

KEY TELEPHONE SYSTEM NO. 1A LINE AND SIGNALING CIRCUIT

FIG. 1
LINE CIRCUIT

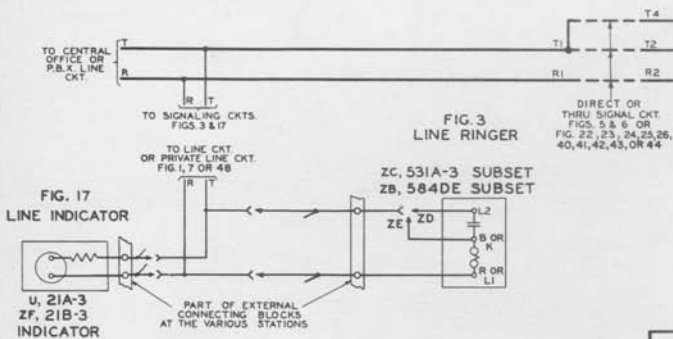
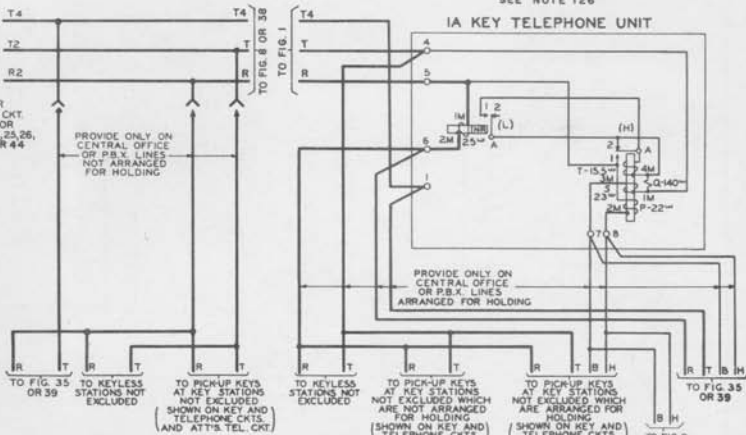


FIG. 8
HOLD CIRCUIT
SEE NOTE 126

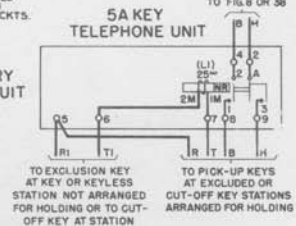


KEY TELEPHONE UNITS USED

K.T.U. USED IN FIG.	K.T.U. USED IN FIG.
1A 8, 49	25, 26
1B 38, 49	40, 46
2A 11	20A 24, 26
3A 10	21A 102, 103
4A 12	103, 107
5A 9	22A 33
6A 6	22K 33
6B 22, 23, 24	
6C 26, 42	23A 34
7A 7, 48	
	25A 35, 39
	25B 39
9A 5	26B 36
	27A 30A 40, 45
11A 18	28A 31A 47, 48
12A 19	33A 50
13A 20	
13B 29, 32	
14A 22, 24, 26	
15A 42, 44	
15B 25, 40	
15C 22, 41	
15D 43, 48, 49	
16A 23, 25, 40	
17A 41, 43, 45, 49	
17B 26, 27, 32	
17C 37, 42, 4, 50	
18A 25	
18B 25, 40	
18C 25, 40	
18D 41, 43	
18E 44, 49	

FIGS.	LOC. SHEETS	FIGS.	LOC. SHEETS	FIGS.	LOC. SHEETS	APP. OR WIRING	LOC. SHEETS	APP. OR WIRING	LOC. SHEETS	APP. OR WIRING	LOC. SHEETS
1	-0101	26	-0105	101		Z	-0103	J	-0102	ZF	-0101
2	-0103	27	-0109	102		X	-0103	H	-0102	ZB	-0102
3	-0101	28	-0109	103		Y	-0104		-0102	ZH	-0109
4	-0109	29	-0110	104	-0125	W	-0104		-0104	ZI	-0113
5		30	-0111	105		V	-0103		-0105	ZJ	-0114
6	-0103	31	-0111	106		U	-0101		-0106	ZK	-0103
6A		32	-0112	107		T	-0102		-0107	ZL	-0106
7	-0109	33	-0111			S	-0125		-0108	ZM	-0109
8		34	-0113			R	-0102		-0110	ZN	-0108
9	-0101	35	-0114			Q	-0102		-0112	ZO	-0108
10		36	-0113			P	-0102		-0116	ZP	-0114
11		37	-0114				-0103		-0117	ZQ	-0114
12		38	-0114				-0104		-0118	ZR	-0109
13	-0102	39	-0113				-0105		-0119	ZS	-0104
14		40	-0115				-0106		-0120	ZT	-0102
15		41	-0116				-0107		-0121	ZU	-0102
16		42	-0117				-0108		-0122	ZV	-0122
17	-0101	43	-0118				-0109		-0123	ZW	-0122
18	-0109	44	-0119				-0110		-0124	ZX	-0122
19		45	-0120				-0111		-0125	ZY	-0122
20	-0102	46	-0120				-0112		-0126		
21		47	-0121				-0113		-0127		
22	-0104	48	-0121				-0114		-0128		
23	-0105	49	-0122				-0115		-0129		
24	-0106	50	-0123				-0116		-0130		
25	-0107	51	-0123				-0117		-0131		

FIG. 9
AUXILIARY
HOLD CIRCUIT



ITEM	SHEET NO.
FORMULAS	-0124, -0125, -0126, -0127
DIRECT FEED FUSING	-0128
LOCAL BAT FEED FUSING	-0129
CIRCUIT NOTE 101	-0130, -0131
CIRCUIT NOTES 102 TO 115	-0132
CIRCUIT NOTES 116 TO 129	-0133
CIRCUIT NOTES 129 TO 140	-0134
CIRCUIT REQ.	-0135

SD-69091-0101 PRINTED IN U.S.A.

