SHEET INDEX

WORKING LIMITS

FIG. 1

	TYPE OF LINE	EARTH POTENTIAL	ADJ "A" 45V MIN	ADJ "A" 48V MIN	(L) RELAY ADJ "B" 45V MIN	ADJ "C" SEE NOTE 301 45V MIN	ADJ "C" SEE NOTE 301 48V MIN
MAX. EXT CKT LOOP RESISTANCE	1,2,4,8, & 10 PTY FLAT RATE & IND MSG RATE	±10V	1400Ω	1500Ω	750Ω	—	—
	2 PTY MSG RATE, AND LOOP START PREPAY COIN (5¢)	0V	1335Ω	1460Ω	800Ω	—	—
		±5V	1290Ω	1410Ω	750Ω	—	—
		±10V	1245Ω	1365Ω	—	—	—
		±20V	1150Ω	1270Ω	—	1400Ω	1500Ω
	DIAL TONE FIRST COIN BOX LINE	±3V	—	—	—	1400Ω	1500Ω
MIN INS RESISTANCE	LOOP START COIN		20,000Ω		20,000Ω	—	
	OTHER		15,000Ω		15,000Ω	15,000Ω	
	DIAL TONE FIRST COIN BOX LINE		—		—	30,000Ω	

FIG. 2

			ADJ "C" 45V MIN	ADJ "C" 48V MIN	MIN INS RES
MAX. EXT CKT LOOP RES (T+R+STATION)	GROUND START	-7V, +10V	1000Ω	1100Ω	20,000Ω
	PREPAY COIN (10¢)				
	LOOP START	±3V	1400Ω	1500Ω	30,000Ω

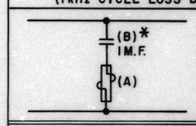
FIG. 2, 3, & 4

			(L) RELAY ADJ "A"	(L) RELAY ADJ "B"	(CTI) RELAY E6121	(CTI) RELAY R77
MAX. EXT. CKT RES TO GROUND	LINES FROM PBX SEL LEVELS	0V	1430Ω	—	—	—
		±6.5V	1055Ω	—	—	247Ω
		±10V	855Ω	525Ω	247Ω	—
		±20V	280Ω	—	—	—
MIN. INS. RES.			30,000Ω	30,000Ω	—	—

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT INFO.	ED-30358-01 ED-30427-03 ED-30556-01 ED-30560-01 ED-30688-01 J32001D-( )
EQPT DESIGN REQT	J32001
KEYSHEET DWG NO. 1	SD-31359-01
NO. 350A	SD-31364-01

TRANSMISSION TEST REQUIREMENTS
(1kHz CYCLE LOSS BETWEEN 600Ω LINES)



MAX. ALLOWABLE CKT LOSS (dB)
0.2

ALLOWABLE INDIVIDUAL APPARATUS LOSSES (dB)

APPARATUS	DESIG	CODE	MAX. LOSS	MIN. LOSS	REMARKS
INDUCTOR	A	546, 2746	0.1		

*INDICATES APPARATUS FOR WHICH IND LOSSES ARE NOT REQD.

OPTIONS USED

FIGS.		APP OR WIRING	
1		Z	ZE
1A	B	Y	ZF
2	C	X	ZG
3		W	ZH
4		V	ZJ
5		U	
6		T	
7		S	
8		R	
		Q	
		P	
		N	
		M	
		K	
		J	
		H	
		G	
		F	
		E	
		B	
		A	
		ZA	
		ZB	
		ZC	
		ZD	

45-52 V

DWG ISS	CD ISS	DWG ISS	CD ISS	DWG ISS	CD ISS
13D	4D	14D	4D APP 1D	15D	5D
16D	5D APP 1D	17D	5D APP 2D	18D	5D APP 3D
19D	5D APP 4D	20D	5D APP 5D	21D	6D
22D	7D	23D	7D APP 1D	24D	7D APP 2D
25D	7D APP 3D	26D	8D	27D	8D APP 1D

DWG ISS	EE OR CD ISSUE	DATE ISSUE	DRN	APPD
28D	8D APP 2D	12-17-70	RPR PJS NS	RAF LCB SEB
29B	8D APP 3B	5-5-72	RPR SAK HY	NTM LCB SEB
30A	8D APP 4A	8-3-72	DJH PJS JEK	NTM LCB SEB
31B	8D APP 5B	3-14-73	ROZ PJS JEK	CAW LCB SEB
32B	8D APP 6B	9-3-76	PHG SAK WJF	DFH GFC SEB
33B	8D APP 7B	2/2/84	REG BJG HSJ	RWH NAR DCJ

HW

AT&T TECHNOLOGIES, INC – PROPRIETARY

REPLACING LINE CKTS OF SD-30427-01, SD-30427-02, ES-241507, ES-241583 & SD-31133-01 REPLACED BY SD-32133-01 EXCEPT FOR ADDITIONS ON PARTIALLY EQUIPPED LINE FINDER FRAMES

ISSUE 33B

SD-31531-01 2D99

STEP BY STEP SYSTEMS
NO. 1 OR 350A
SUBSCRIBER LINE CIRCUITS
FOR USE WITH LINE FINDERS

(L) OR (LINE) (2)

A&M ONLY

SD-31531-01-1
6 SHEETS

AT&T BELL LABORATORIES — DWG SIZE 6S

PRINTED IN U.S.A.

SD-31531-01-1

CIRCUIT NOTES:

101. PROVIDE ONE 1-1/3 AMP. FUSE FOR 48V. BAT. FOR 20 LINE CKTS. AND ASSOCIATED SUB-GROUP RELAY. PROVIDE ONE 1-1/3 AMP. FUSE FOR 48V. BAT. PER 5 CKTS. PER FIG. 4. PROVIDE ONE 1-1/3 AMP. FUSE FOR 48V. BAT. FOR 40 MESSAGE REGISTERS.

102.

FEATURE OR OPTION				PROVIDE FIG. APP OR WRG	PROVIDE QUANTITY
MANUAL PREPAY COIN BOX SERVICE				FIG. 5	I PER LINE
LINES FROM 701A, 711A, 702A, 740A, B OR C PBX SEL LEVELS, OR FDR DIR. CONN TO 10 CENT PREPAY COIN BOX LINE				FIG. 2 ZD	
LINES FROM 700C OR 710C P.B.X. SEL. LEVELS, USED WITH P.B.X. LONG TRK. CKT.				FIG. 2 (MOD. OF FIG. 1)	
LINES FROM 700C OR 710C P.B.X. SEL. LEVELS P.B.X. EQPT. NOT MODIFIED TO REDUCE UNGUARDED INTERVAL WHEN CENTRAL OFFICE DISCONNECTS FIRST, AND NOT USING P.B.X. LONG TRK. CKT.				FIG. 3 (MOD. OF FIG. 1) AND FIG. 4	
LINES FROM 700C OR 710C P.B.X. SEL. LEVELS P.B.X. EQPT. MOD. TO REDUCE UNGUARDED INTERVAL WHEN CENT. OFF. DISCONNECTS FIRST OR MJ MOBILE RADIO TELEPHONE SYSTEM LINE AND LINK CKT				FIG. 2 (MOD. OF FIG. 1)	
LINES OTHER THAN ABOVE INCLUDING DIAL TONE FIRST COIN BOX LINE				FIG. 1	
FIG. 3 WITH MSG. REG.				K	I PER FIG. 3
FIG. 3 WITHOUT MSG. REG.				J	
NUMBER CHECKING	REQUIRED			G	I PER FIG. 4
	NOT REQUIRED			F	
SINGLE PARTY MSG REG SRV REG OPR FROM POS BOOSTER BAT.	OVERTIME CHARGING	REQD	ZG	FIG. 1A OR 6	I PER FIG. 1 OR 2
			W, ZH		
		NOT REQD			
SINGLE PARTY MSG REG SRV REG OPR FROM 48V NEG. BAT.				FIG. C OR 7	
2 PARTY MSG REG SRV				FIGS. 1A & 8	I PER FIG. 1
MSG REG OF FIGS. C OR 7 OPR ON CO BAT. THRU RES OF	103.5Ω ±1%			U	I PER FIG. 1 OR 2
AUTOMATIC TICKETING - OTHER THAN COIN BOX LINES				T	I PER FIGS. 1, 2 OR 3
CLASS OF SERVICE INDICATION IN ACCORDANCE WITH SUB'S. LINE	DIRECT GRD.			R, FIG. 8	I PER 2 FIGS. 1 OR 2
	RES GRD			S, FIG. 8	
AMA OFFICES	OTHER THAN COIN BOX LINES			T	I PER FIGS. 1, 2 OR 3
	OFFICIAL LINES - WHERE OFFICIAL LINES ARE NOT IN A LINE FINDER GROUP OF OFFICIAL LINES.			T, B	
AUTOMATIC NUMBER IDENTIFICATION OFFICES	FOR OTHER THAN COIN BOX LINES			A	I PER FIGS. 1 2, 3 OR B
WHERE FIG. 3 OR 6 IS FURNISHED AND MESSAGE UNIT REPETITION TO PBX VIA 3RD WIRE IS		REQD		ZA	
		NOT REQD		M	
WHERE FIG. 7 IS FURNISHED AND MESSAGE UNIT REPETITION TO PBX VIA 3RD WIRE IS		REQD		ZC	
		NOT REQD		U	
REDUCTION OF THE RECEIVER OFF-HOOK TONE IS REQUIRED				ZJ	I PER FIG. 1, 2, 3 OR 5

CIRCUIT NOTES: (CONT)

103. EQUIP MSG. REG. ONLY WHEN REQ.

104. MULTIPLE THE "G" LEAD TO THE LINE CKTS. IN THE SAME LINE SUB-GROUP.

105. OMIT CONNECTION TO CONNECTOR MULTIPLE WHEN NOT REQ.

106.

