J94024B (24B) LOOP CHECKER GENERATOR ADJUSTING PROCEDURES

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1. GENERAL

1.01 This section describes methods of making both minor and complete adjustments of the 24B loop checker generator.

1.02 This section is revised for the following reasons:

(a) To change apparatus to include requirements for minor adjustments

(b) To change the sequence of minor and complete adjustments

(c) To add information for removal and reinstallation of the generator.

Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The minor adjustments should be made whenever the generator fails to meet the test described in Section 103-343-501. These adjustments require access to the front panel controls only and can be made using a minimum of test equipment.

1.04 The complete adjustments must be made when the minor adjustments fail to remedy the trouble. Since many of the test and adjustment points required for the complete adjustments are not readily accessible, it is necessary to remove the generator from its bay location and perform the adjustments at a bench location in a maintenance or repair center. It is strongly recommended that the generators be sent to a Western Electric distributing house when complete adjustments are necessary. However, the procedures for complete adjustments are included for field use where complete facilities for repair are available.

1.05 The adjustments covered by this section must be performed in the sequence given.

2. APPARATUS

All Adjustments

2.01 J94023A (23A) transmission measuring set.

2.02 2P4C patching cord assembly consisting of P2B cord, 6 feet long, equipped with two 310 plugs.

2.03 3P27A patching cord assembly consisting of P3U cord, 7 feet long, equipped with one 310 plug and one 351A plug.

2.04 2W17C testing cord assembly consisting of W2W cord, 10 feet long, equipped with one 310 plug, one 360B and one 360C tool.

2.05 Two KS-6278 connecting clips for use with 2W17C testing cord assembly.

2.06 2W6A testing cord assembly consisting of W2C cord, 10 feet long, equipped with one 310 plug and two 59 cord tips.

2.07 Blocking tool. Apply as covered in Section 069-020-801.

2.08 Dial handset 1011G or equivalent.

Minor Adjustments

2.09 J64072A (72A) frequency meter or other frequency measuring device, with at least a 50,000-ohm input impedance and 0.5-volt sensitivity, capable of measuring frequencies between 500 Hz and 3500 Hz to an accuracy of ±0.1 percent.

2.10 2P4C patching cord assembly consisting of P2B cord, 6 feet long, equipped with two 310 plugs.

2.11 Testing cord, one end equipped with a 310 plug and the other end equipped as required for connection to a frequency measuring device other than the 72A frequency meter.

2.12 Multiple box consisting of three 238A jacks wired in paralled (tip to tip, ring to ring, sleeve to sleeve).

Complete Adjustments

2.13 Electronic voltmeter, Hewlett-Packard model 410B, or RCA Senior Volt-Ohmyst (WV 98A, B, or C) or equivalent.

2.14 Frequency counter, Hewlett-Packard model 524B or equivalent.

2.15 713A tool for adjusting 1509-type coils.

3. PREPARATION

All Adjustments

3.01 Using the 23A TMS:

(a) Calibrate the 23A TMS in accordance with Section 103-223-100.

(b) Set the DIAL MEAS SLV key to MEAS.

(c) Set the INPUT switch to 900.

Minor Adjustments

3.02 If using the 72A frequency meter:

(a) Connect the 72A frequency meter power cord to 115-volt ac supply. Operate the power switch to ON and allow a 5-minute warmup period.

(b) Calibrate the 72A frequency meter in accordance with Section 103-425-100.

(c) Set the CAL MEAS SEARCH switch to MEAS.

3.03 If using other frequency measuring device, prepare equipment for use and allow the necessary warmup period.

Complete Adjustments

3.04 Connect the electronic voltmeter and frequency counter to 115-volt ac supply. Turn power switches to ON and allow a 5-minute warmup period before using for measurements.

4. PROCEDURE FOR MINOR ADJUSTMENTS

Frequency Sweep Adjustment

4.01 Remove the locking nuts from the FLAT GAIN, OUT GAIN, R52, R71, and R72 controls. If there is a locking nut on the R74 control, discard it.