16 D DWG. 133.
16 D C.D. 133.

SD-69091-01
155 160

KEY TELEPHONE SYSTEM NO. 1A
LINE AND SIGNALING CIRCUIT

TCI Library www.telephonecollectors.info

FIG. 10

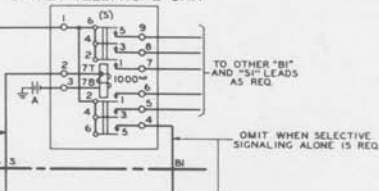


FIG. 21

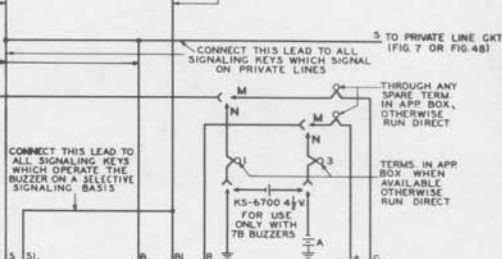


FIG. 14

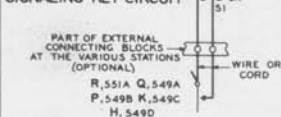


FIG. 13

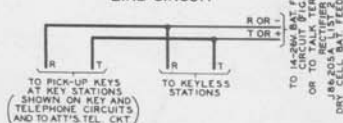


FIG. 15

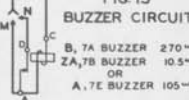


FIG. 11

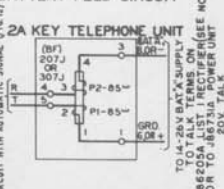


FIG. 1

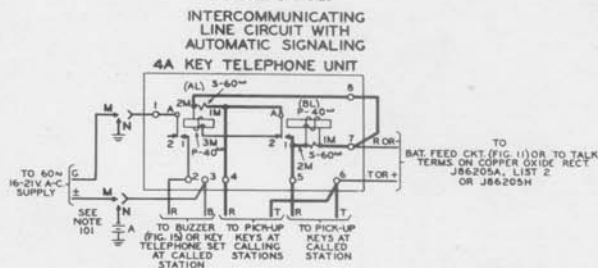


FIG. 20

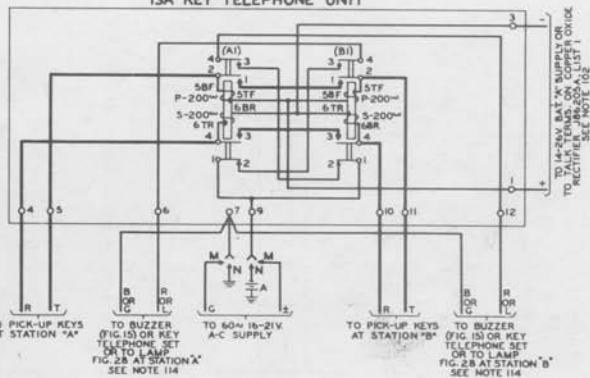


FIG. 19

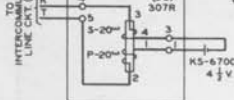


FIG. 16

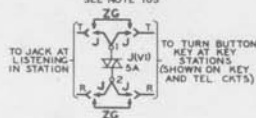
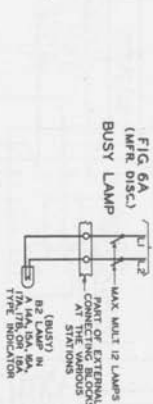
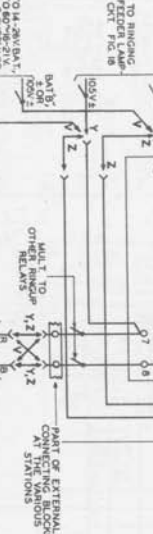
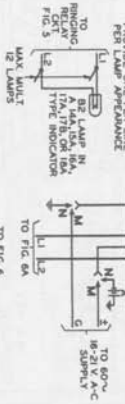
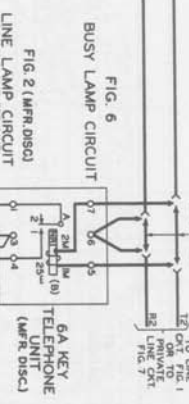
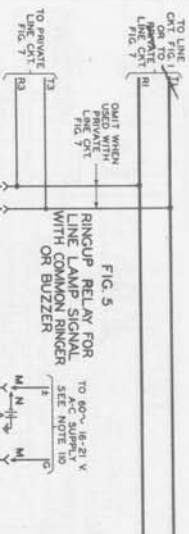


FIG. 5 & 6 (MFR. DISC.)
SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE
SIGNAL BUSY LAMPS AND COMMON AUDIBLE SIGNAL
 ARRANGED FOR NON-LOCKED IN LINE LAMPS



TO 14-20V B.A.T.
 TO 60V-16-21V
 A.C. SUPPLY OR
 FEEDER LAMP
 CXT FIG. 18

TO KEY AND TELEPHONE
 CXT FIG. 18 OR TO SEPARATELY
 MOUNTED RINGER FIG. 4
 SEE NOTE 106

PROVIDE WHEN 6 TYPE KEY
TEL UNIT IS NOT REQUIRED

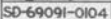
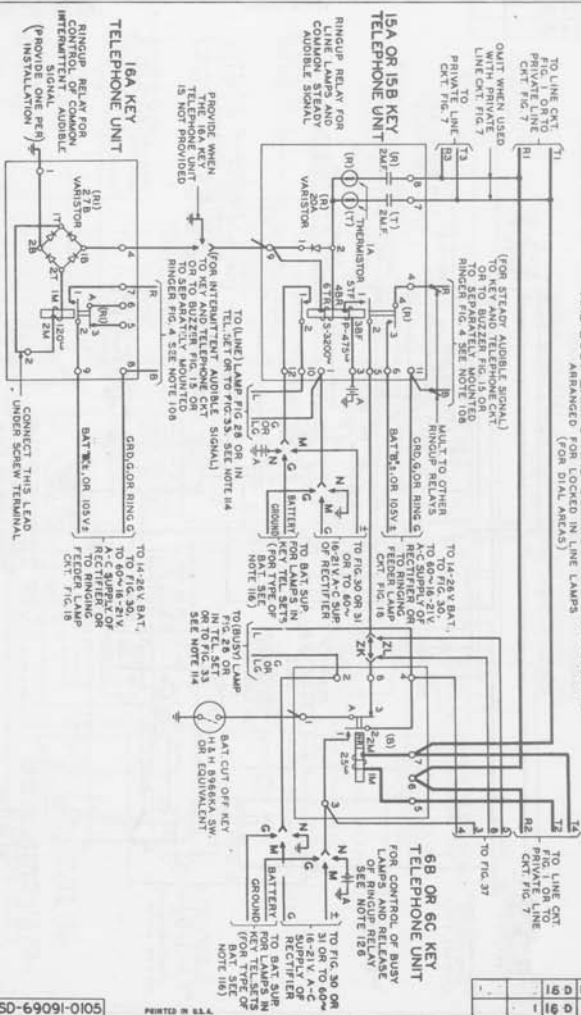


FIG.23 (MFR.DISC.)
 SIGNAL CIRCUIT FOR CONTROLLING SEPARATE LINE
 AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL
 ARRANGED FOR LOCKED IN LINE LAMPS
 (FOR DIAL AREAS)

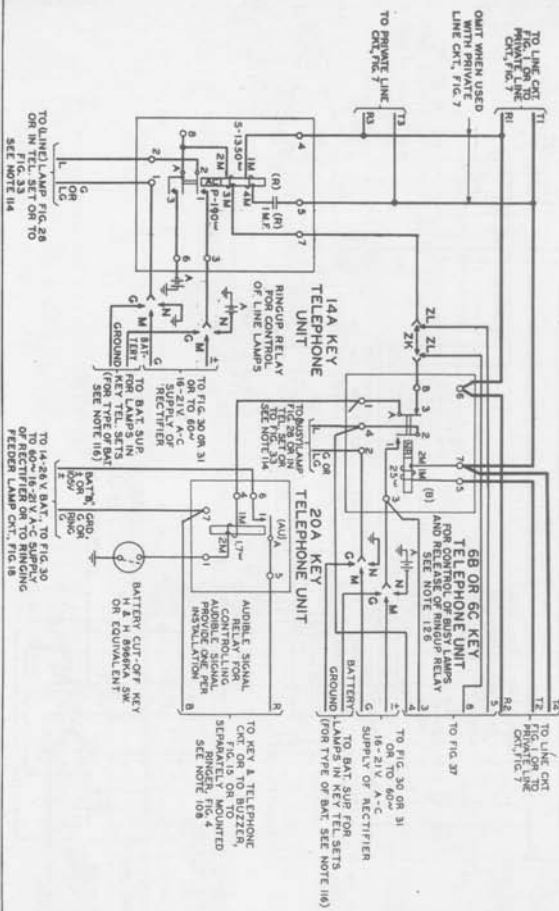


15 D	DWG. 155.
16 D	C.D. 155.

SO-69091-0105

PRINTED IN U.S.A.

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)



16 D	DWG. 133.
16 D	C. D. 133.

SD-69091-0106

PRINTED IN U.S.A.

FIG. 25(MFR. DISC.)

