SHEET INDEX

FIG.	CONTENTS	SHEET NO.	ISSUE NO. 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	OLD SHEET NO.
	SHEET INDEX SUPPORTING INFORMATION	A1	18	19																	0101
	SHEET INDEX	A2	18	19																	
	SHEET INDEX	A3	18	19																	
	CKT NOTES: 101	B1	18	18																	0129
	101 (CONT) - 115	B2	18	18																	0130, 0131
	115 (CONT)	B3	18	18																	0131, 0132
	116-128	B4	18	18																	0133
	129-140 BAT. VARIATION	B5	18	19																	0134
	OPTIONS USED KEY TEL UNITS USED	B6	18	18																	0101
	FORMULAS FOR LOCAL BATTERY: NO. 1-2	B7	18	18																	0125, 0126
	NO. 3	B8	18	18																	0127
	NO. 4-8	B9	18	18																	0128
101 102 103		B10	18	18																	0126
104 105 106 107 108		B11	18	19																	0126
	NOTE A FUSING NOTE FOR FIG. 102, 103, 105, 107	B12	18	19																	0126
1	LINE CKT	C1	18	19																	0101
3	LINE RINGER																				
8	HOLD CKT																				
9	AUX HOLD CKT																				
10	INTERCOM SIG CKT																				0102
11	14-28V BAT. FEED CKT																				
12	INTERCOM LINE CKT WITH AUTO. SIG (MFR DISC.)																				
13	INTERCOM LINE CKT																				
14	INTERCOM SIG KEY CKT																				
15	BUZ CKT																				
16	LIST.-IN LINE CKT																				
17	LINE INDICATOR																				0101

DWG ISS	CD ISS	DWG ISS	CD ISS	DWG ISS	CD ISS
1	1	2D	2D	3D	3D
4D	4D	5D	5D	6A	6A
7D	7D	8D	8D	9D	9D
10D	10D	11D	11D	12D	12D
13D	13D	14B	14B	15D	15D
16D	16D	17D	17D		

DWG ISSUE	CD ISSUE	DATE ISSUED	DRAWN	APP'D
18D	17D APP'D	7-10-69	37/KB - TCS	FWBW LHA JEB
19D	17D APP2D	10-24-69	HBW	GES WPS

SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING, ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE SHEET INDEX.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.
6. "OLD SHEET NO." REFERS TO SHEET NO. PRIOR TO ISSUE: 18D

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT INFO	SD-69243-01

SD-69091-01 1K03

Station Systems

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

AT&TCO STANDARD

SD-69091-01-A1

39 SHEETS

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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DRAWING ISSUE
180
190

SHEET INDEX (CONT)

FIG.	CONTENTS	SHEET NO.	ISSUE NO. 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	OLD SHEET NO.
19 20 21	DRY CELL BAT. FEED CKT INTERCOM LINE CKT 2-WAY AUTO. SIG (MFR DISC.) SIG CKT	C1 (CONT)	18	19																	0102
2 5&6 6A	LINE LP CKT (MFR DISC.) COM AUD SIG & BSY LP (MFR DISC.) BSY LP (MFR DISC.)	C2	18	18																	0103
4 7 18 27 28	COM RING. PRIVATE LINE CKT, LOC. BAT. TLK RING. FDR LP CKT SW REL CKT SIG LP	C3	18	18																	0109
22	BSY LP & COM AUD SIG, NONLOCKED-IN LINE LP, DIAL OR MAN. AREAS	C4	18	19																	0104
23	BSY LP & COM AUD SIG, NONLOCKED-IN LINE LP, DIAL AREAS (MFR DISC)	C5	18	18																	0105
24	BSY LP & COM AUD SIG, LOCKED-IN LINE LP, MAN. AREAS (MFR DISC.)	C6	18	18																	0106
25	BSY LP & COM AUD SIG, DIAL AREAS (MFR DISC.)	C7	18	18																	0107
26	BSY LP & COM AUD SIG, MAN. AREAS (MFR DISC.)	C8	18	18																	0108
29 33	INTERCOM LINE CKT 2-WAY AUTO. SIG WITH OR WITHOUT BSY LP (MFR DISC.) LP RES CKT	C9	18	18																	0110 0111
30 31 32	15-25V AC SUP. 9-11V AC SUP. INTERCOM LINE CKT 2-WAY AUTO. SIG WITH COMB. LINE & BSY LP (MFR DISC.)	C10	18	18																	0111 0112
34 36 37 39	NOISE SPR CKT FOR BAT. SUP. AUTO. CUTOFF CKT RLS OF RINGUP REL & BSY LP CONT CKT AUTO. CUTOFF CONT CKT	C11	18	18																	0113
35 38	AUTO. CUTOFF CONT CKT (MFR DISC.) HOLD CKT	C12	18	18																	0114
40	BSY LP & COM AUD SIG, TIME OUT OF LOCKED-IN SIG, DIAL AREAS (MFR DISC.)	C13	18	18																	0115
41	LOCKED-IN LINE LP ONLY & COM AUD SIG, TIME OUT OF LOCKED-IN SIG, DIAL AREAS	C14	18	19																	0116
42	LOCKED-IN LINE LP ONLY & COM AUD SIG, TIME OUT OF LOCKED-IN SIG, MAN. AREAS	C15	18	19																	0117
43	BSY LP & COM AUD SIG, TIME OUT OF LOCKED-IN SIG, DIAL AREAS	C16	18	19																	0118
44	BSY LP & COM AUD SIG, TIME OUT OF LOCKED-IN SIG, MAN. AREAS	C17	18	19																	0119
45 46 47 49	TIME-OUT CKT FLASHING CKT INTERCOM LINE CKT TO STOP TIME-OUT CKT CO OR PBX LINE, SIG, & HOLD CKT, VISUAL HOLD SIG	C18	18	19																	0120 0122

(3 PAGES) PAGE 2

SHEET INDEX (CONT)

FIG.	CONTENTS	SHEET NO.	ISSUE NO. 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	OLD SHEET NO.
48	PRIVATE LINE SIG & BAT. FEED CKT, LOCAL BATTERY TLK, COMB. LINE & BSY LP OR LOCKED-IN LINE LP ONLY	C19	18	18																	0121
50 51	WINKING CKT AUD SIG CONT CKT	C20	18	18																	0123
52	INTERCOM LINE CKT 2-WAY AUTO. SIG WITH COMB. LINE & BSY LP	C21	18	18																	0124
	CKT REQT	D1	18	18																	0135
	CKT REQT	D2	18	18																	0135
	CKT REQT	D3	18	18																	0135

DRAWING ISSUE

	ST/KB
18D	-
19D	

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-A3

BELL TELEPHONE LABORATORIES
INCORPORATED

3S

CIRCUIT NOTES:

101.

FEATURE OR OPTION			PROVIDE FIGS.	APP. OR WIR.	QUANTITY
LINE CKT. FOR CENT. OFF. OR PBX LINE			1		1 PER LINE
LINE RINGER			3		SEE NOTE 103
COMMON RINGER			4		1 PER GR. OF LINES PER RING. APPEARANCE SEE NOTE 108
PRIVATE LINE CIRCUIT	FOR SEPARATE LINE AND BUSY LAMPS, SIGNALS NOT LOCKED IN, OR AS REQD BY NOTE 137		7		1 PER PRIVATE LINE
	FOR LOCKED IN LINE LAMPS OR COMBINED LINE AND BUSY LAMPS, EXCEPT AS SPECIFIED IN NOTE 137		48		
HOLD CKT. FOR CENT. OFF. OR PBX LINE. (SEE NOTE 126).			8 OR 38		1 PER LINE
AUX. HOLD CKT. FOR CENT. OFF. OR PBX LINE (WHEN A KEY OR KEYLESS STATION NOT ARRANGED FOR HOLDING EXCLUDES STATIONS ARRANGED FOR HOLDING OR WHEN CUTOFF KEY IS USED TO CUT OFF STATIONS ARRANGED FOR HOLDING)			9		1 PER LINE
INTERCOMMUNICATING SIGNALING CKT. (WHEN BOTH CODE AND SELECTIVE SIGNALING ARE REQUIRED FOR ANY BUZZER ASSOCIATED WITH AN INTERCOMMUNICATING LINE)			10		1 PER FIG. 21
14-26V. BATTERY FEED CKT. FOR PRIVATE LINES OR INTERCOMMUNICATING LINES			11		1 PER EACH FIG. 7, 12 & 13
INTERCOMMUNICATING LINE CKT.	NO AUTO. SIG.-NOT ARRANGED TO CONTROL TIME OUT		13		1 PER LINE
	NO AUTO. SIG.-ARRANGED TO CONTROL TIME OUT		47		
	2 WAY AUTOMATIC SIGNALING WITH COMBINED LINE AND BUSY LAMPS		52		
INTERCOMMUNICATING SIGNALING KEY CKT.	ONE BUTTON KEY		14	R	1 PER STATION
	FOUR BUTTON KEY	WITH CORD		Q	
		WITHOUT CORD		P	
	EIGHT BUTTON KEY	WITH CORD		K	
		WITHOUT CORD		H	
BUZZER CKT. POWER SUPPLY IS	15-25 V. AC OR 14-26 V. DC		15	B	1 PER APPEARANCE
	WHEN TWO OR MORE BUZZERS ARE OPERATED IN MULTIPLE OVER THE SAME BUZZER LEAD WHERE THE SUPPLY IS 14-26 V. DC AND THE "B" OPTION DOES NOT GIVE A SATISFACTORY SIGNAL			A	
	4-1/2 V. DRY CELLS			ZA	
LISTENING-IN LINE CKT.			16		1 PER LISTENING-IN LINE
LINE INDICATOR			17		SEE BSP
RINGING FEEDER LAMP CKT.			18		1 PER SYSTEM
DRY CELL BATTERY FEED CKT. FOR INTERCOMMUNICATING LINES			19		1 PER LINE

CIRCUIT NOTES (CONT.):

101. (CONT.)

FEATURE OR OPTION			PROVIDE FIGS.	APP. OR WIR.	QUANTITY
BUZZER SIGNALING CKT.			21		1 PER SIGNALING LINE
SIGNAL CIRCUITS	SEPARATE LINE AND BUSY LAMPS, SIGNALS NOT LOCKED IN, FOR DIAL OR MANUAL AREAS		22		1 PER CENT. OFF., P.B.X. OR PRIVATE LINE
	LINE LAMPS ONLY, TIME OUT OF LOCKED IN SIGNALS, DIAL AREAS		41		
	LINE LAMPS ONLY, TIME OUT OF LOCKED IN SIGNALS, MANUAL AREAS		42		
	COMBINED LINE AND BUSY LAMPS, TIME OUT OF LOCKED IN SIGNALS, DIAL AREAS		43		
	COMBINED LINE AND BUSY LAMPS, TIME OUT OF LOCKED IN SIGNALS, MANUAL AREAS		44		
SWITCHING RELAY CIRCUIT			27		AS REQD.
LINE LAMPS, BUSY LAMPS, OR COMBINED LINE AND BUSY LAMPS IN LAMP INDICATORS			28		1 PER LINE PER STATION
15-25V AC SUPPLY FOR BUZZERS - SEE FORMULA NO. 7	1 AMP.		30	D	1 PER 1 AMP. LOAD
	2 AMP.			E	1 PER 2 AMP. LOAD
9-11V AC SUPPLY FOR LAMPS			31		1 PER 3.2 AMPS. REQD (SEE NOTE 122 AND FORMULA NO. 6)
FOR LAMPS IN KEY TEL. SETS WITH OR WITHOUT LAMPS IN INDICATORS OR ATTENDANTS LINE KEY UNITS	J86731A POWER UNIT-10V.AC TAP			M ZR	
	FIG.31(9-11V.AC)				
	LOCAL BLDG. OR C.O.BAT. (SEE NOTE 116)8,9,10, 11,12 OR 13 CELLS USING SEPARATE FEEDS AND FUSES FOR LAMPS			G ZM	
	23 CELL BAT. (47.5 TO 50V.) REG.(SEE NOTE 116)			G ZS	
FOR LAMPS IN INDICATORS AND ATTENDANTS LINE KEY UNITS ONLY	J86731A POWER UNIT-10V.AC TAP			M ZR	
	FIG.31(9-11V.AC)				
	LOCAL BLDG. OR C.O.BAT. SEPARATE FEEDS AND FUSES NOT REQUIRED 14-26V.			N ZM	
	J86205A RECTIFIER 16V. 1 AMP. AC TAP			M ZM	
	23 CELL BAT. SEE NOTE 116			G ZS	
BUZZERS AND LAMPS IN INDICATORS	DC SUPPLY			N	
	AC SUPPLY			M	

NOTES CONTINUED ON NEXT PAGE

DRAWING ISSUE 180

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-BI

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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CIRCUIT NOTES (CONT.):

101. (CONT.)

FEATURE OR OPTION			PROVIDE FIGS	APP. OR WIR.	QUANTITY
LAMP RESISTANCE CIRCUIT (PROVIDE WHEN DC SUPPLY IS USED FOR LAMPS IN KEY TEL. SETS AND WHEN 47.5 TO 50V. BAT. IS USED FOR K2 LAMPS)			33		1 PER MAX 2 LAMPS EACH FOR 3 LINES OR 6 LAMPS PER LINE (SEE NOTE 17)
NOISE SUPPRESSION CKT (PROVIDE WHEN REQD. TO SUPPRESS NOISE INTERFERENCE FROM AUDIBLE SIGNALS. SEE NOTE 125)			34		1 PER SYSTEM
AUTOMATIC CUTOFF	PROVIDE WHEN ANY STATIONS ARE TO BE CUT OFF		36		1 PER CENT. OFF OR PBX LINE
	FOR EACH FIG. 36 WHICH CONNECTS TO FIG. 22 OR 42		37		1 PER FIG. 36
	FOR STATIONS WHICH CAN CUT OFF OTHER STATIONS		39	ZI ZP	1 PER CENT. OFF. OR PBX LINE (SEE NOTE 132)
	FOR STATIONS WHICH CAN NOT CUT OFF OTHER STATIONS BUT WHICH CAN BE CUT OFF EXCEPT WHEN ON THE LINE			ZJ ZP	
	FOR STATIONS WHICH CAN BE CUT OFF AT ANY TIME			ZJ	
WHEN FIG. 37	IS PROVIDED			ZL	
	IS NOT PROVIDED			ZK	
WHEN KEY TEL UNITS OF FIG. 22 AND OF FIG. 5 OR 6	ARE USED IN THE SAME INSTALLATION			W	
	ARE NOT USED IN THE SAME INSTALLATION			X	
WHEN FIG. 3 IS USED WITH	FIG. 1			ZD	
	FIG. 7 OR 48 (SEE NOTE 139)			ZE	
FOR TIME OUT OF LOCKED-IN SIGNALS			45		1 PER INSTALLATION
FLASHING CIRCUIT (FOR COMBINED LINE AND BUSY LAMPS)			46		1 PER 6 CENT. OFF., PBX OR PRIVATE LINES OR FIGS. 52
CENT. OFF. AND P.B.X. LINE CKT. ARRANGED FOR VISUAL HOLD SIGNAL (WINKING)	FOR NORMAL RANGES		49	ZX	1 PER LINE
	FOR USE WITH 555 PBX'S OR WHEN EXTRA RANGE IS NEEDED (SEE NOTE 126)			ZY	
	INTERMITTENT AUDIBLE SIGNAL	REQD		ZV	
		NOT REQD		ZW	
WINKING CIRCUIT			50		1 PER 5 LINES
INTERMITTENT AUDIBLE SIGNAL	SIGNAL REQD.		51	ZV	IF REQD. 1 PER GROUP HAVING COMMON AUD. SIGNAL

CIRCUIT NOTES (CONT.):

102. WHEN THE BAT. SUP. FOR FIGS. 11, 20, 29, 32, 47, 48, OR 52 IS OBTAINED FROM A J86205A RECTIFIER THE LEAD WHICH MAY BE ON EITHER THE "LO" OR "HI" TERM. IN THE RECTIFIER SHALL BE CONNECTED TO THE "HI" TERM.

103. IN DETERMINING THE ALLOWABLE NUMBER OF RINGER BRIDGES THE 9A, 14A, AND 15 TYPE KEY TELEPHONE UNITS SHOULD EACH BE CONSIDERED THE EQUIVALENT TO TWO HIGH IMPEDANCE RINGERS.

104.

105. WITH "ZG" OPTION THE CONNECTING KEY TELEPHONE SET MUST BE EQUIPPED WITH A VARISTOR.

106. WHEN FIG. 12 IS USED WITH FIG. 11 AND 24 V BAT. SUPPLY THE MINIMUM VOLTAGE OF THE SUPPLY SHALL BE 15 VOLTS.

107.

108. THE MAXIMUM NUMBER OF COMMON AUDIBLE SIGNALS TO BE MULTIPLED TO THE CONTACTS OF ONE RELAY IS TEN 7A BUZZERS, FOUR 7E BUZZERS, OR 12 HIGH IMPEDANCE RINGERS.

109.

110. THE "G" TERMINAL OF THE J86205A RECTIFIER OR THE "GRD" TERMINAL OF THE J86731A POWER UNIT SHOULD BE CONNECTED TO GRD. WITH 24AWG OR LARGER WIRE.

111. THE NOMINAL VOLTAGES FOR THE J86205A RECTIFIER AT THE RATED AMPERAGE ARE GIVEN BELOW. THE VOLTAGES ARE NOMINAL ONLY AND WILL VARY CONSIDERABLY WITH THE LOAD ON ANY OF THE TAPS.

DC SUPPLY FOR RELAYS	-18 V. AT 0.5 AMP.
DC SUPPLY FOR TALKING	-3V. AT 0.1 AMP, 33V. AT NO LOAD
AC SUPPLY FOR BUZZER AND LAMPS	16V. AT 1 AMP.

112.

113.

114. IT IS NOT NECESSARY TO PROVIDE INDIVIDUAL "G" LEADS FROM EACH KEY TELEPHONE UNIT TO THE SAME LAMP INDICATOR IN FIG. 28 ONE "G" LEAD IS SUFFICIENT FOR EACH INDICATOR.

115. 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.	
3D				FIG. 20		FIG. 12	
3D				307J RET. COIL		207J RET. COIL	
3D				1A VAR.		D-157177 VAR.	
5D				FIG. 22		FIGS. 5 & 6	
8D				FIG. 29		FIG. 20	
10D				V		Y & Z	
10D				15B KEY TEL. UNIT		15A KEY TEL. UNIT	
10D				19B KEY TEL. UNIT		19A KEY TEL. UNIT	
11D						FIG. 2	

NOTES CONTINUED ON NEXT PAGE

DRAWING ISSUE 180 2774 -

KEY TELEPHONE SYSTEM NO. 1A.
LINE AND SIGNALING CIRCUIT

SD-69091-01-B2

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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CIRCUIT NOTES (CONT.):

115. (CONT.)

RECORDS 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.
11D				FIGS. 30,31 32,33		
11D	ZC OR ZB	ZB		ZC		ZB
11D	ZD OR ZE	ZD		ZD,ZE		
11D	ZF	U		ZF		U
11D	ZG OR J	J	105	ZG		J
11D	ZH OR F	F		ZH,F		
12D				18B KEY TEL. UNIT		18A KEY TEL. UNIT
12D	ZM OR F			ZM		F
12D				FIGS. 34,35 36,37		
12D				ZI,ZJ ZK,ZL ZN,ZO ZP,ZQ		
13D				18,6C & 18C KEY TEL UNITS		
13D				FIG.38		
14B				FIG.39		FIG.35
14B						ZQ
15D				15C,18D, 18E,26B KEY TEL. UNITS		15B,18B, 18C,26A KEY TEL. UNITS
15D				22F,G, H,J,& K KEY TEL. UNITS		22A,B, C,D,& E KEY TEL. UNITS
15D				27A,28A 29A,30A 31A,32A KEY TEL. UNITS		
15D				FIGS. 41 & 42		
15D						FIGS 23 & 24
15D				FIGS.43 & 44		FIGS.25, 26 & 40
15D				FIGS.45, 46,47 & 48		
15D				ZR & ZS		ZH
15D	ZT OR ZU	ZT	135	ZT & ZU		
15D	B94 OR B10 RELAY	B94 RELAY		B10 RELAY		B94 RELAY

CIRCUIT NOTES (CONT.):

115. (CONT.)

RECORDS 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.
16D				15D, 17B, 25B KEY TEL. UNITS		15C, 17A, 25A KEY TEL. UNITS
16D				33A KEY TEL. UNIT		
16D				FIGS. 49,50 & 51		
16D	L3 OR L1	L1		KS57-14-L3 TRANS.		KS 57-14-L1 TRANS.
16D	A OR B	A		393B TRANS.		393A TRANS.
17D				FIG. 52		FIG. 29 AND 32
17D				12B KEY TEL. UNITS		12A KEY TEL. UNITS
17D				274 AH INDR		307 J INDR

NOTES CONTINUED ON NEXT PAGE

DRAWING ISSUE

18D

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-B3

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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CIRCUIT NOTES (CONT.):

116.

	TYPE OF BAT. SUPPLY	TYPE OF KEY TEL. UNIT TO PROVIDE FOR FIG. 33	R1 VALUE FOR FORMULA NO. 4
FOR LAMPS IN KEY TEL. SETS (51A LAMPS)	LOCAL BAT. 8 CELLS	22A OR F 19RK 210~210~	51~
	9-CELL BAT.	22B OR G 19AH 240~240~	82~
	10-CELL BAT.	22C OR H 19PG 290~290~	91~
	11-CELL BAT.	22D OR J 19DS 350~350~	90~
	12 OR 13 CELL-BAT. MAX VOLTAGE 26 VOLTS	22D OR J 19DS 350~350~	124~
	23-CELL BAT. 47.5 TO 50 VOLTS REGULATION	22E OR K 19BA 900~900~	279~
FOR K2 LAMPS	23-CELL BAT. 47.5 TO 50 VOLTS REGULATION	22D OR J 19DS 350~350~	279~

117. PROVIDE 1 PER STATION BUSY CIRCUIT WHEN DC SUPPLY IS USED AND WHEN 47.5 TO 50V BAT. IS USED FOR K2 LAMPS FOR STATION BUSY LAMPS.

