

**ELECTRONIC DIAL TONE SPEED REGISTER UNIT  
SWITCHING SYSTEMS MANAGEMENT**

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3. CIRCUIT DESCRIPTION . . . . .	2	1.01 This section of the Dial Facilities Management Practices covers the major aspects of the Electronic Dial Tone Speed Register (EDTSR) unit. The EDTSR provides an electronically controlled means of measuring dial tone speed. The administration and the line assignments are covered in this section as they apply to the EDTSR. This unit is a completely solid-state electronic circuit. See Fig. 1.
4. FEATURES . . . . .	2	1.02 Whenever this section is reissued the reason for reissue will be listed in this paragraph.
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Traffic Service Observing Practice; Division F, Section 2.

**2.03** The reliability of the data is assured by the solid-state components which allow for prolonged operation with minimal maintenance. There are several maintenance features which are incorporated in the circuit to facilitate self-checking of the EDTSR and the maintenance of test circuits to which the EDTSR is connected.

**2.04** The EDTSR is compatible with all types of electromechanical Central Offices, with line circuits which require loop start or ground start, and with circuits used for coin lines.

### 3. CIRCUIT DESCRIPTION

**3.01** The EDTSR is of modular design and will accommodate up to 128 unassigned subscriber line equipments on from 1 to 16 line access cards. Each access card contains eight line switches and is divided into two subgroups of four. Each subgroup can be associated with only one class of service (or loading division). There are a total of eight classes of service. A central office may or may not utilize all eight of them. The capability of assigning a subgroup of four line switches to a class of service permits efficient utilization of the EDTSRs line access cards. It also facilitates distribution of a particular class of service over the complete cycle.

**3.02** Each subscriber line equipment requires two leads (tip and ring pair) for connection to the EDTSR. The use of a paired lead ensures maintaining the balance of the line. This reduces noise to other lines and also minimizes noise pickup which might interfere with the detection of actual dial tone.

**3.03** The line sequencer scans the line access circuit for line switches assigned to line equipment and causes the line access circuit to initiate tests in a predefined order.

**3.04** The EDTSR has a preset calling rate of 225, 450, 600 and 900 calls per hour programmed into it via cross-connections on the master clock circuit rack. This preset rate will originate a test call at either 16, 8, 6 or 4 seconds, respectively. These rates were developed to minimize equipment wear and the amount of common control capacity used, while maintaining the statistical

accuracy of the sample results. Selection of an appropriate rate depends on the size of the central office (see Table A).

**3.05** The EDTSR has nine pairs of outputs. One pair is dedicated to Total Calls Overall and Delayed Calls Overall. Each of the remaining output pairs may be associated with one of the eight classes of service.

**3.06** The EDTSR can be activated manually at the EDTSR line sequencer circuit pack or automatically from the TUR Timer, Program Timer (with required connections), or an electronic data gathering system such as EADAS.

**3.07** Several built-in operational checks facilitate the maintenance of the unit, the line circuits connected to it, and ensures machine accuracy.

**3.08** The normal power source is from regular central office -48 volt signal battery.

### 4. FEATURES

**4.01** The EDTSR has several tests and checks provided to verify the integrity of a test call.

#### *Line Integrity Check*

**4.02** During the first 800 milliseconds (ms) of each test call, the EDTSR makes three tests. First, to check that there is loop current (LC) present on the line circuit; second, to check that there is no foreign tone (FT) on the line; and third, to check that there is not an interrupted tone (IT) (60 or 120 IPM) on the line equipment. When any of the above checks do not meet the requirements, an associated light emitting diode (LED) will light (LC, FT, and IT) on the maintenance control panel (MCP). Refer to Fig. 2. Also, the line access card number (first 2 digits, 00 to 15) and the line switch number on that card (third digit, 0 to 7) will be stored in the faulty line register and will be displayed in the upper three digit read-out when the display control toggle switch is in the FAULTY CALLS position on the MCP.

