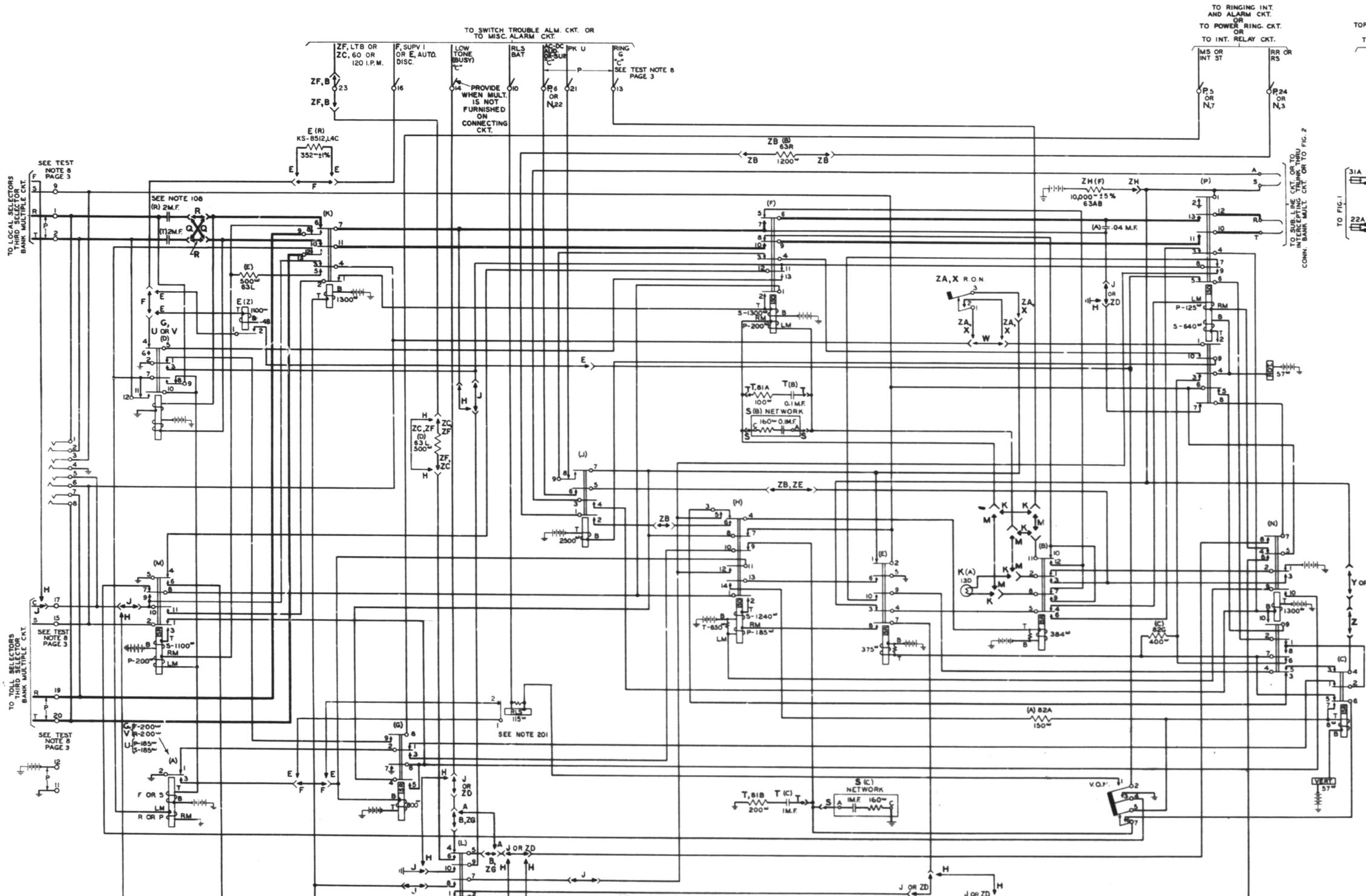INFORMATION NOTES:

301. WHERE CONNECTORS ARE PROVIDED WITH "K" OPTION, INTERCEPT CIRCUITS SHALL BE ARRANGED TO TRIP RINGING EITHER BY A COLD CATHODE TUBE OR BY MOMENTARY BATTERY ON ONE SIDE OF THE CIRCUIT. WHERE CONNECTORS ARE PROVIDED WITH "M" OPTION, INTERCEPT CIRCUITS SHALL BE ARRANGED TO TRIP RINGING EITHER BY A COLD CATHODE OR BY MOMENTARY GROUND ON ONE SIDE OF THE CIRCUIT.

FIG. 1
CONNECTOR

FIG. 2
(MFR. DISC.)

CIRCUIT NOTES (CONT):

	FEATURES OR OPTIONS	PROVIDE
112. (MFR DISC.)	BUSY FLASH TO OPERATORS IN OFFICES WITHOUT TOLL TRAIN	B, H
	OFFICES WITH TOLL TRAIN EQUIPPED FOR RETURN OF BUSY FLASH TO TOLL OPERATOR AND BUSY TONE TO LOCAL OPERATOR	B, J, ZC

W 197DF SWITCH   X 197EC SWITCH   ZA 197HC SWITCH
346 JACK
242C PLUG

CIRCUIT NOTES:

101. THERE SHALL BE ONE LEAD FROM 48V TALKING BATTERY EQUIPPED WITH A 1½ AMP. FUSE FOR EACH CIRCUIT.

102. CONNECT TO ONE OF THE CODE LEADS IN ACCORDANCE WITH THE RING CODE ASSIGNED FOR THE CALLED NUMBER CORRESPONDING TO THE BANK TERMINALS.

103. WHEN "Z" AND "ZB" OPTIONS ARE PROVIDED, THIS CIRCUIT SHALL NOT BE USED IN A LOCAL TRAIN FOR CALLS FROM INC REPEATERS OR TRUNKS WHICH PLACE A HOLDING GRD. FORWARD ON THE SLEEVE AFTER THE CONNECTOR REMOVES ITS GRD. FROM THE INC. SLEEVE AT THE TIME OF RELEASE.

104. THIS CIRCUIT SHALL BE USED FOR REVERTING CALL SERVICE ONLY WHERE THERE IS A DIRECT LOCAL SLEEVE CIRCUIT FROM THE CONNECTOR THRU THE SWITCH TRAIN AND SUBSCRIBER LINE CIRCUIT TO THE CONNECTOR BANK.
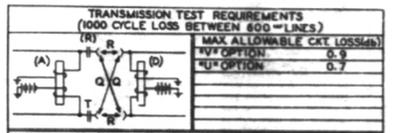
105. PROVIDE FEATURES AND OPTIONS AS FOLLOWS:

FEATURES OR OPTIONS	PROVIDE
REVERTING CALL.	Z, ZB
NO REVERTING CALL.	Y, ZE
OFFICES WITH TOLL TRAIN EQUIPPED FOR RETURN OF BUSY TONE TO TOLL AND LOCAL OPERATOR	J, ZF, ZG
AUTOMATIC DISCONNECT ON LOCAL NON-REVERTING CALLS — REQUIRED	E
AUTOMATIC DISCONNECT ON LOCAL NON-REVERTING CALLS — NOT REQUIRED	F
BUSY TONE TO OPERATORS IN OFFICES WITHOUT TOLL TRAIN	ZD, ZG

106. RECORD OF FIGURES, WIRING AND APPARATUS CHANGES

107. THE DIFFERENCE BET. THE (DI) REL IS AS FOLLOWS:

108. WHERE THE (T) & (R) CAPACITORS ARE PART OF A MULTI-UNIT CAPACITOR THEY SHALL BE BALANCED WITHIN 0.11 M.F.

109. "G" OPTION IS FOR USE WITH "R" OPTION AND TANDEM WOUND (A) AND (DI) RELAYS WHEN IMPROVEMENT IN BALANCE AGAINST INDUCTIVE DISTURBANCES IS REQ.

