

360 JACK 288V PLUG
F-SWITCH 197E INCLUDES 46" MAGNETS
ZL SWITCH 197E INCLUDES 57" MAGNETS
ZL SWITCH 197E INCLUDES 57" MAGNETS
ZL SWITCH 197E INCLUDES 57" MAGNETS

(MFR. DISC.) 101 PROVIDE ONE 3 AMP FUSE FROM 48V BAT FOR EACH CIRCUIT.
SEE NOTE 107
(MFR. DISC.) 102 TO MAKE THIS CONNECTOR NON-REVERSING, REVERSE THE WIRES TO SPRINGS "7" AND "10" OF REL (D).
SEE NOTE 115
(MFR. DISC.) 103 CONNECTION OF RINGING LEAD INDICATED WITH NEG BAT SUPERIMPOSED ON MACHINE RINGING. WHEN POS BAT IS SUPERIMPOSED ON MACHINE RINGING, REVERSE THE WIRES TO SPRINGS "5" AND "24" AT "Z".
SEE NOTE 115

104 SEE TRIPPING RANGES FOR (F) RELAY REQUIRED.
105 PRIOR TO ISSUE 3-B, THE RES. OF THE "S" WDG. OF RELAY (K) WAS 1300Ω

(MFR. DISC.) 106 WHEN CONNECTOR IS REQUIRED TO RELEASE UNDER CONTROL OF THE CALLING PARTY ONLY USE "Y" OPTION, OTHERWISE USE "X" OPTION.
107 PROVIDE ONE 1/2 AMP FUSE FROM 48V TALKING BAT FOR EACH CKT. PRIOR TO ISSUE 10D, NOTE 107 WAS NOT RATED "MFR. DISC." AND THIS NOTE WAS NOT SHOWN.
108 WHEN CAPACITORS (T) AND (R) ARE PART OF A MULTI-UNIT CAPACITOR, UNITS (T) AND (R) SHALL BE BALANCED TO WITHIN 0.11 M.F.

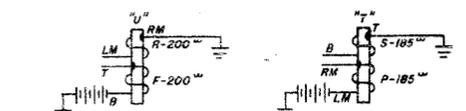
109 RECORD OF FIGURES, WIRING, AND APPARATUS CHANGES

CHANGED ON ISS.	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN.	SEE NOTE	USE IN CIRCUIT			
				STD	A&M	M.D.	PROV.
3-B	197E SW	192E	197E	192E			
3-B	221CK	221D	221CK	221D			
3-B	221U	221AS	221U	221AS			
8-D	X OR Y	X	106	X, Y			
9-B	M OR N	M	112	N			
10-D	A OR B	A	B	A			
13-D	V OR W	V	W	V			
14-D	248A	222A	248A	222A			
17-A	222JJ	222S	222JJ	222S			
21-D	T OR U	U	T	U			
21-D	Z	A OR B	Z	A, B			
22-A	Q	A OR B	108	Q			
22-A	R OR S	A OR B	108	R, S			
23-D				J, K			
24-D				FIG. 2			
26D			113	H			
26D			113	E			
26D			113	ZB			
26D			113	ZE			
26D				W, X, Y, Z			
26D				W, X, Y, Z			
31D	ZH OR ZI	ZH	ZI	ZH			
33D	ZJ OR ZK	ZJ	ZK	ZJ, ZK			
33D	ZL	E OR F	ZL	E			
34B	ZM OR ZN	ZM	ZN	ZM			
34B	V OR W	V	W	V			
34B	E, F, ZL	E, F OR OR ZL	ZL	ZL			

109 RECORD OF FIGURES, WIRING, AND APPARATUS CHANGES

CHANGED ON ISS.	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN.	SEE NOTE	USE IN CIRCUIT			
				STD	A&M	M.D.	PROV.