### **Dial Tone Detection**

**4.03** When the test call has successfully passed the three preliminary integrity checks the test proceeds as follows:

(a) **Tone Present:** With no failure detected during the first 800 ms, the EDTSR assumes that any tone subsequently sensed by the dial tone (DT) detector is valid dial tone. Once a tone is detected a 100 ms time out is started. When completed, the EDTSR will release the line equipment, (so as to minimize the holding time (loading) of the central office equipment). The DT detector stores in its memory the fact that dial tone was present and at the end of three seconds the EDTSR interrogates it to determine this fact. At this point the test call outputs associated with this line (total and class of service) will be pulsed.

(b) **Tone Not Present:** If dial tone is not detected within three seconds, the TEST CALL and DELAYED CALL outputs associated with this line (total and class of service) will be pulsed. The above pulses may be used to operate hardware registers and/or software equivalents.

### **Line Sequention**

**4.04** The line sequencer scans the line access cards to locate the next assigned line switch in the sequence. The line switch sequence is arranged in a pre-defined order (see order outlined in Table B). The sequencer will automatically skip unassigned line switches (inputs) that have been strapped on the line access board, per SD-3B504.01, cross connect note 401. The sequencer will also skip positions which do not have access cards installed or from which the cards have been pulled out. After testing all of the number '0' line switches on each access card available, the sequencer then tests all of the number '1' line switches, and then number '2', '3', '4', etc. until all of the assigned switches and cards have been tested. The sequencer then starts over again at line switch number '0' on access card number '00'. There must always be a line equipment assigned to line switch number '0', access card number '00'. Eight hundred (800) ms after the beginning of the line scanning, the next assigned line equipment is seized. A test call is made and upon its completion, the order of events is repeated (scan-seize-test-complete, etc.).

(a) **The Master Clock Circuit:** The master clock is a sequential circuit controlled by a free running oscillator. The master clock provides the timing pulses for the operation of the line sequencer and the internal timing functions of the EDTSR. The master clock circuit board has strapping options to establish the scanning rate (225, 450, 600, or 900 calls per hour).

(b) **Stop on Delay (SOD):** In the LOCAL RUN mode the EDTSR has the ability to stop line sequencing when a three second delay has been encountered. With the SOD switch on the MCP operated to the SOD ON position, an occurrence of a three second delay will light the LED 'SOD' and activate a minor alarm. The access card number and line switch number is stored in the faulty line register and will be displayed in the upper readout when the display control switch is in the FAULTY CALLS position on the MCP.

### **Output Registration**

**4.05** The EDTSR has nine pairs of output terminals.

Each pair consists of a test terminal and a delay terminal. Numbering is from T-00 to T-08 for test terminals and from D-00 to D-08 for delay terminals. Pair 00 is preassigned to total tests (T-00), and total delays (D-00). Pairs 01 through 08 may be assigned to any class of service or loading division. Each pair of output terminals may be associated with hardware registers and/or software equivalents for recording DTS tests and delays either locally or remotely or both. Remote hardware registers beyond 500 ohms (approximately 5 miles) require a 405 type data set and connecting circuits. Software equivalents must be processed through a data converter. All outputs can be selectively displayed on the MCP.

## **5. OPERATIONAL CHECKS**

**5.01** The EDTSR contains built-in features for monitoring and checking proper operation of the unit.

### **Dial Tone Detector Check**

**5.02** The accuracy of the electronic counters on the MCP can be verified easily. First operate the COUNTER CLEAR switch on the MCP and check that the counters cleared. Then operate the dial tone cutoff (DTC) switch on the circuit

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pack faceplate (CP7), which disables the DT detector. Next operate the toggle switch to LOCAL RUN on the line sequence circuit pack. The EDTSR should now be scanning and testing lines. If functioning properly, the count of the delayed calls will equal the count of the completed calls (total calls).

### **Calling Rate Check**

**5.03** The accuracy of the calling rate can be checked by summing the TOTAL CALLS (upper 3-digit read out) and the FAULTY CALLS (displayed in lower 3-digit read out when the display switch is operated to FAULTY CALL position) per unit of time.