118. THE FOLLOWING WIRING DESIGNATIONS WERE ASSIGNED ON ISSUE 11D: "A","B","H","K","P","Q","R", AND "ZA".

119. WHERE THREE OR MORE STATIONS ARE LOCATED NEAR EACH OTHER AND DC SUPPLY IS PROVIDED, THE "L" AND "LG" LEADS FROM FIG. 33 TO THE CONNECTING BLOCK SERVING THESE STATIONS MAY BE COMMON PROVIDED THAT THE TOTAL LOOP RESISTANCE FROM FIG. 33 TO ANY OF THESE LAMPS SHALL NOT EXCEED 10~ (THE MAXIMUM ALLOWABLE FOR ONE LAMP) DIVIDED BY THE NUMBER OF STATIONS SUPPLIED BY THE COMMON LEADS. THE "L" TERMINALS ASSOCIATED WITH THESE LAMPS AT FIG. 33 MUST BE STRAPPED TOGETHER.

120. CONNECT THE "±" AND "G" LEADS TO THE TERMINALS IN THE TRANSFORMER IN ACCORDANCE WITH THE FOLLOWING:

LINE VOLTAGE	CONNECT "±" LEAD TO	CONNECT "G" LEAD TO
110	A	D
115	A	C
120	B	D
125	B	C

121. FIG. 32 CANNOT BE USED WITH FIG. 25, 26 OR 40 WHEN THE STEADY DC OPERATED AUDIBLE SIGNAL IS PROVIDED FOR FIG. 25, 26, OR 40. IN THESE CASES A SEPARATE 19B KEY TEL. UNIT MUST BE USED FOR FIG. 32.

122. THE 393A TRANSFORMER MAY BE USED WITH TWO 2 AMP. FUSES IN PARALLEL BY CONNECTING ONE SIDE OF EACH FUSE UNDER THE CENTER SCREW AND THE OTHER SIDE OF THE FUSES UNDER THE OUTER SCREWS. WITH THIS ARRANGEMENT THE LEADS BETWEEN THE TRANSFORMER AND THE APPARATUS CABINET SHALL BE 20 GAUGE OR LARGER. IN CASES WHERE THE 393A TRANSFORMER IS INACCESSIBLE THIS ARRANGEMENT MAY BE USED WITH A SINGLE 2 AMP. FUSE IN THE ± SUPPLY LEAD AT THE APPARATUS CABINET. WHERE MORE THAN 1.6 AMPS. AT 10 VOLTS AC IS REQUIRED (SEE FORMULA NO. 6), THIS ARRANGEMENT MAY BE USED WITH TWO 2-AMP DISTRIBUTION FUSES IN THE APPARATUS CABINET. IN THIS CASE, HOWEVER, THE MAXIMUM LEAD DROP IN FORMULA NO. 5 MUST BE REDUCED FROM 1.15 TO 0.9 VOLTS.

CIRCUIT NOTES

(CONT) 122.

123. TO OBTAIN SOMEWHAT LONGER LIFE IN INSTALLATIONS WITH HIGH AVERAGE VOLTAGE THE TELEPHONE COMPANY MAY REPLACE A3 LAMPS BY A1 LAMPS IF THE ILLUMINATION FROM THE A1 LAMPS IS SATISFACTORY.

124. IF MORE THAN 36 LAMPS ARE PROVIDED DUPLICATE BATTERY FEEDS SHALL BE USED.

125. IN INSTALLATIONS WHERE THE BATTERY SUPPLY FOR PRIVATE LINES OR INTERCOMMUNICATING LINES IS USED FOR OPERATING BUZZERS OR BELLS AND NOISE INTERFERENCE IS HEARD ON THE PRIVATE LINE OR INTERCOMMUNICATING LINE WHEN THE BUZZERS OR BELLS ARE OPERATING, PROVIDE FIG. 34 AND CONNECT THE LEADS FROM THIS FIG. ACROSS THE BATTERY SUPPLY, AS CLOSE AS PRACTICAL, WHERE THE LEADS TO THE BUZZERS OR BELLS CONNECT.

126. NORMALLY THE 1A, 6B AND 18D KEY TELEPHONE UNITS ARE PROVIDED. HOWEVER, WHEN THIS CIRCUIT IS USED WITH 555 PBX'S OR WHEN THE RANGES OF THE 1A 6B AND 18D KEY TELEPHONE UNITS ARE NOT SUFFICIENT THE 1B, 6C, 18C AND 18E KEY TELEPHONE UNITS MAY BE EMPLOYED IN SOME INSTANCES IN PLACE OF LONG LINE CKTS. OR INCREASING THE BAT. SUP. V. ON ISSUE 15D THE 18D AND 18E KEY TELEPHONE UNITS REPLACED THE 18B & 18C KEY TELEPHONE UNITS RESPECTIVELY.

127. (A) WITH 9 TO 11 VOLT AC SUPPLY, G2 LAMPS IN INDICATORS ASSOCIATED WITH THE SAME LINE MULTIPLE TOGETHER AND ALSO MULTIPLE DIRECTLY TO LAMPS IN KEY TELEPHONE SETS AND ATTENDANTS' LINE KEY UNITS.
(B) WITH 14 TO 26 VOLT DC SUPPLY A3 LAMPS IN INDICATORS ASSOCIATED WITH THE SAME LINE MULTIPLE TOGETHER, MULTIPLE TO LAMPS IN ATTENDANTS' LINE KEY UNITS AND MULTIPLE TO THE COMMON "L" AND "LG" LEADS OF THE LAMP RESISTANCE CIRCUIT FOR KEY TELEPHONE SET LAMPS ASSOCIATED WITH THE SAME LINE.
(C) WITH 47.5 TO 50 VOLT DC SUPPLY K2 LAMPS IN INDICATORS, LAMPS IN KEY TELEPHONE SETS AND LAMPS IN ATTENDANTS' LINE KEY UNITS CONNECT INDIVIDUALLY TO RESISTANCES IN FIG. 33 EXCEPT AS PROVIDED IN NOTE 119.

128. PRIOR TO ISSUE 15D FIG. 30 WAS USED FOR A3 LAMPS IN INDICATORS AND FOR BUZZERS, FIG. 31 WAS USED FOR 51A LAMPS IN INDICATORS AND TELEPHONE SETS.

NOTES CONTINUED ON NEXT PAGE

DRAWING ISSUE 18D

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-B4

BELL TELEPHONE LABORATORIES INCORPORATED

DWG. SIZE 3S

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CIRCUIT NOTES (CONT.):

129. WITH THE J86731A POWER UNIT IF MORE THAN 1.6 AMPS AT 10V. AC IS REQUIRED THE 10V. AC FUSE IN THE POWER UNIT MAY BE REPLACED BY TWO 2 AMP FUSES SEPARATED BY A NO. 10 BRASS WASHER ON EACH MOUNTING SCREW. WITH THIS ARRANGEMENT THE CONDUCTORS BETWEEN THE POWER UNIT AND THE APPARATUS SHALL NOT BE SMALLER THAN 20 GAUGE AND TWO 2 AMP FUSED DISTRIBUTION CIRCUITS MAY BE USED. THE "MAXIMUM LEAD DROP" FROM APPARATUS CABINET TO 10V. AC SUPPLY IN FORMULA 5 MUST BE REDUCED FROM 1.15 TO 0.9 VOLTS.

130. WHEN THE J86731A POWER UNIT IS USED BATTERY DESIGNATED "A", BATTERY DESIGNATED "B" (EXCEPT WHEN A C SUPPLY CAN BE USED) AND BATTERY DESIGNATED "C" SHOULD BE CONNECTED TO THE 20V. TALK TERMINALS.

131. IN FIG. 29 LAMPS MUST BE LIGHTED BY THE SAME POWER SUPPLY WHICH OPERATES THE BUZZERS. WHEN ANY LAMPS IN KEY TELEPHONE SETS ARE USED, USE 14-26V. DC LOCAL OR BUILDING BATTERY PER NOTE 116 (WITH "G" OPTION) OTHERWISE USE 14-26V DC OR 15-25V AC ("N" OR "M" OPTION) IN EITHER CASE USE A3 LAMPS ("ZM" OPTION) FOR LAMPS IN INDICATORS.

132. FOR STATIONS WHICH ARE REQUIRED TO CUT OFF OTHER STATIONS PROVIDE ONE FIG. 39 PER STATION PER LINE EXCEPT THAT TWO OR MORE OF THESE STATIONS WHICH ARE NOT REQUIRED TO CUT OFF EACH OTHER SHOULD BE CONNECTED TO THE SAME FIG. 39 PER LINE.

133. WITH KEY TELEPHONE UNITS 22F TO 22K PROVIDE ENOUGH UNITS TO OBTAIN 1/3 UNIT PER 2 STATIONS PER LINE. WITH KEY TELEPHONE UNITS 22A TO 22E PROVIDE ONE UNIT PER 6 STATIONS PER LINE.

134. WITH KEY TELEPHONE UNITS 22F TO 22K TERMINALS 4 AND 1 MAY BE STRAPPED TO TERMINAL 3 FOR THE TYPICAL ARRANGEMENT SHOWN IN FIG. 33 OR THESE TERMINALS MAY BE CONNECTED TO "L" LEADS FOR DIFFERENT LINES AS REQUIRED.

135. IN LOCATIONS WHERE INDUCTIVE NOISE HAS BEEN EXPERIENCED WITH 15 TYPE KEY TELEPHONE UNITS IMMEDIATELY AFTER THE CALLED PARTY ANSWERS PROVIDE "ZU" OPTION AND A 6B OR 6C KEY TELEPHONE UNIT. OTHERWISE PROVIDE "ZT" OPTION.

136. FIG. 40 MAY BE USED TO PROVIDE TIME OUT OF LOCKED IN SIGNALS IN EXISTING INSTALLATIONS OR NEW INSTALLATIONS WHERE 15A OR B AND 18B OR C KEY TELEPHONE UNITS ARE AVAILABLE EXCEPT IN LOCATIONS WHERE INDUCTIVE NOISE HAS BEEN EXPERIENCED WITH 15 TYPE KEY TELEPHONE UNITS IMMEDIATELY AFTER THE CALLED PARTY ANSWERS. IN THESE LOCATIONS USE FIG. 43.

137. WHEN A 16A KEY TELEPHONE UNIT IS REQUIRED WITH A PRIVATE LINE CKT. IN LOCATIONS WHERE INDUCTIVE NOISE HAS BEEN EXPERIENCED WITH 15 TYPE KEY TELEPHONE UNITS IMMEDIATELY AFTER THE CALLED PARTY ANSWERS USE FIG. 7 WITH FIG. 41 OR 43 INSTEAD OF FIG. 48.

138. WHEN THE 6C KEY TELEPHONE UNIT IS PROVIDED IN FIG. 42 NOT MORE THAN ONE HIGH IMPEDANCE RINGER SHOULD BE CONNECTED ON THE STATION SIDE OF OF THIS UNIT.

139. WHERE LOCAL INSTRUCTIONS CALL FOR A CONDENSER IN SERIES WITH A RINGER ON PRIVATE LINES USE "ZD" OPTION INSTEAD OF "ZE" IN FIG. 3 WHEN THIS FIGURE IS USED WITH FIG. 7 OR 48.

140. THE CIRCUITS DESIGNATED "FOR MANUAL AREAS" ARE REQUIRED WHERE INCOMING RINGING COMES THROUGH A RING-THROUGH REPEATING COIL IN A MANUAL OFFICE. IN ALL OTHER CASES THE CIRCUITS DESIGNATED "FOR DIAL AREAS" MAY BE USED.

141. THE CAPACITOR C AS SHOWN IN FIG. 108 MAY BE ADDED ACROSS THE SUPERVISORY RELAY COIL (IN 1A, 5A, 6B, 6C, 18D, AND 18E KEY TELEPHONE UNIT) IN ORDER TO REDUCE THE NOISE CONDITION CAUSED BY THE UNBALANCE IN THE TRANSMISSION.

14-26V.
SEE NOTES
106 & 111

DRAWING ISSUE	
18D	LTR
19D	

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-B5

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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DRAWING ISSUE
180 4/74

OPTIONS USED					
APP. OR WIRING	LOC. (SHEET)	APP. OR WIRING	LOC. (SHEET)	APP. OR WIRING	LOC. (SHEET)
Z	C 2	K	C 1	ZF	C 1
Y		J		ZG	C 1
X	C 4	H		ZH	C 3
W		G	C 4	ZJ	C 11
V	C 2		C 5		C 12
U	C 1		C 6	ZK	C 4
T	B 7		C 7		C 5
S			C 8		C 6
R	C 1		C 9	ZL	C 8
Q			C 10		C 15
P			C 13	ZM	C 3
N	C 1		C 14	ZN	C 8
	C 2		C 15	ZO	
	C 4		C 16	ZP	C 11
	C 5		C 17		C 12
	C 6		C 18	ZQ	C 12
	C 7		C 19	ZR	C 3
	C 8		C 21	ZS	
M	C 9	F	C 3	ZT	C 4
	C 10	E	C 10	ZU	
	C 13	D		ZV	C 18
	C 14	B	C 1		C 20
	C 15	A		ZW	C 18
	C 16	ZA	C 1	ZX	
	C 17	ZB	C 1	ZY	
	C 18	ZC	C 3		
	C 19	ZD	C 1		
	C 21	ZE			

KEY TELEPHONE UNITS USED			
K.T.U	USED IN FIG.	K.T.U	USED IN FIG.
1A	8,49	19A	25,26
1B	38,49	19B	40,46
2A	11	20A	24,26
3A	10	21A	102,103 105 107
4A	12		
5A	9	22A TO 22K	33
6A	6		
6B	22,23,24		
6C	26,42	23A	34
7A	7,48		
9A	5	25A	35,39
11A	18	25B	39
12A	19	26A	36
12B	19	26B	
13A	20		
13B	29,32		
13C	52		
		30A	40,45
14A	22,24,26 42,44	31A	47 48
15A	22,23	33A	50
15B	25,40		
15C 15D	22,41 43,48,49		
16A	23,25,40 41,43,48,51		
17A 17B	26,27,32,37 42,44,50		
18A	25		
18B	25,40		
18C			
18D	41,43 44,49		
18E			

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-B6

BELL TELEPHONE LABORATORIES
INCORPORATED

DWG SIZE 3S

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FOR NO LOCAL BATTERY
METHOD OF COMPUTING DIRECT FEEDER RESISTANCE
MAX. ALLOWABLE RES. IN DIRECT FEEDERS TO MAINTAIN 14 VOLTS AT THE KEY TELEPHONE SYSTEM

FORMULA NO. 1 RES. OF FEEDERS $= \frac{\text{FEEDER VOLTAGE DROP (SEE TABLE NO. 1)}}{\text{A+B+C+D+E+F+G+H+I+J+K+L+M+N+O+P+Q+R+S+T+U+V+W+X+Y+Z+AB (SEE TABLE NO. 2)}}$

TABLE NO. 2 VALUES IN AMPS.

A= .031 X NO. OF FIGS. 7 PRIVATE LINES
B= .014 X NO. OF FIGS. 10 INTERCOM. SIGNALING
C= .071 X NO. OF FIGS. 11 TALKING BAT. SUPPLY
D= .029 X NO. OF FIGS. 23 LINE SIGNAL CKT.

E= .073 X NO. OF FIGS. 24 LINE SIGNAL CKT.

F= 0.149 FOR IST FIG. 25 LINE SIGNAL CKT.

G= .059 X NO. OF OTHER FIGS. 25 LINE SIGNAL CKT.

H= 0.195 FOR IST FIG. 26 LINE SIGNAL CKT.

I= .073 X NO. OF OTHER FIGS. 26 LINE SIGNAL CKT.

J= .020 X NO. OF FIGS. 27 SWITCHING RELAY CKT.
K= .062 X NO. OF FIGS. 20, 29 AND 52 INTERCOM LINE CKT
L= .035 X NO. OF LAMPS (FIGS. 2, 6A & 28 OR IN ATTENDANT'S LINE KEY UNITS) SUPPLIED BY "N" OPTION
M= .017 X NO. OF 7A BUZZERS FIG. 15
N= .045 X NO. OF 7E BUZZERS FIG. 15
O= 0.100 X NO. OF FIGS. 32 INTERCOMMUNICATING LINE CKT.
P= .060 X NO. OF FIGS. 35 AND 39 AUTOMATIC CUT-OFF CONTROL CKT
Q= .095 X NO. OF FIGS. 36 AUTOMATIC CUT-OFF CKT.
R= .020 X NO. OF FIGS. 37 RELEASE OF RINGUP RELAY AND BUSY LAMP CONTROL CKT.

SIGNALING CKTS. AS FOLLOWS:

	FIG	WITH TIME OUT NO. OF LINES						WITHOUT TIME OUT NO. OF LINES					
		1	2	3	4	5	6	1	2	3	4	5	6
S=	40	.260	.295	.325	.355	.385	.415						
T=	41	.060	.100	.130	.160	.190	.240	.070	.120	.180	.240	.300	.360
U=	42 & 44	.130	.210	.280	.350	.420	.490	.130	.210	.290	.350	.420	.530
V=	43 & 49	.035	.070	.100	.130	.160	.190	.045	.090	.135	.180	.225	.270
W=	48 LINE SIG. ONLY	.060	.100	.130	.165	.205	.250	.080	.150	.200	.245	.290	.335
	COMB. LINE & BUSY	.035	.065	.095	.120	.155	.190	.080	.130	.180	.220	.260	.300

X= .115 X NO. OF FIGS. 45 TIME OUT CKT.
Y= .110 X NO. OF FIGS. 46 FLASHING CKT.
Z= .056 X NO. OF FIGS. 47 INTERCOMMUNICATING CKT.
AA= .042 X NO. OF LAMPS SUPPLIED BY 14-26V DC (FIGS. 2, 6A, 28 AND IN ATTENDANTS KEY UNITS)
AB= .090X NO. OF FIGS. 50 WINKING CKT.

TABLE NO. 1
FEEDER VOLTAGE DROP

	VOLTAGES AT FUSE PAN. IN CENT. OFF OR AT BLDG. BAT. MAX.	MIN.	FEEDER VOLTAGE DROP
NON-REG. 24V. C.O. SUPPLY			
(A) 11 CELL MAIN BAT.	28	20	6
(B) 24V. SUP. DERIVED FROM 48V. BAT. THRU COUNTER CELLS SINGLE STEP VOLTAGE CONTROL	28	20	6
(C) 24V. SUP. DERIVED FROM 12 CELL BAT. FLOATING FROM 48 V. BAT.	28	21	7
REG. 24V. C.O. SUPPLY			
(A) 12 CELL TAP ON 24 CELL MAIN BAT.	25	21	7
(B) 12 CELL TAP ON 23 CELL MAIN BAT.	26	23	9
(C) 24 V. SUP. DERIVED FROM 48V. BAT. THRU COUNTER CELLS MULTI-STEP VOLTAGE CONTROL	26	22	8
BUILDING BAT. CONTINUOUS CHARGE			
(A) 10 CELLS	24	18	4
(B) 11 CELLS	26	20	6
(C) 12 CELLS	28	22	8
BUILDING BAT. VOLT. CONTROL OF CHARGE			
(A) 10 CELLS	23	18	4

FORMULA NO. 2

MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM. $= \frac{\text{MAX. VOLTAGE OF THE CENT. OFF. OR BLDG. BAT. (SEE TABLE NO. 1)}}{\text{APPROX. RES. OF FEEDERS} + \frac{14}{\text{A+B+C+D+E+F+G+H+I+J+K+M+N+O+P+Q+R+S+T+U+V+W+X+Y+Z+AB (SEE TABLE NO. 2)}} + \text{AA}$

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KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT
SIZE 3S
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FOR LOCAL BATTERY

METHOD OF COMPUTING CHARGING RATE OF LOCAL BATTERY, BATTERY FEEDER RESISTANCE & FUSING

FORMULA NO. 3

BATTERY CHARGING CURRENT (FOR 6 BUSY HRS PER DAY) $= \frac{6(A2+B2+C2+D2+E2+F2+G2+H2+I2+J2+K2+L2+M2+N2+O2+P2+Q2+R2+S2+T2)}{24} \times \frac{1.25(\text{NO. OF WORKING DAYS PER WEEK})}{7}$

TABLE NO. 3

A2 =.005 X NO. OF FIGS. 11 BATTERY SUPPLY WHEN USED WITH INTERCOM. LINE, FIG 12 OR 13
B2 =.015 X NO. OF FIGS. 11 BATTERY SUPPLY WHEN USED WITH PRIVATE LINE, FIG 7
C2 =.004 X NO. OF FIGS. 20, 29 AND 52 INTERCOM. LINES 2 WAY AUTO. SIG.
D2 =.006 X NO. OF FIGS. 25 LINE SIGNAL CKT. WHEN USED WITH C.O. OR P.B.X. LINES
E2 =.013 X NO. OF FIGS. 25 LINE SIGNAL CKT. WHEN USED WITH PRIVATE LINES, FIG. 7
F2 =.002 X NO. OF FIGS. 26 LINE SIGNAL CKT. WHEN USED WITH C.O. OR P.B.X. LINES
G2 =.004 X NO. OF FIGS. 26 LINE SIGNAL CKT. WHEN USED WITH PRIVATE LINES, FIG. 7
H2 =.002 X NO. OF BUSY LAMPS WHEN USED WITH INTERCOM. LINE FIG. 32, 47 OR 52
I2 =.003 X NO. OF BUSY LAMPS WHEN USED WITH C.O. OR P.B.X. LINES.
J2 =.007 X NO. OF BUSY LAMPS WHEN USED WITH PRIVATE LINES, FIG. 7
K2 =.007 X NO. OF FIGS. 32 INTERCOMMUNICATING LINES 2 WAY AUTO SIG.
L2 = .006 X NO. OF FIGS. 35 AND 39 AUTOMATIC CUT-OFF CONTROL CKT.
M2 = .005 X NO. OF FIGS. 36 AUTOMATIC CUT-OFF CKT.
N2 = .002 X NO. OF FIGS. 37 RELEASE OF RING UP RELAY AND BUSY LAMP CONTROL CKT.
O2 = .010 X NO. OF FIGS 40 LINE SIGNAL CKT WHEN USED WITH C.O. OR P.B.X. LINES
P2 = .020 X NO. OF FIGS. 40 LINE SIGNAL CKT WHEN USED WITH PRIVATE LINES
Q2 = .007 X NO. OF FIGS. 41, 43, 44 OR 49 LINE SIGNAL CIRCUIT.
R2 = .004 X NO. OF LINES CONNECTED TO FIGS 45 TIME OUT CKT.
S2 = .004 X NO. OF FIGS. 47 INTERCOMMUNICATION CKT.
T2 = .016 X NO. OF FIGS. 48 PRIVATE LINE CKT.