110.

111. PROVIDE "M" OPTION WHERE 10-PARTY LINES ARE EQUIPPED WITH HIGH IMPEDANCE RINGERS. PROVIDE "K" OPTION IF ANY 10-PARTY LINE IS EQUIPPED WITH TUBE TYPE SUBSETS. SEE NOTE 301.

OPTIONS USED

TRANSMISSION TEST REQUIREMENTS
(1000 CYCLE LOSS BETWEEN 600~ LINES)

		MAX ALLOWABLE CKT LOSS(db)
"V" OPTION		0.9
"U" OPTION		0.7

ALLOWABLE INDIVIDUAL APPARATUS LOSSES(db)

APPARATUS DESIG.	CODE	MAX LOSS	MIN LOSS	REMARKS
CAPACITOR (T OR R)	2 MF	14.9	11.5	SEE NOTE I
RELAY	221A	0.3		"V" OPTION
RELAY	222HD	0.3		"U" OPTION
RELAY	222T	0.3		"V" OPTION
RELAY	222EAR	0.3		"U" OPTION

NOTES:
1. WHERE THE (T) & (R) CAPACITORS ARE PART OF A MULTI-UNIT CAPACITORS THE INDIVIDUAL LOSSES FOR THE (T)&(R) CAPACITORS SHALL BE WITHIN 0.5 db OF EACH OTHER.

TRIPPING RANGES

TYPE OF RINGING AND DISTRICT	RINGING 20 CYCLES			D.C. VOLTAGE			SILENT INTERVAL VOLTAGE	RATING	MAX. EXT. CKT. LOOP FOR TRIPPING	
	A.C. VOLTAGE			NO.1, 350A	NO.355A				ADJ.X"A"	ADJ.S,E & F
	NO.1	NO.350A	NO.355A							
AC-DC	84~88	72~88	75~110	45~52			45~52	STD P	1030~	1400~
	80~88	84~88					48~52	STD M	1115~	1500~
SUR TUBE 25V. E.R.	72~88	72~88	65~90	37~40			45~52	STD P	1030~	1400~
	84~88	84~88	65~90	37~40			48~52	STD M	1115~	1500~

LIMITS ARE FOR SINGLE OFFICE AREAS. FOR MULTI-OFFICE AREAS AND FOR OPERATOR PULSING, SEE KEY SHEETS.

WORKING LIMITS
45-52 V.
48 V. MIN.

SD-31811-01
LOCAL FEATURES REPLACED BY SD-31810-01, EXCEPT FOR ADDITIONS

ED-31811-01 EQUIPMENT INFO.

STEP-BY-STEP SYSTEMS
NO.1, 350A OR 355A
COMBINATION CONNECTOR CIRCUIT
5 CODE FOR
10 PARTY TERMINAL PER STATION DIVIDED
ARRANGED FOR REVERTING CALLS
AND FOR CALLING PARTY CONTROL

(COMB CONN 5 CODE TPS)

SD-31811-01

2 SHEETS

BELL TELEPHONE LABORATORIES, INC.