#### **Example:**

With a calling rate of 900 calls per hour and an observation interval of 15 minutes, the unit should monitor 225 calls (ie,  $900 \div 1/4 \text{ Hr.} = 225 \text{ calls}$ ). If the TOTAL CALLS (LED) register indicated 220 calls at the end of 15 minutes, the FAULTY CALLS (LED) register should indicate five calls. The sum of 220 plus 5 thus equals 225, the calling rate.

### **Failure Check and Alarms**

**5.04** Several of the circuit packs (CP) have LEDs mounted on their face-plates to identify certain internal component failures. A minor central office alarm will be activated if a failure occurs in the following units:

- (a) **5-Volt Power Supply (CP12):** The 5-volt power supply (CP12) is equipped with a green LED which will extinguish when a power failure occurs.
- (b) **Master Clock Circuit (CP11):** The master clock circuit (CP11) has a red LED that lights when a failure occurs.
- (c) **Line Sequencer Circuit (CP10):** The line sequencer circuit is also equipped with a red LED that lights when a failure occurs.

**5.05** There are four green LEDs mounted on circuit packs to monitor the periodic timing pulses. These constantly flashing LEDs provide

verification that the clock pulses are operating properly.

**Note:** When power has been turned off or removed from the EDTSR and then reapplied, all internal LED's and registers should be reinitialized by operating the COUNTER CLEAR switch on the MCP. The CLEAR/ALARM CUT-OFF toggle switch should also be operated to the CLEAR position to reset other LEDs to normal.

## **6. ASSIGNMENT OF TEST LINES TO THE EDTSR**

**6.01** The EDTSR may be equipped with from 1 to 16 line access cards numbered 00 through 15. Each access card contains 8 line switches numbered 0 through 7, and is divided into 2 subgroups of 4. Each line switch can be associated with one subscriber line equipment (test line), or a multiple of a test line. Each subgroup of 4 line switches can be associated with only one class of service. There are a total of 8 classes of service and one or all of them can be used for an entity, as required.

**6.02** A test line must always be assigned to line access card 00 line switch 0. The line sequencer starts scanning at this point and scanning cannot begin if this line switch position is unassigned.

### **6.03 Test Line Requirements**

Class-of-service minimum number of test line assignments for Step-by-Step and Panel:

- 1 line group—1 line equipment multiplied to 3 line switches
- 2 line groups—1 line equipment multiplied to 2 line switches for each line group
- 3 line groups—1 line equipment assigned to 1 line switch for each line group

Crossbar test line assignments:

- Small offices—2 line equipments per Link Link Frame assigned to 1 line switch each. (Less than 11 LLFs)

Large offices—1 line equipment per Link Link Frame assigned to 1 line switch. (11 LLFs or more)

**6.04**

Where ground start is required, it should be indicated on the form used for line assignment.

**6.05** Unassigned line switches on installed access cards require strapping per SD-3B504-01, cross connect note 401, to indicate they are not to be tested. Unassigned line switches should be indicated on the form used for line assignment.

**6.06** The physical location (within a line group or frame) of the subscriber line equipments to be tested should be chosen to give representative DTS results. Before selecting the line equipment locations, Traffic Service Observing Practice, Division F, Section 2 should be reviewed. Line equipment locations should be indicated on the line assignment form.

**6.07 Frequency of Assignments:** The test lines that are used for dial tone testing usually are not changed with any degree of regularity. However, they are changed to facilitate maintenance on a particular line or when additions of equipment to the office would warrant such a change.

**7. REGISTER ASSIGNMENTS**

**7.01** The EDTSR has nine pairs of output terminals.

Each pair consists of a test terminal and a delay terminal. Numbering is from T-00 to T-08 for test terminals and from D-00 to D-08 for delay terminals. Pair 00 is preassigned to total test (T-00), and total delays (D-00). Pairs 01 through 08 may be assigned to any class of service or loading division. Each pair of output terminals may be associated with hardware and/or software equivalents for recording DTS test and delays. The output terminal pair numbered associated with each class of service or loading division should be

indicated for each subgroup of 4 line switches on the form used for line assignment.

**7.02** The hardware register assignments or software equivalents for total calls and total delays and for each class of service should be entered on the assignment form.