110. THE DIFFERENCE BETWEEN THE (D) RELAYS IS AS FOLLOWS:



111. CHANGES IN EXISTING EQUIPMENTS

FEATURE OR OPTION	FURNISH OR APP.	PROVIDE	
		QTY	QUANTITY
CAPACITORS ON SWITCH NETWORKS USED FOR CONTACT PROTECTION		Q, Z	
CAPACITORS ON SWITCH SEPARATE CAPACITORS & RESISTORS USED FOR CONTACT PROTECTION (MFR DISC)		B	
CAPACITORS ON SHELF (MFR DISC)		A	
CAPACITORS ON SWITCH NETWORKS USED FOR CONTACT PROTECTION (T) TO (R) AND (R) TO (T)		S, Z	
CAPACITORS ON SWITCH SEPARATE CAPACITORS & RESISTORS USED FOR CONTACT PROTECTION		S, J	
CAPACITORS ON SHELF		R, K	
WHEN "T" OPTION IS USED OR WHEN "U" OPTION IS USED ON CKTS, MODIFY PER NOTE 102		A, B OR G	

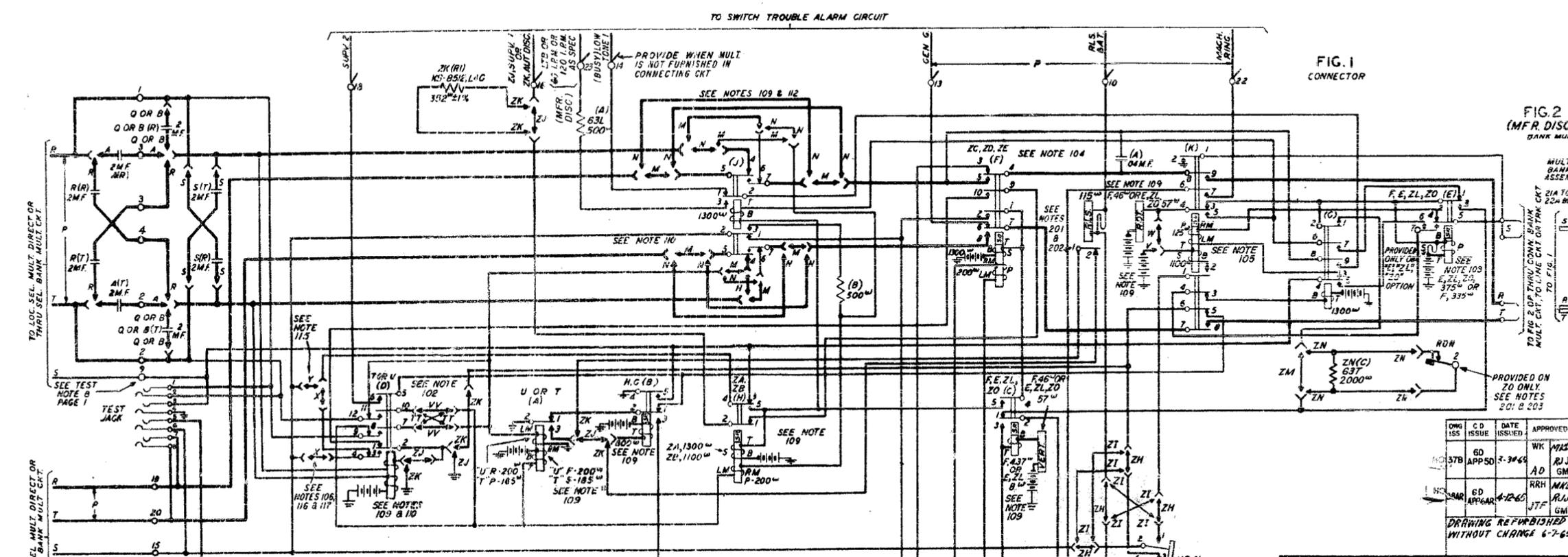
112. WHEN "R" OR "S" OPTION IS USED ON CKTS ASSOCIATED WITH EITHER A TRUNK CKT OR AN A-B TOLL TRANSMISSION SELECTOR ARRANGED TO CUT THRU ON CALLS TO A DISTANT OFFICE, "N" OPTION MUST ALSO BE FURNISHED.

(CIRCUIT NOTES CONTINUED ON SHEET -01-2)

TRANSMISSION TEST REQUIREMENTS (1000 CYCLE LOSS BETWEEN 600 W/LINES)

APPARATUS DESIG	CODE	MAX LOSS	MIN LOSS	REMARKS
CAPACITOR	R	2MF	14.5	11.5
CAPACITOR	T	2MF	14.5	11.5
RELAY	D	222AA	0.3	"U" OPTION
RELAY	A	221ND	0.3	"T" OPTION

