DIMENSION® 600/2000 PBX
TOUCH-TONE SENDERS AND RECEIVERS TEST
(PROC 512)

1. GENERAL

1.1 This section is issued in order to make available the information contained in the Administration and Maintenance Manual, 500-497, PROC 512.

1.2 The attachment provides test and troubleshooting procedures for TT senders and TT receivers.

ATTACHMENT

PROC 512 (11 pages)

Reason for Issue:
New Section

Manager, Denver PBX PECC

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A. DESCRIPTION

Procedure 512 should be used when the NETWORK TT - 512 (TOUCH-TONE) and MINOR alarm indicators on the Alarm Panel are turned on.

Procedure 512 is used to:

- Display the TOUCH-TONE circuit failures.

- Test all TOUCH-TONE sender and receiver circuits.

- Test the TOUCH-TONE digits.

- Retire the alarm when all sender and receiver circuits pass both Tests 2 and 3.

Four tests are available:

- Test 1 - Failure history.

- Test 2 - Tests all TOUCH-TONE sender circuits.

- Test 3 - Tests all TOUCH-TONE receiver circuits.

- Test 4 - Tests an individual sender or receiver circuit continously.

TEST 1: DISPLAYS FAILURE HISTORY. USE 'CLEAR DATA', 'EXECUTE' SEQUENCE TO CLEAR FAIL HISTORY.	TEST 2: TESTS ALL TT SENDER CIRCUITS.	TEST 3: TESTS ALL TT RECEIVER CIRCUITS.	TEST 4: TESTS DISPLAYED TT SENDER AND RECEIVER BY SENDING THE DISPLAYED TEST DIGIT (CHANGING) EVERY SECOND UNTIL 'STOP' IS OPERATED. IF A FAILURE IS DETECTED, THE SAME DIGIT WILL BE SENT REPEATEDLY UNTIL 'STOP' IS OPERATED. USE 'NEXT DATA' TO STEP FROM FAILED DIGIT AND CONTINUE TESTING. USE 'NEXT CKT' TO ADVANCE THE FLASHING EQUIPMENT LOCATION. USE 'NEXT UNIT' TO ENABLE 'NEXT CKT' TO ADVANCE THE OTHER EQUIPMENT LOCATION (FIELDS 2-6 OR 7-10).	FAILURE CODES: 0=PASS / DIGIT SENT BUT NOT DETECTED 1-9, 10=0, 11=*, 12=# / BAD DIGIT CODE DETECTED AS GOOD 20'S=LOW FREQ, 30'S=HIGH FREQ 40'S=UNUSED DIGIT / DIAL TONE: 50=NOT DETECTED WHEN PRESENT 51=DETECTED WHEN NOT PRESENT	IN USE:95=SENDER 96=RECEIVER 98=NETWORK ORDER INCOMPLETE OR NO TIME SLOT
USE 'NEXT CIRCUIT' TO DISPLAY THE NEXT FAILED CIRCUIT. USE 'NEXT DATA' TO DISPLAY MORE FAILURE CODES IN FIELD 12.					
	USE 'BUSY OUT' OR 'RELEASE BUSY OUT' TO CONTROL MAINTENANCE BUSY STATUS OF SELECTED EQUIPMENT LOCATION.		ENCODES:0=NEITHER, 1=SENDER 2=RECEIVER, 3=BOTH		

FLIPCHART ISSUE 5   ◯   ◯   **PROC 512**   ◯   ◯

FLIPCHART ISSUE 5   ◯   ◯   TOUCHTONE SENDERS AND RECEIVERS TEST   ◯   ◯

TEST NO.	TESTS 3,4 SENDER EQUIPMENT LOCATION					TESTS 2,4 RECEIVER EQUIPMENT LOCATION				MTCE BUSY STATUS	FAILURE CODE	TOTAL CIRCUITS (TESTS 1-3) / TEST DIGIT ENCODE (TEST 4)	TOTAL CIRCUITS TESTED	TOTAL CIRCUITS FAILED	CIRCUIT INDEX	PROC 512
	MODULE	CAB	CARR	SLOT	CKT	MODULE	CAB	CARR	SLOT							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

