

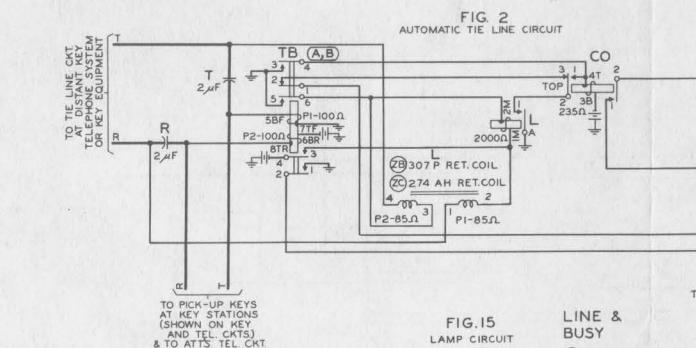


FIG.15
LAMP CIRCUIT

FIG. 1, 3, 4, OR 20

TO OTHER FIGS.15 ASSOC. WITH SAME LINE

LINE & BUSY

- (ZD) K2 LAMP
- (ZE) G2 LAMP
- (S) 51A LAMP
- (R) B2 LAMP
- (F) A3 LAMP

SEE NOTE 10

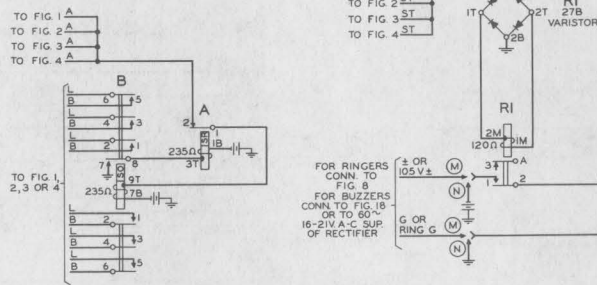


FIG. 7
AUDIBLE SIGNAL CONTROL CIRCUIT

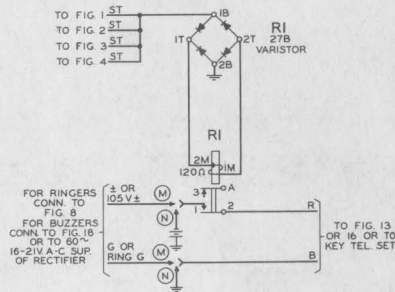
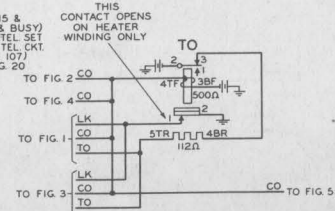


FIG. 17
IC BATTERY CUT-OFF
(TIMEOUT CIRCUIT)



TO FIG. 2 TO FIG. 3 TO FIG. 4

ST1

A 18BJ

1200Ω

FIG. 14
RESISTANCE
CIRCUIT

SD-69136-0101 PRINTED IN U.S.A.

	13-B	12-D	DWG. ISS.
	9-B	8-D	C.D. ISS.

FIGS.	TITLE	LOC.	APPROX. WIRING	LOC.
1	LINE CKT.	-0101	Z	-0102
2	AUTOMATIC TIE LINE CKT.	-0101	Y	-0102
3	RINGDOWN TIE LINE CKT.	-0102	X	-0101
4	STATION LINE CKT.	-0102		-0102
5	INTERCOMMUNICATING CKT.	-0103		W -0110
6	FLASHING CKT.	-0101		
7	AUDIBLE SIGNAL CONTROL CKT.	-0101		V -0110
8	RINGING FEEDER LAMP CKT.	-0102		
9	MANUAL BATTERY CUT-OFF CKT.	-0103	U	-0103
10	INTERCOMMUNICATING SIGNALING CKT.	-0102	T	-0101
11	SIGNALING CKT.	-0102		-0102
12	BUZZER CKT. (INTERCOMMUNICATING)	-0102	S	-0101
13	BUZZER CKT. (COMMON)	-0103	R	-0101
14	RESISTANCE CKT.	-0101	Q	-0109
15	LAMP CKT.	-0101		-0110
16	RINGER CKT. (COMMON)	-0103	P	-0103
17	AUTOMATIC BATTERY CUT-OFF CKT. (TIMEOUT CKT.)	-0101		-0101
18	AC SUPPLY FOR LAMPS IN LAMP INDICATORS AND FOR BUZZERS (15 - 25 V)	-0102	N	-0101
19	AC SUPPLY FOR LAMPS IN TELEPHONE SETS (9-11V)	-0102	M	-0101
20	LAMP RESISTANCE CKT.	-0103		-0102
21	AUTOMATIC CUT-OFF CONTROL CKT.	-0103	L	-0103
22	AUTOMATIC CUT-OFF CKT.	-0103	K	-0103
23	NOISE SUPPRESSION CKT. FOR BATTERY SUPPLY (KEY TEL. UNIT MOUNTED)	-0103	J	-0103
24	NOISE SUPPRESSION CKT. FOR BATTERY SUPPLY (STRIP MOUNTED)	-0103	H	-0103
25	AUTOMATIC CUT-OFF CONTROL CKT.	-0103	F	-0101
51 TO 51 INCL	CROSS CONNECTION DIAGRAMS	-0110	E	-0103
		-0102		-0106
	CKT. NOTES	-0104	D	-0103
		-0105		-0101
	CKT. REQ.	-0106	B	-0102
		-0107		-0106
	FORMULAS	-0108	A	-0101
		-0109		-0106
	FUSING ARRANGEMENTS FOR NO LOCAL BATTERY	-0109	ZA	-0102
	FUSING ARRANGEMENTS FOR DC OPERATION OF LAMPS IN KEY TELEPHONE SETS.	-0110	ZB	-0101
			ZC	-0101
			ZD	-0101
			ZE	-0101
			ZF	-0101
			ZG	-0102
			ZH	-0101
				-0102

OPTIONS USED			
FIG.	APP OR WIRING	LOC.	
1	Z	FIG. 18	
2	Y		
3	X	FIGS. 1, 2, 3 & 4	
4		FIGS. 10, 102, 103	
5	W	106 & 107	
6		108 & 109	
7		110	
8	V	FIGS. 1, 2, 3 & 4	
9	U	FIG. 18	
10		2, 3 & 4	
11	T	FIGS. 1, 2, 3 & 4	
12		2, 3 & 4	
13	S	FIG. 15	
14	R		
15		FIGS. 1, 2, 3 & 4	
16	Q	FIGS. 106, 107 & 108	
17		109	
18		P	FIG. 16
19	N	FIGS. 7, 11, 12 & 13	
20	M	FIG. 25	
21	L	FIGS. 25 & 26	
22	K	FIG. 25	
23	J	FIGS. 25 & 26	
24	H	FIG. 21	
25			
	F	FIG. 15	
	E	FIG. 15	
	D	FIG. 15	
	B	FIG. 2, 3 & 4	
		FIG. 2, 3 & 4	
	A	FIG. 2, 3 & 4	
	ZA	FIG. 18	
	ZB	FIG. 18	
	ZC	FIG. 18	
	ZD	FIG. 15	
	ZE	FIG. 15	
	ZF	FIGS. 1, 8 & 3	
	ZG	FIGS. 1, 8 & 3	
	ZH	FIGS. 1, 8 & 3	

FIG. 3

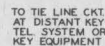
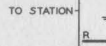


FIG. 4



A-C SUPPLY FOR LAMPS IN LAMP INDICATORS
AND FOR BUZZERS (15-25 V.)
SEE NOTE 106

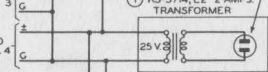


FIG. 19
A-C SUPPLY FOR LAMPS
IN TELEPHONE SETS (9-11 V.)

