

RESISTANCE ZONING OF EXCHANGE SERVICES
INCLUDING LONG SUBSCRIBER ROUTE DESIGN

<u>CONTENTS</u>	<u>PAGE</u>
1. GENERAL	1
2. SUPERVISION AND SIGNALING RANGE CONSIDERATIONS	1
3. APPLICATION OF LONG SUBSCRIBER ROUTE DESIGN TO AN EXCHANGE AREA	2
4. ASSIGNMENT RECORDS	3
5. ASSIGNMENT PROCEDURES	4
6. ORDERING INFORMATION	4

1. GENERAL

1.01 This section describes assignment procedures for the administration of Long Subscriber Route Design. The procedures include assignment of appropriate range extenders, dial long line units, and voice repeaters based on resistance zone codes that meet 8.5dB expected measured loss (EML) at 1000Hz.

1.02 This section replaces BSP 680-800-011, "Resistance Zoning of Exchange Services - Basic Services," and V66.102, "Zoning of Subscriber Station Apparatus."

1.03 Long Subscriber Route Design is a method of designing the outside plant network where the routes are long and the customer density is low. The premise of the design is that overall route systems can be developed using finer gauge cables (than under resistance design-maximum 1300 ohms) and applying electronic equipment to maintain satisfactory transmission, signaling, and supervision performance. The design provides for loops with conductor loop ranges up to 3600 ohms.

1.04 Special designs other than Long Subscriber Route Design may have to be considered under the following conditions:

- (a) ANI for 2-Party Identification - ANI can be provided up to 2800

ohms using the Range Extender Gain (REG) Unit, to 1800 ohms using ANI Dial Long Line equipment, or to 1600 ohms using the 2A range extender.

(b) Transmitter Amplifiers - Existing long routes designed prior to the availability of the 96V Dial Long Line equipment may include transmitter amplifiers. When a 500-type set or the equivalent is used, proper transmission will be ensured using the Long Subscriber Route Design. If transmitter amplifiers have been previously used, however, they must be removed on a programmed basis. These locations are presently designated zone L (former local battery talking set zone) on assignment records.

2. SUPERVISION AND SIGNALING RANGE CONSIDERATIONS

2.01 Supervision and signaling control of a circuit is directly affected by the type of service, the characteristics of the central office equipment, equipment at the customer's premises, and the resistance of the customer's line including the central office, outside cable and wire, and station wiring and equipment.

2.02 In the overall job of providing satisfactory supervision and signaling, all these factors must be considered by the following engineering and operating groups.

(a) The Building & Equipment Engineer must be concerned with the characteristics of central office equipment and must provide information on resistance range of specific central offices with the requirements for extending ranges.

(b) The Plant Engineers who design outside plant must consider the resistance range of the central office equip-

ment and must forecast equipment required to extend the ranges.

(c) The Plant Assigners who make assignments of special equipment on service orders must provide satisfactory supervision and signaling assignments.

(d) The Central Office Forces who maintain the central office equipment within specified limits in order to meet the general range requirements must also connect special equipment as assigned for specific services.

(e) The Plant Installation Forces who place equipment as specified on service orders must verify its functioning when the installation is completed.

(f) The Plant Maintenance Forces must ascertain that proper equipment is replaced when making maintenance replacements.

3. APPLICATION OF LONG SUBSCRIBER ROUTE DESIGN TO AN EXCHANGE AREA

3.01 In order that supervision, signaling, and transmission limitations will not conflict with the assignment of service orders, and also to provide a practical means for exchange of information between Plant Engineers and Assigners, a system of "resistance zoning" is employed.

3.02 Resistance zone codes are arbitrary codes which are applied to cable terminals to designate the resistance zone in which the terminal is located.

TABLE

RESISTANCE ZONE (OHMS)	RESISTANCE ZONE CODE
1300	13
1600	16
1800	18
2800	28
3600	36

Note: Where a resistance zone is required for PBX's between the central office and the low-resistance limit of Zone 13, letter

designations will be given to these zones, and Range Tables will be used to assign facilities.

3.03 Engineering Responsibilities.

(a) The Division Plant (or District Plant) Engineer shall initiate a Central Office Equipment Recommendation (COER) providing central office electronic equipment per forecasted requirements.

