TEST OF ORIGINATING SENDER TEST FRAME FOR TOUCH-TONE AND 0/1 PREFIX DIALING

CONTENTS

1. GENERAL

1.1 This section describes relay operation and lead test for 0/1 Prefix dialing, and test and adjustment of Touch-Tone Generator Circuit in No. 1 Crossbar Sender test frame SD-25221-01.

2. RECORDS AND REQUIREMENTS

2.1 Records: SD-4-1313 forms are required for recording the results of these tests on the Touch-Tone Generator Circuit.

2.2 Requirements to be met are contained in this section, and are based on Notes on drawing SD-25221-01.

3. TESTING EQUIPMENT

3.1 Test Sets

Amt	ITE	Description	Note
1	4607	72A Frequency Meter	1
1	4414	Vacuum Tube Voltmeter	2
1	4029	Pulse Checking Test Set	3 ←

NOTE 1: Do not requisition if telephone company J64072A 72A Frequency Meter is available.

NOTE 2: Do not requisition if telephone company 400 type Hewlett-Packard Vacuum tube voltmeter is available.

NOTE 3: Do not requisition if telephone company J94723 Pulse Checking is available. ↰

3.2 Accessories

Amt	Code	Description
1	KS-19355 L-3	Adjuster ↲

4. FUSING

4.1 Verify 48V bat. (fuse "Y") is present at the following locations lower wdg. of relays CC-0, CC-1, CC-2, CC-4, CC-7, LA, EA, and PD1. Verify 48 bat. (fuse "X") is present at lower wdg. of relay OTC, ZOT and lamps CC-0, CC-1, CC-2, CC-4, CC-7, ZOT, LA, EA and PD1. Verify 48V bat. (fuse "C") is present at lower wdg. of relays PDG-0, PDG-1 and DG-0. Verify 48V bat. (fuse AI) is present at lower winding of relay PO.

5. LOCKING GROUND CC- RELAYS

5.1 Block ASDC selector switch in pos. 4. Insulate 1-2 of EP relay. Using a test receiver apply ground at 2T of EP relay. Manually operate relay CC-0, locks to ground on contact 1, lamp CC-0 lights. Follow same procedure for relays CC-1, CC-2, CC-4 and CC-7. Remove block from ASDC selector.

5.2 Block ASDC selector in pos. 8. Follow same procedure for operating CC- relays and observe same results as Paragraph 5.1.

6. DC LEAD CHECK

6.1 Block operated relays MC, CC-0 and CC-1. Using test receiver apply ground to 9 of relay "EA", observe relay "DA" operates. Remove blocking tools from relays MC, CC-0 and CC-1.

7. OTC LEAD AND ZOT TIMER CHECK

7.1 Block operated relay R1. Operate key PDG-0. Operate code key AO, and observe relay OTC does not operate. Release key PDG-0, operate key PDG-1, relay OTC does not operate. Release key PDG-1 observe relay OTC operates, and at end of timing period (2.5 seconds) relay ZOT operates. Release code key AO relay OTC releases, remove block from relay R1.

8. DGO RELAY OPERATION

8.1 Insulate contacts 2T and 3T of relay C. Operate PDGO key. Block relay G operated. Step switch ASDC to pos. 1. Connect ground through test receiver to contact 6 fixed of relay AV observe relay DGO operates. Remove ground applied to contact 6 fixed of relay AV, relay DGO releases. Check for ground at 4B relay ST, (MF PLS check cont). Remove block from relay G, restore PDGO key.

8.2 Operate PDGO key. Using test receiver apply ground to the following location 4T of relay PS Schematic Figure 12B observing relay DGO operates. Restore PDGO key.

9. P1 RELAY OPERATION

9.1 Operate key PDG-0, using test receiver apply ground to relay SY contact 4B observe relay P1 operates. Release key PDG-0 relay P1 remains operated. Operate key PDG-1 relay P1 does not release. Remove ground from relay SY 4B relay P1 releases. Release key PDG-1.

10. MC RELAY OPERATION

10.1 Step ASDC switch to pos. 8. Apply ground to relay C contact 5T, relay MC operates. Remove the ground, remove insulation from relay C contact 2 and 3T, ASDC switch returns to normal.

