAL control on the demodulator panel for a minimum reading.

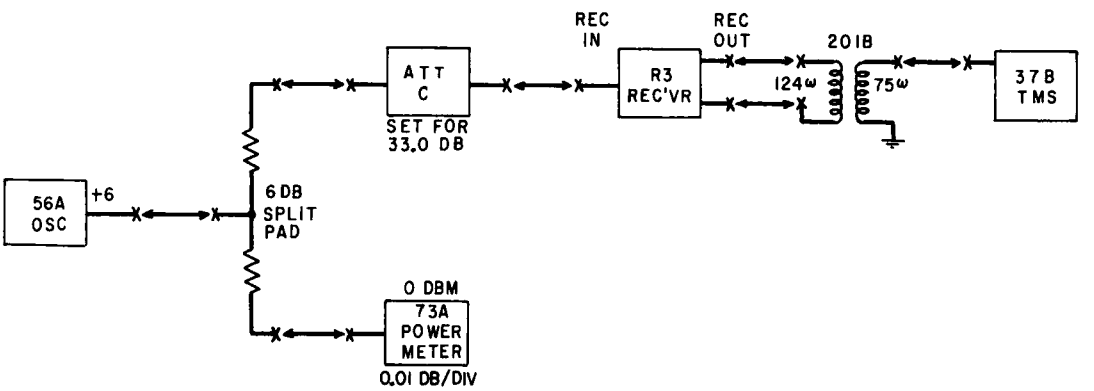


Fig. 5 — Test Arrangement for Measurement of Receiver Gain and Over-all Balance Adjustments

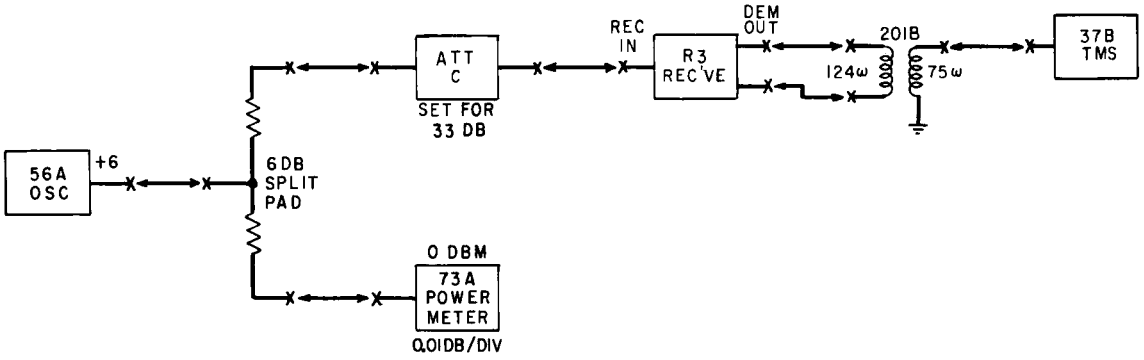


Fig. 6 – Arrangements for Carrier, Signal Balance and Terminal Level Tests

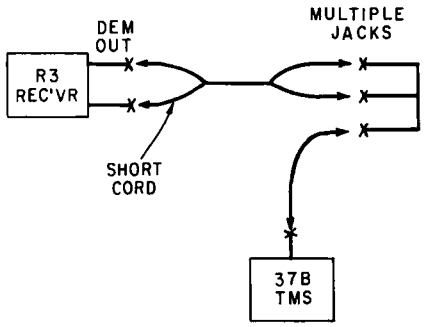


Fig. 7 – Arrangement for Longitudinal Balance Test

When adjusting the LONG CARR BAL control use a nonmetallic screwdriver.

Requirement: 37B shall read −45 dbm or less.

(C) Signal Balance

13.07 This test outlines the procedure for adjusting the signal balance controls.

13.08 *Apparatus:*

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

13.09 *Procedure:*

(1) Set up test arrangement as shown in Fig. 6. Set the 56A oscillator to 4 mc.

(2) Tune the 37B TMS to 4.278 mc and adjust the SIG BAL control on the demodulator panel for a minimum reading.

Requirement: 37B shall read −61 dbm or less.

(3) Tune the 37B TMS to 4 mc and measure signal leak.

Requirement: 37B shall read −58 dbm or less.

(4) If the 4 mc level exceeds the requirement, the SIG BAL control should be readjusted. The final setting of the SIG BAL control is a compromise between the balance requirement at 4 mc and at 4.278 mc. It is important to obtain the best possible adjustment of the SIG BAL making both of these products as low as possible.

(5) Remove patch cords and restore the patch plugs to the DEM OUT and CSF IN jacks.

14. CARRIER FREQUENCY CONTROL ADJUSTMENTS

14.01 The tests outlined here give the procedure for adjusting the carrier frequency control panel. The CARR BAL and SIG BAL controls should not need adjustment on a routine basis. Part 25 covers the adjustment of these controls for initial tests. Part 25 also gives additional tests if the requirements given in this part can not be met.

(A) Adjustment of PHASE BAL and Measurement of Over-all Sensitivity

14.02 This test outlines the procedure for setting the PHASE BAL control. A test for over-all sensitivity of the carrier frequency control circuit is also given.

14.03 ***Procedure:***

(1) Remove the patch plugs from the branching and control panel and set the frequency meter to zero reading by adjusting the MOD BAL R control.

(2) Insert patch plugs in both TST 1 jacks on the branching and control panel.

(3) Adjust the PHASE BAL control on the carrier frequency control panel to obtain a zero reading on the frequency meter.

(4) Measure the sensitivity of the circuit by readjusting the MOD BAL R control on the carrier frequency control panel to obtain a reading of −20 on the frequency meter.

(5) Move the two patch plugs on the branching and control panel from TST 1 to TST 2 jacks.

Requirement: The frequency meter should read +3 cycles or more.

*** (B) Adjustment of MOD BAL R Control**

14.04 The test procedure for setting this control requires the removal of the input signal and the reading of the frequency meter. MOD BAL R is a balancing potentiometer that is correctly set when the frequency meter reads zero.

14.05 ***Procedure:***

(1) Remove the patch plugs from the branching and control panel.

(2) Adjust MOD BAL R to obtain a zero reading on the frequency meter.

(3) Insert patch plugs in OPR jacks on the branching and control panel.

* 15. CARRIER FREQUENCY CALIBRATION

15.01 This test outlines a procedure for comparing the frequency of the carrier oscillator with the 4.139 mc reference frequency.

15.02 ***Procedure:***

(1) Adjust MOD BAL R for zero reading on the frequency meter with no input to the terminal.

(2) Patch from the 4.139 mc reference frequency carrier jack to the REC IN jack. The frequency meter will indicate the frequency difference.

(3) Adjust the FREQ ADJ control on the carrier supply panel to obtain a zero reading on the frequency meter.

(4) Remove patch cords.

15.03 The above procedure assumes that the reference frequency is available at the receiver terminal. There are R3 installations where it is not available. In such cases connect the R3 terminal to an L3 line which is supplied with unmodulated 4.139 mc carrier (or a working line transmitting a picture in the normal fashion). It is assumed here that the carrier frequency of the T3 terminal is correct.

(1) Adjust the FREQ ADJ control on the carrier supply panel to obtain a zero reading on the frequency meter.

16. OVER-ALL BALANCE MEASUREMENTS

*** (A) Over-all Balance**

16.01 This test outlines the procedure for measuring over-all leak at signal (V), and the lower sideband of the carrier second harmonic. (2C-V)

16.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

16.03 ***Procedure:***

(1) Set up test arrangement as shown in Fig. 5 with the 201B connected to REC OUT jacks and the 56A oscillator adjusted to 0 db output at 4 mc.

(2) Tune the 37B TMS to 4 mc and measure the signal leak.

Requirement: 37B shall read −42 dbm or less.

(3) Tune the 37B TMS to 4.278 mc and measure the leak at lower sideband of the second harmonic of carrier.

Requirement: 37B shall read −45 dbm or less.

(4) If requirements of Steps (2) and (3) are not met, adjust the SIG BAL control. The final settings of the SIG BAL control is a compromise between the balance requirements at 4 mc and 4.278 mc. It is important to obtain the best possible adjustment of the SIG BAL making both of these products as low as possible.

*** (B) Harmonic Phase**

16.04 This test outlines the procedure for adjusting the HARM PHASE ADJ control on the carrier harmonic supply panel.

16.05 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

16.06 ***Procedure:***

(1) Set up test arrangement shown in Fig. 5, except that 56A oscillator is tuned for 8 mc output.

(2) Tune the 37B TMS to 4.417 mc and measure level.

(3) Adjust the HARM PHASE ADJ control with a nonmetallic screwdriver to obtain a minimum output power at 4.417 mc.

Requirement: 37B shall read −35 dbm or less.

If this requirement is not met, refer to Part 28.

(C) Adjustment of 542A Filter

16.07 This test outlines the procedure for adjusting the tuning capacitors on the 542A carrier suppression filter.

16.08 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

16.09 ***Procedure:***

(1) Connect receiver under test to a T3 terminal as shown in Fig. 8. Make no connections to the TRANS IN jacks. The T3 terminal should have its carrier adjusted as per Part 8. When the terminals are connected back-to-back the FREQ METER should read 0 ± 2, indicating that both carrier frequencies are adjusted properly.

(2) Connect the 37B set to the receiver output using the 201B transformer on the receiving console and tune it to 4.139 mc.

(3) Adjust the tuning capacitors on the 542A carrier suppression filter for a minimum output.

17. OVER-ALL FREQUENCY CHARACTERISTIC

17.01 This test outlines a procedure to adjust the 226L equalizer and measure the frequency characteristic of the R3 receiving terminal.

17.02 ***Apparatus:***

J68827A Sending Console

70B Power Meter

1 — Single Plug Coaxial Cord

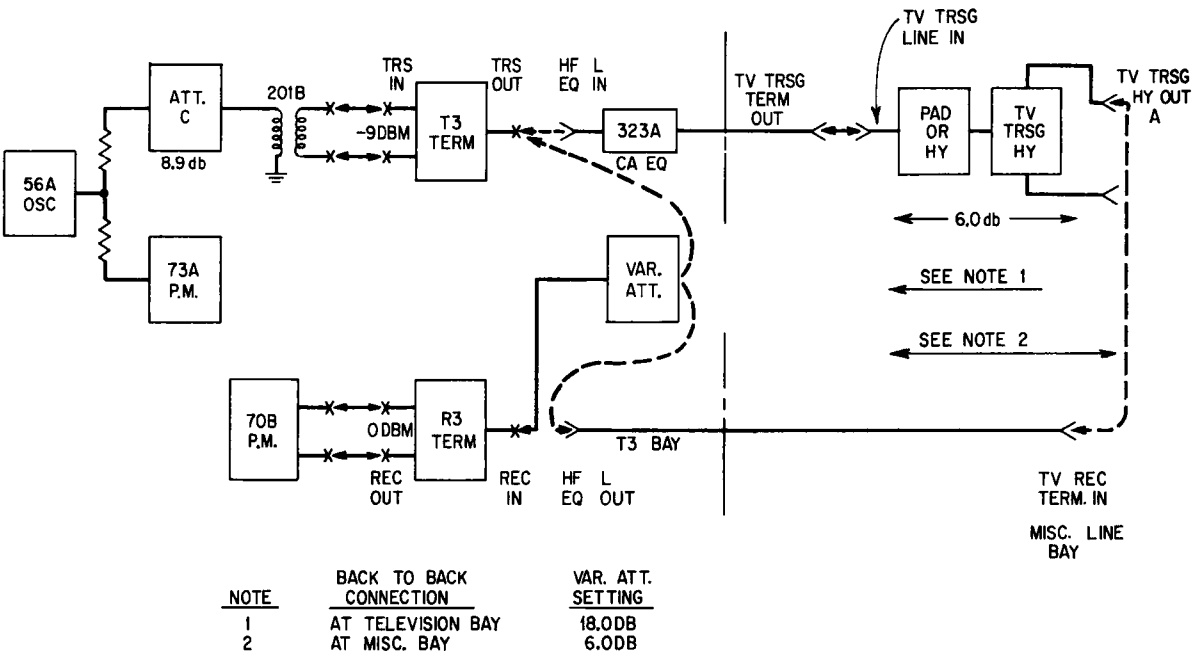
1 — Double Plug Coaxial Cord

17.03 ***Procedure:***

(1) Operate the POL DIS key located in the jack field to TST position.

(2) Set up test arrangement shown in Fig. 9.

(3) Set up the 70B power meter for 124 ohms and calibrate for 1 volt P/P.



NOTE	BACK TO BACK CONNECTION	VAR. ATT. SETTING
1	AT TELEVISION BAY	18.0DB
2	AT MISC. BAY	6.0DB

Fig. 8 – Test Arrangement for Adjusting 226J and 226K Equalizers and Measuring Terminals Back-to-Back

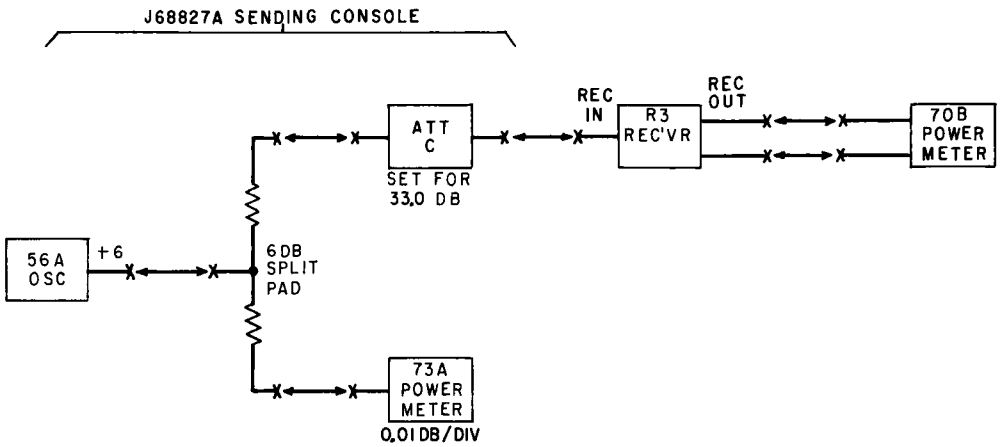


Fig. 9 – Arrangement for Measuring Receiver Characteristic

(4) Set the 56A oscillator for 4 mc and adjust for 0 dbm on 73A power meter.

(5) Adjust ATT C to obtain 0 dbm ± 0.05 db on the 70B power meter. The setting of ATT C should be 33 ± 0.5 db. If ATT C is outside this limit, check the terminal gain by making the test of Part 12. Record reading of 70B power meter.

(6) Repeat Steps (4) and (5) using 7.7 mc except that ATT C should not be adjusted.

Requirement: The reading of the 70B power meter obtained in Steps (5) and (6) should not differ by more than 0.1 db.

(7) If this limit is exceeded, adjust the 226L equalizer to meet the requirement.

(8) Repeat Steps (4) and (5) for each of the frequencies listed below. Do not change ATT C.

Requirement: Transmission of the R3 terminal shall be within the limits given below.

FREQUENCY — MC	DEVIATION FROM 4 MC MEASURED VALUE
3.50	0 ± 0.20
4.00	0
4.50	−0.05 ± 0.15
5.00	−0.15 ± 0.15
5.50	−0.15 ± 0.20
6.00	−0.05 ± 0.20
6.50	+0.05 ± 0.25
7.00	+0.05 ± 0.25
7.50	+0.05 ± 0.20
8.00	−0.05 ± 0.20
8.30	−0.25 ± 0.30

(9) Operate POL DIS key to NOR position.