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



WORKING LIMITS AND TRIPPING RANGES ON SHEET -01-2

FIGS	APP OR WIRING	OR	WIRING
1	Z	N	ZL
2	Y	M	ZB
	X	K	ZC
	W	J	ZD
	V	H	ZE
	U	G	ZF
	T	F	ZG
	S	E	ZH
	R	D	ZI
	Q	B	ZJ
	A	ZK	ZZ

DRG ISS	C.D.	ISSUE	DATE	APPROVED
1	1	1		
2	1	1		
3	1	1		
4	1	1		
5	1	1		
6	1	1		
7	1	1		
8	1	1		
9	1	1		
10	1	1		
11	1	1		
12	1	1		
13	1	1		
14	1	1		
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35	1	1		
36	1	1		

REPLACING ES-30403-01, REPLACED BY SD-31739-01

SD-30228-01

STEP BY STEP SYSTEMS
NO. 1 OR 350A
CONNECTOR CIRCUIT
COMBINATION TOLL AND LOCAL
LOOP DIALING TOLL TRAIN
SELECTIVE OR
RING SEMI-SELECTIVE RINGING

(COMB. CONN. IR)

BELL TELEPHONE LABORATORIES, INC.

3 SHEETS

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CIRCUIT NOTES: (CONT. FROM SH-01-1)

112. OPTIONS "H", "G", "F", "E", "Z", "ZB", "ZD", "ZE", "ZF", "ZG", "VV" & "TT" WERE ASSIGNED ON ISSUE 26D.

114. USE RELAYS (C) 221D AND (E) 221AS WITH THE 192E SWITCH.

115.

FEATURE OR OPTION	PROVIDE	
	APP. FIGS. OR WIR.	QUANTITY
MACHINE RINGING	AC-DC OR SUPERIMPOSED NEG.	ZG
	SUPERIMPOSED POS.	ZF
REVERSE BATTERY SUPERVISION	REQUIRED	VV
	NOT REQUIRED	TT
RELEASE OF CONNECTOR	CALLING PARTY CONTROL	YZJ
	AUTOMATIC DISCONNECT ON CALLING PARTY HOLDS	YZK

116. WHEN OPTION "ZN" IS FURNISHED, REMOVE OPTION "X", IF PROVIDED.

117. WHEN OPTION "ZK" IS FURNISHED, REMOVE OPTION "X", IF PROVIDED.

EQUIPMENT NOTES:

201.

FIELD MOD ADDITION	SWITCH TO BE MOD.		EQUIV. MOD. SWITCH	
	SWITCH CODE	OPT	SWITCH CODE	OPT
RLS SPRING ASSEMBLY	197E	E	197GP	ZL
RON SPRINGS	197E, 192E	E, F	SEE EQUIP NOTE 203	--
	197GP	ZL	197HR	ZO
RLS SPRING ASSEMBLY	192E	F	SEE EQUIP NOTE 202	--
RON SPRINGS & RLS SPRING ASSEMBLY	197E	E	197HR	ZO

202. FOR FIELD MODIFICATION PROVIDE ASSEMBLY PARTS FOR RELEASE MAGNET SPRINGS AS FOLLOWS:

- P-128224 - BREAK CONTACT
- P-250483 - BUSHING
- P-252926 - HEX HEAD MACHINE SCREW
- P-485112 - SPRING ARM

203. TO PROVIDE RON SPRINGS, FURNISH D-179971 WHICH CONSISTS OF THE FOLLOWING ASSEMBLY PARTS:

- P-138221 - RON SPRING ASSEMBLY
- P-251233 - WASHERS (2)
- P-252505 - SCREWS (2)
- P-296779 - CAM ASSEMBLY

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

TYPE OF DIAL OR ADJ.	45 V. MIN.					48 V. MIN.				
	PULSING FROM SUB.		CALLED STA. SUPV.			PULSING FROM SUB.		CALLED STA. SUPV.		
	2, 4 OR 5	6	7	ADJ. 'A'	ADJ. 'B'	2, 4 OR 5	6	7	ADJ. 'A'	ADJ. 'B'
MAX. EXT. CKT. LOOP #	750 ^m	1200 ^m	1100 ^m	1000 ^m	1400 ^m	850 ^m	1500 ^m	1400 ^m	1115 ^m	1500 ^m
MAX. EXT. CKT. LOOP #*	850 ^m	1400 ^m	1300 ^m	1000 ^m	1400 ^m	1000 ^m	1500 ^m	1500 ^m	1115 ^m	1500 ^m
MAX. EXT. CKT. LOOP #**	1000 ^m	1400 ^m	1400 ^m	1000 ^m	1400 ^m	1115 ^m	1500 ^m	1500 ^m	1115 ^m	1500 ^m
MIN. INS. RES.		15,000 ^m		15,000 ^m		15,000 ^m		15,000 ^m	15,000 ^m	15,000 ^m