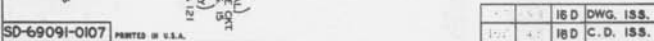


FIG. 7
PRIVATE LINE CIRCUIT
(LOCAL BATTERY TALKING)

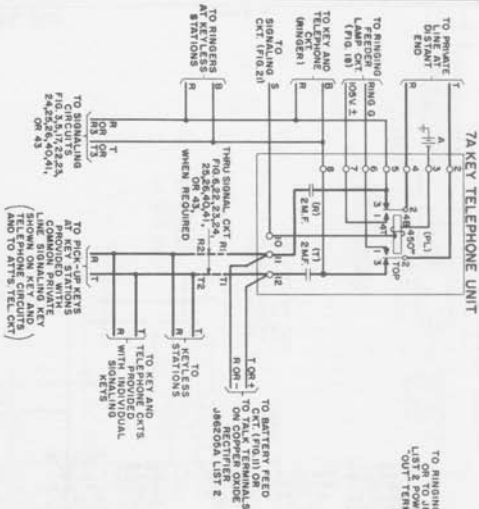


FIG. 8
RINGING FEEDER
LAMP CIRCUIT

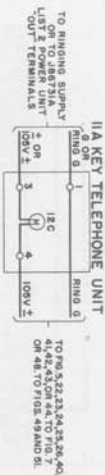


FIG. 27
SWITCHING
RELAY CIRCUIT

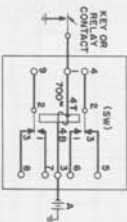


FIG. 4
COMMON RINGER



FIG. 28
SIGNAL LAMP

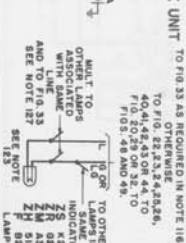
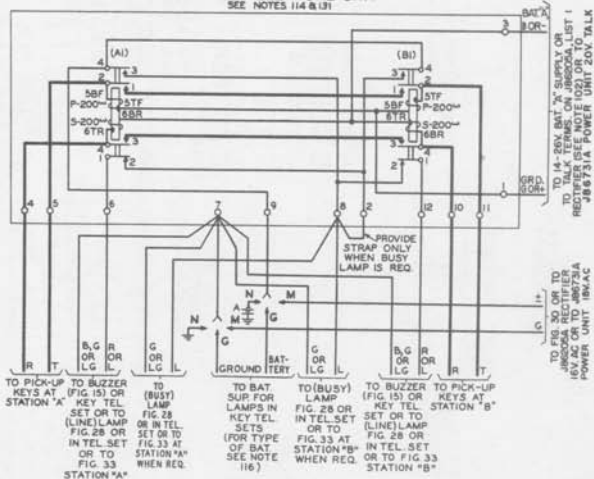


FIG. 29
INTERCOMMUNICATING LINE CIRCUIT
2 WAY AUTOMATIC SIGNALING
WITH OR WITHOUT BUSY LAMP

13B KEY TELEPHONE UNIT
SEE NOTES 114 & 131



SD-69091-0110

PRINTED IN U.S.A.

		16D	DWG. 133.
		16D	C.D. 133.

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

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

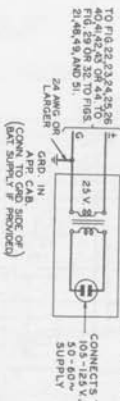


FIG. 31
9-11V. AC SUPPLY
SEE NOTE 128

393A (MD) OR 393B TRANSFORMER

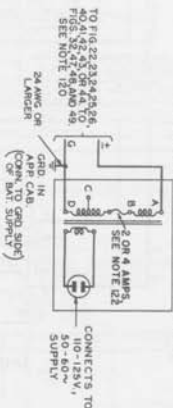
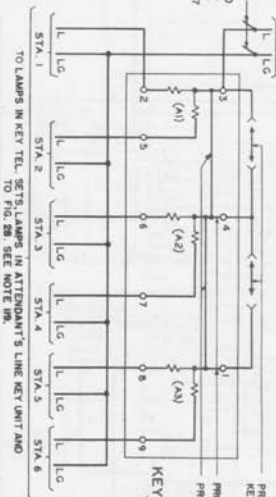


FIG. 33
LAMP RESISTANCE CIRCUIT

TO FIG. 22, 23, 24, 25, 26,
40, 41, 42, 43, OR 44,
TO FIG. 29 OR 32, TO
FIGS. 47, 48, AND 49.

TO LAMPS
OR OTHER
FIGS. 33
ASSOCIATED
WITH SAME
LINE
SEE NOTE 127



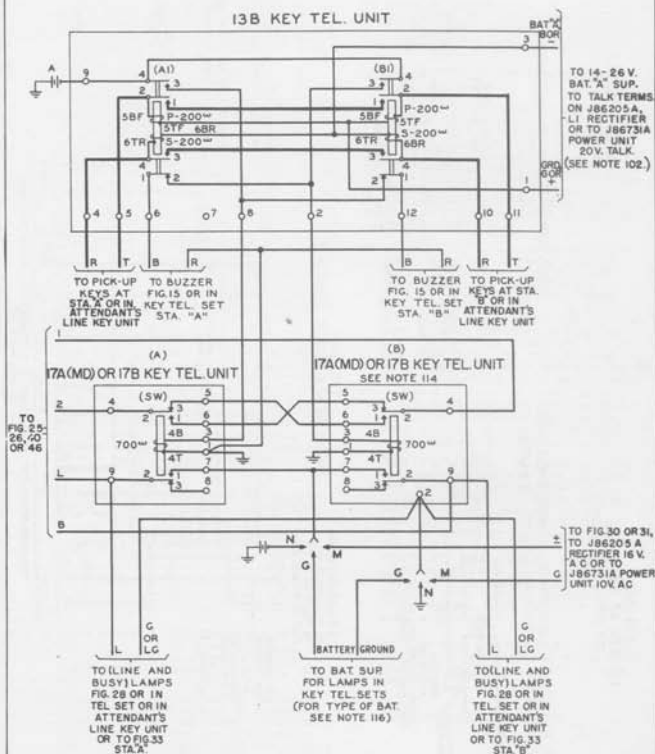
PROVIDE AS REQUIRED ON 22F TO K
KEY TELEPHONE UNITS. (SEE NOTE 134)
PROVIDED ON 22A TO E KEY TELEPHONE UNITS.
KEY TELEPHONE UNIT
SEE NOTES 116 & 113

160	DWG. ISS.
160	C.D. ISS.

SD-69091-0111

PRINTED IN U.S.A.

FIG. 32
INTERCOMMUNICATING LINE CIRCUIT
2 WAY AUTOMATIC SIGNALING
WITH COMBINED LINE AND BUSY LAMPS



SD-69091-0112

PRINTED IN U.S.A.

16D DWG. 155.

16D C.D. 155.