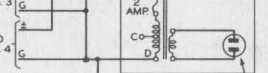


FIG. 10
INTERCOMMUNICATING SIGNALING CIRCUIT
3A KEY TELEPHONE UNIT
PROVIDE WHEN BOTH CODE AND
SELECTIVE SIG. IS REQ. FOR ANY
BUZZER IN AN INSTALLATION



FIG. 8
RINGING FEEDER LAMP CIRCUIT
LIA KEY TELEPHONE UNIT

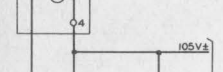


FIG. 12
BUZZER CIRCUIT
(INTERCOMMUNICATING



FIG. 21
AUTOMATIC CUT-OFF CONTROL CIRCUIT
(MFR. DISC.)

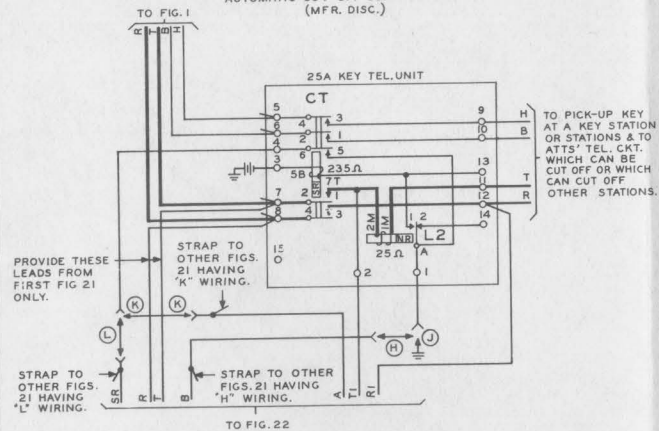


FIG. 22
AUTOMATIC CUT-OFF CIRCUIT

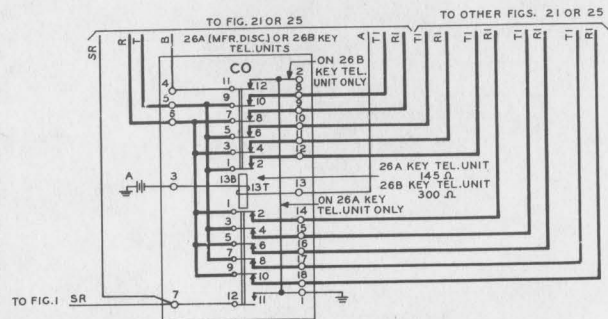


FIG. 13
BUZZER CIRCUIT
(COMMON)

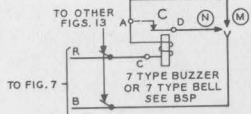


FIG. 16
RINGER CIRCUIT
(COMMON)

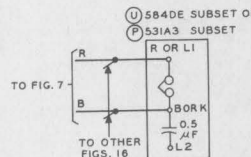


FIG. 9
MANUAL BATTERY
CUT-OFF CIRCUIT

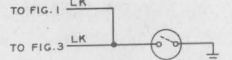


FIG. 5
INTERCOMMUNICATING CIRCUIT
FOR L.P.

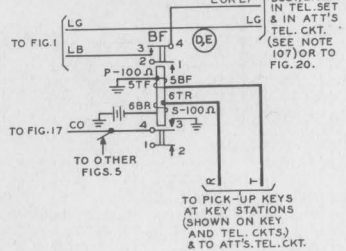


FIG. 20
LAMP RESISTANCE CKT.

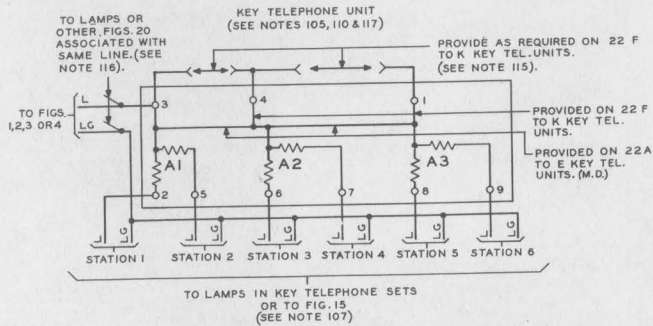


FIG. 25
AUTOMATIC CUT-OFF CONTROL CIRCUIT

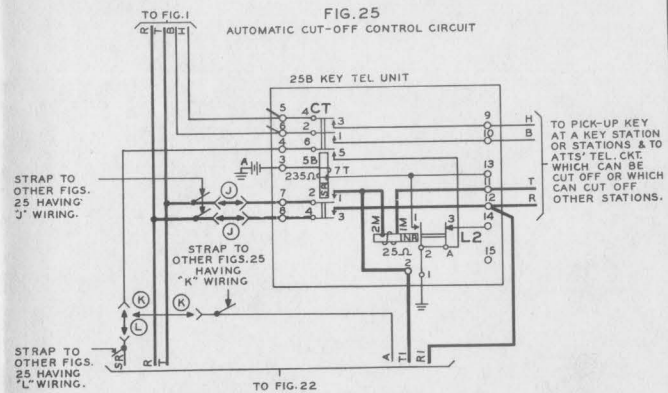


FIG. 23
NOISE SUPPRESSION CIRCUIT
FOR BATTERY SUPPLY
(KEY TEL. UNIT MOUNTED)

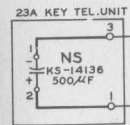


FIG. 24
NOISE SUPPRESSION CIRCUIT
FOR BATTERY SUPPLY
(STRIP MOUNTED)



CIRCUIT NOTES:

101. POWER SUPPLY FOR THE KEY TELEPHONE SYSTEM MAY BE FROM THE J86731A, L1 OR L6 POWER UNIT WHEN A LOCAL RINGING SUPPLY IS NOT REQUIRED, OR L4 WHEN RINGING IS REQUIRED. BATTERY AND GROUND SHALL BE FROM THE "20 V DC TALK" SUPPLY. WHEN THE J86731A POWER UNIT IS NOT SUPPLIED:

- (A) THE DC BATTERY SUPPLY FOR THIS CIRCUIT MAY BE FROM THE CENT. OFF. OVER CABLE PAIR LEADS, BUILDING OR LOCAL BATTERY, OR (ON EXISTING INSTALLATIONS) FROM THE 18V DC TERMINALS OF RECTIFIER J86205A, L1 OR L2. THE RELAY SUPPLY OF THE RECTIFIER MAY BE USED TO SUPPLY BATTERY TO THE WINDINGS OF THE 18V RELAY, FIG. 5, IF FIG. 23 OR 24 IS PROVIDED, BUT SHALL NOT BE USED TO PROVIDE THE DC BATTERY FOR FIGS. 2, 3 OR 4.
- (B) THE 18 VOLT 60 CYCLE SUPPLY FOR THIS CIRCUIT MAY BE FROM THE OUTPUT OF K5-5714, L2 OR L3 TRANSFORMER, FIG. 18, OR (ON EXISTING INSTALLATIONS) FROM THE 16 VOLT 60 CYCLE SUPPLY OF RECTIFIER J86205A, L1 OR L2.
- (C) THE 10 VOLT 60 CYCLE SUPPLY FOR THIS CIRCUIT MAY BE FROM THE OUTPUT OF THE 393A OR B TRANSFORMER, FIG. 10.
- (D) THE 105 VOLT 60 CYCLE SUPPLY FOR THIS CIRCUIT MAY BE FROM RINGING SUPPLY OVER CABLE PAIR LEADS FROM THE CENT. OFF. OR PBX.