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	MD	PROV
2-D					FIG. 3, FIG. 4		
4-D	FIG. 1A	FIG. 1A		FIG. 1A			
5-D	FIG. 6	FIG. 6		FIG. 6			
8-D	FIGS. B, C & 7	NONE	102	FIGS. B, C & 7			
11-D	Y OR Z	Y	102	Z	Y		
12-D	V OR W	W	102	W			V
13-D	T	NONE	102	T			
14-D	FIG. 8	NONE	102	FIG. 8			
15-D				Q		X	
16-D	M OR N	N		M		N	
	U	Y OR Z		U		Z	
			102	V			
17D	RELAYS			B34		3140	
18D	P	M OR N			P		
	H OR E	U, Y OR Z	108		H, E	Y	
20D						Q	
21D	B	NONE	102	B			
22D	A	NONE	102	A			
23D	ZA	M, N OR P		ZA			
23D	ZB	E, Y	108		ZB		
23D	ZC	H, U OR Z		ZC			
24D						V	
26D	ZD, ZE, ZF	ZD	102	ZD, ZE, ZF			
28D			111, 112		ZE, ZF		
29B	ZG	W OR V OR ZH	102	ZG, W, ZH			
32B	ZJ	NONE	114	ZJ			

107. OPTION LETTERS "J" & "K" ASSIGNED TO (CTI) RELAYS ON ISSUE 16-D.

108. A & M ONLY

FEATURE OR OPTION				PROVIDE FIGS.	PROVIDE APP OR WRG	PROVIDE QUANTITY
MSG. REG. OF FIG. 7 OPR. ON CENT. OFF. BAT. THRU RES OF	115Ω	AND MSG. UNIT REPETITION TO A PBX VIA A 3RD WIRE IS	REQD		ZB	
			NOT REQD		E	
	103.5 ± 1%		REQD		SEE NOTE 102	
			NOT REQD		H	

109. REGISTER CONTACTS PROVIDED ONLY WITH OPTIONS ZA, ZB OR ZC.

CIRCUIT NOTES: (CONT)

110. WHEN THIS CIRCUIT CONNECTS TO THE DIAL TONE SPEED REGISTER CIRCUIT IN STEP BY STEP OFFICES ARRANGED FOR TOUCH-TONE CALLING, A P32B126 (RED) PLASTIC SLEEVE SHOULD BE USED TO INSULATE 3 AND 4 TOP OF THE (CO) RELAY IN ORDER TO REMOVE GROUND FROM THE TIP SIDE OF THE LINE TO PROVIDE FOR RING GROUND START AS REQUIRED. THE MAXIMUM EXTERNAL RESISTANCE SHALL NOT EXCEED 420 OHMS WHEN THIS FEATURE IS APPLIED.

111. (A & M ONLY) OPTIONS ZD AND ZE, TOGETHER, PROVIDE UNBALANCED LOOP START OPERATION. OPTION ZF PROVIDES BALANCED LOOP START OPERATION.

112. OPTIONS ZE AND ZF IN FIG. 2 ARE FOR FIELD MODIFICATION OF EXISTING EQUIPMENT AND SHALL NOT BE SPECIFIED FOR NEW MANUFACTURE.

113. THE COMBINED SERIES RESISTANCE OF THE MC1 AND MC2 LEADS SHALL NOT EXCEED 14 OHMS.

114. OPTION ZJ IS USED IN CASE WHEN REDUCTION OF THE LEVEL OF ROH TONE IS REQUIRED FOR CORRESPONDING LINE (E.G. PBX LINE) ONLY.

115. DO NOT CONNECT THE "S" LEAD WHEN THE CDA 2 WAY AUX LINE CIRCUIT IS PROVIDED.

EQUIPMENT NOTES:

201. PRIOR TO ISSUE 16-D, FIG. 51 WAS NOT SHOWN, AND THE LOCAL WIRING "TR OR A" LEAD IN FIGS. 1K, 2K AND 5K CONNECTED TO "SW. JK. NO. 3."

202. THE 14LA AND 14LB REGISTERS SHALL BE USED FOR REPLACING THE 5AH AND 5AA REGISTERS RESPECTIVELY AND IN SOME CASES FOR ADDITIONS TO EXISTING EQUIPMENT WHERE THEY MOUNT WITH THE 5 TYPE REGISTERS.

203. PRIOR TO ISSUE 23D, FIG. 52 WAS NOT SHOWN.

INFORMATION NOTES:

301. USE OF ADJUSTMENT "C" TO EXTEND THE RANGE OF 2 PARTY MESSAGE RATE LINES IS RECOMMENDED ONLY WHERE THERE IS NEGLIGIBLE RISK OF REPEATED LINE FINDER STARTS DUE TO LOW INSULATION RESISTANCE.

302. FOR PBX AUTOMATIC IDENTIFIED OUTWARD DIALING (AIOD) SERVICE A CONNECTION TO AN AIOD NUMBER NETWORK IS REQUIRED IN ADDITION TO THE CONNECTION TO A REGULAR NUMBER NETWORK, OR IN PLACE OF THE CONNECTION TO A MISC. NUMBER NETWORK.

303. LINE CIRCUIT FIG. 2 CAN BE MODIFIED FOR UNBALANCED "LOOP START" AND CONTINUE TO OPERATE AS "GROUND START" BY INSULATING SPRING 4T OF RELAY CO WITH A P32B126 PLASTIC SLEEVE AND APPLYING OPTIONS ZD & ZE.

WHEN THE DIAL TONE FIRST SERVICE (COIN STATION SERVICE ARRANGED FOR COINLESS ACCESS TO SPECIFIED NUMBERS) IS IMPLEMENTED, REMOVE PLASTIC SLEEVE.

DRAWING ISSUE

SUPERSEDES ISS 27D HW 28D

ISSUE 33B HW

SUBSCRIBER LINE CIRCUITS (2) SD-31531-01-2

AT&T BELL LABORATORIES SIZE 6S

PRINTED IN U.S.A.

FIG. 1

LINE CIRCUIT ARRANGED FOR LOOP START
(SEE NOTE 110)

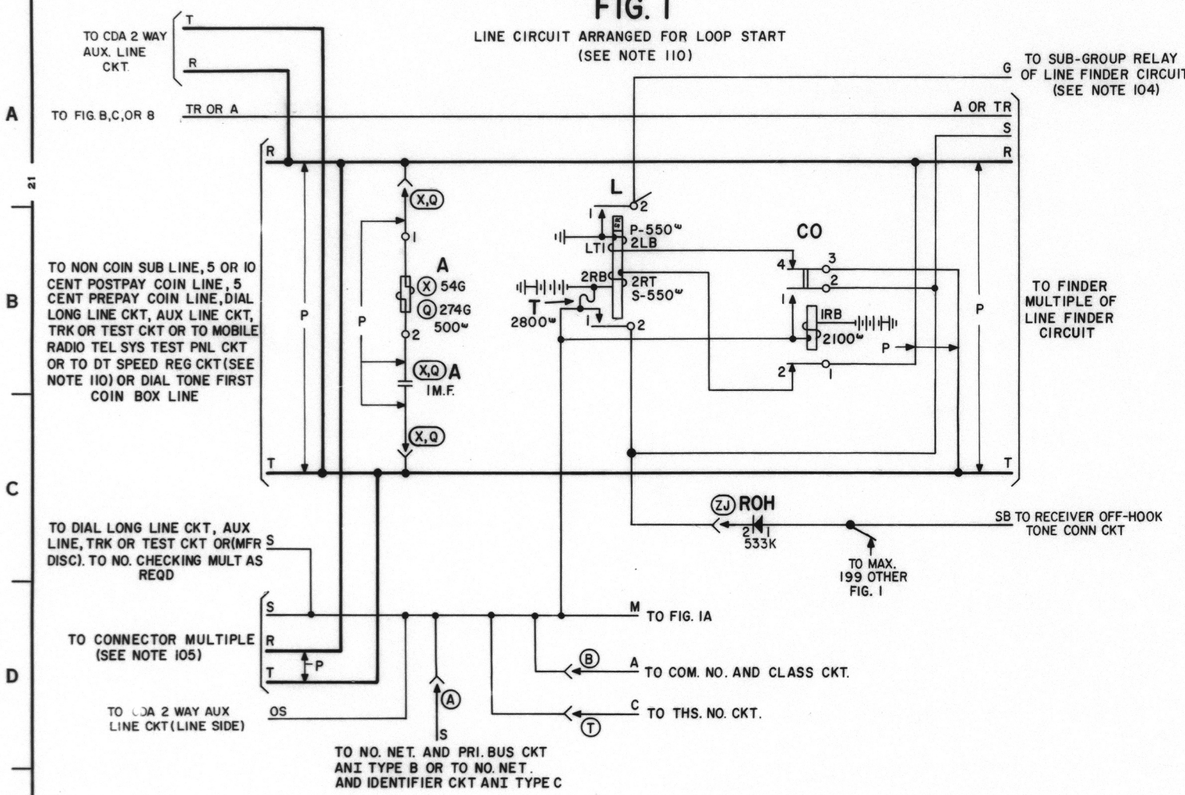


FIG. 2

LINE CIRCUIT ARRANGED FOR GROUND START ON THE RING OR LOOP START
(SEE NOTES 110, 111, 112, & 303)