11. LEAD CHECK SCHEMATIC FIGURE 33

11.1 Insulate contact 2 fixed of relay PDG-1. Using test cord apply ground to contact 2 fixed of relay PDG-1. Using test receiver check for this ground at the following locations relay P3' contact 1B, relay PDG-0 contact 1M, relay PDG-1 contact 1B.

11.2 Using test receiver apply ground to relay PDG-1 contact 2M, observe relay PP operates.

11.3 Using test receiver apply ground to relay PDG-1 contact 4M, observe relay ACA operates.

11.4 Using test receiver apply ground to relay PDG-0 contact 2M, observe relay DGO operates.

11.5 Using test receiver apply ground to relay ST contact 5B, observe relay CN operates. Remove the ground, relay CN releases. Operate key PDG-0, manually close contacts 4B and 5B of relay ST, relay CN operates. Release key PDG-0 CN relay releases.

12. TEST SET PREPARATION

12.1 Locate 72A Frequency Meter near the Touch-Tone Generator Circuit.

12.2 Set the controls on the 72A frequency meter as follows:

Control	Position
CAL-MEAS-SEARCH	MEAS
HORIZ GAIN AND OSC OUT	Mid Position
INTENSITY	Max. Clockwise
ON-OFF	OFF
VERTICAL GAIN	Max. Counterclockwise

12.3 Connect the power cord to a 115 volt 60 cycle power source. Connect the ground connector on the plug to ground. Operate the ON-OFF switch to ON.

12.4 After the tubes in the set have heated for about one-half minute a horizontal trace should appear on the oscilloscope screen.

12.5 Adjust the INTENSITY and FOCUS controls to obtain a sharply defined line. The intensity should be adjusted as low as possible, consistent with a plainly visible line.

13. TEST SET CALIBRATION

13.1 The frequency meter should be calibrated each time it is placed in operation. Where maximum precision is required, the set should be recalibrated after the first 15 minutes of operation and hourly thereafter.

13.2 Operate the CAL-MEAS-SEARCH switch to CAL. This connects the output of the crystal oscillator to the vertical amplifier of the oscilloscope.

13.3 Adjust the VERTICAL GAIN and HORIZ GAIN AND OSC OUT controls to obtain a pattern on the oscilloscope screen that is approximately 1/4 inch high and 1-1/4 inches wide.

13.4 Set the FREQUENCY CPS decade dials successively to read each frequency shown in Table 1 and at each frequency setting, adjust the associated CAL control to obtain a stationary pattern on the oscilloscope screen that is similar to the pattern shown in Figure 1 for the corresponding frequency.

13.41 The patterns shown in Figure 1 will be observed on the oscilloscope screen at only certain phase relations while the pattern is slowly rotating.

13.42 It is not necessary to count the loops in the pattern for calibration purposes. The CAL controls will not change the frequency over wide enough range to give a pattern of the wrong frequency ratio.

13.43 When setting the FREQUENCY CPS decade dials to read between 1000 and 4000 cycles, always set the thousands dial to read the correct thousand, instead of setting the hundreds dial at 10.

TABLE 1 CALIBRATION FREQUENCIES

FREQUENCY CPS SETTING	ADJUST CAL CONTROL
100	100
200	200
300	300
400	400
500	500
1000	1000
2000	2000
3000	3000

13.5 Whenever the CAL 100 control is readjusted, the calibration at all other frequencies will be affected, therefore, all other CAL controls must also be readjusted.

