

DWG ISSUE	CD ISSUE	DATE ISSUED	Drawn	APPRO
1	1	2-18-76	ZEN FCR	KK FTF WA
2AR	1 APP 1AR	8-6-80	ANT FCR	KK RO WA
3B	1 APP 2B	8-6-80	ANT FCR	KK RO WA

[illegible][illegible]

OPTION INDEX			
APP OR WRG	RATED ON ISSUE	REF NOTES	LOC
Y			1E7, 2B5 2C5, 2E5 2G5, 2H5
X			1A7, 2C5 2E5, 2H5
W			1F2
T			1B8, 1C8, 1F SHEET 3 APP FIG. 3
S			3F6
R	MD 38	110, 108	1B1, APP FIG. 3
Q	STD 38	110, 108	1B1 APP FIG. 3

CAD 4

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.

SUPPORTING INFORMATION

S.	CATEGORY	NO.
	EQUIPMENT DRAWING	J86872A-()
ET	EQUIPMENT DESIGN REQ'T	J86872
	MAINTENANCE SPECIFICATION	167-615-302

NOTICE- NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL
SYSTEM EXCEPT UNDER WRITTEN AGREEMENT.

3B

POWER SYSTEMS
CHARGE AND DISCHARGE CIRCUIT
24 CELLS
151A POWER PLANT

AT&T CO
STANDARD

② SD-82304-OI-AI
10 SHEETS

BELL TELEPHONE LABORATORIES
INCORPORATED

65

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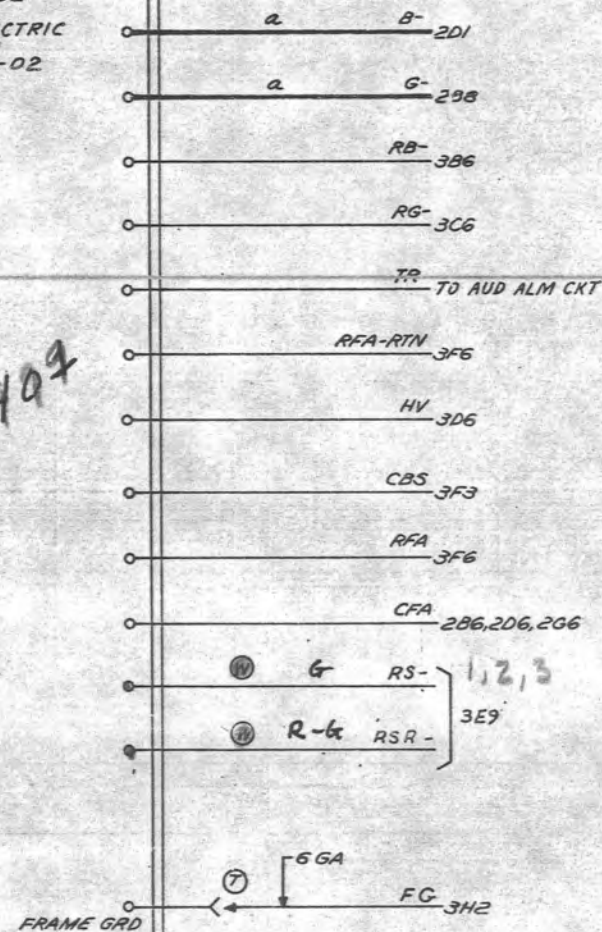
FS 1
100 AMP RECTIFIER
SEE NOTES 105, 108 & 204

RECTIFIER -
KS-20493, L21
208/240 VOLT AC INPUT,
48 VOLT NEGATIVE OUTPUT

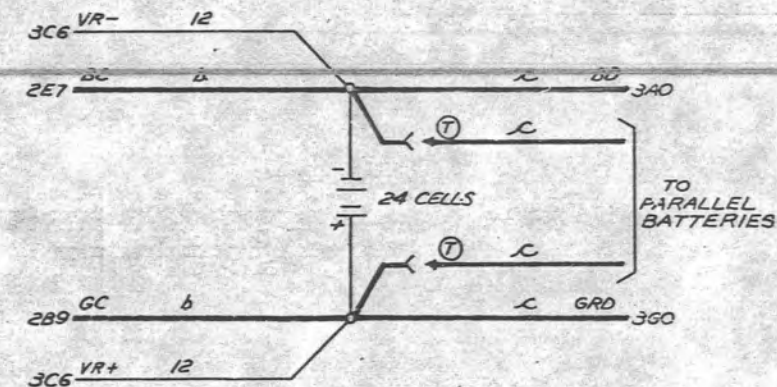
- ① LORAIN RECTIFIER
SD-81999-01
- ② NORTH ELECTRIC RECTIFIER
SD-82401-01
- ③ LORAIN RECTIFIER
SD-81999-02
- ④ NORTH ELECTRIC
RECTIFIER
SD-82401-02