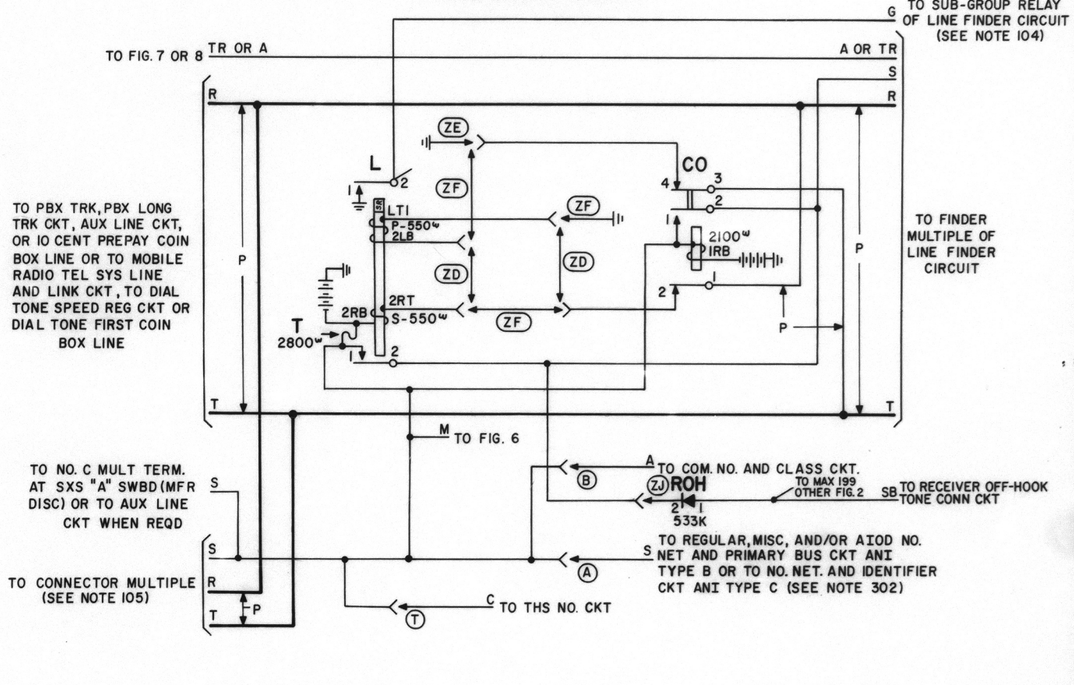


FIG. IA

(SEE NOTE 103)

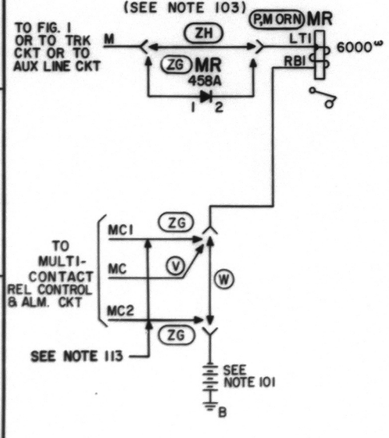


FIG. B

(SEE NOTE 103)

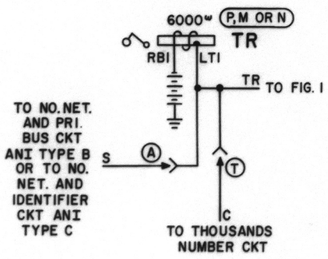


FIG. C

(SEE NOTE 103)

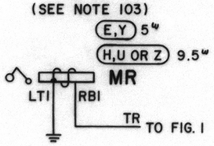
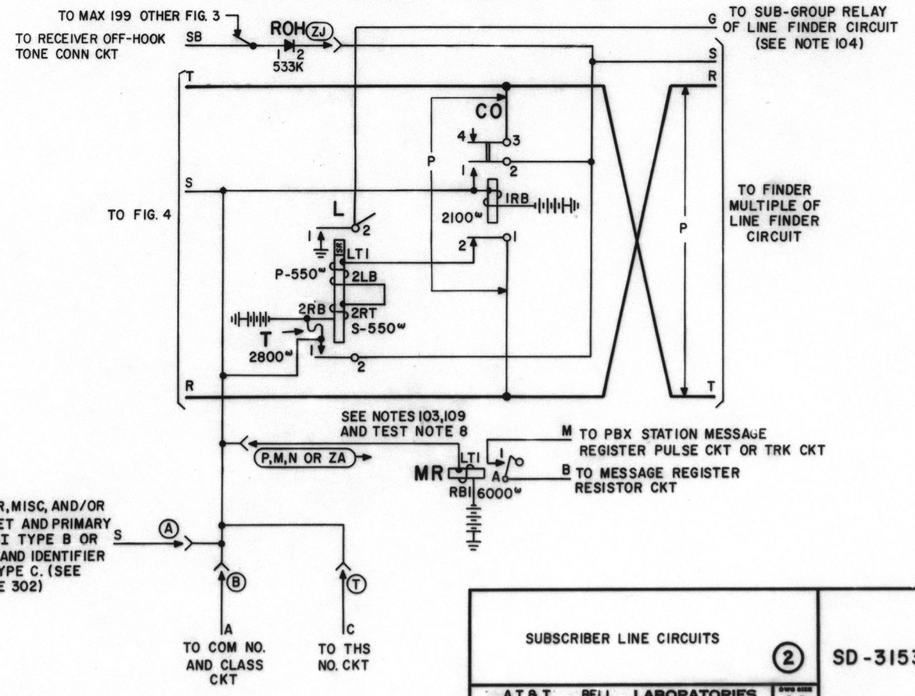


FIG. 3(A&M ONLY)

LINE CIRCUIT ARRANGED FOR GROUND START ON THE RING



DRAWING ISSUE
SUPER-SEDES
SS 27D HW
28D

ISSUE 33B HW

SUBSCRIBER LINE CIRCUITS (2)

SD-31531-01-3

AT&T BELL LABORATORIES 6S

SD-31531-01-3

FIG. 4 (A & M ONLY)