T3-R3 MEASUREMENTS

18. ADJUSTMENT OF 226J AND 226K EQUALIZERS

18.01 The 226J and 226K equalizers are adjusted by making over-all tests from the input of the T3 transmitting terminal to the output of an R3 receiving terminal with the carrier side of the terminals connected together at the television bays. The TRS OUT jack of the T3 terminal is connected through a suitable pad to the REC IN jacks of the R3 terminal. The 226L equalizers in the T3 and R3 terminals should be adjusted to meet the requirements of Parts 10 and 17 before proceeding with this test. Power meter measurements on the output of the R3 receiving terminal are used to determine the correct setting of the 226J and 226K equalizers. The correct adjustment of these equalizers is important since maladjustment will result in picture smear.

18.02 ***Apparatus:***

T3 TERMINAL

J68827A Sending Console

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

R3 TERMINAL

Adjustable 75-Ohm Attenuator

70B Power Meter

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

18.03 ***Procedure:***

(1) Set up test arrangement shown in Fig. 8, Note 1, with the TRS OUT jacks of the T3 terminal connected directly to the input of the 75-ohm variable attenuator set for 18 db. The output of the attenuator is connected to the REC IN jacks of the R3 terminal.

(2) Set carrier level control key to BAL position in the T3 bay.

(3) Operate the POL DIS key to TST position in the R3 bay jack panel.

(4) Set the 56A oscillator to 900 kc and adjust for 0 dbm output on the 73A power meter.

(5) Set the 70B meter to 124 ohms and calibrate for 1 volt P/P.

(6) Adjust the variable attenuator (at the input of the R3 receiver) to obtain 0 ± 0.05 dbm on the 70B power meter. The attenuator should read 18 ± 1 db.

(7) Set the 56A oscillator to 250 kc and adjust for 0 dbm output on the 73A power meter.

(8) Adjust the 226J equalizer dial on the T3 terminal so that the 70B power meter, on the output of the R3 terminal, reads the same as 900 kc measured in Step (6).

(9) Set the 56A oscillator to 50 kc and adjust for 0 dbm output on the 73A power meter.

(10) Adjust the 226K equalizer dial on the T3 terminal so that the 70B power meter, on the output of the R3 terminal, reads the same as 900 kc measured in Step (6).

(11) Operate POL DIS key to NOR position.

18.04 If the T3 and R3 television terminals in the same office are physically separated so that it is not possible to connect their carrier sides together with a patch cord, an alternative procedure may be applied wherein the carrier sides of the T3 and R3 television terminals are connected together at the miscellaneous bay. The miscellaneous bay serves to connect television terminals to the L3 line connecting equipment. However, this connection introduces about 12 db additional loss due to the equalized connecting cable. This is compensated for by changing the variable attenuator to 6 db, as indicated in Fig. 8, Note 2. Apply the procedure given in Paragraph 18.03 to adjust the 226J and 226K equalizers.

18.05 The test arrangement used in Part 20 measuring the frequency characteristic of the T3 and R3 terminals on a back-to-back basis is the same as used in Part 18. The tests of Part 20 should be performed following the initial adjustment of the 226J and 226K equalizers.

18.06 The adjustment procedure of the 226J and 226K equalizers described above assumes that both a T3 and an R3 terminal are available in the same office. The back-to-back measurement is the preferred measurement to make in adjusting these equalizers. It is also the simplest procedure. Where a receiving terminal is not available, however, the back-to-back measurement can not be made, accordingly, the following method should be used.

18.07 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

18.08 ***Test Conditions:***

(1) Set up the test arrangement shown in Fig. 10.

(2) Operate the OPR-BAL key to the BAL position.

(3) Calibrate the 37B TMS by patching a 30.8 db pad between the 7.2 db attenuator and the 37B TMS. Set the 56A oscillator to 5039 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B TMS to 5039 kc and adjust the sensitivity knobs to obtain a

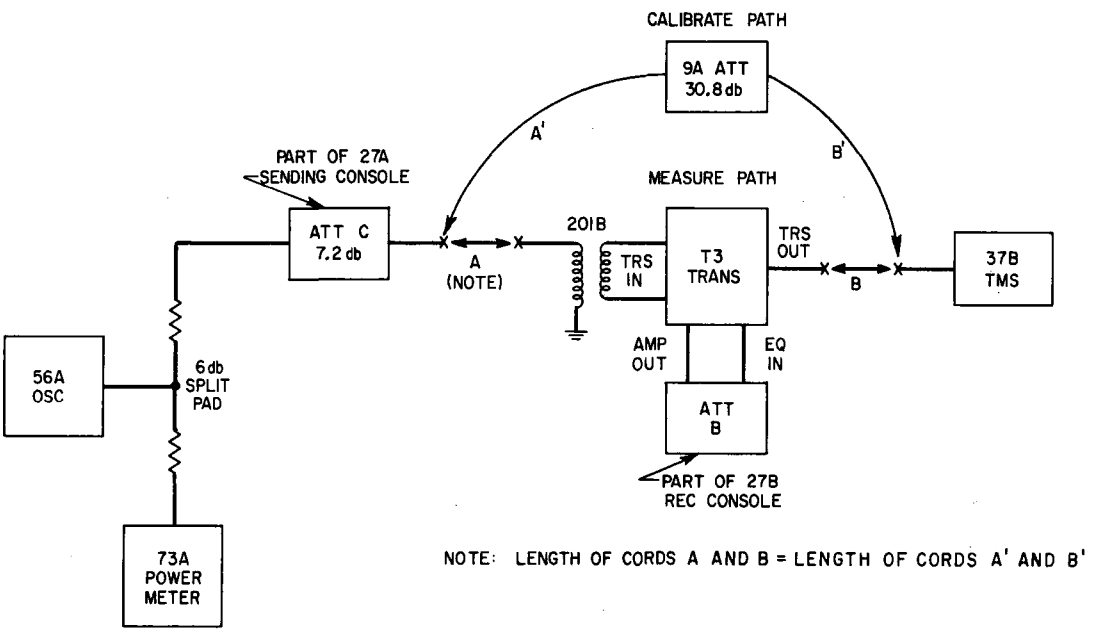


Fig. 10 – Test Arrangement for Adjusting 226J and 226K Equalizers Using the Transmitting Terminal Only

reading of −38 ± 0 dbm. Patch the 37B TMS to measure as shown in Fig. 10. Set the 56A oscillator to 900 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B to 5039 kc and adjust attenuator B to obtain a reading of −38 ± 0.1 dbm in the 37B. Note the attenuator setting.

(4) Set up the calibrate circuit of Fig. 10. Set the 56A oscillator to 4389 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B to 4389 kc. Note the 37B TMS reading.

(5) Set up the measure circuit of Fig. 10. Change the 56A oscillator to 250 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B TMS to 4389 kc. Adjust ATT B to obtain the same 37B TMS reading as noted in Step (4) ± 0.1 dbm. Record the ATT B setting.

(6) Determine the difference between the ATT B setting of Step (5) and the ATT B setting of Step (3). Record this difference.

(7) Set up the calibrate circuit of Fig. 10. Set the 56A oscillator to 3889 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B TMS to 3889 kc. Note the 37B TMS reading.

(8) Set up the measure circuit of Fig. 10. Change the 56A oscillator to 250 kc and adjust for 0 dbm on the 73A power meter. Tune the 37B TMS to 3889 kc. Adjust ATT B to obtain the same 37B TMS reading as noted in Step (7) ± 0.1 dbm. Record the ATT B reading.

(9) Determine the difference between the ATT B setting of Step (8) and the ATT B reading of Step (3). Record this difference.

(10) The 226J equalizer should be adjusted so that the two differences recorded in Steps (6) and (9) are related as shown in Table A.

Note: An effort should be made to achieve condition 1 which should be most readily attainable and the most desirable in the theoretical sense. Thus if the 226J equalizer is adjusted to make the difference between 5039 kc and 4389 kc, 1.49 db, the difference between 5039 kc and 3889 kc should be 16.08 ± 0.55 db. If condition 1 is not attainable, the other conditions are acceptable in the order listed. Upon final adjustment of the J equalizer the difference should correspond to one of the six conditions shown in Table A.

18.09 To adjust the 226K equalizer follow the procedure of Paragraph 18.08 except that other frequencies such as follows are used.

Step (2) — 56A oscillator and 37B TMS at 4189 kc

Step (3) — 56A oscillator at 50 kc
37B TMS at 4189 kc

Step (5) — 56A oscillator and 37B TMS at 4089 kc

Step (6) — 56A oscillator at 50 kc
37B TMS at 4089 kc

The required relationships between the differences between 5039 kc and 4189 kc and between 5039 kc and 4089 kc are also specified in Table A. Every effort should be made to then adjust the "K" equalizer to agree with the same condition as the "J" equalizer. This will then result in the best ripple in the vestigial region. If this condition is not attainable, the other conditions are acceptable.

TABLE A

PREFERRED ORDER OF FINAL ADJUSTMENT	226J EQUALIZER ADJUSTMENT DIFFERENCE IN ATTENUATOR SETTINGS FOR 5039/4389 Kc	5039/3889 Kc	226K EQUALIZER ADJUSTMENT DIFFERENCE IN ATTENUATOR SETTINGS FOR 5039/4189 Kc	5039/4089 Kc
1	1.49	16.08 ± 0.55	4.77	7.48 ± 0.21
2	1.71	15.04 ± 0.45	5.04	7.06 ± 0.19
3	1.71 ± 0.1	15.04	5.09 ± 0.16	7.06
4	1.49 ± 0.1	16.03	4.77 ± 0.16	7.48
5	1.59	15.55 ± 0.5	4.93	7.27 ± 0.2
6	1.59 ± 0.1	15.55	4.93 ± 0.16	7.27

18.10 Additional transmission measurements are to be made using the same general procedures as discussed in Paragraphs 18.06 through 18.09. The calibration of the 37B TMS is made at each of the measured frequencies listed in Table B.

TABLE B

56A OSC FREQ.—Kc	MEASURED FREQ.—Kc	REQUIREMENT
150	4289	Reading of Paragraph 18.08 (3) -3.1 ± 0.13 db
150	3989	Reading of Paragraph 18.08 (3) -10.46 ± 0.29 db
350	4489	Reading of Paragraph 18.08 (3) -0.3 ± 0.17 db

19. ADJUSTMENT OF 323A EQUALIZER

19.01 The 724-type cable from the T3 terminal bay to the L3 miscellaneous bay, the TV TRSG HY and PAD are equalized by strapping the proper lugs on the 323A equalizer. The lugs to be connected for various cable lengths are shown on a chart attached to the inside of the 323A equalizer cover.

19.02 ***Procedure:***

(1) Set the 56A oscillator to 7700 kc at 0 dbm output and connect to the HF L EQ IN jack of the T3 transmitter trunk at the T3 bay.

(2) Refer to the equalizer chart in the equalizer cover, and strap the lugs which will equalize the estimated length of cable between the T3 bay and the miscellaneous bay plus a 25-foot allowance for the hybrid.

(3) Calibrate the 37B at 7700 kc. Measure the 7700 kc output at the TV TRSG HY OUT A jack at the miscellaneous bay.

(4) Set the 56A oscillator to 3500 kc at 0 dbm output, calibrate the 37B to 3500 kc and then measure the 3500 kc output.

Requirement: The 3500 kc and 7700 kc measurements shall be within 0.1 db of each other.

Note: If the 3500 kc measurement is numerically lower, the trunk is underequalized. The strapping on the lugs should be moved to the next setting to equalize for greater length as obtained from the equalizer chart. Remeasure the 3500 kc and 7700 kc outputs and readjust the lug strapping on the equalizer, if necessary, to meet the transmission requirement.

20. BACK-TO-BACK TRANSMISSION TESTS

20.01 Over-all video transmission is measured with a T3 and R3 terminal connected back-to-back as shown in Fig. 8. This test should be made on a routine basis or as required. These measurements should also be made after the initial equalizer adjustments of Part 18 are completed. The 226J, K and L equalizers should not require readjustment tests until this is indicated as necessary due to the back-to-back transmission measurements being out of limits. If the frequencies out of limits lie between 50 and 900 kc, adjustment of the 226J or 226K or both equalizers is indicated. For this reason, measure 900 kc first and then measure the frequencies from 50 to 900 kc. If these measurements are out of limits, adjust the 226J or K or both equalizers as specified in Part 18.

20.02 ***Apparatus:***

T3 Terminal

J68827A Sending Console

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

R3 Terminal

Variable 75-Ohm Attenuator — KS-13964 as provided in console or equivalent

70B Power Meter

2 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

20.03 ***Procedure:***

(1) Set up test arrangement shown in Fig. 8, Note 1.

(2) In the T3 bay operate the carrier level control key to BAL position.

(3) In the R3 bay set the POL DIS key to TST position.

(4) Set the 56A oscillator to 900 kc and adjust the output for 0 dbm on the 73A power meter.

(5) Set the 70B power meter for 124 ohms and calibrate for 1 volt P/P.

(6) Measure the output level of the R3 terminal as indicated on the 70B power meter. Adjust the 75-ohm variable attenuator to obtain 0 ± 0.05 dbm on the 70B power meter.

(7) Repeat Steps (4) and (6) measuring the frequencies in the order listed below. Do not change the setting of the variable attenuator.

Requirement: Transmission through the T3 and R3 terminals connected back-to-back at the television bays shall be within the limits given below.

FREQUENCY — Mc	DEVIATION FROM 900 Kc MEASURED VALUE
0.05	0 ± 0.10
0.15	0 ± 0.15
0.25	0 ± 0.10
0.35	+0.05 ± 0.20
0.50	+0.05 ± 0.20
0.70	0 ± 0.20
0.90	0
1.50	−0.05 ± 0.25
2.00	+0.05 ± 0.30
2.50	+0.10 ± 0.30
3.00	+0.15 ± 0.30
3.50	+0.10 ± 0.30
4.00	−0.10 ± 0.30
4.20	−0.45 ± 0.35

(8) Return the carrier level control key to OPR position and the POL DIS key to NOR position. Remove test patch cords and restore patch plugs to normal.

20.04 The preferred method of testing television terminals on a back-to-back basis is to connect the carrier jacks together at the television bay as specified in Paragraph 20.03. However, when the terminals are separated so that it is not physically possible to make this connection the terminals may be connected at the miscellaneous bay by patching from the TV TRSG TERM OUT jack to the TV REC TERM IN jack. This test arrangement is shown in Fig. 8, Note 2.

20.05 ***Procedure:***

(1) Set up the test arrangement shown in Fig. 8, Note 2.

(2) In the T3 bay operate the carrier level control key to BAL position.

(3) In the R3 bay operate the POL DIS key to TST position.

(4) Set the 56A oscillator to 900 kc and adjust the output for 0 dbm on the 73A power meter.

(5) Set the 70B power meter for 124 ohms and calibrate for 1 volt P/P.

(6) Measure the output level of the R3 terminal as indicated on the 70B power meter. Adjust the 75-ohm variable attenuator to obtain 0 ± 0.05 dbm on the 70B power meter.

(7) Repeat Steps (4) and (6) measuring the frequencies in the order listed below. Do not change the setting of the variable attenuator.

Requirement: Transmission through the T3 and R3 terminals connected back-to-back at the L3 miscellaneous bay shall be within the limits given below.

