

CIRCUIT NOTES:

DESIG	FUSE AMP	POTENTIAL	ONE PER
A	1-1/3	48V TALK	FIG. 1
B	3	48V TALK	10 FIG. 2
C	1-1/3	+24V TALK	ZL OPTION
BATTERY SYMBOL		BATTERY VARIATIONS	
-48		44-52V	

FEATURE OF OPTION		FIG.	APP OR WRG	QUANTITY
LONG LINE CIRCUIT		1		1 PER CKT
RESISTANCE LAMP PROTECTION CKT (SEE NOTE 106)		2		1 PER 20 FIG. 1 WHEN REQD
LONG LINE CKT LOCATED IN INTERMEDIATE CENTRAL OFFICE COND LOOP TO TERMINATING CENTRAL OFFICE (SEE ALSO ZJ OPTION)	0-250 OHMS		W	
	OVER 250 OHMS		X	
LONG LINE CIRCUIT LOCATED IN (SEE ALSO TERMINATING CENTRAL OFFICE ZJ OPTION)			W	
PULSING RELAY BIAS RESISTOR	STEP BY STEP			*Y
	TANDEM OPERATION			*V
PANEL NO. 1 ESS OR CROSSBAR SEE SHEET -013	SINGLE CIRCUIT OPERATION			*Y
	TANDEM OPERATION			*Z
RELAYED RINGING (±10%) WITH TRIPPING DURING SILENT INTERVAL ONLY			P	
RELAYED RINGING WITH TRIPPING DURING RINGING INTERVAL AND DURING SILENT INTERVAL	AC-DC AUD		S, T	
	SUP. -AUD		T, U	
BYPASSED RINGING			ZI	
MOTOR START LEAD REQUIRED WHEN RINGING MACHINE IS OPERATED ON A CALL START BASIS			D	
FOR USE WITH NO. 1 ESS OFFICES			ZB	
ARRANGED FOR USE WITH 24V4 REPEATERS	CONVENTIONAL TIP AND RING LEAD ARRANGEMENT		ZD, ZE	
	LOOP SIGNALING ON SIMPLEX LEGS OF 24V4 REPEATER WITH DIAL LONG LINE CIRCUIT LOCATED AT		ZF	
NOT ARRANGED FOR USE WITH 24V4 REPEATERS	STATION END OF FACILITY		ZG	
	CO OR PBX END OF FACILITY		ZH	
IN TANDEM WITH LONG LINE CKT OTHER THAN 48V SUPPLY (PBX LL CKT) ARRANGED TO RECEIVE WET PULSING AND SUPERVISION		1	ZJ	
48V OPERATION		1, 2	ZK	
72V OPERATION		1, 2	ZL	
RATIO OF 120T REP COIL (SEE NOTE 110)	.8 (600: 900 OHM)		ZU	
	.8 TO 1.25 (900: 900 OHM)		ZT	
	1.25 (900: 600 OHM)		ZV	