AUX. LINE CIRCUIT

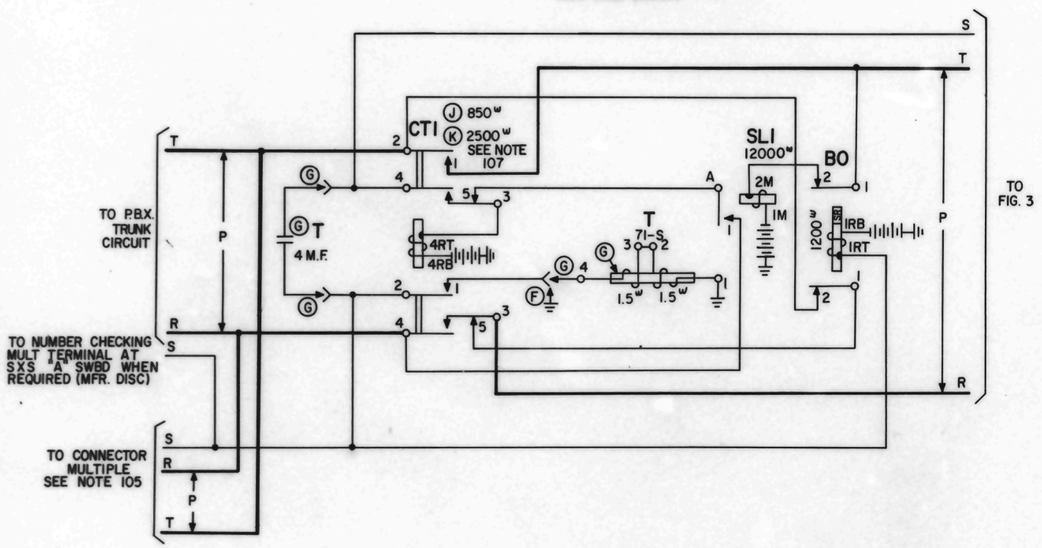


FIG. 6

MESSAGE REGISTER
SEE NOTES 103 & 109

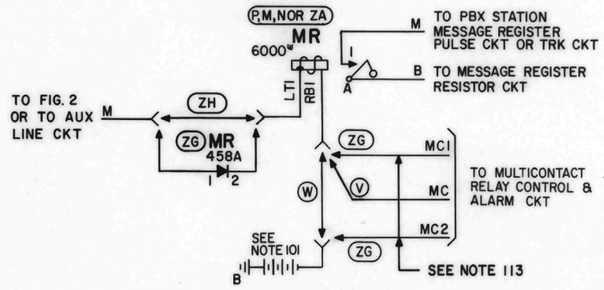


FIG. 7

MESSAGE REGISTER
SEE NOTES 103 & 109

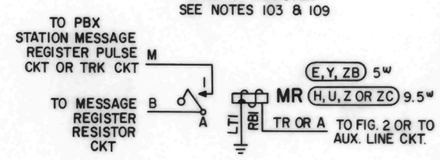


FIG. 8

CLASS OF SERVICE
INDICATION IN ACCORDANCE WITH SUBS. LINE
FOR LINES OTHER THAN MESSAGE RATE

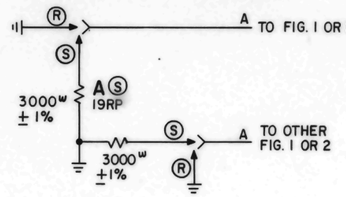
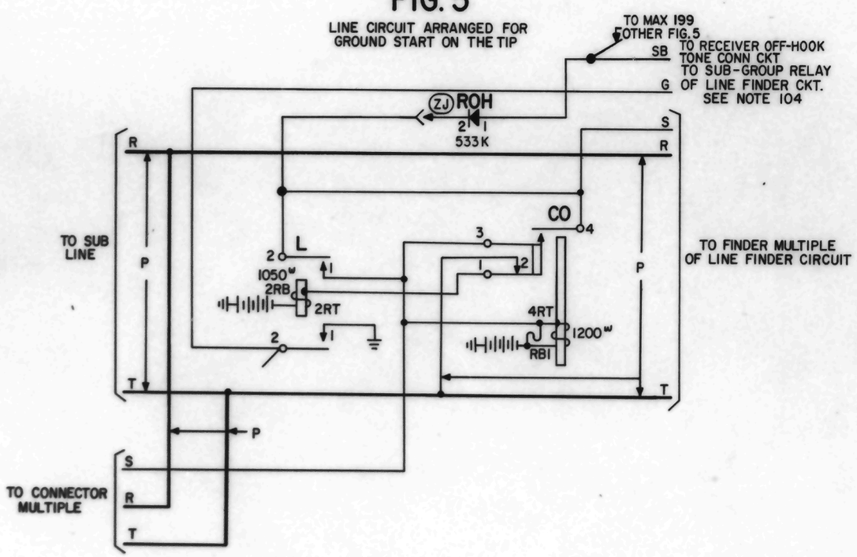


FIG. 5

LINE CIRCUIT ARRANGED FOR GROUND START ON THE TIP



DRAWING ISSUE
SUPER SEDES SS 27D HW
28D

ISSUE 32B HW

SUBSCRIBER LINE CIRCUITS (2) SD-31531-01-4

BELL TELEPHONE LABORATORIES INCORPORATED 6S

SD-31531-01-4

CIRCUIT REQUIREMENTS

APPARATUS DESIG	APPARATUS CODE	APPARATUS OPT	APPARATUS CKT FIG.	CKT OPT	MECH REQT BSP FIG.	MECH REQT CONT PRES	MECH REQT ARM. TRVL	CIRCUIT PREPARATION BLOCK OR INSULATE	TEST CLIP DATA CONN BAT.	TEST CLIP DATA CONN GRD	TEST SET PREP	SEE TEST NOTE	DIRECT CURRENT FLOW REQT TEST WDG	TEST FOR	AFTER SOAK MA	TEST MA	READJ MA	REMARKS
RELAYS																		
BO	E6119		4		2/2	L	15			RT (BO)	GRD			0		17	16	
CO	R1886		1		10/2	H	15			IT (CO)	GRD	1		0		8.7	8.2	WDG. ALONE
										IT (CO)	GRD	1		0		16	15	
										IT (CO)	GRD	2		0		19.5	18.5	
										IT (CO)	GRD	3		0		18	17	
CO	R1886		2,3		10/2	H	15							0		8.7	8.2	WDG. ALONE
										IT (CO)	GRD	1		0		16	15	
										IT (CO)	GRD	2		0		19.5	18.5	
CO	R1842		5		47	H	35			RT (CO)	GRD			0		15.5	14.3	
CTI	R77	K	4		9/9	H	35	4T (CTI)		RT (CTI)	GRD			0		12.6	12	
CTI	E6121	J	4		9/9	H	35	4T (CTI)		RT (CTI)	GRD			0		25	23	
L	R1885		1		1/1	H	15		4T (CO)	2B (CO)	M	4	P/S	0		16.5	15.5	ADJ. A
									4T (CO)	2B (CO)	M	4	P/S	0		19.5	18.5	ADJ. B
								4T (CO) 2B (CO)	4T (CO)	2B (CO)	M		P/S	NO		10.9	11.5	ADJS. A & B
										2B (CO)	GRD		S	NO		24.5		
							15		4T (CO)	2B (CO)	M	5	P/S	0		13.4	12.7	ADJ. C
									4T (CO)	2B (CO)	M	5	P/S	NO		9	9.5	
L	R1885		2	ZD	1/1	H	15			2B (CO)	GRD	4/7	P/S	0		16.5	15.5	ADJ. A
										2B (CO)	GRD	4	P/S	0		19.5	18.5	ADJ. B
										2B (CO)	GRD	7	P/S	NO		10.9	11.5	ADJS. A & B
				ZD OR ZD & ZE		L	15	2B (CO)		2B (CO)	GRD	7	P/S	0		13.4	12.7	ADJ. C
										2B (CO)	GRD	7	P/S	NO		9	9.5	ADJ. C
				ZF		L	15	4T (CO) 2B (CO)	4T (CO)	2B (CO)	M	7	P/S	0		13.4	12.7	ADJ. C
									4T (CO)	2B (CO)	M	7	P/S	NO		9	9.5	ADJ. C
L	R1885		3		1/1	H	15	2B (CO)		2B (CO)	GRD	4	P/S	0		16.5	15.5	ADJ. A
										2B (CO)	GRD	4	P/S	0		19.5	18.5	ADJ. B
										2B (CO)	GRD		P/S	NO		10.9	11.5	ADJ. A & B
L	R403		5		1/1	H	15	IT (CO)		RT (L)	GRD			0		9.3	8.8	
										RT (L)	GRD			NO		5	5.3	
MR	5AA,M.R.	N	1A											0		12.6		
														NO		10.2		REGISTER ONLY
														H		5.3		
									1B (L)		+BAT	6/8		0		85		
									1B (L)		+BAT	6/8		NO		56.5		
									1B (L)		+BAT	6/8		H		35		
MR	14C 14LB M.R.	M P	1A 1A											0		12.6		
														NO		10.2		REGISTER ONLY
														H		5.3		
									1B (L)		+BAT	8/9		0		85		
									1B (L)		+BAT	8/9		NO		56.5		
									1B (L)		+BAT	8/9		H		35		
MR	5AA,M.R.	N	3						LTI (MR)		+BAT	10/11		0		12.6		
									LTI (MR)		+BAT	10/11		NO		10.2		
									LTI (MR)		+BAT	10/11		H		5.3		
MR	14C	M	3						LTI (MR)		+BAT	10/11/12		0		12.6		
	14LB	P	3						LTI (MR)		+BAT	10/11/12		NO		10.2		
	14S,M.R.	ZA	3						LTI (MR)		+BAT	10/11/12		H		5.3		
MR	5AA,M.R.	N	6											0		12.6		
														NO		10.2		REGISTER ONLY
														H		5.3		
									1B (L)		+BAT	8/9		0		85		
									1B (L)		+BAT	8/9		NO		56.5		
									1B (L)		+BAT	8/9		H		35		