FREQUENCY — Mc	DEVIATION FROM 900 Kc MEASURED VALUE
0.05	0 ± 0.10
0.15	0 ± 0.15
0.25	0 ± 0.10
0.35	+0.05 ± 0.20
0.50	0 ± 0.10
0.70	0 ± 0.25
0.90	0
1.50	0 ± 0.30
2.00	+0.09 ± 0.40
2.50	+0.15 ± 0.40
3.00	+0.20 ± 0.40
3.50	+0.15 ± 0.45
4.00	−0.05 ± 0.45
4.20	−0.40 ± 0.50

(8) Operate the carrier level control key to OPR position and the POL DIS key to NOR position. Remove test patch cords and restore patch plugs to normal.

21. ADJUSTMENT OF PILOT SUPPRESSION FILTER

21.01 The following procedures cover centering the suppression peaks of the 542B filter at the two pilot frequencies, 7266 kc and 8320 kc, appearing in the TV band. Each filter has two sections, each of which has a capacitor associated with the 7266 kc and 8320 kc element of the pilot elimination filter. One filter section is located near the center of the panel and the other at the left end. In filters marked "Modified per SD-50001-01" the section at the center of the panel is disabled, so that only the capacitors located at the left end of the panel need be tuned.

(A) T3 Transmitting Terminal

21.02 The filter in the T3 terminal is intended to attenuate components of the video signal in a narrow band centered at each of the two pilots. T3 terminals are used only at the transmitting end of an L3 line, or at switching main repeaters where the through connection in the TV band is made at video through an R3 and T3 terminal connected in tandem. At either of these points a spare pilot jack is available as a source of transmitted pilots. A frequency about midway between the two pilots is applied to the circuit at the same point as pilots will be applied in order to serve as a reference so that transmission at the peaks of the adjusted filter may be checked against it.

21.03 In this test the transmitted pilots are used to adjust the 542B pilot suppression filters to obtain maximum loss at 7266 kc and 8320 kc.

21.04 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

3 — P2BJ Cords

21.05 ***Procedure:***

(1) Set up the test arrangement as shown in Fig. 11. The T3 terminal must be out of service.

(2) Remove patch plugs between TRS OUT and HF L EQ IN (in jack field), and between MOD OUT and VSTGL FLT IN on CLC. Then patch from HF L EQ IN to VSTGL FLT IN on the CARR LEV CONT panel. This provides a circuit from the L3 miscellaneous bay through the PEF to HF AMP 1 OUT.

(3) Remove the patch plug from EQ IN and AMP OUT jacks in the HF AMP 1 panel. Patch the TMS jack to AMP OUT.

(4) Send a power of −45 dbm at 7800 kc into the TV TRSG TERM OUT jack, mounted in the L3 miscellaneous bay, associated with the terminal to be adjusted. Measure the

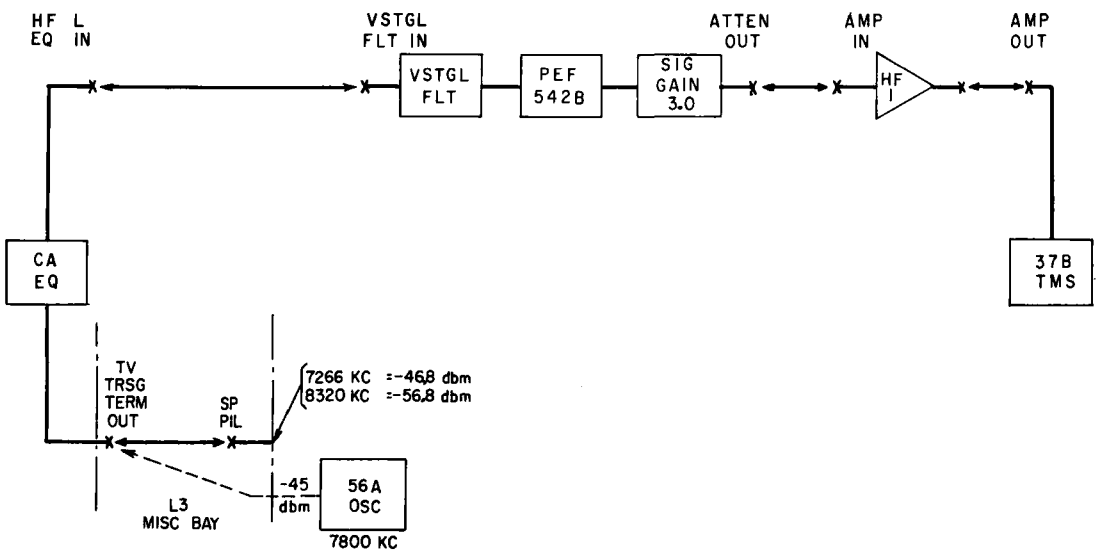


Fig. 11 — Test of Pilot Elimination Filter Loss in the T3 Terminal

7800 kc power received at AMP OUT, and note this value.

Requirement: −38 ± 3 dbm.

(5) Disconnect the oscillator from TV TRSG TERM OUT, and connect the TV TRSG jack to a SP PIL jack. (This jack may deliver either two or all six pilots.)

(6) Tune the TMS carefully to the 7266 kc pilot, adjusting sensitivity as required for a reading close to 0 db. Adjust the capacitor associated with the 7266 kc element of the pilot elimination filter, located at the left end of the filter panel, to minimize the reading of the TMS.

Requirement: The 7266 kc power should be 30 db or more below the measured 7800 kc power.

(7) To measure the 8320 kc power and adjust the capacitors associated with the 8320 kc element of the pilot elimination filter, proceed as in Step (6).

Requirement: The 8320 kc power should be 40 db or more below the measured 7800 kc power.

(B) R3 Receiving Terminal

21.06 At the receiving end of an L3 system the PEF appears either in the line connecting equipment or the R3 terminal. The filter suppresses pilot frequency interference in the video output.

21.07 The following procedure is employed when the 542B filter is present in the R3 terminal.

21.08 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

4 — P2BJ Patch Cords

21.09 ***Procedure:***

(1) The R3 terminal must be out of service.

(2) Remove the patch plug from HF L EQ OUT and REC IN jacks. Send a power of −49 dbm at 7800 kc into the REC IN jack.

(3) Remove the patch plug from SIG HYB OUT and DEM IN on the DEM panel. Measure the 7800 kc power at SIG HYB OUT, using the 37B set. Record the measured value.

Requirement: −13 ± 3 dbm.

(4) Disconnect the oscillator from REC IN and restore the patch plug between this jack and HF L EQ OUT, thus sending pilots into the terminal.

(5) Tune the TMS to the 7266 kc pilot, adjusting sensitivity as required, then adjust to obtain close to 0 db reading. Adjust the capacitor associated with the 7266 kc element of the pilot elimination filter, located at the left end of the filter panel, to minimize the reading of the TMS.

Requirement: The measured 7266 kc power should be 30 db or more below the measured 7800 kc power.

(6) To measure the 8320 kc power and adjust the capacitors associated with the 8320 kc element of the pilot elimination filter, proceed as in Step (5).

Requirement: The 8320 kc power should be 40 db or more less than the measured 7800 kc power.

(7) Restore normal patches.

22. DIFFERENTIAL PHASE AND GAIN TEST

22.01 In the transmission of color television, distortions of hue will occur if the transmission system produces a different phase shift in the color subcarrier at different amplitudes of the luminance signal. This variation in phase shift caused by variations in amplitude of the luminance signal is called differential phase. Distortions of color saturation will occur if the gain of the transmission system to the color carrier is different for different amplitudes of the luminance signal. This variation in the amplitude transmission of the color signal caused by variation in the amplitude of the luminance signal is called differential gain.

22.02 The amount of differential phase and gain distortion at the color carrier frequency is measured by the 47A transmission measuring system. The measurements are made by connecting the L3 television terminals together at the line side on a back-to-back basis and testing from the video side as illustrated by the block diagram of Fig. 12. The modulator and demodulator signal balances must be set properly in order to measure differential phase and gain. Poor balances will result in an oscilloscope

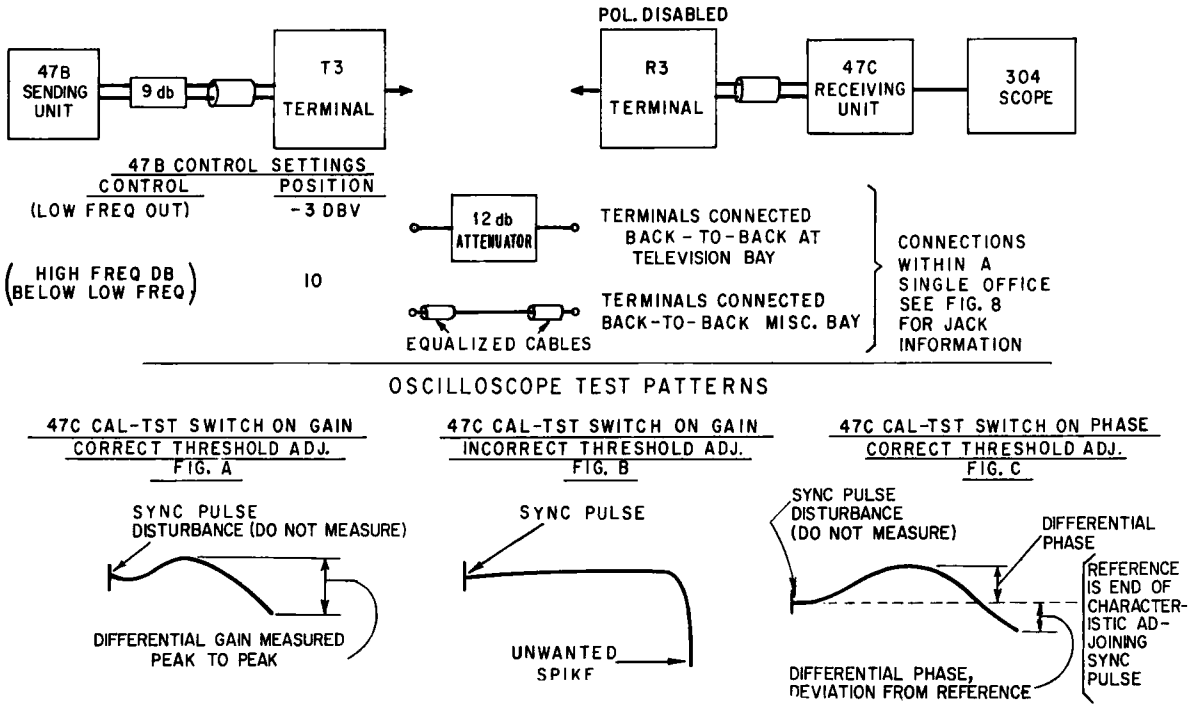


Fig. 12 – Test Arrangement for Differential Phase and Gain Test

display which is difficult to interpret. A poor carrier balance will result in a thick trace on the oscilloscope.

22.03 ***Apparatus:***

47B Sending Unit

47C Receiving Unit

Oscilloscope — DuMont 304A, 304AR, or 304AH

75-Ohm Attenuator — 12 db

T3 and R3 Terminal Controls

Carrier Level Control to "OPR"

POL DIS key to TST position

22.04 ***Procedure:***

(1) Set up the test circuit shown in Fig. 12 with the 47B control settings as indicated.

(2) Calibrate the 47C unit and the oscilloscope as directed in Section E47.423 — R70.785 and addendum. (The oscilloscope should be calibrated for a deflection of 10 divisions per 1 db or 5 degrees of differential distortion.)

(3) To check for correct polarity of sync pulse at the input of the T3 terminal, connect an unbalanced cord between the Y-INPUT jacks on the scope and the upper MON IN jack on the terminal. Operate the SYNC PULSE switch on the 47B to ON. If the polarity is correct, the sync pulse will appear at the bottom of the trace. If the pulse appears at the top of the trace, reverse the balanced plug at the input of the terminal. To check for correct polarity of sync pulse at the output of the R3 terminal, restore the normal test connection to the Y-INPUT of the scope. The sync disturbance due to the pulse should appear at the left end of the trace. If not, reverse the balanced plug at the REC OUT jacks of the terminal.

(4) To measure differential gain, set the CAL-TST switch on the 47C unit to the GAIN position. If the THRESHOLD CONTROL on the clipper panel is set high or is properly adjusted, the oscilloscope trace will appear as shown in Fig. A of Fig. 12. If the control is set too low, the trace will appear as in Fig. B. Differential gain is measured as the peak-to-peak vertical deviation of the scope trace, ex-

cluding the sync pulse disturbance. If the scope trace has some width, due to imperfect adjustment of the carrier balance, use either the upper or lower edge of the trace for measuring purposes.

Requirement: 0.1 db for differential gain.

(If the oscilloscope was calibrated for 10 divisions per db, the trace curvature should not exceed 1 division.)

(5) To measure the differential phase in the terminals, operate the CAL-TST switch of the 47C unit to phase. The oscilloscope pattern should appear as shown in Fig. C of Fig. 12. Adjust the Y-POSITION control on the scope until the end of the trace adjacent to the sync pulse disturbance is coincident with the reference center line of the screen. Differential phase is measured as a deviation from the phase at sync pulse level, the reference just established.

Requirement: ±0.25 degree of differential phase.

(If the scope was calibrated for 10 divisions for 5 degrees, the trace, excluding sync pulse disturbance, should not depart from the reference line by more than 0.5 division.)

(6) If either requirement is exceeded, test the video section of the T3 terminal by connecting the 47C receiving unit to the VID AMP OUT jacks of the T3 terminal. To test the video section of the R3 terminal, connect the 47B transmitter to the VID AMP IN jacks (using the 9 db pad and LF OUT = −11 DBV) and measure with the 47C at the REC OUT jacks. For video components in the individual terminals, the requirements should be half that given in Steps (4) and (5). If the video sections meet requirements, but the over-all terminal does not, one or more of the HF amplifiers are likely to be in trouble.

(7) The correct setting of the THRESHOLD CONTROL is easily found using the 47A sets. Increase the LOW FREQ OUT control on the 47B unit to 0 dbv. Adjust the THRESHOLD CONTROL to the point where the unwanted spike of Fig. B just becomes perceptible. The clipper THRESHOLD CONTROL may also be adjusted with the 47C receiver connected to the AMP OUT jacks of the T3 video amplifier.

OTHER TESTS

23. GAIN CHECKS IN TRANSMITTER TERMINAL

23.01 If the gain measurement specified in Part 6 is out of limits, measurements should be made to determine the reason. Normal operating levels are shown in Fig. 13 for the T3 transmitting terminal. The signal amplitudes preceding the modulator are given in terms of dbv for a full amplitude video signal. At the modulator output the power of the unmodulated carrier is shown in dbm. Beyond the vestigial filter two numbers are shown, as for example $\overline{-13}\,|\,-15$ at the transmitter output. With no video applied to the T3 terminal, the unmodulated carrier at the output should be −13 dbm. For a sine-wave video input of −9 dbv (between 1 mc and 4 mc) the sideband power at the output should be −15 dbm. Deviations in the order of ±2.5 db can be corrected by adjusting the SIG GAIN control. Hence measurements will usually be made to investigate relatively large errors.

23.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

1 — Single Plug Coaxial Cord

1 — Double Plug Coaxial Cord

23.03 ***Procedure:***

(1) If the requirement of Paragraph 6.04 Step (4) can not be met, set up the test arrangement of Fig. 14.

(2) Set key on carrier level control panel to BAL position.

