

INFORMATION NOTES  
 301. WHERE ANY CONNECTORS ARE PROVIDED WITH "N" OPTION INTERCEPT CIRCUITS SHALL BE ARRANGED TO TRIP RINGING EITHER BY A ZOLU CATHODE TUBE OR BY MOMENTARY BATTERY ON ONE SIDE OF THE CIRCUIT. INTERCEPT CIRCUITS WHICH TRIP RINGING ONLY BY MOMENTARY GROUND ON ONE SIDE OF THE CIRCUIT MAY BE USED ONLY WHERE ALL CONNECTORS ARE PROVIDED WITH "N" OPTION.

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

TYPE OF DIAL OR ADJ.	45V. MIN.				42V. MIN.				
	PULSING FROM SUB. 2, 4 OR 5	ADJ. A	ADJ. B	ADJ. C	PULSING FROM SUB. 2, 4 OR 5	ADJ. A	ADJ. B	ADJ. C	
MAX. EXT. CKT. LOOP**	750"	1200"	1100"	1000"	850"	1500"	1400"	1115"	1500"
MAX. EXT. CKT. LOOP***	850"	1400"	1300"	1000"	1000"	1500"	1500"	1115"	1500"
MIN. INS. RES.	1000"	1400"	1400"	1000"	15000"	15000"	15000"	15000"	15000"

\*\*WHEN USING 1000" LOOP-LEAK B IN PULSING TEST SET  
 \*\*\*WHEN USING 1400" LOOP-LEAK A IN PULSING TEST SET

TYPE OF RINGING AND DISTRICT	RINGING INTERVAL	VOLTAGE	SILENT INTERVAL	VOLTAGE	CODE OF RELAY	OPTION	MAX. EXT. CKT. LOOP FOR TRIPPING		
							ADJ. A	ADJ. B	ADJ. C
AC-DC	80-90(1) 75-110(2)	45-52	45-52	222T	D, N	STD. 1030	1400"	1500"	1500"
							1500"	1500"	1500"
SUP. TUBE 15V. E.P.	65-90	37-40	45-52	222T	D, M, OR N	STD. 1030	1400"	1400"	1500"
							1500"	1500"	1500"
SUP. INVERTED 42A AND TUBE	65-90	37-40	60-75	222DP	E, N	A & B	1040"	900"	900"
							1040"	900"	900"