RES OF CABLE FEEDERS (WHEN 24V BAT FEEDERS ARE USED TO CHARGE 18V KEY TEL SYSTEM BATTERY) $= \frac{6 \text{ VOLTS}}{\text{BAT. CHARGING CURRENT}}$

RES. OF CABLE FEEDERS (WHEN 48V BAT FEEDERS ARE USED TO CHARGE 18V. KEY TEL SYSTEM BATTERY) $= \frac{30 \text{ VOLT}}{\text{BAT. CHARGING CURRENT}}$

FUSING NOTE FOR LOCAL BATTERY FOR MAX. OF 6 LINES.
(FUSES TO BE LOCATED AT THE BATTERY)

	LINE	PROVIDE 2 AMP. FUSES. CONNECT TO FUSE
BATTERY DESIG. "A" OF A LINE & ASSOCIATED CIRCUITS.	1	1
	2	2
	3	3
	4	1
	5	2
	6	3
BATTERY DESIG "B" OF CKT FIG. 22, 23, 24, 25, 26, 40, 41, 42, 43, 44 46 48 AND 50.		1 *
BATTERY DESIG. "C" OF SIG. CKT. FIG 40 OR TIME OUT CKT FIG 45		2 *
BATTERY DESIG "A" OF SWITCHING RELAY CIRCUIT FIG. 27.		3
BATTERY FOR LAMPS IN KEY TEL. SETS.		4

*WHEN BOTH LAMPS AND AUTOMATIC CUT-OFF CIRCUITS ARE FED FROM EITHER OF THESE FUSES CONNECT BATTERY DESIG. "B" AND BATTERY DESIG. "C" TO FUSE 5.

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KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SIZE 3S

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MISCELLANEOUS FORMULAS

FORMULA NO. 4 MAXIMUM ALLOWABLE BATTERY FEEDER RESISTANCE FOR LAMPS FOR LOCAL BATTERY OR BUILDING BATTERY OR FOR DIRECT FEEDER FROM 48 V CENTRAL OFFICE BATTERY. FOR USE WHERE ANY LAMPS IN KEY TEL. SETS OR K2 LAMPS ARE USED (SEE NOTE 124).

$$\text{RESISTANCE OF FEEDERS} = \frac{\text{RI (SEE NOTE 116)}}{\text{TOTAL NUMBER OF LAMPS IN SYSTEM}}$$

(RI) IN THIS FORMULA IS ADJUSTED TO PROVIDE AT LEAST 7 VOLTS AT LAMPS IN KEY TEL. SETS WITH A MAXIMUM TOTAL RESISTANCE OF 10Ω IN LAMP LEADS "L" AND "LG".

FORMULA NO. 5 9 TO 11V. AC SUPPLY. MAXIMUM ALLOWABLE RESISTANCE OF THE "±" AND "G" LEADS BETWEEN THE TRANSFORMER OR POWER PLANT AND THE KEY TEL. UNITS.

$$\text{RESISTANCE OF WIRE} = \frac{1.15\ (\text{VOLTS} - \text{MAXIMUM LEAD DROP})}{.035 \times \text{NO. OF 51A LAMPS} + .044 \times \text{NO. OF G2 LAMPS}}$$

1.15 VOLTS IS THE MAXIMUM DROP ALLOWABLE TO MAINTAIN A MINIMUM OF 7 VOLTS AT THE LAMPS WITH A MAXIMUM TOTAL RESISTANCE OF 25Ω IN LAMP LEADS "L" AND "LG".

FORMULA NO. 6 MAXIMUM CURRENT REQUIREMENTS FOR 10V. AC SUPPLY.

$$\text{MAXIMUM CURRENT} = .042 \times \text{NO. OF 51A LAMPS} + .052 \times \text{NO. OF G2 LAMPS.}$$

FORMULA NO. 7 MAXIMUM CURRENT REQUIREMENTS FOR 16-21V. AC SUPPLY.

$$\text{MAXIMUM CURRENT} = .0375 \times \text{NO. OF A3 LAMPS} + .0185 \times \text{NO. OF 7A BUZZERS.}$$

FORMULA NO. 8 MINIMUM RESISTANCE OF LOAD ON 20V DC FOR USE WHEN A MINIMUM RESISTANCE LOAD IS SPECIFIED FOR RECTIFIERS OR POWER UNITS

$$\text{MINIMUM RESISTANCE} = \frac{14}{A+B+C+D+E+F+G+H+I+J+K+L+M+N+O+P+Q+R+S+T+U+V+W+X+Y+Z+AB}$$

(SEE TABLE NO. 2)

THE MINIMUM RESISTANCE FOR THE J86205A RECTIFIER IS 45Ω WITH THE "LO" TAP AND 55Ω WITH THE "HI" TAP.

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

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DRAWING ISSUE
18D 12TH

FOR NO LOCAL BATTERY

METHOD OF FUSING DIRECT FEEDERS

FIG. 101

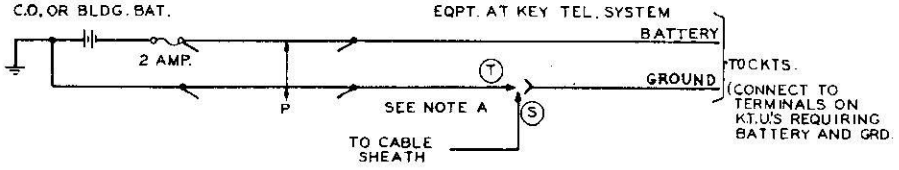


FIG. 102

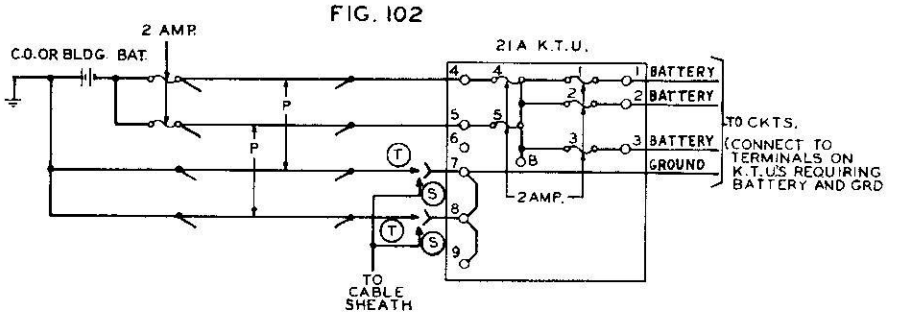
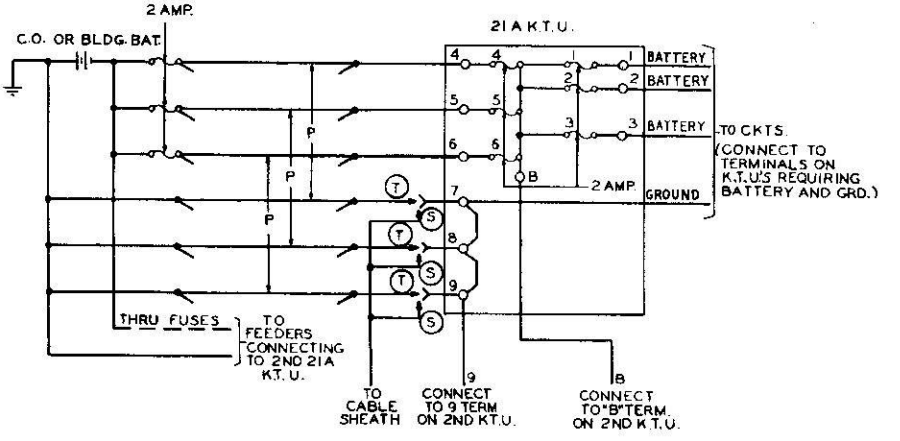


FIG. 103



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

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18D
19D

FIG. 104

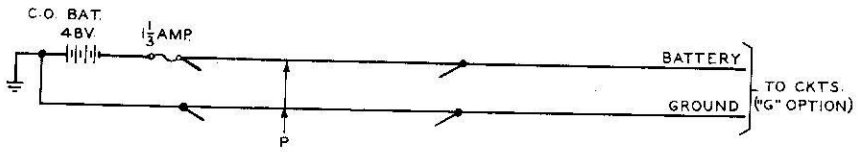


FIG. 105

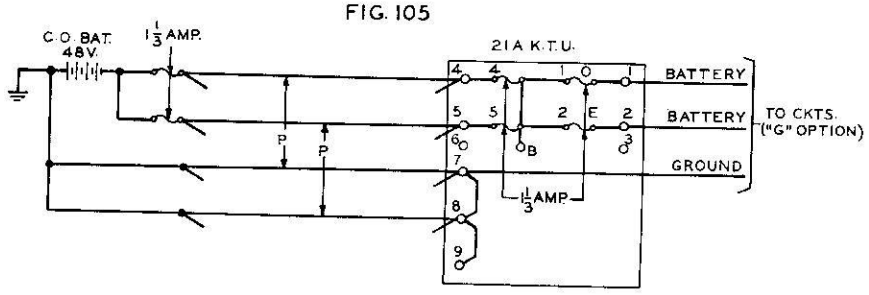


FIG. 106

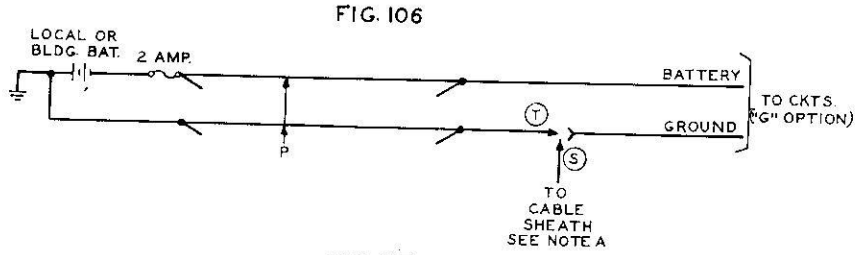


FIG. 107

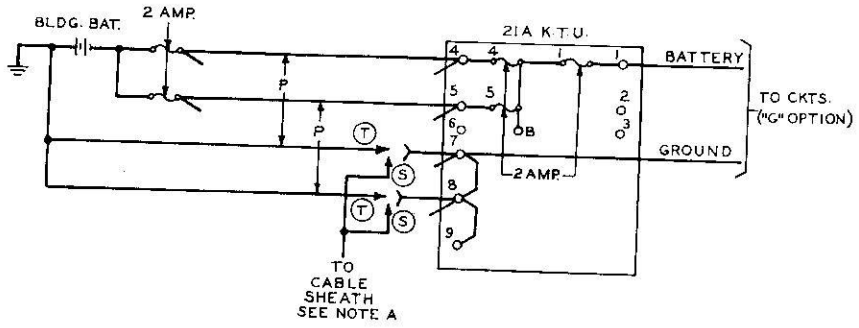
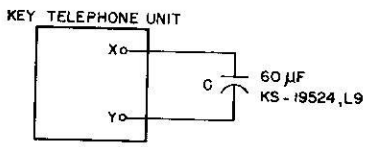


FIG. 108 (SEE CKT NOTE 141)

KEY TEL UNIT	SHOWN ON FIG.	TERM NO.	
		X	Y
1A	8,49	5	6
5A	9	6	7
6B	22,42	5	7
6C	22,42	5	7
18D	41,43,44,49	9	11
18E	41,43,44,49	9	11



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-B11

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DRAWING ISSUE	
18D	11TH –
19D	

NOTE A:

FEATURE OR OPTION				PROVIDE		
				FIGS.	APP. OR WIR.	QUANTITY
WHEN THE MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM DOES NOT EXCEED 1.6 AMPS. (SEE FORMULA NO. 2) AND THE FUSES AT THE CENT. OFF. OR BLDG. BATTERY ARE	READILY ACCESSIBLE			101		
	NOT READILY ACCESSIBLE AND THE FEEDER RESISTANCE IS	NOT OVER 14 OHMS		102		
		OVER 14 OHMS		101		
WHEN THE MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM EXCEEDS 1.6 AMPS. (SEE FORMULA NO. 2) WHETHER THE FUSES AT THE CENT. OFF OR BLDG. BATTERY ARE OR ARE NOT READILY ACCESSIBLE, A 2 AMP FUSE IS REQUIRED FOR EACH 1.6 AMP. OF MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM				103		
FOR CABLE SHEATH RETURN. (CABLE SHEATH RETURN SHALL ONLY BE USED WHEN THE BATTERY IS LOCALLY GROUNDED AND LOCATED IN THE SAME BLDG. AS THE KEY TEL. SYSTEM.)					S	
FOR METALLIC RETURN (METALLIC RETURN SHALL ALWAYS BE PROVIDED WHEN THE BATTERY IS NOT LOCATED IN THE SAME BLDG. AS THE KEY TEL. SYSTEM OR WHEN IT IS LOCATED IN THE SAME BLDG. AND IT IS CHARGED OVER METALLIC RETURN FEEDERS.)					T	
FOR 48V. BAT. SUPPLY	WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS 24 OR LESS AND THE CENT. OFF. BATTERY IS	READILY ACCESSIBLE		104		
		NOT READILY ACCESSIBLE AND THE FEEDER RESISTANCE IS	NOT OVER 38 OHMS	105 & "O" FUSE		
			OVER 38 OHMS	104		
	WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS NOT MORE THAN 48 NOR LESS THAN 25. (CONNECT THE BATTERY LEAD FROM THE NO. 1 TERMINAL TO CIRCUITS OF LINES 1, 3 & 5 AND THE BATTERY LEAD FROM THE NO. 2 TERMINAL TO CIRCUITS OF LINES 2, 4 & 6).			105 & "O" & "E" FUSES		
FOR 9, 10, 11, 12 OR 13 CELL BAT. SEE NOTE 116	WHEN THE FUSES AT THE BLDG. BATTERY ARE (PROVIDES FOR A MAX. OF 36 LAMPS)	READILY ACCESSIBLE		106		
		NOT READILY ACCESSIBLE		107		
FOR LOCAL BATTERY (8 CELLS) (PROVIDES FOR A MAX. OF 36 LAMPS) (2 AMP. FUSE TO BE LOCATED AT THE BATTERY)				106		
WHEN CAPACITOR C ACROSS THE SUPERVISORY RELAY COIL IN 1A, 5A, 6B, 6C, 18D, AND 18E KEY TELEPHONE UNIT IS REQUIRED (SEE CKT NOTE 141)				108		1 PER RELAY COIL

FUSING NOTE FOR FIGS. 102, 103, 105 & 107 BASED ON A MAXIMUM OF 6 LINES PER INSTALLATION

	LINE	WHEN A MAX. OF 3 FEEDER FUSES ARE REQUIRED	WHEN MORE THAN 3 FEEDER FUSES ARE REQUIRED	
		CONNECT TO FUSE	CONNECT TO FUSE IN	
			1ST 21A K.T.U.	2ND 21A K.T.U.
BATTERY DESIGNATED "A" OF A LINE AND ASSOCIATED CIRCUITS	1	1	1	–
	2	2	2	–
	3	3	3	–
	4	1	–	1
	5	2	–	2
	6	3	–	3
BATTERY DESIGNATED "B" OF CIRCUIT FIG. 5, 22, 23, 24, 25, 26, 40, 41, 42, 43, 44, 46, 48, AND 5		1*	1*	–
BATTERY DESIGNATED "C" OF SIG. CIRCUIT FIG. 40, OR TIMEOUT CKT FIG. 45		2*	2*	–
BATTERY DESIGNATED "A" OF SWITCHING RELAY CIRCUIT FIG. 27		3	3	–
BATTERY FEEDER FUSES		4, 5, 6	4, 5, 6	4, 5, 6

* WHEN BOTH LAMPS AND AUTOMATIC CUTOFF CIRCUITS ARE SUPPLIED BY EITHER OF THESE FUSES CONNECT BATTERY DESIGNATED "B" AND BATTERY DESIGNATED "C" TO A SEPARATE FUSE USING ANOTHER 21A K.T.U. IF NECESSARY.

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-812

BELL TELEPHONE LABORATORIES
INCORPORATED

DWG SHEET 3S

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DRAWING ISSUE	
18D	1-7-71
19D	-

FIG. 1 LINE CIRCUIT

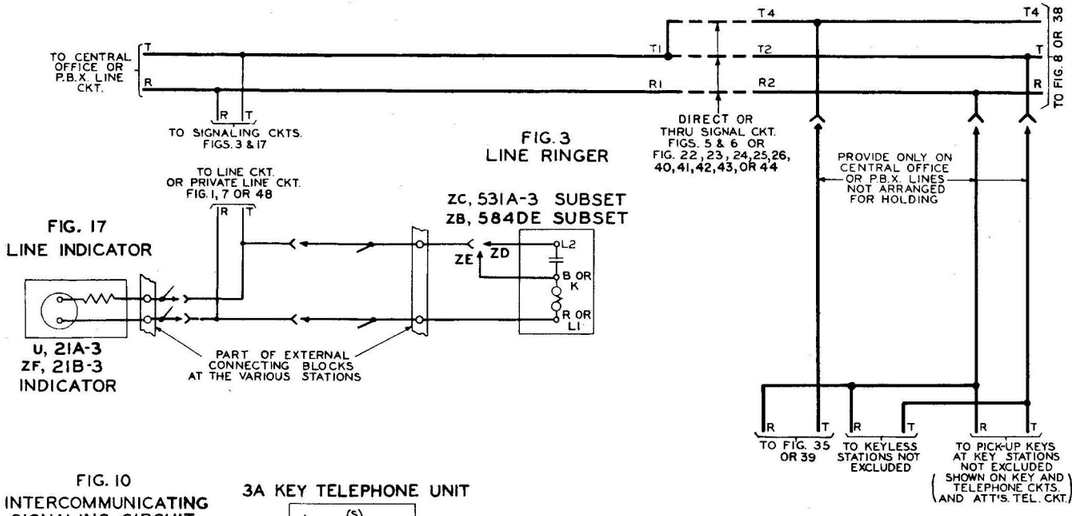


FIG. 3 LINE RINGER

FIG. 17 LINE INDICATOR

FIG. 8 HOLD CIRCUIT

SEE NOTES 126 & 141

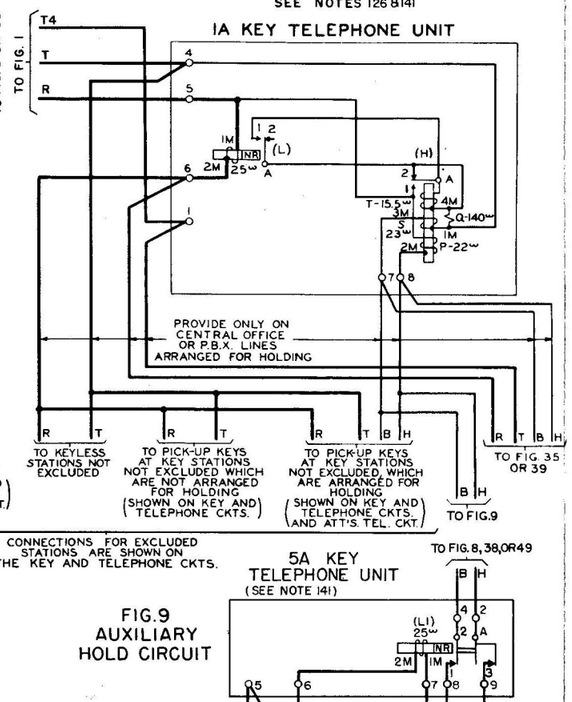


FIG. 10 INTERCOMMUNICATING SIGNALING CIRCUIT

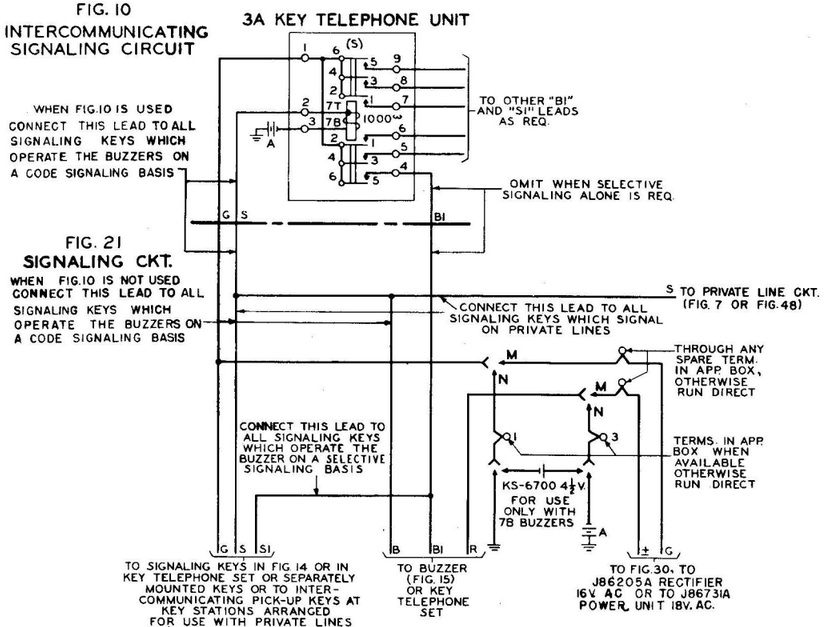


FIG. 21 SIGNALING CKT.