* NON-RECORD OPTION

NETWORK VALUES			
NO.	CODE	RESISTANCE IN OHMS	CAPACITANCE IN UF
1	186A	120	0.35
2	185A	470	0.11

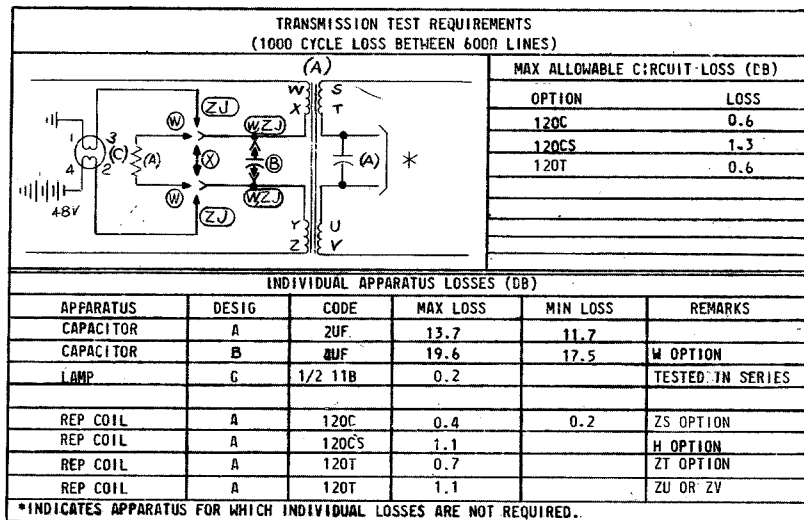
RECORD OF FIGURES, WIRING AND APPARATUS CHANGES									
CHANGED ON ISS	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT					
				STD	A&M	MD			
4AC	FIG. B	FIG. A	102	FIG. B			FIG. A		
6B	FIG. C OR FIG. D	FIG. C	102, 108	FIG. D			FIG. C		
6B	D	NONE	102, 108	D					
6B	B	R OR T	102, 107	B					
6B	A OR ZA	A	107	ZA			A		
6B	ZB	NONE	102	ZB					
9B							B		
10D	ZC, ZD, ZE, ZF, ZG, ZH	ZC, ZE	102, 103	ZC, ZD, ZE, ZF, ZG, ZH					
11B	ZI	R	102	ZI			R		
12D	RESISTORS			221A			145A		
13D	ZK, ZL	ZK	102	ZK, ZL					
	ZM, ZN	ZM	111	ZN			ZM		
	ZJ	X, W	102, 204	X, W, ZJ					
15A	ZT, ZU OR ZV	ZS	105	ZT, ZU, ZV			ZS		
	ZS OR H	ZS	105				ZS, H		

RATIO OF LINE OR * TRUNK IMPEDANCE OF LOOP CONN TO REP COIL TERMS. S-V TO IMPEDANCE OF LOOP CONN TO REP COIL TERMS. W-Z		OPTION **	CODE	TERMINAL CONNECTIONS											
				S	T	U	V	W	X	Y	Z				
0.8 TO 1.25		ZS	120C	4	3	8	7	2	1	6	5				
0.8 TO 1.25		H	120CS	4	3	8	7	2	1	6	5				
0.8 TO 1.25 (600:600 OR 900:900)		ZT	120T	4H	3	8	7H	2	1	6	5				
0.8 (600:900)		ZU	120T	4L	3	8	7L	2	1	6	5				
1.25 (900:600)		ZV	120T	2	1	6	5	3	4L	7L	8				
CODE	OP-TION	IMPEDANCE RATIO	WINDING RESISTANCE												
120C	ZS	1:1		7.8											
120CS	H	1:1		20											
120T	ZT	2-1,6-5 TO 4H-3,8-7H		2-1,6-5				4H-3,8-7H							
		1:1		7.4				9.8							
120T	ZU	2-1,6-5 TO 4L-3,8-7L		2-1,6-5				4L-3,8-7L							
120T	ZV	1.5:1		7.4				7.8							

*FOR IMPEDANCE DATA SEE MASTER KEY SHEET.

**USE H OPTION ONLY IF REQUIRED BY GOVERNMENT RESTRICTIONS.

106. SINCE FIG. 2 IS PROTECTION UPON PROTECTION ITS APPLICATION SHOULD BE LIMITED TO CASES WHERE THE LINE IS OPEN WIRE OR CABLE ON JOINT USE POLES AND WHERE INDUCED VOLTAGES WOULD OTHERWISE CAUSE BURNED OUT LAMPS.
107. WHEN B OPTION IS ADDED TO PROVIDE IMPROVED PARTY LINE SERVICE, ZA OPTION MUST ALSO BE ADDED.
108. FIG. D IS REQUIRED WHEN D OPTION IS SPECIFIED.
109. FOR INTERCONNECTING INFORMATION SEE COMPATABILITY APPLICATION SCHEMATIC, SD-99421-01, FOR THE TRANSMISSION SYSTEM TO WHICH CONNECTIONS ARE TO BE MADE.
110. OMITTED ON ISSUE 15A.
111. PRIOR TO ISSUE 13D, 14A TYPE RESISTANCE LAMP WAS PROVIDED, 14B TYPE RESISTANCE LAMP IS PROVIDED TO LIMIT CURRENT TO MAXIMUM OF 65MA ON SHORT LOOPS.



