

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.	45 V. MIN.			48 V. MIN.		
	PULSING FROM SUB.	CALLLED STA. SUPPLY	ADJ. A	PULSING FROM SUB.	CALLLED STA. SUPPLY	ADJ. A
MAX. EXT. CKT. LOOP**	750"	1200"	1000"	850"	1500"	1400"
MAX. EXT. CKT. LOOP***	850"	1400"	1300"	1000"	1500"	1500"
MIN. INS. RES.	1000"	1400"	1400"	1115"	1500"	1500"

**WHEN USING 1000" LOOP-LEAK B IN PULSING TEST SET
***WHEN USING 1200" LOOP-LEAK A 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		
	A C VOLTAGE	D C VOLTAGE				ADJ. A	ADJ. B	ADJ. C
AC-DC	80-90(1) 75-110(2)	45-52	45-52	222T	D, N	1030"	1400"	1500"
SUP. TUBE ±5V. E.P.	80-90(2)	45-52	45-52	222T	D, N	1030"	1400"	1500"
	65-90	37-40	45-52	222T	D, N	1030"	1400"	1500"
SUP. INVERTED 42A AND TUBE	65-90	37-40	60-75	222DP	E, N	1040"	1500"	1500"
SUP. 42A, INVERTED 42A AND TUBE	65-90	37-40	60-75	222DP	E, N	900"	1500"	1500"

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

FIG. 1
CONNECTOR CIRCUIT

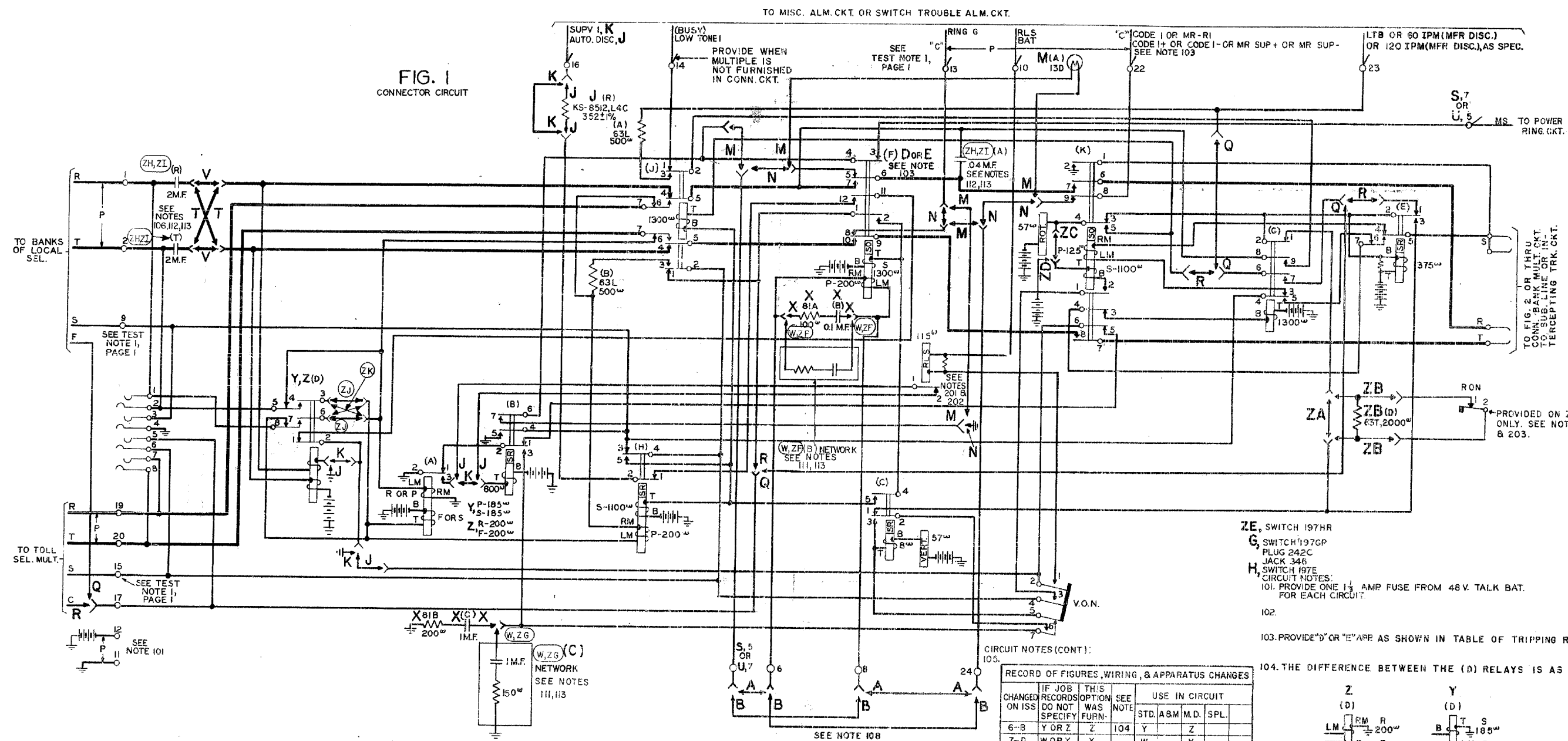
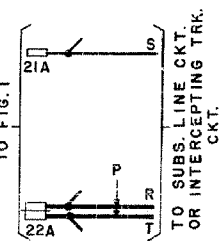