WHEN FIG. 10 IS NOT USED CONNECT THIS LEAD TO ALL SIGNALING KEYS WHICH OPERATE THE BUZZERS ON A CODE SIGNALING BASIS

TO FIG. 5, 21, 22, 23, 24, 25, 26, 40, 41, 42, 43, OR 44. TO FIG. 12, 20, 29, OR 32. TO FIGS. 48, 49 AND 51. TO FIG. 52. TO SEPARATELY MOUNTED CUT-OFF OR TRANSFER KEY (SHOWN ON KEY AND TELEPHONE CIRCUITS)

FIG. 14 INTERCOMMUNICATING SIGNALING KEY CIRCUIT

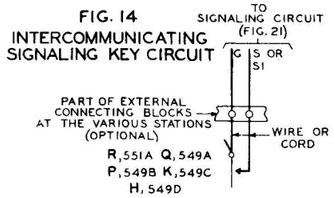


FIG. 15 BUZZER CIRCUIT

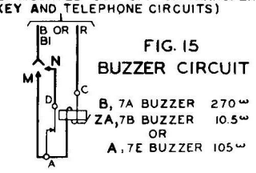


FIG. 16 LISTENING-IN LINE CIRCUIT

SEE NOTE 105

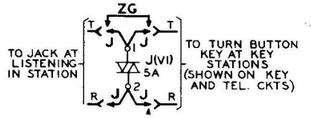


FIG. 9 AUXILIARY HOLD CIRCUIT

FIG. 20 (MFR. DISC.)

REPLACED BY FIG. 29

INTERCOMMUNICATING LINE CIRCUIT 2-WAY AUTOMATIC SIGNALING 13A KEY TELEPHONE UNIT

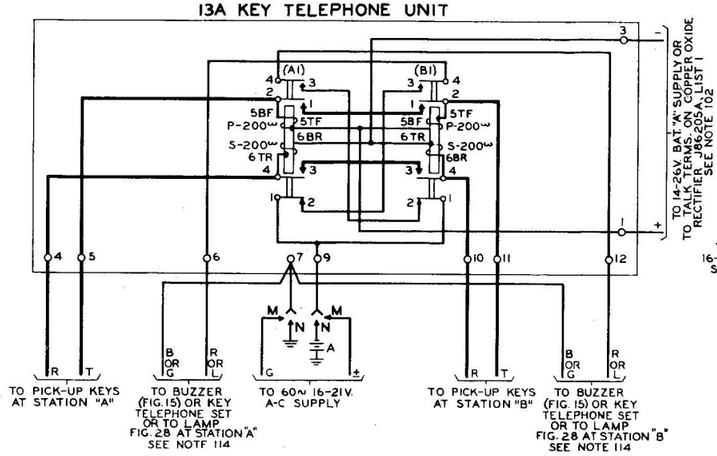


FIG. 11 14-28V BATTERY FEED CIRCUIT 2A KEY TELEPHONE UNIT

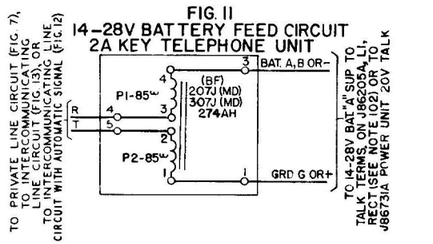


FIG. 13 INTERCOMMUNICATING LINE CIRCUIT

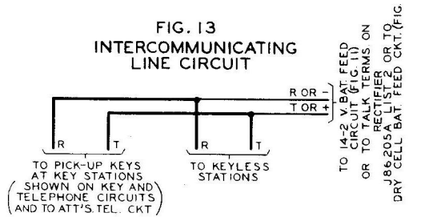
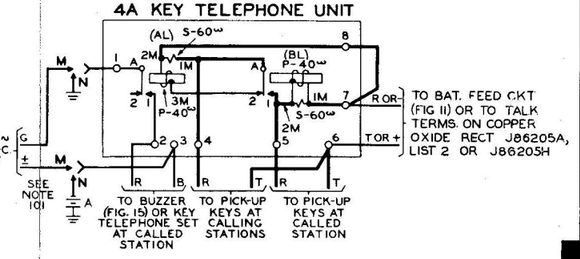


FIG. 19 DRY CELL BATTERY FEED CIRCUIT 12A KEY TELEPHONE UNIT (MFR DISC) 12B KEY TELEPHONE UNIT

FIG. 12 (MFR. DISC.)

REPLACED BY FIG. 20

INTERCOMMUNICATING LINE CIRCUIT WITH AUTOMATIC SIGNALING 4A KEY TELEPHONE UNIT



KEY TELEPHONE SYSTEM NO. 1A LINE AND SIGNALING CIRCUIT	SD-69091-01-C1
BELL TELEPHONE LABORATORIES INCORPORATED	DWG SIZE 6S

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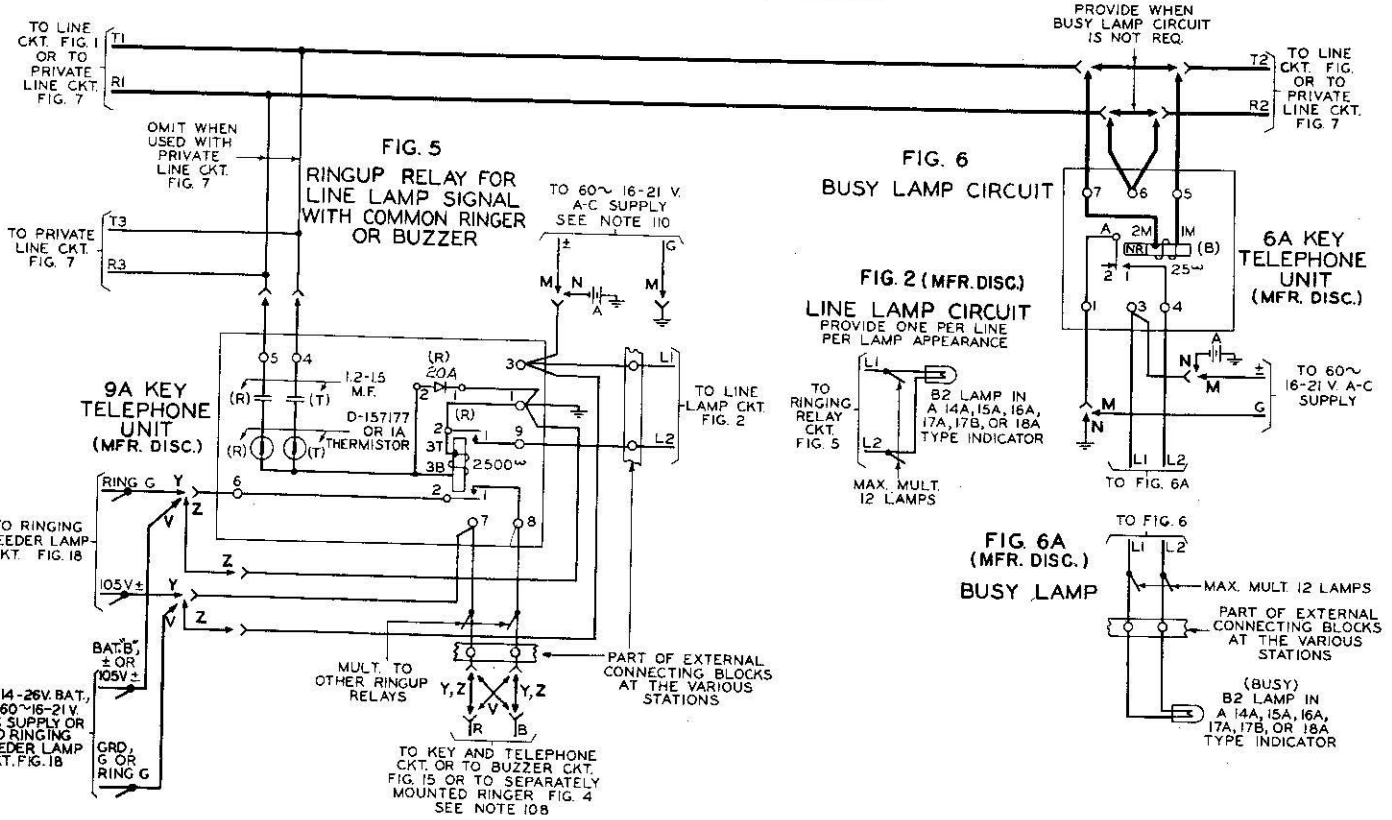
FIG. 5 & 6 (MFR. DISC.)

SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

ARRANGED FOR NON-LOCKED IN LINE LAMPS



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

3S

SD-69091-01-C2

DRAWING ISSUE 180

DRAWING ISSUE
180 | 1174 -

FIG. 7
PRIVATE LINE CIRCUIT
(LOCAL BATTERY TALKING)

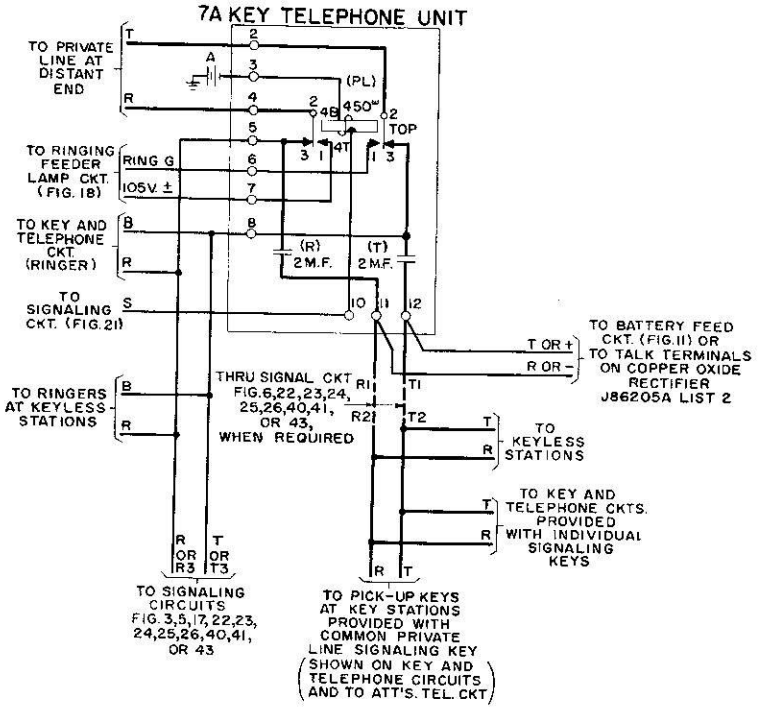
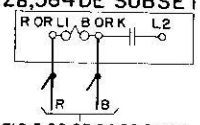


FIG. 4
COMMON RINGER

ZC,531A-3 SUBSET
Z8,584DE SUBSET



TO FIG. 5,22,23,24,25,26,40, 41,42,43, OR 44. TO FIGS. 48, 49 AND 51.

FIG. 27
SWITCHING
RELAY CIRCUIT

17A (MD) OR 17B KEY TELEPHONE UNIT

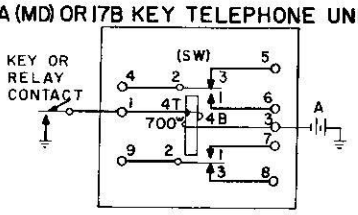


FIG. 18
RINGING FEEDER
LAMP CIRCUIT

11A KEY TELEPHONE UNIT

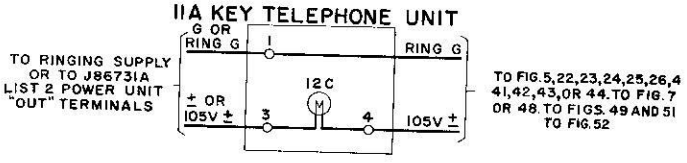
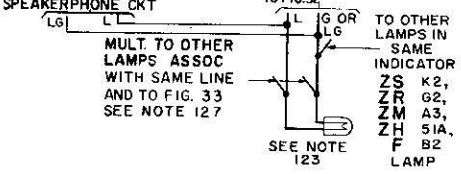


FIG. 28
SIGNAL LAMP

TO FIG. 33 AS REQUIRED IN NOTE 116 OTHERWISE



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C3

BELL TELEPHONE LABORATORIES
INCORPORATED

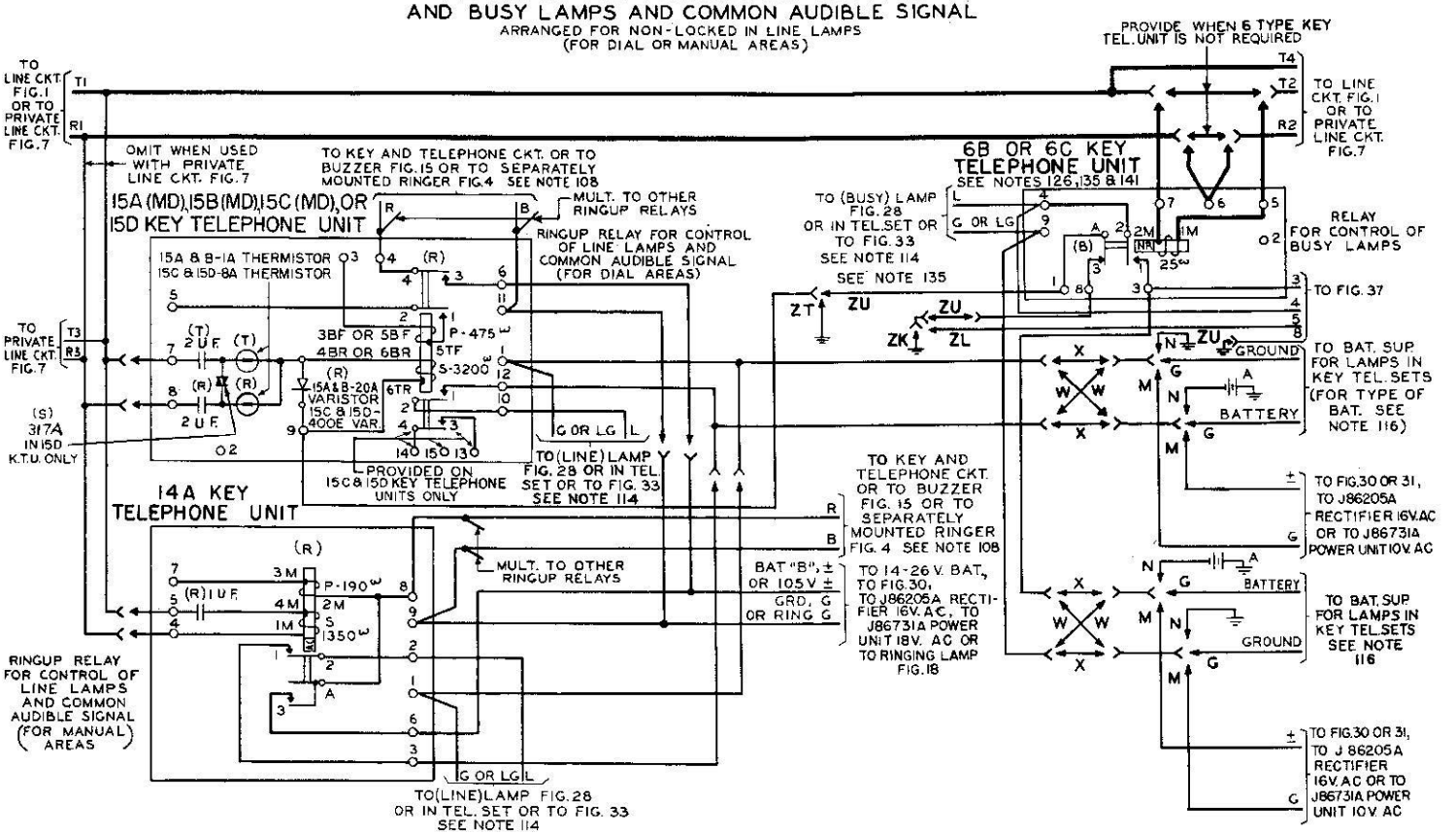
DWG SIZE 3S

PRINTED IN U. S. A.

FIG. 22

SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

ARRANGED FOR NON-LOCKED IN LINE LAMPS (FOR DIAL OR MANUAL AREAS)



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

BELL TELEPHONE LABORATORIES INCORPORATED

SIZE 3S

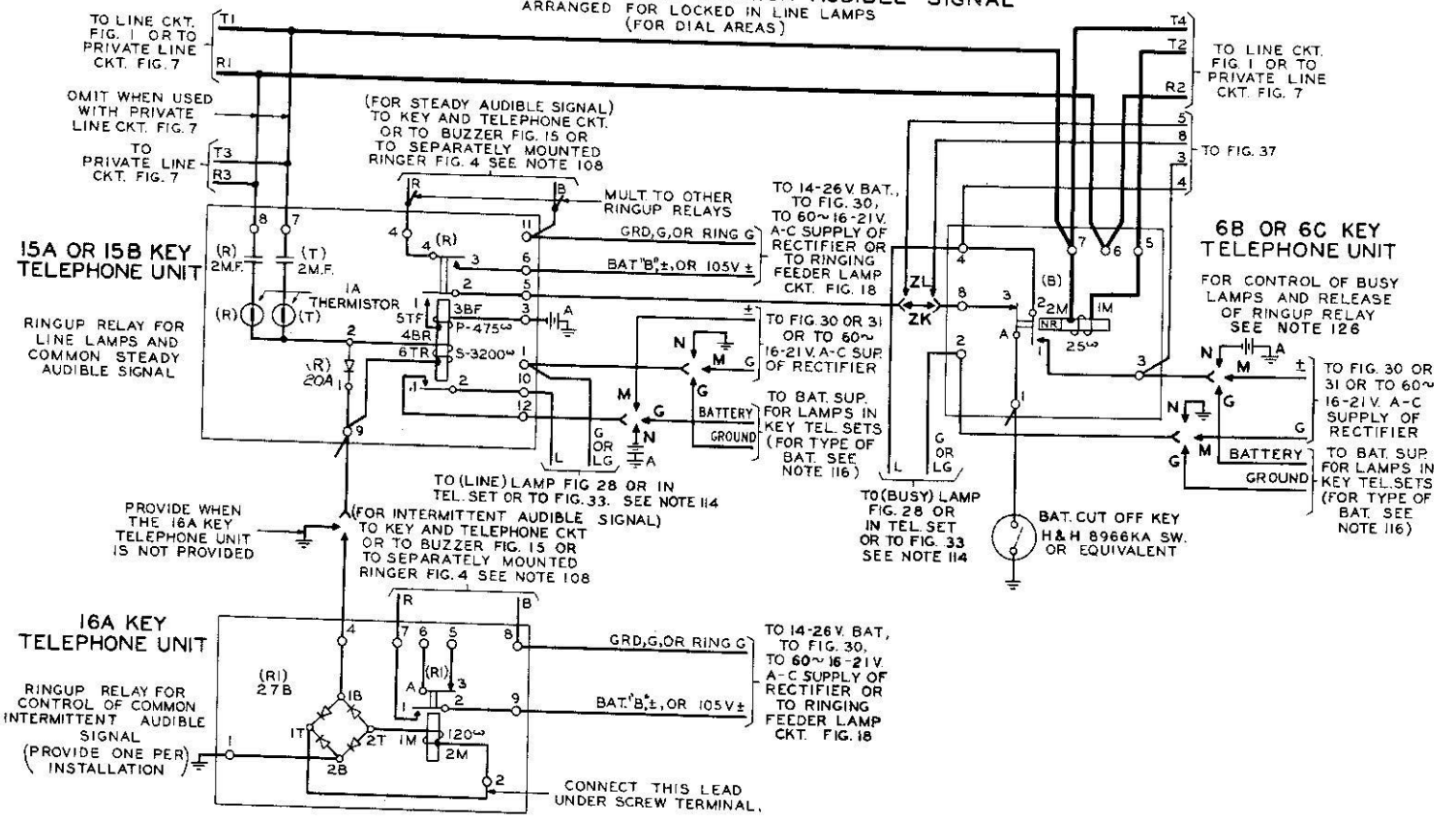
SD-69091-01-C4

DRAWING ISSUE 180 - ORIG

FIG.23 (MFR.DISC.)

SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

ARRANGED FOR LOCKED IN LINE LAMPS (FOR DIAL AREAS)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

DWG SIZE 3S

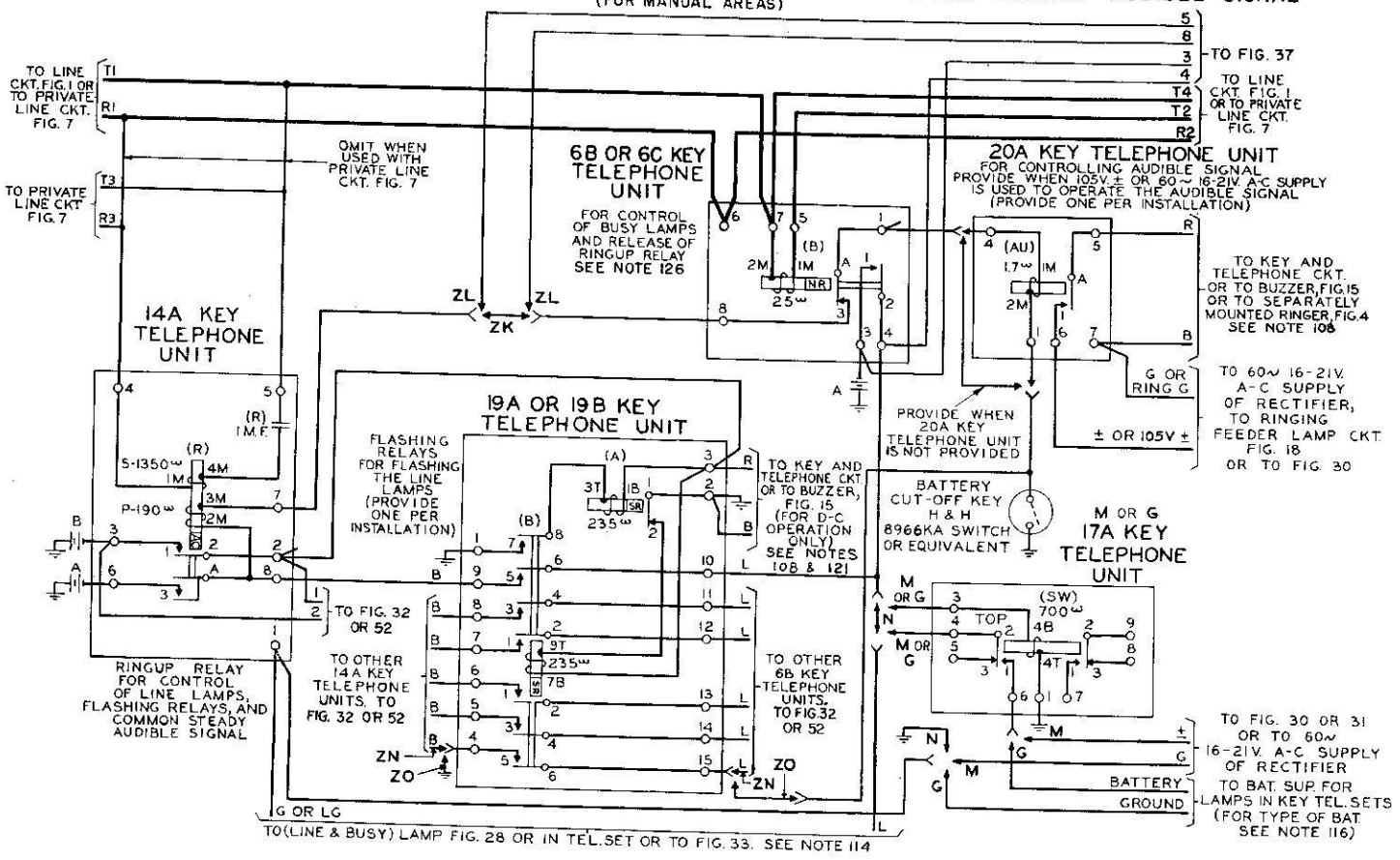
SD-69091-01-C5

DRAWING ISSUE 18 D

FIG. 26 (MFR. DISC.)

SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

(FOR MANUAL AREAS)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

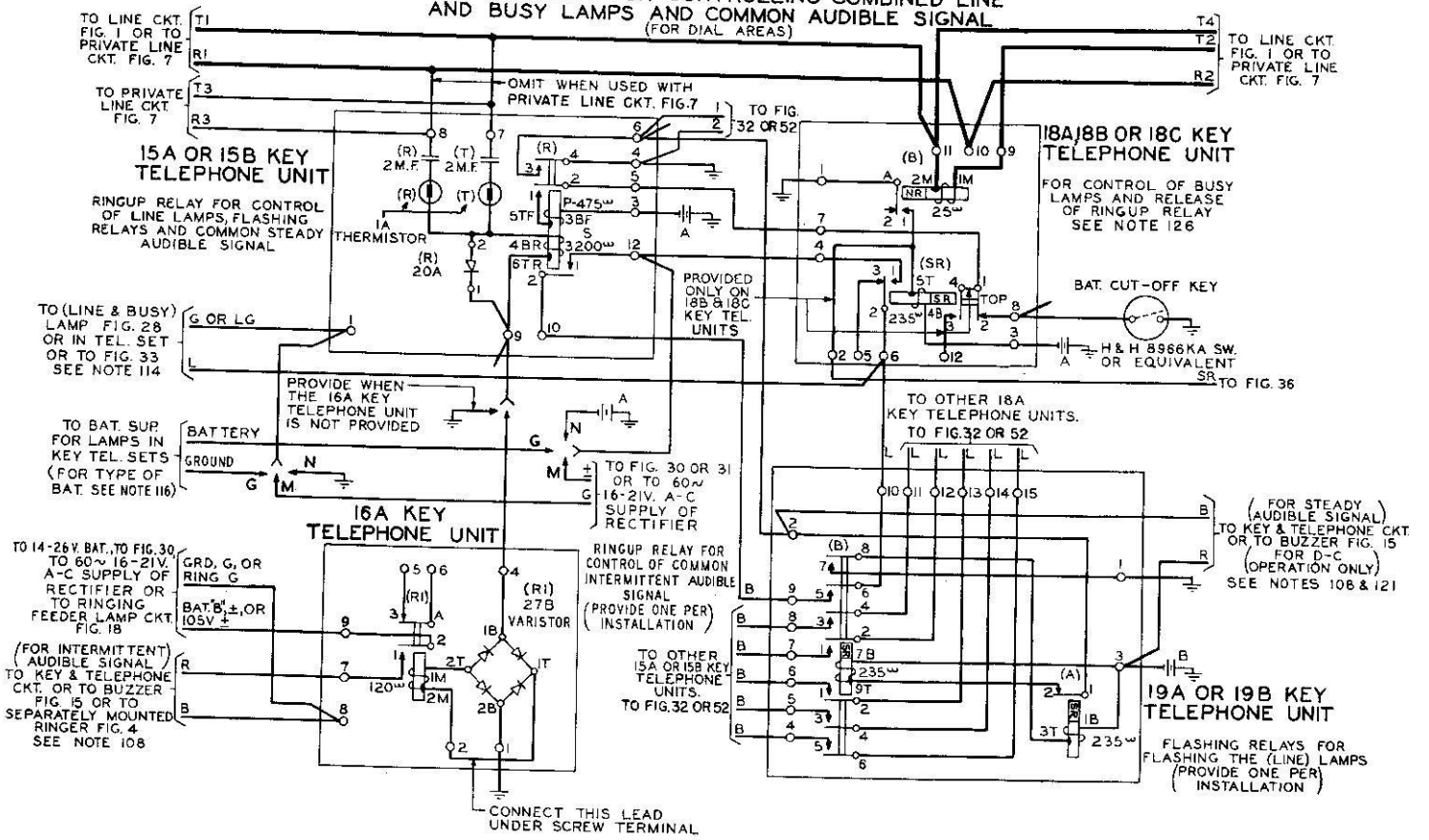
3S

SD-69091-01-C8

DRAWING ISSUE 18D

FIG. 25 (MFR. DISC)

SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL (FOR DIAL AREAS)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

DWG. SIZE 3S

SD-69091-01-C7

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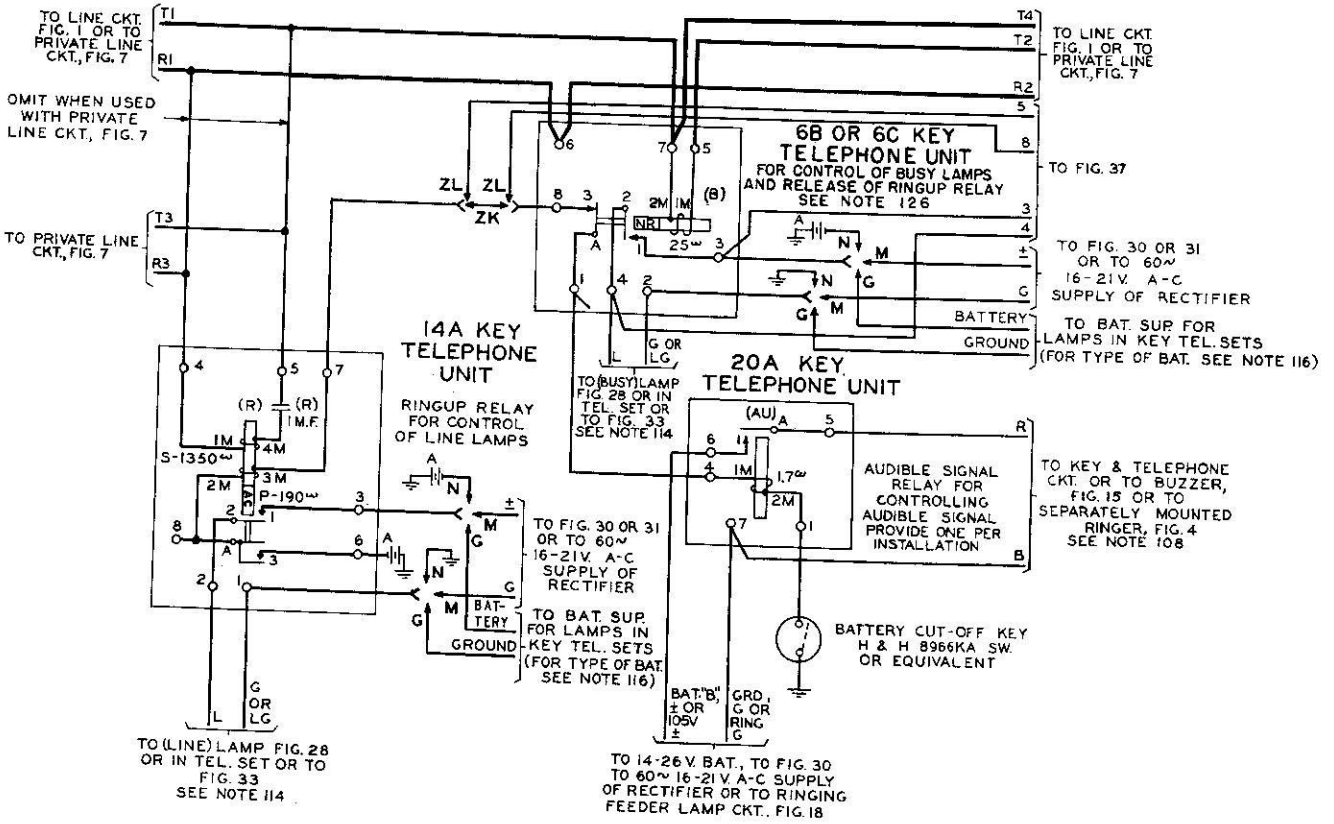
DRAWING ISSUE 18 D - ISSUED

FIG. 24 (MFR. DISC)

SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

ARRANGED FOR LOCKED-IN LINE LAMPS. (FOR MANUAL AREAS)



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

BELL TELEPHONE LABORATORIES INCORPORATED

PAGE SIZE 3S

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SD-69091-01-C6

DRAWING ISSUE 18D 5574

DRAWING ISSUE
18D

FIG. 29 (MFR DISC)
INTERCOMMUNICATING LINE CIRCUIT
2-WAY AUTOMATIC SIGNALING
WITH OR WITHOUT BUSY LAMP

13B KEY TELEPHONE UNIT
SEE NOTES 114 & 131

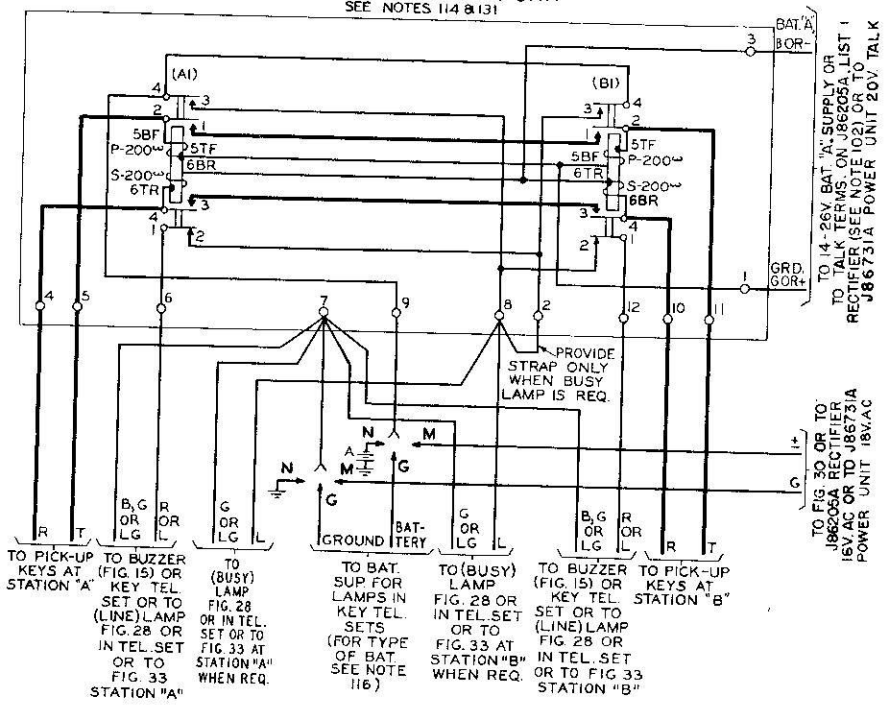
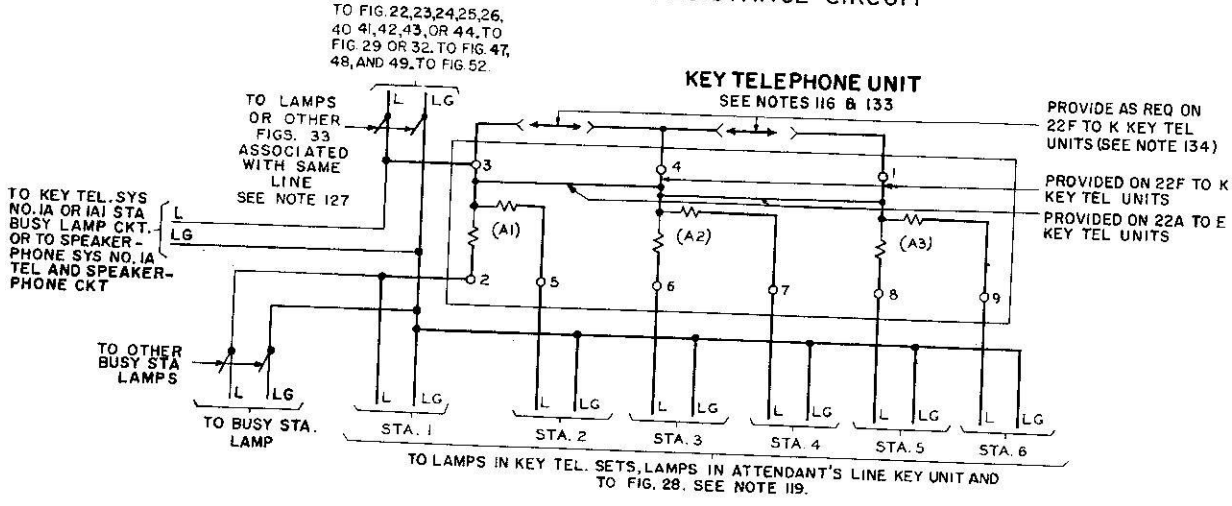


FIG. 33
LAMP RESISTANCE CIRCUIT



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C9

BELL TELEPHONE LABORATORIES
INCORPORATED

DWG SIZE 3S

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DRAWING ISSUE 18D

FIG. 30
15-25V. AC SUPPLY
SEE NOTE 128

(D), KS-5714, L1(MD) OR L3 TRANSFORMER 1AMP.
(E), KS-5714, L2 TRANSFORMER 2 AMPS.

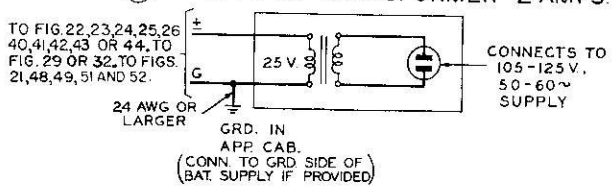


FIG. 31
9-11V. AC SUPPLY
SEE NOTE 128

393A (MD) OR 393B TRANSFORMER

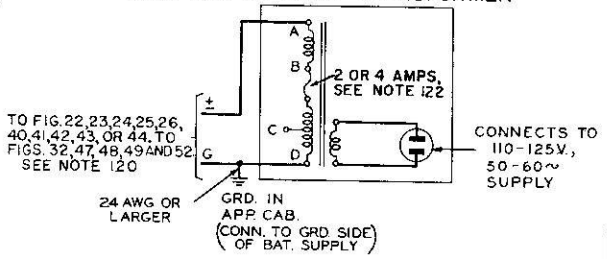
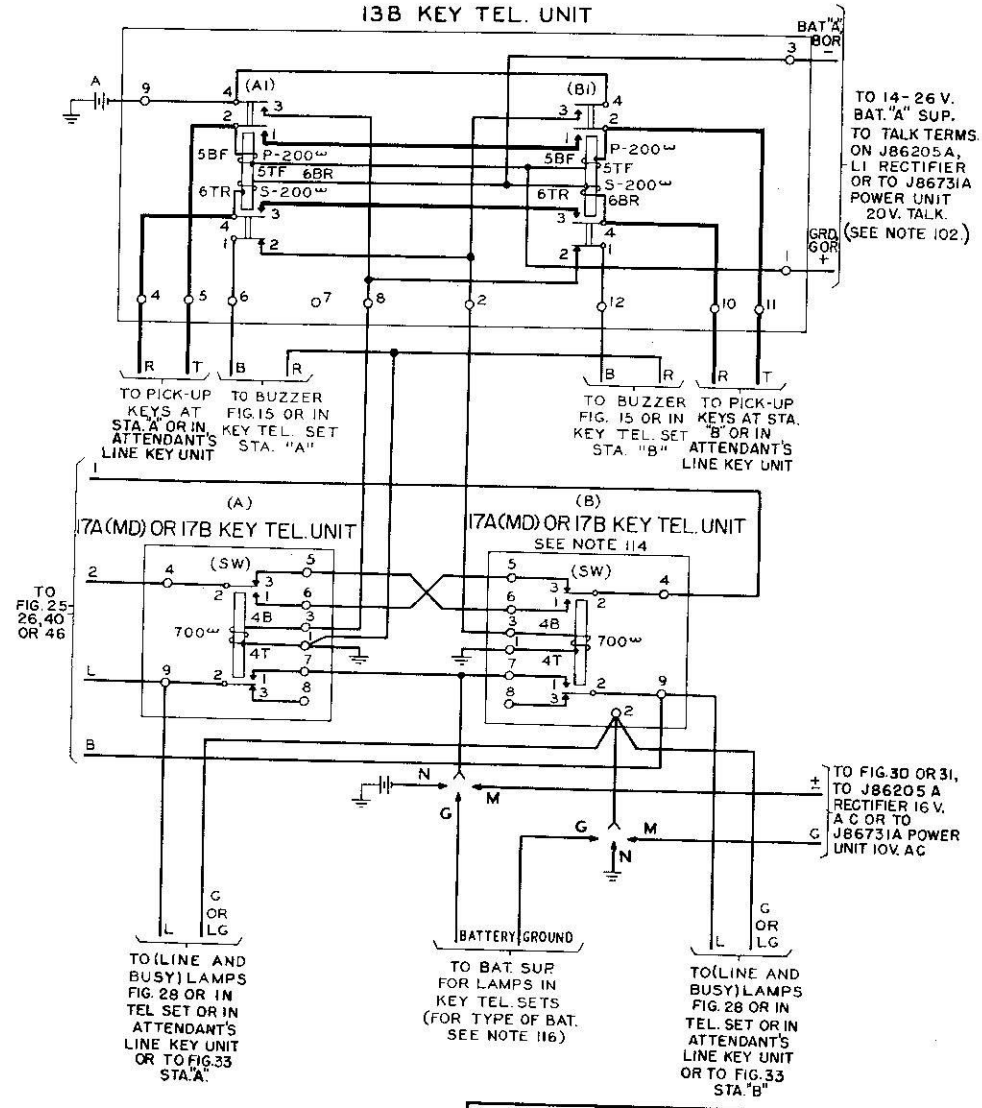


FIG. 32 (MFR DISC.)
INTERCOMMUNICATING LINE CIRCUIT
2-WAY AUTOMATIC SIGNALING
WITH COMBINED LINE AND BUSY LAMPS



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C10

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

PRINTED IN U. S. A.