102. WHEN FIG. 102 OR 103 SHOWN IN THE BATTERY FEEDER FUSING DATA IS USED:

- (A) PROVIDE ONE 2 AMP. FUSE PER FIG. 1 FROM THE BATTERY SUPPLY.
- (B) PROVIDE ONE 2 AMP. FUSE PER FIG. 2 FROM THE BATTERY SUPPLY.
- (C) PROVIDE ONE 2 AMP. FUSE PER FIG. 3 FROM THE BATTERY SUPPLY.
- (D) PROVIDE ONE 2 AMP. FUSE PER FIG. 4 FROM THE BATTERY SUPPLY.
- (E) PROVIDE ONE 2 AMP. FUSE PER FIGS. 5, 6, 10, 14 & 17 FROM THE BATTERY SUPPLY.
- THE 14-26 VOLT BATTERY SUPPLY IN FIGS. 7, 11 & 12 FOR THE BUZZERS SHALL BE TAKEN FROM THE SAME FUSE WHICH SUPPLIES FIG. 6 IF FUSING IS REQUIRED. FIGS. 22 & 25 SHALL BE FUSED WITH THE ASSOCIATED FIG. 1.

103.

FEATURE OR OPTION	PROVIDE	
	FIGS. OR WIR.	QUANTITY
LINE CIRCUIT (TO CENTRAL OFFICE OR PBX)	1	2 F Z H 1 PER CENT. OFF. OR PBX LINE
TIE LINE (TO DISTANT KEY TEL. SYS. OR KEY TEL. EQPT.)	2	1 PER TIE LINE
STATION LINE	4	1 PER STA. LINE
INTERCOMMUNICATING CIRCUIT	5	1 PER INTERCOMMUNICATING LINE
FLASHING CIRCUIT	6	1 PER MAX. 6 LINES
AUDIBLE SIGNAL CONTROL CIRCUIT	7	1 PER KEY TEL. SYS.
RINGING FEEDER LAMP CIRCUIT	8	1 PER KEY TEL. SYS.
BATTERY CUT-OFF	9	1 PER KEY TEL. SYS.
MANUAL USING BATTERY CUT-OFF KEY	17	1 PER KEY TEL. SYS.
INTERCOMMUNICATING SIGNAL CIRCUIT WHERE BOTH CODE & SELECTIVE SIGNALING ARE REQ. FOR ANY BUZZER	10	1 PER KEY TEL. SYS.
SIGNALING CIRCUIT	11	1 PER BUZZER
WHEN USED WITH FIG. 10		1 PER KEY TEL. SYS.
WHEN FIG. 10 IS NOT USED		1 PER STA.
INTERCOMMUNICATING BUZZER CIRCUIT	12	1 PER STA.
COMMON AUDIBLE SIGNAL CIRCUIT	13	1 OR MORE PER KEY TEL. SYS. AS REQ.
BUZZER USED WITH 14-26 V. BAT. OR 16-21 V. A-C SUPPLY		
RINGER USED WITH 105 V. A-C SUPPLY	16	

103. (CONT.)

FEATURE OR OPTION	FIGS.	PROVIDE	
		APP. OR WIR.	QUANTITY
RESISTANCE CIRCUIT. PROVIDE WHEN FIG. 2, 3 OR 4 IS USED.	14		1 PER KEY TEL. SYS.
LAMP CIRCUIT	15	A3 LAMP WITH 14-26 V. SUPPLY	F
		K2 LAMP WITH 475-50 V. SUPPLY	1 TO 12 PER FIG. 1, 2, 3, 4 OR 5
		G2 LAMP WITH 9-11 V. A-C SUPPLY	ZE
14-25 V. A-C SUPPLY FOR LAMPS IN LAMP INDICATORS AND FOR BUZZERS.	18	1 AMP.	1 PER 1 AMP CURRENT LOAD SEE NOTE 106
		2 AMP.	1 PER 2 AMP CURRENT LOAD SEE NOTE 106
9-11 V. A-C SUPPLY FOR LAMPS IN TEL. SETS AND LAMP INDICATORS.	19		SEE NOTES 106 AND 112
PROVIDE WHEN D-C SUPPLY IS USED FOR LAMPS IN TEL. SETS AND LAMP INDICATORS.	20		1/2 UNIT PER 2 LAMPS PER LINE SEE NOTE 117
AUTOMATIC CUT-OFF CIRCUIT (PROVIDE WHEN STATIONS ARE TO BE CUT-OFF)	22		1 PER LINE
NOISE SUPPRESSION CIRCUIT FOR BATTERY SUPPLY	23	KEY TEL. UNIT MOUNTED	1 PER SYSTEM
		STRIP MOUNTED	1 PER SYSTEM
AUTOMATIC CUT-OFF CONTROL CIRCUIT	25	STATION CAN CUT OFF OTHER STATIONS	1 PER STATION PER LINE SEE NOTE 118
		STATION CAN NOT CUT OFF OTHER STATIONS AND CAN BE CUT OFF EXCEPT WHEN ON THE LINE	1 PER LINE
		STATION CAN NOT CUT OFF OTHER STATIONS AND CAN BE CUT OFF AT ANY TIME.	1 PER LINE
LAMPS IN INDICATORS		D-C SUPPLY	V
LAMPS IN TEL. SETS		A-C SUPPLY	T
BELL FIG. 12		D-C SUPPLY	N
BUZZER FIG. 12		D-C SUPPLY	N
RINGER FIG. 16		A-C SUPPLY	M

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

CIRCUIT NOTES CONT.

105.	TYPE OF BATTERY SUPPLY	TYPE OF KEY TEL. UNIT TO PROVIDE FOR FIG. 20	R VALUE FOR FORMULA NO. 2
FOR LAMPS IN KEY TEL. SETS (51A LAMPS)	LOCAL BATTERY 8 CELLS 14-20V	22 A OR F 19A RES. 210Ω/210Ω	51Ω
	9 CELL BUILDING BATTERY 16-22V	22 B OR G 19AH RES. 240Ω/240Ω	82Ω
	10 CELL BUILDING BATTERY 18-24V	22 C OR H 19PQ RES. 280Ω/280Ω	91Ω
	11 CELL BUILDING BATTERY 20-26V	22 D OR J 19DS RES. 350Ω/350Ω	90Ω
	12 OR 13 CELL BUILDING OR C.O. BATTERY 22-28V	22 D OR J 19DS RES. 350Ω/350Ω	125Ω
FOR K2 LAMPS	23 CELL C.O. BATTERY 47.5-50V. REGULATED	22 E OR K 19BA RES. 900Ω/900Ω	279Ω
	23 CELL C.O. BATTERY 47.5-50V. REGULATED	22 D OR J 19DS RES. 350Ω/350Ω	279Ω

106. TRANSFORMER CURRENT LOAD IN AMPS:
- (A) USING KS-571A TRANSFORMER (15 TO 25 VOLTS)
 $I = \text{NO. OF LAMPS} \times .035 + \text{NO. OF 7A BUZZERS} \times .0185 + \text{NO. OF 7A BELLS} \times .020$
- (B) USING J-86731A POWER UNIT (16 TO 20 VOLTS A.C.) OR KS-86205A RECTIFIER (16 VOLTS A.C.)
 $I = \text{NO. OF LAMPS} \times .036 + \text{NO. OF 7A BUZZERS} \times .020 + \text{NO. OF 7A BELLS} \times .022$
- (C) USING J-86731A POWER UNIT OR 393A OR B TRANSFORMER (8.75 TO 11 VOLTS A.C.)
 $I = \text{NO. OF 51A LAMPS} \times .042 + \text{NO. OF G2 LAMPS} \times .052$

107. WHERE THREE OR MORE STATIONS ARE LOCATED NEAR EACH OTHER, THE "L" AND "LO" LEADS FOR THESE STATIONS FROM FIG. 20 MAY BE CONNECTED TO COMMON "L" AND "LO" LEADS AT APPARATUS BOX TO SERVE THESE STATIONS, PROVIDED THE TOTAL RESISTANCE OF COMMON "L" AND "LO" LEADS DOES NOT EXCEED 10 OHMS (WHICH IS THE MAXIMUM TOTAL RESISTANCE FOR SINGLE "L" AND "LO" LEADS) DIVIDED BY THE NUMBER OF STATIONS IN THE GROUP. THE "L" TERMINALS ASSOCIATED WITH THESE LAMPS AT FIG. 20 MUST BE STRAPPED TOGETHER.