3.	0.1.4.	8.0.	1.0.0.2	3.0.	1.	4.	4.	1.	1.	512

B. FIELD DEFINITIONS AND CODES

Field	Code	Definition
1	1-4	Test numbers.
Sender Equipment Location:		
2	0-24	Module number.
3	0-4	Cabinet numbers.
4	0-4	Carrier number.
5	2-25	Slot number.
6	0,1	Circuit number.
Receiver Equipment Location:		
7	0-24	Module number.
8	0-4	Cabinet number.
9	0-4	Carrier number.
10	2-25	Slot number.
11		Maintenance busy status:
	0	Neither sender or receiver busy.

Field	Code	Definition
11 (Contd)	1	Sender busy.
	2	Receiver busy.
	3	Both busy.
12		Failure code:
	0	Pass.
		Digit sent but not detected:
	1-9	1-9
	10	0
	11	✳
	12	♯
		Bad digit code detected as good:
		Low frequency half tone:
	20	810 Hz (L1 + L2)
	21	897 Hz (L2 + L3)
	22	990 Hz (L3 + L4)
		High Frequency half tone:

B. FIELD DEFINITIONS AND CODES (Contd)

Field	Code	Definition
12 (Contd)	30	1406 Hz (H1 + H2)
	31	1555 Hz (H2 + H3)
	32	1633 Hz (H3 + H4)
		Unused digits detected:
	40	697 + 1719 Hz (L1 + H4)
	40	770 + 1719 Hz (L2 + H4)
	40	852 + 1719 Hz (L3 + H4)
	40	941 + 1719 Hz (14 + H4)
		Dial tone detection:
	50	Not detected when present.
	51	Detected when not present or another tone set.
		In use failure codes:
	95	Sender in use.
	96	Receiver in use.
	98	Network order incomplete or no time slot available.
13	1-99	Test 1, 2, 3: Total number of senders or receivers in the system.

Field	Code	Definition
13 (Contd)		Test 4: Good digits sent:
	1-9	1-9
	10	0
	11	✳
	12	♯
	Dash	Other parameters that display error codes 20 through 51.
14	0-6	Test 1: Total circuits tested.
	0-99	Tests 2 and 3 : Total circuits tested.
15	0-6	Test 1: Total circuits tested.
	0-99	Tests 2 and 3 : Total circuits tested.
16	0-33	Index to displayed failed circuit.

C. TEST PROCEDURES

A list of TOUCH-TONE sender/receiver tests, what each one does and how each is run follows:

Call in Procedure 512:

PROC NO.; 512; ENTER

All on-line maintenance testing is turned off.

Test 1 is automatically selected.

Depressing the NEXT TEST key repeatedly advances the procedure to the desired test.

Test selection may result in the display of a "default" circuit. A default circuit is the last failing circuit detected. The location of this circuit is automatically displayed on entry to a test that requires an equipment location before it can be run (Test 2, 3, or 4).

The identity of the default circuit is redefined when a failing circuit is displayed from failure tables used in Test 1, 2, or 3, or when a failure is detected in Test 4.

NOTE

Special error code 74 indicates that the PBX is not equipped with TOUCH-TONE senders and/or receivers. Its appearance, therefore, causes this procedure to be terminated.

Test 1:

Test 1 provides a failure history of the TOUCH-TONE sender or receiver circuits. The failure history is generated by the on-line software, which busies out all but one of the failed circuits it finds.

While Procedure 512 is running, the on-line software stops testing the sender and receiver circuits. To update the failure history, call up another procedure and wait a time period equal to:

$$5 \text{ minutes} \times (\text{number of senders} + \text{number} \\ \text{of recivers})$$

before reentering Procedure 512.

To start the test, select Test 1 and depress the EXECUTE key. If one or more failures have occurred, the following is displayed.

Field	Contents
2-6	Equipment Location of failed sender.
or	
7-10	Equipment Location of failed receiver.
11	Maintenance busy status.
12	Failure code.
13	Total number of senders or recivers in the PBX.
15	Total failed circuits.
16	1, indicating first failed circuit.