4.02 Set the R52 control to its maximum clockwise position.

4.03 Set the FLAT GAIN and OUT GAIN controls to their approximate midpositions.

4.04 Set the R71 and R72 controls to their maximum counterclockwise positions.

4.05 Connect the GEN OUT CAL jack of the 24B generator to one of the jacks of the multiple box.

4.06 Connect the MEAS jack of the 23A TMS to the second jack of the multiple box.

4.07 If the 72A frequency meter is used, connect the BRDG IN jack of the 72A frequency meter to the third jack of the multiple box. Operate the controls of the 72A frequency meter to produce a deflection pattern approximately one inch square.

Note: If other frequency measuring equipment is used, connect its input to the third jack of the multiple box.

4.08 Operate the FREQ CHK switch to its 1000 ~ position.

4.09 Starting with the R74 control in its maximum clockwise position, adjust it ***slowly*** for a minimum reading on the transmission measuring set. This is a critical adjustment and must be set as close to the minimum value as possible.

4.10 Adjust the R71 control for a frequency as close to 1000 Hz as possible, as indicated by the frequency measuring equipment.

4.11 Operate the FREQ CHK switch to its 3000 ~ position.

4.12 Starting with the R75 control in its maximum counterclockwise position, adjust it ***slowly*** for a maximum reading on the transmission measuring set. This is a critical adjustment and must be set as close to the maximum value as possible.

4.13 Adjust the R72 control for a frequency as close to 3000 Hz as possible, as indicated by the frequency measuring equipment.

4.14 Repeat 4.08 through 4.13 until no readjustment of R71 or R72 is required for the frequency indications in 4.10 and 4.13 to be 1000 ±50 Hz and 3000 ±25 Hz, respectively.

4.15 Replace the locking nuts on the R71 and R72 controls. Repeat 4.08 through 4.13 to check that the frequency indications in 4.10 and 4.13 are within the limits of 1000 ±80 Hz and 3000 ±50 Hz.

> ***Note:*** It is necessary to adjust initially the end frequencies to the close limits given above in order to ensure satisfactory operating end frequencies to within ±200 Hz over a long period of time. Some shifting will occur because of aging and temperature effects.

4.16 Remove the connection from the GEN OUT CAL jack of the 24B generator.

Flat Output Level Adjustment

4.17 Operate the FREQ CHK switch to its OPR position.

4.18 Connect the MEAS jack of the 23A TMS to the FLAT OUT CAL jack of the 24B generator. Adjust the FLAT GAIN control until the 23A TMS indicates an average level of 8.4 dBm.

4.19 Alternately adjust the R52 and FLAT GAIN controls so that the level indication does not vary by more than ±0.1 dB from its adjusted value in 4.18 when observed over a period of 30 seconds.

> ***Note:*** Flatness is more dependent on the setting of the R52 control than the setting of the FLAT GAIN control.

4.20 Replace the locking nuts on the R52 and FLAT GAIN controls and tighten them securely. Recheck that the level and flatness over a period of 30 seconds are still within the limits specified in 4.19.

4.21 Remove the connection to the FLAT OUT CAL jack.

Shaped Output Level Check

4.22 Check that the FREQ CHK switch is in its OPR position.

4.23 Connect the MEAS jack of the 23A TMS to the GEN OUT CAL jack of the 24B generator. While holding the LEV CHK switch operated, adjust the OUT GAIN control for an average indication on the 23A TMS of 0 dBm. Release the LEV CHK switch.

> ***Note:*** The level variation should be less than ±0.1 dB around the 0 dBm setting.

4.24 Operate the FREQ CHK switch to the 1000 ~ position.

4.25 Starting with the R74 control in its maximum clockwise position, ***slowly*** turn it in a counterclockwise direction and note the minimum level indicated on the transmission measuring set. This is a critical operation and should be repeated several times to be sure that the true minimum is noted. The minimum indication should be between -5.5 and -6.1 dBm. After the test, the R74 control may be left in any position.

4.26 Operate the FREQ CHK switch to the 3000 ~ position.

4.27 Starting with the R75 control in its maximum counterclockwise position, ***slowly*** turn it in

a clockwise direction and note the maximum level indication on the transmission measuring set. This is a critical operation and should be repeated several times to be sure that the true maximum is noted. The maximum indication should be between +2.1 and +3.5 dBm. After the test, the R75 control may be left in any position.