(1) 75-90 DURING POWER FAILURE  
 (2) 75-110 IS A & B

FIG. 1  
CONNECTOR CIRCUIT

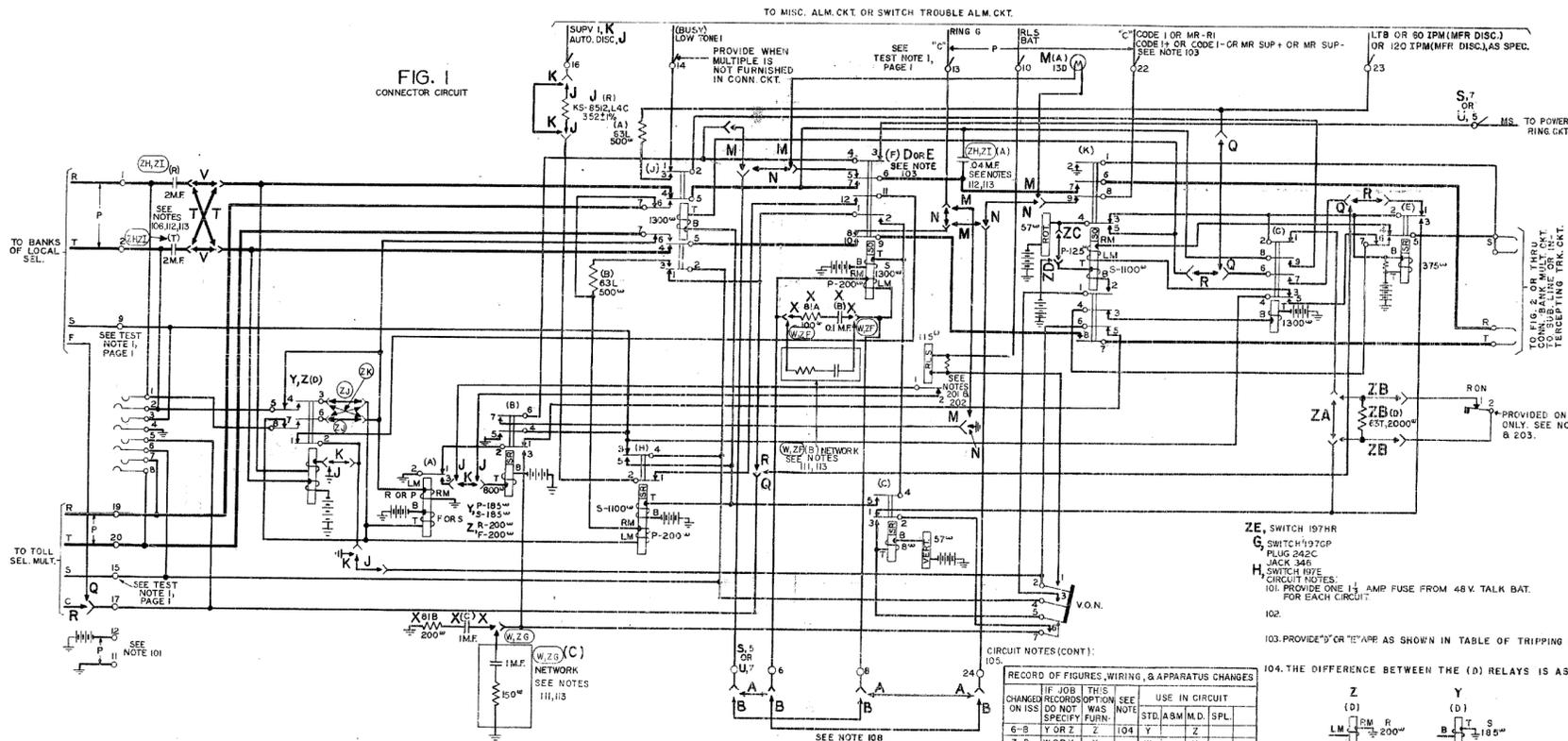


FIG. 2  
(MFR. DISC.)  
BANK MULT.



CIRCUIT NOTES (CONT.)

FEATURE OR OPTION	PROVIDE
COMBINED CONNECTOR-T RING	I
AC-DC OR SUP. NEG. RING.	A
SUP. POS. RING.	B
OFFICES WITH TOLL TRAIN	R
REVERSE BATTERY	REQUIRED
SUPERVISION	NOT REQUIRED
TRIP RELAY IN RINGING SUPPLY SIDE	N, B, D, OR E
TRIP RELAY IN GROUND RETURN SIDE	D, M
AUTOMATIC DISCONNECT ON LOCAL CALLING PARTY HOLDS NOT REQUIRED	J

109. "N" OPTION SHALL BE FURNISHED AS FOLLOWS:

- (a) FOR CONNECTORS WITH ACCESS TO LINES HAVING A DC PATH TO GROUND AT THE STATION (E.G. 2 PARTY MR OR PREPAY COIN LINES).
  - (b) FOR CONNECTORS WITH ACCESS TO 4 PARTY FULL SELECTIVE LINES IN OFFICES EMPLOYING 37-40V SUPERIMPOSED BATTERIES.
  - (c) FOR CONNECTORS IN OFFICES EMPLOYING AC-DC RINGING.
- "M" OPTION SHALL BE FURNISHED AS FOLLOWS:
- (a) FOR CONNECTORS WITH ACCESS TO 4 PARTY FULL SELECTIVE LINES IN 355A OFFICES EMPLOYING 50V SUPERIMPOSED BATTERIES.
  - (b) CONNECTOR GROUPS EQUIPPED WITH "N" OPTION MAY BE FILLED OUT WITH OTHER TYPES OF LINES (E.G. INDIVIDUAL OR 2 PARTY FR) EXCEPT THOSE REQUIRING "M" OPTION.
  - (c) CONNECTOR GROUPS EQUIPPED WITH "M" OPTION MAY BE FILLED OUT WITH OTHER TYPES OF LINES (E.G. INDIVIDUAL) EXCEPT THOSE REQUIRING "N" OPTION.