FIG. 2
(MFR. DISC.)
BANK MULT.



CIRCUIT NOTES (CONT.)

FEATURE OR OPTION	PROVIDE
COMBINED CONNECTOR-T RING	1
AC-DC OR SUP. NEG. RING.	A
SUP. POS. RING.	B
OFFICES WITH TOLL TRAIN	R
REVERSE BATTERY SUPERVISION	NOT REQUIRED
TRIP RELAY IN RINGING SUPPLY SIDE	N B
GROUND RETURN SIDE	D, M
AUTOMATIC DIS-CONNECT ON LOCAL CALLING PARTY HOLDS	NOT REQUIRED

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 PR) EXCEPT THOSE REQUIRING "N" 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).

FEATURE OR OPTION	PROVIDE
BUSY FLASH TO OPERATORS OVER LOCAL TRAIN IN OFFICES WITHOUT TOLL TRAIN	0

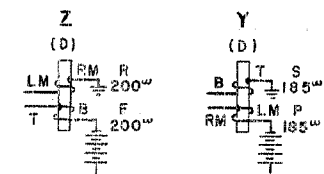
(CIRCUIT NOTES CONTINUED ON SHEET 2)

OPTIONS USED	FIGS.	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	N	ZK
12	M	
13	L	
14	K	
15	J	
16	I	
17	H	
18	G	
19	F	
20	E	
21	D	
22	C	
23	B	
24	A	

ZE, SWITCH 197HR
G, SWITCH 197CP
H, SWITCH 197CP
I, SWITCH 197CP
J, SWITCH 197CP
K, SWITCH 197CP
L, SWITCH 197CP
M, SWITCH 197CP
N, SWITCH 197CP
O, SWITCH 197CP
P, SWITCH 197CP
Q, SWITCH 197CP
R, SWITCH 197CP
S, SWITCH 197CP
T, SWITCH 197CP
U, SWITCH 197CP
V, SWITCH 197CP
W, SWITCH 197CP
X, SWITCH 197CP
Y, SWITCH 197CP
Z, SWITCH 197CP

102. PROVIDE "D" OR "E" APP. AS SHOWN IN TABLE OF TRIPPING RANGES.

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



RECORD OF FIGURES, WIRING, & APPARATUS CHANGES

FIG.	APP. OR WIRING	USE IN CIRCUIT
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	N	ZK
12	M	
13	L	
14	K	
15	J	
16	I	
17	H	
18	G	
19	F	
20	E	
21	D	
22	C	
23	B	
24	A	

CIRCUIT NOTES (CONT.)
106. WHERE THE (T) & (R) CAP. ARE PART OF A MULTI-UNIT CAP., THEY SHALL BE BALANCED WITHIN 0.1 MF.
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 IND. LOSS	0.9
MAX. ALLOWABLE EXT. LOSS	0.7
MAX. ALLOWABLE CAP. LOSS	0.5
MAX. ALLOWABLE IND. LOSS	0.3
MAX. ALLOWABLE EXT. LOSS	0.2
MAX. ALLOWABLE CAP. LOSS	0.1
MAX. ALLOWABLE IND. LOSS	0.1
MAX. ALLOWABLE EXT. LOSS	0.1
MAX. ALLOWABLE CAP. LOSS	0.1

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

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

(COMB. CONN. IN)

BELL TELEPHONE LABORATORIES, INC.

SD-31739-01-1

3 SHEETS

AT&T CO. STANDARD

A&M ONLY FOR 350A

ED-31739-01 EQUIPMENT INFO.