AC POWER SERVICE
1 PH 60 HZ
480V OR 208V-240V

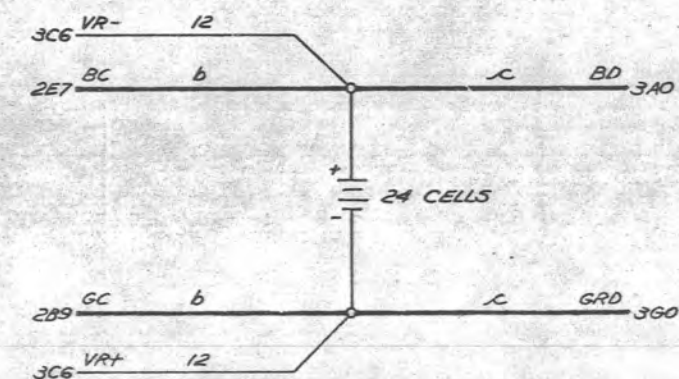
SD 82404



FS 3
NEGATIVE BATTERY
SEE NOTES 105 & 204



FS 4
POSITIVE BATTERY
SEE NOTES 105 & 204



CHARGE AND DISCHARGE CIRCUIT

SD-82304-01-B1

BELL TELEPHONE LABORATORIES
INCORPORATED

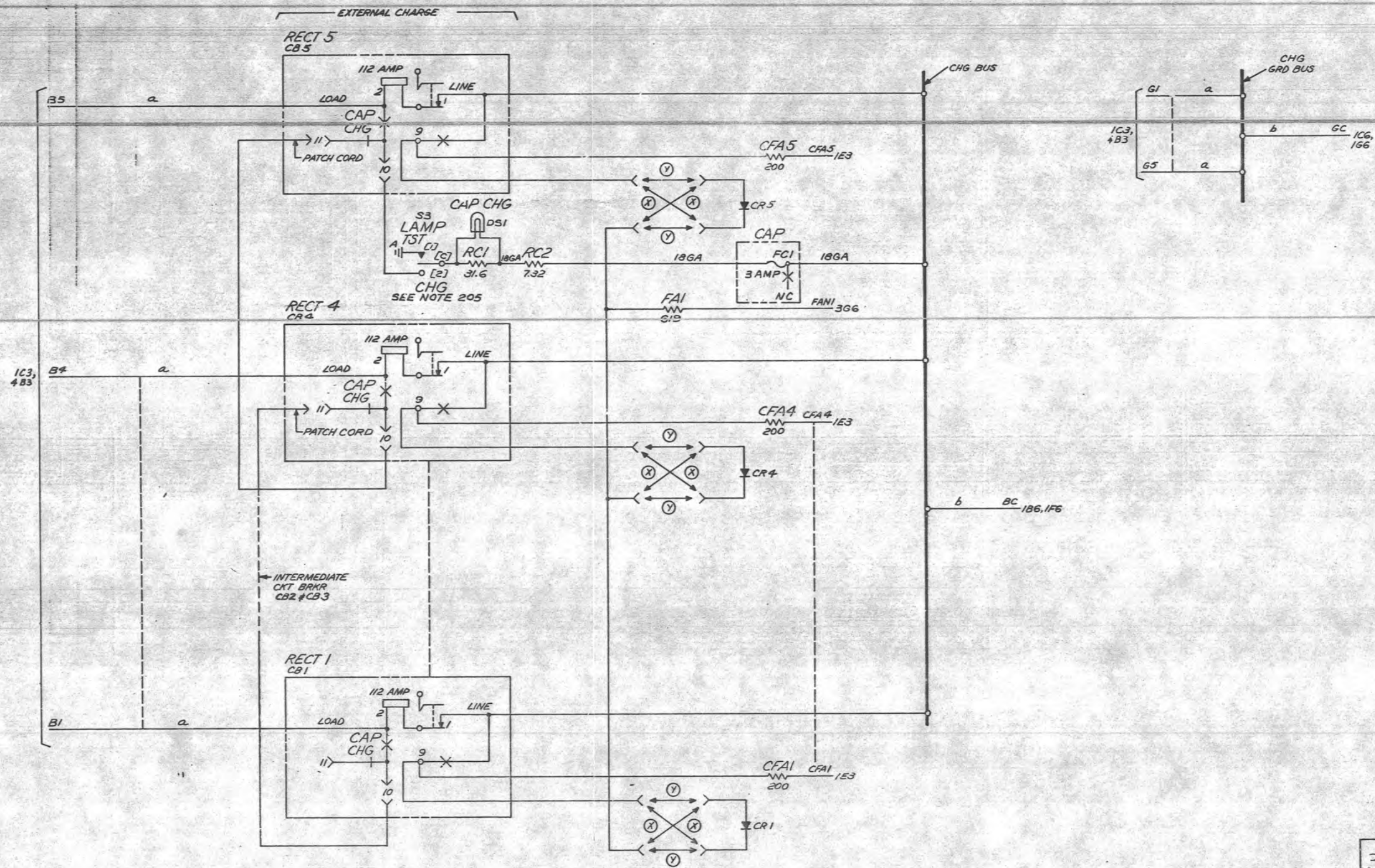
6S

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ISSUE
3B

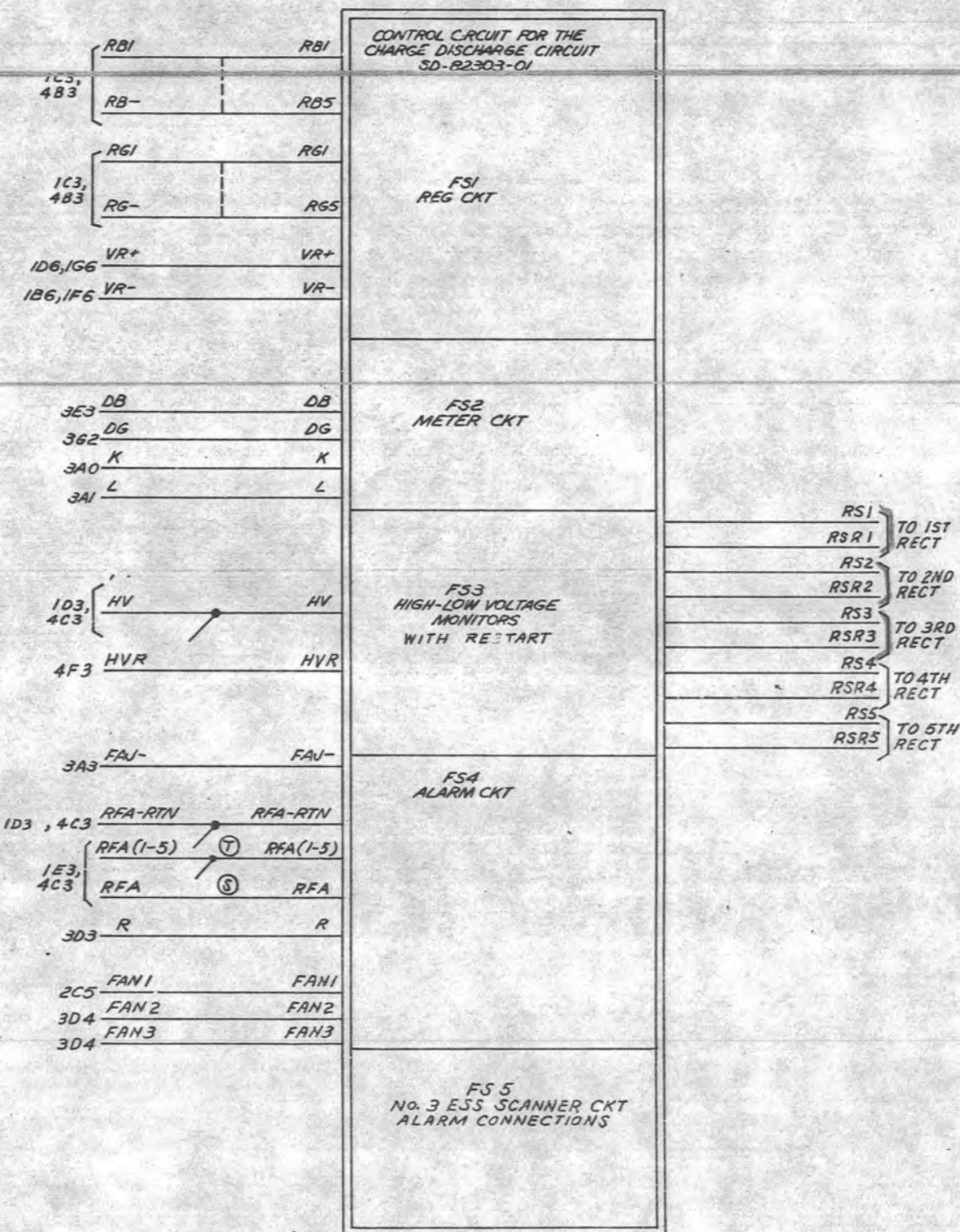
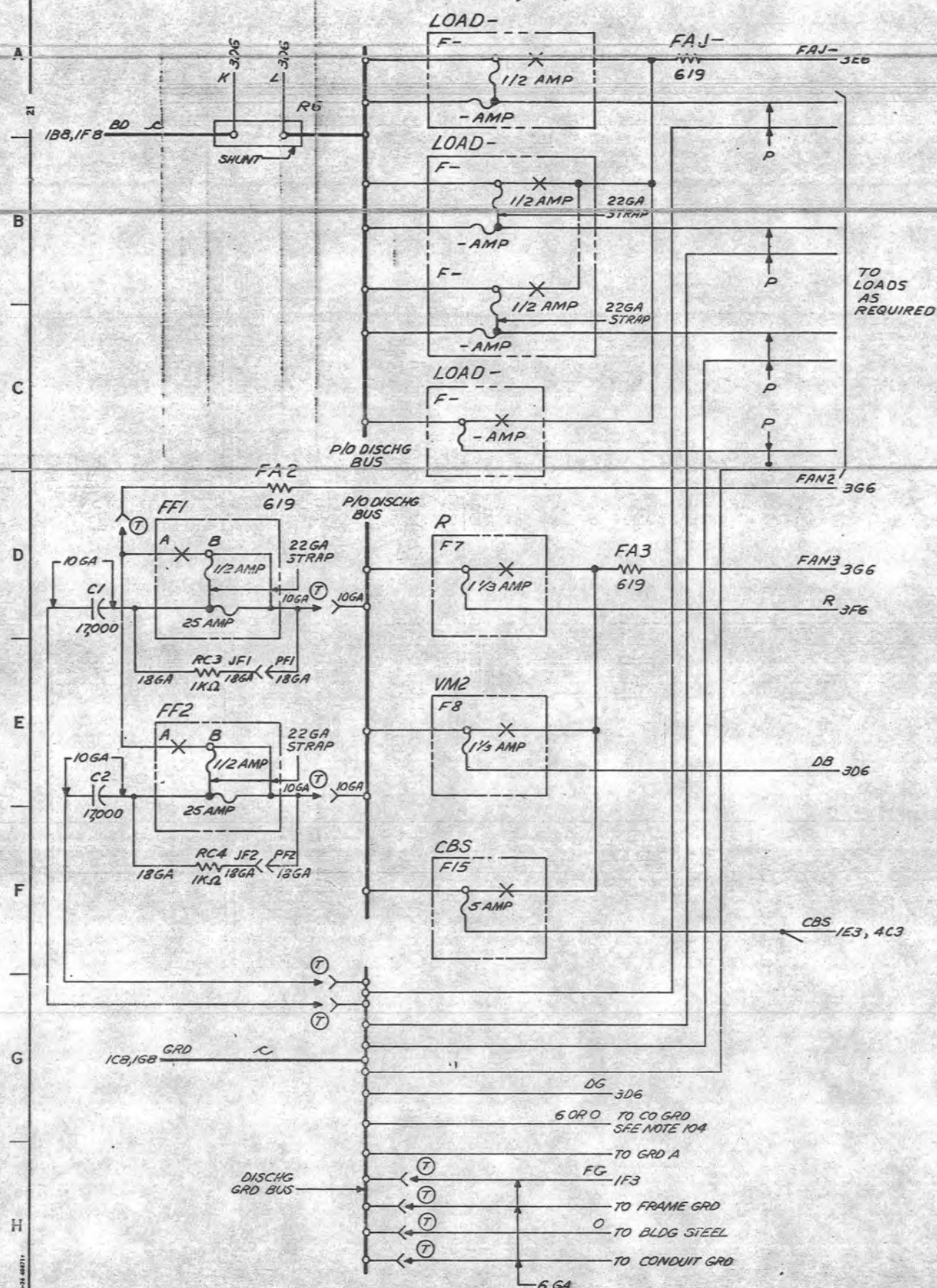
FS 2