4.28 Remove the connection to the GEN OUT CAL jack and operate the FREQ CHK switch to its OPR position.

Output Level Adjustment

4.29 Find the value of office loss marked on the front panel of the 24B generator. If it is missing, refer to 4.37 through 4.42 for method of determining office loss. Let this value be represented by X.

Note: The office loss X is always a positive number. For example, when the office loss is 0.7 dB, X = +0.7.

4.30 Connect the MEAS jack of the 23A TMS to the line link, connector bank, or final frame appearance of a test line per SD-98100-01 associated with the 24B generator.

4.31 Block the OS relay of the test line being used operated.

Caution: It is important that only the OS relay associated with the test line being used is blocked operated.

4.32 Check that the FREQ CHK switch is in its OPR position.

4.33 Hold the LEV CHK switch operated and adjust the OUT GAIN control for an average level indication on the 23A TMS of X dB higher than -0.5 dBm within limits of ±0.2 dB. Record the reading.

Examples:

(1) If X = 0.7 dB, then -0.5 + 0.7 = +0.2 dBm. Then 23A TMS should read +0.2 ±0.2 dBm or between 0.0 and +0.4 dBm.

(2) If X = 0.3 dB, then -0.5 + 0.3 = -0.2 dBm. Then 23A TMS should read -0.2 ±0.2 dBm or between -0.4 and 0.0 dBm.

4.34 Replace the locking nut on the OUT GAIN control and tighten it securely. Recheck that the level indication is still within the limits specified in 4.33. Record the reading.

4.35 Remove the test connections and the blocking tools from the test line OS relay.

4.36 Connect the MEAS jack of the 23A TMS to the GEN OUT CAL jack of the 24B generator. With the LEV CHK switch held operated, the 23A TMS should read up to 0.5 dB higher than the average reading obtained in 4.34.

Determination of Office Transmission Loss

4.37 Select ten spare subscriber lines from various line link or line finder frames.

4.38 Connect the MEAS jack of the 23A TMS to the T and R appearance of one of the subscriber lines at the HMDF. Connect the 1011G handset to the DIAL jack of the 23A TMS and operate the handset key to TALK.

4.39 Operate the DIAL-MEAS-SLV key of the 23A TMS to its DIAL position and dial the telephone number of the milliwatt supply. When tone is heard, operate the DIAL-MEAS-SLV key to its MEAS position. The measured loss value in dB is numerically equal to the difference between 0 dBm (the milliwatt supply level) and the 23A TMS level indication. Record this loss value.

4.40 Repeat 4.38 and 4.39 for the remaining nine subscriber lines.

4.41 Total the 10 loss values and divide by 10. This number is the office transmission loss in dB.

4.42 Mark the value of office loss determined in 4.41 on the front panel of the 24B generator.

5. PROCEDURE FOR COMPLETE ADJUSTMENTS

5.01 If the generator is equipped with a terminal block TS1 per CAD1 of SD-99707-01, disconnect and tag all leads externally connected to it. If the generator has been modified to provide the connectors of CAD2, remove connector P3 from connector J3. Remove the generator from its bay location.

5.02 At the maintenance or repair center location, connect the -48 volt office battery and ground to the proper terminals of the TS1 terminal block or the J3 connector, in accordance with SD-99707-01.

5.03 Remove the locking nuts from the FLAT GAIN, OUT GAIN, R52, R71, and R72 controls. If there is a locking nut on the R74 control, discard it.

5.04 Allow a one-hour warmup time before starting tests.

5.05 Circuit components are mounted on four circuit cards and on the front panel. Those components which are mounted on the front panel are labeled with their circuit designations.

5.06 Terminal numbers in this section refer to numbers stamped on the four circuit cards; for example, terminal C1 refers to terminal 1 on card C.

Caution 1: Care should be exercised when replacing components in or making connections to the 24B loop checker generator, since it uses solid state components which are easily damaged by excess heat or overloads.

Caution 2: Care should be exercised when adjusting the slugs of inductors in the generator. When the locking device is loosened the slugs should turn easily. Damage will result if they are forced at the end of their clockwise adjustment range.

DC Regulator Tests

5.07 Set the FREQ CHK switch to its OPR position.

5.08 Set the electronic voltmeter controls for -dc measurements and connect its common lead to terminal C3. Connect the dc lead of the voltmeter to terminal C1. The voltmeter shall read 22 ±3.3 volts.