ISSUE 170

SD-31739-01 3 PAGES CIRCULATORY REQUIREMENTS															
CONNECTOR CIRCUIT COMBINATION TOLL AND LOCAL (CONV. CONV. IN)															
DESIG.	CODE	OPTION	CT. FIG.	RESID.	SP. FIG.	CONT. PRESS.	ARM. TYLE.	BLACK OR INSULATE	TEST CLIP DATA	TEST SET PREP.	SEE TEST NOTE NO.	TEST FOR	TEST READ.	TIME REQ.	
SWITCHES															
RLS 197MG	ZE	1							1(VON)	GRD	7	0		100 95	
MAG 197GP	G								1(VON)	GRD	8	NO		65 70	
DBL OR 197E	H											NO		115 115	
DOG 197D															
RELAYS															
A 221A	Z	1	7-11	726				(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				(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		1	15-4	515				5&7(VON)	3(A)	GRD	3	0	FS 10.5 10		
OR 248D									3(A)	GRD	3	NO	FS 8.5 9		
			MIN.						TST.K.2 TST.K.1	V-BK	4/5	H		.333	
			1.5						TST.K.2 TST.K.1	V-BK	4	R		.750 .500	
C 221CK		1	5-4	4				5&7(VON)	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 222JW	Z	1	5-2	33				15	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 19.3 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 27

APPARATUS				MECH. REQ.				CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.						TIME REQ.		DW
DESIG.	CODE	OPTION	CT. FIG.	RESID.	BSF FIG.	CONT. PRESS.	ADM. TYLE.	BLACK OR INSULATE	TEST CLIP DATA	TEST SET PREP.	SEE TEST NOTE NO.	TEST WDG.	TEST AFTER DOW.	TEST MA	TEST MA	REAR.	TEST SEC.	TEST REAR.		
D	222AN	Y	1	5-2	33		15	(A) NO	7(F) 10(F) M 11/13	P/S	0	FS	20.5	19.5					10	
									7(F) 10(F) M 11/13	P/S	NO	FS	13.3	14					11	
									7(F) 10(F) M 11/14	P/S	0	FS	28.5	27					12	
									7(F) 10(F) M 11/14	P/S	NO	FS	19	21					13	
E	221OT		1	5-2	94		14	(X) O	6(VON) GRD	5/8	P/S	0	FS	15.5	14.7				14	
									6(VON) GRD	5/8	P/S	NO	FS	10.6	14.2				15	
									TST.JK2 TST.JK1	V-M	5/17B	H							16	
									TST.JK2 TST.JK1	V-M	6/8	R							17	
								(N) O	6(VON) GRD	6/8	NO	FS	10.6	14.2					18	
F	222T	D	1	5-4	113A		25		97(K) 5(F) 8/6	2/19B	P	0	FS	28	26.5					
									97(K) 5(F) 8/6	2/11	P	NO	FS	22	23.5					
									97(K) 5(F) 8/6	2/19B	P	0	30	27						
									97(K) 5(F) 8/6	2/11	P	NO	2.9	25.5						
									4(C) GRD	13	5	0	FS	28.5	27					
									4(C) GRD	13	5	NO	FS	20	21					
									1B(J) 5(F) 8/6	2/19B	P	0	FS	23.5	22					
									3(F) 6(B) 1/13	2/14H	P	NO	FS	19	20.5					
									97(K) 5(F) 8/6	2/19B	P	0	FS	23.5	22.5					
									97(K) 5(F) 8/6	2/14H	P	NO	FS	20	21					
									1B(J) 5(F) 8/6	2/19B	P	C	FS	21.5	20.5					
									3(F) 6(B) 1/13	2/14H	P	NO	FS	18	19					

TEST NOTES:

TEST-1: MIN. 35 GRAMS ON CONTACTS 4-5 & 6 & 7-8.

TEST-2: "A" IS SUPERSEDED BY ADV. "B" ON ISS 10 D.

ADV. "B"

ADV. "A"

FOR USE WHEN TIMING REQUIREMENTS ARE NOT APPLIED.

FOR USE WHEN TIMING REQUIREMENTS ARE APPLIED.

TEST HOLD-USE LEAK "A" IN PULSING TEST SET.

TEST-MIN. 15 GRAMS ON CONTACTS 6-7.

CONTACTS 1-2 SHALL MAKE BEFORE SPRING 1 STRIKES THE BUSHING ON SPRING-4.

WHEN SWITCH IS ARRANGED FOR SUP. POS. RINGING, REVERSE THE TEST CLIP DATA.