108. THE FOLLOWING OPTIONAL DESIGNATIONS WERE ADDED ON ISSUE 9-D: "Z", "Y", "X", "W", "V", "U" AND "T".

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.
9-D	P	U		P		U
11-D				L, K, J, H, G		
11-D				FIGS. 21, 22, 23, 24		
11-D	F	R		F		R
12-D	D	E		D		E
12-D	A	B		A		B
12-D	ZA	Z		ZA		Z
12-D	ZC	ZB		ZC		ZB
12-D	ZD OR ZE	S		ZD & ZE		S
12-D				22 F TO K 19DS RES. 350Ω		22 A TO F 19A RES. 210Ω
12-D				FIG. 25		FIG. 21
12-D						H, G
12-D				393 B TRANS.		393 A TRANS.
13-B				Z F		
13-B	ZG OR ZH	ZG		ZH		ZG

110. DUPLICATE BATTERY FEEDS SHALL BE PROVIDED IF NO. OF LAMPS EXCEEDS 36 WITH 24V BAT. SUPPLY OR 48 LAMPS WITH 48V BAT. SUPPLY. LAMPS ASSOCIATED WITH THE DIAL INTER-COMMUNICATION LINE SHALL BE INCLUDED.

111. CONNECT THE E AND G LEADS TO TERMINALS IN TRANSFORMER AS FOLLOWS:

LINE VOLTAGE	CONNECT E LEAD	CONNECT G LEAD
110	A	D
115	A	C
120	B	D
125	B	C

112. WHEN THE 393A OR B TRANSFORMER IS INACCESSIBLE OR WHEN MORE THAN 16 AMPS AT 10V. A-C, THE MAX. CONTINUOUS CURRENT OF A 2 AMP FUSE IS REQUIRED. THE "MAX. LEAD DROP" IN FORMULA NO. 5 MUST BE REDUCED FROM .15 TO 0.9 VOLTS AND TWO DISTRIBUTION CIRCUITS, EACH WITH A TWO AMP. FUSE, MUST BE PROVIDED.

113. WHEN THE J86731A POWER UNIT IS USED, IF MORE THAN 16 AMPS AT 10V. A-C, THE MAX. CONTINUOUS CURRENT OF A 2 AMP FUSE IS REQUIRED. THE "MAX. LEAD DROP" FROM APPARATUS CABINET TO 10V. A-C SUPPLY IN FORMULA NO. 5 MUST BE REDUCED FROM .15 TO 0.9 VOLTS AND TWO DISTRIBUTION CIRCUITS, EACH WITH A TWO AMP. FUSE, MUST BE PROVIDED.

114. THE "GRD." TERMINAL OF THE J86731A POWER UNIT OR THE "G" TERMINAL OF THE J86205A RECTIFIER SHALL BE CONNECTED TO GROUND WITH A 24 GAUGE OR LARGER WIRE.

115. WITH KEY TELEPHONE UNITS 22 F TO K, TERMINALS 4 AND I MAY BE STRAPPED TO TERMINAL 3 FOR THE TYPICAL ARRANGEMENT SHOWN IN FIG. 20 OR THESE TERMINALS MAY BE CONNECTED TO "L" LEADS FOR DIFFERENT LINES AS REQUIRED.

116. (A) WITH 10 VOLT A-C 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 D-C 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 "LO" LEADS OF THE LAMP RESISTANCE CIRCUIT FOR KEY TELEPHONE SET LAMPS ASSOCIATED WITH THE SAME LINE.

(C) WITH 47.5 TO 50 VOLT D-C SUPPLY, K2 LAMPS IN INDICATORS, LAMPS IN KEY TELEPHONE SETS AND LAMPS IN ATTENDANTS' LINE KEY UNITS CONNECT INDIVIDUALLY TO RESISTANCES IN FIG. 20 EXCEPT AS PROVIDED IN NOTE 107.

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

118. STATIONS WHICH CAN CUT OFF OTHER STATIONS FROM A LINE BUT ARE NOT REQUIRED TO CUT OFF EACH OTHER MAY BE GROUPED AND PROVIDED WITH ONE FIG. 25 FOR EACH GROUP INSTEAD OF FOR EACH STATION.

STATION SYSTEMS KEY TELEPHONE SYSTEMS NO. 1A

A

DWG.
ISS.

APPARATUS					MECH. REQ.		CIRCUIT PREPARATION				TEST SET	SEE	DIRECT CURRENT FLOW REQ.					REMARKS		
DESIG.	CODE	FEATURE OR OPTION	CKT. FIG.		BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA		PREP.	NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK	TEST	READJ.			
									CONN. BAT.	CONN. GRD.									MA	MA
RELAYS																				
A	Y221		6		131/164	H	SPL			T (A)	GRD	I		O		54	51	ARM. TRVL. 59		
										T (A)	GRD	I		NO		36	38			
										T (A)	GRD	I		H		4.1	3.8			
										T (A)	GRD	I		R		1.9	2.5			
B	Y284		6		212/123	SPL	29	(A) O 7 T (B)		T (B)	GRD	I		O	FS	49.5	47	FRONT CONT.		
										T (B)	GRD	I		NO	FS	33	35	MAKE		
										T (B)	GRD	I		H	FS	8.3	7.9	6 READJ.,		
										T (B)	GRD	I		R	FS	2	2.6	4 TEST		
BF	U6107	E	5		111/110	H	35		BF (BF)	TR (BF)	M		P/S	O		25	23.5	MFR. DISC.		
BF	UA129	D	5		111/110	H	35		BF (BF)	TR (BF)	M		P/S	O		19.5	18.5	STANDARD		
CO	U557		2,4		132/101	H	47			T (CO)	GRD			O		39	36.5			
H	B1158		1		14		30		1M (L)	2M (H)	B/G	2	P	O		20	19	OPEN TIP &		
									1M (L)	2M (H)	B/G		P	NO		13.4	14.1	RING. LEADS		
									1M (L)	2M (H)	B/G		P	R		9.3	9.8	TOWARD		
									3M (H)	1M (L)	B/G		S	O		20.		CENT. OFF.		
								2 (H)	1 (L)	4M (H)	B/G		T	O		20		OR P. B. X.		

TEST NOTES:

- ADJACENT RELAYS SHALL NOT BE ENERGIZED.
SEE BSP.
- ADJUST FRONT CONTACT FOLLOW AND SEPARATION AS CLOSE TO THE MINIMUM .005" AS POSSIBLE. TENSION RELAY SO THAT IT FAILS TO OPERATE ON THE READJUST OPERATE CURRENT AND THEN BACK OFF THE ADJUSTING SCREW UNTIL THE RELAY WILL OPERATE.