C. TEST PROCEDURES (Contd)

Depressing the NEXT CIRCUIT key advances the display to the next failed sender or reciver circuit in the failure history.

Depressing the NEXT DATA key repeatedly displays additional failure codes associated with the circuit.

Depressing the NEXT CIRCUIT key repeatedly displays the failure histories of the remaining failing circuits. Depressing NEXT CIRCUIT after all failure histories have been displayed dashes fields 2 through 16. Depressing NEXT CIRCUIT again causes Test 1 to be executed.

Refer to paragraph 2C in Section 4 for information on clearing the failure history.

Test 2:

Test 2 automatically tests all TOUCH-TONE sender circuits in the system. To start the test, select Test 2 and depress the EXECUTE key. The WAIT indicator on the MAAP turns on and the failure code flashes while testing is in progress.

A receiver location for testing all sender circuits is displayed in fields 7 through 10.

> **NOTE**
> Only the change field sequence can be used to change the receiver location; eg:
>
> CHANGE FIELD; 1; ENTER; (Module); ENTER; (Cabinet); ENTER; (Carrier); ENTER; (Slot); ENTER

If a sender line is busy, the test waits up to 10 seconds to connect that sender line to the receiver before progressing to the next sender location. A failure code of 95 for sender in use or 96 for receiver in use appears in field 12, and the IN-USE indicator turns on.

If a failure is detected, the NETWORK TT-512 and MINOR alarm indicators are turned on. If, after all senders have been tested (WAIT OFF), one or more failures has occurred, the first failed sender is displayed on the MAAP as follows:

Field	Contents
2-6	Equipment location of first failed sender.
7-10	Equipment location of connected receiver line.
11	Maintenance busy status.
12	Lowest failure code detected.
13	Total number of circuits in the system.
14	Total circuits tested.
15	Total circuits failed.
16	Circuit index of 1.

Depressing NEXT CIRCUIT repeatedly displays the remaining failing circuits. Depressing NEXT CIRCUIT after all the failing circuits have been displayed dashes fields 2 through 6, 12, and 16. Depressing NEXT CIRCUIT again causes Test 2 to be executed, as described previously.

The NEXT DATA key can be used to display additional

failure codes associated with the failed sender circuit.

The STOP key can be used to stop Test 2 any time the WAIT indicator is turned on.

In Test 2, the BUSY OUT and RLS BUSY OUT keys can be used to change the maintenance busy status of a failed sender circuit only. Use Test 4 to change the maintenance busy status of operable circuits.

The NETWORK TT-512 indicator is automatically turned off (indicating the TOUCH-TONE sender/ receiver alarm is retired) when all sender circuits pass Test 2 and all receiver circuits pass Test 3.

Test 3:

Test 3 operates the same as Test 2, except that receiver circuits are tested instead of sender circuits.

Test 4:

Test 4 is used to continuously test any sender (fields 2 through 6) or receiver (fields 7 through 10) circuit suspected of having intermittent failures or to trace wiring problems. It is also used to release from busy any circuits that are busied out.

Test 4 can be initialized in two ways:

1. If no failures have occurred (no default circuit exists), both equipment locations (fields 2 through 6 and 7 through 10) are dashed. In field 2, the dash is flashed indicating that the field is selected for entry. An equipment location can be entered in any of the following ways:

(a) Direct entry; eg:

(Sender Module); ENTER; (Cabinet); ENTER; (Carrier); ENTER; (Slot); ENTER; (Circuit); ENTER; (Receiver Module); ENTER; (Cabinet); ENTER; (Carrier); ENTER; (Slot); ENTER

(b) Change field sequence; eg:

CHANGE FIELD; 2; ENTER; [sender and receiver equipment locations as described in method 1(a)]

(c) The NEXT CIRCUIT key can be depressed repeatedly to sequence through all the sender equipment locations in the PBX, starting with the lowest. Depressing NEXT CIRCUIT after all locations have been displayed dashes the display. Depressing NEXT CIRCUIT again starts the sequence over again with the lowest location.