REQ. FOR SPRINGS 1 & 2 ONLY

12. ADJ. "C" IS SUPERSEDED BY ADV. "E" AFTER ISS. 12-B.

13. CONTACTS 1-2 SHALL 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"

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APPARATUS				MECH. REQ.				CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.				REMARKS
RESID.	CODE	OPTION	CT. FIG.	RESID.	SP. FIG.	CONT. PRESS.	ARM. TYLE.	BLACK OR INSULATE	TEST CLIP DATA		TEST SET PREP.	SEE TEST NOTE NO.	TEST FOR	TEST READ.		
									DOWN BAT.	CONN. ORG.			TEST FOR	TEST READ.		
F	222DF	E	1	5-4	155		27		97(N)	5(F)	8/6	6/7	P	0	FS 28 26.5	ADJ. "B" FOR
								1B(U)	97(K)	5(F)	8/6	6/7	P	NO	FS 22 23.5	SPGS. 12 ONLY
												6/8	P	NO	A C	A C
												4(C)	P	NO	A C	A C
												4(C)	GRD	13	5	FS 28.5 27
												4(C)	GRD	10	5	NO FS 20 21
G	221W		1	5-4	31		13	(E) O	BRUSH	GRD		0	FS	17	16	
									BRUSH	GRD		NO	FS	13	13.7	
H	222JU		1	5-2	96		13	4-5(H)	67(U)	GRD	P	0	FS	25	23.5	
									67(U)	GRD	P	NO	FS	19	20	
									5(H)	GRD	S	0	FS	20		
J	223A		1	5-4	200		16	(A) NO	57(K)	BAT.	1	NO	FS	16	14	CONN DIRECT
									57(K)	BAT.	1	NO	FS	11	12	GRD TO 5(C)
K	224E		1	5-4	208		31	4(E)	4(E)	BAT.	2	P	NO	23.5	28	FOR SPRINGS
									4(E)	BAT.	5	P	NO	23.5	25	18-28 ONLY
								37(K)	28(K)	GRD	2/14	S	0	FS	22.5	27
									28(K)	GRD	2/13	S	0	FS	32.5	31.5
									28(K)	GRD	5	S	NO	FS	24.5	26

TEST NOTES:

AS PERMITTED BY SEQUENCE ANY TWO BREAK

CONTS MAY BREAK

CONTS 1B-28 SHALL MAKE BEFORE SPRING 1B STRIKES THE BUSHING ON SPRING 4B & BEFORE SPRING IT STRIKES THE BUSHING ON SPRING 4T.

TEST CONTS 1B-28 SHALL MAKE BEFORE CONTS 1T-27 MAKE. CONTS 3T-47 SHALL BREAK BEFORE CONTS 3B-48 BREAK. CONTS 1T-27 SHALL MAKE BEFORE CONTS 3B-48 BREAK.

CONTS 1T-27 MAY MAKE, ONLY 1B-28, 3T-47 REG. TO OPERATE.

CONTS 1T-27 & 1B-28 MAY MAKE & CONTS 3T-47 & 3B-48 MAY BREAK.

CONTS 1-2 SHALL MAKE BEFORE SPRING 1 STRIKES THE BUSHING ON SPRING 4.

WHEN SWITCH IS ADJUSTED FOR SUP POS. RINGING, REVERSE THE TEST CLIP DATA.

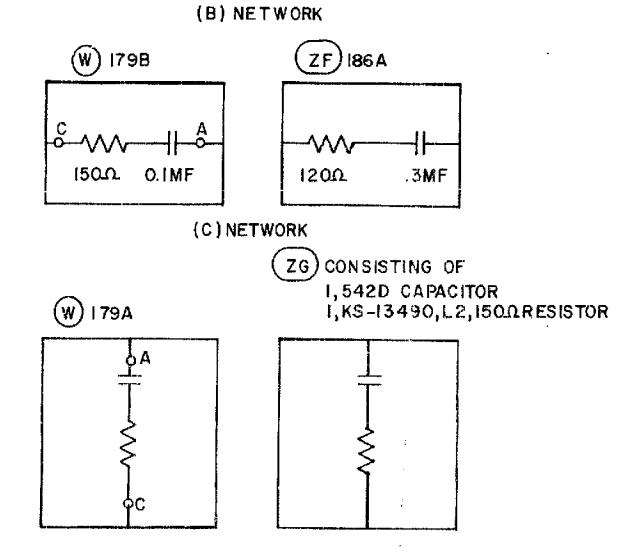
SHORT CKT. SPGS. 3-4 OF TEST JACK.