- * WHEN USING 1000^m LOOP - LEAK B IN PULSING TEST SET
- ** WHEN USING 1200^m LOOP - LEAK A IN PULSING TEST SET
- *** WHEN USING 1400^m LOOP - LEAK A IN PULSING TEST SET

TRIPPING RANGES

TYPE OF RINGING AND DISTRICT	RINGING INTERVAL VOLTAGE		SILENT INTERVAL VOLTAGE	CODE (1) RELAY	OPTION	RATING	MAX. EXT. CKT. LOOP FOR TRIPPING		
	NO. 1	NO. 350A					ADJ. 'A'	ADJ. 'B'	ADJ. 'C'
AC - DC	84-88 (1) AC	72-88 OR 84-88 AC	45-52	222 J	ZE	STD. (1)	1030 ^m	--	1400 ^m
	48-52 DC	45-52 DC					1115 ^m	--	1500 ^m
SUP. TUBE ± 5V. E.P.	84-88 (1) AC	72-88 OR 84-88 AC	45-52	222 J	ZE	STD. (1)	1030 ^m	--	1400 ^m
SUP. INVERTED ± 2A AND TUBE	84-88 (1) AC	72-88 OR 84-88 AC	60-75	222X OR 222L	ZC OR ZD	A & M	1040 ^m	--	--
SUP. ± 2A, INV. ± 2A, AND TUBE	76-80 (2) AC	72-88 OR 84-88 AC	60-75	222X OR 222L	ZC OR ZD	A & M	980 ^m	--	--

- (1) 72-88 AC & 80-88 AC ARE A&M IN NO. 1.
- (2) 64-80 AC & 72-80 AC ARE ALSO A&M IN NO. 1.
- (3) 64-80, 72-80, OR 76-80 AC & 42-46 DC ARE ALSO A&M IN NO. 1 AND 350A.

S-10-8550E-02

STEP BY STEP SYSTEMS
NO. 1 OR 350A
CONNECTOR CIRCUIT
COMBINATION TOLL AND LOCAL
LOOP DIALING TOLL TRAIN
BELL TELEPHONE LABORATORIES, INC.

CL II
38
5D-30228-01-2
M3

SD-30228-01 5 PAGES CIRCUIT REQUIREMENTS

CONNECTOR CIRCUIT COMBINATION TOLL AND LOCAL (COMB. CONT. 12)

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	SEE TEST	DIRECT CURRENT FLOW REQ.				TIME REQ.		DWG. ISS.
					TEST WDG.	TEST FOR	AFTER SOAK	TEST	TEST READJ.	TEST READJ.	
RELAYS											
A 221A U 1	7-11 11	8 B(NO) TST. JK. 2 TST. JK. 1 M 1/2 F/R	0	FS	15.1	14.8					26
A 221ND T 1	7-11 11	8 B(NO) TST. JK. 2 TST. JK. 1 M 1/2 P/S	0	FS	15.1	14.8					27
B 248A H 1	15-4 500	27 587(VON) 3(A) GRD 3	0	FS	10.5	10					28
B 222A G 1	SL 4A	12 587(VON) 3(A) GRD 3	0	FS	8.4	7.9					29
B 222A G 1	15-4 500	27 587(VON) 3(A) GRD 3	0	FS	9.8	9.3					30

TEST NOTES:
 1. ARMATURE NEED NOT TOUCH CORE.
 2. TEST-CONT FOLLOW ON MAKE CONT. MIN. .003" CONT. SEP ON ALL CONTS. MIN. .003"
 3. FOR USE WHEN TIME REQ. ARE NOT APPLIED.
 4. TEST HOLD-USE 1400" LOOP IN PULSING TEST SET.
 5. FOR USE WHEN TIME REQ. ARE APPLIED.
 6. TEST HOLD-USE 1200" LOOP IN PULSING SET.