FIG. 39
AUTOMATIC CUT-OFF CONTROL CIRCUIT

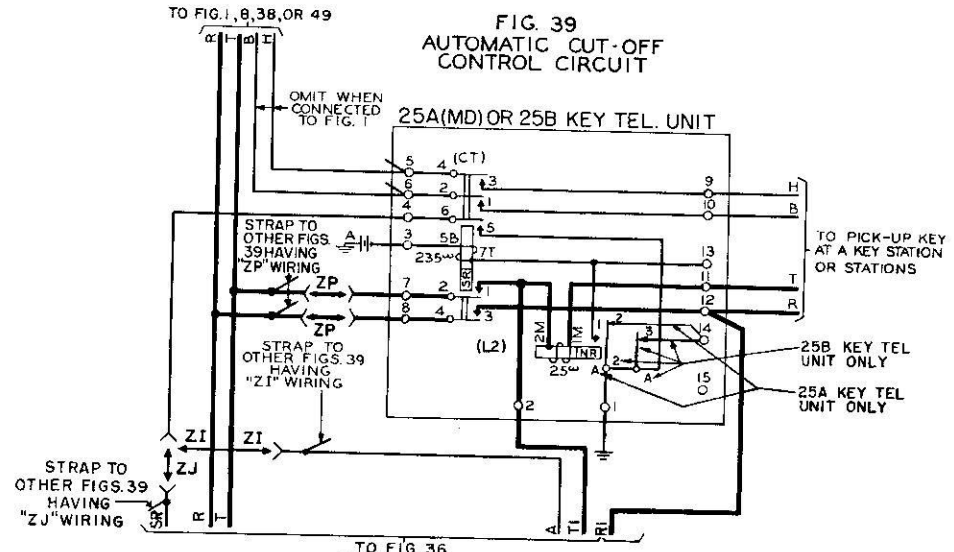


FIG. 36
AUTOMATIC CUT-OFF CIRCUIT

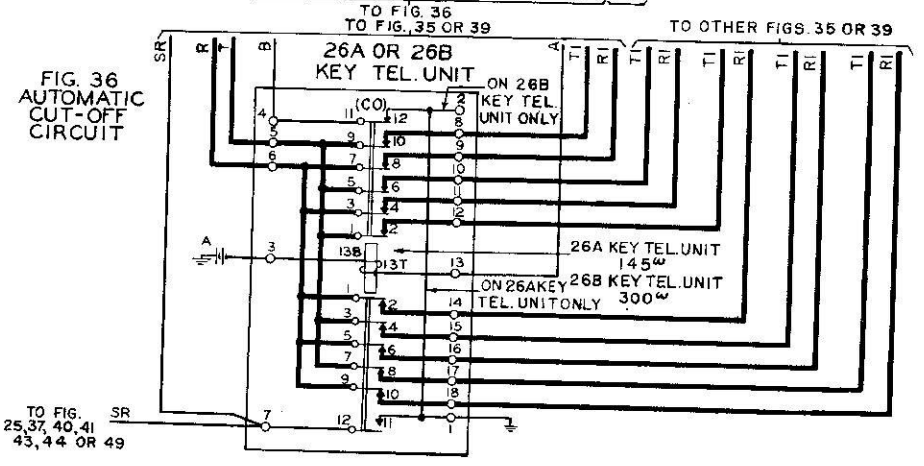


FIG. 37
RELEASE OF RINGUP RELAY AND BUSY LAMP CONTROL CIRCUIT

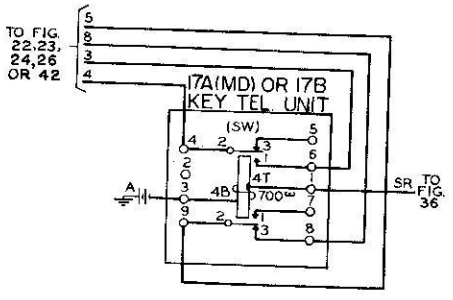
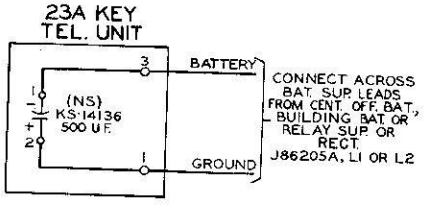


FIG. 34
NOISE SUPPRESSION CIRCUIT FOR BATTERY SUPPLY



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C11

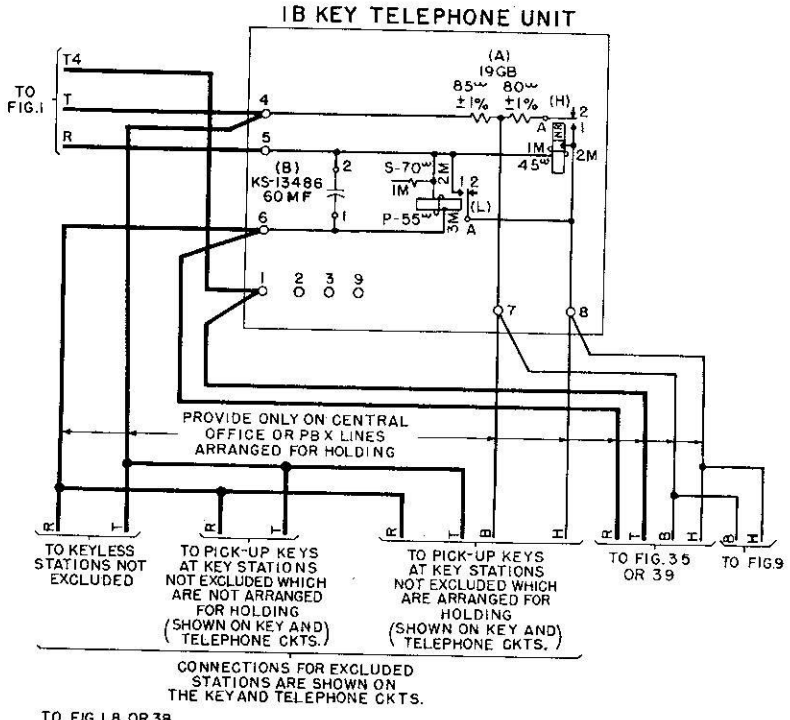
BELL TELEPHONE LABORATORIES INCORPORATED

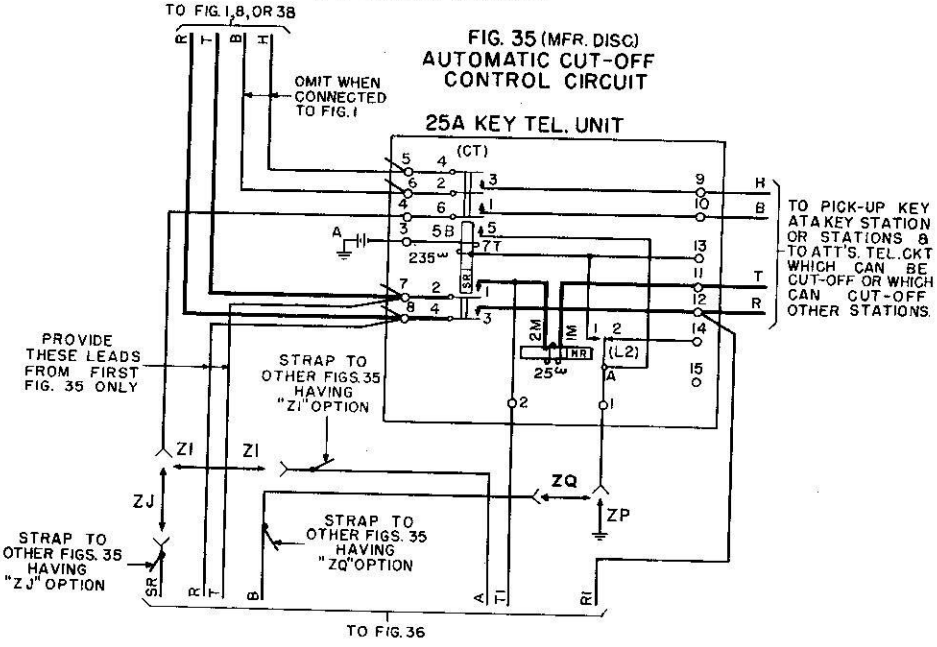
DWG SIZE 3S

PRINTED IN U. S. A.

DRAWING ISSUE
18D ST/A -

FIG. 38
HOLD CIRCUIT
SEE NOTE 126





KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C12

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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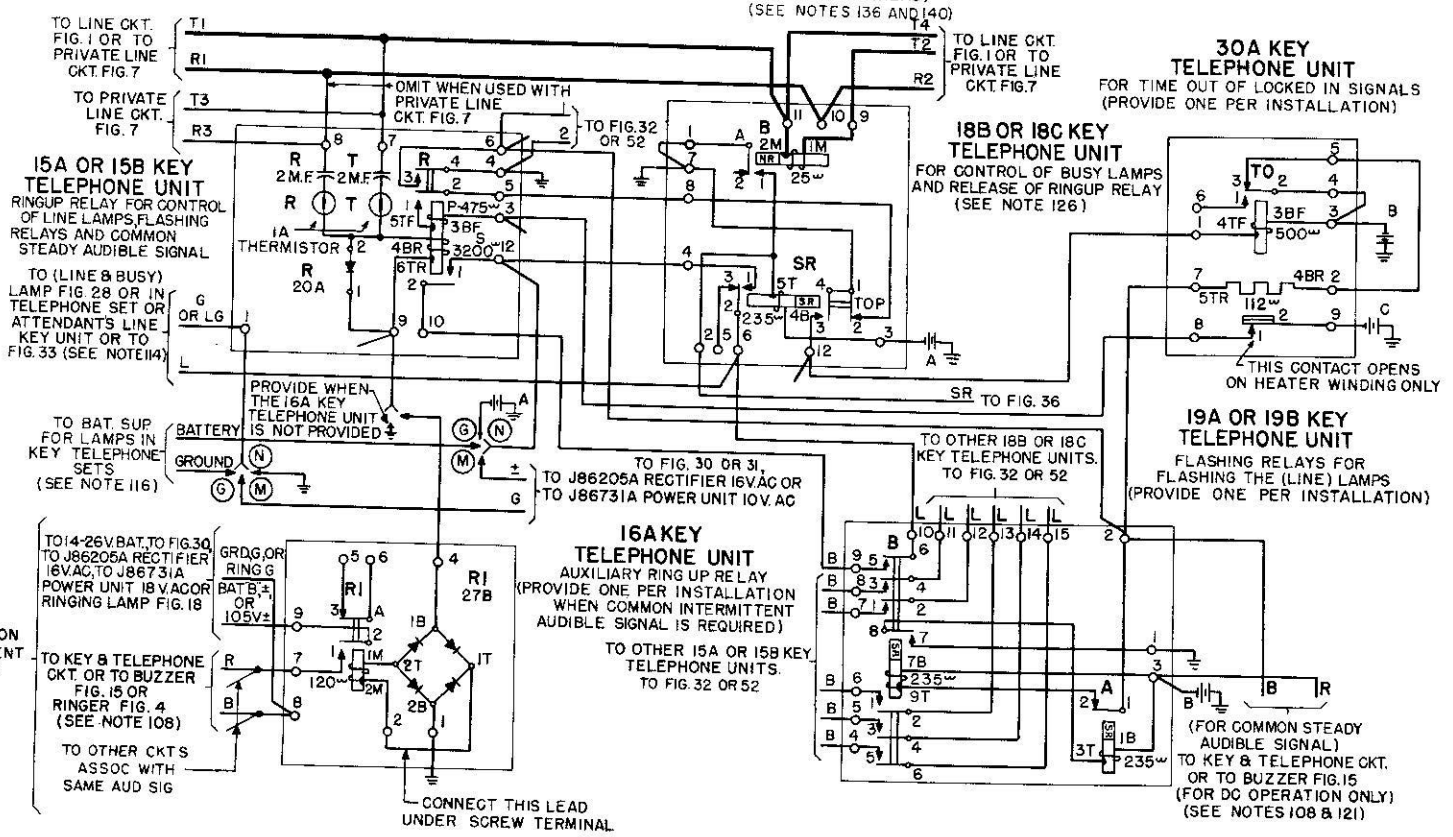
FIG. 40 (MFR. DISC.)
SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL
ARRANGED FOR TIME OUT OF LOCKED-IN SIGNALS
(FOR DIAL AREAS)
(SEE NOTES 136 AND 140)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

3S

SD-69091-01-C13

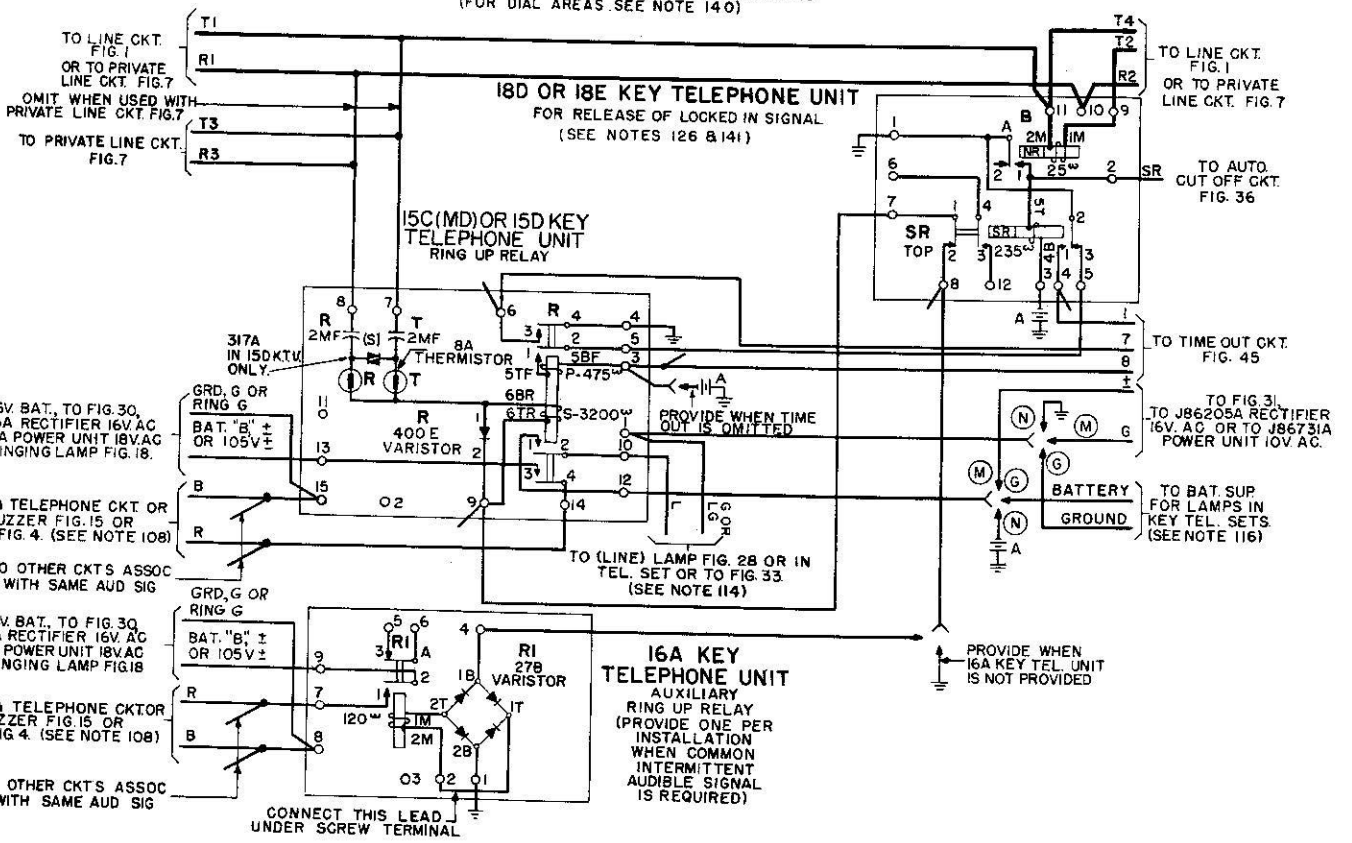
DRAWING ISSUE 18D

FIG. 41

SIGNAL CIRCUIT FOR CONTROLLING LOCKED-IN LINE LAMPS ONLY AND COMMON AUDIBLE SIGNAL

ARRANGED FOR TIME OUT OF LOCKED IN SIGNALS

(FOR DIAL AREAS SEE NOTE 140)



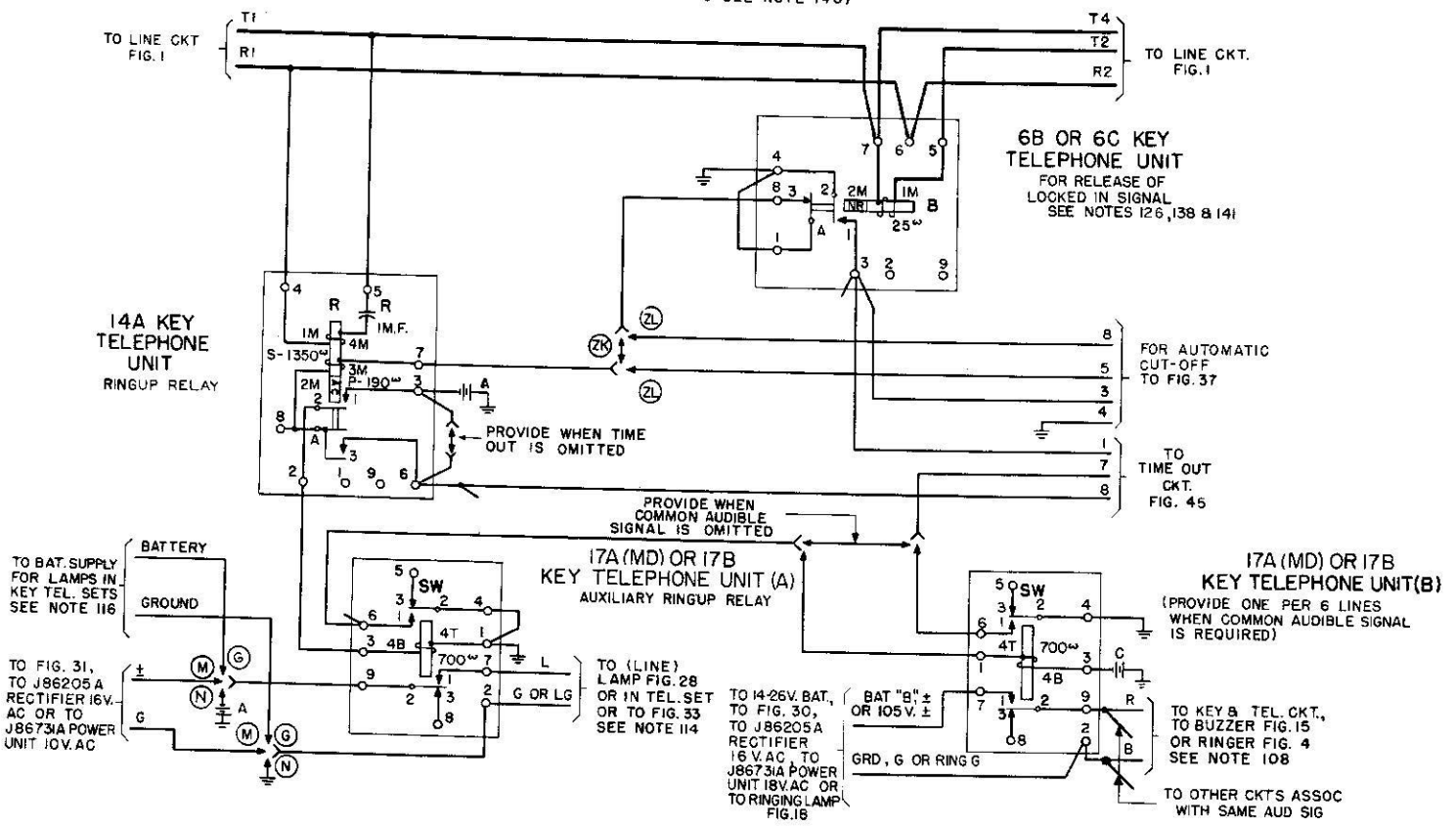
BELL TELEPHONE LABORATORIES (INCORPORATED)	KEY TELEPHONE SYSTEM NO. 1A LINE AND SIGNALING CIRCUIT
3S	SD-69091-01-C14

DRAWING ISSUE	18D	19D
	-	

FIG. 42

SIGNAL CIRCUIT FOR CONTROLLING LOCKED IN LINE LAMPS ONLY AND COMMON AUDIBLE SIGNAL

ARRANGED FOR TIME OUT OF LOCKED-IN SIGNALS
(FOR MANUAL AREAS SEE NOTE 140)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

DWG SIZE 3S

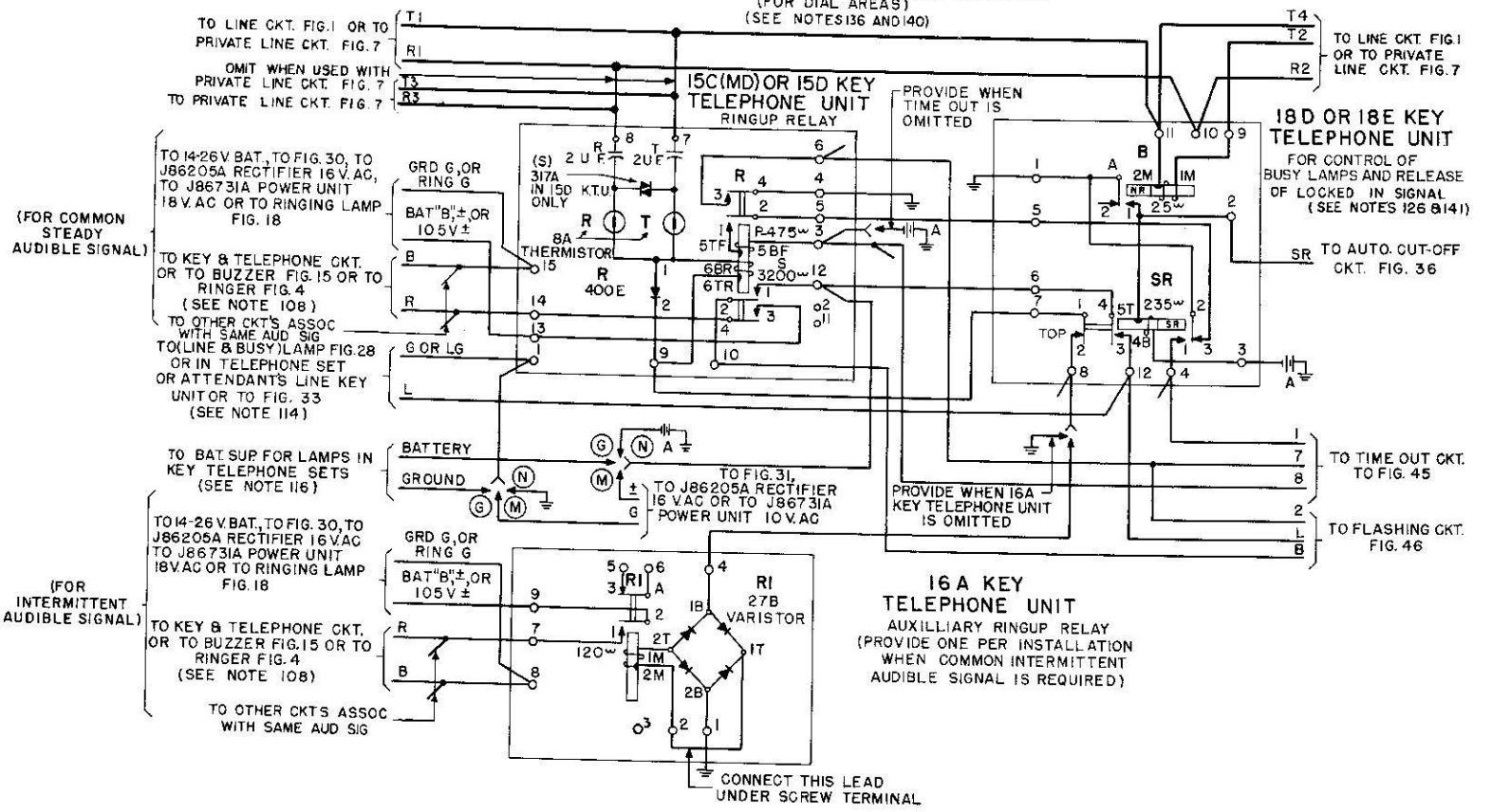
SD-69091-01-C15

PRINTED IN U.S.A.