SD-31811-01

26
A&M ONLY

R2

10 PARTY TPS CONNECTOR   (COMB CONN 5 CODE TPS)

RELAYS

DESIG.	CODE	OPTION	CKT. FIG.	RESID.	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READI. MA	TEST SEC.	READI. SEC.	DWG. ISS.
A	221A	G,V	1	7-11	11		8	(G) NO	TST.JK.2	TST.JK.1	M	1/4	F/R	O	FS	15.1	14.8			17
								(G) NO	TST.JK.2	TST.JK.1	M		F/R	NO	FS	13.9	14.4			19
A	221ND	U	1	7-11	11		8	(G) NO	TST.JK.2	TST.JK.1	M	1/4	P/S	O	FS	15.1	14.8			21
								(G) NO	TST.JK.2	TST.JK.1	M		P/S	NO	FS	13.9	14.4			22
B	222HA		1	O	107		17			4(H) GRD.				O	FS	22	20.5			24
										4(H) GRD.		3		NO	FS	16	17			25
C	221CH		1	S-4	36		14			5(VON) GRD.		6		O	500	90	85			
										5(VON) GRD.		2/6		NO	500	62	69			
									TST.JK.1	TST.JK.1 V-M	7/8/9		H						.100	
									TST.JK.2	TST.JK.1 V-M	7/9		R					.155	.140	
										5(VON) GRD.		2/7		NO	500	62	69			
D	222Y	G,V		S-2	44		16	(A) NC	6(K)	10(K)	M	5/11/12	F/R	O	FS	20.5	19.5			
								(A) NO	6(K)	10(K)	M	5/11/12	F/R	NO	FS	13.3	14			
				S-4				(A) NO	6(K)	10(K)	M	5/10/12	F/R	O	FS	28.5	27			
								(A) NO	6(K)	10(K)	M	5/10/12	F/R	NO	FS	19	21			
D	222KR	U		S-2	44		16	(A) NO	6(K)	10(K)	M	5/11/12	P/S	O	FS	20.5	19.5			
								(A) NO	6(K)	10(K)	M	5/11/12	P/S	NO	FS	13.3	14			
				S-4				(A) NO	6(K)	10(K)	M	5/10/12	P/S	O	FS	28.5	27			
								(A) NO	6(K)	10(K)	M	5/10/12	P/S	NO	FS	19	21			

TEST NOTES:
1. TST.- CONT. FOLLOW ON MAKE MIN. 8 CONT. SEPARATION ON ALL CONTS. MIN. 3.
2. CONTS. 1-2 & 3-4 MAY BREAK.
3. CONTS. 12 & 4-5 MAY BREAK.
4. ARM. NEED NOT TOUCH CORE.
5. CONT. PRESS. SPGS. 8-9 & 11-12 MIN 35 GRAMS.
6. FOR USE WHEN TIMING REQ. ARE NOT APPLIED.
7. FOR USE WHEN TIMING REQ. ARE APPLIED.
8. TST HOLD-USE LEAK A IN PULSING TST. SET.
9. CONNECT DIRECT GRD. TO SLEEVE WIPER.
10. ADJ. "A"
11. ADJ. "B"
12. ADJ. "A" IS SUPERSEDED BY ADJ. "B" ON ISS. 14D.

PAGE 1   (4 PAGES)   SD-31811-01

DESIG.	CODE	OPTION	CKT. FIG.	RESID.	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READI. MA	REMARKS	DWG. ISS.
P	224B5	1	3-5	422		31		4(B)		4(B) 4T(N)	B/G	2,3	P	O		28.5	27	SPGS. 1B-2B	14
								4(B)		4(B) 4T(N)	B/G		P	NO		20	21.5		15
								1B(P), 4B(P)		2B(B)	GRD.	4	S	O	FS	30.5	29		16
										2B(P)	GRD.	5	S	NO	FS	52.5	50		17
										2B(P)	GRD.	1	S	NO	FS	38.5	41		19
Z	225E	E	1	S-4	45		13	5T(P)		4(D)	GRD.			O	FS	29.5	28		
														NO	FS	22	24		

SWITCHES

DESIG.	CODE	OPTION	...					BLOCK		TEST CLIP DATA			SEE	TEST	TEST	AFTER	TEST	READI.		
RLS 197HC MAG 197EC DBL 197DF DOG MOD		ZA X W								1(VON) GRD.		5		O		100	95		
										1(VON) GRD.		6		NO		65	70		
														NO		115	115		