5.09 Transfer the dc lead of the voltmeter to terminal C4. On generators equipped with a 426M diode (A option) for CR9 the voltmeter shall read 22 ±3.3 volts. On generators equipped with an IN1430 (B and G option) or a 426AG (K option) for the CR9 the voltmeter shall read 27 ±4.0 volts. (CR9 is connected between terminals C13 and C26.)

5.10 Transfer the dc lead of the voltmeter to terminal A45. The voltmeter shall read 24 ±3.4 volts. Remove the voltmeter connections.

Swept Oscillator Test and Adjustment

5.11 Operate the FREQ CHK switch to its 3000 ~ position.

5.12 Turn the R71 control to its maximum clockwise position and the R75 control to its maximum counterclockwise position. Set the electronic voltmeter controls for -dc measurements and connect its common lead to terminal A21 (A21 is circuit ground). Connect the dc lead of the voltmeter to terminal A42. Adjust the R72 control for a voltmeter reading of 7 volts.

5.13 Transfer the dc lead of the voltmeter to terminal A43. Adjust the R71 control for a voltmeter reading of 9 volts.

5.14 Transfer the dc lead of the voltmeter to terminal C12. On generators equipped with a 426M diode (A option) for CR9 the voltmeter shall read 11 ±1.6 volts. On generators equipped with an IN1430 diode (B or G option) or a 426AG diode (K option) for CR9, the voltmeter shall read 13.5 ±2 volts. (CR9 is connected between terminals C13 and C26.) Remove the voltmeter dc lead connection.

5.15 Set the electronic voltmeter for ac measurements and connect the ac probe to terminal C22. The voltmeter shall read 0.4 ±0.1 volt.

5.16 Transfer the ac probe connection to terminal C29. Adjust the R52 control for a maximum voltage reading. This voltmeter reading shall be greater than 2.0 volts. Replace the locking nut on the R52 control and remove the voltmeter connections.

5.17 Loosen the locking device on the L6 inductor slug. Connect the ground lead of the counter to terminal C18. Connect the other lead of the counter to terminal C19. Adjust inductor L6 until the counter indicates 26,000 ±1500 Hz. Lock the slug of indicator L6 in place. Check that the frequency is still within the limits and note the

frequency for use as A in 5.20. Remove the connections to the counter.

Fixed Oscillator Test and Adjustment

5.18 Set the electronic voltmeter controls for -dc measurements and connect its common lead to terminal B10. Connect the dc lead to terminal B19. The voltmeter shall read 6.0 ±0.6 volts. Remove the voltmeter dc lead connection.

5.19 Set the electronic voltmeter controls for ac measurements and connect its ac probe to terminal B24. The voltmeter shall read 4.7 ±0.7 volts. Remove the voltmeter connections.

5.20 Loosen the locking device on the L1 inductor slug. Connect the ground lead of the counter to terminal B10. Connect the other lead of the counter to terminal B22. Adjust the slug of inductor L1 until the counter indicates A +3000 ±100 Hz (A is frequency noted in 5.17). Lock the slug of inductor L1 in place. Check that the frequency is still within the limits. Remove the connections to the counter.

Frequency Sweep Adjustment

5.21 Turn the FLAT GAIN and OUT GAIN controls to their maximum clockwise positions. Turn the R71 and R72 controls to their maximum counterclockwise positions.

5.22 Set the electronic voltmeter controls for -dc measurements and connect its common lead to terminal A21. Connect the dc lead of the voltmeter to terminal A41.

5.23 Connect the counter to the GEN OUT CAL jack.

5.24 Operate the FREQ CHK switch to its 1000 ~ position.

5.25 Starting with the R74 control in its maximum clockwise position, adjust it for a minimum voltmeter reading. This is a critical adjustment and must be monitored and kept as close to the minimum value as possible during the adjustment of 5.26.

5.26 With the direct voltage at terminal A41 set to its minimum value in 5.25, slowly adjust the R71 control until the counter indicates approximately 1000 Hz.