FIGURES AND OPTIONS ON THIS DWG	
CKT FIG.	APP OR WIRING
1	ZI ZC
2	Y ZD
A	X ZE
B	W ZF
C	V ZG
D	U ZH
	T ZI
	S ZJ
	R ZK
	Q ZL
	P ZM
	N ZN
	ZS
	H ZT
	ZU
	ZV
	ZW
	D
	B
	A
	ZA
	ZB

DWG ISSUE	EE OR CD	DATE ISSUED	DRAWN	APPRO
1	1	8-15-61	WVH	WVH
2A	1	5-2-62	WVH	WVH
3AR	2AR	10-9-62	WVH	WVH
4AC	2AR	10-14-62	WVH	WVH
5AR	2AR	10-14-62	WVH	WVH
6B	2AR	2-19-64	WVH	WVH
7D	2AR	1-14-65	WVH	WVH
8D	2AR	9-13-65	WVH	WVH
9B	3B	7-11-66	WVH	WVH
10D	APP 1D	3-18-68	WVH	WVH
11B	3B	9-23-68	WVH	WVH
12D	3B	7-29-68	WVH	WVH
13D	4D	12-22-70	WVH	WVH
14D	4D	3-21-73	WVH	WVH
15A	4D	3-21-73	WVH	WVH
16D	4D	1-30-74	WVH	WVH
17D	4D	12-12-77	WVH	WVH

199234T
EQUIP INFO.

ISSUE
17D

WORKING LIMITS
SEE RANGE CHARTS FOR DIAL LONG LINE CIRCUITS
SEE SHEET -013 FOR SINGLE CIRCUIT OPERATION
SHEET -0128 CANCELED ON ISSUE 15A.

REPLACED BY SD-1C359-01
SD-96555-01
COMMON SYSTEMS
DIAL LONG LINE CIRCUIT
10 OR 20 PPS REPEATING
FOR SUBSCRIBER LINES, PBX STATION LINES
OR PBX MANUAL SELECTED TRUNKS
DIAL CENTRAL OFFICE OR PBX

AT & TCO
STANDARD

SD-96555-011
7 SHEETS

BELL TELEPHONE LABORATORIES
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6S
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PART OF FIG. 1
LONG LINE CIRCUIT

FIG. D

FIG. A
(MFR DISC.)

FIG. 2
RESISTANCE LAMP
PROTECTION CKT

FIG. B

DRAWING	ISSUE
1	1
2A	2
3AR	3
4AC	4
5AR	5
6B	6
7D	7
8D	8
9B	9
10D	10
11B	11
12D	12
13D	13

ISSUE
17D

DIAL LONG LINE CIRCUIT

SD-96555-012

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DWG NO
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WORKING LIMITS (CONT)

- 1.1 DIALING (48V) 10 PPS 20 PPS
MAXIMUM CONDUCTOR LOOP 3000 OHMS 2000 OHMS
- 1.2 SUPERVISION (48V)
MAXIMUM EXTERNAL
CIRCUIT LOOP 3100 OHMS
- 1.3 TALKING (STATION LOOP)
MAXIMUM EXTERNAL
CIRCUIT LOOP -48V 1800 OHMS
-72V 1000 -
(SEE NOTE 7 & 1.6-4) 2800 OHMS
- 1.4 INSULATION RESISTANCE
MINIMUM 30,000 OHMS
- 1.5 TRIPPING RANGE (FOR S & U OPTIONS)

1. RINGING PLANTS HAVING 44-52 VOLT SUPERIMPOSING BATTERY (S AND CERTAIN U OPTIONS) 3000 OHMS MAX EXTERNAL CIRCUIT LOOP
2. RINGING PLANTS HAVING 36-40 VOLT SUPERIMPOSING BATTERY (U OPTION) 2400 OHMS MAX EXTERNAL CIRCUIT LOOP

NOTE: SOME SUPERIMPOSED RINGING PLANTS HAVE 36 VOLT SUPERIMPOSED BATTERY, ALL AC-DC PLANTS HAVE 48 VOLT SUPERIMPOSED BATTERY.