CIRCUIT REQUIREMENTS

APPARATUS DESIG	APPARATUS CODE	APPARATUS OPT	APPARATUS CKT FIG.	CKT OPT	MECH REQT BSP FIG.	MECH REQT CONT PRES	MECH REQT ARM. TRVL	CIRCUIT PREPARATION BLOCK OR INSULATE	TEST CLIP DATA CONN BAT.	TEST CLIP DATA CONN GRD	TEST SET PREP	SEE TEST NOTE	DIRECT CURRENT FLOW REQT TEST WDG	TEST FOR	AFTER SOAK MA	TEST MA	READJ MA	REMARKS
MR	14C	M	6											0		12.6		
	14LB	P	6											NO		10.2		REGISTER ONLY
	14S,M.R.	ZA	6											H		5.3		
									1B (L)		+BAT	8/9/12		0		85		
									1B (L)		+BAT	8/9/12		NO		56.5		
									1B (L)		+BAT	8/9/12		H		35		
MR	5AH,M.R.	Z	7,C						RBI (MR)		BAT			0		325		
									RBI (MR)		BAT			NO		260		
MR	5S	Y	7,C						RBI (MR)		BAT			0		330		
	14LM,M.R.	E	7,C						RBI (MR)		BAT			NO		255		
MR	14B	U	7,C						RBI (MR)		BAT			0		325		
	14LA,M.R.	H	7,C						RBI (MR)		BAT			NO		260		
MR	14R,M.R.	ZC	7					1 (MR)	RBI (MR)		BAT			0		325		
								1 (MR)	RBI (MR)		BAT			NO		260		
MR	14U,M.R.	ZB	7					1 (MR)	RBI (MR)		BAT			0		330		
								1 (MR)	RBI (MR)		BAT			NO		255		
SLI	B140		4		1		50			2T (BO)	GRD			0		3.3	2.7	
	B34									2T (BO)	GRD			R		1.2	1.3	
TR	5AA,M.R	N	B						LTI (TR)		+BAT			0		12.6		
									LTI (TR)		+BAT			NO		10.2		
									LTI (TR)		+BAT			H		5.3		
TR	14C	M	B						LTI (TR)		+BAT			0		12.6		
	14LB,M.R.	P	B						LTI (TR)		+BAT			NO		10.2		
									LTI (TR)		+BAT			H		5.3		

TEST NOTES:

1. REQUIRED FOR CIRCUIT COMBINATION (CO) RELAY, AND "T" WINDING (L) RELAY.
2. REQUIRED FOR CIRCUIT COMBINATION (CO) RELAY, AND "T" WINDING (L) RELAY AND MESSAGE REGISTER.
3. REQUIRED FOR CIRCUIT COMBINATION (CO) RELAY, AND "T" WINDING (L) RELAY AND (S) RELAY OF AUXILIARY LINE CIRCUIT FOR BUSYING LINE TO INCOMING CALLS MESSAGE REGISTER IS EQUIPPED BLOCK (L) RELAY OF AUXILIARY LINE CIRCUIT OPERATED.
4. PRIOR TO ISSUE 6D ADJ. "A" WAS NOT SHOWN. ADJ. "A" SUPERSEDES ADJ. "B".
5. PRIOR TO ISSUE 19D ADJ. "C" WAS NOTE SHOWN, ADJ. "C" IS FOR USE WITH 2 PARTY MESSAGE RATE LINES. SEE NOTE 301.
6. WHEN ANY EQUIPMENT IN ASSOCIATED AUXILIARY LINE OR TRUNK CIRCUIT IS CONNECTED IN PARALLEL WITH THE MESSAGE REGISTER, SEE ASSOCIATED CIRCUIT FOR METHOD OF REMOVING THIS EQUIPMENT. WHEN TESTING MESSAGE REGISTER PRIOR TO ISSUE 14D THIS NOTE READ: WHEN AUXILIARY LINE CIRCUIT FOR BUSYING LINE TO INCOMING CALLS IS USED INSULATE 2T (L) OF AUXILIARY LINE CIRCUIT.
7. PRIOR TO ISSUE 15D ADJ. "C" WAS NOT SHOWN. APPLY ADJ. "C" WHEN CONNECTED DIRECTLY TO 10 CENT COIN BOX LINE; OTHERWISE APPLY ADJ. "A".
8. REQUIRED FOR CIRCUIT COMBINATION MESSAGE REGISTER, (CO) RELAY, AND "T" WINDING (L) RELAY WITH "V" OPTION, CONNECT DIRECT 48V. NEG. BAT. TO RBI (M.R.)
9. WHEN ANY EQUIPMENT IN ASSOCIATED AUXILIARY LINE OR TRUNK CIRCUIT IS CONNECTED IN PARALLEL WITH THE MESSAGE REGISTER, SEE ASSOCIATED CIRCUIT FOR METHOD OF REMOVING THIS EQUIPMENT WHEN TESTING MESSAGE REGISTER.
10. LINE CIRCUITS EQUIPPED WITH MESSAGE REGISTERS AND MODIFIED PER FIG. 3 SHALL HAVE THEIR REGISTERS CHECKED ON WINDING ALONE WHEN MODIFICATION IS MADE.
11. REMOVE WIRE FROM "LTI" TERMINAL OF MESSAGE REGISTER.
12. WHEN "ZA" OPTION IS FURNISHED INSULATE 1 (M.R.)

DRAWING ISSUE

SUPERSEDES ISS 27D HW

28D

ISSUE 32B H1

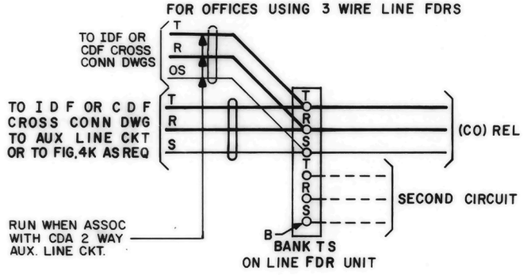
SUBSCRIBER LINE CIRCUITS (2) SD-31531-01-5

BELL TELEPHONE LABORATORIES INCORPORATED DWG SIZE 6S PRINTED IN U.S.A.

SD-31531-01-5

FIGS. IK, 2K, 3K & 5K

FOR OFFICES USING 3 WIRE LINE FDRS



FIGS. IK, 2K & 5K

FOR OFFICES USING 4 WIRE LINE FDRS

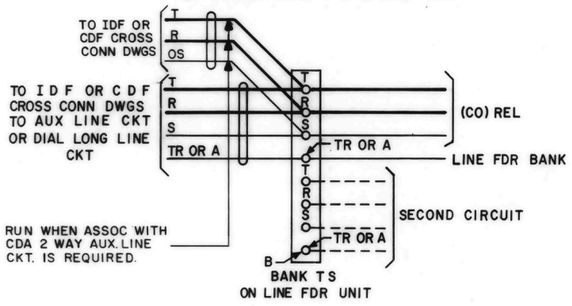
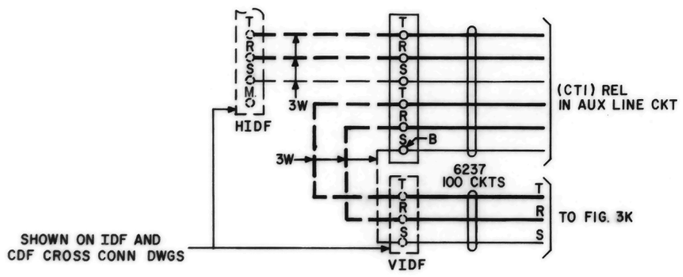


FIG. 4K (A&M ONLY)



FIGS. IL & 2L (A&M ONLY)

FOR 360A DIAL OFFICE
WHERE MDF ONLY IS PROVIDED

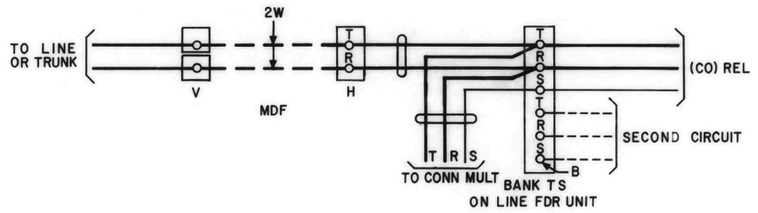


FIG. 51

(FOR FIG. B, C OR 7)

FIG. 52

(FOR FIG. 3 "ZA" APP OR
FIG. 7 "ZB" OR "ZC" APP ONLY)
FOR MESSAGE REGISTERS PROVIDING MESSAGE
UNIT REPETITION TO PBX VIA 3RD WIRE

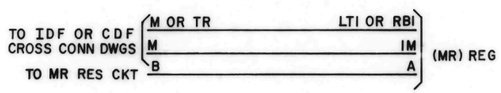


FIG. 53

(FOR FIG. IA WITH "ZG" OPTION)

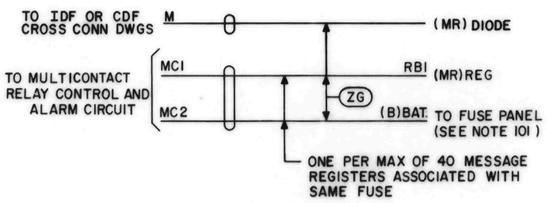


FIG. 54

(FOR FIG. IA WITH "ZH" OPTION)

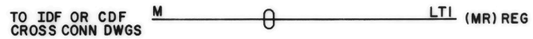


FIG. 55

(FOR FIG. 6)