TO FIG. 1, 6, 38, OR 49

FIG. 39
AUTOMATIC CUT-OFF
CONTROL CIRCUIT

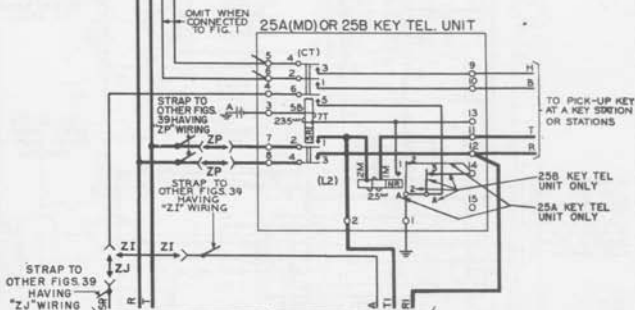


FIG. 36
AUTOMATIC
CUT-OFF
CIRCUIT

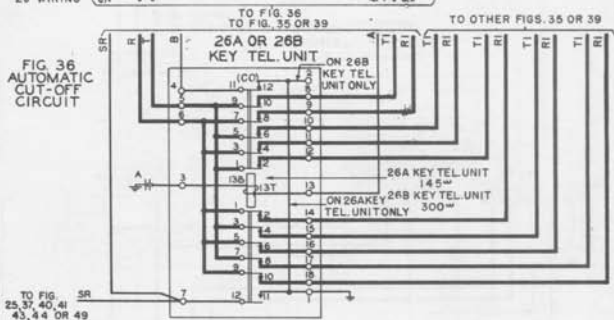


FIG. 37
RELEASE OF RINGUP RELAY AND
BUSY LAMP CONTROL CIRCUIT

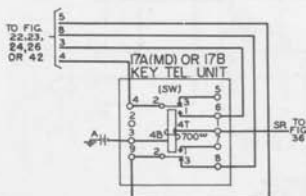


FIG. 34
NOISE SUPPRESSION CIRCUIT
FOR BATTERY SUPPLY

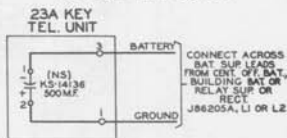
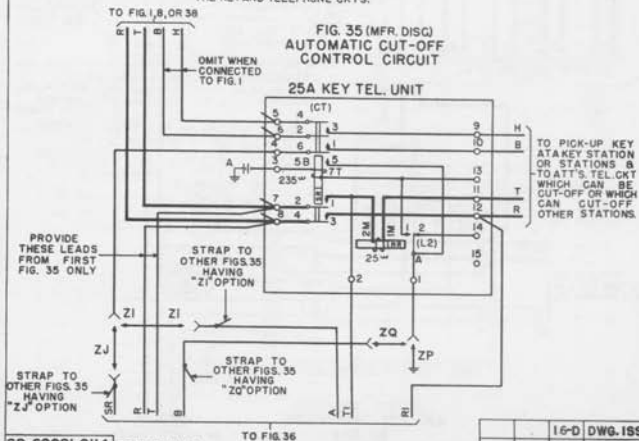
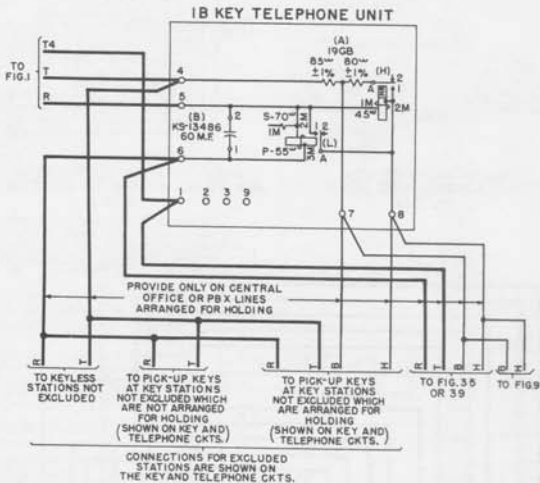


FIG. 38
HOLD CIRCUIT
SEE NOTE 126



SD-6909I-0114 PRINTED IN U.S.A.

16-D	DWG. ISS.
------	-----------

16-D	C.D. ISS.
------	-----------

(SEE NOTES 136 AND 140)



FIG. 4

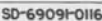
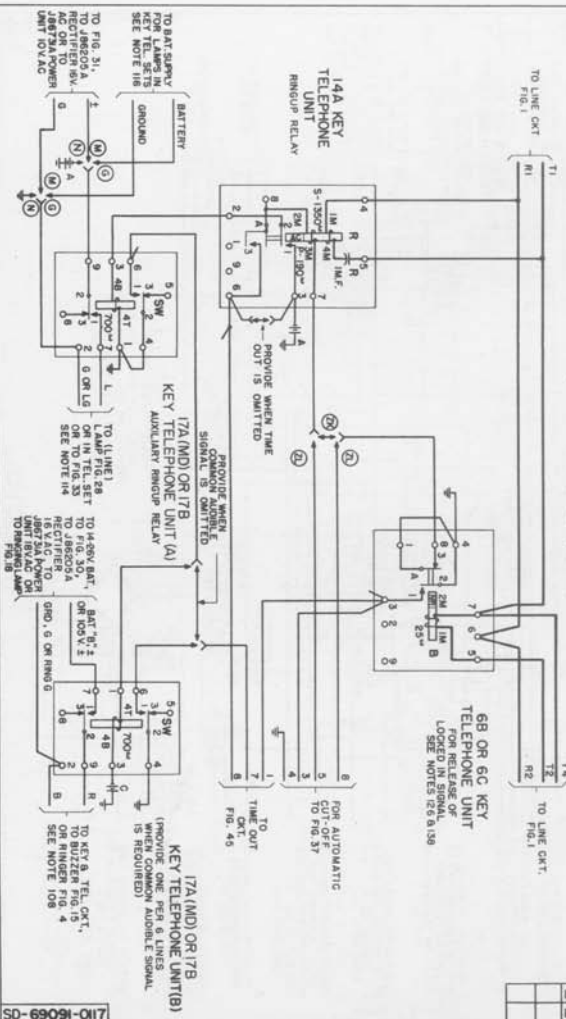


FIG. 42
SIGNAL CIRCUIT FOR CONTROLLING LOCKED IN LINE LAMPS ONLY AND COMMON AUDIBLE SIGNAL
ARRANGED FOR TIME OUT OF LOCKED IN SIGNALS
(FOR MANUAL AREAS SEE NOTE 140)



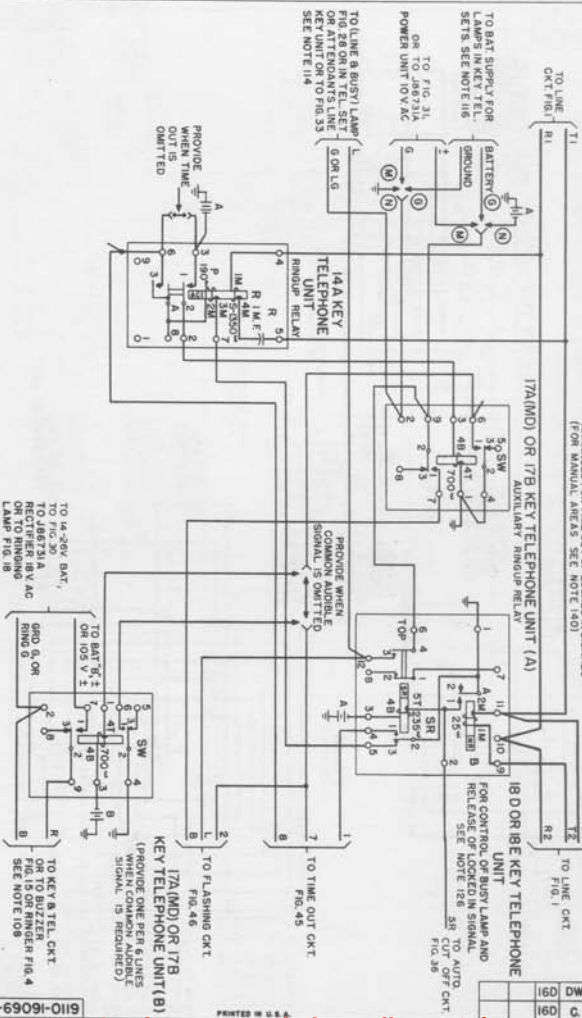
(FOR DIAL AREAS)
(SEE NOTES 106 AND 107)



		16D	DWG. ISS.
		16D	C.D. ISS.

FIG. 44
SIGNAL CIRCUIT FOR CONTROLLING COMBINED LINE AND BUSY LAMPS AND COMMON AUDIBLE SIGNAL

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



160	DWG. ISS.
160	C. D. ISS.

SD-69091-0119

FIG. 45
TIME OUT CRT.

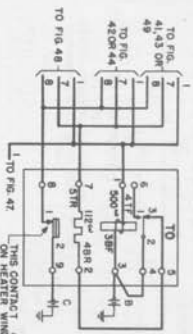


FIG. 47
INTERCOMMUNICATING LINE CIRCUIT.
ARRANGED TO STOP TIME OUT CIRCUIT.