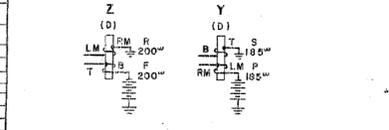
110.

FEATURE OR OPTION	PROVIDE
BUSY FLASH TO OPERATORS OVER LOCAL TRAIN IN OFFICES WITHOUT TOLL TRAIN	O

(CIRCUIT NOTES CONTINUED ON SHEET 2)

OPTIONS USED	APP. OR WIRING
1	Z ZA
2	Y ZB
3	X ZC
4	W ZD
5	V ZE
6	U ZF
7	T ZG
8	S ZH
9	R ZI
10	Q ZJ
11	P ZK
12	N
13	M
14	K
15	J
16	H
17	G
18	E
19	D
20	B
21	A

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



RECORD OF FIGURES, WIRING, & APPARATUS CHANGES

FIG.	CHANGES	RECORDS	OPTION	SEE	NOTE	USE IN CIRCUIT
6-B	Y OR Z	Z	04	Y	Z	
7-D	WORK	X	W	X		
7-D	T OR V	V	107	V	T	
8-D	U OR S	U	S	U		
9-D						
10-D						
11-D	N OR M	N	108	M, N		
11-D	R OR Q	R	108	R	Q	
14-D	J OR K	K	108	J, K		
14-D	O OR H	H		O	H	
15-B	Z A OR Z B	Z A	Z B	Z A		
15-B	Z C OR Z D	Z C	Z D	Z C		
15-B	G, H OR G, H	Z E	Z F	Z G		
15-B	Z E	2480	248C	REL.	Q	
16-D	Z F	W	N1	W OF		
19-D	Z I	Z H	106	Z I		
	Z J	N2	106	Z J		
	Z K	N3	106	Z K		

CIRCUIT NOTES (CONT.)

- 106. WHERE THE (T) & (R) CAP. ARE PART OF A MULTI-UNIT CAP., THEY SHALL BE BALANCED WITHIN 0.1M.F.
- 107. "T" OPTION IS FOR USE WITH "Z" OPTION WHEN IMPROVEMENT IN BALANCE AGAINST INDUCTIVE DISTURBANCES IS REQUIRED.

TRANSMISSION TEST REQUIREMENTS (1000 CYCLE LOSS BETWEEN 600" LINES)	
(A)	(B)
MAX. ALLOWABLE CKT. LOSS DB	0.9
MAX. ALLOWABLE CKT. LOSS DB	0.7

APPROXIMATE INDIVIDUAL IMPROVEMENTS (CONSIDER LOSS)	MARKS
RELAY A	2.1X
RELAY B	2.2X
RELAY C	2.3X
RELAY D	2.4X
RELAY E	2.5X
RELAY F	2.6X
RELAY G	2.7X
RELAY H	2.8X
RELAY I	2.9X
RELAY J	3.0X
RELAY K	3.1X
RELAY L	3.2X
RELAY M	3.3X
RELAY N	3.4X
RELAY O	3.5X
RELAY P	3.6X
RELAY Q	3.7X
RELAY R	3.8X
RELAY S	3.9X
RELAY T	4.0X
RELAY U	4.1X
RELAY V	4.2X
RELAY W	4.3X
RELAY X	4.4X
RELAY Y	4.5X
RELAY Z	4.6X

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

SD-31739-0H

**CLASS II**

REPLACES SD-30228-01

SD-31739-01 1099

STEP-BY-STEP SYSTEMS  
 NO. 1, 350A OR 355A  
 COMBINATION CONNECTOR CIRCUIT  
 WITH OR WITHOUT REVERSE BATTERY SUPERVISION

(COMB. CONN. IR) SD-31739-01-1  
 3 SHEETS

BELL TELEPHONE LABORATORIES, INC.

AT&TCO STANDARD  
 A & M ONLY FOR 350A

ED-31739-01 EQUIPMENT INFO.

ISSUE 170

PRINTED IN U.S.A.