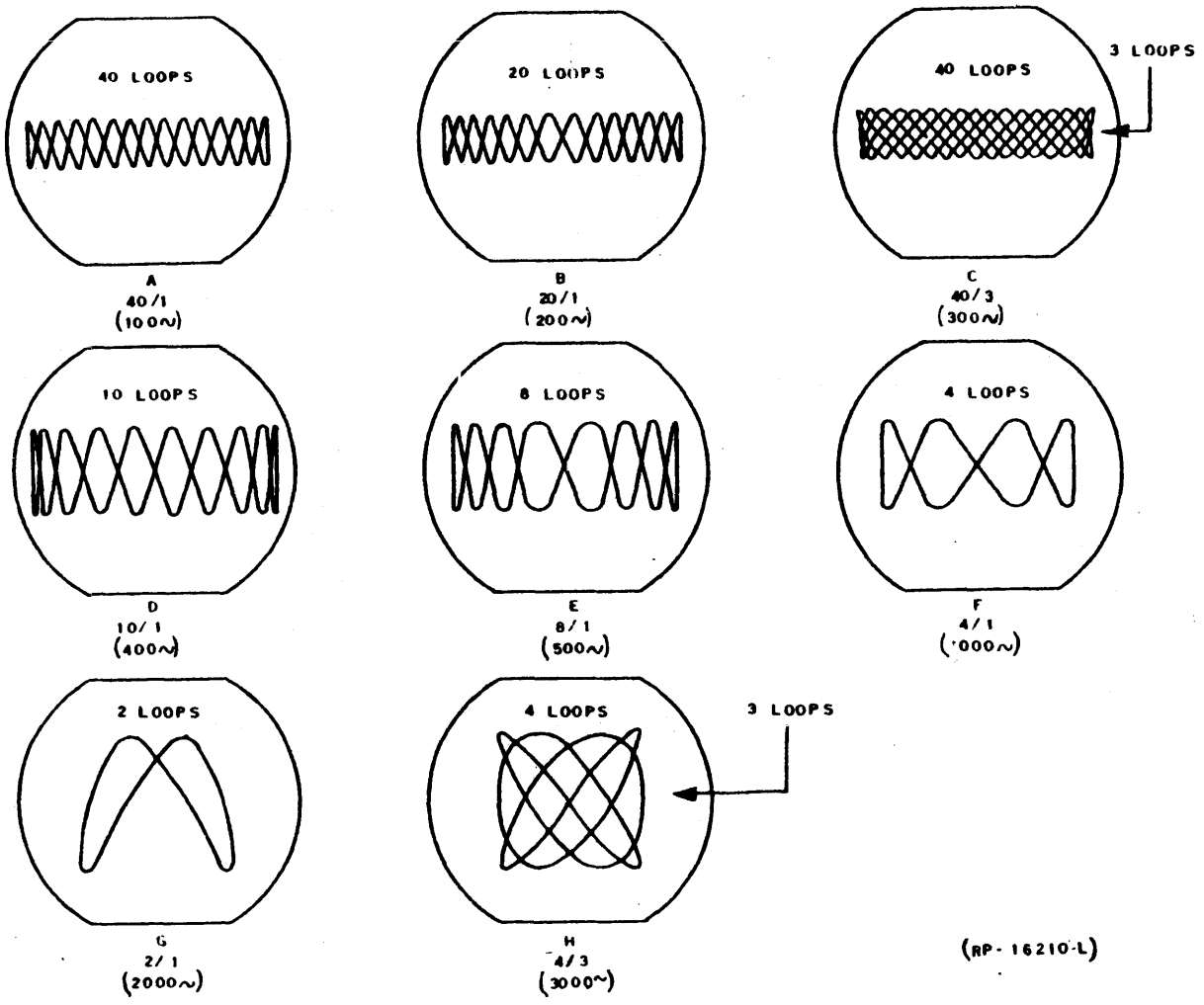

FIG. 1 OSCILLOSCOPE CALIBRATION FREQUENCY PATTERNS

14. TOUCH-TONE GENERATOR FREQUENCY ADJUSTMENT

14.1 Test Setup

14.11 Operate 72A set CAL-MEAS-SEARCH switch to MEAS position.

14.12 Connect the Touch-Tone Generator VL jack to the 72A set 600W IN jack.

14.2 Adjusting High Frequency Oscillator

14.21 Set 72A decade dials to provide a frequency of 1336 cycles per second.

14.22 Operate Touch-Tone Generator ADJ, ADJ1 and HFA keys. Set switch FCA to position 2 (H2 relay operates.) Set switch FCB to OFF.

14.23 Adjust 72A set VERTICAL GAIN and HORIZONTAL GAIN and OSC OUT controls to obtain a pattern that is as large as possible but does not extend beyond the edges of the oscilloscope screen.

14.24 Using a KS-19355 L-3 adjustor, adjust the tuning slug in the Touch-Tone Generator LA transformer until a stationary 1 to 1 frequency pattern is obtained. (Refer to Figure 2 for appearance of this type of pattern.) The Touch-Tone high frequency oscillator will now have been adjusted for a frequency of oscillation of 1336 CPS. If this requirement can not be obtained, check for proper installation of trimmer capacitor A04 per SD-25221-01 Note 105.