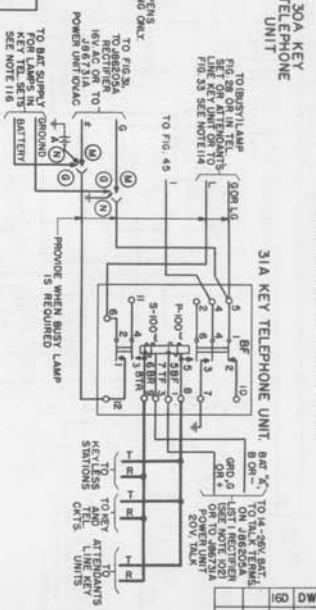
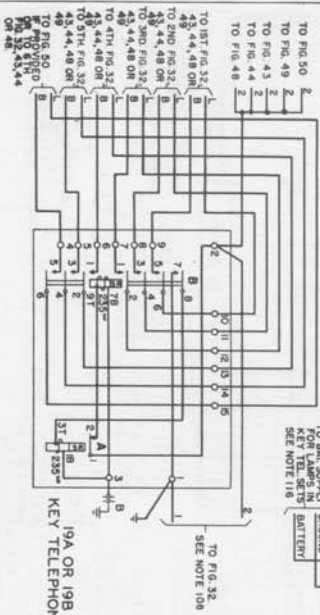


FIG. 46
FLASHING CRT.



SD-69091-01/20

160	DWG. 1SS.
160	C D. ISS.

FIG. 49

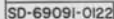


FIG. 50
WINKING CIRCUIT

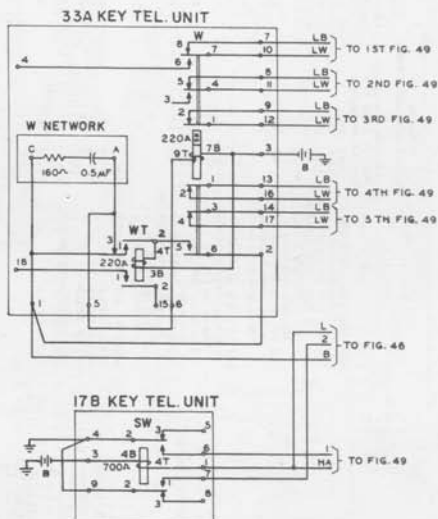
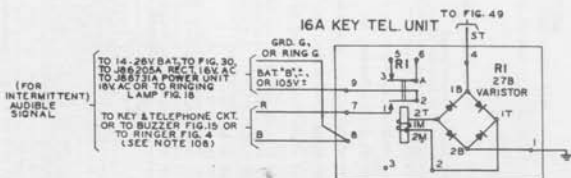


FIG. 51
AUDIBLE SIGNAL CONTROL CIRCUIT



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

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 = .049 FOR 1ST FIG. 25 LINE SIGNAL CKT.
G = .059 X NO. OF OTHER FIGS. 25 LINE SIGNAL CKT.
H = .046 FOR 1ST 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 AND 29 INTERCOM. LINE CKT.
L = .035 X NO. OF LAMPS (FIGS. 2, 6A, 2, 6 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 = .000 X NO. OF FIGS. 32 INTERCOMMUNICATING LINE CKT.
P = .000 X NO. OF FIGS. 35 AND 39 AUTOMATIC CUT-OFF CONTROL CKT.
Q = .093 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 CKT. AS FOLLOWS

FIG	WITH TIME OUT						WITHOUT TIME OUT					
	1	2	3	4	5	6	1	2	3	4	5	6
S = 40	240	295	325	355	385	415						
T = 41	0660	100	130	160	190	240	070	120	180	240	300	360
U = 42 B 4.6	130	210	280	350	420	480	130	210	290	350	420	530
V = 43 B 4.9	035	070	100	130	160	190	045	090	135	180	225	270
W = 44 LINE 50 ONLY	040	100	150	165	180	210	040	100	150	170	190	210
X = 45 LINE 50 BUSY	095	120	155	190	220	250	100	130	160	190	220	250

- 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 J4-26V DC (FIGS. 2, 6A, 2, 6 AND IN ATTENDANT'S LINE KEY UNITS)
AB = .090 X NO. OF FIGS. 30 WINNING CKT.

TABLE NO. 1
FEEDER VOLTAGE DROP

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

	16-D	DWG. 155.
	16-D	C. D. 155.

SD-69091-0124

PRINTED IN U.S.A.

FOR NO LOCAL BATTERY METHOD OF FUSING DIRECT FEEDERS

FIG. 101

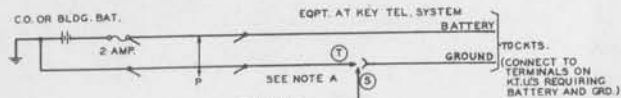


FIG. 102

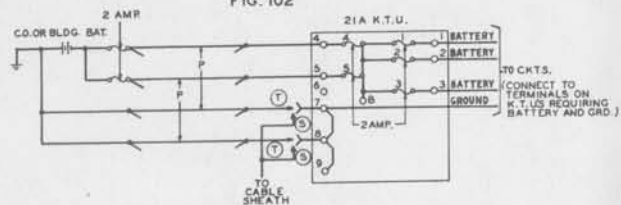
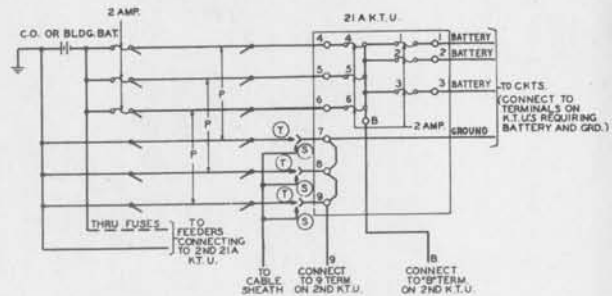


FIG. 103



FORMULA NO. 2

MAX. CURRENT WHICH
MAY BE SUPPLIED TO =
THE SYSTEM

MAX. VOLTAGE OF THE CENT. OFF. OR BLDG. BAT.

(SEE TABLE NO. 1)

APPROX. RES. OF

FEEDERS

$A+B+C+D+E+F+G+H+I+J+K+L+M+N+O+P+Q+R+S+T+U+V+W+X+Y+Z+AB$

(SEE TABLE NO. 2)

FIG. 104

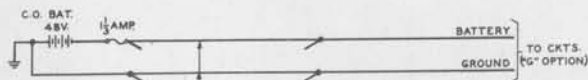


FIG. 105

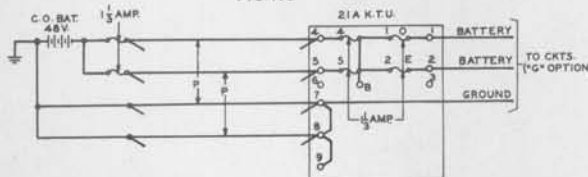


FIG. 106

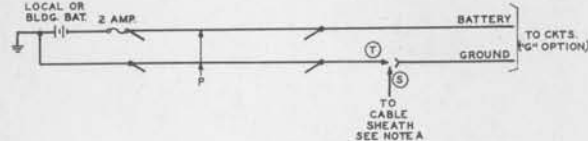
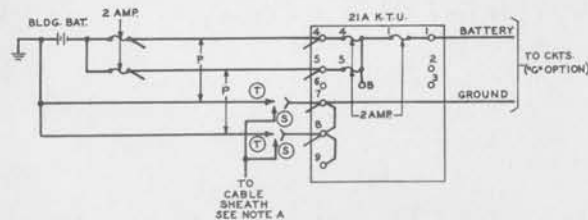


FIG. 107



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 1.8 AMPS (SEE FORMULA NO. 2) AND THE FUSES AT THE CENT. OFF. OR BLDG. BATTERY ARE	101	
WHEN THE MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM EXCEEDS 1.8 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 1.8 AMP. OF MAX. CURRENT WHICH MAY BE SUPPLIED TO THE SYSTEM.	102	
FOR CABLE SHEATH RETURN (CABLE SHEATH RETURN SHALL ONLY BE USED WHEN THE BATTERY IS LOCALLY GROUNDING AND LOCATED IN THE SAME BLDG. AS THE KEY TEL. SYSTEM.)	103	
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 CHANGED OVER METALLIC RETURN FEEDERS.)	104	
WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS 24 OR LESS AND THE CENT. OFF. BATTERY IS	105	
WHEN THE NUMBER OF LAMPS IN THE SYSTEM IS NOT MORE THAN 48 NOR LESS THAN 24 (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).	106	
WHEN THE FUSES AT THE BLDG. BATTERY ARE (PROVIDES FOR A MAX. OF 36 LAMPS)	107	
FOR LOCAL BATTERY (8 CELLS) (PROVIDES FOR A MAX. OF 36 LAMPS) (2 AMP FUSE TO BE LOCATED AT THE BATTERY)	108	

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	1ST	2ND	21A K.T.U.
BATTERY DESIGNATED "A" OF A LINE AND ASSOCIATED CIRCUITS		1	2	3
BATTERY DESIGNATED "B" OF CIRCUIT FIG. 5, 22, 23, 24, 25, 26, 40, 41, 42, 43, 44, 45, 46, 48, AND 53		1*	1*	-
BATTERY DESIGNATED "C" OF SIG. CIRCUIT FIG. 40, OR TIMEOUT CRT 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	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.