**7.03** An assignment form, suitable for reproduction, is attached.

**8. TEST CALL RATE SELECTION**

**8.01** The EDTSR originates test calls on up to 128 unassigned subscriber line equipments at a preset test rate (either 4, 6, 8 or 16 seconds). The test rate, programmed into the EDTSR via wire-wrap cross-connections on the Master Clock circuit board, establishes the number of test calls per hour (900, 600, 450 or 225). These rates were developed to minimize equipment wear and the amount of common control capacity used, while maintaining the statistical accuracy of the sample results. Selection of an appropriate rate depends upon the size of the central office. (See Table A.) The test call rate should be indicated on the assignment form.

**9. CONNECTIONS**

**9.01** The designation card (Fig. 3A&B) shows which subscriber line equipment is connected to what line access card and line number on that card. If a line number on an access card is not assigned a line circuit, this should be noted in the appropriate column on the card. The class of service for each subgroup should also be entered on the card. When ground start is required, it should show on the card which subgroups require such a connection.

**10. EQUIPMENT INFORMATION**

The equipment for the EDTSR is shown and listed in Fig. 1. The equipment, list, and drawing information, along with quantities needed may be found in BSP 822-125-151.

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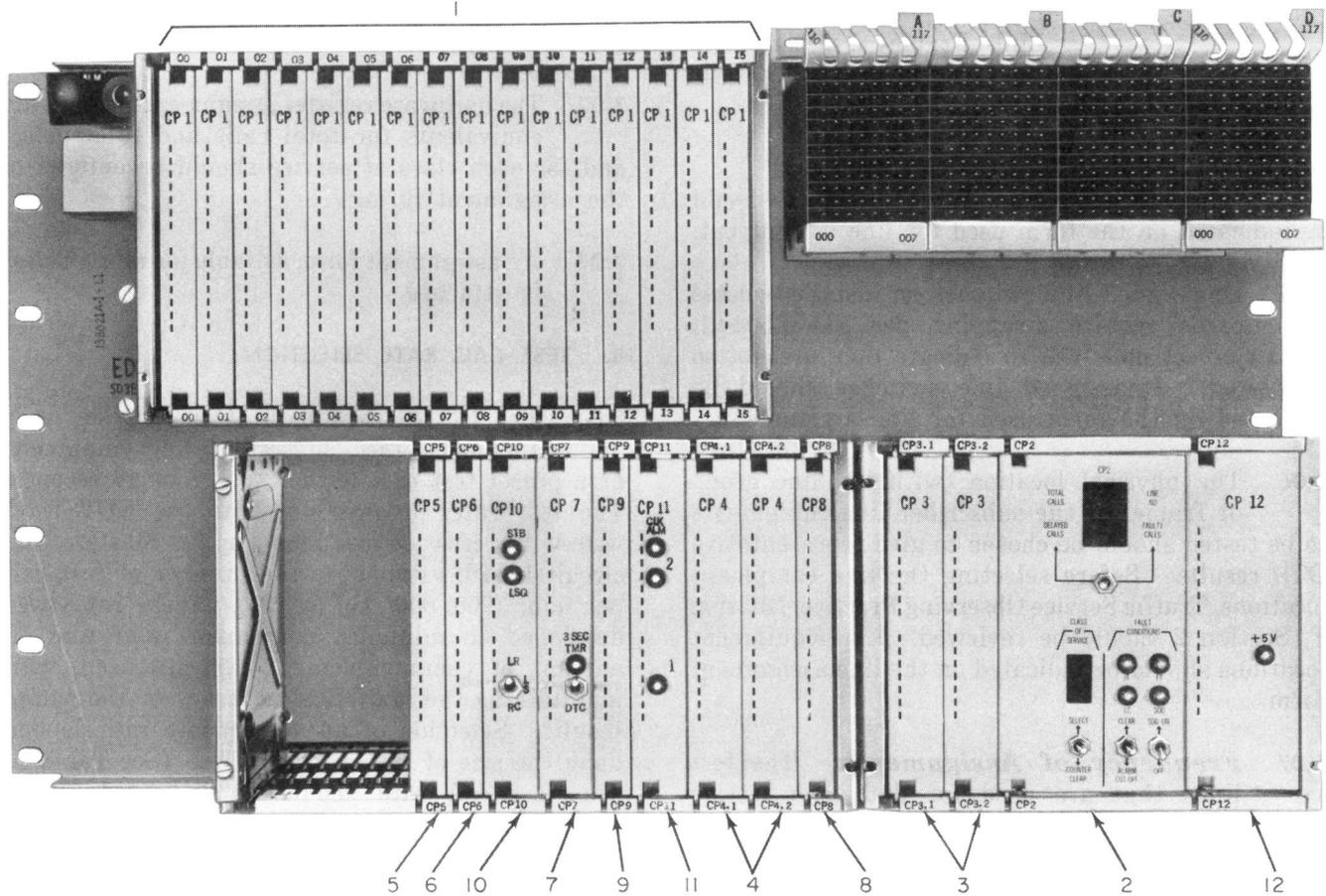