CHARGE BUS AND CIRCUIT BREAKER CIRCUIT
SEE NOTES 105 & 206



FS 5
DISCHARGE CIRCUIT
SEE NOTES 105, 203, 204 & 207

FS 6
CONTROL CIRCUIT



CHARGE AND DISCHARGE CIRCUIT

SD-82304-01-B3

BELL TELEPHONE LABORATORIES
INCORPORATED

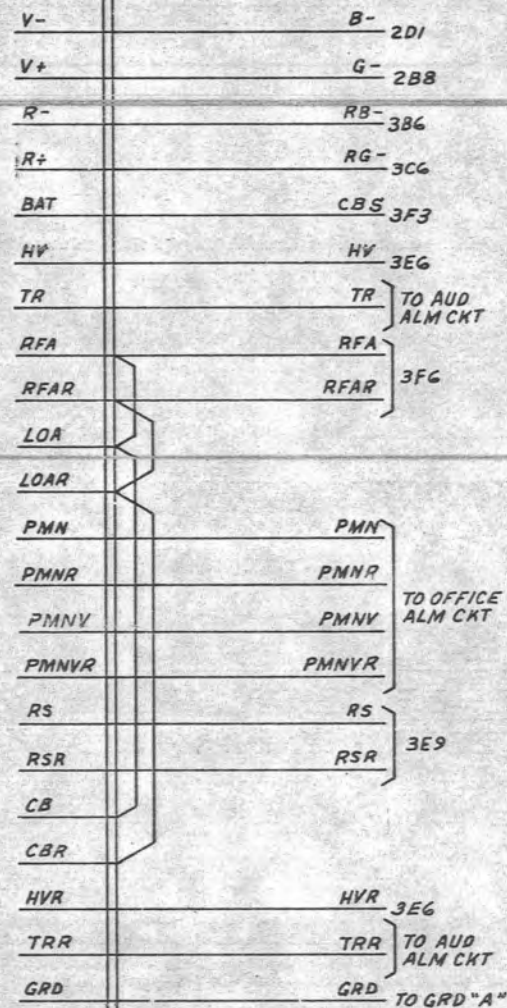
6S

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ISSUE
3B

FS 7
30, 100 AMP RECTIFIER
SEE NOTE 109

RECTIFIER -
48 VOLT
J87437A
SD-82393-01



AC POWER SERVICE

CHARGE AND DISCHARGE CIRCUIT

DWG SIZE
6S

ISSUE
3B

DELL LABORATORIES

SD-82304-01

-B4

APP FIG. 1

CIRCUIT BREAKER

DESIG	LOC	CODE
CB1	2F2	KS-21225, L112
CB2	2E2	KS-21225, L112
CB3	2E2	KS-21225, L112
CB4	2D2	KS-21225, L112
CB5	2A2	KS-21225, L112

DIODE

DESIG	LOC	CODE
CR1	2H5	426P, 813C
CR2	2F5	426P, 813C
CR3	2F5	426P, 813C
CR4	2E5	426P, 813C
CR5	2C5	426P, 813C

FUSE (SEE NOTE 1)

DESIG	LOC	CODE
FC1	2C5	70C

LAMP

DESIG	LOC	CODE
DS1	2C3	M1

RESISTOR

DESIG	LOC	CODE
CFA1	2G5	KS-8512, L19D, 200
CFA2	2F5	KS-8512, L19D, 200
CFA3	2F5	KS-8512, L19D, 200
CFA4	2D5	KS-8512, L19D, 200
CFA5	2B5	KS-8512, L19D, 200
FA1	2C5	KS-8512, L3A, 619
RC1	2C3	KS-8512, L10A, 31.6
RC2	2C4	KS-8512, L24A, 7.32

SWITCH (SEE NOTE 205)

DESIG	LOC	CODE
S3	2C3	CUTLER HAMMER 8805K9

APP FIG. 2

RECTIFIER

DESIG	LOC	CODE
RECTIFIER-	1C1	KS-20493, L21; LORAIN RECTIFIER SD-81999-01; NORTH ELECTRIC RECTIFIER SD-82401-01
		LORAIN RECTIFIER SD-81999-02
		NORTH ELECTRIC RECTIFIER SD-82401-02

CAPACITOR

DESIG	LOC	CODE
C1	3E0	KS-20133, L34, 17000
C2	3D0	KS-20133, L34, 17000

CONNECTOR

DESIG	LOC	CODE
JF1	3E0	POWER POLE CONN CAT. NO. 1315 ANDERSON POWER PRODUCTS, INC BOSTON, MASS
JF2	3F0	
PF1	3E0	
PF2	3F0	

FUSE

DESIG	LOC	CODE
CBS	3F1	70D
FF1	3D0	25 AMP BUSSMAN BAN, 70G & 70B
FF2	3E0	SEE NOTE 110
LOAD- LOAD- LOAD- R	3A1 3B1 3C1 3D1	70G, N.E.C. AS REQ'D 70G, KS-19780 FURN AS REQ'D 70 TYPE, FURN AS REQ'D 70A
VM2	3E1	70A

RESISTOR

DESIG	LOC	CODE
FAJ-	3A3	KS-8512, L3A, 619
RC3	3E0	KS-14603, L1C, 1KΩ
RC4	3F0	KS-14603, L1C, 1KΩ
FA2	3D0	KS-8512, L3A, 619
FA3	3D2	KS-8512, L3A, 619

SHUNT

DESIG	LOC	CODE
R6	3A1	KS-9442, L10

APP FIG. 4

RECTIFIER

DESIG	LOC	CODE
RECTIFIER	4B1	J87437A, L1 208/240V, 60~

APP FIG. 5

RECTIFIER

DESIG	LOC	CODE
RECTIFIER	4B1	J87437A, L4 220V AC SPECIAL

APP FIG. 6

RECTIFIER

DESIG	LOC	CODE
RECTIFIER	4B1	J87437A, L1 380V AC SPECIAL

NOTES:

1. ADDITIONAL CONTROL FUSES SHOWN ON SD-82303-01

CHARGE AND DISCHARGE CIRCUIT

BELL TELEPHONE LABORATORIES
INCORPORATED

6S

SD-82304-01-C1

ISSUE
3B

CIRCUIT NOTES:

DESIG	FUSE AMP	POTENTIAL	ONE PER
R	1-1/3	48	PLANT
VM2	1-1/3	48	PLANT
CAP	1-1/3	48	PLANT
CBS	5	48	PLANT
FF1	25	48	PLANT
FF2	25	48	PLANT

BATTERY SYMBOL	GROUND SYMBOL	VOLTAGE RANGE
		44 - 52V

FEATURE OR OPTION	PROVIDE		
	APP FIG.	APP OR WRG	QUANTITY
POSITIVE PLANT (NEGATIVE GROUND)	1	Y	1 PER PLANT
NEGATIVE PLANT (POSITIVE GROUND)	1	X	1 PER PLANT
48 VOLT RECTIFIER NEGATIVE OUTPUT	2	X	AS REQD 5 MAX.
DISCHARGE FUSING, FILTER CAPACITANCE AND SHUNT	3		AS REQD
NO. 3 ESS APPLICATION		T	