1.6 RINGING RANGE

1. MAXIMUM EXTERNAL CIRCUIT LOOP RANGE FOR OPERATION OF (R1) RELAY IS 2300 OHMS WITH MINIMUM 84 VOLTS AC RINGING VOLTAGE. (3000 OHMS IS ALLOWED WITH 105 VOLTS AC)
2. MAXIMUM RINGING RANGE WITH BYPASSED RINGING IS 3000 OHMS USING 1 HIGH IMPEDANCE RINGER AND 0.5 UF CAPACITOR.
3. MAXIMUM RINGING RANGE WITH RELAYED RINGING IS 3000 OHMS USING TWO HIGH IMPEDANCE RINGERS.
4. MAXIMUM RINGING CAPABILITY ON STATION LOOPS IS:
FOR -48V BAT. 3 BRIDGED OR 10 GROUNDED HIGH IMPEDANCE RINGERS
FOR -72V BAT. 2 BRIDGED OR 8 GROUNDED HIGH IMPEDANCE RINGERS
5. IF AN E6 OR E7 TYPE REPEATER IS USED WITH THIS CIRCUIT TO IMPROVE TRANSMISSION, THEIR RESISTANCE MUST BE INCLUDED WITH THE CONDUCTOR LOOP AS FOLLOWS:
- A. WITH RINGING VOLTAGE AT 84V OR HIGHER
E6-65 OR 90 OHMS PLUS LINE BALANCING NETWORK RESISTANCE.
E7-18 TO 44 OHMS DEPENDING ON TRANSFORMER TAP.
- B. WITH RINGING VOLTAGE BELOW 84V
E6-500 OHMS PLUS LINE BALANCING NETWORK RESISTANCE.
E7-200 OHMS.

1.7 CENTRAL OFFICE RANGES (SINGLE CIRCUIT OPERATION)

1. THE RANGE OF THE CENTRAL OFFICE OR PBX WILL BE CONTROLLING IF IT IS LESS THAN RANGES GIVEN HEREIN FOR LOOP A. SEE NOTES 6 & 7 UNDER NOTES.
2. 20 PPS RANGE
45-52V A 45-52V B
CO.SD-96555-01.PBX
300-1400 0-2000
3. 10 PPS RANGE
45-52V A 45-52V B STA
CO.SD-96555-01.
300-1400 0-1800
4. PERMISSIBLE CAPACITY IN PBX RERING BRIDGE FOR THROUGH DIALING AT 10 PPS.
IF IN LOOP A 2 UF
B 2 UF
5. STATION DIALS SHALL GENERATE PULSES IN THE RANGE OF 58 TO 64 PER CENT BREAK (7L AND 8C DIALS TYPICAL).
6. BIAS RESISTANCE FOR (P) RELAY SHALL BE SELECTED PER NOTE 102 UNLESS OTHERWISE NOTED.

1.8 PRIVATE BRANCH EXCHANGE RANGES 47-52V
CONDUCTOR LOOP RANGES (T) BETWEEN THE LONG LINE CIRCUIT AND PBX TRUNK CIRCUIT WITH CORRESPONDING STATION CONDUCTOR LOOPS (STA).

	TABLE X			
	T	STA	T&S	T STA
1. 550C, SC (NOTES 1 AND 5)				
2. 551A & B (NOTES 1 AND 5)				
3. B1088 & B1089 RELAYS	1170	250	1170	250
4. B1088 & B1089 RELAYS (LIM STA)	2420	TABLE X		1080 200 1280 150 1540 100
5. B42 RELAYS	1145	100	1145	
6. B42 RELAYS (LIM STA)	1685	TABLE Y		1895 50 1620 25 2420 0