C. TEST PROCEDURES (Contd)

When the desired sender circuit has been selected, the NEXT UNIT key can be depressed to move NEXT CIRCUIT control to the receiver equipment location fields (field 7 is flashed). NEXT CIRCUIT can then be used to sequence to the desired receiver equipment location.

NOTE

NEXT CIRCUIT must be depressed after NEXT UNIT to display the first equipment location.

Depressing NEXT UNIT again moves NEXT CIRCUIT control back to the sender equipment location fields (field 2 is flashed).

2. If a failure has occurred, a default circuit is displayed. The default circuit is the last sender or receiver failure displayed in Test 1, 2, or 3. If a sender circuit location is displayed (fields 2 through 6), the receiver circuit location fields (7 through 10) are dashed. If a receiver is displayed, the sender fields are dashed.

The module field of the dashed equipment location (field 2 or 7) is flashed indicating

an entry is required. Either an equipment location can be entered and the default circuit tested or another sender/receiver combination can be selected. If the default circuit is to be tested, the required equipment location can be entered using method 1(a) or 1(c). If another pair of circuits is to be selected, method 1(b) or 1(c) can be used.

NOTE

If the change field sequence [method 1(b)] is used to enter an equipment location into fields that are not under NEXT CIRCUIT control (module field flashing) and the location is not valid, an error code will be displayed and the equipment location field will flash when the EXECUTE key is depressed.

To start the test, depress EXECUTE. The WAIT indicator turns on until the test connection is made.

NOTE

If a connection is not made in 10 seconds, failure code 95 or 96 is displayed and the test is stopped.

C. TEST PROCEDURES (Contd)

Sequential test digits are displayed in field 13. Flashing dashes in field 12 indicate the test is running. If a failure occurs, the digit that caused the failure is displayed repeatedly in field 13 and the failure code for the first failure detected is locked into field 12 and flashed. When the test is stopped, (STOP depressed), the display appears as follows:

Field	Contents
2-6	Equipment location of sender circuit.
or	
7-10	Equipment location of receiver circuit.
11	Maintenance busy status.
12	Failure code.
3	Test digit encode.
14-16	Dashes.

The NEXT DATA key can be used to step to the next test digit and resume the test. After encode 12 has been tested, dashes appear in fields 12 and 13. Depressing NEXT CIRCUIT loops the test around to encode 1.

Depressing the STOP key halts the test and depressing EXECUTE restarts the test.

The BUSY OUT and RLS BUSY OUT keys can be used to change the maintenance busy status of the selected equipment.

When BUSY OUT and RLS BUSY OUT are used, the equipment location under NEXT CIRCUIT control (Module field flashing) is under control of BUSY OUT or RLS BUSY OUT.

D. REPAIR GUIDE

When a TOUCH-TONE sender/receiver failure is indicated, the following steps should be performed in the order shown to isolate and repair the faulty unit.

NOTE

Before using Procedure 512, run the following procedures to verify that the corresponding circuit packs are not faulty.

Procedure	Circuit Pack
505	LC123,LC124,LC130,LC131
506	LC46,LC49
508,580	LC101 through LC105
511	LC100

Failure of any of these circuit packs could cause the TT-512 indicator to turn on.

D. REPAIR GUIDE (Contd)

Step   Isolation Procedure

1. Using Test 1, step through the failure history and record the results.

2. Execute Test 2 to determine if a TOUCH-TONE sender circuit is failing and record the results.

3. Execute Test 3 to determine if a TOUCH-TONE receiver circuit is failing and record the results.

4. Based on the test results, take the corrective action necessary for each failed circuit. Repeat Test 2 or 3 to verify that the fault has been corrected. Using Test 4, release from busy those circuits that have been busied out.

NOTE

In Test 2 and 3, the BUSY OUT key can be used only on failed circuits. In Test 4, the BUSY OUT and RLS BUSY OUT jets can be used on any sender or receiver circuit entered in fields 2 through 6 and fields 7 through 10. If the circuit selected is in use, Test 4 seizes the circuit, if it becomes idle within 10 seconds, and busies it out.