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	SEE TEST	DIRECT CURRENT FLOW REQ.				REMARKS	DWG. ISS.
					TEST WDG.	TEST FOR	AFTER SOAK	TEST		
F 222K ZC 1	5 4 73	25 1B(J) 6T(K) 3(F) B/G	0	FS	28	26.5				26
F 222L ZD 1	5 4 73	25 1B(J) 6T(K) 3(F) B/G	0	FS	28	26.5				27
G 221W 1	5 4 31	13 E(O) BRUSH S GRD	0	FS	17	15				31

TEST NOTES:
 1. PRIOR TO ISS. 190, THE CURRENT FLOW VALUES FOR THE P WDG. OF THE (F) 222 L REL. WERE AS FOLLOWS:
 TEST NO. 45 READJ. NO. 43
 TEST NO. 38 READJ. NO. 40
 THE TEST CLIP DATA WAS CONN. BAT. 5T(K), CONN. GRD. 6T(K) AND TEST SET PREP. WAS B/G.
 2. CONTS. 1-2 SHALL MAKE BEFORE SPG. 1 STRIKES THE BUSHING ON SPG. 4.
 3. WHEN SWITCH IS ARRANGED FOR SUPERIMPOSED POSITIVE RINGING, REVERSE TEST CLIP DATA.
 4. ADJ. B, ADDED ON ISS. 260, IS FOR USE WITH LINES UP TO 1500" EXT. CKT. AND NOT EQUIPPED WITH REL. TYPE SUBSETS.
 5. ADJ. "A" IS FOR USE WITH REL. TYPE SUBSETS, OR IN AREAS WHERE THE CORRESPONDING TRIPPING RANGE IS SATISFACTORY.
 6. TEST AND READJ. DURING THE RINGING INTERVAL USING 1% RES. AS SPEC. BELOW:
 TEST READJ. TEST READJ.
 NO NO
 SUP. 42A DIST. 1230" 1120" 900" 970"
 SUP. INK. 42A 1440" 1315" 1080" 1160"
 DIST. TUBE DIST.
 7. SPGS. 1-2 ONLY.
 8. CONTS. 1-2 MAY MAKE.
 9. PRIOR TO ISSUE 298, THE SECONDARY OPERATE REQ. WERE: TEST 31(M), READJ. 21-S MA.

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	SEE TEST	DIRECT CURRENT FLOW REQ.				TIME REQ.		DWG. ISS.
					TEST WDG.	TEST FOR	AFTER SOAK	TEST	TEST READJ.	TEST READJ.	
C 221CK E 1	5 4 4	12 3(B) GRD 1	0	500	90	85					26
C 221D F 1	5 4 4	12 3(B) GRD 1	0	500	115	105					27
D 222AA U 1	5 2 118	15 (A)NO 5(F) 8(F) M 5/6 B F/R	0	FS	20.5	19.5					28
D 222KP T 1	5 2 118	15 (A)NO 5(F) 8(F) M 5/6 B F/R	0	FS	20.5	19.5					29

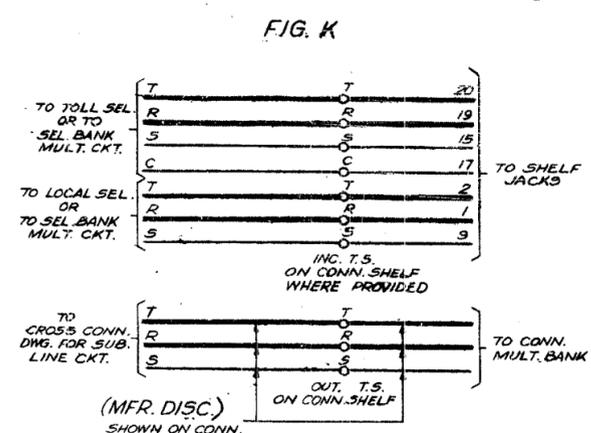
TEST NOTES:
 1. FOR USE WHEN TIME REQ. ARE NOT APPLIED.
 2. TEST HOLD-USE LEAK A IN PULSING TEST SET.
 3. FOR USE WHEN TIME REQ. ARE APPLIED.
 4. CONNECT DIRECT GRD. TO "S" WIPER.
 5. TEST-MIN. 35 GRAMS ON CONTS. 3-4, 8-9 & 11-12.
 6. ADJ. "A" IS SUPERSEDED BY ADJ. "B" ON ISS. 260.
 7. PRIOR TO ISS. 180, TEST OPERATE VALUE FOR THE (D) REL. WAS 29 MA.
 8. ADJ. "B"
 9. ADJ. "A"