CIRCUIT NOTES: (CONT)

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	SPL
3B	FIG. 4, 5 OR 6	FIG. 2	109	FIG. 2 FIG. 4			FIG. 5 FIG. 6
	R OR Q	R	110	Q		R	

104. PROVIDE GROUNDING AS COVERED IN BSP 802-001-193 OR 802-001-195.

105. (A) FOR LEAD LENGTHS EXCEEDING TABLE VALUES, A LEAD SHALL BE CALCULATED FOR 1/2 VOLT LOOP DROP AT MAX CHARGE CAPACITY OF THE RECTIFIER

VOLTAGE DROP = $\frac{IKL}{CM}$ WHERE K=11.1 FOR COPPER, I IS CURRENT IN AMPERES, L IS LOOP LENGTH IN FEET AND CM IS CONDUCTOR CROSS SECTION IN CIRCULAR MILS.

RECTIFIER CAPACITY	a LEAD	
	MIN SIZE	LOOP LENGTH
100 AMP	1/0	43 FT

(B) FOR LEAD LENGTHS EXCEEDING TABLE VALUES, b LEADS SHALL BE CALCULATED FOR 1/2 VOLT LOOP DROP AT THE ULTIMATE CHARGING CAPACITY.

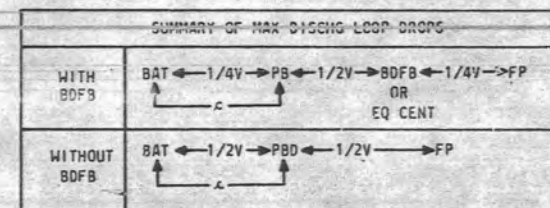
ULTIMATE CHARGING CAPACITY	b LEAD	
	MIN SIZE	LOOP LENGTH
100 - 250	350,000	51 FT
251 - 400	500,000	50 FT
401 - 600	2-350,000	47 FT

(C) THE c LEADS SHALL BE CALCULATED FOR CIRCUIT PEAKS WHERE THE CIRCUIT PEAK IS DEFINED AS THE BUSY HOUR LOAD TIMES 1.33 FOR VARIABLE LOAD AND IS EQUAL TO THE BUSY HOUR LOAD FOR FIXED LOADS.

ULT PEAK LOAD	c LEAD WITH BDFB OR EQ CENT		c LEAD WITHOUT BDFB	
	MIN SIZE	LOOP LENGTH	MIN SIZE	LOOP LENGTH
100 - 250	2-350,000	54 FT	350,000	54 FT
251 - 400	2-500,000	50 FT	500,000	50 FT
401 - 600	2-750,000	50 FT	750,000	50 FT

CIRCUIT NOTES: (CONT)

105. VOLTAGE DROP IN POWER BOARD INTERNAL WIRING MAY BE IGNORED. BATTERY AND GROUND SUPPLY LEADS TO BDFB OR EQUIPMENT FUSE PANELS SHALL BE CALCULATED ON CIRCUIT PEAKS.



106. LEADS SHALL HAVE AMPACITY FOR AVERAGE AMPERES PER BATTERY STRINGS OR 1/4 OF THE 8 HOUR AMPERE HOUR RATING OF THE CELL SIZE USED.

$$\text{AVERAGE AMP} = \frac{\text{AMP LOAD (ULTIMATE)}}{\text{NO. OF STRINGS OF CELLS (ULTIMATE)}}$$

THE FOLLOWING TABLE LISTS COPPER WIRE SIZES WITH THEIR AMPACITIES.

SIZE	CAPACITY	SIZE	CAPACITY
8	55 AMP	350,000	405 AMP
4	105 AMP	500,000	500 AMP
2	140 AMP	750,000	630 AMP
00	220 AMP		
4/0	295 AMP		

IN THIS TABLE AMPACITY OF KS-5482-01 WIRE ON CABLE RACK IS BASED ON THE AVERAGE OF THE OPEN AND ENCLOSED NEC RATINGS.

107. RECTIFIER POLARITY OPTIONS SHALL BE FURNISHED TO MATCH PLANT POLARITY OPTIONS.

108. WHEN FS1 RECTIFIER CIRCUIT IS PER SD-81999-01 AND USED IN THIS PLANT FOR NO. 3 ESS, ZK OPTION (FAST WALK IN RESET), ZL OPTION (OVERVOLTAGE SHUTDOWN) AND ZN OPTION (REMOTE RECYCLE) OF SD-81999-01, ISS & AC MUST BE FURNISHED. WITH ISSUE 3B OF THIS DRAWING, SD-81999-01 IS MFR DISC. AND THE NEW SD-81999-02 IS STANDARD AND INCLUDES ALL REQUIRED OPTIONS.

109. RECTIFIERS SHOWN ON FS7 HAVE THE FOLLOWING CODES

RECTIFIER	CODE
3 ϕ , 100 AMP 208/240 AC	J87437A,L1
3 ϕ , 100 AMP 220 VAC SPL	J87437A,L4
3 ϕ , 100 AMP 380 VAC 50~SPL	J87437B,L1

110. 70B FUSES ARE BEING FURNISHED FOR USE ON NO. 3 ESS, FOR SOME KNOWN LOADS, ON ISSUE 3B.

