"TOUCH-TONE" CALLING RECEIVING CIRCUIT (J99266) TROUBLE LOCATION

1. GENERAL

1.01 This section describes a method of locating a trouble in the TOUCH-TONE calling receiving circuit (J99266) using a KS-14510 volt-ohmmeter, the appropriate central office test circuit, a TOUCH-TONE subset, and an electron tube voltmeter.

1.02 This section is intended to be used when receiving circuit malfunctions as indicated by the appropriate Bell System Practice on central office maintenance tests and inspections.

1.03 If tests under the appropriate Bell System Practice section referred to in 1.02 indicate normal receiving circuit operation for a regular TOUCH-TONE call (nominal level and frequency and low pulsing speed), Part 4,A should be omitted. If under the above conditions normal operation is not indicated, Part 4,B should be omitted.

2. APPARATUS

2.01 Depending on the type of central office one of the following central office test circuits is required.

No. 5 Crossbar

Master Test Frame Automatic Monitor, Register, and Sender Test Circuit — SD-25680-01

Test Circuit for Register and CAMA Sender Circuits — SD-25988-01

Master Test Frame Control Circuit — SD-25800-01

No. 1 Crossbar and Panel

TOUCH-TONE Test Circuit — SD-21985-01

Appropriate Test Frame Circuit — SD-21186-01, SD-21026-01, SD-21026-02, or ES-239493-01

Step by Step

TOUCH-TONE Test Circuit — SD-32329-01

TOUCH-TONE Test Set — SD-32330-01

2.02 Provide a TOUCH-TONE subset or equivalent portable TOUCH-TONE signaling test circuit with manual keying.

2.03 Provide line patching facilities between the appropriate connecting circuit location and the receiving circuit location, if necessary and if available.

2.04 Provide KS-14510 volt-ohmmeter or equivalent.

2.05 Provide capacitor for meter isolation, between 1 and 4 mf at 200 volts dc (such as Western Electric code 524F).

2.06 Provide ac electron tube voltmeter such as Hewlett Packard 400D or equivalent, if available.

3. PREPARATION

3.01 If Part 4,B is to be used, set up as specified in the appropriate section on central office maintenance tests and inspections.

3.02 If Part 4,A is to be used, prepare as follows.

(a) Make busy the appropriate associated connecting circuit or circuits.

(b) Block the associated connecting circuit as follows.

(1) *No. 5 Crossbar:* Block nonoperated TMA and RA1 relays and block operated P2A relay in register circuit.

(2) *No. 1 Panel and Crossbar:* Block nonoperated ON1 relay and block operated ON relay in converter circuit.

(3) *Step by Step:* Block nonoperated TM3 and IS1 relays and block operated ON1 and REC relays in converter circuit.

(c) Connect either a TOUCH-TONE subset or equivalent test set, located at the receiver location (if possible) and patched back (if necessary) to the tip-ring terminals on the associated connecting circuit.

4. METHOD

A. General Receiver Failure

4.01 This localizing procedure should be followed in sequence unless directed by the results of a test to transfer to a specified paragraph, in which case a new sequence is started at the new paragraph.

4.02 Make all dc voltage measurements with respect to the ground test point with the positive lead of the volt-ohmmeter connected to the ground test point, unless otherwise specified. Check that all cards are properly inserted.

4.03 Measure the following dc voltages at the specified test points.

TEST POINT	MAX VOLTAGE	MIN VOLTAGE
−48	50	45
−24	27	21
−22	24.5	19.5
−30	33	27
CKL	13	9.5
CKH	13	9.5
STM	11.4	8.2
OT	16	11.5

If any voltage fails to lie within the specified limits, replace that card on which the test point is located. Note the following exceptions. −48 test point out of limits indicates probable interconnecting wiring or connecting circuit failure; CKL or CKH out of limits could indicate channel circuit failure as well as signal timer failure. Further tests will show the exact nature of the trouble.

4.04 Measure the dc voltage at the STM test point and note that it increases to about 22 volts when digit 1 is keyed and held. If this voltage change is not noted, proceed to 4.16.

4.05 Measure the dc voltage at the OT test point and note that it momentarily increases slightly when digit 1 is keyed. If the jump is not noted, proceed to 4.25.

4.06 Measure the dc voltage across the windings of the 295A digit output relays in the associated connecting circuit and note that it is essentially zero. If the voltage on any relay is not zero, trouble is indicated in the associated channel circuit, or output timer, or possible cable, or connecting circuit failure in the digit output leads. Also note that the voltage from either end of the relay winding (−) to office ground or ground test point (+) is essentially 48 volts. If it is not, connecting circuit trouble is indicated. If channel circuit trouble is indicated, the channel circuits may be associated with the relays by the following table (use 60-volt scale for all readings).

CHANNEL CIRCUIT	FREQUENCY DESIGNATION	FREQUENCY (cps)	RELAY #5, #1 PANEL	STEP BY STEP
H	L1	697	Y0	LF0
H	L2	770	Y3	LF3
J	L3	852	Y6	LF6
J	L4	941	Y9	LF9
K	H1	1209	Z1	HF1
K	H2	1336	Z2	HF2
L	H3	1477	Z3	HF3
L	H4	1633 (optional)		

4.07 Measure the dc voltage across the winding of the digit relay associated with the L1 channel and note that when digit 1 is keyed, the meter reading increases momentarily from 0 volt (use the 60-volt scale). Failure to observe jump in meter reading indicates either channel circuit trouble, or output timer trouble, or digit lead cable failure (open).