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	SEE TEST	DIRECT CURRENT FLOW REQ.				REMARKS	DWG. ISS.
					TEST WDG.	TEST FOR	AFTER SOAK	TEST		
H 222S ZA 1	5 4 96	13 4-5(H) TST. JK. 7 GRD	0	FS	37	35				26
H 222JU ZB 1	SL 96	13 4-5(H) TST. JK. 7 GRD	0	FS	28	29.5				27
J 223A 1	5 4 200	16 (A)NO 5T(K) BAT. 1	0	FS	16	14				31
K 224E 1	5 4 208	31 4(E) 4(E) BAT. 2/3/4	0	FS	29.5	28				32

TEST NOTES:
 1. AS PERMITTED BY SEQUENCE ANY TWO BREAK CONTS. MAY BREAK.
 2. CONTS. 1B-2B SHALL MAKE BEFORE SPG. 1 STRIKES THE BUSHING ON SPG. 4 AND BEFORE SPG. 1B STRIKES THE BUSHING ON SPG. 4B.
 3. TEST-CONTS. 1B-2B SHALL MAKE BEFORE CONTS. 1T-2T MAKE, CONTS. 3T-4T SHALL BREAK BEFORE CONTS. 3B-4B BREAK. CONTS. 1T-2T SHALL MAKE BEFORE CONTS. 5B-6B BREAK.
 4. GRD. TST. JK. 3
 5. CONTS. 1T-2T MAY MAKE, ONLY CONTS. 1B-2B AND 3T-4T REQ. TO OPERATE.
 6. CONTS. 1T-2T AND 1B-2B MAY MAKE AND CONTS. 3T-4T AND 3B-4B MAY BREAK.
 7. (RLS) SPRINGS 1-2 SHALL BREAK WITH A SEPARATION OF READJ. .008 INCH, TEST .006 INCH.
 8. (RLS) SPRINGS 1-2 SHALL NOT BREAK.

APPARATUS	MECH. REQ.	CIRCUIT PREPARATION	TEST SET	SEE TEST	DIRECT CURRENT FLOW REQ.				TIME REQ.		DWG. ISS.
					TEST WDG.	TEST FOR	AFTER SOAK	TEST	TEST READJ.	TEST READJ.	
E 221DT E 1	0 94	14 (K)O 6(VON) GRD 1/2	0	FS	15.5	14.7					26
E 221AS F 1	5 4 94	14 (K)O 6(VON) GRD 1/2	0	FS	15.5	13.8					27
F 222J ZE 1	5 4 74	25 1B(J) 6T(K) 3(F) B/G	0	FS	28	26.5					28

TEST NOTES:
 1. FOR USE WHEN TIME REQ. ARE NOT APPLIED.
 2. TEST-MIN. 15 GRAMS ON CONTS. 6-7.
 3. TEST HOLD-USE LEAK A IN PULSING TEST SET.
 4. FOR USE WHEN TIME REQ. ARE APPLIED.
 5. CONNECT DIRECT GRD. TO "S" WIPER.
 6. WHEN SWITCH IS ARRANGED FOR SUPERIMPOSED POSITIVE RINGING, REVERSE TEST CLIP DATA.
 7. ADJ. "A" IS SUPERSEDED BY ADJ. "B" ON ISSUE 260.
 8. CONTS. 1-2 SHALL MAKE BEFORE SPG. 1 STRIKES THE BUSHING ON SPG. 4.
 9. REQ. FOR SPGS. 1-2.
 10. CONTS. 1-2 MAY MAKE.
 11. ADJ. "A"
 12. ADJ. "B"
 13. ADJ. "C"
 14. ADJ. "B" IS SUPERSEDED BY ADJ. "C" FOR AG-80 AND SUP. (WITH SILENT INTERVAL DAT.) OFFICES ON ISS. 298. ADJ. "B" IS FOR "MAINTENANCE ONLY" FOR SUP. OFFICES WITH 60% TEST SILENT INTERVAL BAT.



E-10-8550E-02

STEP BY STEP SYSTEMS
 NO. 1 OR 350A
 CONNECTOR CIRCUIT
 COMBINATION TOLL AND LOCAL
 LOOP DIALING TOLL TRAIN
 BELL TELEPHONE LABORATORIES, INC.

SD-30228-01-3
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