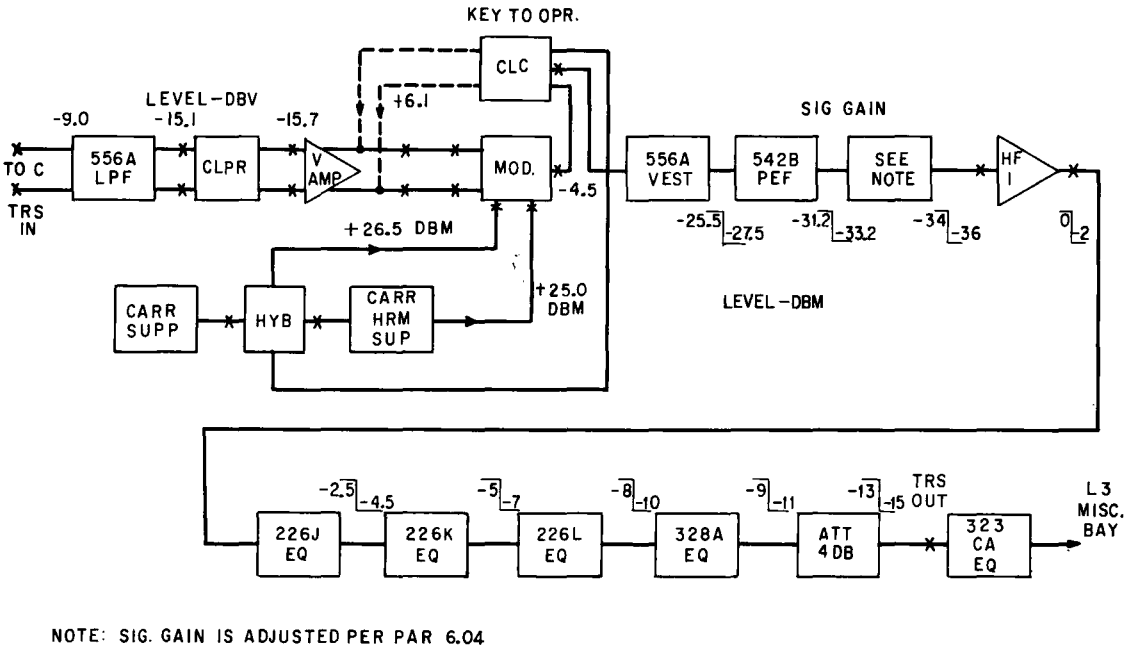
(3) Set 56A oscillator for 1 mc and adjust for 0 dbm output on the 73A power meter.

(4) Remove the patch plug from MOD OUT jack in the modulator panel.

(5) Calibrate the 37B TMS for −12 dbm at 5.139 mc per Paragraph 6.03 and measure power at MOD OUT jack.

Requirement: 37B shall read −12.5 ± 1 dbm.

(6) If this requirement is met, the trouble is in the carrier portion of the transmitting terminal where carrier powers should now be measured. If the requirement is not met, refer to Paragraph 23.04 for video measurements.



NOTE: SIG. GAIN IS ADJUSTED PER PAR 6.04

Fig. 13 – Block Diagram of T3 Transmitting Terminal

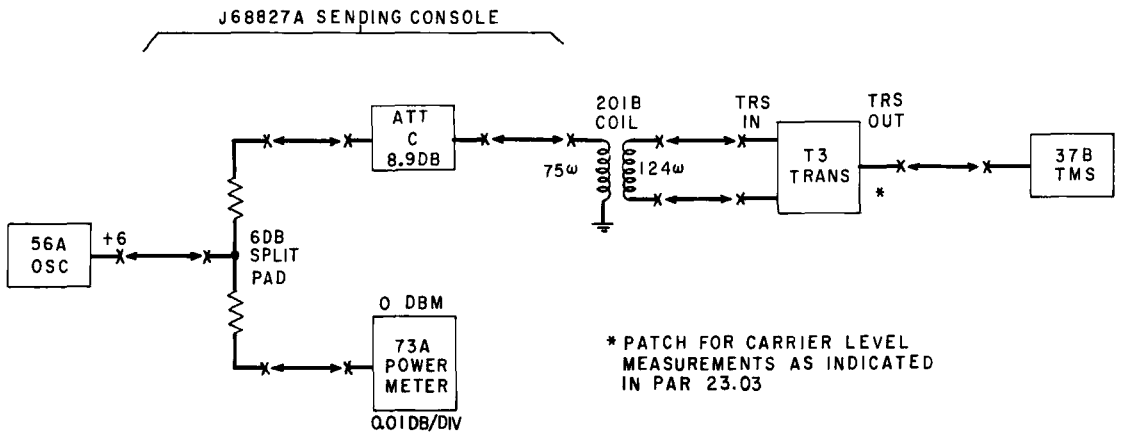


Fig. 14 – Test Arrangement for Checking Carrier Level in Carrier Section

(7) Remove the 1 mc signal from the TRS IN jacks.

(8) Operate the carrier level control key to OPR position to transmit unmodulated carrier.

(9) Calibrate the 37B TMS for 0 dbm at 4.139 mc per Paragraph 6.03 and measure power at MOD OUT jack on the carrier level control panel.

Requirement: 37B shall read −4.5 dbm.

(10) If this requirement is not met, adjust the CARR LEV control on the carrier level control panel to obtain −4.5 dbm.

(11) If the CARR LEV control can not be adjusted to obtain −4.5 dbm, make the carrier level control tests outlined in Part 29 of this section.

(12) Measure carrier powers by removing patch plugs, as necessary and patching the 37B to various jacks as follows.

MEASURE	MEASURE ÁT	REQUIREMENT — Dbm
Filter section output	ATTEN OUT jack at HF AMP 1 panel	−34.0 ± 1.0
HF AMP 1 output	AMP OUT jack at HF AMP 1 panel	0 ± 1.0
Terminal output	TRS OUT jack at jack panel	−13.0 ± 1.0

23.04 If the requirement of Paragraph 23.03 Step (5) is not met, the trouble is in the video portion of the circuit where amplitudes should now be measured.

23.05 ***Procedure:***

(1) Set up test arrangement of Fig. 15.

(2) Set 56A oscillator for 1 mc and adjust for 0 dbm output on the 73A power meter.

(3) Measure video amplitudes by removing patch plugs, as necessary, and patching the balance side of the 201B coil to various jacks as indicated below. Set ATT B at zero loss except when measuring the output of the video amplifier. For this measurement, increase ATT B to obtain a negative value on the 37B set and correct its reading by adding the setting value of ATT B to the 37B set reading.

MEASURE	MEASURE AT	REQUIREMENT — Dbm
556A filter output	LPF OUT jacks in clipper panel	−15.1 ± 0.5
Clipper output	CLPR OUT jacks at video amplifier panel	−15.7 ± 0.7
Video amplifier output	AMP OUT jacks at video amplifier panel	+6.1 ± 1.0

23.06 Amplitude discrepancies in a particular circuit should be investigated by making electron tube filament activity tests, alignment tests, and voltage measurements as prescribed in this section.

24. GAIN CHECKS IN RECEIVER TERMINAL

24.01 If the gain measurement specified in Part 12 is out of limits, measurements should be made to determine the reason. Normal operating levels are shown in Fig. 16 for the R3 receiving terminal. Signal amplitudes between the demodulator output and the terminal output are given in terms of dbv. Signal amplitudes preceding the demodulator are described in terms of two numbers, as for example $\overline{-25}\,|\,-27$ at the receiver input. This means that the nominal value of the unmodulated carrier at this point is −25 dbm and that the nominal power for a full amplitude sideband signal is

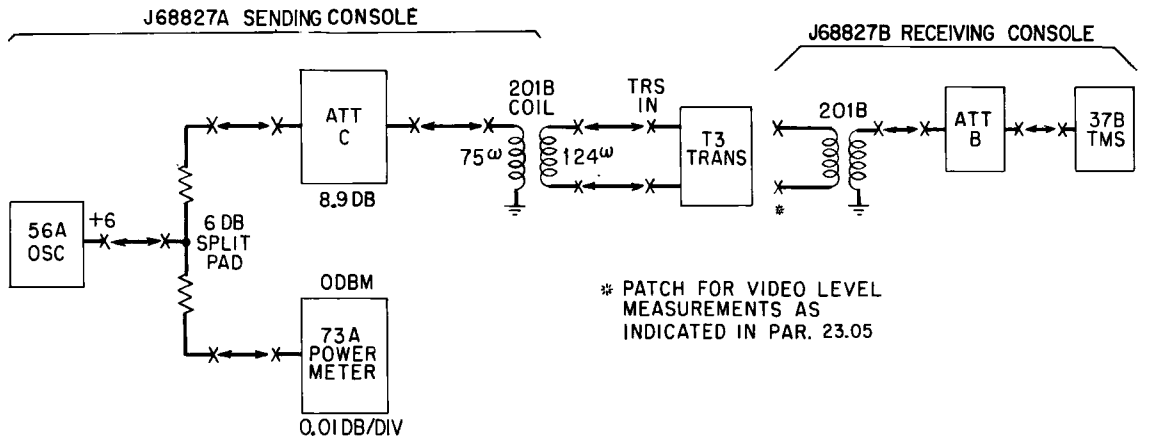


Fig. 15 — Test Arrangement for Checking Signal Amplitudes in Video Section

−27 dbm. Deviations in the order of ±2.5 db can be corrected by adjusting the SIG GAIN control. Hence, measurements will usually be made to investigate relatively large errors.

24.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

3 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

24.03 ***Procedure:***

(1) If the requirement of Paragraph 12.03 Step (6) can not be met, measure the demodulator output voltage in order to sectionalize the trouble in the carrier or video section.

(2) Use the test arrangement of Fig. 6, setting 56A oscillator to 4 mc and 0 dbm output on the 73A power meter.

(3) Remove the patch plugs from DEM **OUT** jacks in the demodulator panel.

(4) Tune and calibrate the 37B TMS for −16 dbm at 139 kc per Paragraph **6.03** and measure the power at the DEM **OUT** jacks by patching the balanced side of the 201B coil to these jacks. Adjust the SIG GAIN control to obtain requirement.

Requirement: 37B shall read −15.8 ± 0.25 dbm.

(5) If this requirement is met, the trouble is in the video section of the terminal where amplitudes should now be measured. If the requirement is not met, refer to Paragraph 24.04 for carrier measurements.

(6) Measure video amplitudes at CSF **OUT** and AMP OUT jacks on the video amplifier panel.

Requirement: 37B shall read −22.8 ± 0.5 dbm at CSF OUT jacks and 0 ± 0.8 dbm at AMP OUT jacks.

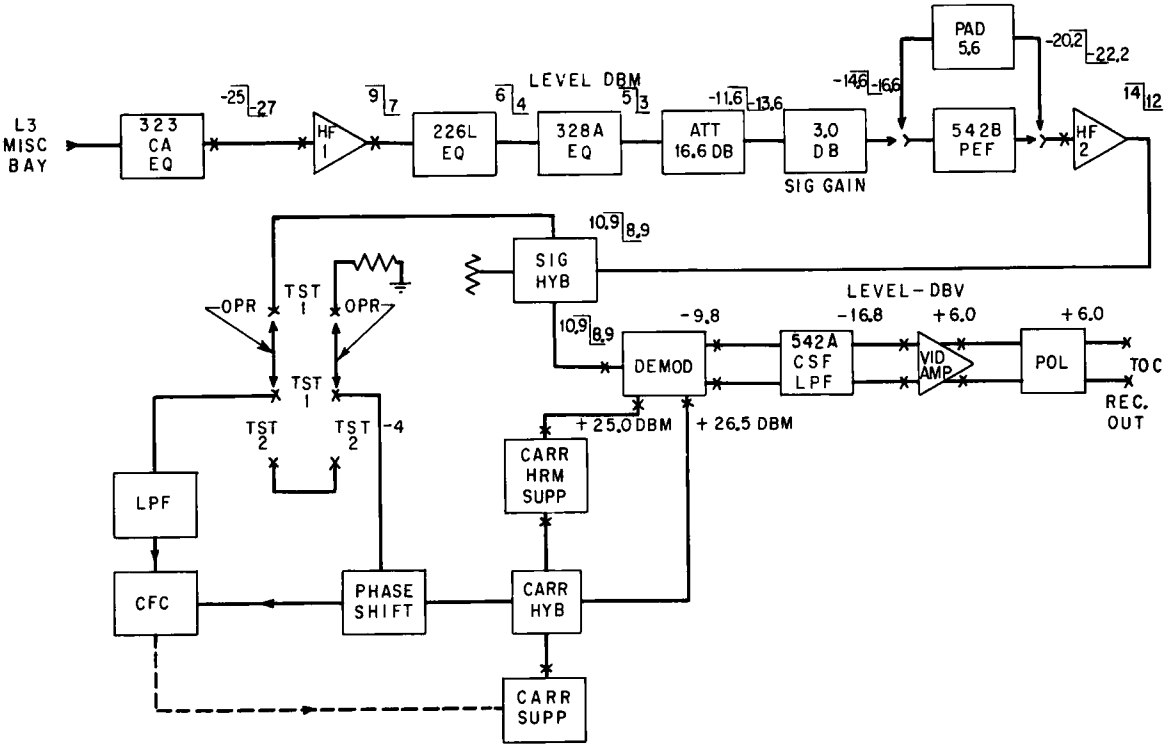


Fig. 16 — Block Diagram of R3 Receiving Terminal

24.04 If the requirement of Paragraph 24.03 Step (4) was not met, measurements should be made in the carrier section.

24.05 ***Procedure:***

(1) Set up test circuit of Fig. 6 except the 201B coil is not used.

(2) Set 56A oscillator to 4 mc and adjust for 0 dbm output on the 73A power meter. Change ATT C to 40 db.

(3) Measure carrier powers by removing the patch plugs on the branching and control panel and patching the 37B TMS to the upper left-hand jack of TST 1 jack (shown in Fig. 16) on branching and control panel.

Requirement: 37B shall read -4 ± 0.25. Adjust SIG GAIN control, if necessary, to obtain this requirement.

(4) If requirement can not be met, set the SIG GAIN control to 2 db. Measure carrier levels by patching the 37B TMS to various jacks indicated below, as necessary to sectionalize the trouble. ATT C remains set at 40 db in order to read negative levels.

MEASURE	MEASURE AT	REQUIREMENT — Dbm
HF AMP 1 output	AMP OUT jack at HF AMP 1 panel	-6.0 ± 1.0
Equal and flt. section output	PEF OUT jack at HF AMP 2 panel	-35.0 ± 1.0
HF AMP 2 output	AMP OUT jack at HF AMP 2 panel	-1.0 ± 1.4

24.06 Discrepancies in a particular circuit should be investigated by making the electron tube filament activity tests, alignment tests and voltage measurements as specified in this section.

25. CARRIER FREQUENCY CONTROL TESTS

(A) Gain Check of DC Amp

25.01 The following measurements are made to check the dc amplifier portion of the carrier frequency control circuit.

25.02 ***Procedure:***

(1) Remove the patch plug between the CARR OUT and CARR HYB IN jacks on the carrier supply panel and the patch plugs on the branching and control panel.

(2) Adjust the MOD BAL R control and make certain that the FREQ meter reading can be varied ± 25 cycles.

(3) Adjust the MOD BAL R control to obtain a -20 reading on the FREQ meter. Note the MOD BAL R dial setting.

(4) Rotate the MOD BAL R dial knob reading by 10 divisions, in the direction to make the frequency meter reading increase. The FREQ meter should now read between 0 and $+20$ cycles.

(5) Adjust MOD BAL R to obtain zero reading on frequency meter.

Requirement: Dial reading of MOD BAL R shall be 5 ± 3.

(6) If the requirement of Step (5) is not met, tubes V4 and V5 of the carrier frequency control panel should be tested in a KS-15560, L1 or L2 or KS-15559, L1 vacuum tube test set.