5.27 Operate the FREQ CHK switch to its 3000 ~ position.

5.28 Starting with the R75 control in its maximum counterclockwise position, adjust it for a maximum voltmeter reading. This maximum shall be 20 ±4 volts. This is a critical adjustment and must be monitored and kept as close to the maximum value as possible during the adjustment of 5.29.

5.29 With the direct voltage at terminal A41 set to its maximum value in 5.28, ***slowly*** adjust the R72 control until the counter indicates approximately 3000 Hz. If this setting cannot be made, change the sweep control circuit to the alternate X or Y option as shown on SD-99707-01. (This will normally be unnecessary unless the CR16 diode has been replaced.)

5.30 Repeat 5.24 through 5.29 until the respective frequencies in 5.26 and 5.29 are 1000 ±50 Hz and 3000 ±25 Hz without further adjustment of the R71 and R72 controls.

5.31 Replace the locking nuts on the R71 and R72 controls and tighten them securely. Repeat 5.24 through 5.29 to check that the frequency indications in 5.25 and 5.29 are within the limits of 1000 ±80 Hz and 3000 ±50 Hz. Remove the connections to the counter.

> ***Note:*** It is necessary to adjust initially the end frequencies to the close limits given above in order to ensure satisfactory operating end frequencies to within ±200 Hz over a long period of time. Some shifting of frequencies will occur because of aging and temperature effects.

5.32 Operate the FREQ CHK switch to its OPR position. Note that the direct voltage, as indicated by the voltmeter, sweeps slowly from about 5 to 20 volts with a fast fly back. The elapsed time for a single cycle shall be between 4 and 10 seconds. Remove the voltmeter connections.

Output Amplifier Test and Filter Adjustment

5.33 Turn the FLAT GAIN and OUT GAIN controls to their maximum clockwise positions.

5.34 Check that the slug of inductor L2 is locked in place in such a position that the locking device is flush with the end of the inductor assembly.

5.35 Set the electronic voltmeter controls for -dc measurements and connect its common lead to terminal D4 (circuit ground). Connect the dc lead of the voltmeter to terminal D22. The voltmeter shall read 12 ±3 volts. Disconnect the dc lead of the voltmeter.

5.36 Set the electronic voltmeter controls for ac measurements and connect the ac probe to terminal D22. Hold the LEV CHK switch operated. The voltmeter shall read at least 5.0 volts. Release the LEV CHK switch.

5.37 Connect a shorting lead between terminals C12 and C22. Remove the locking nut from the R52 control and turn the R52 control to its maximum counterclockwise position. Loosen the locking device on the L3 inductor slug. Adjust the slug of the L3 inductor for the lowest possible voltage reading. This voltage shall be less than 0.05 volt. Lock the slug of inductor L3 in place. Check that the voltage limit is still met. Remove the voltmeter connections and the shorting lead.

Flat Output Amplifier Test and Flatness Adjustment

5.38 Set the electronic voltmeter for -dc measurements and connect its common lead to terminal B10 (circuit ground). Connect the dc lead of the voltmeter to terminal B9. The voltmeter shall read 39 ±4 volts. Disconnect the voltmeter connections.

5.39 Set the FREQ CHK switch to its OPR position and turn the R52 control to its maximum clockwise position.

5.40 Repeat the procedure given in 4.18 through 4.21.

Shaped Output Level Check

5.41 Repeat the procedure given in 4.22 through 4.27.

5.42 Replace the locking nut on the OUT GAIN control and tighten it securely. Remove the connections to the transmission measuring set and the power connections.

Reinstallation of Generator

5.43 After the generator has been returned from the maintenance or repair center, mount it in its bay location and connect all tagged leads or connect the P3 connector to the J3 connector, as required. Allow about a one-hour warmup period before proceeding with the tests. Remove the locking nut from the OUT GAIN control.

5.44 Adjust the output level in accordance with the procedure of 4.29 through 4.36. Use the value of the office loss marked on the 24B generator only if it is certain that the generator is being reinstalled in the same office from which it was removed.

5.45 Perform the tests described in Section 103-343-501. All requirements should be met. If they are not, there is an indication that the locked controls have been changed since the adjustments were made or the generator has been damaged in shipment. In any case, the procedure for minor adjustments should be followed at the bay location. If this does not clear the trouble, the generator must be sent back to the maintenance or repair center for complete adjustments.