(b) The Building & Equipment Engineer shall arrange to code existing and proposed electronic equipment with the common language transmission equipment codes applicable to the central office involved and will arrange for the stenciling of the distributing frame terminal strip associated with this equipment with the correct assignment code designation. (See Fig. 1.) The Building and Equipment Engineer shall also ensure that the Assignment Office is provided with transmission equipment instructions (Fig. 2) for the central office involved. These instructions should be developed jointly by the Outside Plant, Transmission and Protection and Building and Equipment Engineers at the time Long Route Design is first considered for the central office.

(c) The Plant Engineer is responsible for coordinating the central office equipment and outside plant jobs to ensure their availability when needed.

(d) The Plant Engineer shall monitor the usage of plug-in central office equipment associated with Long Subscriber Route Design and shall arrange for additional units per 002-100-900SW and 002-100-902SW as necessary.

(e) The Plant Engineer will clearly identify resistance zone boundaries on work prints and will precisely define any subsequent changes in a route for assignment center personnel to administer

terminals within each zone. He will further indicate the preferred count (PC) for each terminal.

(f) The Plant Engineer will furnish assignment with proper line build-out (LBO) settings where E6 repeaters are to be used.

3.04 The Common Language Transmission

Equipment Identification Code will be assigned to each existing and to each new dial long line or range extender by the Building & Equipment Engineer. The basic or abbreviated code as indicated in BSP 795-200-000 will be assigned.

3.05 The resistance zones set up for a particular Long Subscriber Route Design will be applied in the form of RZ (resistance zone) codes at cable terminals. The general plan for applying RZ boundaries to cable terminals will be as follows:

RZ 13 - Terminals located between the resistance where coin service requires DL and 1300 ohms, for example:

Step-By-Step Co	885 to 1300 ohms
#5XB Co	1200 to 1300 ohms

RZ 16 - Terminals located between 1301 ohms to 1600 ohms will require 1A or 2A range extender equipment or surplus 48V DL for basic services. Coin service requires 48V DL.

RZ 18 - Terminals located between 1601 ohms and 1800 ohms require either E6 repeaters and 48V DL in CO or a Range Extender with Gain (REG) for basic services.

RZ 28 - Terminals located between 1801 ohms and 2800 ohms require either E6 repeaters and 96V DL or a REG.

(See Fig. 3 for configuration of Zones 16 through 36.)

4. ASSIGNMENT RECORDS

4.01 Exchange Customer Cable Record. The RZ code and preferred count (PC), as they apply to various terminals, will be entered in the appropriate column of the ECCR (Fig. 4).

4.02 Exchange Wire Record. The RZ code will be indicated on these records (Fig. 5).

4.03 Dedicated Plant Assignment Card (DPAC) and Terminal Assignment Card (TAC). Include RZ code information on these records (Fig. 6).

4.04 Miscellaneous Central Office Facilities Central Office Facilities Record Form E-4052. Records of range extenders, long line equipment of various types and voice repeaters will be shown on Form E-4052. These records will reflect the Common Language Code designation and numbering sequence as indicated by the Building & Equipment Engineer in his response to the Plant Engineer's COER for additional equipment. E6 repeater settings as indicated by the Plant Engineer, will be noted in the Instruction space on this form and the assignment code as shown for each setting. E6 Assignment Code and Zone will be indicated in the "Remarks" column (Figs. 7-9).

4.05 Resistance Zone Key Record. (Fig. 10)

The Resistance Zone Key Record is designed for use in the local assignment center for reference to the proper assignment of electronic equipment. It is prepared at the assignment center from information provided on the central office supervision chart and engineering work prints. The information to be recorded on the RZ Key Record will include:

(a) Resistance Zone Codes which apply in a particular central office.

(b) The meaning of each RZ code translated into a method for satisfying supervision, signaling, and transmission requirements by reference to range tables providing specific central office line equipment and for use of electronic equipment.

(c) An illustrative arrangement of

Resistance Zone Codes applying to a central office area translated into a Resistance Zone Key Record as shown in Fig. 10.

Note: The form for this record is printed on the Exchange Customer Cable Record Forms E-4009-1-VR and E-4010-1-VR. (Ordering information is covered in BSP 680-201-010.)

4.06 Form E-6037 Long Subscriber Route Design Voice Repeater Index. The assignment center will prepare a Form E-6037 and forward a copy to the central office involved. This Index will be prepared from information provided by the Plant Engineer on the construction drawings, and will include LBO settings and clearly identify the assignment code for each setting required for E6 use in the serving zones 18 and 28. The Central Office Force will refer to this Index when interpreting the assignment code setting for E6 repeaters shown on the service order (Fig. 11). Gain Unit Gain Settings will be made by the Central Office Force as per BSP 332-310-510. A copy of Form E-6037 will be filed in the Miscellaneous Central Office Facilities Book.