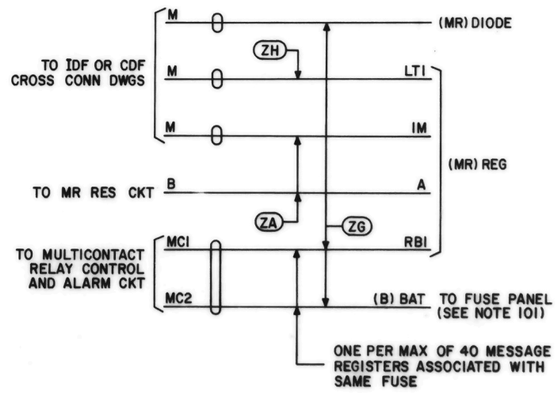
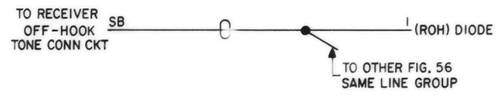


FIG. 56

(FOR FIG. 1, 2, 3 OR 5 WITH "ZJ" OPTION)



DRAWING ISSUE
SUPER-SEDES SS 27D
28D
HW

ISSUE 33B HW

SUBSCRIBER LINE CIRCUITS (2) SD-31531-01-6

AT&T BELL LABORATORIES SIZE 6S

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SD-31531-01-6

CIRCUIT REQUIREMENTS

SD-31933-01 2 PAGES

SELECTOR CIRCUIT DIGIT ABSORBING (D A SEL)

DESIG.	CODE	BSP FIG.	CONT. PRESS	ARM. TRVL.	RESID.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT	TEST CLIP DATA CONN. GRD.	TEST SET PREP.	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READJ. MA	TIME REQ. TEST SEC.	TIME REQ. READJ. SEC.	REMARKS
RELAYS FIG. I																		
A	221A	11		8	7-11	(B) NO	TST. JK. 2	TST. JK. 1	M	3	F/R	O	FS	15.1	14.8			ARM. NEED NOT TOUCH CORE
							TST. JK. 2	TST. JK. 1	M	3	F/R	NO	FS	13.9	14.4			
C	221EF	164		13	S-4	(VERT) NO		3(B)	GRD.	5		O	500	90	85			
								3(B)	GRD.	5		NO	500	62	69			
							TST. JK. 2	TST. JK. 1	V-M	4/7		H					.100	
							TST. JK. 2	TST. JK. 1	V-M	4		R				.155	.140	
						(VERT) NO		3(B)	GRD.	4		NO	500	62	69			
F	224CB	432		14	S-4		5(RLS)		BAT.	2		O	FS	27	25.5			CONNECT TST. JK. 3 TO TST. JK. 4
							5(RLS)		BAT.	2/11		NO	FS	20.5	22			
							5(RLS)		BAT.	2/12		NO	FS	14.7	15.5			
"U" OPTION																		
B	248B	502		27	1.5-4	1(A)		3 (A)	GRD.	5		O	FS	10.5	10			
								3 (A)	GRD.	5		NO	FS	8.5	9			
					MIN. 1.5		TST. JK. 2	TST. JK. 1	V-BR	4/6		H					.333	
							TST. JK. 2	TST. JK. 1	V-BR	4		R				.750	.500	
						1(A)		3 (A)	GRD.	4		NO	FS	8.5	9			
"P" OPTION																		
B	248G	517		27	1.5-4	1(A)		3 (A)	GRD.	5		O	FS	10.5	10			
								3 (A)	GRD.	5		NO	FS	8.5	9			
					MIN. 1.5		TST. JK. 2	TST. JK. 1	V-BR	4/6		H					.333	
							TST. JK. 2	TST. JK. 1	V-BR	4		R				.750	.500	
						1(A)		3 (A)	GRD.	4		NO	FS	8.5	9			
"E" OPTION																		
D	222JU	381		29	S-4			4 (RLS)	GRD.	9		O	FS	13.2	12.5			SPRING 1-2 ONLY
								4 (RLS)	GRD.	9		NO	FS	8.9	9.4			
								4 (RLS)	GRD.	9		O	FS	24.5	23			WHOLE COMBINATION
								4 (RLS)	GRD.	9/10		NO	FS	18	19			

TEST NOTES:
1. JK. SPGS. 9 & 11 SHALL MAKE CONT. WHEN SW. IS REMOVED.
2. BLOCK (D) O WHEN "H" WIRING IS PROVIDED.
3. CONT. FOLLOW SPGS. 2-3 MIN. 8. CONT. SEPARATION ALL CONTS. MIN. 3
4. FOR USE WHEN TIMING REQ. ARE APPLIED.
5. FOR USE WHEN TIMING REQ. ARE NOT APPLIED.
6. TEST HOLD-USE 1400ω LOOP IN PULSING TEST SET.
7. TEST HOLD-USE LEAK "A" IN PULSING TEST SET.
8. THE UPPER WIPER IS NORMALLY ADJUSTED AS A SINGLE CONDUCTOR WIPER FOR 3 WIRE OPERATION. WHERE 4 WIRE OPERATION IS SPECIFIED THE UPPER WIPER SHALL BE ADJUSTED AS A 2 CONDUCTOR WIPER.
9. CONTS. 1-2 SHALL MAKE BEFORE SPG. 1 STRIKES BUSHING ON SPG. 4.
10. CONTS. 1-2 MAY MAKE.
11. AS PERMITTED BY SEQ. TWO BREAK CONTS. MAY BREAK.
12. NO CONT. MAY BREAK. THIS LINE ADDED ON ISSUE 7-B.

SD-31933-01 PAGE 1

DESIG	CODE	BSP FIG.	CONT PRESS	ARM. TRVL.	RESID.	BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT.	TEST CLIP DATA CONN. GRD.	TEST SET PREP	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READJ. MA	REMARKS
"ZD" OPTION																
E	221C	1		13	4-8	4 (C)		2 (V.O.N.)	GRD.	1/2		O	FS	105	100	ADJ. "A" (MFR. DISC.) REPLACED BY ADJ. "B"
								2 (V.O.N.)	GRD.			NO	FS	85	90	
		700		16	7-9	4 (C)		2 (V.O.N.)	GRD.	1/2		O	FS	105	100	ADJ. "B" REPLACING ADJ. "A"
								2 (V.O.N.)	GRD.			NO	FS	85	90	
"ZE" OPTION																
E	221NL	700		16	7-9	4 (C)		2 (V.O.N.)	GRD.	1/2		O	FS	105	100	
								2 (V.O.N.)	GRD.			NO	FS	85	90	

TEST NOTES:
1. INSULATE 6 (D) WHEN "H" OPTION IS PROVIDED.
2. ARMATURE NEED NOT TOUCH CORE ON OPERATE CURRENT.

SD-31933-01 (2 PAGES) PAGE 2

SD-31933-011

197DA SWITCH (SEE NOTE 204)
R, 344 JACK, 242A PLUG
S, 345 JACK, 242B PLUG

CIRCUIT NOTES:

101. PROVIDE FEATURES OR OPTIONS IN ACCORDANCE WITH THE FOLLOWING TABLE:

FEATURE OR OPTION			PROVIDE FIGS	APP. OR WIR.	QUANTITY	ITEM
SELECTOR	NO. 1 OR 350A OFFICE	3W	1, A	ZH OR ZI	1 PER CKT.	1
		4W		ZJ OR ZK		2
	NO. 360A OFFICE	3W	1, 2, B	ZH OR ZI	1 PER CKT.	3
		4W		ZJ OR ZK		4
DIAL TONE REQUIRED		YES		Y		7
		NO		X		8
WHEN ALL LINES HAVING ACCESS TO THIS SELECTOR ARE OF THE SAME CLASS OF SERVICE AND A CLASS OF SERVICE INDICATION TO THE SUCCEEDING CKTS. IS REQ.				G		9
DIGIT ABSORBING ON LEVELS WHICH CLOSE "L" NORMAL POST SPRINGS.	NOT REQ.			B, K		10
	REQ. SEE ITEMS 12, 13 AND 19			E, ZB		11
DIGITS TO BE ABSORBED	FIRST ONLY			W		12
	REPEATEDLY			Z		13
RESTRICT SERVICE UNTIL A DIGIT IS ABSORBED, ON LEVELS WHICH CLOSE "R" NORMAL POST SPRINGS.	SEE ITEMS 16-19 INCL.			F		14
RESTRICT SERVICE ON ALL LEVELS UNTIL A DIGIT HAS BEEN ABSORBED ("R" NORMAL POST SPRING OPR. - NOT REQ.)				F, V, H		15
CLASS OF SERVICE AND RESTRICTION BY L.F. LEVELS. CLASS OF SERVICE INDICATION ON "A" LEAD AND	INDICATION FOR RESTRICTION ALSO ON "A" LEAD SEE ITEM 19			T		16
	INDICATION FOR RESTRICTION ON "RS" LEAD SEE ITEM 19			Q		17
ALL LINES RESTRICTED ALIKE SEE ITEM 19				V		18
RESTRICT SERVICE ON LEVELS WHICH CLOSE "R" NORMAL POST SPRINGS, REGARDLESS OF WHETHER DIGITS ARE ABSORBED.				F, K		19
BUSY TONE REQ. SEE NOTE 301	YES			ZO		
	NO			ZP		
BUSY FLASH REQ				ZO		

102. THERE SHALL BE ONE $1\frac{1}{3}$ AMP. FUSE PER SELECTOR FOR FIG. B.

103.