Fig. 1—Electronic Dial Tone Speed Register Unit

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. CP1 — Line Access Board and CP13</li> <li>2. CP2 — Display Circuit Board (Maintenance Panel)</li> <li>3. CP3 — Output Relay Board</li> <li>4. CP4 — Cutoff Relay Circuit Board</li> <li>5. CP5 — Class of Service Output, Idle Line Concentrator, and Loop Current Concentrator Board</li> <li>6. CP6 — Program Bit Concentrator Board</li> </ul> | <ul style="list-style-type: none"> <li>7. CP7 — DIAL Tone Detector and Timer Circuit</li> <li>8. CP8 — Faulty Line Register and Faulty Call Counter Board</li> <li>9. CP9 — Test Call and Delay Counter Board</li> <li>10. CP10 — Line Sequencer Circuit Board</li> <li>11. CP11 — Master Clock Circuit Board</li> <li>12. CP12 — DC to DC converter Board</li> </ul> |
|---|---|

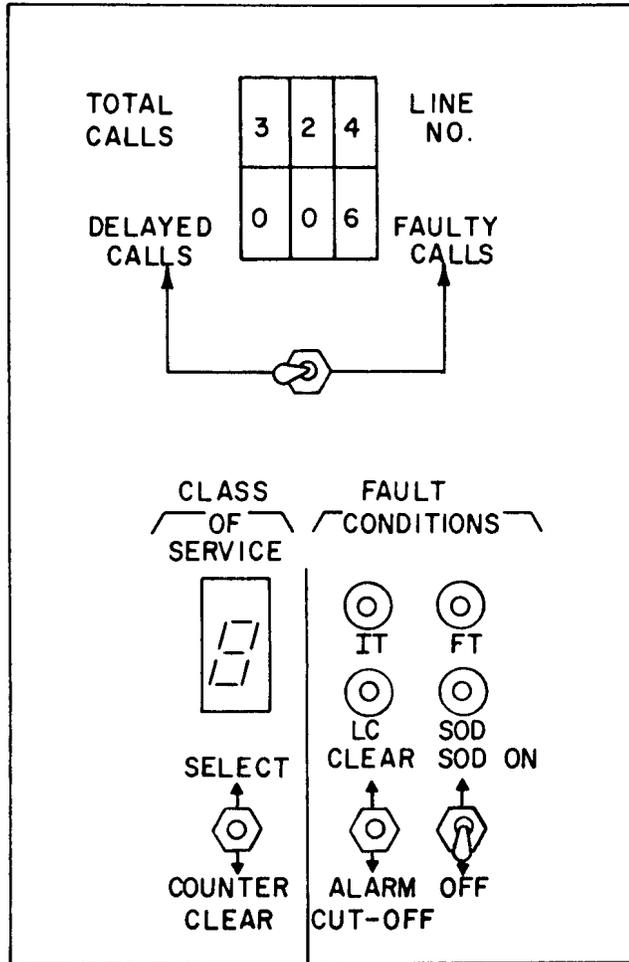


Fig. 2—Maintenance Panel

**SECTION 1d(2)**

LINE ACCESS CARD NO.  
 LINE NO.  
 CLASS OF SERVICE  
 GROUND START  
 LINE NOT ASSIGNED

L C N O	L N O	C O S	G R O U N D S T A R T	N A	SUBSCRIBER LINES	L C N O	L N O	C O S	G R O U N D S T A R T	N A	SUBSCRIBER LINES
0	0					0	0				
0	1					0	1				
0	2					0	2				
0	3					0	3				
0	4					0	4				
0	5					0	5				
0	6					0	6				
0	7					0	7				
0	0					0	0				
0	1					0	1				
0	2					0	2				
0	3					0	3				
0	4					0	4				
0	5					0	5				
0	6					0	6				
0	7					0	7				
0	0					0	0				
0	1					0	1				
0	2					0	2				
0	3					0	3				
0	4					0	4				
0	5					0	5				
0	6					0	6				
0	7					0	7				
0	0					0	0				
0	1					0	1				
0	2					0	2				
0	3					0	3				
0	4					0	4				