SD-31739-01 3 PAGES CIRCUIT REQUIREMENTS

DESIGN	CODE	OPTION	RESID.	MECH. REQ.			CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.				TIME REQ.		
				RESID.	CONSTR.	INSULATE	TEST CLIP DATA	TEST SET PREP.	SEE TEST NOTE NO.	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST
<b>SWITCHES</b>																	
RLS	197MG	ZE	1						1(VOM)	GRD	7	0			100	95	
MAG	197GP	G							1(VOM)	GRD	8	NO			65	70	
DBL OR 197E		H										NO			115	115	
DOG	MOD																
<b>RELAYS</b>																	
A	221A	Z	1	7-11	726	8	(B)NO	TST.K.2 TST.K.1	M	2/10	F/R	0	FS	15.1	14.8		
								TST.K.2 TST.K.1	M	10	F/R	NO	FS	13.9	14.4		
A	221ND	Y	1	7-11	726	8	(B)NO	TST.K.2 TST.K.1	M	2/13	F/S	0	FS	15.1	14.8		
								TST.K.2 TST.K.1	M	13	F/S	NO	FS	13.9	14.4		
B	248E OR 248D	I		15-4	515	27	5&7(VOM)	3(A)	GRD	3	0	FS	10.5	10			
								3(A)	GRD	3	NO	FS	8.5	9			
				MIN.				TST.K.2 TST.K.1	V-BK	4/5	H					.333	
								TST.K.2 TST.K.1	V-BK	4	R						.750 .500
C	221CK	I		5-4	4	12	5&7(VOM)	3(A)	GRD	4	NO	FS	8.5	9			
								3(B)	GRD	3	0	500	70	85			
								3(B)	GRD	3	NO	500	62	69			
								TST.K.2 TST.K.1	V-M	4/9	H					.100	
								TST.K.2 TST.K.1	V-M	4	R						.155 .140
								3(B)	GRD	4	NO	300	62	69			
D	221JW	Z	1	5-2	33	15	(A)NO	7(F)	10(F)	N	11/12	F/R	0	FS	20.5	19.5	
								7(F)	10(F)	M	13	F/R	NO	FS	13.3	14	
								7(F)	10(F)	M	11/12	F/R	0	FS	28.5	27	
								7(F)	10(F)	M	14	F/R	NO	FS	19	21	

TEST NOTES:  
 1. SPRING 9 SHALL MAKE CONTACT WITH SPRING 11 AND SPRING 13 SHALL MAKE CONTACT WITH SPRING 15 WHEN SWITCH IS REMOVED FROM FRAME.  
 2. ARMATURE NEED NOT TOUCH CORE ON OPERATE CURRENT.  
 3. FOR USE WHEN TIMING REQUIREMENTS ARE NOT APPLIED.  
 4. FOR USE WHEN TIMING REQUIREMENTS ARE APPLIED.  
 5. TEST HOLD-USE 1000<sup>OHM</sup> LOOP IN PULSING TEST SET.  
 6. (RLS) SPRINGS 1-2 SHALL BREAK WITH A SEPARATION OF 200<sup>OHM</sup> IN TEST-006 INCH.  
 7. (RLS) SPRINGS 1-2 SHALL NOT BREAK.  
 8. TEST HOLD-USE LEAK "A" IN PULSING TEST SET.  
 9. TEST-CONT. 35 GRAMS ON WIRE CONTACT WITH B CONTACT.  
 10. TEST-CONT. 35 GRAMS ON CONTACTS 4-5 & 7-8.  
 11. ADJ. "A" IS SUPERSEDED BY ADJ. "B" ON ISS. 10-D.  
 12. ADJ. "B" IS SUPERSEDED BY ADJ. "C" ON ISS. 10-D.  
 13. ADJ. "C" IS SUPERSEDED BY ADJ. "D" ON ISS. 10-D.  
 14. ADJ. "D" IS SUPERSEDED BY ADJ. "E" ON ISS. 10-D.