PAGE 1

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APPARATUS					MECH. REQ.			CIRCUIT PREPARATION			TEST SET PREP.	SEE TEST NOTE NO.	DIRECT CURRENT FLOW REQ.					REMARKS	DWG. ISS.
DESIG.	CODE	FEATURE OR OPTION	CKT. FIG.		BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA				TEST WDG.	TEST FOR	AFTER SOAK	TEST	READJ.		
									CONN. BAT.	CONN. GRD.									
L	B1159		1		14		30		1M(L)	2M(L)	B/G		O		8.7	8.2	OPEN RING LEAD TOWARD CENT. OFF. OR P.B.X.	12	
									1M(L)	2M(L)	B/G		R		3.9	4.1		13	
L	B363		2		6		30		3B(TB)	6T(TB)	B/G		O	6.6	1.1	1	OPEN TIP & RING LEADS TOWARD DISTANT END		
									3B(TB)	6T(TB)	B/G		R	6.6	0.1	0.2			
L	G1		4		3		40	3T &	2M(L)	4M(L)	M		O	75	9	7.8			
								3B(RO)	2M(L)	4M(L)	M		R	75	4	5			
LI	B1159		1		14		30		1M(LI)	2M(LI)	B/G		O		20	19	OPEN TIP LEAD TOWARD CENT. OFF. OR P.B.X.		
									1M(LI)	2M(LI)	B/G		NO		13.4	14.2			
LI	U62		2		III/III	H	29			T(LI)	GRD		O		13	11.4			
LI	U62		4		III/III	H	29			T(LI)	GRD		O		13	11.4			
R	UA63		1		III/IOI	H	SPL	(SR) O		TF(R)	GRD		P	O	18	17	ARM. TRVL. 23		
								(SR) O				I	S	O	A-C	A-C			
TEST NOTES:																			
1. TEST AND READJUST THE (R) AND (RI) RELAYS FOR OPERATION ON A-C BY RINGING ON THE LINE AT THE CENT. OFF. IF THE LINE TERMINATES IN A P.B.X. IT SHOULD BE CONNECTED TO A CENT. OFF. TRK. FOR THIS TEST BY MEANS OF A P.B.X. CORD WITH THE TALKING KEY IN THE NORMAL POSITION OR BY APPLYING MIN. 95V. (1100-1200 R.P.M.) IN SERIES WITH A 13B RES. LAMP OR EQUIVALENT & A 7000 OHM NON-INDUCTIVE RES. TO THE LINE SIDE OF THE (I) OR (R) CONDENSER WHILE THE LINE IS OPENED TOWARD THE CENT. OFF. OR P.B.X.																			

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TEST NOTES:

1. TEST AND READJUST THE (R) AND (RI) RELAYS FOR OPERATION ON A-C BY RINGING ON THE LINE AT THE CENT. OFF. IF THE LINE TERMINATES IN A P.B.X. IT SHOULD BE CONNECTED TO A CENT. OFF. TRK. FOR THIS TEST BY MEANS OF A P.B.X. CORD WITH THE TALKING KEY IN THE NORMAL POSITION OR BY APPLYING MIN. 95V. (1100-1200 R.P.M.) IN SERIES WITH A 13B RES. LAMP OR EQUIVALENT & A 7000 OHM NON-INDUCTIVE RES. TO THE LINE SIDE OF THE (T) OR (R)

CONDENSER WHILE THE LINE IS OPENED TOWARD THE CENT. OFF. OR P.B.X.

APPARATUS				MECH. REQ.			CIRCUIT PREPARATION			TEST SET PREP.	SEE TEST NOTE NO.	DIRECT CURRENT FLOW REQ.					REMARKS	DWG. 155.
DESIG.	CODE	FEATURE OR OPTION	CKT. FIG.	BSP FIG.	CONT. PRESS.	ARM. TRVL.	BLOCK OR INSULATE	TEST CLIP DATA				TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READ. MA		
R	UA71		3		III/101	H	29	6T,3B(RO)	B(R)	T(R)	B/G		O		4.7	4.4		12
											I			A-C	A-C			13
RI	U62		3		III/III	H	29			T(RI)	GRD		O		13	11.4		
RI	B617		7		9		30		IM(RI)	TERM.21	B/G	2	O		5.8	5.5		
									IM(RI)	T.S.(B)	B/G	2	R		1.9	2		
									TERM.26	BAT.	3	O			6.1	5.8		
									T.S.(B)	BAT.	3	R			1.9	2.0		
											4	O			A-C	A-C		
RO	U211		3		121/102	H	53			T(RO)	GRD		O		37	35		
RO	U349		4		108/108	H	47			T(RO)	GRD		O		19	18		
S R	Y169		1		188/175	SPL	SPL			T(SR)	GRD	5/6	O	FS	44.5	42	ARM. TRVL A1	
										T(SR)	GRD	6	H	FS	5.6	5.3		
										T(SR)	GRD	6	R	FS	1.9	2.5		

APPARATUS					MECH. REQ.			CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ.									REMARKS	DWG. ISS.
DESIG.	CODE	FEATURE OR OPTION	CKT. FIG.		BSP FIG.	CONT. PRESS.	ARM TRVL.	BLOCK OR INSULATE	TEST CLIP DATE		TEST SET PREP.	SEE TEST NOTE NO.	TEST WDG.	TEST FOR	AFTER SOAK MA	TEST MA	READJ. MA					
									CONN. BAT.	CONN. GRD.												
TB	UA130	A	234		120/III	H	35		BF(TB)	TR(TB)	M		P/S	O		23	21.5	STANDARD	12 13			
TB	U6116	B	234		120/III	H	35		BF(TB)	TR(TB)	M		P/S	O		26	24.5	MFR. DISC.				
TO	27IA		17		132 / I	H	47		TF (TO)	GRD.	I		O			16.5	15.5					
3A KEY TEL. UNIT IO																						
S	U650				123/123	H	29		TERM.2	GRD.			O			10.3	9.8					
2SA KEY TEL. UNIT 21																			MFR. DISC.			
CT	Y315				238/190	H	29		T(CT)	GRD.	2		O	FS	3I		29.5					
									T(CT)	GRD.	2		H	FS	5.7		5.4					
									T(CT)	GRD.	2		R	FS	1.5		2.1					
L2	BII59				14		30	(CT) NO,	TERM.2	B/G			O			8.7	8.2					
								(CO) O	TERM.II	TERM.2	B/G		R			3.9	4.1					

[illegible]

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 = $\frac{\text{FEEDER VOLTAGE DROP (SEE TABLE NO 1)}}{A+B+C+D+E+F+G+H+I+J+K+L+M \text{ (SEE TABLE NO 2)}}$

TABLE NO 1
FEEDER VOLTAGE DROP

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

TABLE NO 2
VALUES OF A TO M IN AMPS

- A = .060 X NO OF FIGS 1
LINE CKT
- B = .0125 X NO OF FIGS 2
AUTOMATIC TIE LINE CKT
- C = .0120 X NO OF FIGS 3
RINGDOWN TIE LINE CKT
- D = .0185 X NO OF FIGS 4
STATION LINE CKT
- E = .070 FOR FIG 5
INTERCOMMUNICATING CKT
- F = .0120 FOR FIG 6
FLASHING CKT
- G = .035 X NO OF LAMPS
FIG 15 (D-C OPERATION)
- H = .017 X NO OF BUZZERS
FIG 12 (D-C OPERATION)
- I = .019 X NO OF BELLS
FIG 12 (D-C OPERATION)
- J = .015 X NO OF FIGS 10
INTERCOMMUNICATING SIG CKT
- K = .028 X NO OF FIGS 17
TIMEOUT CKT
- L = .060 X NO OF FIGS 21 OR 25
AUTOMATIC CUT-OFF
CONTROL CKT
- M = .095 X NO OF FIGS 22
AUTOMATIC CUT-OFF CKT
USING 26A K.T.U. OR
.047 X NO OF FIGS 22
USING 26B K.T.U.
- * DO NOT USE IF SEPARATE
FEEDERS ARE PROVIDED
FOR LAMP BATTERY
SUPPLY.