(7) Restore the patch plugs to OPR jacks on branching and control panel and to the jacks on carrier supply panel.

(B) SIG and CARR BAL Adjustment

25.03 ***Apparatus:***

J68827B Receiving Console

1 — Single Plug Coaxial Cord

25.04 ***Procedure:***

(1) This test should be made once each month or when a tube in one of the squaring circuits (V1), (V2), (V7), or (V8) has been replaced.

(2) Patch the 37B transmission measuring set to the HF TEST jack on the carrier frequency control panel, and tune it to 4.139 mc. Adjust the CARR BAL control to obtain a minimum reading.

Requirement: 37B shall read -60 dbm or less.

(3) Remove both the upper left-hand patch plug on the branching and control panel and the patch plug between the CARR OUT and CARR HYB IN jacks on the carrier supply panel.

(4) Patch the TST output of the carrier supply circuit directly to the center left-hand jack of the group of six jacks on the branching and control panel.

(5) Adjust the SIG BAL control on the carrier frequency control panel for a minimum reading of the 37B set.

Requirement: 37B shall read −50 dbm or less.

(6) Restore the patch plug connections on the carrier supply panel and the branching and control panel OPR jacks.

(C) MOD BAL X Adjustment

25.05 ***Apparatus:***

J68827A Sending Console

Vacuum Tube Voltmeter such as Model 300 Ballantine

Electronic Voltmeter (0.01-volt sensitivity)

1 — Shielded Cord with 347-Type Plug

2 — Single Plug Coaxial Cords

Nonmetallic Screwdriver

25.06 ***Procedure:***

(1) The MOD BAL X control may require readjustments when tube V4 of the carrier frequency control panel has been changed.

(2) Remove the patch plugs from the group of six jacks on branching and control panel. Remove the patch plug between the CARR HRM IN and CARR HYB OUT jacks on the carrier harmonic supply panel.

(3) Set the 56A oscillator to approximately 4.139 mc and adjust its output for 0 ± 1 dbm.

(4) Set up test circuit of Fig. 17. The HF amplifier is used as a buffer amplifier for this test.

(5) Adjust the MOD BAL R control on the carrier frequency control panel to obtain a zero reading on the frequency meter.

(6) Adjust the frequency of the 56A oscillator to obtain a maximum reading of the vacuum tube voltmeter.

Requirement: If the voltmeter reads more than 0.03 volt, a readjustment of the MOD BAL X control should be made.

(7) If the above requirement is not met, adjust the MOD BAL X control with a nonmetallic screwdriver to obtain a minimum voltmeter reading when the frequency meter is set to zero reading. This is a critical adjustment and ***must*** be done in very small increments. After each small change of MOD BAL X, MOD BAL R ***must*** be readjusted for a zero reading of the frequency meter. The best adjustment of the MOD BAL X control results in a minimum reading (less than 0.04 volt) of the vacuum tube voltmeter when the frequency meter is set to zero by the MOD BAL R control.

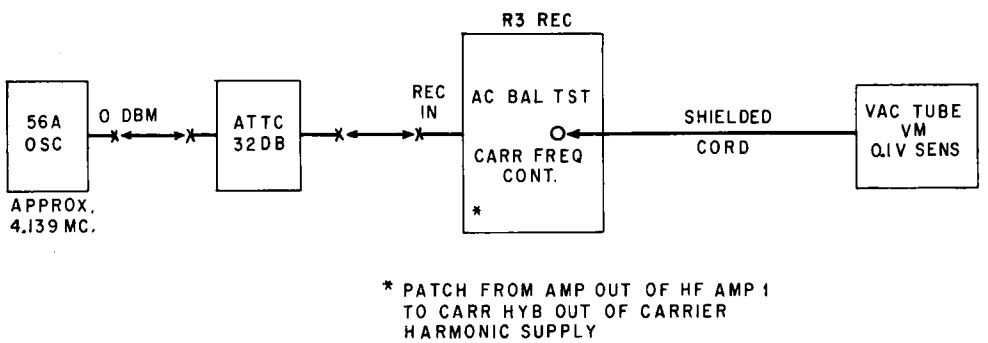


Fig. 17 – Test Arrangement for Adjusting MOD BAL X Control of the Carrier Frequency Control — R3 Terminal

(8) It is possible for the control circuit to oscillate when the MOD BAL X control is set near the limit of its adjustment range. This is indicated when the frequency meter needle slowly oscillates between scale reading of +25 and −25 cycles. When this occurs, set the MOD BAL X capacitor to its middle position and repeat tests.

(9) Restore the normal patching on the branching and control panel, carrier harmonic supply panel, HF AMP 1, and disconnect the vacuum tube voltmeter.

(D) Tuning of 8.278 Mc Interstages

25.07 If the PHASE BAL adjustment specified in Part 14(A) can not be made, it may be that the Z2, Z3, and Z4 networks on the carrier frequency control panel are not adjusted properly. Each of these networks has an adjustable inductance and these tests outline the procedures for adjusting these tuned networks.

25.08 ***Apparatus:***

J68827B Receiving Console

1 — Single Plug Coaxial Cord

1 — Nonmetallic Screwdriver — Walsco No. 2520 or its equivalent

25.09 ***Procedure:***

(1) Remove the patch plugs from the branching and control panel.

(2) Patch the 37B TMS to the HF TST jack on the carrier frequency control panel. Tune the 37B TMS to 8.278 mc and measure the output. 37B TMS should read about −22 dbm.

(3) Adjust Z4 for a maximum HF TST output by tuning the coil slug with a nonmetallic screwdriver.

Requirement: Set Z4 slug so that the output is within 0.02 db of the maximum output when measured on the 37B TMS.

(4) Remove the patch plug on carrier supply panel.

(5) Patch the TST jack of the carrier supply panel to the center left-hand jack of the group of six jacks on the branching and control panel.

(6) Measure the 8.278 mc output at the HF TST jack of the 37B TMS. 37B should read about −28 dbm.

(7) Adjust Z2 for a maximum output on the 37B TMS by tuning the coil slug with a nonmetallic screwdriver.

Requirement: Set the Z2 slug so that the output is within 0.02 db of the maximum HF TST output when measured on the 37B TMS.

(8) Adjust Z3 for maximum output on the 37B TMS by tuning the coil slug with an insulated screwdriver.

Requirement: Set the Z3 slug so that the output is within 0.02 db of the maximum HF TST output when measured on the 37B TMS.

(9) Remove test cords and restore patch plugs to the normal connection.

Caution: Z5 is a factory adjustment and should not be touched.

(E) QUAD PHASE SHIFTER Adjustment

25.10 The carrier and the signal must be very nearly in phase at the demodulator to minimize quadrature distortion in the video output. The carrier frequency control circuit maintains an in-phase relationship between the carrier and signal. The QUAD TST key is located on the branching and control panel and when it is pressed, the control current is reversed in the circuit connection between the carrier frequency control and the carrier supply panels. This action shifts the carrier by 90° thus placing the carrier and the signal in quadrature if the phase shifter of AT4 is adjusted correctly. While the QUAD TST button is pressed, the phase shifter screw adjustment of AT4 is tuned as described in the following test procedures to obtain a minimum real output from the demodulator. Under these conditions the carrier and the signal will be in phase at the demodulator when the QUAD TST button is released. The phase relationship may be checked and adjusted in the following manner.

25.11 ***Apparatus:***

KS-15512 Oscilloscope

341F Terminating Plug (124 Ohms)

25.12 ***Procedure:***

(1) This test consists of energizing the R3 terminal with an L3 carrier signal modulated by a video signal such as a test pattern. The L3 carrier signal may be obtained from another city via the L3 line or on a local basis if a T3 transmitting terminal is available. The input video signal to the T3 terminal should be full amplitude (−9 dbv). The test signal is observed on the oscilloscope while the phase shifter screw adjustment is tuned for the best condition with the QUAD TST button pressed.

(2) Set up the test arrangement of Fig. 18. Connect an attenuator between the terminals when connecting back-to-back on a local basis. Set the attenuator to 12 db if the terminals are connected at the television bays. Set it to 6 db if the terminals are connected at the miscellaneous bay. If the carrier is being energized at a distant office, the R3 terminal should be connected to the L3 connecting equipment by means of the normal connecting trunk to the miscellaneous bay. Connect the oscilloscope input to the top monitor jack of the REC OUT jacks in the jack field.

(3) Operate the POL DIS key to TST position.

(4) Set the oscilloscope controls as follows:

Calibrate for 1 volt P/P equals 100 divisions

SYNC SELECTOR – – – Negative

SWEEP FREQUENCY – – – LO

BANDWIDTH – – – 6 mc

INPUT – – – 1:1

(5) The oscilloscope presentation should be similar to Fig. 18A.

(6) Increase the H gain control of the oscilloscope to obtain an expanded presentation similar to Fig. 18B.

(7) Press the QUAD TST button. The oscilloscope presentation should be similar to Fig. 18C. Observe the region indicated by the arrow in Fig. 18C. Increase V gain of oscilloscope to maximum and tune the phase shifter (AT4) until minimum amplitude is obtained above and below the base line for the region indicated by the arrow. The phase shifter (AT4) is now set for the best adjustment. With this adjustment a minimum real com-

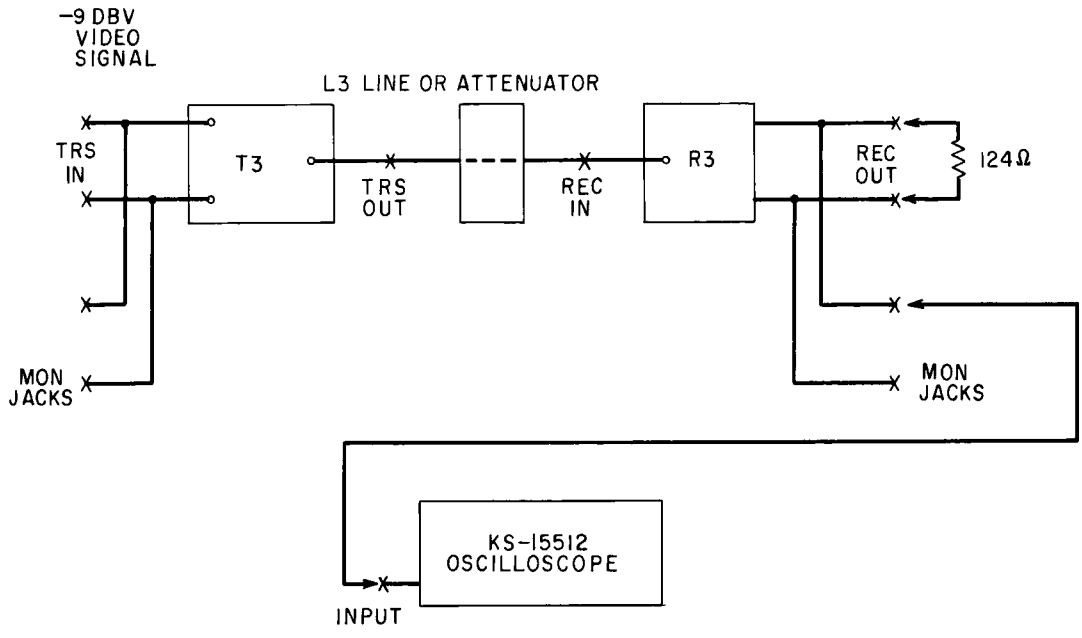


Fig. 18 – Test Arrangement for Adjusting Phase Shifter of R3 Terminal

ponent is obtained in the region of the vertical synchronizing pulses.

Fig. 18A – Slow Sweep Norm

Fig. 18B – Slow Sweep Expanded

Fig. 18C – Slow Sweep Quad TST Key Pressed Sweep Expanded

(F) Calibration of Frequency Control Circuit

25.13 The frequency control circuit is adjusted in the factory and the calibration of this circuit should be made only if the checks and adjustments of Part 25(A) or 25(C) can not be met. A test is made to check if the frequency control circuit meets requirements. Circuit adjustments are specified if requirements are not met.

25.14 ***Apparatus:***

KS-15512, L2, L3, L4 or L5 Oscilloscope

Audio Oscillator (RC type variable in the 15- to 25-cycle range such as Hewlett-Packard-204A or equivalent)

20 db Pad (75 Ohms)

25.15 ***Procedure:***

(1) Set the KS-15512 oscilloscope controls as follows:

SWEEP FREQ – – – EXT

BANDWIDTH – – – 6 mc

INPUT – – – 1:1

(2) Set up test arrangement of Fig. 19. Adjust the frequency of the audio oscillator to 20 cycles. The output level of the oscillator is adjusted in Step (7) to obtain a convenient oscilloscope display.

(3) Remove the patch plugs from the group of six jacks on the branching and control panel.

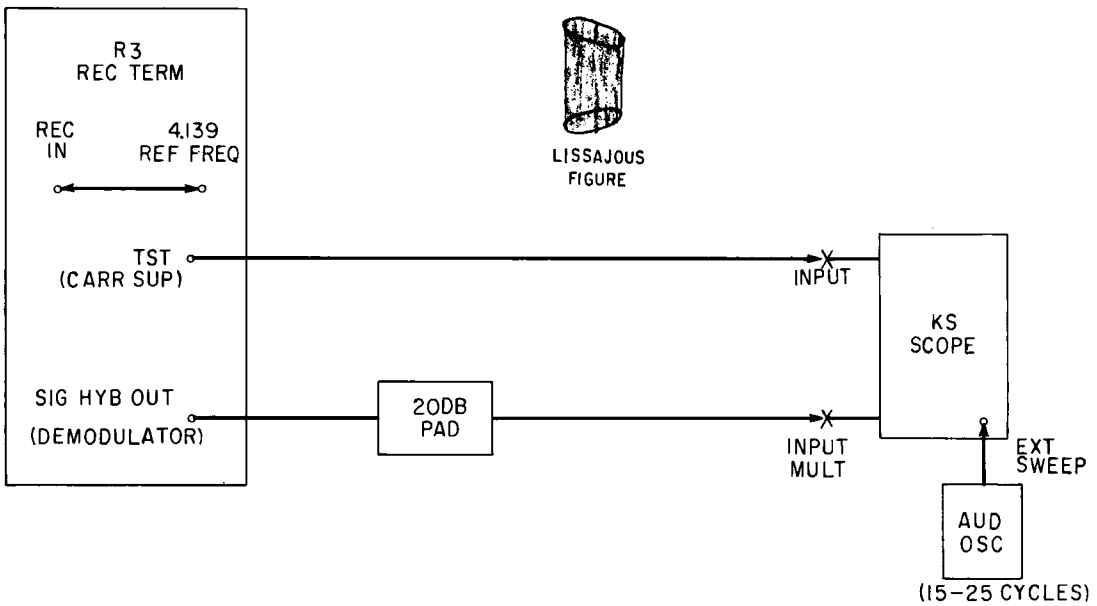


Fig. 19 – Test Arrangement for Calibrating Frequency Control Circuit

(4) Adjust MOD BAL R control for a frequency meter reading of zero.

(5) Insert two patch plugs in the OPR jacks on the branching and control panel.

(6) Adjust the FREQ ADJ control on the carrier supply panel so the frequency meter reads −20 cycles.

(7) Remove the patch plugs between the OPR jacks. Adjust the audio oscillator level and oscilloscope horizontal gain together with the oscilloscope vertical gain to obtain a convenient display on the oscilloscope of the Lissajous figure. Fig. 19 illustrates the relative dimensions of this frequency comparing figure.

(8) Adjust the frequency of the audio oscillator until the Lissajous figure becomes stationary.

Requirement: Audio oscillator frequency should be 20 ± 3 cycles.