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.	
3-B	F OR J	J	101	F		J	
5-D	B OR E	E	101	B, E			
5-D	U OR P	U	101	U, P			
5-D	A OR ZA	A		ZA		A	
8-D	FIG. A OR B	FIG. A	101, 102	A	B		
9-D	ZB	NONE		ZB			
10-D						FIG. 2	
10-D	ZC	X OR Y	101	ZC, Y		X	
11-D	ZD OR ZE	ZD		ZE		ZD	
12-D				R		S	
12-D				U		P	
14-D	ZF OR ZG			ZF		ZG	
15-D	ZH OR ZI	M	104	ZH, ZI		M	
15-D	ZJ OR ZK	N	104	ZJ, ZK		N	
15-D	ZL, ZM OR ZN	ZL	104	ZM, ZN		ZL	
15-D			104	FIG. 2			
17-B			101	X		ZC	
21D	ZO OR ZP	ZO	101	ZO, ZP			
23D	ZQ	NONE	101, 204	ZQ			

104. FIG. 2 IS RATED "STANDARD" FOR USE IN 360A OFFICES ONLY. OPTIONS "ZH," "ZJ" AND "ZM" ARE USED WHEN MECHANIZED BANKS ARE SOLDERED. OPTIONS "ZI," "ZK" AND "ZN" ARE USED WHEN THEY ARE CLINCHED.

45-50V.

WORKING LIMITS

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

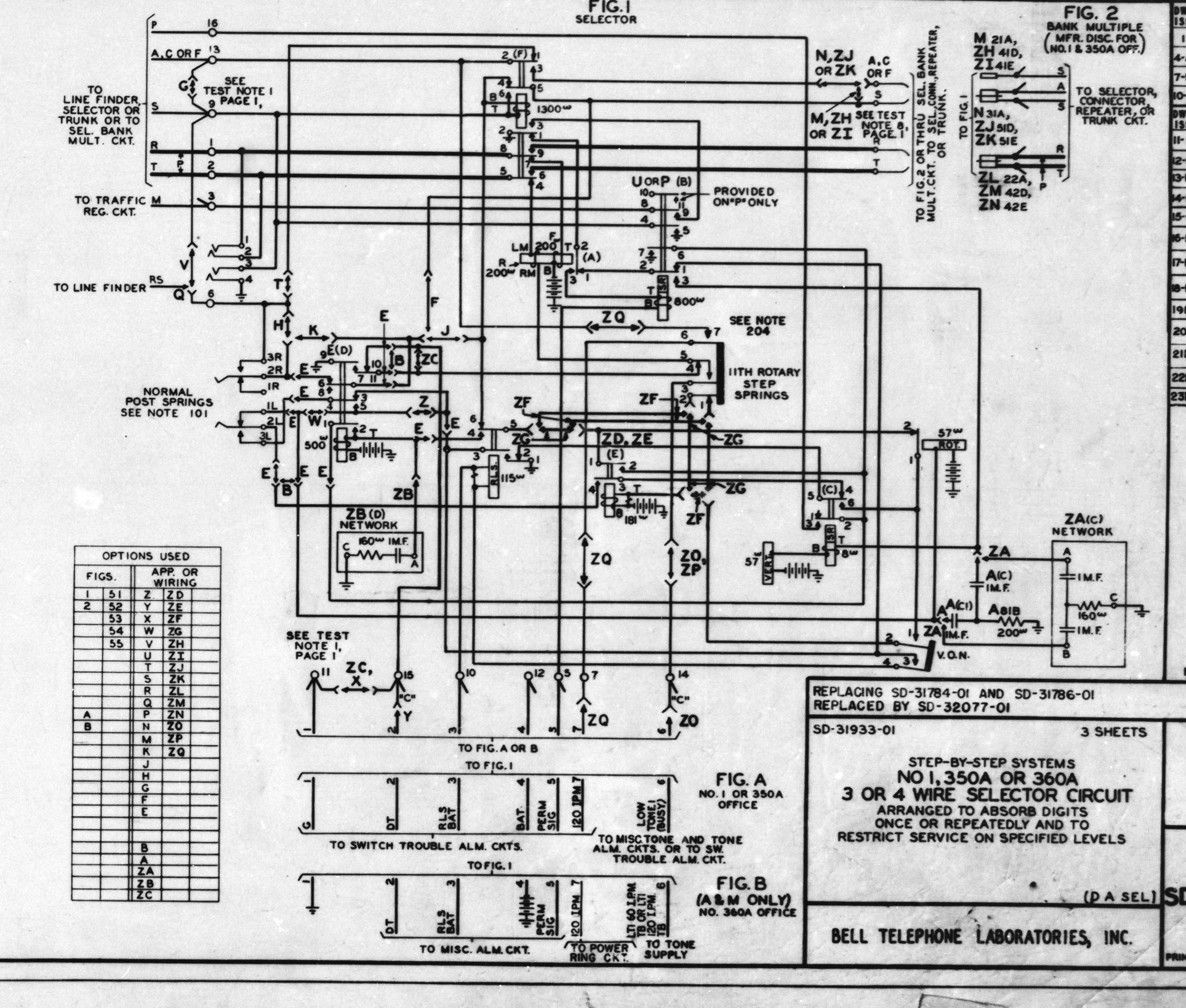
TYPE OF DIAL	45V MIN. PULSING FROM SUB. 2,4 OR 5	6	7	48V MIN. PULSING FROM SUB. 2,4 OR 5	6	7
MAX. EXT. CKT. LOOP*	750ω	1200ω	1100ω	850ω	1500ω	1400ω
MAX. EXT. CKT. LOOP**	850ω	1400ω	1300ω	1000ω	1500ω	1500ω
MAX. EXT. CKT. LOOP***	1000ω	1400ω	1400ω	1115ω	1500ω	1500ω
MIN. INS. RES.		15000ω			15000ω	

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

INFORMATION NOTES:

301. BUSY TONE IS REQUIRED EXCEPT WHEN THIS CIRCUIT IS USED IN A REPEATED DIAL TOLL TRAIN AS A TOLL PRECEDING SELECTOR.

OPTIONS USED			
FIGS.		APP. OR WIRING	
1	51	Z	ZD
2	52	Y	ZE
	53	X	ZF
	54	W	ZG
	55	V	ZH
		U	ZI
		T	ZJ
		S	ZK
		R	ZL
		Q	ZM
A		P	ZN
B		N	ZO
		M	ZP
		K	ZQ
		J	
		H	
		G	
		F	
		E	
		B	
		A	
		ZA	
		ZB	
		ZC	



DWG. ISS.	C.D. ISSUE	DWG. ISS.	C.D. ISSUE	DWG. ISS.	C.D. ISSUE
1	1	2-D	1 APP1-D	3-B	2-B
4-A	2-B APP1-A	5-D	3-D	6-A	3-D APP1-A
7-B	3-D APP2-B	8-D	3-D APP3-D	9-D	3-D APP4-D
10-D	3-D APP5-D				

DWG. ISS.	C.D. ISSUE	DATE ISSUED	APPROVED
11-D	3-D APP6-D	9-2-47	F.J.S. H.
12-D	4-D	3-16-48	F.J.S. A.
13-B	4-D APP1-B	3-16-48	F.J.S. A.
14-D	4-D APP.2-D	10-29-48	A.J.B. A.
15-D	5-D	4-12-49	R.C.D. H.
16-D	5-D APP.1-D	5-25-49	A.J.B. A.
17-B	5-D APP.2-B	6-15-50	C.E.M. F.G.S. M.H.K. R.L.L.
18-D	5-D APP.3-D	6-15-50	C.E.M. F.G.S. M.H.K. R.L.L.
19D	5D APP.4D	10-19-50	W.A.T. P.D. S.V. R.L.L.
20D	5D APP.5D	9-18-51	J.H.A. P.D. W.C.B. R.L.L.
21D	5D APP 6D	7-29-53	A.K.B. L.S.H. J.P.D. E.W.O.
22D	5D APP 7D	5-26-54	[illegible] L.S.H. J.R.D. E.W.O.
23D	6D	[illegible]-3-55	G.J.S. [illegible]

ED-31933-01 EQUIPMENT INFO.

REPLACING SD-31784-01 AND SD-31786-01
REPLACED BY SD-32077-01

SD-31933-01 3 SHEETS

STEP-BY-STEP SYSTEMS
NO 1, 350A OR 360A
3 OR 4 WIRE SELECTOR CIRCUIT
ARRANGED TO ABSORB DIGITS ONCE OR REPEATEDLY AND TO RESTRICT SERVICE ON SPECIFIED LEVELS

MFR. DISC.

(D A SEL) SD-31933-011

BELL TELEPHONE LABORATORIES, INC.

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FIG. 51 (MFR. DISC.)
FOR OFFICES USING FRAMES WITH D.T.A.