SD-G9091-0125

PRINTED IN U.S.A.

16 D DWG. ISS.

16 D C.D. ISS.

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

FORMULA NO. 3:
 BATTERY CHARGING CURRENT = $\frac{6(A_2+B_2+C_2+D_2+E_2+F_2+G_2+H_2+I_2+J_2+K_2+L_2+M_2+N_2+O_2+P_2+Q_2+R_2+S_2+T_2)}{24}$ L251 NO. OF WORKING DAYS PER WEEK.
 (FOR 6 BUSY HRS PER DAY)

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 AND 29 INTERCOM. LINES 2 WAY AUTO. SIG.
 D2 = .004 X NO. OF FIGS. 25 LINE SIGNAL. CKT WHEN USED WITH C.O. OR
 PBX. 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
 PBX. 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 OR 47
 I2 = .003 X NO. OF BUSY LAMPS WHEN USED WITH C.O. OR PBX. 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
 PBX. 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 = $\frac{6 \text{ VOLTS}}{10 \text{ X KEY TEL. SYSTEM BATTERY}}$
 (WHEN 24V BAT FEEDERS
 ARE USED TO CHARGE
 10X KEY TEL. SYSTEM BATTERY)

RES. OF CABLE FEEDERS = $\frac{30 \text{ VOLTS}}{10 \text{ X KEY TEL. SYSTEM BATTERY}}$
 (WHEN 48V BAT FEEDERS
 ARE USED TO CHARGE
 10X KEY TEL. SYSTEM BATTERY)

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

BATTERY DESIG. "A"	LINE	PROVIDE 2 AMP. FUSES CONNECT TO FUSE
1	1	1
2	2	2
3	3	3
4	4	1
5	5	2
6	6	3
BATTERY DESIG. "B" OF CKT. FIG. 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. "N" 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.

16-D	DWG. 155.
16-D	C.D. 155.

PRINTED IN U.S.A.

SD-69091-026

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).
 RESISTANCE OF FEEDERS = $\frac{R_1}{N}$ (SEE NOTE 116)
 (R1) IN THIS FORMULA IS ADJUSTED TO PROVIDE AT LEAST 7 VOLTS AT LAMPS IN KEY TEL. SETS WITH A MAXIMUM TOTAL RESISTANCE OF 10" IN LAMP LEADS "L" AND "LG"

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

RESISTANCE OF WIRE = $\frac{.035 \times \text{NO. OF 51A LAMPS} + .044 \times \text{NO. OF 62 LAMPS}}{115 \text{ VOLTS-MAXIMUM LEAD DROP}}$
 115 VOLTS IS THE MAXIMUM DROP ALLOWABLE TO MAINTAIN A MINIMUM OF 7 VOLTS AT THE LAMPS WITH A MAXIMUM TOTAL RESISTANCE OF 25" IN LAMP LEADS "L" AND "LG"

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

MAXIMUM CURRENT = $.042 \times \text{NO. OF 51A LAMPS} + .052 \times \text{NO. OF 62 LAMPS}$.

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

MAXIMUM CURRENT = $.0375 \times \text{NO. OF 43 LAMPS} + .0185 \times \text{NO. OF 7A BUZZERS}$.

FORMULA NO. 8 MINIMUM RESISTANCE OF LOAD ON 20V DC FOR USE WHEN A MINIMUM

RESISTANCE LOAD IS SPECIFIED FOR RECTIFIERS OR POWER UNITS

MINIMUM RESISTANCE = $\frac{A + B + C + D + E + F + G + H + I + J + K + L + M + N + O + P + Q + R + S + T + U + V + W + X + Y + Z + AB}{14}$ (SEE TABLE NO. 2)

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

	16D	DWG. ISS.
	16D	C. D. ISS.

CIRCUIT NOTES:

101

FEATURE OR OPTION		PROVIDE	
		FIGS. OR WIR.	QUANTITY
LINE CKT. FOR CENT. OFF. OR P B X 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
HOLD CKT. FOR CENT. OFF. OR P B X LINE. (SEE NOTE 126).		8 OR 36	1 PER LINE
AUX. HOLD CKT. FOR CENT. OFF. OR P B X LINE. (WHEN A KEY OR KEYLESS STATION NOT ARRANGED FOR HOLDING EXCLUDES STATIONS ARRANGED FOR HOLDING OR WHEN CUT-OFF 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
14-26 V. BATTERY FEED CKT. FOR PRIVATE LINES OR INTERCOMMUNICATING LINES		11	1 PER EACH FIG. 7, 12 & 13
INTERCOMMUNICATING SIGNALING KEY CKT.	ONE BUTTON KEY	R	1 PER STATION
	FOUR BUTTON KEY WITH CORD	Q	
	WITHOUT CORD	P	
	EIGHT BUTTON KEY WITH CORD	K	
BUZZER CKT. POWER SUPPLY IS	15-25 V. A C OR 14-26 V. D C	H	1 PER APPEARANCE
	WHEN TWO OR MORE BUZZERS ARE OPERATED IN MULTIPLE OVER THE SAME BUZZER LEAD WHERE THE SUPPLY IS 14-26 V. D C AND THE "B" OPTION DOES NOT GIVE A SATISFACTORY SIGNAL	B	
	4 1/2 V. DRY CELLS	A	
		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
BUZZER SIGNALING CKT.		21	1 PER SIGNALING LINE

101 (CONT.)

FEATURE OR OPTION		PROVIDE	
		FIGS. OR WIR.	QUANTITY
INTERCOMMUNICATING LINE CKT.	2 WAY AUTOMATIC SIGNALING WITH OR WITHOUT BUSY LAMPS	29	1 PER LINE
	2 WAY AUTOMATIC SIGNALING WITH COMBINED LINE AND BUSY LAMPS	32	
	NO AUTO. SIG. ARRANGED TO CONTROL TIME OUT	47	
	NO AUTO. SIG. NOT ARRANGED TO CONTROL TIME OUT	13	
PRIVATE LINE CKT.	WHEN NO LOCKED IN LINE LAMPS OR COMBINED LINE AND BUSY LAMPS ARE REQUIRED OR AS REQUIRED BY NOTE 137	7	1 PER PRIVATE LINE
	FOR LOCKED IN LINE LAMPS OR COMBINED LINE & BUSY LAMPS SEE NOTE 137	4 & 8	
	SIGNALING CKT. FOR A COMMON AUDIBLE SIGNAL RESPONDING TO THE RINGING SIG. USE 16A KEY TEL. UNIT	45	
	TIME OUT CKT. FLASHING CKT. FOR COMBINED LINE & BUSY	46	
SIGNAL CKT. FOR NON-LOCKED IN LINE LAMPS	FOR DIAL AREAS USE 15 C KEY TEL. UNIT. (SEE NOTE 135) FOR MANUAL AREAS USE 14 C KEY TEL. UNIT	22	1 PER CENT. OFF. P B X OR PRIVATE LINE
SIGNAL CKT. FOR BUSY LAMPS ONLY	6B OR 6C KEY TEL. UNIT. (SEE NOTE 126)		
SIGNAL CKT. FOR LOCKED IN LINE LAMPS ONLY	15 C AND 18 D OR 18 E KEY TEL. UNITS. (SEE NOTE 126)	41	1 PER CENT. OFF. P B X OR PRIVATE LINE
	FOR A COMMON AUDIBLE SIGNAL RESPONDING TO THE LINE RINGING USE 16A KEY TEL. UNIT		1 PER INSTALLATION
	FOR TIME OUT OF LOCKED IN SIGNALS.	45	1 PER 6 CENT. OFF. P B X OR PRIVATE LINES
	FOR DIAL AREAS		
SIGNAL CKT. FOR LOCKED IN LINE LAMPS ONLY	14 A, 17 A (A) AND 6B OR 6C KEY TEL. UNITS (SEE NOTE 126)	42	1 PER CENT. OFF. OR P B X LINE
	FOR A COMMON AUDIBLE SIGNAL (STEADY SIGNAL) USE 17 A KEY TEL. UNIT (B)		1 PER 6 CENT. OFF. P B X OR PRIVATE LINES
	FOR TIME OUT OF LOCKED IN SIGNALS	45	