4.07 Maintenance of Resistance Zone Information on Assignment Records.

(a) Changes in resistance zone limits due to outside plant rearrangements are transmitted by the Plant Engineer to the Assigner by means of notations on construction work prints, by zoning maps, or by memoranda.

(b) Changes in RZ Codes at cable terminals will require consideration of all services working from those terminals, following the same procedure as would be used for an original installation.

(c) Addition or removal of long line equipment is reported by type, number, and frame location to the assignment center concerned.

5. ASSIGNMENT PROCEDURES

5.01 Service Order Assignment. The assigner will determine the proper serving terminal for the customer location indicated on the service order, will note the RZ, and will assign a cable pair designed to serve this terminal. The assigner will refer to the Resistance Zone Key Record for the cable complement involved to determine the proper equipment required to ensure satisfactory supervision, signaling, and transmission. The assigner will then refer to the available line equipment or Miscellaneous Central Office Equipment Record to assign equipment indicated on the Resistance Zone Key Record for the particular zone and type of service. The Miscellaneous Central Office Facilities Record (Form E-4052) for long line equipments and central office E6 repeaters will be noted as shown in BSP 680-120-010. DL and E6 repeater assignment codes will be indicated on the Service Order.

6. ORDERING INFORMATION

6.01 Form E-6037, Long Subscriber Route Design Voice Repeater Index, is provided in packages of 25. The forms should be ordered in multiples of the package unit from your local W.E. Co. Distributing House as follows:

(Quantity) Form E-6037

Central Office Belltone

Date 8-1-70
Work Order

	SD Number	Common Language 8 Digit Code	Abbreviated Code	Unit Terminals	Mounting Slots
DIAL LONG LINE	SD 96589	DLS0100A	DLS01	1-10	1-41
	SD 96590	DLS0200A	DLS02	42-53	42-64
	SD 96588	DLSI000L	DLSI	1-20	SAME
	SD 32053	DLCS 222A	DLCS	1-10	HARD WIRED
	SD 1C247	DLXR 200A	DLXR	1-20	SAME
	Range Extender With Gain - SD97716	DLXRA00	DLXG	1-25	1-165
	E6 REPEATERS CO	-	VRE6	1-20	1-50

1. 8 digit code as indicated in Bell System Practice 795-200-000 for the options required for use in the central office involved.
 2. The abbreviated code to be used by plant assignment when assigning electronics to service orders.
 3. Actual number of units provided.
 4. Total number of plug in mounting slots provided for each type unit.
- The miscellaneous central office facilities records will be prepared by the assignment center from the information indicated on this list.

Fig. 1
Assignment Code Designations
Long Subscriber Route Design

Central Office Belltone

Date 8-1-70

RANGE IN OHMS \ TYPE OF SERVICE	885-1300	1301-1600	1601-1800	1801-2800	2800-3600			
	13	16	18	28	36			
COIN	DLCS →		DLCS VRE6	SEE NOTE (1)	(1)			
INDIVIDUAL		DLXR	DLS01 → VRE6 → DLXG	DLXG				
2-PARTY		DLXR	DLS1 VRE6 DLXG	DLS02 VRE6 DLXG				
4-PARTY		DLXR	DLS02 → VRE6 → DLXG	DLXG	(1)			
MULTI-PARTY		DLXR	DLS02 → VRE6 → DLXG	DLXG				

Notes:

(1) Refer to engineer

Fig. 2
Transmission Equipment Instructions
Long Subscriber Route Design

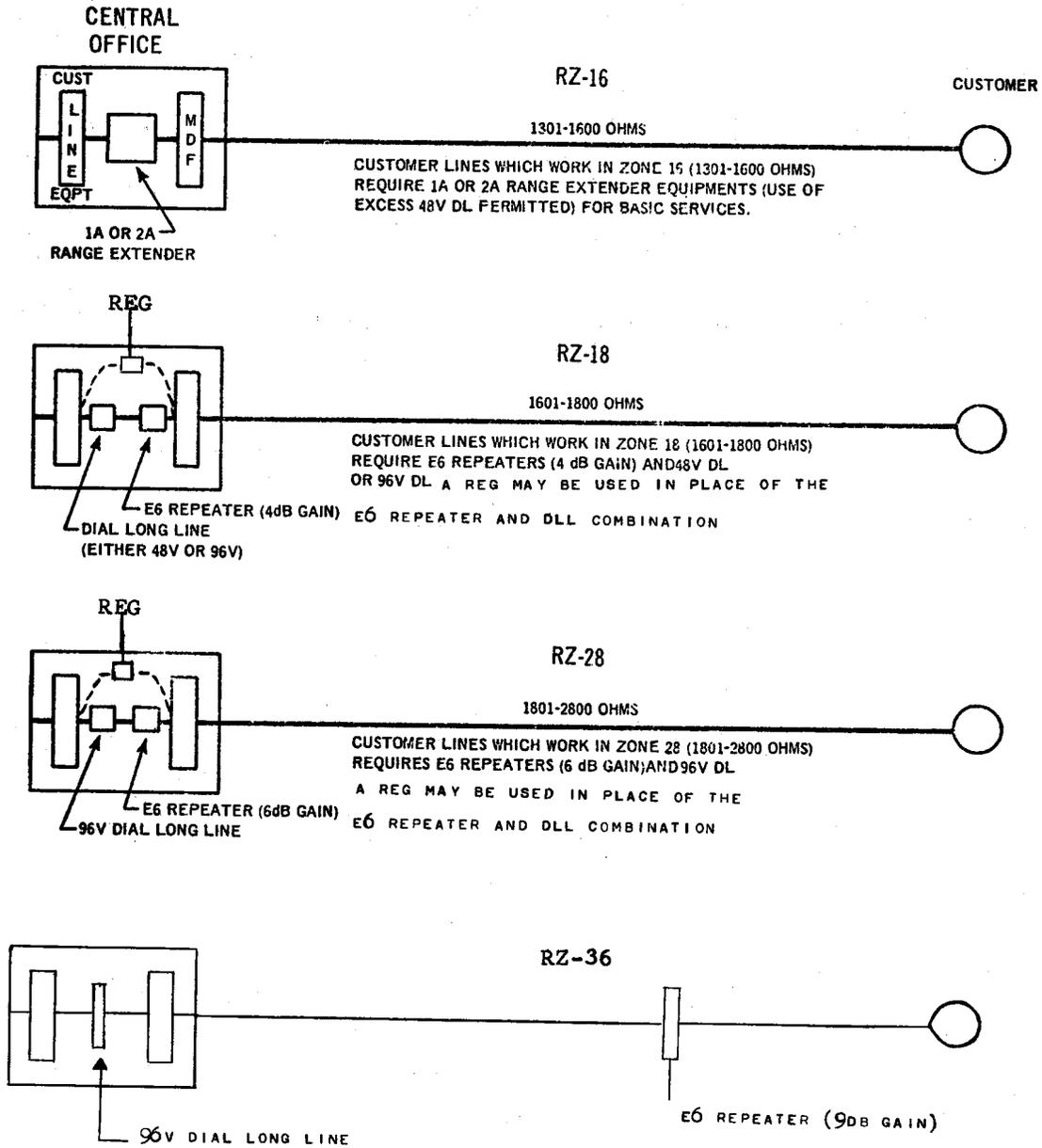


Fig. 3
 General Loop
 Configuration of Zones 16 Through 36

PAIRS 401 - 450 CABLE 12

DATE VERIFIED		OFFICE BELTONE		DATE VERIFIED	
CONN. TO CA.	COUNT	TER. LOC.			
HELD ORDERS & REGRADES		PIC CABLE COUNTS		BNDR. GROUP	
ORDER NO.	CAT.	DATE	SERV.	TER.	
				A	401-500
				B	401-425
SHOULD BE		PRESENT		SHOULD BE	
0	1ST PR.	TER.	CA. NO.	PAIR	CA. NO.
O. EQUIP.		CONN. TO PAIR	PAIR	PIC COLOR CODE	
				1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
				401 W BL	
CONNECT TO COLUMN AND SHEET					
P 2525 HOLLADAY RD 1B RA 12					
P 2519 HOLLADAY RD 1B RA 12					
P 2513 HOLLADAY RD 1B RA 12					
P 2501 HOLLADAY RD 1B RA 12					
P 1231 SPRING RD 1A RA 12					
P 1225 SPRING RD 1A RA 12					
P 1219 SPRING RD 1A RA 12					
P 1211 SPRING RD 1A RA 12					
P 1205 SPRING RD 1A RA 12					
P 1139 SPRING RD 1A RA 12					
P 1131 SPRING RD 1A RA 12					
P 1125 SPRING RD 1A RA 12					
P 1119 SPRING RD 1A RA 12					
RZ-13					
RZ-16					
RZ-18					
RZ-28					