FOR LOCAL BATTERY OR BUILDING BATTERY OR FOR DIRECT FEEDER RESISTANCE FROM 48V. CENTRAL OFFICE BATTERY METHOD OF COMPUTING FEEDER RESISTANCE BATTERY SUPPLY FOR LAMPS IN KEY TEL SETS

MAX ALLOWABLE RES IN FEEDERS TO MAINTAIN 7 VOLTS AT LAMPS IN KEY TELEPHONE SETS
(MAX. RES. OF LAMP LEADS "L" & "LG" 10/11) (SEE NOTE 110)

FORMULA NO. 2 RES. OF FEEDERS = $\frac{R1 \text{ (SEE NOTE 105)}}{\text{TOTAL NUMBER OF LAMPS IN SYSTEM}}$

FOR 10VOLT A-C SUPPLY METHOD OF COMPUTING MAXIMUM RESISTANCE OF THE WIRE BETWEEN THE TRANSFORMER AND THE APPARATUS CABINET TO MAINTAIN A MINIMUM OF 7 VOLTS AT THE LAMPS WITH A MAXIMUM TOTAL RESISTANCE OF 25Ω IN LAMP LEADS "L" AND "LG". SEE NOTES 112 AND 113.

FORMULA NO. 5 RES. OF WIRE = $\frac{1.15 (\text{VOLTS} - \text{MAXIMUM LEAD DROP})}{.035 \text{ X NO. OF 51A LAMPS} + .044 \text{ X NO. OF G2 LAMPS}}$

FORMULA NO. 6 LOAD ON 18V D-C TERMINALS OF J 86205A RECTIFIER A+E+F+G+H+I+J+K+L+M
(SEE TABLE 2) SHALL NOT EXCEED 0.5 AMPERES

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13-B	12-D	11-D	DWG. 155.
9-B	8-D	7-D	C.D. 155.

FOR LOCAL BATTERY 18 VOLTS

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

FORMULA NO. 4

BATTERY CHARGING CURRENT
(FOR 6 BUSY HOURS PER DAY) = $\frac{6(A2 + B2 + C2 + D2 + E2 + F2 + G2 + H2 + I2 + J2)}{24} \times \frac{1.25(\text{NO. OF WORKING DAYS PER WEEK})}{7}$

TABLE NO. 4

A2 = .006 X NO. OF FIGS. 1
LINE CKT.

B2 = .015 X NO. OF FIGS. 2
AUTOMATIC TIE LINE CKT.

C2 = .004 X NO. OF FIGS. 3
RINGDOWN TIE LINE CKT.

D2 = .009 X NO. OF FIGS. 4
STATION LINE CKT.

E2 = .004 X NO. OF FIGS. 5
INTERCOMMUNICATING LINE CKT.

F2 = .003 X NO. OF (LINE & BUSY) LAMPS
FIG. 15 OR IN ILLUMINATED SETS
WHEN USED WITH CO. OR PBX LINES
(D-C OPERATION)

G2 = .007 X NO. OF (LINE & BUSY) LAMPS
FIG. 15 OR IN ILLUMINATED SETS
WHEN USED WITH TIE LINES
(D-C OPERATION)

H2 = .002 X NO. OF (LINE & BUSY) LAMPS
FIG. 15 OR IN ILLUMINATED SETS
WHEN USED WITH STATION LINES
(D-C OPERATION)

I2 = .006 X NO. OF FIGS. 21 OR 25
CUT-OFF CONTROL CKT.

J2 = .010 X NO. OF FIGS. 22
AUTOMATIC CUT-OFF CKT USING 28A K.T.U. OR
.005 X NO. OF FIGS. 22 USING 26B K.T.U.

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

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

FUSING NOTE FOR LOCAL BATTERY
(FUSES TO BE LOCATED AT THE BATTERY)

	LINE	PROVIDE 2 AMP. FUSES CONNECT TO FUSE
FOR FIGS. 1, 2, 3 & 4	1	1
	2	2
	3	3
	4	1
	5	2
	6	3
FOR FIGS. 5, 6, 10, 14 & 17		1
BATTERY FOR LAMPS IN KEY TEL. SETS		4

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13-B	12-D	11-D	DWG. ISS.
9-B	8-D	7-D	C.D. ISS.

FUSING ARRANGEMENTS FOR NO LOCAL BATTERY METHOD OF FUSING DIRECT FEEDERS FOR ALL EQUIPMENT EXCEPT LAMPS IN SYSTEMS HAVING LAMPS IN KEY TELEPHONE SETS SEE NOTE A

FIG. 101



FIG. 102

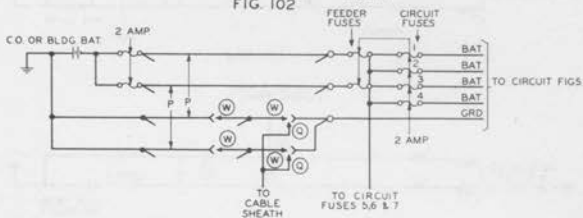
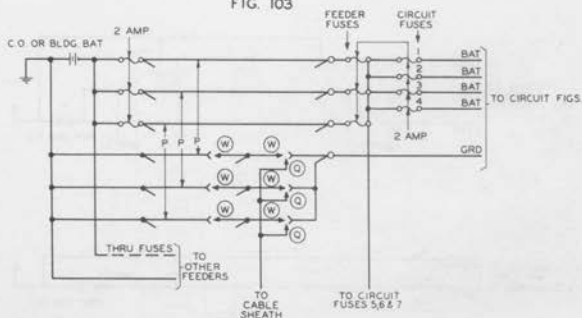


FIG. 103



FORMULA NO 3

MAX CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM (EXCEPT FOR LAMPS IN SYSTEMS HAVING LAMPS IN KEY TELEPHONE SETS)

MAX VOLTAGE OF THE CENT OFF OR BLDG BAT.
(SEE TABLE NO 1)

APPROX RES
OF FEEDERS

+

$\frac{14}{A+B+C+D+E+F+H+I+J+K+L+M}$

(SEE TABLE NO 2)

+ 0.42 X NO. OF
LAMPS SUPPLIED
BY 14-26 VOLT
BATTERY

NOTE A (FOR ALL EQUIPMENT EXCEPT ALL LAMPS IN SYSTEMS HAVING LAMPS IN KEY TELEPHONE SETS)

FEATURE OR OPTION	PROVIDE		
	FIGS	APP OR WIR	QUANTITY
WHEN THE MAX CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM DOES NOT EXCEED 16 AMPS (SEE FORMULA NO 3) AND THE FUSES AT THE CENT OFF OR BLDG BAT ARE	READILY ACCESSIBLE	101	1 PER SYSTEM
	NOT READILY ACCESSIBLE AND THE FEEDER RESISTANCE IS	102	1 PER SYSTEM
	NOT OVER 14 OHMS	101	1 PER SYSTEM
WHEN THE MAX CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM EXCEEDS 16 AMPS (SEE FORMULA NO 3) WHETHER THE FUSES AT THE CENTRAL OFFICE OR BLDG BAT ARE OR ARE NOT READILY ACCESSIBLE, A 2 AMP FEEDER FUSE IS REQUIRED FOR EACH 16 AMP OF MAX CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM	103		
FOR METALLIC RETURN (METALLIC RETURN SHALL ALWAYS BE PROVIDED WHEN THE BAT 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)	W		
FOR CABLE SHEATH RETURN (CABLE SHEATH RETURN SHALL ONLY BE USED WHEN THE BAT IS LOCALLY GROUNDING AND LOCATED IN THE SAME BLDG AS THE KEY TEL SYSTEM)	Q		