DRAWING ISSUE
18D
19D

FIG. 43
SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

ARRANGED FOR TIME OUT OF LOCKED IN SIGNALS
(FOR DIAL AREAS)
(SEE NOTES 136 AND 140)



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

TYPE SET 3S

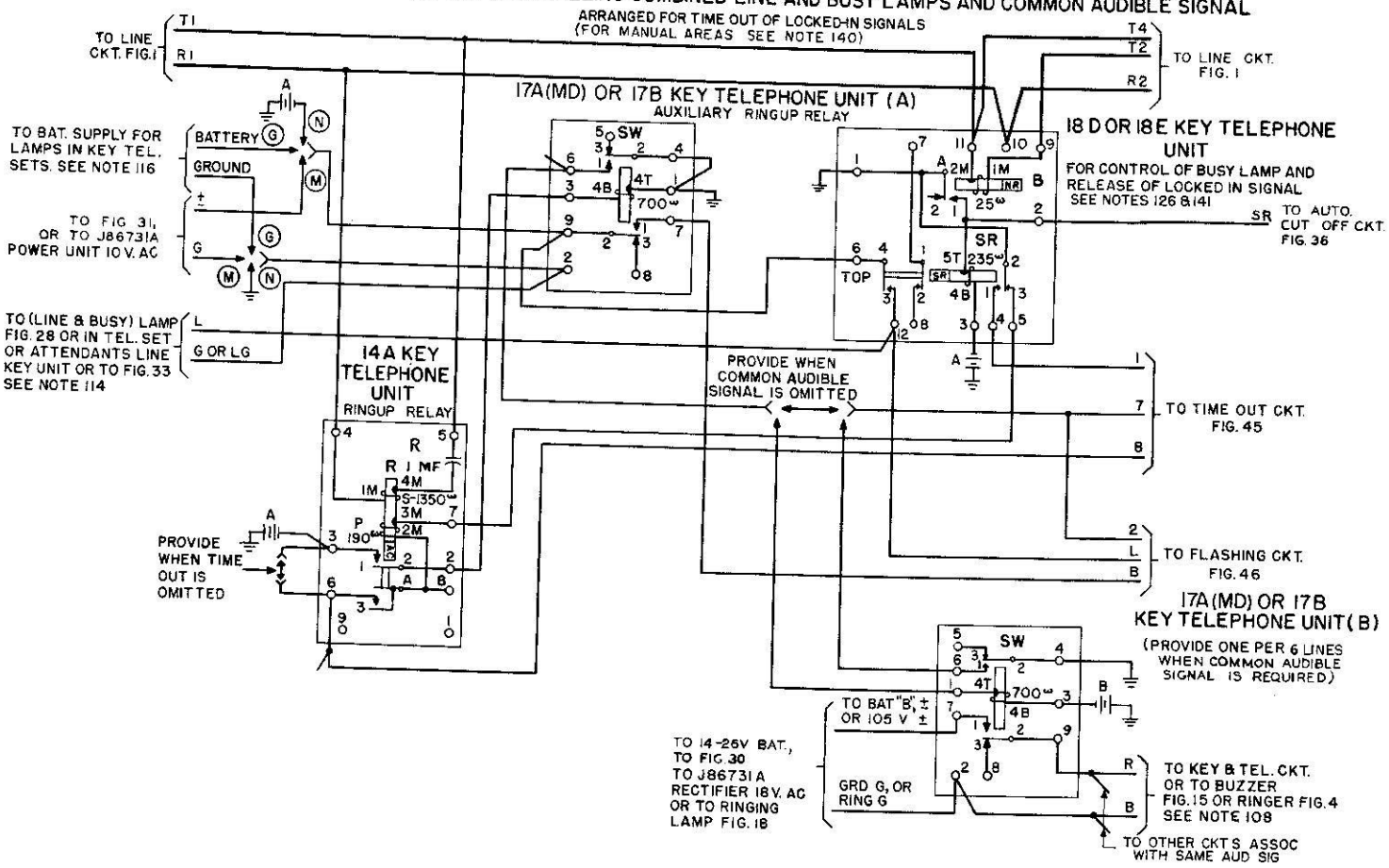
SD-69091-01-C16

PRINTED IN U.S.A.

DRAWING ISSUE 18D ISSUE - 191 CD

FIG. 44

SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL



BELL TELEPHONE LABORATORIES INCORPORATED

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

DWG SIZE 3S

SD-69091-01-C17

PRINTED IN U.S.A.

DRAWING ISSUE 18D 19D

DRAWING ISSUE	
18D	K7%
19D	

FIG. 45
TIME-OUT CKT.

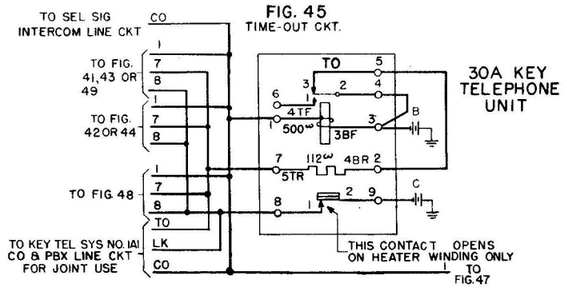


FIG. 46
FLASHING CKT.

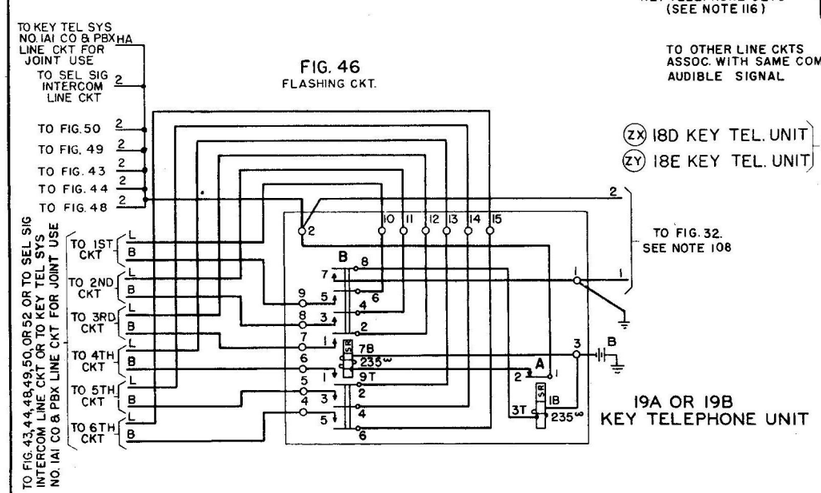


FIG. 47
INTERCOMMUNICATING LINE CIRCUIT.
ARRANGED TO STOP TIME-OUT CIRCUIT.

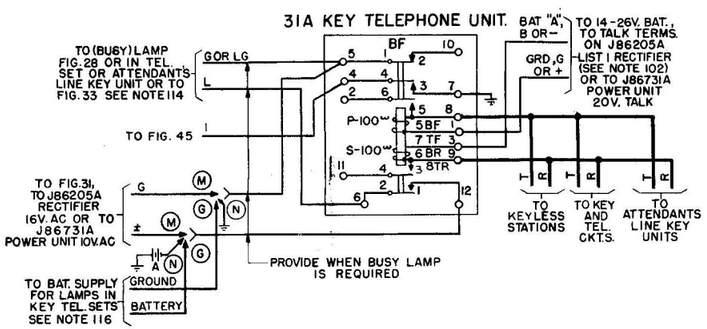
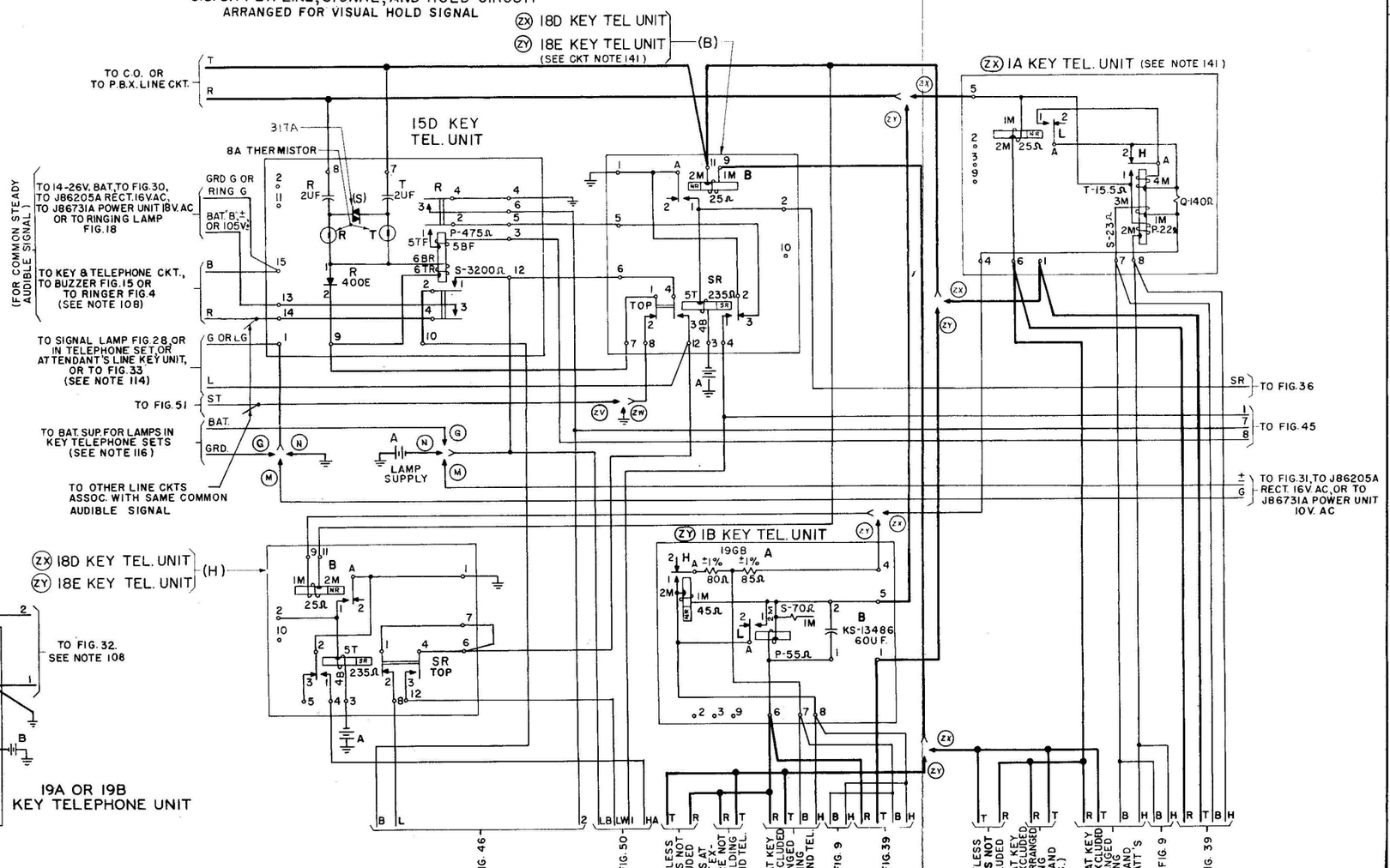


FIG. 49
C.O. OR PBX LINE, SIGNAL, AND HOLD CIRCUIT
ARRANGED FOR VISUAL HOLD SIGNAL



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C18

BELL TELEPHONE LABORATORIES INCORPORATED

DWG. SIZE 6S

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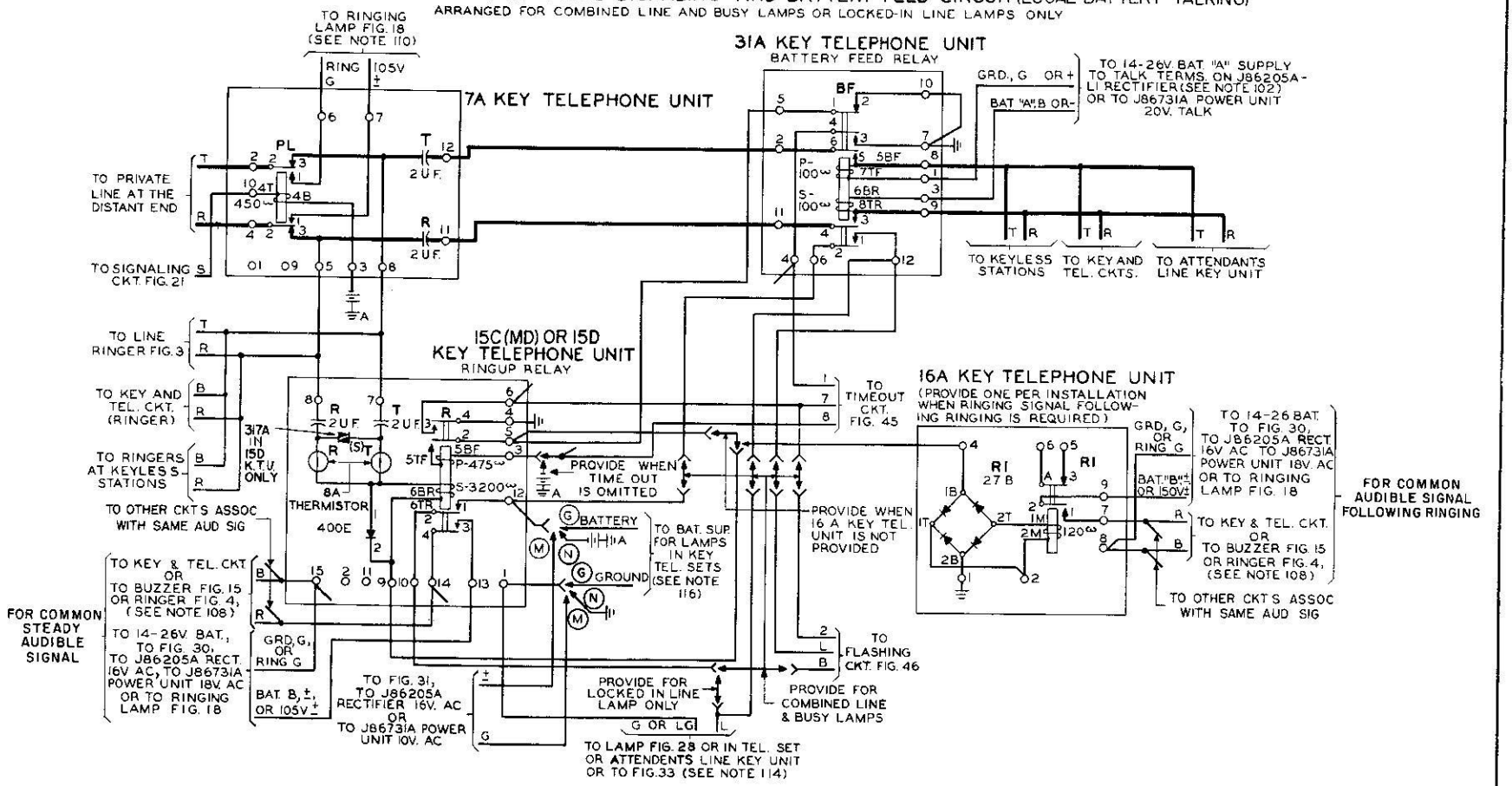
FIG. 48

PRIVATE LINE SIGNALING AND BATTERY FEED CIRCUIT (LOCAL BATTERY TALKING)

ARRANGED FOR COMBINED LINE AND BUSY LAMPS OR LOCKED-IN LINE LAMPS ONLY



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KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SIZE 3S

SD-69091-01-C19

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DRAWING ISSUE 18D 5TH

FIG. 50
WINKING CIRCUIT

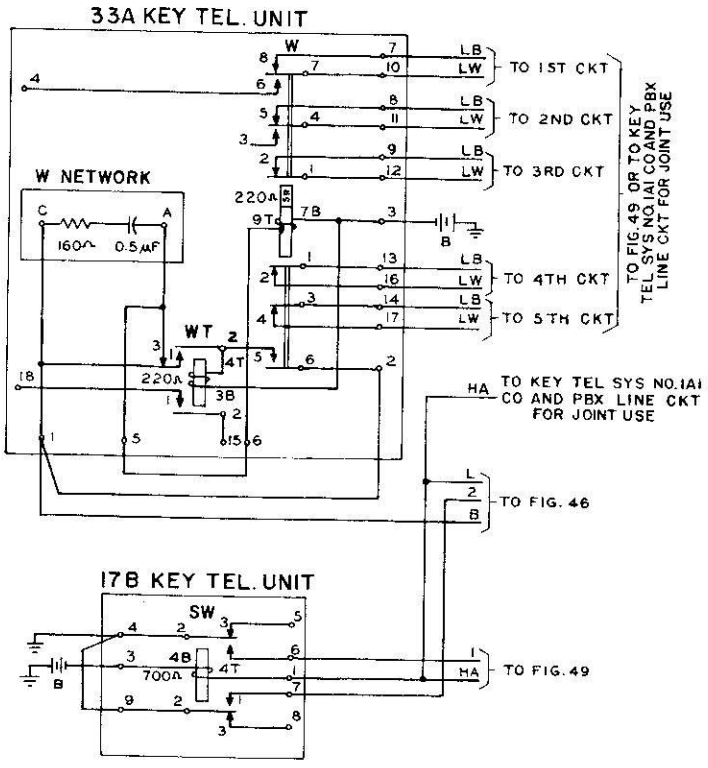
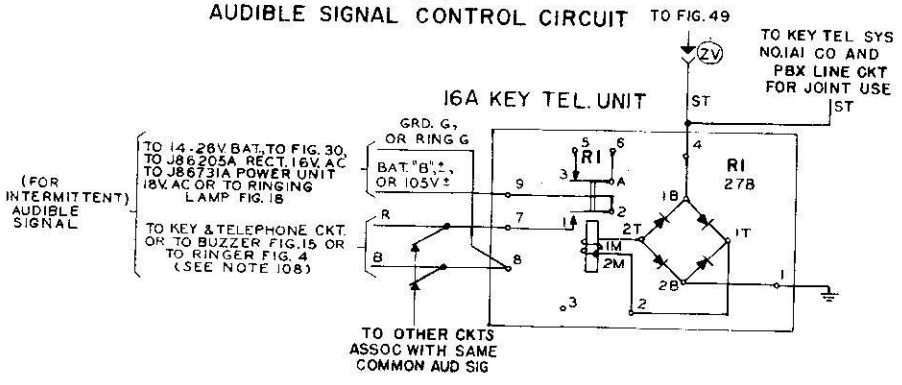