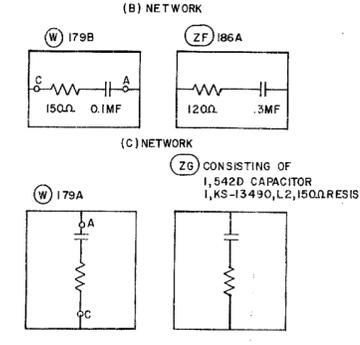
DESIGN	CODE	OPTION	RESID.	MECH. REQ.			CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.				TIME REQ.		
				RESID.	CONSTR.	INSULATE	TEST CLIP DATA	TEST SET PREP.	SEE TEST NOTE NO.	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	TEST TEST	
D	222XW	Y	1	5-2	33	15	(A)NO	7(F)	10(F)	M	11/12	F/S	0	FS	20.5	19.5	
								7(F)	10(F)	M	12/13	F/S	NO	FS	13.3	14	
								7(F)	10(F)	M	11/12	F/S	0	FS	28.5	27	
								7(F)	10(F)	M	13/14	F/S	NO	FS	19	21	
E	221OT	I		5-2	94	14	(N)O	6(VOM)	GRD	5/8	F/S	0	FS	15.5	14.7		
								6(VOM)	GRD	5/8	F/S	NO	FS	10.6	11.2		
								TST.K.2 TST.K.1	V-M	6/7B	H					.111	
								TST.K.2 TST.K.1	V-M	6/8	R						.300 .275
								6(VOM)	GRD	6/8	NO	FS	10.6	11.2			
F	222T	D	1	5-4	113A	25	1B(J)	97(A)	5(F)	8/6	2/3B	P	0	FS	28	26.5	
								97(A)	5(F)	8/6	2/3B	P	NO	FS	22	23.5	
								97(A)	5(F)	8/6	2/3B	P	0	FS	30	27	
								97(K)	5(F)	8/6	2/3B	P	NO	FS	23	25.5	
								4(C)	GRD	13	S	0	FS	28.5	27		
								4(C)	GRD	13	S	NO	FS	20	21		
								5(F)	8/6	2/3B	P	0	FS	23.5	22		
								3(F)	8/6	2/3B	P	NO	FS	19	20.5		
								97(K)	5(F)	8/6	2/3B	P	0	FS	23.5	22.5	
								97(K)	5(F)	8/6	2/3B	P	NO	FS	20	21	
								18(J)	8(F)	8/6	2/3B	P	0	FS	21.5	20.5	
								3(F)	8/6	2/3B	P	NO	FS	18	19		

TEST NOTES:  
 1. YES - MIN. 35 GRAMS ON CONTACTS 4-5 & 7-8.  
 2. ADJ. "A" IS SUPERSEDED BY ADJ. "B" ON ISS. 10-D.  
 3. ADJ. "B" IS SUPERSEDED BY ADJ. "C" ON ISS. 10-D.  
 4. ADJ. "C" IS SUPERSEDED BY ADJ. "D" ON ISS. 10-D.  
 5. FOR USE WHEN TIMING REQUIREMENTS ARE NOT APPLIED.  
 6. FOR USE WHEN TIMING REQUIREMENTS ARE APPLIED.  
 7. TEST HOLD-USE LEAK "A" IN PULSING TEST SET.  
 8. TEST-CONT. 35 GRAMS ON CONTACTS 4-5 & 7-8.  
 9. CONTACTS 1-2 SHALL MAKE BEFORE SPRING 1 STRIKES THE BUSHING ON SPRING 4.  
 10. WHEN SWITCH IS ARRANGED FOR SUR POS. RINGING, REVERSE THE TEST CLIP DATA.  
 11. REQ. FOR SPRINGS 1 & 2 ONLY.  
 12. ADJ. "C" IS SUPERSEDED BY ADJ. "D" ADDED ON ISS. 12-B.  
 13. CONTACTS 1-2 MAY MAKE AND CONTACTS 3-4 & 5-6 MAY BREAK.  
 14. FOR USE WITH "M" OPTION.  
 15. FOR USE WITH "N" OPTION.  
 16. ADJ. "B" IS SUPERSEDED BY ADJ. "D" ADDED ON ISSUE 12-B FOR AC-DC AND SUP. OFFICES WITH 50V SILENT INTERVAL BATTERY. ADJ. "B" IS FOR MAINTENANCE ONLY IN SUP. OFFICES WITH 60-75V SILENT INTERVAL BATTERY.  
 17. ADJ. "C".  
 18. ADJ. "D".  
 19. ADJ. "E".