NOTE 101 CONTINUED ON NEXT PAGE

SD-69091-0128

PRINTED IN U.S.A.

16D	DWG. ISS.
16D	C.D. ISS.

101 (CONT.)

FEATURE OR OPTION		PROVIDE	
		FIGS	QUANTITY
SIGNAL CKT FOR COMBINED LINE AND BUSY LAMPS FOR DIAL AREAS SEE NOTE 140. NOT ARRANGED FOR VISUAL HOLD SIGNAL	15C AND 18D OR 18E KEY TEL UNIT SEE NOTE 126	43 SEE NOTE 136	1 PER CENT OFF PBX OR PRIVATE LINE
	FOR A COMMON AUDIBLE SIGNAL RESPONDING TO THE LINE RINGING USE 16A KEY TEL. UNIT		1 PER INSTALLATION
	FLASHING CKT.	46	1 PER 6 CENT. OFF PBX OR PRIVATE LINES OR FIGS. 32
	FOR TIME OUT OF LOCKED IN SIGNALS	45	1 PER CENT. OFF, PBX OR PRIVATE LINES
SIGNAL CKT FOR COMBINED LINE AND BUSY LAMPS FOR MANUAL AREAS SEE NOTE 140	14A, 17A (A) AND 18D OR 18E KEY TEL. UNITS SEE NOTE 126		1 PER 6 CENT. OFF, PBX OR PRIVATE LINES
	FOR A COMMON AUDIBLE SIGNAL (STEADY SIGNAL) USE 17A KEY TEL. UNIT (B)	44	1 PER 6 CENT. OFF, PBX OR PRIVATE LINES OR FIGS. 32
	FLASHING CKT.	46	
	FOR TIME OUT OF LOCKED IN SIGS.	45	
CENTRAL OFFICE AND PBX LINE CKT. ARRANGED FOR VISUAL HOLD SIGNAL (WINKING)	LINE CKT FOR NORMAL RANGES (USING 1A B 18D KEY TEL. UNITS)	49	1 PER LINE
	LINE CKT FOR USE WITH 555 PBXS OR WHEN EXTRA RANGE IS NEEDED (USING 1B 18E KEY TEL. UNITS) SEE NOTE 126		
	WINKING CKT.	50	1 PER 5 LINES
	FLASHING CKT.	46	
	AUDIBLE SIGNAL RESPONDING TO LINE RINGING	51	1 PER GROUP HAVING COMMON AUD. SIG.
	AUD. SIG. RESPONDING TO LINE RINGING	REQ	ZV
	NOT RINGING	REQ	ZW
	SWITCHING RELAY CKT.	27	AS REQ.
LINE LAMPS, BUSY LAMPS OR COMBINED LINE AND BUSY LAMPS IN LAMP INDICATORS		28	1 PER LINE PER STA.
FOR LAMPS IN KEY TEL. SETS WITH OR WITHOUT LAMPS IN INDICATORS OR ATTENDANTS' LINE KEY UNITS	J86731A POWER UNIT-10V AC TAP FIG. 31 (9-11V AC)	M	ZR
	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
	J86731A POWER UNIT-10V AC TAP FIG. 31 (9-11V AC)	M	ZR
FOR LAMPS IN INDICATORS AND ATTENDANTS' LINE KEY UNITS ONLY	LOCAL BLDG. OR C.O. BAT. SEPARATE FEEDS AND FUSES NOT REQUIRED 14-26V.	N	ZM
	J86205A RECTIFIER 16V. 1AMP AC TAP	M	ZM
	23 CELL BAT. (SEE NOTE 116)	G	ZS
	D.C. SUPPLY	N	
BUZZERS AND LAMPS IN INDICATORS			M

101 (CONT.)

FEATURE OR OPTION		PROVIDE	
		FIGS	QUANTITY
15-25VAC SUPPLY FOR BUZZERS AND FIG. 29 SEE NOTE 131	1 AMP.	D	1 PER 1 AMP LOAD SEE FORMULA NO. 7
	2 AMP.	E	1 PER 2 AMP LOAD SEE FORMULA NO. 7
9-11V. AC SUPPLY FOR LAMPS		31	1 PER 36 LAMPS
LAMP RESISTANCE CKT. PROVIDE FOR LAMPS IN KEY TEL. SETS WHEN D.C. SUPPLY IS USED AND FOR K2 LAMPS		33	SEE NOTE 133
NOISE SUPPRESSION CKT. FOR BAT. SUPPLY. PROVIDE WHEN FIG. 25, 26, 40, 43, 44 OR 48 IS USED OR WHEN THE BAT. SUPPLY IS FROM AJ86205A RECTIFIER WITH FIG. 23, 24, 41 OR 42 (SEE NOTE 125)		34	1 PER SYSTEM
AUTO-MATIC CUT-OFF	FOR STATIONS WHICH CAN CUT-OFF OTHER STATIONS	39	Z1 ZP
	FOR STATIONS WHICH CAN NOT CUT OFF OTHER STATIONS BUT WHICH CAN BE CUT OFF EXCEPT WHEN ON THE LINE	39	ZJ ZP
	FOR STATIONS WHICH CAN BE CUT OFF ANY TIME	39	ZJ
	AUTOMATIC CUT-OFF CKT. 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. 2, 23, 24, 26 OR 42	37	1 PER FIG. 36
WHEN FIG. 37 IS PROVIDED	IS NOT PROVIDED	ZL	
		ZK	
COMMON SIGNAL FIG. 5	BUZZER	ZV	
	RINGER	YV	
WHEN KEY TEL. UNITS OF FIG. 22 AND KEY TEL. UNITS OF FIG. 5 OR 6 ARE USED IN THE SAME INSTALLATION	ARE NOT USED IN THE SAME INSTALLATION	W	
		X	
WHEN FIG. 3 IS USED WITH	FIG. 7 OR 48 SEE NOTE 139	ZD	
		ZE	
WHEN ALL "L" LEADS IN FIG. 26 ARE	REQUIRED	ZN	
		ZO	

NOTES CONTINUED ON NEXT PAGE

CIRCUIT NOTES (CONT.)

102. WHEN THE BAT. SUP. FOR FIGS. 11, 20, 29, 32, 47, OR 48 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 24V BAT. SUPPLY THE MINIMUM VOLTAGE OF THE SUPPLY SHALL BE 15 VOLTS.
- 107.
108. THE MAXIMUM NUMBER OF COMMON AUDIBLE SIGNALS TO BE MULTIPLIED 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.