	TABLE Y			
	T	STA	T&S	T STA
7. 605A (NOTES 1 AND 5)	1330	1330	1330	
8. (LIMITED STA)	2435	TABLE Z		1045 100 1140 80 1240 60
9. 505C, 506A, & 506B		T STA		1375 40
10. 186A RELAY TRUNKS	(NOTE 2)	70		1515 20
11. 186B RELAY TRUNKS	1640	70		1575 15 1685 0

	TABLE Z			
	T	STA	T&S	T STA
12. 750A				
13. KEY STATIONS	(NOTE 2)	20		380 1000
14. KEYLESS STATIONS	(NOTE 2)	200		535 800 630 700
15. 755A				740 600
16. KEY STATIONS	(NOTE 2)	100		880 500
17. KEYLESS STATIONS	(NOTE 2)	285		1045 400 1255 300 1555 200 1905 100 2435 0

NOTES:

1. MODIFY THE ATTENDANT'S DIAL CIRCUITS PER THE NOTES REFERRED TO BELOW FOR THE CENTRAL OFFICE CONDITION INDICATED AND LIMIT (T) TO THE RANGE SHOWN.

TYPE OF CENTRAL OFFICE	STANDARD DIAL CIRCUITS		OLD TYPE DIAL CIRCUITS	
	MOD REQD	(T) RANGE	MOD REQD	(T) RANGE
NO. 1 ESS, PANEL, NOTES 3A & B AND CROSSBAR		0-*	NOTE 4A NOTE 4B	150-* 100-*
STEP-BY-STEP	NONE	0-*	NOTE 4A	0-*

*MAX VALUE OF (T) NOT LIMITED BY DIAL CIRCUIT

2. T IS LIMITED BY THE 20 CYCLE SIGNALING RANGE OF THE PBX TRUNK AS INDICATED BELOW.

TRUNK CIRCUITS - 20 CYCLE SIGNALING RANGES

PBX	TRUNK A-C RELAY	MAX TRUNK CONDUCTOR LOOP MIN A-C VOLTAGES AT 20 CYCLE				
		72	75	80	84	95
505C, 506A AND B	56L AND 186A REL	520	525	540	550	635
701A	J29	1200	1300	1500	1600	2000
740A, B, C AND AX	221GD	600	700	800	1000	1200
750A, 755A	J44	700	800	1000	1200	1500