DESIGN	CODE	OPTION	RESID.	MECH. REQ.			CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.				REMARKS		
				RESID.	CONSTR.	INSULATE	TEST CLIP DATA	TEST SET PREP.	SEE TEST NOTE NO.	TEST TEST	TEST TEST	TEST TEST	TEST TEST				
F	222DF	E	1	5-4	155	27	1B(K)	97(K)	5(F)	8/6	6/7	P	0	FS	28	26.5	ADJ. "B" FOR SPGS. 12 ONLY
								97(K)	5(F)	8/6	11	P	NO	FS	22	23.5	ADJ. "A" FOR SPGS. 12 ONLY
								6/8	P	0	A-C	A-C	ADJ. "A" FOR SPGS. 12 ONLY				
								4(C)	GRD	13	S	0	FS	28.5	27		
								4(C)	GRD	10	S	NO	FS	20	21		
G	221W	I		5-4	31	13	(E)O	BRUSHES	GRD		0	FS	17	16			
								BRUSHES	GRD	110	FS	13	13.7				
H	222JU	I		5-2	96	13	4-5(H)	67(J)	GRD		P	0	FS	25	23.5		
								67(J)	GRD		P	NO	FS	19	20		
								5(H)	GRD		S	0	FS	20			
J	223A	I		5-4	200	16	(A)NO	57(K)	BAT.		0	FS	16	14	CONN DIRECT		
								57(K)	BAT.	1	NO	FS	11	12	GRD TO 5(C)		
								4(E)	BAT.	2/3B	P	0	FS	23.5	23	FOR SPRINGS 18-28 ONLY	
								4(E)	BAT.	5	P	NO	FS	23.5	27		
								28(K)	GRD	2/3A	S	0	FS	32.5	31		
								28(K)	GRD	2/3	S	0	FS	32.5	31.5		
								28(K)	GRD	5	S	NO	FS	24.5	26		

TEST NOTES:  
 1. AS PERMITTED BY SEQUENCE ANY TWO BREAK CONTACTS MAY BREAK.  
 2. CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES THE BUSHING ON SPRING 4.  
 3. TEST-CONT. 35 GRAMS ON CONTACTS 36-40 MAKE. CONTACT-47 SHALL BREAK BEFORE CONTACTS 36-40 BREAK. CONTACTS 1-2 SHALL MAKE BEFORE CONTACTS 36-40 BREAK.  
 4. CONTACTS 1-2 SHALL MAKE ONLY 18-28. 31-47 REG. TO OPERATE.  
 5. CONTACTS 1-2 & 18-28 MAY MAKE & CONTACTS 31-47 & 36-40 MAY BREAK.  
 6. CONTACTS 1-2 SHALL MAKE BEFORE SPRING 1 STRIKES THE BUSHING ON SPRING 4.  
 7. WHEN SWITCH IS ARRANGED FOR SUR POS. RINGING, REVERSE THE TEST CLIP DATA.  
 8. SHORT CKT. SPGS. 3-4 OF TEST JACK.  
 9. TEST & READJUST DURING THE RINGING INTERVAL BRING 27K RESISTANCE AS FOLLOWS: TEST REARJ. TEST REARJ. MIN-OPR. NON-OPR. OPR. OPR.  
 10. RELAY SUB. SETS 1230<sup>OHM</sup> 120<sup>OHM</sup> 900<sup>OHM</sup> 370<sup>OHM</sup>  
 11. INVERTED REL. SUB. SETS 1440<sup>OHM</sup> 1315<sup>OHM</sup> 1080<sup>OHM</sup> 1160<sup>OHM</sup>  
 12. 1000<sup>OHM</sup> SUB. SETS  
 13. ADJ. "B" ADDED ON ISS. 10-D IS FOR USE WITH LINES UP TO 1500<sup>OHM</sup> EXT. CTK. & NOT EQUIPPED WITH REL. TYPE SUB. SETS.  
 14. ADJ. "B" IS FOR USE WITH ALL TYPE SUB. SETS OR IN OFFICES WHERE THE CORRES. TAPPING RANGE IS SATISFACTORY.  
 15. PRIOR TO ISSUE 10-B THE OPERATE REQS. WERE: TEST 31 MA. REGRD. 23.5 MA.