ISSUE
3B

CHARGE AND DISCHARGE CIRCUIT

SD-82304-01-DI

BELL TELEPHONE LABORATORIES
INCORPORATEDCWS SIZE
6S

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EQUIPMENT NOTES:

201. UNLESS OTHERWISE SPECIFIED WIRE SHALL BE 22 GAUGE BH. WHEN STRANDED WIRE IS SPECIFIED USE KS-1919S,L1
202. BATTERY EQUIPMENT SHALL BE ORDERED SEPARATELY AS REQUIRED PER J87122 OR J87124.
203. ADDITIONAL WIRING USED IN THIS PLANT IS:

SIZE	WIRE TYPE	REMARKS
6 GA	KS-5482	FRAME TO GROUND BUS BAR VR LEADS
12 GA	KS-5482	
8 GA	KS-5482	
10 GA	KS-1919S,L1	
18 GA	KS-1919S,L1	WIRES ARE USED AS EXTENSIONS OF THE DISCHARGE BUS BAR
4/0 GA	KS-20921	

FRAME TO GROUND BUS BARS ARE USED AS EXTENSIONS OF
THE DISCHARGE BUS BARS

204. FOR NO. 3 ESS APPLICATION, LEADS SHALL BE:

DESIG	WIRE TYPE
a	2 GA,KS-20921
b	2-4/0 GA,KS-20016,L120
c	2-4/0 GA,KS-20016,L120

205. AS VIEWED FROM THE WIRING SIDE, THE (S3) SWITCH HAS THE FOLLOWING ORIENTATION AND WIRING TERMINAL ASSIGNMENTS. CONTACTS CLOSE IN DIRECTION OPPOSITE TO LEVER OPERATION



206. THE (CFA1) THRU (CFA5) RESISTORS AND THE (FA1) RESISTOR ARE MOUNTED AS CLOSE AS POSSIBLE TO THE (CB1) THRU (CB5) CIRCUIT BREAKERS TO MINIMIZE POTENTIAL HAZARDS TO UNFUSED BATTERY SUPPLY LEADS FEEDING THE ALARM CIRCUIT.
207. ONE (FAJ) RESISTOR SHALL BE PROVIDED WITH EACH DISCHARGE FUSE PANEL, MOUNTED AS CLOSE AS POSSIBLE TO THE BATTERY SUPPLY BUS BAR TO MINIMIZE POTENTIAL HAZARDS TO UNFUSED BATTERY SUPPLY LEADS FEEDING THE ALARM CIRCUIT.
208. THE (FA2), (RC3), (RC4) AND (FA3) RESISTORS SHALL BE MOUNTED AS CLOSE AS POSSIBLE TO THE ASSOCIATED MISCELLANEOUS FUSES (FF1), (FF2) AND (R), (VM2), (CB5) RESPECTIVELY TO MINIMIZE POTENTIAL HAZARDS TO UNFUSED BATTERY SUPPLY LEADS FEEDING THE ALARM CIRCUIT.

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.

LEAD DESIG	TERM STRIP	FUNCTION
FAN-	TB (1)	REG FUSE
FAJ-	TB (1)	DISCHG FUSE
RFA-	TB (1)	RECTIFIER FAILURE
RB-	TB (1)	RECTIFIER REGULATING CIRCUIT
SI(A),SIR(A)	TB (1)	REG FUSE, LOW VOLTAGE
SI(B),SIR(B)	TB (1)	DISCHG FUSE HIGH VOLTAGE, VERY LOW VOLTAGE
SI(C),SIR(C) SI(D),SIR(D)	TB (1)	RECTIFIER FUSE
PMNV,PMNVR PMN,PMNR	TB (1)	RECTIFIER FAIL, REG FUSE, LOW VOLTAGE
PMJ,PMJR	TB (1)	DISCHARGE FUSE, VERY LOW VOLTAGE

IT IS RECOGNIZED THAT ALARM LEADS DESIGNATED AS MAJOR MAY BE CONNECTED TO MINOR ALARMS AND VICE VERSA, HOWEVER, SUCH DEVIATIONS SHOULD NOT BE MADE UNLESS A CAREFUL EVALUATION OF LOCAL CONDITIONS HAS BEEN MADE IN LIGHT OF THE ABOVE TABLE.

*TB1 IS SHOWN ON SD-82303-01.