1 RZ Code Entries For Terminals Within Designated Resistance Zones
Fig. 4

LEAD AA		FRONT		FRONT		BACK		BACK		FRONT	
DATE VERIFIED 8-10-70		EXCHANGE BEL		PRINTED IN U.S.A.							
WIRE ROUTE MEASUREMENT	STREET OR ROAD	SIZE CROSSARM	TYPE WIRE REQUIRED	POLE NUMBER	CONNECTS TO SPUR NUMBER	REMARKS					CONNECTS TO SPUR NUMBER
107	SEAFORTH RD.	109	109	50	AA3	CROSSARMS CARRYING ONLY TOLL WIRES					RZ28
19				8	AA2	←					AA1 RZ16
15				7							
				6							
				5							
				4							
				3							
				2							
				1							
JUNCTION POLE LOCATION		TERMINAL POLE LOCATION		TRANSMISSION ZONE							
0		SELLERS RD. A/35									
CONNECTS TO LEAD NUMBER		CROSSARM		RESISTANCE ZONE							
PIN POSITION OR CIRCUIT NUMBER		1-2 3-4 5-6 7-8 9-10		ABOVE							
BINDING POST		2 7 5 1 6		MAP NUMBER							
CABLE NUMBER		PAIR → 321 315 326 312 310		37							
TELEPHONE NO OR BUNCH BLOCK NO				TAX DISTRICT							
PANEL & JACK OR DIAL EQUIV				6A							
CLASS SERVICE		4FR 4FR 1FR 4FR 4FR									

Fig. 5

Exchange Wire Record

C.O. AREA				EXCH. OR MUNIC.													
HOUSE OR BLDG. NO.	CABLE NO. PAIR	ACCESS POINT CONNECTION		TERMINAL LOC. OR S.O.P. NO.	B.P.	OTHER INFORMATION	ROUTE OR BLOCK	TZ	RZ	LEFT-IN		ORIGINATING EQUIPMENT	SERV	PTY	TEL. NO.		
		IN	OUT							NO.	NO.						
1199	12-430			P-1199 SPRING RD.					16								
1200																	
1201																	
1202																	
~~~~~																	
1295	12-430			P-1219 SPRING RD.													
1296	↓			↓													
STREET		FROM		TO													
SPRING RD.		1199		1296		1	2	3	4	5	6	7	8	9	10	11	12

Illustrates RZ Code When All Terminals Are In Same Resistance Zone-DPAC

C.O. AREA				EXCH. OR MUNIC.													
HOUSE OR BLDG. NO.	CABLE NO. PAIR	ACCESS POINT CONNECTION		TERMINAL LOC. OR S.O.P. NO.	B.P.	OTHER INFORMATION	ROUTE OR BLOCK	TZ	RZ	LEFT-IN		ORIGINATING EQUIPMENT	SERV	PTY	TEL. NO.		
		IN	OUT							NO.	NO.						
1300	12-424			P-1231 SPRING RD.					18								
1301	↓			↓													
1302	↓			↓													
~~~~~																	
N.N.	12-416			F 901 SELLERS RD.		BET. SCARTH + SELLERS RD.			28								
	LEAD AA			↓		RD.											
N.N.	12-416			↓		W. OF SELLERS RD.											
	LEAD AA																
STREET		FROM		TO													
						1	2	3	4	5	6	7	8	9	10	11	12

Illustrates RZ Codes When Terminals Are Located In Different Resistance Zones On Same DPAC