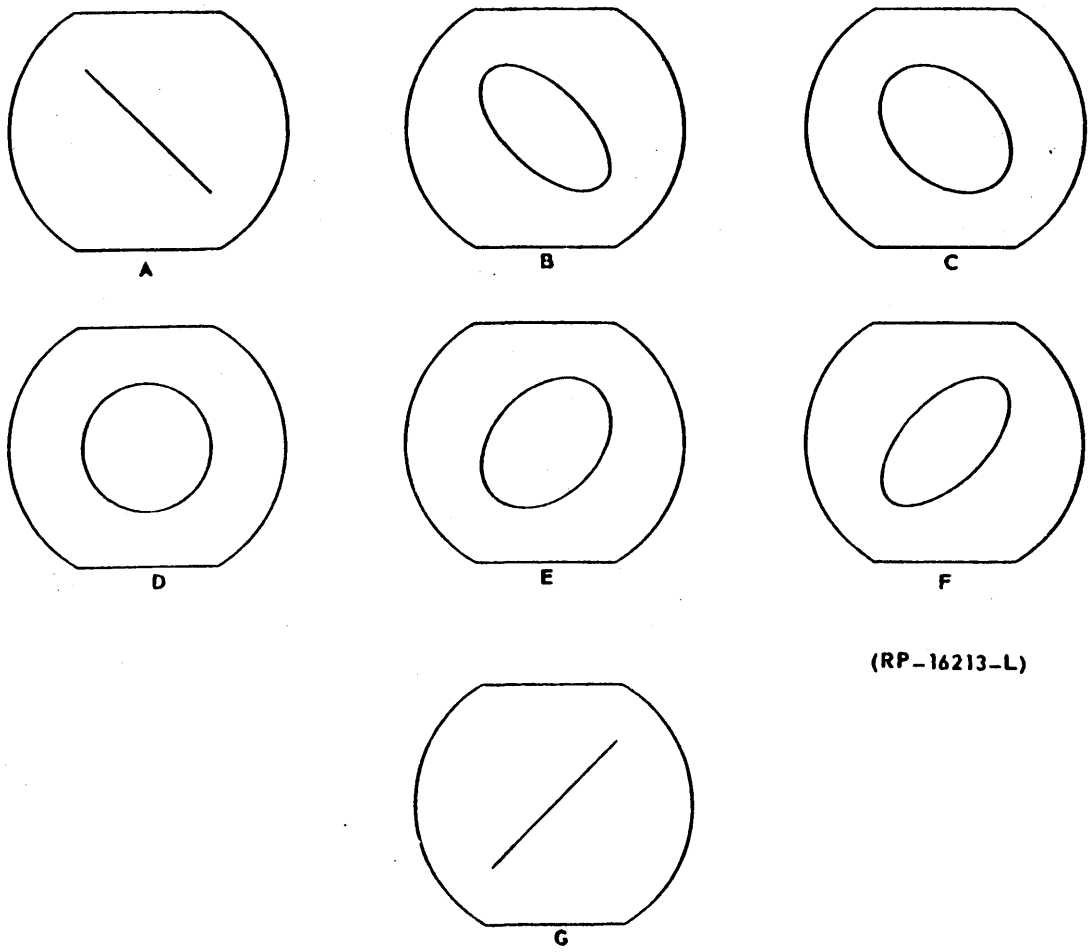

FIG. 2 OSCILLOSCOPE PATTERNS - SUCCESSIVE PHASES OF 1 TO 1 FREQUENCY RATIO

14.3 Adjusting Low Frequency Oscillator

14.31 Release key HFA and operate key LFA. (Relay L-2 operates.)

14.32 Adjust 72A set decade dials to provide a frequency of 770 CPS.

14.33 Adjust tuning slug in LB transformer until a stationary 1 to 1 pattern is obtained. The low frequency oscillator will now have been adjusted for a frequency of 770 CPS. If this requirement can not be obtained, check for proper installation of trimmer capacitor B04 per SD-25221-01, Note 105.