FUSING NOTE FOR FIGS 102,103,105 & 107

LINE	WHEN A MAX OF 3 FEEDER FUSES ARE REQUIRED	WHEN MORE THAN 3 FEEDER FUSES ARE REQUIRED
	CONNECT TO FUSE	CONNECT TO FUSE
FOR FIG. 1,2,3 OR 4		
1	1	1
2	2	2
3	3	3
4	1	4
5	2	5
6	3	6
FOR FIGS 5,6, 7,10,11,12,14 & 17	4	7
FOR SEPARATE BAT SUPPLY FOR LAMPS IN KEY TEL SETS ("W" AND "X" WIRING)	5	8

FUSING ARRANGEMENTS FOR DC OPERATION
OF LAMPS IN SYSTEMS HAVING LAMPS IN KEY TELEPHONE SETS
SEE NOTE B

FIG. 104

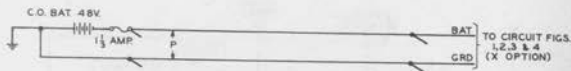


FIG. 105

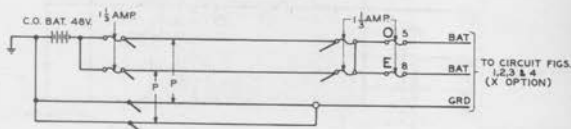


FIG. 106

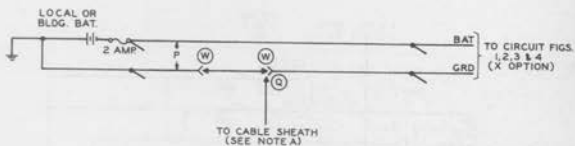
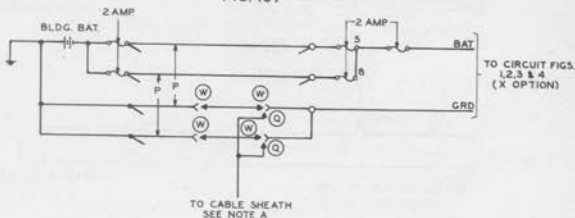


FIG. 107



NOTE B (FOR LAMPS IN KEY TELEPHONE SETS)

NOTE B (FOR LAMPS IN KEY TELEPHONE SETS)				PROVIDE		
FEATURE OR OPTION				FIGS.	APP OR WIR.	QUANTITY
FOR 9,10,11,12 OR 13 CELL BAT. WHEN THE FUSES AT THE BUILDING BAT. ARE: (PROVIDES FOR A MAX. OF 36 LAMPS)				106		1 PER 6 FIGS. 20
				107		1 PER 6 FIGS. 20
FOR LOCAL BATTERY, 8 CELLS (PROVIDES FOR A MAX. OF 36 LAMPS)				106		1 PER 6 FIGS. 20
2 AMP FUSE TO BE LOCATED AT BATTERY						
FOR 48V BAT. SUPPLY	WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS 24 OR LESS AND THE FUSES AT THE CENTRAL OFFICE ARE		READILY ACCESSIBLE		104	1 PER 4 FIGS. 20
			NOT READILY ACCESSIBLE AND THE FEEDER RESISTANCE IS	NOT OVER 36 OHMS	105 & (D) FUSE	1 PER 4 FIGS. 20
				OVER 36 OHMS	104	1 PER 4 FIGS. 20
				WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS NOT MORE THAN 48 NOR LESS THAN 25 AND THE FUSES AT THE CENTRAL OFFICE ARE NOT READILY ACCESSIBLE (THERE SHALL NOT BE MORE THAN 24 LAMPS ON ANY 1 1/2 AMP. FUSE)		105 & (D) & (E) FUSES

FIG. 51E
S1A KEY TEL. UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN 14-26V D-C IS USED FOR BUZZER
AND 60~ 9-11V. A-C
FOR LAMPS IN TEL. SET

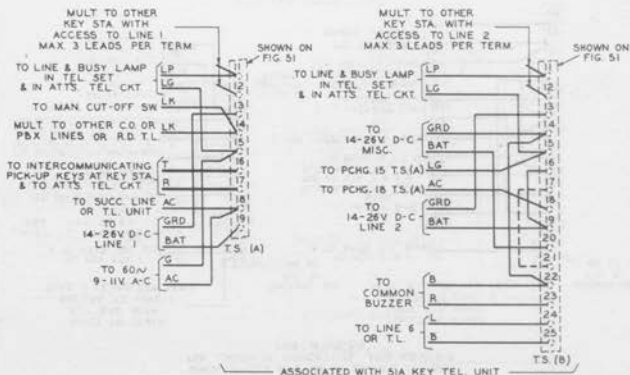
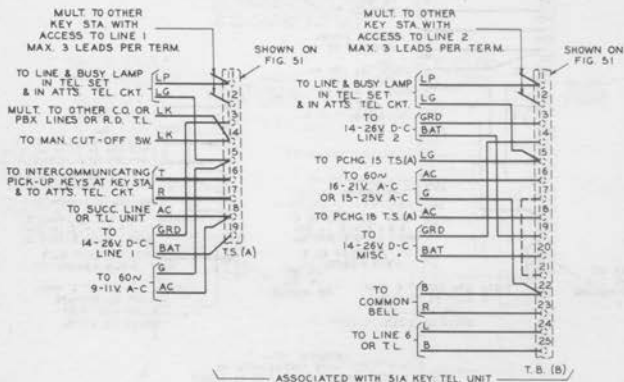


FIG. 51F
S1A KEY TEL. UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN 15-25V A-C OR 16-21V. A-C IS USED
FOR BELL AND 9-11V. A-C
FOR LAMPS IN TEL. SET



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13-B	12-D	11-D	DWG. ISS.
9-B	8-D	7-D	C.D. ISS.

FIG. 51G
SIA KEY TEL UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN 9-11V A-C IS USED FOR LAMPS
IN TEL SET AND 105V A-C
FOR RINGERS

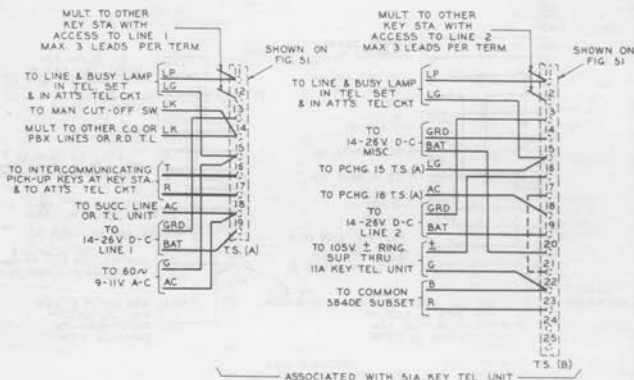


FIG. 51H
SIA KEY TEL UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN 14-26V D-C IS USED FOR BUZZER
AND D-C IS USED FOR LAMPS IN TEL SET