0	5					0	5				
0	6					0	6				
0	7					0	7				
0	0					0	0				
0	1					0	1				
0	2					0	2				
0	3					0	3				
0	4					0	4				
0	5					0	5				
0	6					0	6				
0	7					0	7				

THIS INFORMATION IN THESE BOXES  
 MUST BE ASSIGNED PER CENTRAL OFFICE

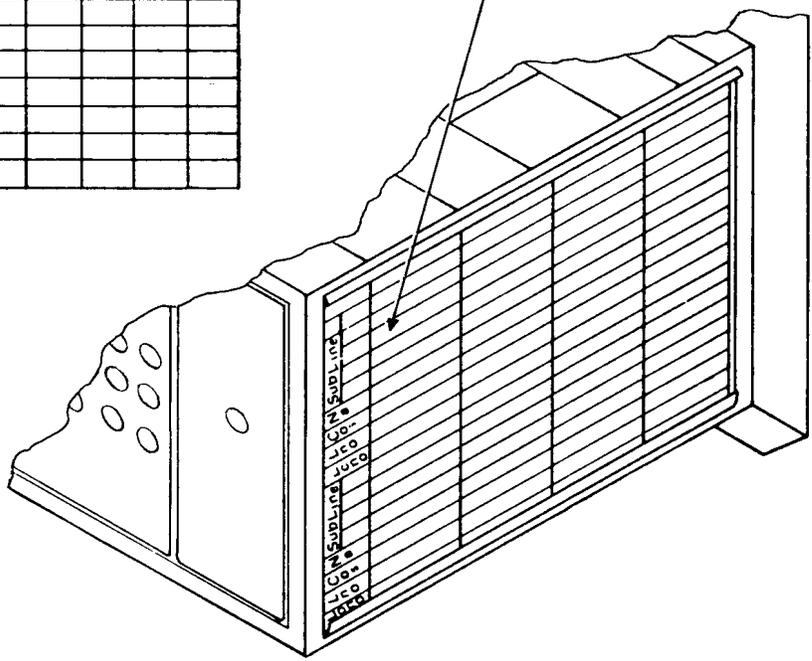
NO.5 X-BAR    LL   VG   HG   VF

NO.1 X-BAR    LL   VG   HG   VF

PANEL        LF   GR   BK   TERM

STEP X STEP    LFG + LSW   TERM

The Designation Card is removable from the unit and is kept in a card holder mounted to the side of the apparatus mounting. The line information can be changed by erasing and penciling in the new information.



**Fig. 3A—Designation Card**

LINE ACCESS CARD NO.  
 LINE NO.  
 CLASS OF SERVICE  
 GROUND START  
 LINE NOT ASSIGNED

L C N O	L N O	C O S	G R O U N D S T	N A	SUBSCRIBER LINES				L C N O	L N O	C O S	G R O U N D S T	N A	SUBSCRIBER LINES				
0	0								0									
0	1								1									
0	2								2									
0	3							1	3									
8	4							2	4									
8	5								5									
8	6								6									
8	7								7									
0	0								0									
0	1								1									
0	2								2									
0	3							1	3									
9	4							3	4									
9	5								5									
9	6								6									
9	7								7									
1	0								0									
1	1								1									
1	2								2									
1	3							1	3									
1	4							4	4									
1	5								5									
1	6								6									
1	7								7									
1	0								0									
1	1								1									
1	2								2									
1	3							1	3									
1	4							5	4									
1	5								5									
1	6								6									
1	7								7									