NOTE (Contd)

The BUSY OUT indicator on the MAAP turns off only when all circuits interfacing with the MAAP are no longer busied out. Therefore, use field 11 to determine the maintenance busy status of the sender/receiver circuits being tested.

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5. If during Test 2 a series of sender circuit failures occurs, remember that a failure code is displayed when either a sender or reciver circuit has failed. A defective receiver line can cause a failure code to appear when testing an operable sender circuit connected to it. If this situation is suppected, change the receiver location entered for testing all sender circuits. Using Test 4, determine which receiver location is operable and enter it into fields 7 through 10 using the change field sequence.

6. When all sender circuits fail Test 2, an alternate repair procedure to Step 5 is:

    (a) Replace the LC54 receiver circuit pack and LC10 TOUCH-TONE register, if the system is not equipped with a single circuit pack LC10C reciever/register.

    (b) After repair, repeat Test 2.

D. REPAIR GUIDE (Contd)

Step   Isolation Procedure

NOTE

In some machines, circuit pack LC210/10C
has replaced circuit packs LC54 and LC10.
Where this is the case, substitute LC210/10C
wherever LC54 or LC10 are mentioned in the
repair procedures.

(c) Use a similar replacement procedure for
the failed sender circuit if Test 3
fails all receivers.

(d) Replace sender circuit pack LC12 and
rerun Test 3.

If all receivers in a carrier have failed,
replace LC49B and run Test 3. If the
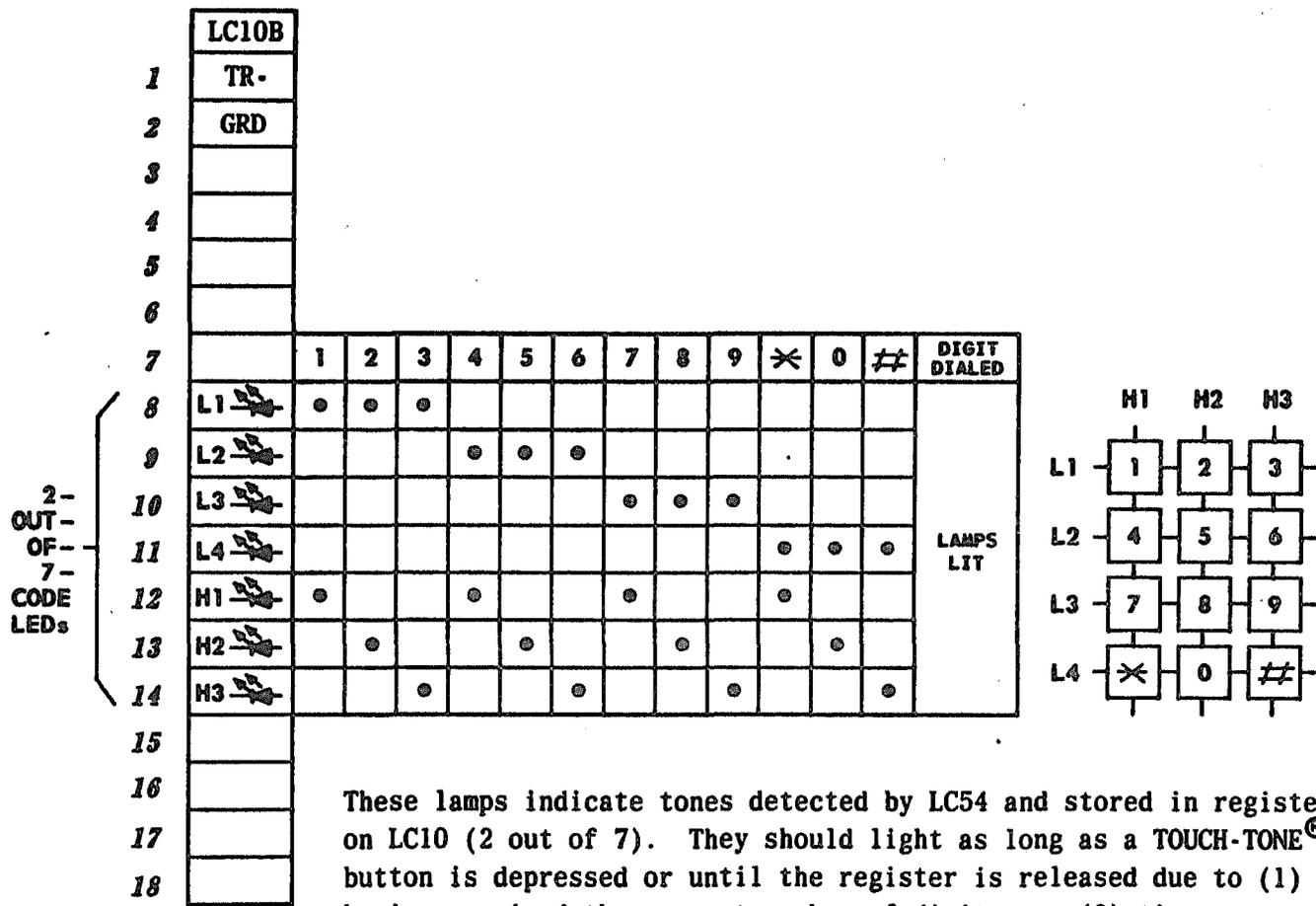trouble had not been cleared, replace LC101
and rerun Test 3.