303. INFORMATION SHOWN IN BRACKETS [] ARE FOR REFERENCE ONLY.

CHARGE AND DISCHARGE CIRCUIT

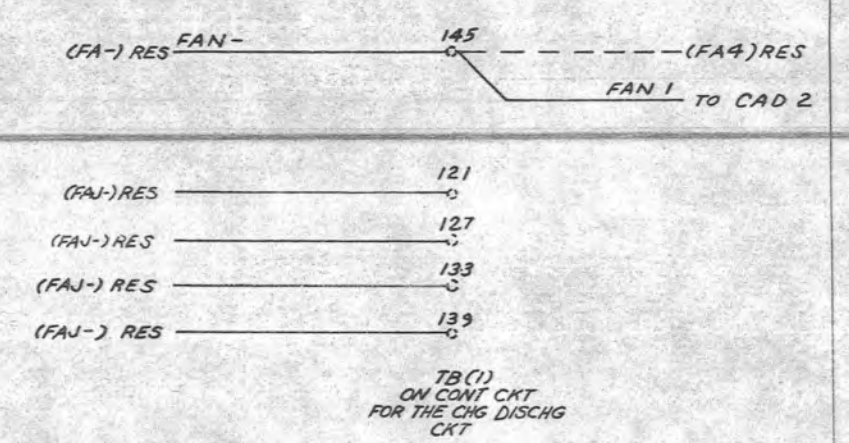
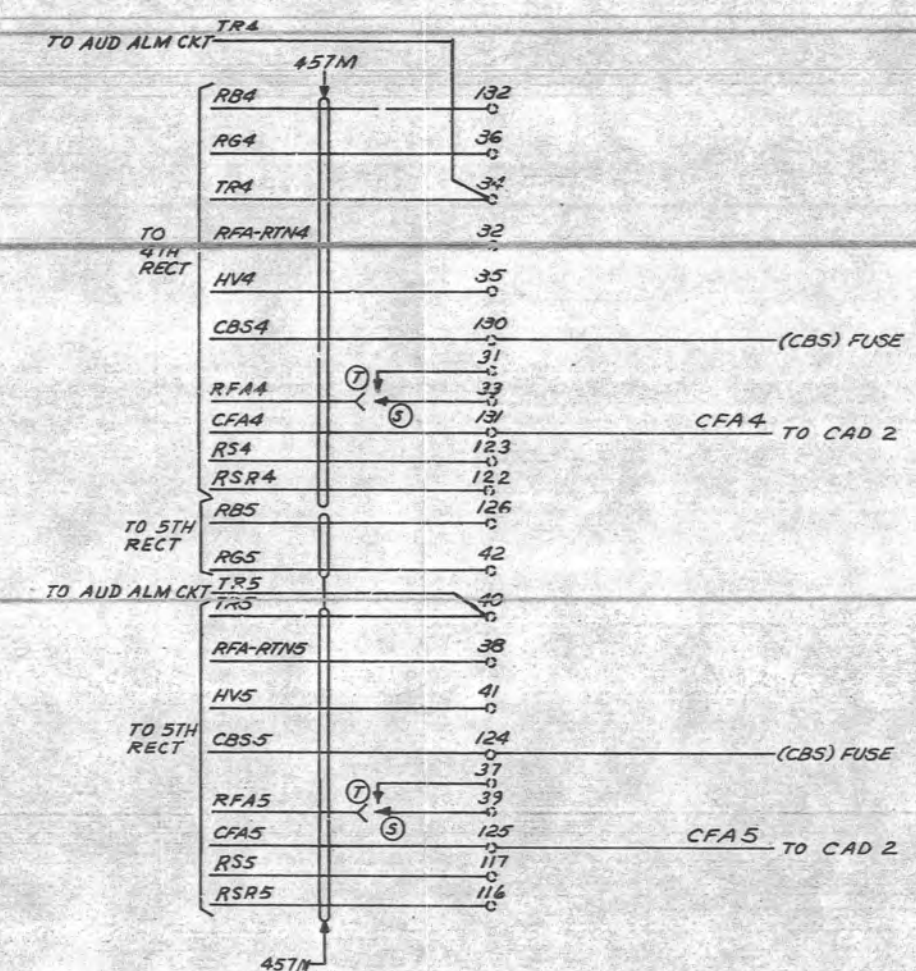
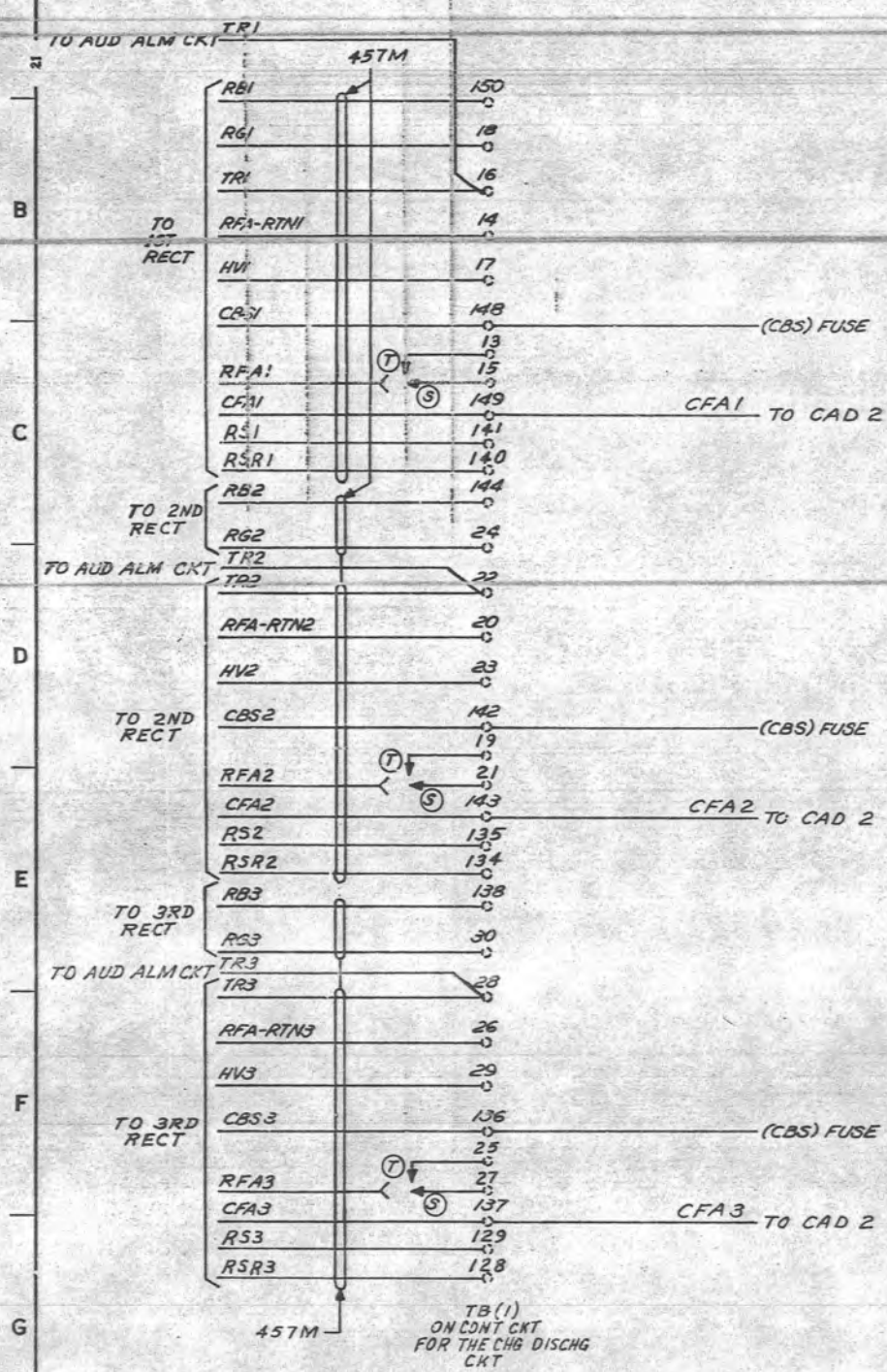
BELL TELEPHONE LABORATORIES
INCORPORATED