3. MODIFY STANDARD ATTENDANT'S DIAL CIRCUITS (I.E., THOSE EQUIPPED WITH A 1000 OHM 18BH RESISTANCE) AS FOLLOWS:

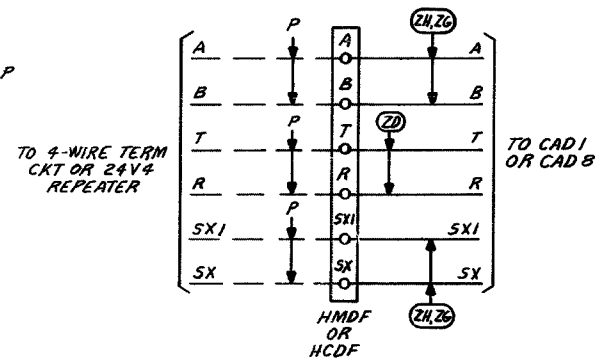
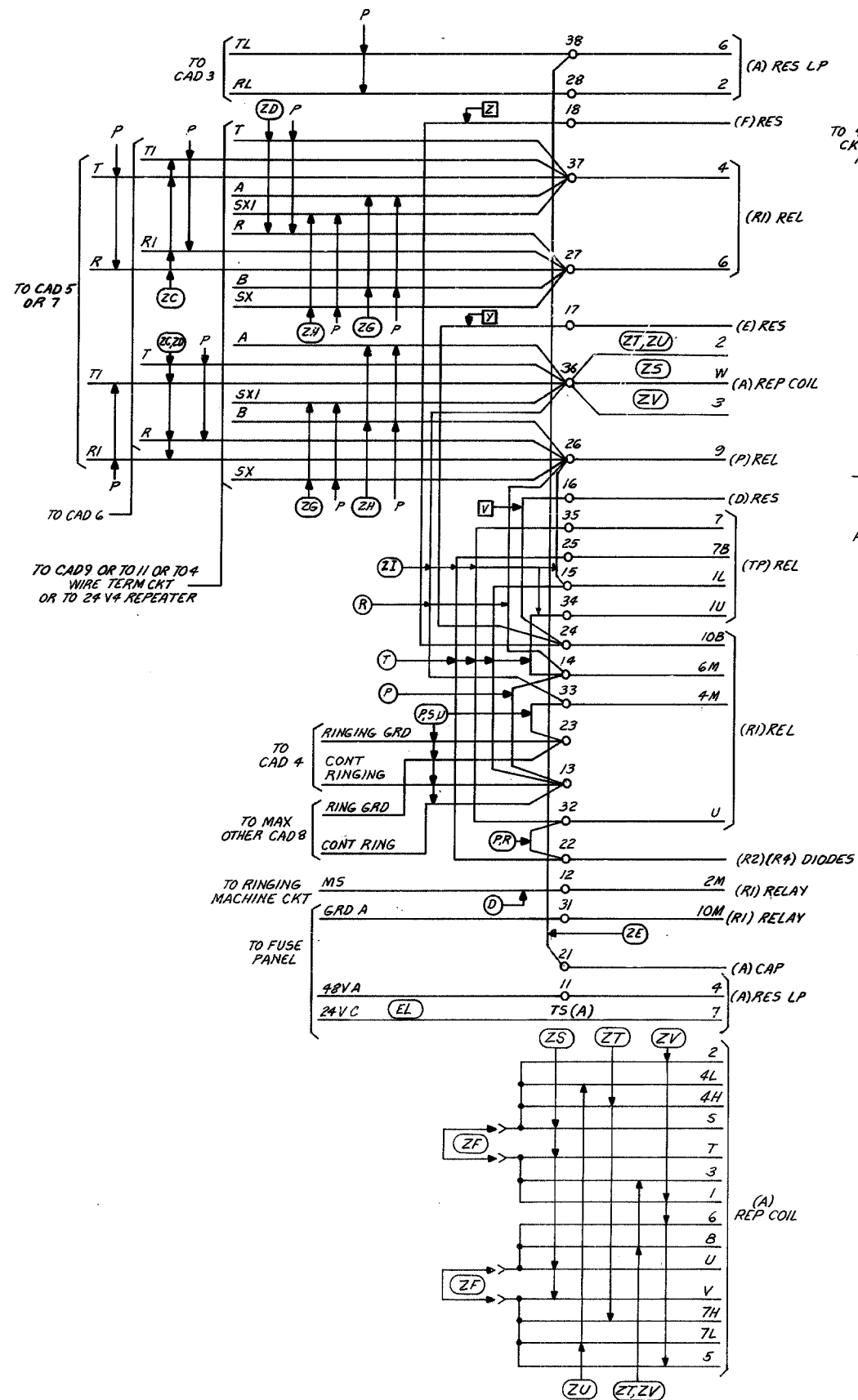
- A. REPLACE THE 1000 OHM 18BH RESISTANCE BY A 500 OHM 18AC RESISTANCE.
- B. SHUNT THE (T1) AND (R1) CAPACITORS IN 605A AND 552 (701A AND 740AX) BOARDS WITH 100,000 OHM KS-8058 RESISTANCE.

NOTES (CONT):