THIS INFORMATION IN THESE BOXES  
 MUST BE ASSIGNED PER CENTRAL OFFICE

NO.5 X-BAR    LL   VG   HG   VF

NO.1 X-BAR    LL   VG   HG   VF

PANEL        LF   GR   BK   TERM

STEP X STEP    LFG+LSW    TERM

Fig. 3B—Designation Card

TABLE A

## DETERMINATION OF CALLING RATE

TESTS/ HOUR	STEP by STEP LINE GROUPS	PANEL, No.1 Xbar, No.5 Xbar, & No. 5A Xbar	MAXIMUM HOURLY TESTS	
			PER LINE GROUP	PER OFFICE
900	15 or more	3000 or more Main Stations	60	900
600	11 to 14	2200 - 2999 Main Stations	55	600
450	8 to 10	0 - 2199 Main Stations	56	450
225	4 to 7		56	225

*Note:* The minimum number of test terminal assignments per class of service should be determined on the following basis:

In Panel or Step-by-Step, if the office has —

- 1 Line Group — then 1 line relay and 3 DTS test terminals per line group should be used.
- 2 Line Groups — then 1 line relay and 2 DTS test terminals per line group should be used.
- 3 Line Groups or more — then 1 DTS test terminal per line group should be used.

In Small X bar (No. 1 or 5) Offices (less than 11 LLFs), 2 line relays per line link frame should be used.

In Large X bar Offices (11 LLFs or more) , 1 line relay per line link frame should be used.

**TABLE B**  
**LINE CIRCUIT SEQUENCING ORDER**

GROUP	SUB GRPS	LINE-CKTS	LINE ACCESS CARDS																
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1ST 2ND 3RD 4TH 5TH 6TH 7TH 8TH	1	0	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	13TH	14TH	15TH	16TH	
		1						*											
		2																	
		3																	
	2	4																	
		5																	
		6																	
		7																	

\* SKIPPED LINE

ACCESS CARDS  
PULLED OUT  
(REMOVED)

## DIAL TONE SPEED ASSIGNMENTS ELECTRONIC DIAL TONE SPEED REGISTER CIRCUIT

Entity \_\_\_\_\_

Test Call Rate

Type Central Ofc. \_\_\_\_\_

900@ 4 Sec

450@ 8 Sec

Project No. \_\_\_\_\_

600@ 6 Sec

225@ 16 Sec

### Line Assignments

LINE ACCESS CARD NO	LINE SW NO	CLASS OF SERV	OUT PUT TERM PAIR	GRD ST	UNASSND	LINE EQPT LOC				LINE ACCESS CARD NO	LINE SW NO	CLASS OF SERV	OUT PUT TERM PAIR	GRD ST	UNASSND	LINE EQPT LOC				
						LLF LG LFG	VG COL BK TERM	HG SW TERM	VF V							LLF LG LFG	VG COL BK TERM	HG SW TERM	VF V	
00 or 08	0									04 or 12	0									
	1										1									
	2										2									
	3										3									
	4										4									
	5										5									
	6										6									
	7										7									
01 or 09	0									05 or 13	0									
	1										1									
	2										2									
	3										3									
	4										4									
	5										5									
	6										6									
	7										7									
02 or 10	0									06 or 14	0									
	1										1									
	2										2									
	3										3									
	4										4									
	5										5									
	6										6									
	7										7									
03 or 11	0									07 or 15	0									
	1										1									
	2										2									
	3										3									
	4										4									
	5										5									
	6										6									
	7										7									

### Register Assignments

CLASS OF SERV	TOTAL		01		02		03		04		05		06		07		08		
OUTPUT TERM. PAIR	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	T	D	
REGISTER NUMBER OR SOFTWARE EQUIV																			

Note: Strap All Unassigned Line Switches Per SD 3B504-01 Cross Connect Note 401