B. TEST & READOUT DURING THE RINGING INTERVAL USING 25K RESISTANCES AS FOLLOWS:

TEST READ: MIN-OPR-NO-OPR

TEST NOTES:
 1. AS PERMITTED BY SEQUENCE ANY TWO BREAK
 2. CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES
 3. TEST CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES
 4. CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES
 5. CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES
 6. CONTACTS 18-28 SHALL MAKE BEFORE SPRING 18 STRIKES
 7. WHEN SWITCH IS ARRANGED FOR SUR POS. RINGING,
 8. SHORT CKT. SPES. 3-4 OF TEST JACK.

CIRCUIT NOTES (CONT):
 III. THE DIFFERENCE BETWEEN THE (B) AND (C) NETWORKS
 IS AS FOLLOWS: (SEE NOTE 113)



112. THE DIFFERENCE BETWEEN THE (T,R & A) CAPACITORS,
 OPTIONS "ZH" & "ZI", IS AS FOLLOWS:
 OPTION "ZH" CONSISTS OF A 4458 (T,R & A) CAPACITOR AND
 OPTION "ZI" CONSISTS OF A 580A (T,R & A) CAPACITOR AND A
 542U (A) CAPACITOR. (SEE NOTE 113).

113. OPTIONS "ZF" "ZG" & "I" WILL BE PROVIDED IN ALL
 CASES EXCEPT WHEN "M" OPTION IS REQUIRED.

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

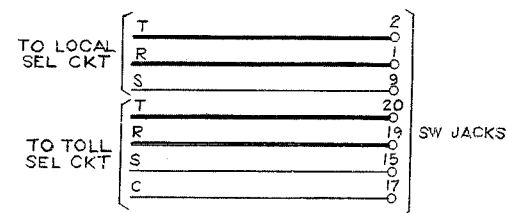


FIG. 55
(FOR FIG. 1)
ONE PER SHELF
355A ONLY

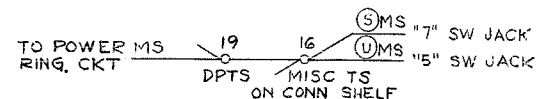


FIG. 52 (MFR DISC)
(FOR FIG. 1)
WHEN LINE CKT & CONN
ARE CROSS CONN AT DISTG
FRAME

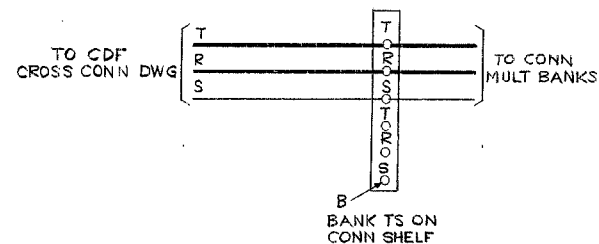


FIG. 56 (A & M ONLY)
ONE PER CONN
FOR USE WHEN BUSY FLASH
SIG TO OPERATOR IS REQD

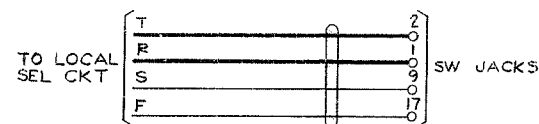


FIG. 53 (MFR DISC)
(FOR FIG. 1)
WHEN LINE CKT & CONN
ARE CROSS CONN AT SW
FRAMES

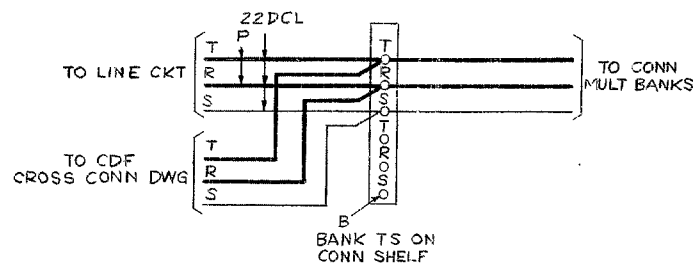
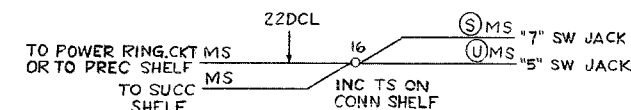


FIG. 54 (MFR DISC)
(FOR FIG. 1)
ONE PER SHELF



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

DRAWING ISSUE	
14D	WV
15B	RJB
16D	RJB
17B	AD
18A	WV

ISSUE
14D

COMBINATION CONNECTOR CIRCUIT

SD-31739-01-3

BELL TELEPHONE LABORATORIES

SD-31739-01-3