14.4 Adjusting 2000 cycle oscillator.

14.41 Set switch FCA to OFF. Release keys LFA and ADJ1. (Relays SPF and TF operate.)

14.42 Adjust 72A set decade dials to provide a mean frequency of 2000 CPS. (Low limit 1900.0 and high limit 2100.0 CPS).

14.43 Adjust tuning slug in generator LC transformer until a stationary 1-1 pattern is obtained on the 72A set oscilloscope.

14.44 Release generator ADJ key.

14.5 Checking All Touch-Tone Generator Frequencies

14.51 Operate keys and switch as shown in Table 2 to read the listed frequencies on the 72A set. Transformers LA and LB should not have to be readjusted to meet these requirements.

TABLE 2

Operate Keys	SW Setting FCB	SW Setting FCA	Output Freq. (CPS) Must be Between
ADJ, ADJ1 LFA	MNF	1	685.8 - 687.2
		2	757.7 - 759.2
		3	838.4 - 840.1
		4	925.9 - 927.8
	MXF	1	706.8 - 708.2
		2	780.8 - 782.3
		3	863.9 - 865.6
		4	954.2 - 956.1
ADJ, ADJ1 HFA	MNF	1	1189.7 - 1192.1
		2	1314.6 - 1317.3
		3	1453.4 - 1456.4
		4	1606.8 - 1610.2
	MXF	1	1225.9 - 1228.3
		2	1354.7 - 1357.4
		3	1397.6 - 1500.6
		4	1655.8 - 1659.2

14.52 Release all keys and set all switches to OFF. Disconnect the 72A set from jack VL.

15. TOUCH-TONE GENERATOR OUTPUT LEVEL ADJUSTMENT

15.1 Connect ITE-4414 or Hewlett-Packard 400 type vacuum tube voltmeter to Touch-Tone Generator LV jack tip and ring. Set voltmeter range switch on 3 volt range. Connect voltmeter power cord to 117 VAC supply and operate power switch to ON.

15.2 Operate keys and adjust potentiometers to obtain output voltages as follows:

Keys Operated	Adjust Potentiometers	Output Volts AC
HLV, ADJ, HFA	PA	1.34
HLV, ADJ, LFA	PB	1.34
HLV, ADJ	PC	1.5

15.3 Disconnect voltmeter from VL jack.

16. TOUCH-TONE GENERATOR PG RELAY PULSING

16.1 Adjust the pulsing of relay PG per the Timing Requirements Table on SD-25221-01 sheet 0148.

17. TEST OF SENDER SELECT UNIT FOR PARTIAL TOUCH-TONE

17.1 Test of SG Diodes

17.11 Temporarily strap together terminals SGO-9 and terminal PO of terminal strip TT on each Touch-Tone pattern relay unit. Momentarily operate key PCS. Lamps TO and UO lighted. Relay PO operated. Verify that only one T- lamp is lighted. Momentarily operate key PCR. Verify only one T- lamp lighted and relay PO operated. Repeat this test for all levels of the connector switch and all connector switches. To select switches 1 and 2 key G- must be operated to the proper position. To release connector switch, operate key RN.

17.2 Test of U Diode

17.21 Temporarily strap together terminals UO to U9 and PDS of terminal strip TT on each equipped Touch-Tone pattern relay unit. Momentarily operate key PCS. Lamp TO and UO lighted. Relays PO and PSD operated. Verify that no other U- lamps are lighted. Momentarily operate key PCS a second time. Lamp TO and U1 lighted and relays PO and PSD, operated. Verify only one U- lamp is lighted. Repeat this test for U2 to U9 of the connector switch. Repeat the test for connector switches 1 and 2 if provided. Operate key RN. Remove all temporary straps.

17.3 Pattern Relay Check

17.31 Using a grounded test receiver momentarily ground terminals PO-P5. Verify each equipped R- relay operates in order. Repeat this test for each equipped pattern relay unit.

17.4 Cross connect terms of terminal strip TT on each Touch-Tone pattern relay unit per Note 401 of SD-25521-0156 and Telephone Company information.

→ Arrowed lines indicate new or changed information.

Manager, Crossbar Product Engineering
Control Center

Reason for Reissue:
To bring Section into agreement with schematic on oscillator adjustment. To make reference to PG relay adjusting.

Replaces Section 161.5 dated 8-18-66.