TEST NOTES:
1. CONTS. 1T-2T & 1B-2B MAY MAKE AND 3B-4B MAY BREAK AND IS PERMITTED BY SEQ. ANY TWO OTHER BREAK CONTS. MAY BREAK.
2. CONTS. 1B-2B SHALL MAKE BEFORE SPG. 1B STRIKES THE BUSHING ON SPG. 4B AND 1T STRIKES THE BUSHING ON SPG. 4T.
3. TST: CONTS. 1B, 2B SHALL MAKE BEFORE 1T-2T MAKE CONTS. 1T-2T SHALL MAKE BEFORE 3T-4T & 5B-6B BREAK, CONTS. 3B-4B SHALL BREAK BEFORE 3T-4T & 5B-6B BREAK.
4. 1T-2T MAY MAKE ONLY 1B-2B, 3B-4B REQ TO OPR.
5. (RLS) SPRINGS 1-2 SHALL BREAK WITH A SEPARATION OF .008 IN READ.; .006 IN TEST.
6. (RLS) SPRINGS 1-2 SHALL NOT BREAK.

PAGE 4   (4 PAGES)   SD-31811-01

DESIG.	CODE	OPTION	CKT. FIG.	RESID.	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READI. MA	TEST SEC.	READI. SEC.	DWG. ISS.
E	221MS		1	S-2	119		13	3B(P)		5(C) GRD.		3		O	FS	15.5	14.7			14
								3B(P)		5(C) GRD.				NO	FS	10.6	11.2			15
									TST.JK.2	TST.JK.1 V-M	4/6/7		H						.111	16
									TST.JK.2	TST.JK.1 V-M	4/6		R					.300	.275	17
								3B(P)		5(C) GRD.		4		NO	FS	10.6	11.2			19
F	222H		1	S-4	72		27	11(B)		BAT. 18/14				P	O	FS	21.5	20.5			20
								11(B)		BAT. 16/16				P	NO	FS	18	19			22
								8(B)		GRD. 18/15				P	O	FS	23.5	22.5			23
								8(B)		GRD. 17/18				P	NO	FS	20	21			24
								11(B)		BAT. 18/19				P	O	FS	23.5	22			25
								11(B)		BAT. 18/18				P	NO	FS	19	20.5			26
								8(B)		GRD. 18/19				P	O	FS	26.5	25			
								8(B)		GRD. 18/18				P	NO	FS	22	23.5			
								11(B)		BAT. 18/19				P	O	FS	28.5	27			
								11(B)		BAT. 11/14				P	NO	FS	24	25.5			
								8(B)		BAT. 18/19				P	O	FS	30	27			
								8(B)		GRD. 10/15				P	NO	FS	23	25.5			
								1(K)		GRD.				S	O	FS	26.5	27			
								1(K)		GRD.		2		S	NO	FS	20	21			
G	247B		1	1.5-4	50S		27	1(A)		3(A) GRD.		3		O	FS	10.5	10			
								1(A)		3(A) GRD.		3		NO	FS	8.5	9			
				MIN 1-5					TST.JK.2	TST.JK.1 V-BR	4/5/6		H						.333	
									TST.JK.2	TST.JK.1 V-BR	4/6		R					.750	.500	
								1(A)		3(A) GRD.		4		NO	FS	8.5	9			

TEST NOTES:
1. REQ. IN SPG. 1-2 ONLY.
2. CONTS. 1-2 MAY MAKE AND 3-4 & 5-6 MAY BREAK.
3. FOR USE WHEN TIMING REQ. ARE NOT APPLIED.
4. FOR USE WHEN TIMING REQ. ARE APPLIED.
5. TST. HOLD-USE 1400 W LOOP IN PULSING TST. SET.
6. CONNECT DIRECT GROUND TO SLEEVE WIPER.
7. TST. HOLD-USE LEAK A IN PULSING TST. SET.
8. CONTS. 1-2 SHALL MAKE BEFORE SPG. 1 STRIKES THE BUSHING ON SPG. 4
9. ADJS. "A" & "B" ARE SUPERSEDED BY ADJS. "C" & "D" RESPECTIVELY ON ISS. 14D.
10. ADJ. "A"
11. ADJ. "B"
12. ADJ. "C"
13. ADJ. "D"
14. WITH "M" OPTION
15. WITH "N" OPTION
16. ADJ. "E"
17. ADJ. "F"
18. ADJ. "C" & "D" ARE SUPERSEDED BY ADJ. "E" & "F" RESPECTIVELY ON ISSUE 17B.