(9) Restore the patch plugs in the OPR jacks.

(10) Readjust the FREQ ADJ control on the carrier supply oscillator so that the frequency meter reads +20 cycles.

(11) Remove the patch plugs from the OPR jacks and adjust the frequency of the audio oscillator until the Lissajous figure is stationary.

Requirement: Audio oscillator frequency should be 20 ± 3 cycles.

(12) Restore the patch plugs in the OPR jacks.

(13) If the requirement of either Step (8) or (11) is not met the RANGE (R26) and SYM (R17) controls on the wiring side of the carrier supply panel must be readjusted.

(14) ***Caution shall be exercised in the following steps since they involve exposure to hazardous voltages.*** Remove rear can cover from carrier supply panel. Remove panel shield by unscrewing the four corner screws and the remaining two similar screws.

(15) If the frequency difference as determined by Steps (8) and (11) is within a few cycles but not sufficiently close to 20 cycles, the range control, R26, shall be readjusted. Repeat Steps (8) and (11) and adjust R26 so that the average frequency difference is 20 cycles.

(16) If the frequency difference as determined by Steps (8) and (11) is more than 6 cycles, the SYM control, R17, shall be readjusted. Turn R17 slightly in a counterclockwise direction. Repeat Steps (8) and (11). If the frequency difference is closer, R17 is being adjusted in the proper direction. If the frequency difference is greater, R17 shall be turned in a clockwise direction. Repeat Steps (8) and (11) and continue this process until the frequency difference is reduced to 3 or ***less*** cycles.

(17) Repeat Step (15) if Step (16) has been found necessary.

(18) Replace panel shield and rear can cover. Remove cords and restore normal connections.

(19) Repeat the test of Part 25 that indicated the requirement for the calibration of the frequency control circuit.

26. CLIPPER ADJUSTMENTS AND TESTS

26.01 These tests outline the procedure for setting the BAL adjustments in order to compensate for transmission loss at high frequencies. Other tests are specified to be made when it is suspected that clipper action is defective. These additional tests may prove helpful in locating trouble. Measuring the socket voltages, however, is probably the most simple method of trouble shooting and frequently the most direct.

(A) BAL Control Adjustment

26.02 The BAL control is adjusted to compensate for a high-frequency transmission characteristic due to parasitic capacity. This control setting should be checked whenever electron tubes V5 or V6 are replaced.

26.03 ***Apparatus:***

J68827B Receiving Console

61C Signal Generator

2 — Double Plug Coaxial Cords

2 — Single Plug Coaxial Cords

J44104R Vacuum Tube Test Set

26.04 ***Procedure:***

(1) Set up the test arrangement of Fig. 20 with 61C signal generator controls set as indicated.

(2) Set the carrier level control key to BAL.

(3) Set the 61C to 3.6 mc and adjust the level monitor for zero reading.

(4) Plug the cord connector of the J44104R vacuum tube tester into the receptor on the clipper panel. Set the test set selector switch to position V3A. This operation disables the clipper circuit.

(5) Tune the 37B TMS to 3.6 mc and measure the output on the expanded scale. Note this reading carefully.

(6) Remove the vacuum tube tester cord connector from the clipper. This restores the clipper to normal operation.

Requirement: 37B reading shall not change by more than 0.01 db when the vacuum tube test set is disconnected.

(7) If the requirement is not met, repeat Steps (4), (5) and (6). Adjust the BAL control of the clipper until the measurement obtained in Step (5) does not change by more than 0.01 db when the clipper circuit is restored by Step (6).

(8) Repeat test of Steps (3), (5) and (6) using 2 mc.

Requirement: 37B reading shall not change by more than 0.02 db when the vacuum tube test set is disconnected.

(9) Replace patch plugs in AMP OUT jacks of video amplifier and return carrier level control key to OPR position.

(B) THRESHOLD Voltage Check

26.05 This test will indicate that the proper voltage bias is applied to the output amplifier stage of the clipper circuit when the clipper is activated by a signal 3 db above normal level. This bias is a measure of the gain of stages V1, V2, V3 and V9.

26.06 ***Apparatus:***

61C Signal Generator

1 — Double Plug Coaxial Cord

KS-14510 Volt-Ohm-Milliammeter (or Simpson Model 260, or Weston 779A Analyzer)

1 — Pair of Test Leads with Probe Tips and Insulated Handles

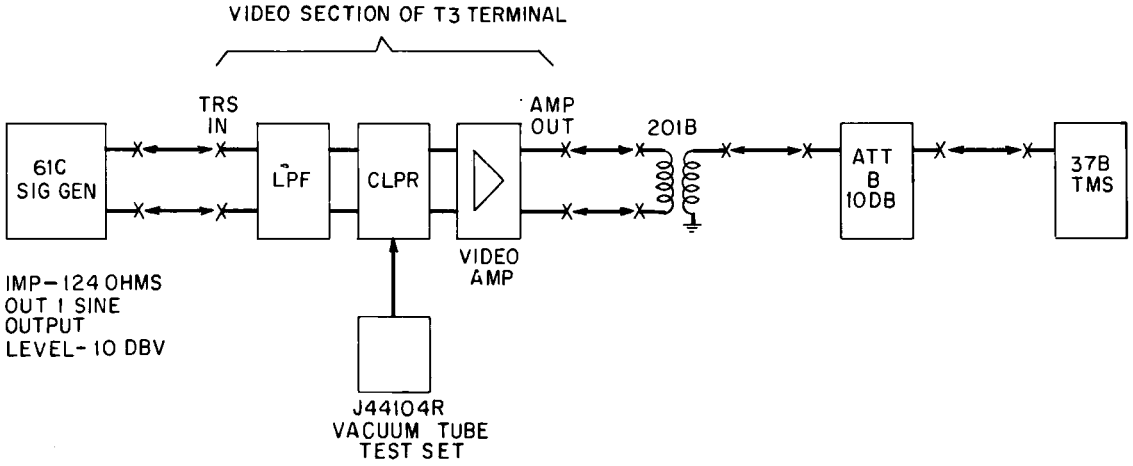


Fig. 20 – Test Arrangement for Clipper Balance Control Adjustment and Feed-back Gain Check — T3 Terminal

26.07 ***Procedure:***

(1) Set the 61C signal generator controls as follows:

OUT 1 – – – SINE

FREQ – – – 50 Kc

OUTPUT LEV – 6 Dbv

124-Ohm Balanced

(2) Set up 61C to send into TRS IN jacks of T3 terminal.

(3) Set voltmeter to 60-volt scale and measure voltage between terminals 2 and 3 of THRESHOLD potentiometer (R46) on the clipper panel.

Requirement: 25 ± 6 volts.

(4) Failure to meet this requirement indicates trouble in the clipper circuit between its input and the THRESHOLD control.

(5) Test setup should remain intact if it is desired to make the following test.

(C) High Level Check

26.08 This test checks that clipping action is effective at a level 11 db higher than the level at which clipping starts.

26.09 ***Apparatus:***

61C Signal Generator

201B Coil

KS-15512, L2, L3, L4 or L5 Oscilloscope

1 — Single Plug Coaxial Cord

2 — Double Plug Coaxial Cords

26.10 ***Procedure:***

(1) The 61C signal generator controls are set in Paragraph 26.07.

(2) Set the oscilloscope controls as follows:

SWEEP FREQ – – – HI

INPUT – – – 1:1

BANDWIDTH – – – 2 Mc

Adjust for 100 division deflection

(3) Set up test arrangement of Fig. 21.

(4) Observe oscilloscope to see that signal clipping is taking place at the top of the sine wave as illustrated in Fig. 21A.

(5) Change the output level of the 61C signal generator to +4 dbv.

(6) Observe the wave shape on the oscilloscope.

Requirement: The top of the sine wave should have a pronounced flatness on top as illustrated in Fig. 21B. The wave amplitude should be between 100 and 125 divisions.

(7) This test checks the load handling capacity of the output tubes V5 and V6. Insufficient capacity will result in a wave such as Fig. 21C.

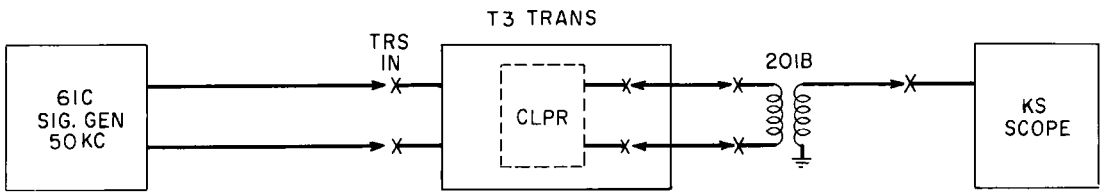


Fig. 21 – Arrangement for Testing Clipper T3 Terminal

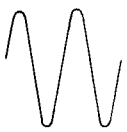


Fig. 21A

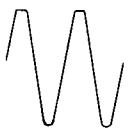


Fig. 21B

Fig. 21C

(D) Feed-back Gain

26.11 This test outlines a procedure for testing the feed-back gain of the clipper circuit. This test should be made when tubes are replaced or whenever clipping action is unsatisfactory.

26.12 ***Apparatus:***

61C Signal Generator
J68827B Receiving Console
2 — Double Plug Coaxial Cords
2 — Single Plug Coaxial Cords

26.13 ***Procedure:***

(1) Set up the test arrangement of Fig. 20 except for the omission of the vacuum tube test set and the change in settings of the 61C signal generator.

(2) Set the controls of the 61C signal generator as follows:

OUT 1 - - - SINE
FREQ - - - 300 Kc
OUTPUT LEV −10 Dbv
124-Ohm Balanced

(3) Turn the THRESHOLD control to maximum counterclockwise position.

(4) Tune the 37B TMS to 300 kc and measure the power.

(5) Adjust the THRESHOLD control counterclockwise to obtain a minimum reading on the 37B TMS.

Requirement: The difference between the powers measured in Step (4) and Step (5) should be 25 ± 3 db.

(6) If this limit is not met, it is necessary to measure socket voltages as described in Part 32.

(7) Reset the THRESHOLD control as described in Part 9.

27. VIDEO AMPLIFIER TESTS

(A) Gain Frequency

27.01 If the over-all frequency characteristic of the terminal deviates from the limits, the frequency characteristic of the video amplifier should be measured.

27.02 ***Apparatus:***

61C Signal Generator
70B Power Meter
2 — Double Plug Coaxial Cords

27.03 ***Procedure:***

(1) Set up test arrangement of Fig. 22.

(2) Operate the BAL-OPR key on the carrier level control circuit to the BAL position before testing the video amplifier of a T3 transmitting terminal.

(3) Set the 61C signal generator controls as follows:

Connect to 124-ohm impedance output
OUT 1 - - - SINE
100 Kc Frequency
OUTPUT LEV −30 Dbv
Calibrate output on level monitor

(4) Calibrate the 70B power meter for 1 volt P/P. Connect the AMP OUT jacks of the video amplifier to the 124-ohm balanced input jacks of the power meter.

(5) Increase the level of the 61C signal generator until the 70B power meter reads between zero and plus 1 dbv. This should be −22 dbv since the expected gain is 22.6 db. The gain of the amplifier will be the numerical sum of the output level attenuator and the reading of the 70B power meter.

Requirement: 22.6 ± 0.7 db gain.

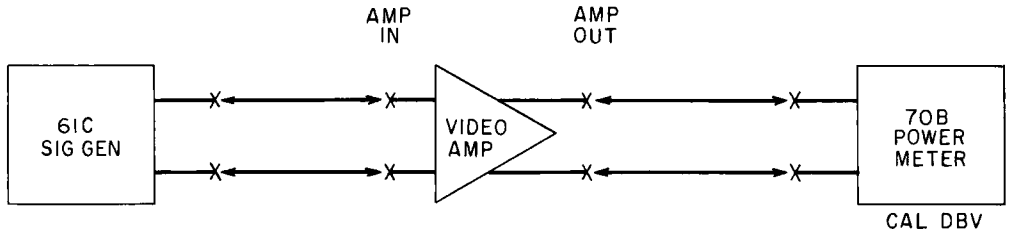


Fig. 22 – Arrangement for Testing Video Amplifier in T3 or R3 Terminal

(6) If gain requirement is not met the following tests are suggested:

(a) Measure socket voltages and compare with the nominal values given in Part 32.

(b) Measure the resistance values of the output resistances and the Beta networks. The output resistances (R73 and R74) should measure 61.9 ± 1 ohm. The Beta networks are on the front of the video panel and its resistance is measured between the center pin and the cylindrical case of each network. The measured value should be 2.25 ± 0.06 ohm. The accurate performance of this measurement requires that the terminal power be turned off.

(7) Change the 61C to send 4.5 mc. Calibrate its output on level monitor. Read the 70B power meter. Repeat test at 1, 2, 3 and 4 mc.

Requirement: The 70B power meter reading shall not deviate from the reading of Step (5) by more than ±0.15 db.

(B) Noise Tests

27.04 This test outlines a procedure for measuring noise at the output of the video amplifier and for checking microphonic tube noise. Noise as used here refers to power supply hum and other kinds of interferences. It is expected that less output hum from transmitter video amplifiers than from receiver amplifiers will be experienced. In addition, it is also expected that less dc bounce or bubble at the output of a T3 amplifier than at the output of an R3 amplifier will result. This occurs because the T3 amplifiers have longitudinal feedback at low frequencies whereas the R3 amplifiers do not.

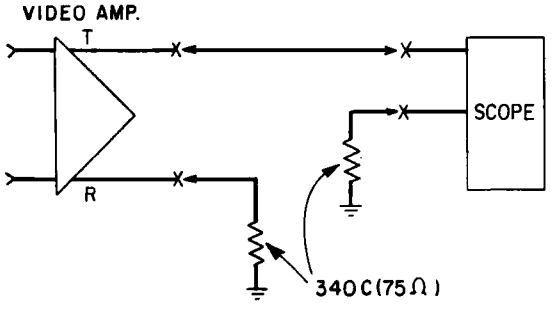


Fig. 23 – Arrangement for Noise Tests of Video Amplifier T3 or R3 Terminal

27.05 ***Apparatus:***

Oscilloscope — DuMont 304A or equivalent

2 — 340C Plugs (75 Ohms)

1 — Single Plug Coaxial Cord

27.06 ***Procedure:***

(1) Set up the test arrangement of Fig. 23. Terminate the ring or lower output jack of the video amplifier with 75 ohms.

(2) Calibrate the oscilloscope for vertical deflection of 0.1 volt P/P equals 4 inches.

(3) Observe that noise voltage on the tip side does not exceed 0.02 volt P/P. The dc bounce in R3 amplifiers should not exceed 0.1 volt or 0.03 volt for T3 amplifiers.

(4) Interchange the 340C plug and the cord at the output of the video amplifier.

(5) Observe that the noise voltage on the ring side does not exceed 0.02 volt P/P. The dc bounce in R3 amplifiers should not exceed 0.1 volt or 0.03 volt for T3 amplifiers.

(6) If the voltage is exceeded on either tip or ring sides, check that each electron tube has the correct plate current by measuring the tube plate voltages and comparing with the nominal values given in Part 32(B).

(7) Tap the video amplifier panel and observe that a momentary burst of noise appears on the oscilloscope. Make this test with the oscilloscope patched to the tip and then the ring side of the video amplifier. If the noise, due to tapping, dies very slowly, there is probably a microphonic tube. Replace the input tube on the side (tip or ring) where this condition is observed.