6S

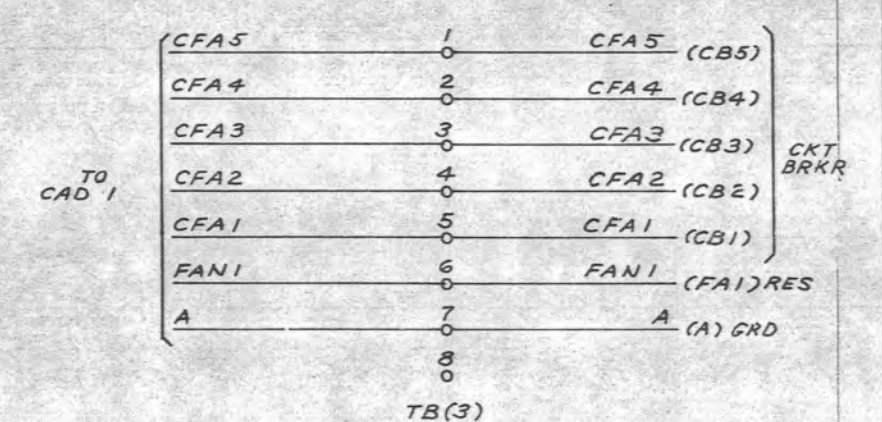
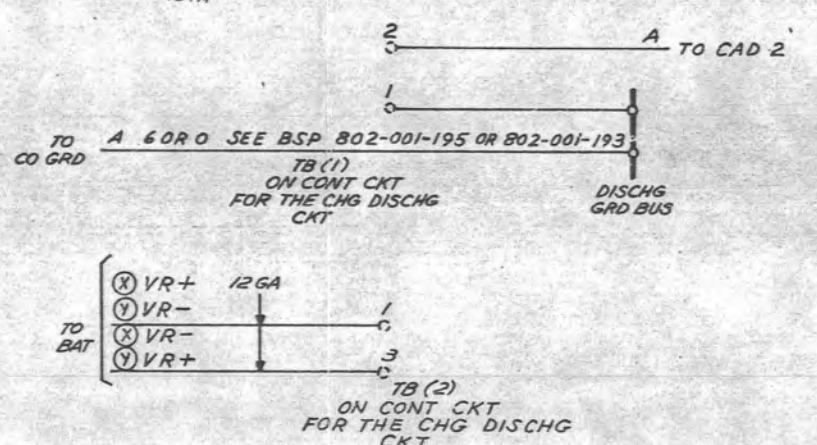
SD-82304-01-D2

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CAD 1



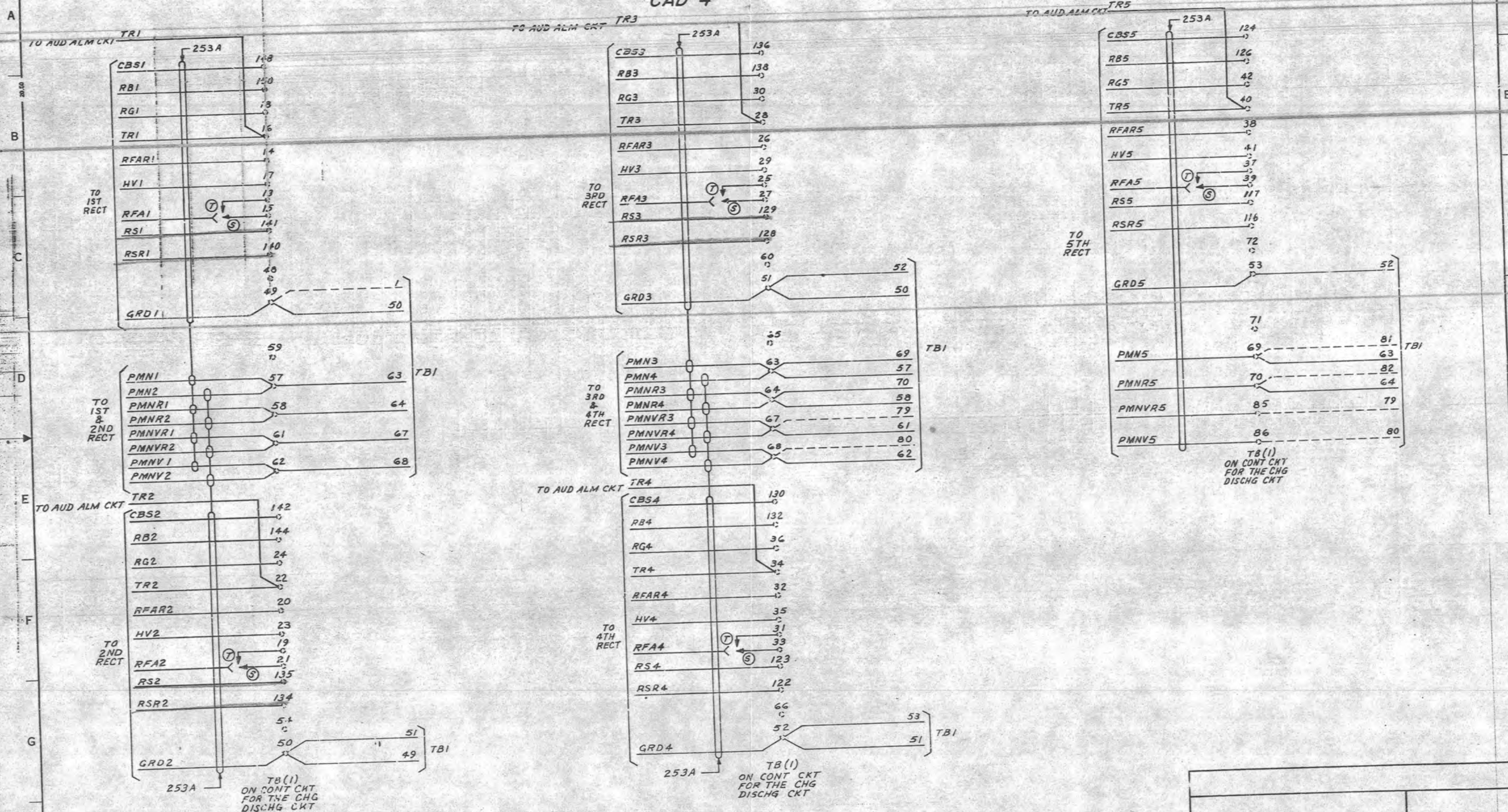
CAD 2



CAD 3



CAD 4



CHARGE AND DISCHARGE CIRCUIT		DWG SIZE	ISSUE
		6S	3B
BELL LABORATORIES		SD-82304-01	
		-G2	