D.C. SUPPLY FOR RELAYS	-18 V. AT 0.5 AMP.
D.C. SUPPLY FOR TALKING	-3V AT 0.1 AMP, 33V. AT NO LOAD
A.C. 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.	ABM	M.D.
30				FIG. 20	FIG. 12	
30				307J RET. COIL	207J RET. COIL	
30				1A VAR.	25717 VAR.	
50				FIG. 22	FIGS. 586	
80				FIG. 29	FIG. 20	
100				V	Y & Z	
100				158 KEY TEL. UNIT	15A KEY TEL. UNIT	
100				198 KEY TEL. UNIT	19A KEY TEL. UNIT	
110					FIG. 2	

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.	ABM	M.D.
110				FIGS. 30, 31, 32, 33		
110	ZC OR ZB	ZB		ZC	ZB	
110	ZD OR ZE	ZD		ZD, ZE		
110	ZF	U		ZF	U	
110	ZG OR J	J	105	ZG	J	
110	ZH OR F	F		ZH, F		
120				18B KEY TEL. UNIT	18A KEY TEL. UNIT	
120	ZM OR F			ZM	F	
120				FIGS. 34, 35, 36, 37		
120				Z1, ZJ, ZK, ZL, ZM, ZN, ZP, ZO		
130				18, 6C, 819C KEY TEL. UNITS		
130				FIG. 38		
14B				FIG. 39		FIG. 30
14B					ZO	
150				15C, 18C, 19C, 20C KEY TEL. UNITS	15A, 18A, 19A, 20A KEY TEL. UNITS	
150				225G, 241, 25R KEY TEL. UNITS	22A, 25C, 25E KEY TEL. UNITS	
150				22A, 25A, 25A, 30A, 30A, 35A KEY TEL. UNITS		
150				FIGS. 41B, 42		
150				FIGS. 43, 44	FIGS. 23, 24, 25, 40	
150				FIGS. 45, 46, 47, 48		
150				ZR & ZS	ZH	
150	ZT OR ZU	ZT	135	ZT & ZU		
150	B94 OR B10 RELAY	B94 RELAY		B10 RELAY	B94 RELAY	

SD-69091-0130

PRINTED IN U.S.A.

16D DWG. ISS.

16D C.D. ISS.

115 (CONT.)

[illegible]

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 19AK 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-
FOR K2 LAMPS		23 CELL BAT. 47.5 TO 50 VOLTS REGULATION	22E OR K 19BA 900-900-	279-
		23 CELL BAT. 47.5 TO 50 VOLTS REGULATION	22D OR J 19DS 350-350-	279-

117.

118. THE FOLLOWING WIRING DESIGNATIONS WERE ASSIGNED ON ISSUE 110: "A", "B", "K", "P", "Q", "H", 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 AP-

182 (CONT.)

PARATUS 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.

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 150 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 150 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

SD-69091-0132

PRINTED IN U.S.A.

160 DWG. ISS.

160 C.D. ISS.

CIRCUIT NOTES (CONT.)

129. WITH THE J86731A POWER UNIT IF MORE THAN 15 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 "Z1" 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 "20" OPTION INSTEAD OF "ZE" IN FIG. 3 WITH 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.

14-26V.
SEE NOTES
106 & 111

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

APPARATUS			LOC. SH NO.	MCH. REQ. BSP CONT. PRES. TRM.	CIRCUIT PREPARATION BLOCK OR INSULATE	TEST CLIP DATA CONN. BAT. COHN. GRD.	TEST SET PREP.	SEE TEST NOTE NO.	DIRECT CURRENT FLOW REQ.		REMARKS
DESIG.	CODE	OPTION							TEST WOL.	AFTER SOAK FOR	
1A KEY TEL. UNIT			-0101								
H	B1158		14	30		TIP TERM.8 LEAD	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	M 3	S 0	20		
					2UH	LEAD	M 3	T 0	20		
						TERM.4 TERM.6	M	O	8.7	8.2	
L	B1159		14	30		TERM.4 TERM.6	M	R	3.9	4.1	
1B KEY TEL. UNIT			-0114								
H	B1182		14	30		TIP TERM.8 LEAD	M 1/2	O	10.3	9.8	
						TERM.8 M 2	NO		6.8	7.2	
						TERM.8 M 2	R		4.7	5	
L	B1175		8	30		TERM.4 TERM.6	M	O	4.2	4	
						TERM.4 TERM.6	M	R	1.9	2.1	
3A KEY TEL. UNIT			-0102								
S	U650		123/123	H 29		TERM.2 GRD.		O	10.3	9.8	
4A KEY TEL. UNIT			-0102								
AL	B612		3	30		TERM.4 GRD.		P/S O	20	19	WOGS. IN
						TERM.4 GRD.		P/S R	7.5	7.9	PARALLEL
BL	B1157		3	30		TERM.5 GRD.	4	O	15	14.2	
						TERM.5 GRD.	4	R	6.8	7.2	

TEST NOTES:

1. ADJUST FRONT CONTACT FOLLOW AND SEPARATION AS CLOSE TO THE MINIMUM SETTINGS POSSIBLE. TENSION RELAY SO THAT IT FAILS TO OPERATE ON THE READ-JUST OPERATE CURRENT AND THEN BACK OFF THE ADJUSTING SCREW UNTIL THE RELAY WILL OPERATE.
2. REMOVE TIP LEAD FROM TERM. 4.
3. REMOVE RING LEAD FROM TERM. 5.
4. REMOVE STRAP BETWEEN TERMS. 7 AND 8.

APPARATUS				LOC. SH. NO.	MECH. REQ.			CIRCUIT PREPARATION			DIRECT CURRENT FLOW REQ.			REMARKS
DENIA	CODE	OPTION	FIG.		BSF FIG.	CONT PRES	ARM TRVL	BLOCK OR INSULATE	TEST CLIP DATA	TEST SET PROG	TEST NOTE	TEST FOR	AFTER SOAK	
17A KEY TEL. UNIT				-0006					TERM. 1	GRD. 8	0	0	17	16
SW U735				-0109	132/132	H	47		TERM. 3	BAT. 9	0	0	17	16
17B KEY TEL. UNIT				-0112										
SW UA141				-0113					TERM. 1	GRD. 8	0	0	12.6	12
				-0117	132/132	H	47		TERM. 3	BAT. 9	0	0	12.6	12
18A KEY TEL. UNIT				-0123										
18B OR 18C KEY TEL. UNIT				-0107										
18D OR 18E KEY TEL. UNIT				-0116										
B B1159				-0118	14		30		TERM. 9	TERM. 10	M	1	0	8.7
				-0119					TERM. 9	TERM. 10	M	1	R	3.9
				-0122					TERM. 9	TERM. 10	M	2	0	20
									TERM. 9	TERM. 10	M	2	NO	13.4
SR Y169					188/175	SPL	SPL		5T (SR)	GRD. 3/4	0	FS	44.5	42
									5T (SR)	GRD. 4	H	FS	5.6	5.3
									5T (SR)	GRD. 4	R	FS	1.9	2.5
19A KEY TEL. UNIT				-0107										
A Y221				-0108	131/164	H	SPL		3T(A)	GRD. 4/5	0		5.4	5.1
				-0115					3T(A)	GRD. 4/5	NO		3.6	3.8
				-0120					3T(A)	GRD. 4/5	H		4.1	3.8
									3T(A)	GRD. 4/5	R		1.9	2.5
B Y222					109/123	SPL	29		TERM. 2	GRD. 4/6/7	0	FS	48.5	46
								(A) NO, 7T(B)	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

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 READ. 6, TEST 4 MIN. TENSION IT 8 28 READ. 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 COMM. DIRECT BAT. TO TERM. 3 AND BLOCK (B) REL. NO.
6. FRONT CONTACT MAKE 6 READ. 4 TEST.
7. 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.
8. FOR USE WHERE DIRECT BATTERY IS CONNECTED TO TERM. 3.
9. FOR USE WHERE DIRECT GROUND IS CONNECTED TO TERM. 1 & 32 INSULATE 1B & 2B (A) WHEN TESTING (SW) REL. IN (B) KEY TEL. UNIT. INS. 1B & 2B (B) WHEN TESTING 3V REL. IN (A) K.T.U.