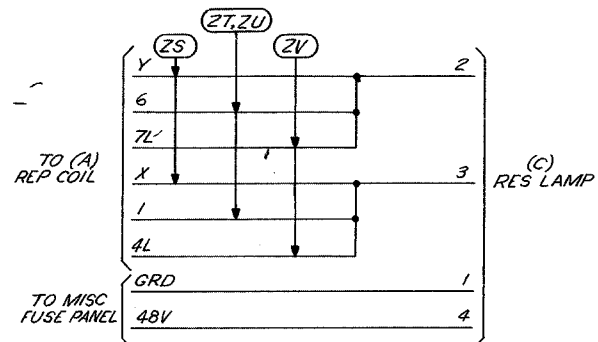
4. MODIFY OLD TYPE ATTENDANT'S DIAL CIRCUITS (I.E., 550C DIAL CIRCUITS WITH E TYPE RELAYS AND 550SC DIAL CIRCUITS WITH 206 AND 263 RELAYS) AS FOLLOWS:
- A. PER SD-66501-01,
- B. PER SD-66572-01, FIGS. 3 AND C - 550C
PER SD-66573-01, FIGS. 3 AND C - 550SC
5. IF THE CONDUCTOR LOOP FROM THE SOURCE OF RINGING TO THE PBX TRUNK CIRCUIT EXCEEDS THE 20 CYCLE SIGNALING RANGE OF THE PBX TRUNK A-C RELAY AS SHOWN IN THE RANGE TABLE ON THE CIRCUIT DRAWING, MODIFY THE TRUNK CIRCUIT BY MEANS OF A THERMISTOR, LARGER CAPACITOR OR MORE SENSITIVE RELAY, AS REQUIRED.
6. THE EMERGENCY LOW VOLTAGE OF 42.75 VOLTS IN THE NO. 1 ESS OFFICE WILL REDUCE THE MAXIMUM RANGE OF THIS CIRCUIT BY A FACTOR OF 5%.
7. RANGE ON STATION TALKING BATTERY IS TO INSURE 23MA CURRENT IN TALKING CIRCUIT.

DRAWING ISSUE
3AR
4AC
44C
5AR
6B
7D
8D
9B
10D
11B
12D
13D
17D

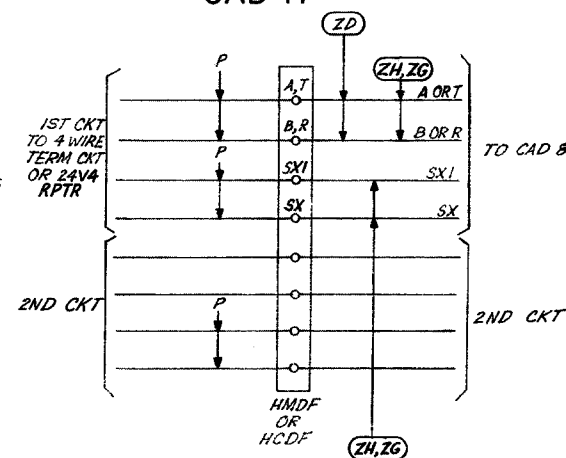
CAD 9 (MFR DISC)



(ZJ) CAD 10



CAD II



EQUIPMENT NOTES:

201. ON ISSUE 98, CAD 1 WAS RATED A & M ONLY. CAD 2 WAS RATED MFR DISC. CAD 7 & CAD 8 WERE ADDED.
- MFR DISC**
202. ON ISSUE 100, CAD 1 WAS RATED MFR DISC AND CAD 9 WAS ADDED.
203. THE INSTALLER SHALL REMOVE "ZE" STRAP ON TS (A) WHEN "ZF" OPTION IS APPLIED.
204. WHEN (C) LAMP IS PROVIDED PER "ZJ" OPTION, IT SHALL BE MOUNTED ON A MISCELLANEOUS BASIS AND WIRED PER CAD 10.