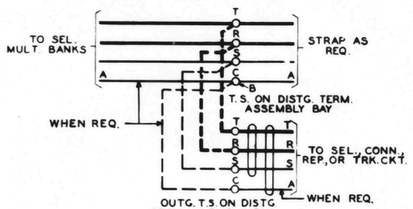
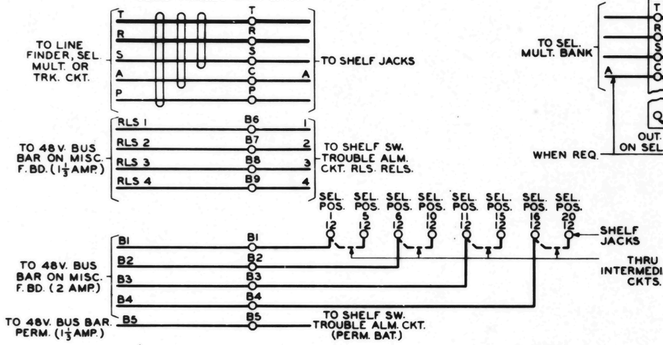


FIG. 52 (MFR. DISC.)
FOR 350A OFFICES USING FRAMES WITH D.T.A.



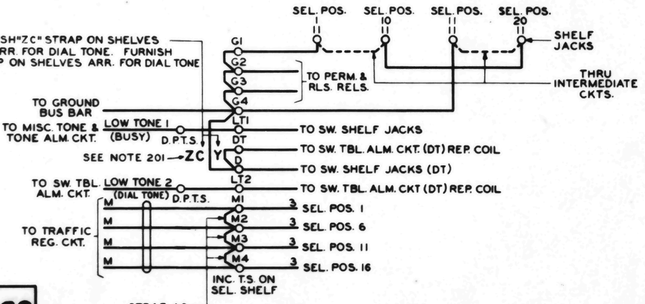


FIG. 53
(MFR. DISC.)

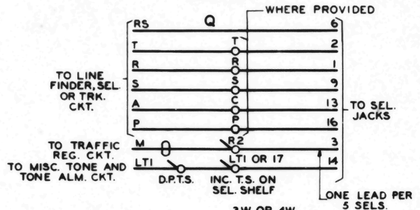


FIG. 55 (MFR. DISC.)
FOR OFFICES USING FRAMES WITHOUT D.T.A.

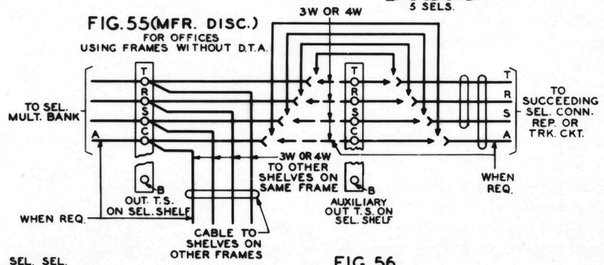


FIG. 56
(A & M ONLY)
FOR 360A OFFICES

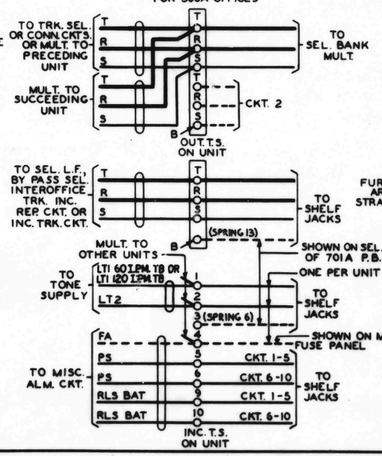


FIG. 54 (MFR. DISC.)
FOR NO. 1 OFFICES USING FRAMES WITH D.T.A.

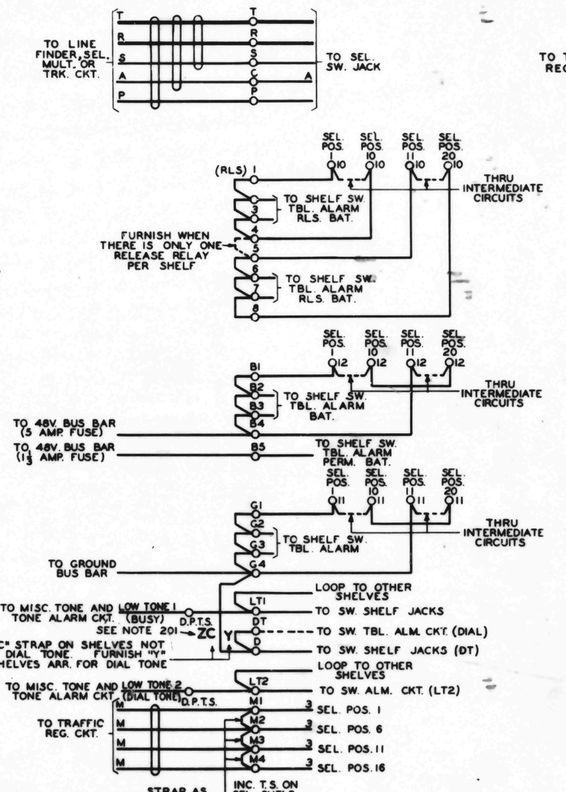


FIG. 57 (A & M ONLY)
(FOR FIG. 1)
FOR REGISTER LEADS

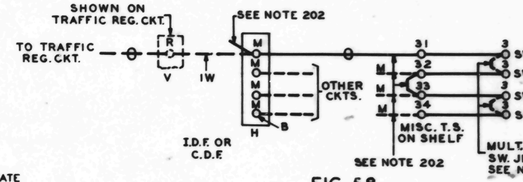
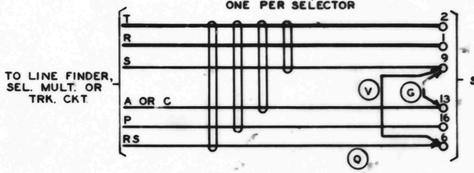


FIG. 58
(FOR FIG. 1)
ONE PER SELECTOR



EQUIPMENT NOTES:

201. PRIOR TO ISSUE 10-D, OPTION "ZC" WAS "X".

(A & M ONLY) 202. THE WIRING TO REGISTER CKT. IN FIG. 57 IS BASED ON ONE REGISTER FOR ALL SELECTORS ON THE SAME SHELF. SHELF STRAPS BETWEEN SW. JK. TERMS. 3 OF SW. POS. 5 AND 6 OR 15 AND 16 OR MISC. SHELF TERMS. 32 AND 33 SHALL BE CUT, AND ADDITIONAL LEADS RUN TO THE DISTRIBUTING FR. AS REQ. WHEN REGISTRATION ON A QUARTER OR HALF SHELF BASIS AS SPECIFIED. LEADS FROM DIFFERRENT SHELVES SHALL BE CONNECTED TO THE SAME REGISTER CKT. BY MULTIPLING TOGETHER THE ASSOCIATED TERMS. AT THE DISTRIBUTING FR.

203. SWITCHES MAY BE GROUPED FOR TRAFFIC REGISTRATION ON A QUARTER, HALF OR FULL SHELF BASIS, OR ON THE BASIS OF MORE THAN ONE SHELF. WHEN GROUPED ON A SINGLE SHELF BASIS THE M1, M2, M3, & M4 TERMS. SHALL BE STRAPPED TOGETHER AND CROSS-CONNECTED TO REGISTERS AS REQUIRED. WHEN GROUPED ON THE BASIS OF MORE THAN ONE SHELF THE ASSOCIATED "M" LEADS OF THE DIFFERENT SHELVES SHALL BE MULTIPLED TOGETHER AT THE DISTRIBUTING FRAME AND CROSS-CONNECTED TO REGISTERS AS REQUIRED.

204. WHERE "ZQ" OPTION IS REQUIRED, THE 197DA SWITCH SHOULD BE MODIFIED BY REPLACING THE 11TH ROTARY STEP SPRINGS BY P-46357 3 SPRINGS.

3 SHEETS, SHEET 2

3 OR 4 WIRE SELECTOR CIRCUIT

BELL TELEPHONE LABORATORIES, INC.

SD-31933-012

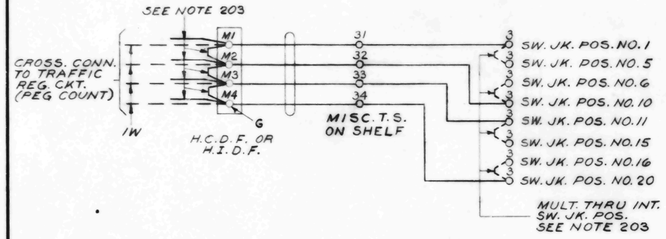
PRINTED IN U.S.A.

M1

DWG. 155.
11-D
12-D
13-B
14-D
15-D
16-D
17-B
18-D
19D
20D
21D
22D
23D

SIO-EEPIE-02

FIG. 59
(FOR PART OF FIG. 1)



DWG. ISS.
19D
20D
21D
22D
23D

3 SHEETS, SHEET 3

3 OR 4 WIRE SELECTOR CIRCUIT

BELL TELEPHONE LABORATORIES, INC.

SD-31933-013

M1

PRINTED IN U. S. A.

E-1403-30A (11-60)

SD-31933-013