28. MODULATOR AND DEMODULATOR TESTS

28.01 When the gain checks made in Part 23 or 24 indicate that trouble is in the modulator or demodulator, the tests of this section should be made to confirm the location of the trouble. Tests are also outlined to be made if the HARMONIC PHASE control, Part 7(C) or Part 16(B), can not be adjusted.

28.02 ***Apparatus:***

J68827A Sending Console

J68827B Receiving Console

5 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

(A) Over-all Modulator Loss

28.03 ***Procedure:***

(1) This test measures the loss of the modulator with its carrier and carrier harmonic frequencies being supplied by normal connection.

(2) Set up test arrangement of Fig. 24 for modulator.

(3) Calibrate the 37B TMS for −18 dbm at 8.139 mc per Paragraph 6.03.

(4) Set the 56A oscillator to 4 mc and adjust for 0 dbm on the 73A power meter. Measure the output power at 8.139 mc.

Requirement: 37B shall read −18.1 ± 0.7 dbm.

(5) This test outlines a procedure for measuring the (3C-V) loss through each modulator using the test arrangement of Fig. 24.

(6) Remove patch plugs between MOD 1 OUT and HYB IN and MOD 2 OUT and HYB IN jacks on modulator panel.

(7) Calibrate the 37B TMS for −15 dbm at 8.41 mc per Paragraph 6.03. Measure the power at MOD 1 OUT and MOD 2 OUT jacks.

Requirement: 37B shall read −15.3 ± 0.7 dbm and the measurements shall be alike to within 0.2 db.

(8) Restore patch plugs.

(B) Resistance Hybrid Balance

28.04 ***Procedure:***

(1) This tests the balance of the modulator resistance hybrid.

(2) Remove the patch plug between the MOD 1 OUT and HYB IN jacks and terminate these jacks with 75-ohm terminations.

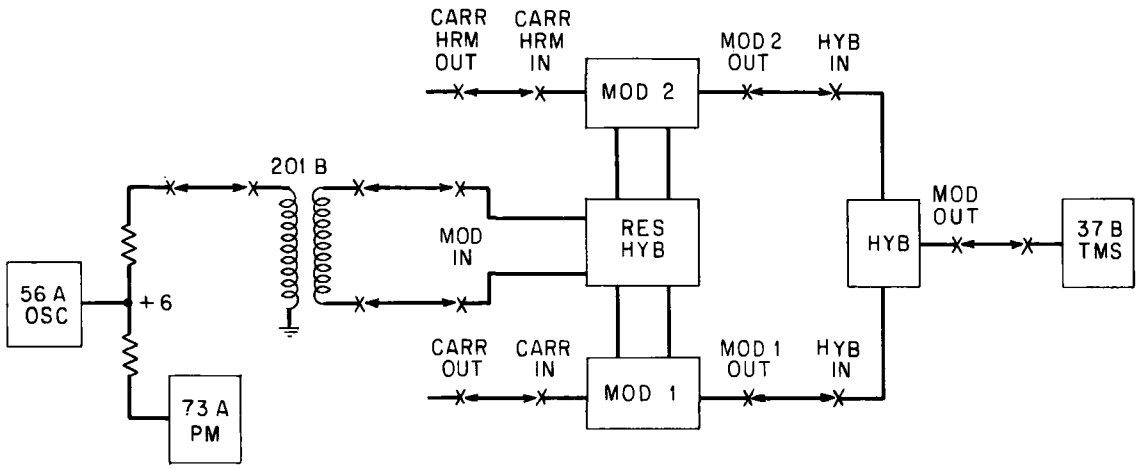


Fig. 24 – Modulator Tests

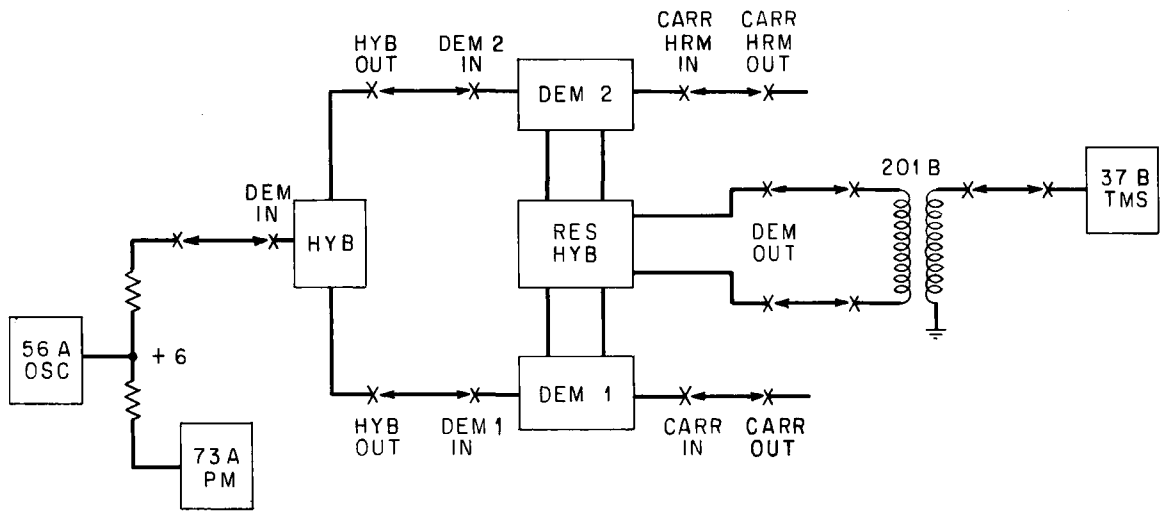


Fig. 24A – Demodulator Tests

(3) Tune the 37B TMS to 8.139 mc and measure the power at the MOD OUT jack.

Requirement: 37B shall read −60 dbm or less.

(4) Remove terminations and restore patch plugs.

(C) Over-all Demodulator Loss

28.05 ***Procedure:***

(1) This test measures the loss of the demodulator with carrier and carrier harmonic frequencies being supplied by normal connections.

(2) Set up test arrangement of Fig. 24A for the demodulator.

(3) Calibrate the 37B TMS for −18 dbm at 139 kc per Paragraph 6.03.

(4) Set the 56A oscillator to 4 mc and adjust for 0 dbm on the 73A power meter. Measure the power at 139 kc at the DEM OUT jacks.

Requirement: 37B shall read −18.1 ± 0.6 dbm.

(D) Demodulator 1 and 2 Loss

28.06 ***Procedure:***

(1) This test outlines a procedure for measuring the (3C-V) loss through each demodulator using the test arrangement of Fig. 24A.

(2) Remove patch plugs between DEM 1 IN and HYB OUT and DEM 2 IN and HYB OUT jacks on demodulator panel.

(3) Move patch cord from DEM IN jacks to DEM 1 IN jacks.

(4) Calibrate the 37B TMS for −25 dbm at 4.417 mc per Paragraph 6.03.

(5) Set the 56A oscillator to 8 mc and adjust for 0 dbm on the 73A power meter. Measure the power at the DEM OUT jacks at 4.417 mc.

(6) Move patch cord from DEM 1 IN to DEM 2 IN jacks and again measure the power at DEM OUT jack.

Requirement: 37B shall read −25.6 ± 1 dbm and the two measurements shall be alike to within 0.2 db.

(7) Restore patch plugs.

29. CARRIER LEVEL CONTROL ADJUSTMENTS

29.01 The carrier level control circuit holds the amplitude of the modulated carrier essentially constant at sync pulse intervals. If this amplitude varies with the amplitude of the video signal, the operation of the carrier level control circuit should be checked. If filament activity tests do not reveal the trouble, the following tests are suggested.

(A) Carrier Level Regulation

29.02 This test gives a visual indication that the carrier level control circuit operation is satisfactory.

29.03 ***Apparatus:***

61C Signal Generator

KS-15512, L2, L3, L4 or L5 Oscilloscope

J68827A Sending Console

1 — Single Plug Coaxial Cord with an open end

4 — Single Plug Coaxial Cords

1 — Double Plug Coaxial Cord

29.04 ***Procedure:***

(1) Set the 61C signal generator controls as follows:

OUT 1 to Video and Sine

OUT 2 to Unmod

(2) Set the oscilloscope controls as follows:

Calibrate for 1 volt equals 100 scale divisions

SWEEP FREQ – – – HI

SYNC SELECTOR – – – Negative

BANDWIDTH SWITCH – – – 6 Mc, LINE TEST

(3) Patch the INPUT jack (INPUT MULT — terminated) of the oscilloscope to the VIDEO OUT jack of the signal generator. Turn the PIC AMP control to zero output. Adjust the SYNC WIDTH and SYNC AMP controls to obtain a pulse similar to Fig. 25A.

(4) Check that BAL-OPR key of the carrier level control panel is in OPR position.

(5) Check that the synchronizing pulses observed at the tip monitor jack have the polarity shown in Fig. 25A. If the polarity is wrong, turn over the input cord.

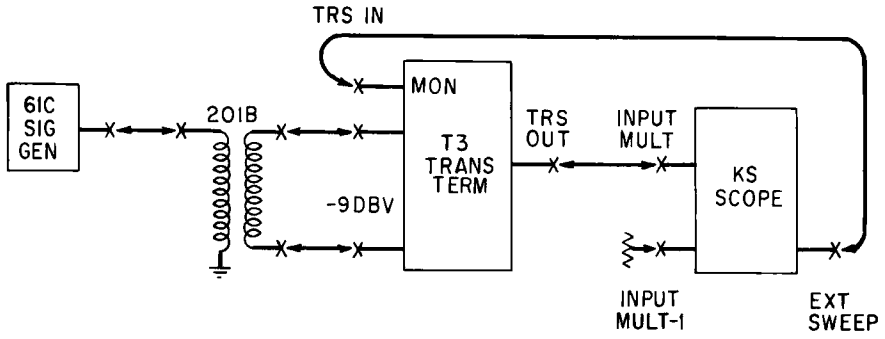


Fig. 25 – Test Arrangement for Carrier Level Control Test

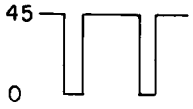
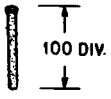
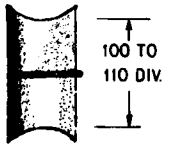


Fig. 25A – Pulse Output of 61C



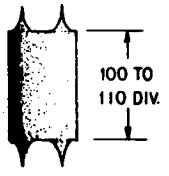
Set Sync Amplitude to Zero Adjust V Gain for 100 Div.

Fig. 25B



Increase Sync Amp to Obtain this Picture

Fig. 25C



Increase Sync Amp Further to Obtain this Picture

Fig. 25D

(6) Set up test arrangement of Fig. 25. Turn the sweep frequency switch of the oscilloscope to EXT position and set the H gain control of oscilloscope to maximum. Set SYNC AMP of signal generator to zero output.

(7) The oscilloscope presentation will be a vertical line which is the unmodulated carrier output of the terminal. Adjust the V gain control to obtain an oscilloscope presentation of 100 scale divisions similar to Fig. 25B.

(8) Increase the SYNC AMP control of the 61C to obtain a signal pattern similar to Fig. 25C.

Requirement: Amplitude on oscilloscope should be 100-110 scale divisions.

(9) Increase the SYNC AMP control of the 61C to obtain a presentation similar to Fig. 25D.

Requirement: Amplitude on oscilloscope should be 100-110 scale divisions.

(10) If the carrier level control does not operate properly, the following tests are suggested.

(B) Gain of Output Stage

29.05 This test checks the gain of the output stage of the carrier level control circuit.

29.06 ***Apparatus:***

KS-14510 Volt-Ohm-Milliammeter (or Simpson Model 260, or Weston 779A Analyzer)

29.07 ***Procedure:***

(1) Operate BAL-OPR key of carrier level control panel to BAL position.

(2) Remove patch plugs between the CLPR OUT and AMP IN jacks on the video amplifier panel and between the AMP OUT and MOD IN jacks on the modulator panel.

(3) Connect voltmeter (3-volt scale) to the center conductors of the AMP OUT jacks located in the modulator panel.

(4) Turn the CARR BAL 1 control (on the carrier level control panel) to maximum clockwise position. Read the voltmeter.

(5) Reverse the voltmeter connections and turn the CARR BAL 1 control to maximum counterclockwise position. Read the voltmeter.

Requirement: Voltmeter readings shall be 0.33 ± 0.12 volt for the maximum clockwise position and 0.33 ± 0.12 volt of reversed polarity for the maximum counterclockwise position.

(6) Return BAL-OPR key to OPR position.

(C) HF Amp Gain Check

29.08 This test checks circuit operation from the input to the output of tube V6. A specific input signal produces a specific voltage value across capacitor C21. If the requirements are met tubes V1 to V5 and their associated circuits are operating satisfactorily.

29.09 ***Apparatus:***

J68827B Receiving Console

KS-14510 Volt-Ohm-Milliammeter (or Simpson Model 260 or Weston 779A Analyzer)

3 — Single Plug Coaxial Cords

340C Plug

29.10 ***Procedure:***

(1) Set up test arrangement of Fig. 26, setting ATT B to 33 db. Remove patch plug on CARR SUPP panel. Terminate the CARR HYB IN jack on CARR SUPP panel with a 340C plug (75 ohms).

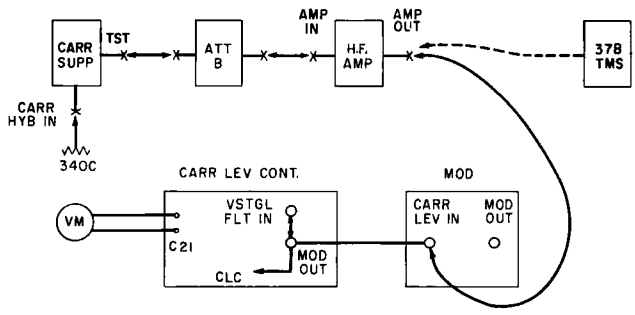


Fig. 26 – Test Arrangement for Checking High-frequency Circuit of Carrier Level Control in T3 Terminal

(2) Tune the 37B TMS to 4.139 mc and patch it to the output of the HF AMP 2. Adjust ATT B to obtain 0 dbm on the 37B TMS. Then patch the output of the HF AMP 2 to CARR LEV IN jack on MOD panel.

(3) Remove the rear can cover of the carrier level control and connect the voltmeter leads to capacitor C21.

(4) Decrease loss in ATT B (about 3.5 db) until 200 volts is measured across C21.

Requirement: The change in the setting of ATT B shall be 3.7 ± 0.5 db.

(5) Remove patch cords and restore patch plugs in the CARR SUPP, MOD and HF AMP panels.

(6) If the requirement of Step (4) can not be met, measure carrier level control reference voltages of V2, V4 and V7 at the electron tube socket pins as shown and compare the results with the requirements given. Use the 50-60-volt scale of 20,000 ohms per volt meter.