MFR DISC

204. WHEN (C) LAMP IS PROVIDED PER "ZJ" OPTION,
IT SHALL BE MOUNTED ON A MISCELLANEOUS
BASIS AND WIRED PER CAD 10.

DIAL LONG LINE CKT

SD-96555-016

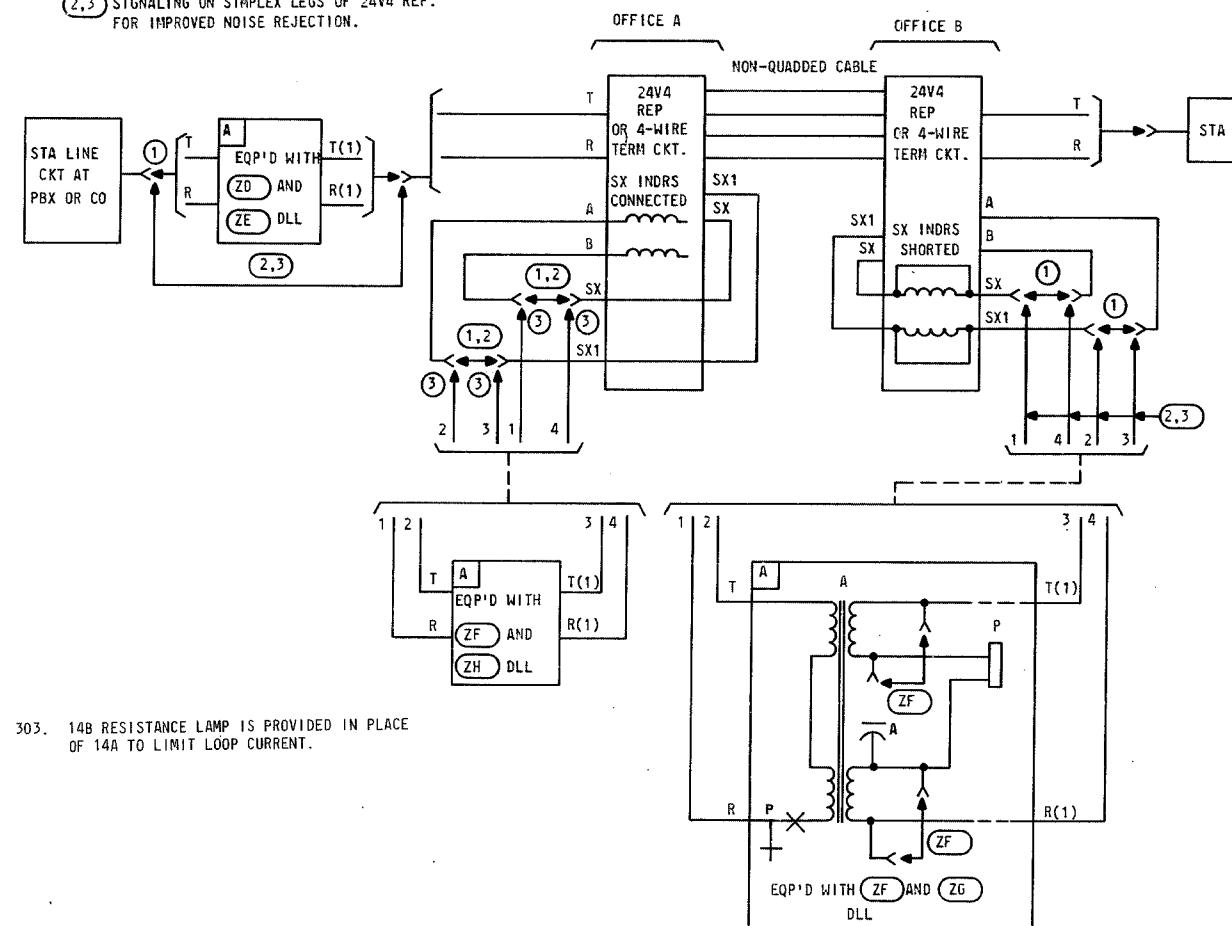
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DWG SIZE
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INFORMATION NOTES:

301. UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS,
CAPACITANCE VALUES ARE IN MICROFARADS,
VALUES PRECEDED BY THE SYMBOL + (PLUS)
OR - (MINUS) ARE IN VOLTS.
302. SIGNALING ARRANGEMENT USING 24V4 REPEATERS WITH
2 WIRE EXTENSIONS.
- ① CONVENTIONAL ARRANGEMENT
②, ③ SIGNALING ON SIMPLEX LEGS OF 24V4 REP.
FOR IMPROVED NOISE REJECTION.



303. 14B RESISTANCE LAMP IS PROVIDED IN PLACE
OF 14A TO LIMIT LOOP CURRENT.

DRAWING	ISSUE
100	103
11B	
12D	
13D	

ISSUE
17D

DIAL LONG LINE CKT

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