STREET		FROM		TO		S.W.B.T.CO. FORM 5-400-A		STREET		FROM		TO		FROM		TO	
C.O.		CABLE		TERMINAL				ROUTE	TZ	RZ	OTHER INFORMATION						
		NO.	PAIR														
1200		12	401	P1199 SPRING RD.						16							
1202																	
~~~~~																	
STREET		FROM		TO		FROM		TO									
SPRING RD.		1200		1296		1201		1297									

Illustrates Use Of RZ Code On TAC

DPAC & TAC - Resistance Zone Codes

Fig. 6

B 5 P M24-52

MISCELLANEOUS CENTRAL OFFICE FACILITIES

E4052 A VV  
(5-53)

TYPE DLXR (2A RANGE EXTENDER) TERMINALS 1-20  
 DATE VERIFIED _____ OFFICE BELTONE TOTAL TERMINALS 1-20  
 WIRING LIST _____ ISSUE _____ BAY LOCATION _____ FRAME LOCATION _____  
 DWG. NO. SD-1C 247-1 ISSUE _____ FIG. _____ APP. _____ WIRING _____

INSTRUCTIONS:  
 2A RANGE EXTENDER, FOR USE IN ZONE 16 ONLY  
 ASSIGN TO 1-2-4 AND 8 PARTY OR 2 PARTY ANI

TERM'S.	CA / PR	WORKING SERVICE REF.	REMARKS	TERM'S.	WORKING SERVICE REF.	REMARKS
			RZ			
1						
2						
3						
4	12 439	236-3496	16			

Miscellaneous Central Office  
 Facilities Record 2A Range Extender  
 Fig. 7

B 5 P M24-52

MISCELLANEOUS CENTRAL OFFICE FACILITIES

E4052 A VV  
(5-53)

TYPE DL501 (1 PARTY SERVICE) TERMINALS 1-41  
 DATE VERIFIED _____ OFFICE BELTONE TOTAL TERMINALS 1-41  
 WIRING LIST _____ ISSUE _____ BAY LOCATION _____ FRAME LOCATION _____  
 DWG. NO. SD 96589-01 ISSUE _____ FIG. _____ APP. _____ WIRING _____

INSTRUCTIONS:  
 96 V DL FOR INDIVIDUAL LINE USE IN ZONES 18 & 28

TERM'S.	CA / PR	WORKING SERVICE REF.	REMARKS	TERM'S.	WORKING SERVICE REF.	REMARKS
			RZ			
1	12 410	236-3456	28			
2	12 401	236-4567	28			
3						
4						
5						

1. Plug-in unit terminal numbers are shown only for the actual units in place.

Miscellaneous Central Office Facilities  
 Record - Plug-in Dial Long Line Equipment  
 Fig. 8

BSP M24-52

MISCELLANEOUS CENTRAL OFFICE FACILITIES

E4052 A VR (5-53)

TYPE VR E6 TERMINALS 1-50  
 DATE VERIFIED _____ OFFICE BELTONE TOTAL TERMINALS 1-50  
 WIRING LIST _____ ISSUE _____ BAY LOCATION _____ FRAME LOCATION _____  
 DWG. NO. _____ ISSUE _____ FIG. _____ APP. _____ WIRING _____

INSTRUCTIONS:

**LBO SETTING CODE DESIGNATION REQUIRED, OBTAIN FROM RESISTANCE ZONE KEY RECORD OR LONG SUBSCRIBER ROUTE VR INDEX**

TERM'S.	CA	WORKING SERVICE REF.	REMARKS	TERM'S.	WORKING SERVICE REF.	REMARKS
	PR		CODE RZ			
1	12 425	236-1234	A 18			
2	12 426	236-2346	A 28			
3	12 410	236-3456	A 28			
4						
5						

1. Assignment repeater LBO setting code in use or last used.
2. Resistance zone in use or last used.  
 Assigners should try to reassign repeaters to the code and zone indicated. This will reduce the central office time required to administer repeaters.

Misc. Central Office Facilities Record - Central Office E6 Repeaters  
 Fig. 9

CA 12-401-450 RESISTANCE ZONE KEY RECORD BELTONE  
 CENTRAL OFFICE

TYPE SERVICE	RZ →					
	13	16	18	28	36	
PBX			SEE NOTE 1			
COIN	1	1	3	SEE NOTE 1		
INDIVIDUAL		2	4	4	8	
2 PARTY ANI		2	5	7	9*	
4 PARTY		2	6	6	9	
8 PARTY		2	6	6	SEE NOTE #1	

REFERENCE NO.	ASSIGNMENT REQUIREMENT
1	DLCS
2	DLXR
3	DLCS PLUS VRE6A
4	DLSO1 PLUS VRE6A OR DLXG
5	DLSI PLUS VRE6A OR DLXG
6	DLSO2 PLUS VRE6A OR DLXG
7	DLXG
8	DLSO1 PLUS RURE6B P1131 SPRING Rd.
9	DLSO2 PLUS RURE6B P1131 SPRING Rd.

NOTES:  
 1 REFER TO OUTSIDE PLANT ENGINEER  
 * 2 PARTY ANI CAN NOT BE PROVIDED BEYOND ZONE 28

BSP 680-201-010 PRINTED IN U.S.A. E4001A-1 (9-53)

Resistance Zone Key Record  
 Fig. 10