PAGE 2   (4 PAGES)   SD-31811-01

DESIG.	CODE	FEATURE OR OPTION	CKT. FIG.	RATING	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READI. MA	REMARKS	DWG. ISS.

PAGE (PAGES)   SD-

DESIG.	CODE	OPTION	CKT. FIG.	RESID.	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READI. MA	REMARKS	DWG. ISS.
H	222BY		1	S-4	324		31	8(E)		GRD.		3		P	O	FS	41	39	SPGS. 1-2 ONLY.	14
								8(E)		GRD.				P	NO	FS	21	22.5		15
								2(H)		GRD.				S	O	FS	24	22.5		16
								2(H)		GRD.		1		S	NO	FS	17.5	18.5		17
J	221GS		1	S-4	305		16	9B(P)		GRD.				O	FS	9	8.5		20
								9B(P)		GRD.				NO	FS	6.7	7.1		21
K	222GF		1	S-4	69			3(L)		GRD.		2		O	FS	26	23.5		23
								3(L)		GRD.		2/6		NO	FS	17	18		24
L	221EE		1	S-4	163		13			GRD.		9		O	FS	15	14		25
										GRD.		9		NO	FS	10.9	11.5		26
M	248H		1	1.5-3	520		31	(G) NO		8(K)	GRD.	2		O	FS	29.5	28		
								8(K)		GRD.		2/7		P	NO	FS	21.5	23		
								1(K)		3(M)	GRD.	2		S	O	FS	24			
N	223AE		1	S-4	263		17	4(J)		GRD.		6		O	FS	23	21.5		
								4(J)		GRD.		4/5		NO	FS	17	18		
								5B(P)		GRD.										

TEST NOTES:
1. CONTS. 1-2 & 3-5 MAY MAKE AND 3-4 & 7-8 MAY BREAK.
2. BLOCK RON. SPGS. OPERATED.
3. TST.; CONTS. 1-2 SHALL MAKE BEFORE SPG. 1 STRIKES THE BUSHING ON SPG. 4 CONT. PRESSURE SPGS. 3-5 (ARM. OPR.) MIN. 15 GRAMS.
4. CONTS. 1T-2T & 1B-2B MAY BREAK.
5. TST.; CONT. SEPARATION SPGS. 2T-3T MIN 13.
6. CONTS. 1-2 & 3-4 MAY BREAK.
7. CONTS. 1-2 & 4-5 MAY BREAK.
8. JK. SPGS. 9 & 11 AND 13 & 15 SHALL MAKE CONT. WHEN THE SW IS REMOVED.
9. TEST CLIP DATA: CONN. GRD. TO 6(M) FOR "J" OPTION, TO 8T(N) FOR "H" OPTION.

PAGE 3   (4 PAGES)   SD-31811-01

EQUIPMENT NOTES:

201. EXISTING SWITCHES MAY BE MODIFIED TO AGREE WITH "ZA" OPTION BY ADDING THE FOLLOWING ASSEMBLY PARTS TO THE RELEASE MAGNET.
P-128224 - BREAK CONTACT
P-250483 - BUSHING
P-485112 - SPRING ARM
P-252926 - HEX HEAD MACHINE SCREW

FIG. 51 (FOR FIG.1) ONE PER CONN.

FIG. 52 (MFR. DISC.) (FOR FIG.1) ONE PER TERMINAL

FIG. 53 (MFR. DISC.) (FOR FIG. 1) ONE PER SHELF

FIG. 54 (FOR FIG.1) ONE PER SHELF

COMBINATION CONNECTOR CIRCUIT

BELL TELEPHONE LABORATORIES, INC.

SD-31811-01-2   R

26