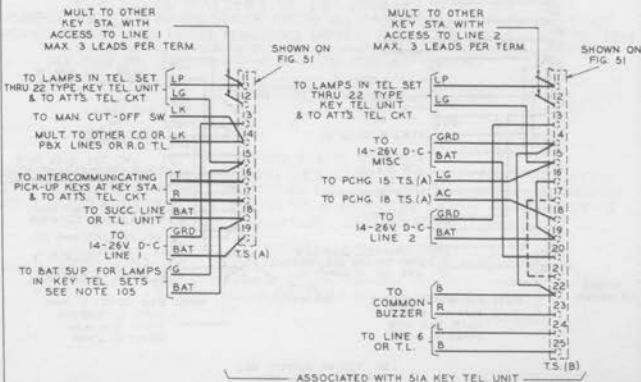


FIG. 51J
S1A KEY TEL. UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN 15-25V A-C OR 16-21V A-C IS USED
FOR BELL AND D-C
FOR LAMPS IN TEL. SET

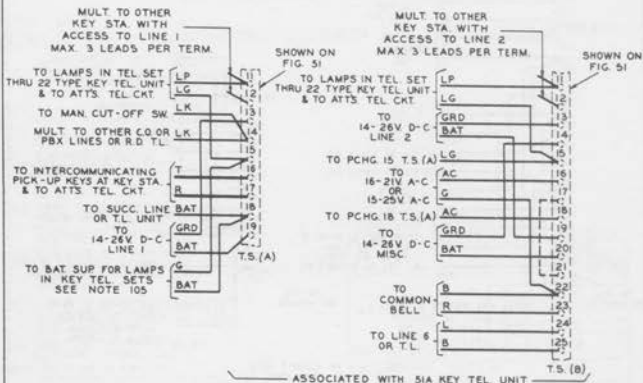


FIG. 51K
S1A KEY TEL. UNIT
INCOMING CONNECTIONS FOR FIG. 51
WHEN D-C IS USED FOR LAMPS
IN TEL. SETS AND 105V A-C
FOR RINGERS

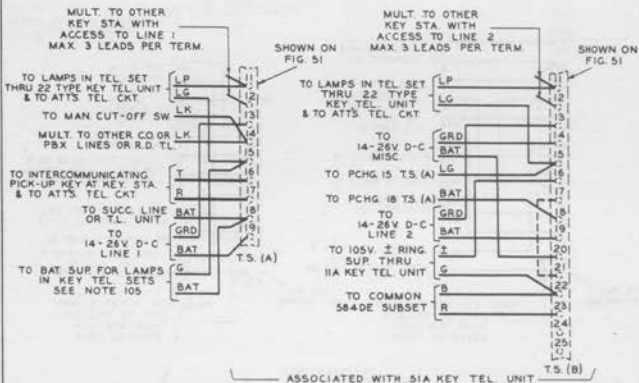


FIG. 52
52A KEY TELEPHONE UNIT
FOR LAMPS IN INDICATORS
(FOR FIG. 1)

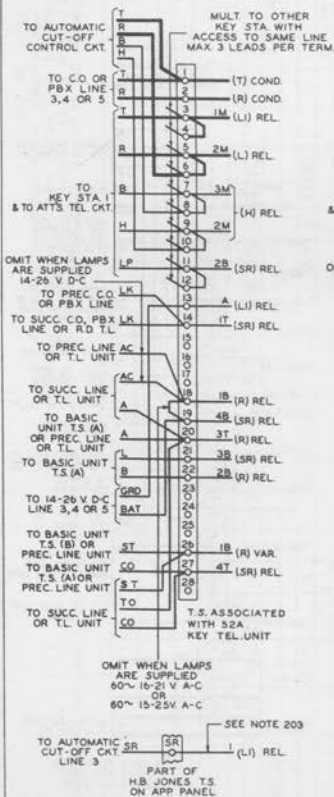


FIG. 53
53A KEY TELEPHONE UNIT
FOR LAMPS IN INDICATORS
(FOR FIG. 2)

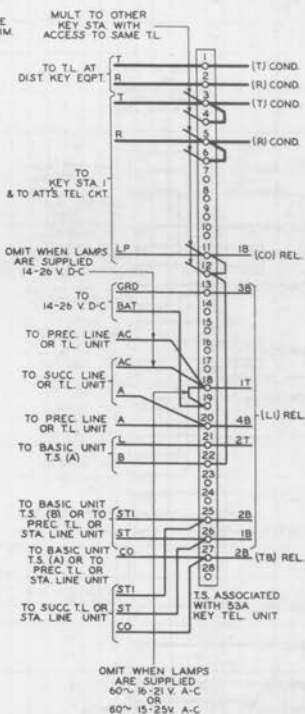


FIG. 54

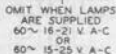
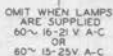


FIG. 55



13-B	12-D	11-D	DWG. ISS.
9-B	8-D	7-D	C.D. ISS.

FIG. 56
BATTERY SUPPLY CIRCUIT

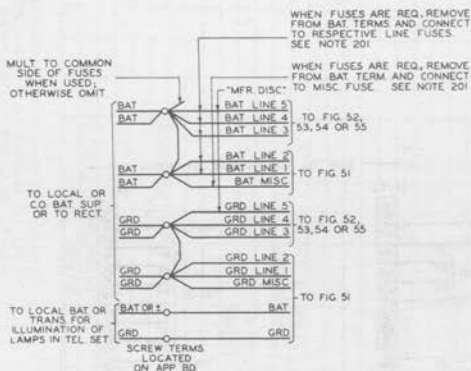
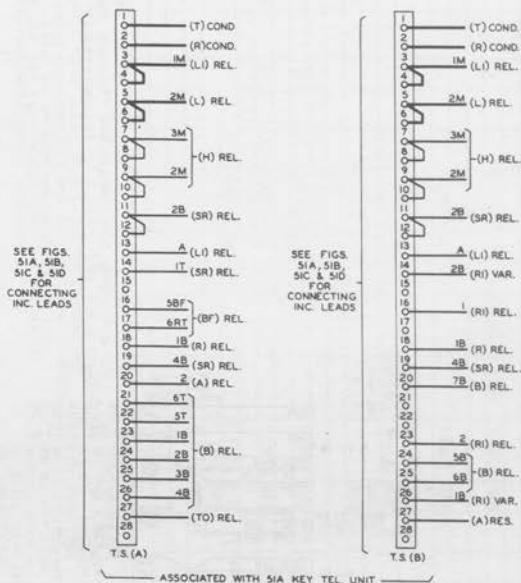


FIG. 57 (MFR. MISC.)
(FOR FIGS. 1, 5, 6, 7, 14 & 17)



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13-B	12-D	11-D	DWG. ISS.
9-B	8-D	7-D	C.D. ISS.

FIG. 58

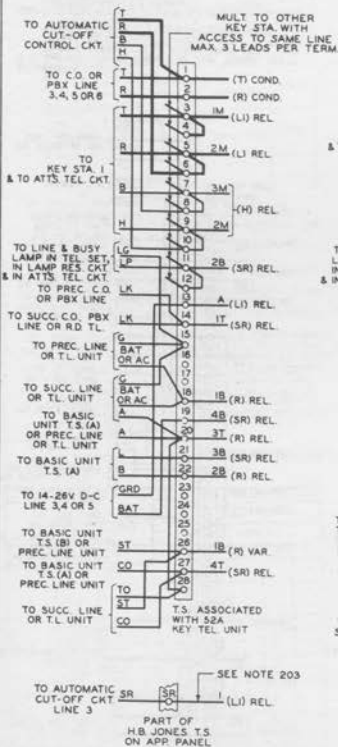
52A KEY TELEPHONE UNIT
FOR LAMPS IN TELEPHONE SET
(FOR FIG. 1)

FIG. 59

53A KEY TELEPHONE UNIT
FOR LAMPS IN TELEPHONE SET
(FOR FIG. 2)