CIRCUIT NOTES (CONT):  
 III. THE DIFFERENCE BETWEEN THE (B) AND (C) NETWORKS IS AS FOLLOWS: (SEE NOTE III)



12. THE DIFFERENCE BETWEEN THE (T,R B) CAPACITORS, OPTIONS "ZH" & "ZI", IS AS FOLLOWS:  
 OPTION "ZH" CONSISTS OF A 445B (T,R B) CAPACITOR AND OPTION "ZI" CONSISTS OF A 580A (T,R B) CAPACITOR AND A 542U (A) CAPACITOR. (SEE NOTE III).  
 13. OPTIONS "ZF", "ZG" & "ZI" WILL BE PROVIDED IN ALL CASES EXCEPT WHEN "M" OPTION IS REQUIRED.

SD-31739-01

DWG. NO. 100  
 100  
 110  
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 13A  
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 15B  
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FIG. 51  
(FOR FIG. 1)  
ONE PER CONN

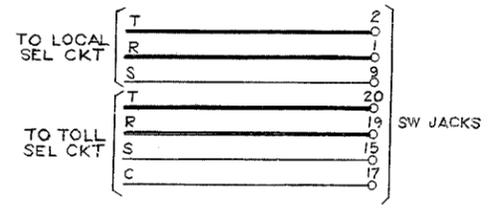


FIG. 52 (MFR DISC)  
(FOR FIG. 1)  
WHEN LINE CKT & CONN  
ARE CROSS CONN AT DISTG  
FRAME

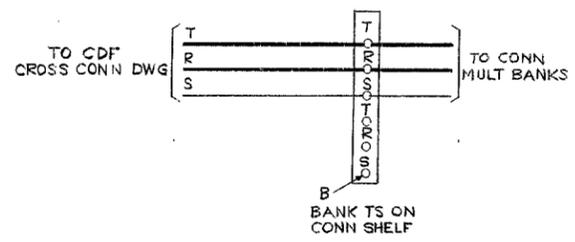


FIG. 53 (MFR DISC)  
(FOR FIG. 1)  
WHEN LINE CKT & CONN  
ARE CROSS CONN AT SW  
FRAMES

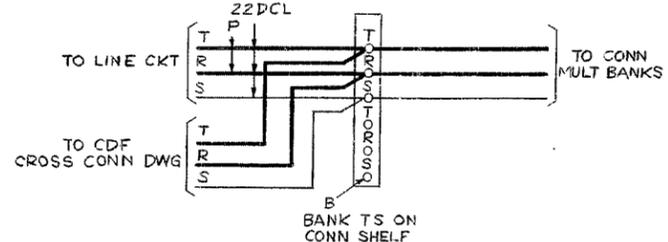


FIG. 54 (MFR DISC)  
(FOR FIG. 1)  
ONE PER SHELF

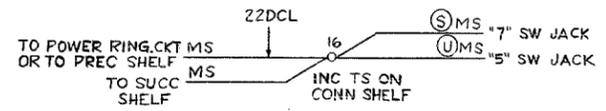


FIG. 55  
(FOR FIG. 1)  
ONE PER SHELF  
355A ONLY

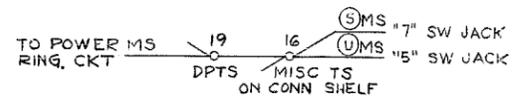
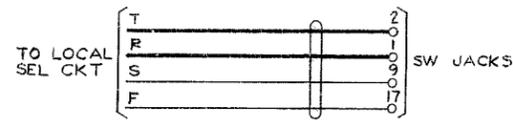


FIG. 56 (A & M ONLY)  
ONE PER CONN  
FOR USE WHEN BUSY FLASH  
SIG TO OPERATOR IS REQD



DRAWING ISSUE	
14D	REV 1
15B	REV 2
16D	REV 3
17B	REV 4
18A	REV 5

EQUIPMENT NOTES:

201. FIELD MOD. ADDITION	SWITCH TO BE MOD.		EQUIV. MOD SWITCH	
	SWITCH CODE	OPT	SWITCH CODE	OPT
RLS SPRING ASSEMBLY	197E	H	197GP	G
RON SPRINGS	197E	H	SEE NOTE 203	-
	197GP	G	197HR	ZE
RON SPRINGS AND RLS SPRINGS	197E	H	197HR	ZE

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

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

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

ISSUE  
19D

SD-31739-01-3