Requirements: The voltage measured from socket pin 1 to ground of tubes V2, V4 and V7 should be:

V2 +10.8 ± 0.7

V4 +46.5 ± 3.0

V7 +46.0 ± 3.0

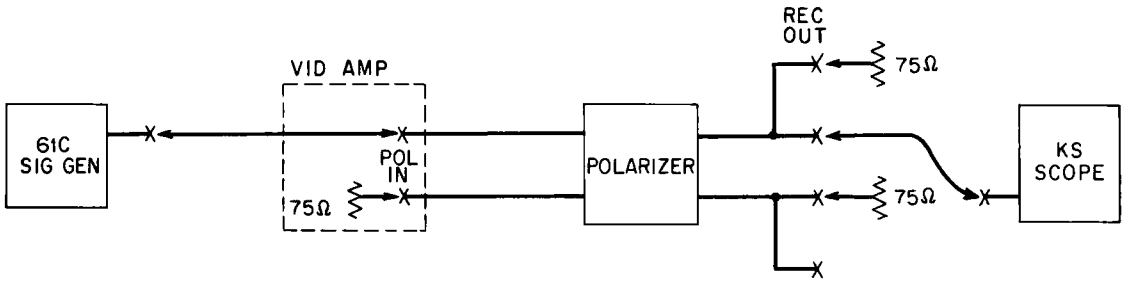


Fig. 27 – Arrangement for Testing Polarizer R3 Terminal

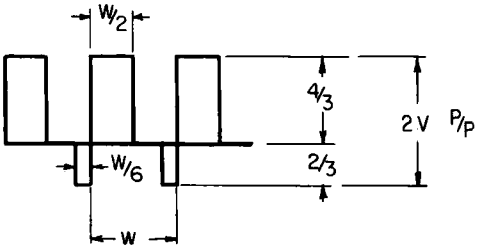


Fig. 27A

30. POLARIZER TESTS

(A) Polarizer Operation

30.01 This test is made to determine that the polarizer operates satisfactorily when driven by a full amplitude signal.

30.02 ***Apparatus:***

61C Signal Generator

KS-15512, L2, L3, L4 or L5 Oscilloscope

3 — 340C Plugs (75 Ohms)

2 — Single Plug Coaxial Cords

30.03 ***Procedure:***

(1) Calibrate the oscilloscope. Set the controls as follows:

SWEEP FREQ – – – HI

SYNC SELECTOR – – – Negative

BANDWIDTH – – – 6 Mc, LINE TEST

INPUT – – – 1:1

(2) Set the controls on the 61C signal generator as follows:

OUT 1 — Video or 60-Cycle

OUT 2 — Mod

Output — Video

(3) Patch the INPUT jack of the oscilloscope to the VIDEO jack of the 61C signal generator. Terminate the INPUT MULT jacks of the oscilloscope with a 340C plug (75 ohms).

(4) Adjust video signal for the dimensions shown in Fig. 27A.

(5) Set up the test arrangement of Fig. 27 with the POL DIS key set in NOR position.

(6) Observe on the oscilloscope, that a sync negative video signal is received at the upper or tip jack.

(7) Send a "sync positive" video signal into the polarizer by interchanging the 340C plug and the cords, at the POL IN jacks on the video amplifier panel.

Requirement: Observe on oscilloscope that video signal remains sync negative.

(8) If the polarizer does not work make test as follows:

(B) Check of Relay Operation

30.04 ***Procedure:***

(1) This test checks whether relay K3 and relay K1 (line reversing relay) operate satisfactorily when relay K2 is operated.

Relays K1 and K3 oscillate at approximately 2 to 3 cycles per second.

(2) Place POL DIS key in NOR position.

(3) Remove relay covers from relays K1, K2, and K3. Block relay K2 in operated position.

Requirement: Observe that relays K1 and K3 operate successively.

(4) Inoperation or sluggish operation of relays should be checked by testing relays for circuit requirements given by SD-42032.

(5) If the relays operate normally and the trouble is still present, make filament activity tests as covered by Part 4 followed by tube socket voltage measurements as covered by Part 32(G). The tests of Part (C) which follows are also prescribed as an aid in locating trouble.

(C) Modulator Grid and Cathode Voltages

30.05 If the previous tests have not revealed the cause of the trouble, the following tests should be made. Tube V2 functions to operate relay K2 when its grid voltages are of such value to cause this tube to conduct. The operation of relay K2 causes relays K3 and K1 to operate and turn over the tip and ring connections. The grid voltages of tube V2 are dependent on the nature of the input signal and these voltages are measured, when necessary, to detect trouble in the polarizer electronic circuit.

30.06 ***Apparatus:***

KS-14510 Volt-Ohm-Milliammeter (or Simpson Model 260, or Weston 779A Analyzer)

Vacuum Tube Voltmeter

61C Signal Generator

KS-15512, L2, L3, L4 or L5 Oscilloscope

3 — 340C Plugs

2 — Single Plug Coaxial Cords

1 — Pair Leads with Insulated Handles and Probe Tips

30.07 ***Procedure:***

(1) Set the controls on the oscilloscope as follows:

SWEEP FREQ – – – HI

SYNC SELECTOR – – – Negative

BANDWIDTH – – – 6 Mc, LINE TEST

INPUT – – – 1:1

(2) Calibrate the 61C signal generator as follows:

OUT 1 – – – Video or 60-Cycle

OUT 2 – – – Mod

Output – – – Video

(3) Patch the INPUT jack of the oscilloscope to the VIDEO jack of the 61C signal generator. Terminate the INPUT MULT jack of the oscilloscope with a 340C plug.

(4) Adjust the video signal for the dimensions shown in Fig. 27A.

(5) Set up the test arrangement of Fig. 27 with the POL DIS key set in NOR position.

(6) Two values are given, one for a KS-14510 meter and one for a vacuum tube voltmeter which is the preferred instrument. The meter is set for dc and voltages are measured to ground from the two grids and the cathode of tube V2.

Nominal Voltages for Correct Video Signal (Sync Negative)

	GRID 1 (PIN 1)	GRID 3 (PIN 7)	CATHODE (PIN 2)
KS meter (60-volt scale)	6	−11	−17
VTVM	10	−14	−17

(7) Interchange the cord and 340C plug at the POL IN jacks on the video amplifier panel.

Note: The voltage readings will be incorrect unless the K1 relay is blocked released.

Nominal Voltages for an Incorrect Video Signal (Sync Positive)

	GRID 1 (PIN 1)	GRID 3 (PIN 7)	CATHODE (PIN 2)
KS meter (60-volt scale)	17	14	29
VTVM	28	25	29

(8) The voltages are now measured with a synchronizing pulse signal or correct and incorrect polarity. Interchange the cord and 340C plug at the POL IN jacks on the video amplifier panel.

(9) Turn the OUT 2 selector switch of the 61C to UNMOD and turn the PIC AMP control to OFF position. This will apply a sync negative pulse of 2/3 volt P/P into 75 ohms.

Nominal Voltages for Correct Sync Pulse

	GRID 1 (PIN 1)	GRID 3 (PIN 7)	CATHODE (PIN 2)
KS meter (60-volt scale)	3	7	12
VTVM	5	10	12

(10) Interchange the cord and 340C plug at the POL IN jacks on the video amplifier panel. This will apply a sync positive pulse of 2/3 volt P/P into 75 ohms.

Nominal Voltages for Incorrect Sync Pulse

	GRID 1 (PIN 1)	GRID 3 (PIN 7)	CATHODE (PIN 2)
KS meter (60-volt scale)	18	14	29
VTVM	27	25	29

(11) Remove cord from ring side of POL IN jacks and terminate this jack with a 340C plug. This gives a condition of no signal.

Nominal Voltages for "No Signal" Condition

	GRID 1 (PIN 1)	GRID 3 (PIN 7)	CATHODE (PIN 2)
KS meter (60-volt scale)	0.2	6	12
VTVM	0.5	10	12

31. HIGH-FREQUENCY AMPLIFIER TESTS

31.01 Maintenance of the high-frequency amplifiers in the T3 and R3 terminal bays consists of measuring filament activity as specified in Part 4 and measuring the gain and gain-frequency characteristics as specified in this part.

31.02 ***Apparatus:***

J68827A Sending Console
J68827B Receiving Console
2 — Single Plug Coaxial Cords

31.03 ***Procedure:***

(1) Set up test arrangement as shown in Fig. 28.

(2) Tune and calibrate the 37B TMS for −0.1 dbm at 4.139 mc per Paragraph 6.03.

(3) Set 56A oscillator to 4.139 mc and 0 dbm on 73A power meter. Measure the output power at 4.139 mc.

Requirement: 37B shall read − 1 dbm ± 0.3.

Note: It may be necessary to change the GAIN ADJ switch setting in order to meet the above requirement.

(4) Repeat Steps (2) and (3) using frequencies of 3.5, 4.5, 5.5, 6.5, 7.5, 8.5 mc.

Requirement: Deviation from the value measured in Step (3) shall not be greater than: −0.4, +0.5 for the 3.5, to 6.5 mc band, and −0.4, +0.7 for the 7.5 to 8.5 mc band.

(5) Amplifiers which do not meet the above requirements shall be replaced.

32. VOLTAGE MEASUREMENTS

32.01 Voltage measurements shown in the Tables of this part give an approximate check on the normal operation of the tubes. The nominal dc socket voltages for the various equipment panels of the T3 and R3 terminals are given in the following Tables. All voltages are measured using a 20,000 ohms per volt meter. If the socket terminal has an anti-sing resistor connected to it, the measurement should be made on the resistor terminal that is not connected to the socket. Prior to making voltage measurements

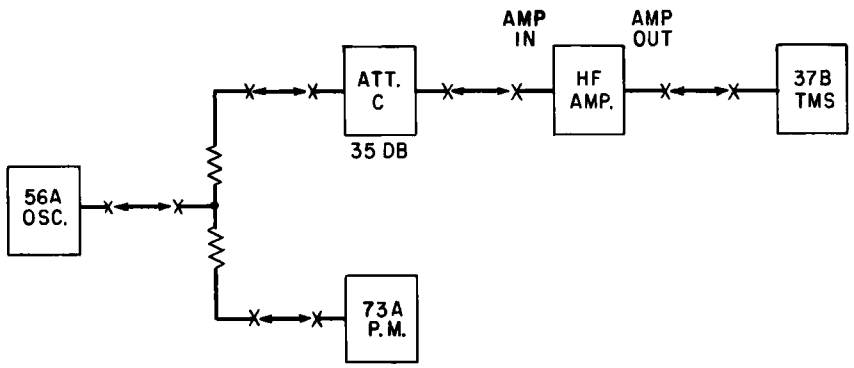


Fig. 28 — Test Arrangement for Measuring Gain of HF Amplifier — T3 or R3 Terminal

the power supply voltage should be checked by making the tests of Parts 3(A) and 3(B) of this section.

Caution: Proper care and precaution shall be taken to guard against accidental shock.

32.02 ***Apparatus:***

KS-14510 Volt-Ohm-Milliammeter (or Simpson Model 260, or Weston 779A Analyzer)

1 — Pair of Test Leads with Probe Tips and Insulated Handles

341F Terminating Plug (124 Ohms)

340C Terminating Plug (75 Ohms)

Clip Lead

(A) Clipper

32.03 ***Procedure:***

(1) Remove patch plug in TRS IN jack of terminal. Turn THRESHOLD control maximum counterclockwise for this test. Remove rear can cover. All voltages in Table 1, except as noted below, are measured between the 315-volt point (lug 1A on the clipper terminal block) and the designated socket terminal.

Notes:

* As noted in Table 1 use the 25-volt scale on socket terminal 6 of V6.

** As noted in Table 1 use the 10-volt scale on socket terminal 4 of V1 and measure to ground.

(2) Reset THRESHOLD control. Remove patch plug from TRS IN jack. Replace rear can cover.

(B) Video Amplifier

32.04 All voltages in Table 2 are measured between ground and the indicated terminal socket with no input signal.

(C) Carrier Supply

32.05 All voltages in Table 3 are measured between ground and the indicated terminal sockets.

TABLE 1

TUBES	SOCKET TERMINALS 1	2	4	6	8
V1	—	—	5.5 ± 1 **	215 ± 10	—
V2	220 ± 10	—	214 ± 10	147 ± 35	115 ± 15
V3	220 ± 10	—	215 ± 10	110 ± 25	115 ± 15
V5	153 ± 15	—	132 ± 20	0	—
V6	130 ± 15	—	130 ± 15	17 ± 5 *	—
V9	—	143 ± 30	0	160 ± 15	—

TABLE 2

TUBES	SOCKET TERMINALS 2	4	6	8
V1	—	1.5 ± 0.25	160 ± 25	150 ± 15
V2	—	1.5 ± 0.25	160 ± 25	150 ± 15
V3	—	2.2 ± 0.3	145 ± 30	158 ± 15
V4	—	2.2 ± 0.3	145 ± 30	158 ± 15
V5	155 ± 30	2.0 ± 0.3	—	—
V6	155 ± 30	2.0 ± 0.3	—	—

TABLE 3

TUBES	SOCKET TERMINALS 2	3	5	7	8	9
V1	—	12 ± 2	—	155 ± 15	—	—
V2	165 ± 10	—	150 ± 15	—	8.8 ± 0.5	11 ± 2

(D) Carrier Harmonic Supply

32.06 All voltages in Table 4 are measured between ground and the indicated terminal sockets.

(E) Carrier Level Control

32.07 Terminate the TRS IN jacks of the T3 terminal with 341F plug. Operate the BAL-OPR key to OPR position. All voltages in Table 5 are measured between ground and the indicated terminal sockets. Remove patch plugs on carrier and carrier harmonic supply panels.

(F) Carrier Frequency Control

32.08 Terminate the REC IN jacks of the R3 terminal with a 340C plug. All voltages in Table 6 are measured between ground and the indicated socket terminal. Remove patch plugs on carrier harmonic supply panels.

TABLE 4

	SOCKET TERMINALS					
TUBES	2	3	5	7	8	9
V1	–	12 ± 2	–	150 ± 15	–	–
V2	165 ± 10	–	150 ± 15	–	9 ± 1.0	11 ± 1.5

TABLE 5

	SOCKET TERMINALS						
TUBES	1	2	4	5	6	7	8
V1	–	14 ± 1.5	–	167 ± 12	145 ± 15	–	–
V2	–	–	14 ± 1.5	–	161 ± 12	–	165 ± 12
V3	11 ± 1	–	51 ± 5	–	–	–	190 ± 5
V4	50 ± 5	–	50 ± 5	–	137 ± 15	–	190 ± 5
V6	–	51 ± 5	–	280 ± 10	190 ± 5	–	–
V7	–	–	–	88 ± 25	190 ± 5	–	–
V8	–	190 ± 5	88 ± 8	190 ± 30	–	–	–
V9	–	190 ± 5	27 ± 3	–	–	–	–
V10	–	–	–	–	–	100 ± 7	–

TABLE 6

	SOCKET TERMINALS				
TUBES	2	4	5	6	8
V1	65 ± 7	–	184 ± 7	–	–
V2	65 ± 7	–	–	184 ± 7	–
V3	195 ± 20	–	–	–	–
V4	14 ± 2	–	–	–	–
V5	185 ± 20	–	–	–	–
V6	–	10.7 ± 1	–	157 ± 12	157 ± 12
V7	65 ± 7	–	184 ± 7	–	–
V8	65 ± 7	–	–	184 ± 7	–
V9	–	10.7 ± 1	–	157 ± 12	157 ± 12

(G) Polarizer

32.09 Terminate the REC OUT jacks at the R3 terminal with a 341F plug. Remove patch plug from REC IN jacks for this test. Connect clip lead from pin 8 of tube V4 to ground. The voltages for pin 2 of tubes V8 and V9 should not differ from each other by more than 8 volts. All voltages in Table 7 are measured between ground and the indicated socket terminal.

32.10 Remove clip lead from pin 8 of tube V4.

TABLE 7

	SOCKET TERMINALS				
TUBES	1	2	5	6	8
V2	–	12 ± 1.7	190 ± 5	156 ± 21	–
V3	35 ± 7	–	–	146 ± 15	2.9 ± 0.8
V5	–	1 ± 0.25	–	105 ± 20	–
V6	–	11.5 ± 3.5	160 ± 15	–	–
V8	–	70 ± 12	155 ± 30	190 ± 5	–
V9	–	70 ± 12	190 ± 5	190 ± 5	–