4.08 Repeat 4.07 noting voltage across relay associated with H1 channel.

4.09 Repeat 4.07 noting voltage across relays associated with L2, L3, L4, H2, H3, and H4 channels and key digit 1. No jump in meter reading should be observed.

4.10 Repeat 4.07 noting voltage across relays associated with H2 and I2 channels and key digit 5.

4.11 Repeat 4.07 noting voltage across relays associated with L1 and H1 channels and key digit 5.

4.12 Repeat 4.07 noting voltage across relays associated with H3 and L3 channels and key digit 9.

4.13 Repeat 4.07 noting voltage across relay associated with L4 channel and key either digit "0" or that signal consisting of the combination of L4 and H4 tones if the receiving circuit is equipped to receive H4 (1633 cps) channel.

4.14 If the receiving circuit is equipped for H4 channel, repeat 4.07 noting voltage across relay associated with H4 channel and key that signal consisting of the combination of L4 and H4 tones.

4.15 If the trouble has not been cleared at this point in the procedure, receiving circuit operation is probably normal and trouble could exist in either the interconnecting cable or the associated connecting circuit, or possibly the output timer interval is not within requirements. No further receiving circuit tests are indicated.

4.16 Enter the test procedure at this point when so directed by 4.04. Measure the dc voltage at the STM test point and note that it increases to about 22 volts when digit 5 is keyed and held. If the voltage change is not noted, try digit 9. If there is still no voltage change, possible signal timer trouble is indicated. If replacing the signal timer clears the trouble, return to 4.04; if it does not, output timer trouble may be indicated. If there is neither output nor signal timer trouble, go to 4.22. If, however, a voltage change is noted for digit 9, proceed to 4.17; if noted for digit 5, go to 4.20.

4.17 Measure the dc voltage at the STM test point and note that it increases to about 22 volts when digit 3 is keyed and held. Lack of a change indicates trouble in channel circuit H.

4.18 Repeat 4.17 with digit 1. Lack of a change indicates trouble in channel circuit K.

4.19 Do 4.05 and if all right, proceed from 4.05.

4.20 Do 4.17 with digit 2. Lack of a change indicates trouble in channel circuit H.

4.21 Repeat 4.17 with digit 1. Lack of a change indicates trouble in channel circuit K. Now return to 4.19.

4.22 Enter the test procedure at this point when so directed by 4.16. Set the volt-ohmmeter to read ac volts on the 3-volt scale and connect a capacitor (between 1 and 4 mf) in series with one meter lead. If an electron tube voltmeter is available, use it for this measurement. Connect the other lead of the volt-ohmmeter or the ground lead of the electron tube voltmeter to the GND test point. Connect the other capacitor lead or the electron tube voltmeter input to the OUT test point and note that when any digit is keyed, a voltage greater than 0.2 volts is indicated. Lack of a voltage indicates either tip-ring trouble, connecting circuit trouble, or input amplifier trouble. If trouble is cleared at this point, recheck 4.04 and 4.22, if necessary, and return to normal test sequence if a check is obtained. If no check is obtained on 4.04 or 4.22 or if trouble is not cleared, proceed to 4.23.

4.23 Using the voltage measurement procedure of 4.22 to check the voltage at the OUT L and OUT H test points, note that when any digit is keyed, a meter reading greater than 1.7 volts is indicated. (Note that with no digit keyed, meter reading may be either equal to or less than reading with digit keyed.) Lack of proper voltage indicates limiter or input amplifier or wiring trouble. If trouble is cleared at this point, recheck 4.04 and 4.16, if necessary, and return to normal test sequence if a check is obtained. If no check is obtained on 4.04 or 4.16 or if trouble cannot be cleared, proceed to 4.24.

4.24 No further tests can be made to localize trouble. Return to 4.04 and check all receiver frame and interconnecting wiring. Other sources of trouble in the order in which they are likely to occur are the following cards, limiter, input amplifier, H and/or K channel circuits, output timer, signal timer, and/or band elimination filter.

4.25 Enter the test procedure at this point when so directed by 4.05. Trouble is indicated in the output timer or signal timer. Replace the output timer and recheck 4.05. If a check is not obtained, replace the signal timer and recheck 4.05. If a check is obtained, restore

the original output timer and recheck 4.05. If no check is obtained at this point, check for interconnecting cable or connecting circuit trouble in the STR circuit.

B. Marginal Circuit Failure

4.26 This test procedure should only be used if the receiving circuit functions normally for a regular TOUCH-TONE call, that is nominal level and frequency and low or manual pulsing speed, but fails on one or more of the marginal tests of the appropriate central office maintenance tests and inspections. The probable receiving circuit cards in trouble will be indicated for various conditions under which failure is noted.

4.27 Receiving circuit failure under conditions of high pulsing speed and nominal level and frequency indicates signal timer or output timer trouble. If failure continues under long pulse, fast pulsing speed conditions, output timer trouble is probably indicated.

4.28 Receiving circuit failure under conditions of either high or low signal level and nominal frequency indicates input amplifier or limiter trouble.

4.29 Receiving circuit failure under conditions of nominal level and either maximum or minimum frequency indicates:

(a) Failure on all digits, limiter trouble.

(b) Failure on certain digits, trouble in that channel circuit associated with the frequency common to those digits on which failure is noted.

4.30 Receiving circuit failure on a single- or 3-frequency test indicates probable limiter or possible channel circuit trouble.