FIG. 51
AUDIBLE SIGNAL CONTROL CIRCUIT



KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

SD-69091-01-C20

BELL TELEPHONE LABORATORIES
INCORPORATED

DWG SIZE 3S

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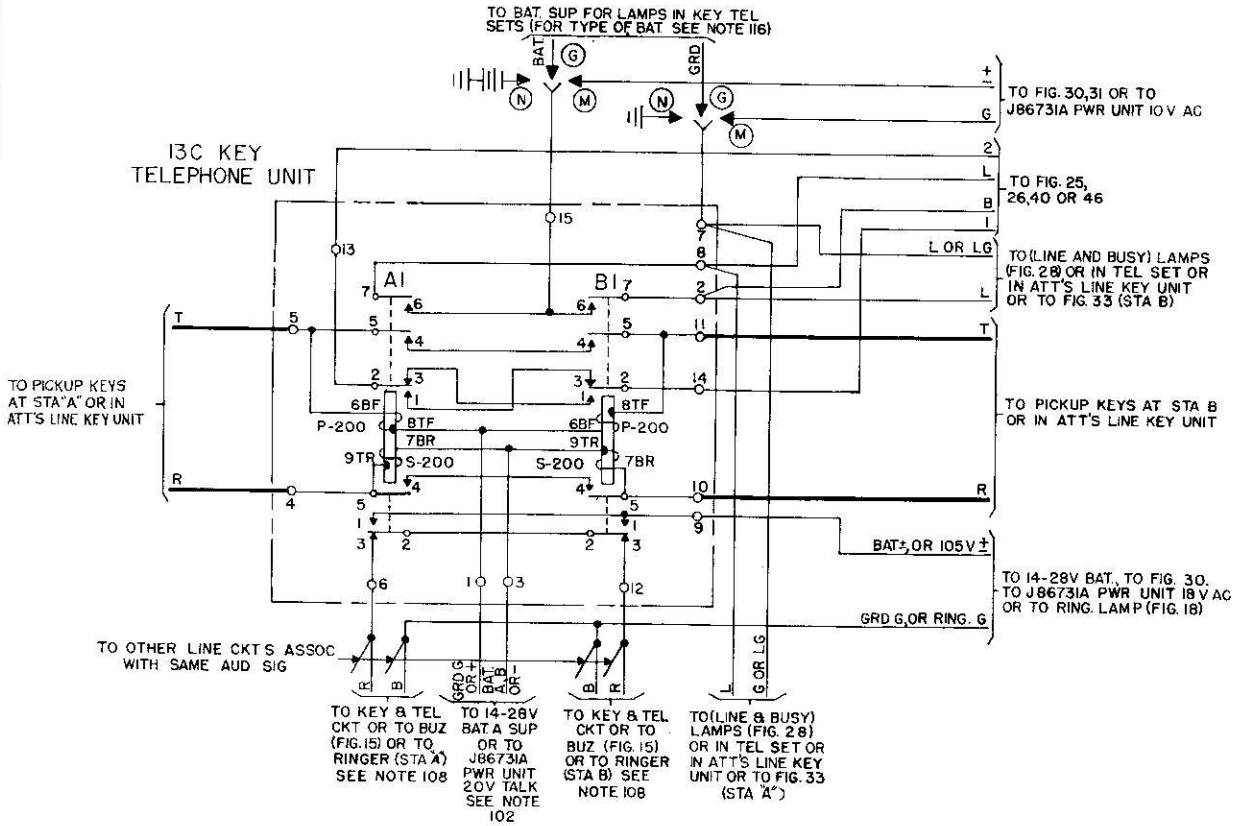
DRAWING ISSUE
18D

FIG. 52
INTERCOMMUNICATING LINE CIRCUIT 2-WAY AUTOMATIC SIGNALING WITH COMBINED LINE AND BUSY LAMPS



KEY TELEPHONE SYSTEM NO. 1A LINE AND SIGNALING CIRCUIT	SD-69091-01-C21
BELL TELEPHONE LABORATORIES INCORPORATED	DWG SIZE 3S

SD-69091-01 3 PAGES

CIRCUIT REQUIREMENTS

KEY TELEPHONE SYSTEM NO. 1A, LINE AND SIGNALING CKT

DRAWING ISSUE 18D 12TH

APPARATUS DESIG	APPARATUS CODE	APPARATUS OPTION	APPARATUS FIG.	MECH REQT BSP FIG.	MECH REQT CONT PRESS.	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																	
1A KEY TEL UNIT																	
H	B1158		8, 49	14		30		TIP LEAD	TERM. 8	M	1,2	P	0		20	19	
									TERM. 8	M	2	P	NO		13.4	14.1	
									TERM. 8	M	2	P	R		9.3	9.8	
								TERM. 7	RING LEAD	M	3	S	0		20		
							2(H)	1(L)		M	3	T	0		20		
L	B1159		8, 49	14		30		TERM. 4	TERM. 6	M	5		0		8.7	8.2	
								TERM. 4	TERM. 6	M	5		R		3.9	4.1	
1B KEY TEL UNIT																	
H	B1182		38, 49	14		30		TIP LEAD	TERM. 8	M	1,2		0		10.3	9.8	
									TERM. 8	M	2		NO		6.8	7.2	
									TERM. 8	M	2		R		4.7	5	
L	B1175		38, 49	8		30		TERM. 4	TERM. 6	M	5		0		4.2	4	
								TERM. 4	TERM. 6	M	5		R		1.9	2.1	
3A KEY TEL UNIT																	
S	U650		10	123/123	H	29			TERM. 2	GRD			0		10.3	9.8	
4A KEY TEL UNIT																	
AL	B612		12	3		30			TERM. 4	GRD		P/S	0		20	19	WDG IN PARALLEL
									TERM. 4	GRD		P/S	R		7.5	7.9	
BL	B1157		12	3		30			TERM. 5	GRD	4		0		15	14.2	
									TERM. 5	GRD	4		R		6.8	7.2	
5A KEY TEL UNIT																	
L1	B1160		9	7		35		TERM. 7	TERM. 5	M			0		11.1	10.5	
								TERM. 7	TERM. 5	M			R		4.7	5	
6A KEY TEL UNIT																	
B	B1159		6	14		30		TERM. 5	TERM. 6	M			0		20	19	
								TERM. 5	TERM. 6	M			NO		13.4	14.2	
6B OR 6C KEY TEL UNIT																	
B	B1176		2223 24, 26, 42	9		30		TERM. 5	TERM. 6	M	7		0		20.5	19.5	
								TERM. 5	TERM. 6	M	7		NO		13.8	14.6	
								TERM. 5	TERM. 6	M	8		0		8.7	8.2	
								TERM. 5	TERM. 6	M	8		R		3.9	4.1	
7A KEY TEL UNIT																	
PL	U423		7,48	132/132	H	47			TERM. 10	GRD			0		19	18	
9A KEY TEL UNIT																	
R	D-157175		5	101/101	H	SPL		38(R)		BAT.	6		0		4.9	4.6	
											9		0		AC	AC	ARM. TRVL 23
13A AND 13B KEY TEL UNIT																	
A1	U1056		2029 32	111/110	H	35	(B1)NO	TERM. 5	TERM. 4	M		P/S	0		20	19	
							(B1)NO	TERM. 5	TERM. 4	M		P/S	H		17	16	
B1	U1056		2029 32	111/110	H	35	(A1)NO	TERM. 11	TERM. 10	M		P/S	0		20	19	
							(A1)NO	TERM. 11	TERM. 10	M		P/S	H		17	16	
13C KEY TEL UNIT																	
A1	UA145		52	145/108	SPL	SPL	(B1)NO	TERM. 5	TERM. 4	M	10	P/S	0		20.5	19.5	ARM. TRVL 38
							(B1)NO	TERM. 5	TERM. 4	M	10	P/S	H		16.5	15.5	
B1	UA145		52	145/108	SPL	SPL	(A1)NO	TERM. 11	TERM. 10	M	10	P/S	0		20.5	19.5	ARM. TRVL 38
							(A1)NO	TERM. 11	TERM. 10	M	10	P/S	H		16.5	15.5	

TEST NOTES:

1. ADJUST FRONT CONTACT FOLLOW AND SEPARATION AS CLOSE TO THE MIN 5 MILS AS POSSIBLE. TENSION REL SO THAT IT FAILS TO OPERATE ON THE READJ OPERATE CURRENT AND THEN BACK OFF THE ADJUSTING SCREW UNTIL THE REL WILL OPERATE.
2. REMOVE TIP LEAD FROM TERM. 4 (FOR FIG. 49 FROM TERM. 1).
3. REMOVE RING LEAD FROM TERM. 5.
4. REMOVE STRAP BETWEEN TERMS. 7 AND 8.
5. FOR FIG. 49 INSULATE TERM. 1 OF THE (B) REL OF THE 18D OR E KEY TEL UNIT H.
6. DISCONNECT VARISTOR AT TERM. 1.
7. WHEN USED IN THE 6B KEY TEL UNIT.
8. WHEN USED IN THE 6C KEY TEL UNIT.
9. CHECK FOR OPERATION ON AC BY RINGING ON LINE AT CENT. OFF. OR PBX, OR TEST AND READJ BY CONNECTING 95-111V, 1100-1200 RPM RINGING SUPPLY THROUGH A 13C OR EQUIV RES LAMP AND 10,000Ω NONINDUCTIVE RES.
   (A) TO RING OF LINE OR
   (B) TO TIP OF LINE.
10. CONTACTS 2T, 5T, AND 2B MAKE 6 READJ, 4 TEST. MIN SPRING TENSION (2T AND 2B) 10 GRAMS READJ, 8 GRAMS TEST.

(3 PAGES) PAGE 1

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CKT

SD-69091-01-01

BELL TELEPHONE LABORATORIES INCORPORATED 3S

PRINTED IN U. S. A.

CIRCUIT REQUIREMENTS

DRAWING ISSUE 180 LTR -

APPARATUS DESIG	APPARATUS CODE	APPARATUS OPTION	APPARATUS FIG.	MECH REQT BSP FIG.	MECH REQT CONT PRESS.	MECH REQT ARM. TRVL	CIRCUIT PREPARATION BLOCK OR INSULATE	CIRCUIT PREPARATION TEST CLIP DATA CONN BAT.	CIRCUIT PREPARATION TEST CLIP DATA CONN GRD	TEST SET PREP	SEE TEST NOTE	DIRECT CURRENT FLOW REQT TEST WDG	DIRECT CURRENT FLOW REQT TEST FOR	DIRECT CURRENT FLOW REQT AFTER SOAK MA.	DIRECT CURRENT FLOW REQT TEST MA.	DIRECT CURRENT FLOW REQT READJ MA.	REMARKS
14A KEY TEL UNIT																	
R	J23		2224	5		23			TERM. 7	GRD	1	P	O		38		
			2642								2	S	O		AC	AC	
			44					TERM. 4	4M(R)	B/G	3	S	NO		7.2	7.6	
15A KEY TEL UNIT																	
R	U904		2223	111/101	H	SPL			5TF(R)	GRD	4,5	P	O		17.5	16.5	ARM. TRVL 23
			2540								5,8	S	O		AC	AC	
15B KEY TEL UNIT																	
R	UA63		2223	111/101	H	SPL			5TF(R)	GRD	4,5	P	O		18	17	ARM. TRVL 23
			2540								5,8	S	O		AC	AC	
15C OR 15D KEY TEL UNIT																	
R	UA57		2241	111/111	H	SPL			5TF(R)	GRD	4,5	P	O		18	17	ARM. TRVL 23
			4348								5,8	S	O		AC	AC	
			49														
16A KEY TEL UNIT																	
R1	B617		2325	9		30					6		O		5.8	5.5	
			4041								6		R		1.9	2	
			43,					TERM. 4	TERM. 1	B/G	7				6.1	5.8	
			48,					TERM. 4	TERM. 1	B/G	7				1.9	2.0	
			51								8		O		AC	AC	
17A KEY TEL UNIT																	
SW	U735		2632	132/132	H	47			TERM. 1	GRD	9		O		17	16	
			3742					TERM. 3		BAT.	10		O		17	16	
			44														
17B KEY TEL UNIT																	
SW	UA14		2732	132/132	H	47			TERM. 1	GRD	9		O		12.6	12	
			3742					TERM. 3		BAT.	10		O		12.6	12	
			4450														
18A KEY TEL UNIT																	
B	B1159		25	14		30		TERM. 9	TERM. 10	M			O		8.7	8.2	
								TERM. 9	TERM. 10	M			R		3.9	4.1	
								TERM. 9	TERM. 10	M	11		O		20	19	
								TERM. 9	TERM. 10	M	11		NO		13.4	14.2	
SR	Y169		25	188/175	SPL	SPL			5T(SR)	GRD	12,13		O	FS	44.5	42	ARM. TRVL 41
									5T(SR)	GRD	13		H	FS	5.6	5.3	
									5T(SR)	GRD	13		R	FS	1.9	2.5	
18B OR 18C KEY TEL UNIT																	
B	B1159		25,	14		30		TERM. 9	TERM. 10	M			O		8.7	8.2	
			40					TERM. 9	TERM. 10	M			R		3.9	4.1	
								TERM. 9	TERM. 10	M	11		O		20	19	
								TERM. 9	TERM. 10	M	11		NO		13.4	14.2	
SR	Y169		25,	188/175	SPL	SPL			5T(SR)	GRD	12,13		O	FS	44.5	42	ARM. TRVL 41
			40						5T(SR)	GRD	13		H	FS	5.6	5.3	
									5T(SR)	GRD	13		R	FS	1.9	2.5	

TEST NOTES:

1. CONNECT DIRECT BAT. TO TERM. 4 & REMOVE UNSOLDERED CONN FROM TERM. 7.
2. TEST FOR AC OPR BY RINGING FROM CENT. OFF. OR PBX.
3. REMOVE TIP & RING LEADS FROM TERMS. 4 & 5.
4. CONNECT BAT. TO TERM. 3 WHEN THE 15-TYPE KEY TEL UNIT IS USED IN FIG. 22, OR WHEN TIME OUT IS USED.
5. ARM. TRVL 23 REMOVE UNSOLDERED CONN FROM TERM. 5.
6. WINDING ONLY.
7. WINDING IN PARALLEL WITH 27B VARISTOR.
8. TEST AND READJ THE (R) AND (R1) REL FOR OPERATION ON AC BY RINGING ON THE LINE AT THE CENT. OFF. IF THE LINE TERMINATES IN A PBX, IT SHOULD BE CONNECTED TO A CENT. OFF. TRK FOR THIS TEST BY MEANS OF A PBX CORD WITH THE NIGHT & THRU DIAL KEY OPERATED OR BY APPLYING MIN 95V (1100-1200 RPM) IN SERIES WITH A 13C OR EQUIVALENT RES LAMP & A 7000Ω NONIND RES TO THE LINE SIDE OF THE (T) OR (R) COND WHILE THE LINE IS OPENED TOWARD THE CENT. OFF. OR PBX.
9. FOR USE WHERE DIRECT BATTERY IS CONNECTED TO TERM. 3.
10. FOR USE WHERE DIRECT GROUND IS CONNECTED TO TERM. 1 IN FIG. 32. INSULATE 1B & 2B (A1) WHEN TESTING (SW) REL IN (B) KEY TEL UNIT. INS 1B & 2B (B1) WHEN TESTING SW REL IN (A) KTU.
11. WHEN USED IN THE 18A, 18B, OR 18D KEY TEL UNITS.
12. MIN FRONT CONTACT MAKE READJ 6, TEST 4 MIN TENSION 1T & 2B, READJ 10 GRAMS, TEST 8 GRAMS.
13. ADJACENT RELAYS SHALL NOT BE ENERGIZED. SEE BSP.

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CKT

BELL TELEPHONE LABORATORIES INCORPORATED
DWG SIZE 3S
SD-69091-01-D2
PRINTED IN U. S. A.

CIRCUIT REQUIREMENTS

DRAWING ISSUE 18D 17TH

APPARATUS DESIG	APPARATUS CODE	APPARATUS OPTION	FIG.	MECH REQT BSP FIG.	MECH REQT CONT PRESS.	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
18D OR 18E KEY TEL UNIT																	
B	B1159		41, 43, 44, 49	14		30		TERM. 9	TERM. 10	M	1,6		O		8.7	8.2	
								TERM. 9	TERM. 10	M	1,6		R		3.9	4.1	
								TERM. 9	TERM. 10	M	2,6		O		20	19	
								TERM. 9	TERM. 10	M	2,6		NO		13.4	14.2	
SR	Y169		41,43 44, 49	188/175	SPL	SPL			5T(SR)	GRD	3,4		O	FS	44.5	42	ARM. TRVL 41
									5T(SR)	GRD	4		H	FS	5.6	5.3	
									5T(SR)	GRD	4		R	FS	1.9	2.5	
19A KEY TEL UNIT																	
A	Y221		25, 26, 40, 46	131/164	H	SPL			3T(A)	GRD	4,5		O		54	51	ARM. TRVL 59
									3T(A)	GRD	4,5		NO		36	38	
									3T(A)	GRD	4,5		H		4.1	3.8	
									3T(A)	GRD	4,5		R		1.9	2.5	
B	Y222		25, 26, 40, 46	109/123	SPL	29	(A)NO, 7T(B)		TERM. 2	GRD	4,7,8		O	FS	48.5	46	
									TERM. 2	GRD	4		NO	FS	32	34	
									TERM. 2	GRD	4		H	FS	8.3	7.9	
									TERM. 2	GRD	4		R	FS	1.5	1.6	
19B KEY TEL UNIT																	
A	Y221		25, 26, 40, 46	131/164	H	SPL			3T(A)	GRD	4,9		O		54	51	ARM. TRVL 59
									3T(A)	GRD	4,9		NO		36	38	
									3T(A)	GRD	4,9		H		4.1	3.8	
									3T(A)	GRD	4,9		R		1.9	2.5	
B	Y284		25, 26, 40, 46	212/123	SPL	29	(A)NO, 7T(B)		TERM. 2	GRD	4,8,10		O	FS	49.5	47	
									TERM. 2	GRD	4		NO	FS	33	35	
									TERM. 2	GRD	4		H	FS	8.3	7.9	
									TERM. 2	GRD	4		R	FS	2	2.6	
20A KEY TEL UNIT																	
AU	B94 OR B10		24, 26	1		30		TERM. 4		BAT.			O		29	27.5	
								TERM. 4		BAT.			R		6.9	7.3	
25A KEY TEL UNIT																	
CT	Y315		35, 39	238/190	H	29			7T(CT)	GRD	4		O	FS	31	29.5	
									7T(CT)	GRD	4		H	FS	5.7	5.4	
									7T(CT)	GRD	4		R	FS	1.5	2.1	
L2	B1159		35, 39	14		30	(CT)NO, (CO)O	TERM. 11	TERM. 2	B/G			O		8.7	8.2	
								TERM. 11	TERM. 2	B/G			R		3.9	4.1	
25B KEY TEL UNIT																	
CT	Y315		39	238/190	H	29			TERM. 13	GRD	4		O	FS	31	29.5	
									TERM. 13	GRD	4		H	FS	5.7	5.4	
									TERM. 13	GRD	4		R	FS	1.5	2.1	
L2	B1176		39	9		30		TERM. 11	TERM. 12	M			O		8.7	8.2	
								TERM. 11	TERM. 12	M			R		3.9	4.1	
26A KEY TEL UNIT																	
CO	U324		39	125/124	H	62			TERM. 13	GRD			O		63	60	
26B KEY TEL UNIT																	
CO	UA123		39	125/124	H	62			TERM. 13	GRD			O		35	33	
30A KEY TEL UNIT																	
TO	271A		40,45	132/1	H	47			TERM. 1	GRD	11		O		16.5	15.5	
31A KEY TEL UNIT																	
8F	UA130		47,48	120/111	H	35		TERM. 8	TERM. 9	M		P/S	O		23	21.5	
33A KEY TEL UNIT																	
W	Y318		50	219/201	H	50	3T(WT)		T(W)	GRD			O	42	29	27.5	
							3T(WT)		T(W)	GRD			H	42	7.3	6.9	
							3T(WT)		T(W)	GRD			R	42	1.5	1.9	
WT	UA76		50	106/101	H	44	3T(WT)		T(WT)	GRD			O		19	18	
							3T(WT)		T(WT)	GRD			NO		10.8	11.4	

TEST NOTES:

1. WHEN USED IN THE 18C OR 18E KEY TEL UNIT.
2. WHEN USED IN THE 18A, 18B, OR 18D KEY TEL UNITS.
3. MIN FRONT CONTACT MAKE READJ 6, TEST 4 MIN TENSION IT & 2B, READJ 10 GRAMS, TEST 8 GRAMS.
4. ADJACENT RELAYS SHALL NOT BE ENERGIZED. SEE BSP.
5. WHEN THE 19A KEY TEL UNIT IS USED IN FIG. 26 CONN DIRECT BAT. TO TERM. 3 AND BLOCK (B) REL NO.
6. FOR FIG. 49 CONN GRD TO TERM. 5 OF THE 1A OR 1B KEY TEL UNIT INSTEAD OF TO TERM. 10 OF THE 18D OR E KEY TEL UNIT.
7. FRONT CONTACT MAKE 6 READJ, 4 TEST.
8. REMOVE LEAD TO BUZZER FROM TERM. 2 WHEN THE 19A OR 19B KEY TEL UNIT IS USED. IN FIG. 26 CONNECT DIRECT BAT. TO TERM. 3 AND REMOVE THE GRD LEAD FROM TERM. 2.
9. WHEN THE 19B KEY TEL UNIT IS USED IN FIG. 26 CONN DIRECT BAT. TO TERM. 3 AND BLOCK (B) REL NO.
10. FRONT CONTACT MAKE 6 READJ , 4 TEST.
11. BLOCK (TO) RELAY OPERATED FOR 5 MINUTES BEFORE TESTING HEATER WINDING. RELEASE (TO) RELAY AND APPLY DIRECT GROUND TO TERM. 7. HEATER SHALL OPEN 1-2 CONTACTS IN NOT LESS THAN 20 SEC MAX TENSION OF 2B -30 GRAMS.

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CKT

SD-69091-01-03

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