8.   If a single receiver circuit fails, use Test
4 to determine whether LC10 or LC54 is at
fault by performing the following steps:

(a) Observe the 2-out-of-7 code light-
emitting diodes (LEDS) on the LC10
(Fig. 512-1). If the LEDS are correct
for the displayed failed digit, replace
the LC10 and retest. If the trouble is
not cleared, check the wiring.

(b) If the LEDs are not correct, check TP1 on
the LC10. If the signal is absent,
replace the LC10. If the signal is
present, check TP8 on the LC54B. If the
signal is absent, replace the LC54B.
If the signal is present, Test 4
is failing a good digit. Check TP1 through
TP7 on the LC54 for the 2-out of-7 code.

(c) If the 2-out-of-7 code is not correct,
replace the LC54; otherwise, replace the
LC10. If the problem persists, check
TP9 through TP12 on the LC54 for correct
voltages. If the voltages are not correct,
replace the LC54.

9.   If intermittent sender or receiver circuit
failures or wiring problems are suspected, use
Test 4 to continuously test suspect circuits.

10. Exchanging circuit packs while testing the
circuit may cause the test connection to be
broken. This results in a test failure. If
testing of this circuit cannot be restarted,
especially where error code 95 or 96 is
displayed, busy out the circuit using Test 4.
Continue Test 4 until the failure is corrected
and the circuit passes in either the busied out
or released from busy status.

11. After all failures have been corrected, repeat
Test 1 to clear the failure history and Test 2
and 3 to retire the alarm.

LC10B

Pin	LC10B
1	TR-
2	GRD
3	
4	
5	
6	

2-OUT-OF-7-CODE LEDs (pins 8–14)

	1	2	3	4	5	6	7	8	9	✳	0	♯	DIGIT DIALED
L1	●	●	●										
L2				●	●	●							
L3							●	●	●				
L4										●	●	●	LAMPS LIT
H1	●			●			●			●			
H2		●			●			●			●		
H3			●			●			●			●	

(pins: L1=8, L2=9, L3=10, L4=11, H1=12, H2=13, H3=14; pins 15–18 blank)

Keypad:

	H1	H2	H3
L1	1	2	3
L2	4	5	6
L3	7	8	9
L4	✳	0	♯

These lamps indicate tones detected by LC54 and stored in registers on LC10 (2 out of 7). They should light as long as a TOUCH-TONE® button is depressed or until the register is released due to (1) having received the correct number of digits, or (2) time-out (about 20 seconds). There is additional decoding before these signals leave LC10.

Fig. 512-1 — 2-out-of-7 Code LEDs