

CONTENTS	SHEET NO.	ISSUE NO.																								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
SHEET INDEX SUPPORTING INFORMATION	A1	1	2	3																						
FS1 DC TO DC CONVERTER CIRCUIT	B1	1	1	3																						
	B2	1	1	3																						
	B3	1	2	3																						
APP FIG.1	C1	1	2	3																						
	C2	1	1	3																						
CIRCUIT NOTES EQUIPMENT NOTES INFORMATION NOTES	D1	1	1	3																						
	D2	1	1	3																						
CAD 1	G1	1	1	1																						
BD 1	H1	1	1	1																						

SHEET INDEX

CONTENTS	SHEET NO.	ISSUE NO.																								

DWG ISSUE	CD ISSUE	DATE ISSUED	Drawn	APPD
1	1	6-17-76	WF	PFL REN LCO
2AR	1 APP 1AR	10-4-78	FCR	PFF GCD LCO
3B	1 APP 2B	10-4-78	FCR	PFF GCD LCO

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

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

CATEGORY	NO.
EQUIPMENT DRAWING	J87422B-() ED-82780-30 ED-82781-30
EQUIPMENT DESIGN REQUIREMENTS	J87422 802-219-160
MANUFACTURING TESTING REQ	X-79113

1M99
POWER SYSTEMS
DC TO DC CONVERTER
-48 VOLTS, +24 VOLTS, +5 VOLTS INPUTS
+12.00 VOLTS, 2.0 AMPERES OUTPUT
-5.00 VOLTS, 0.05 AMPERE OUTPUT
J87422B

BELL TELEPHONE LABORATORIES
INCORPORATED

2

6S

ISSUE
3B

AT&TCO
STANDARD

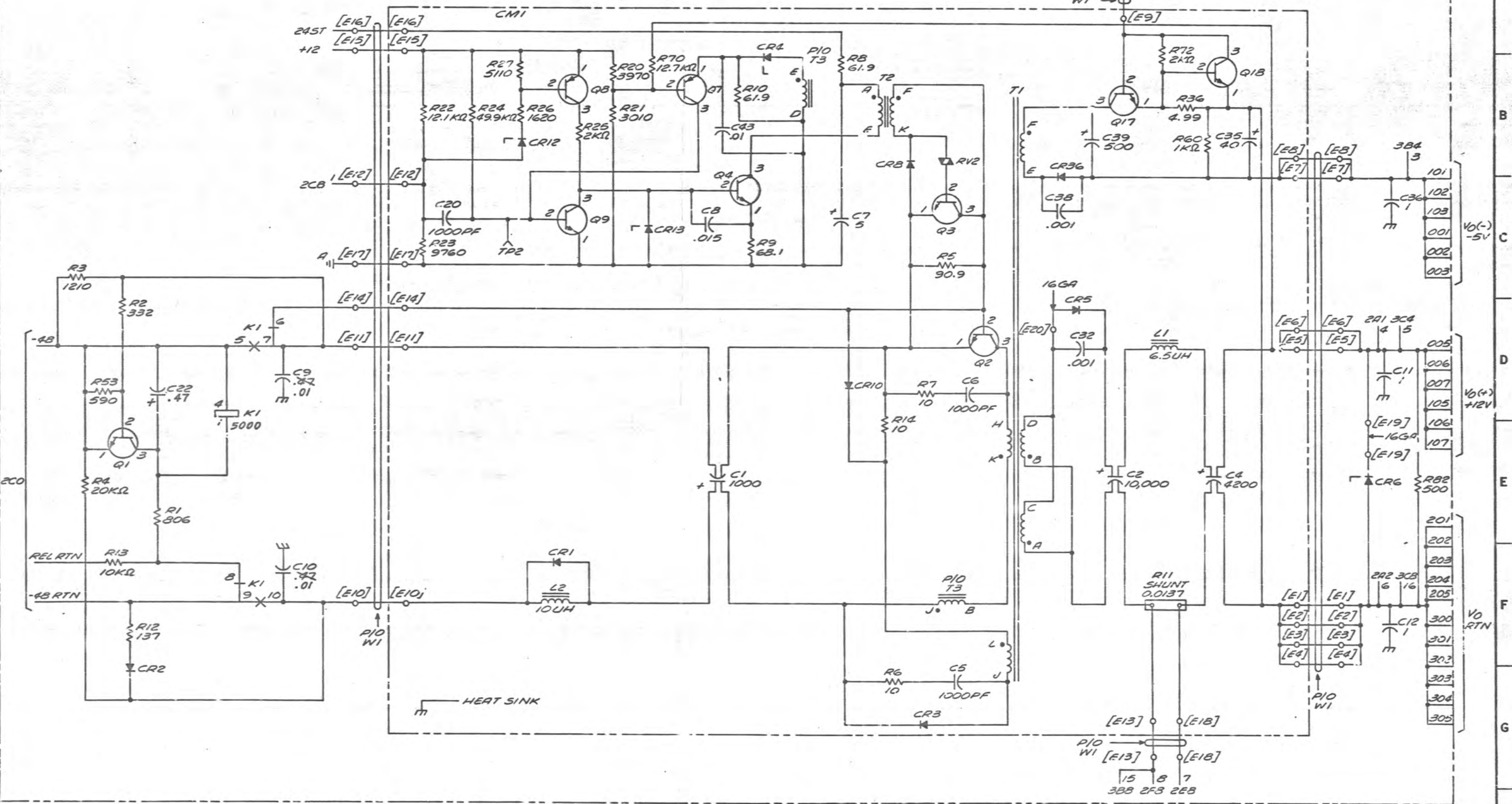
SD-82383-01-A1

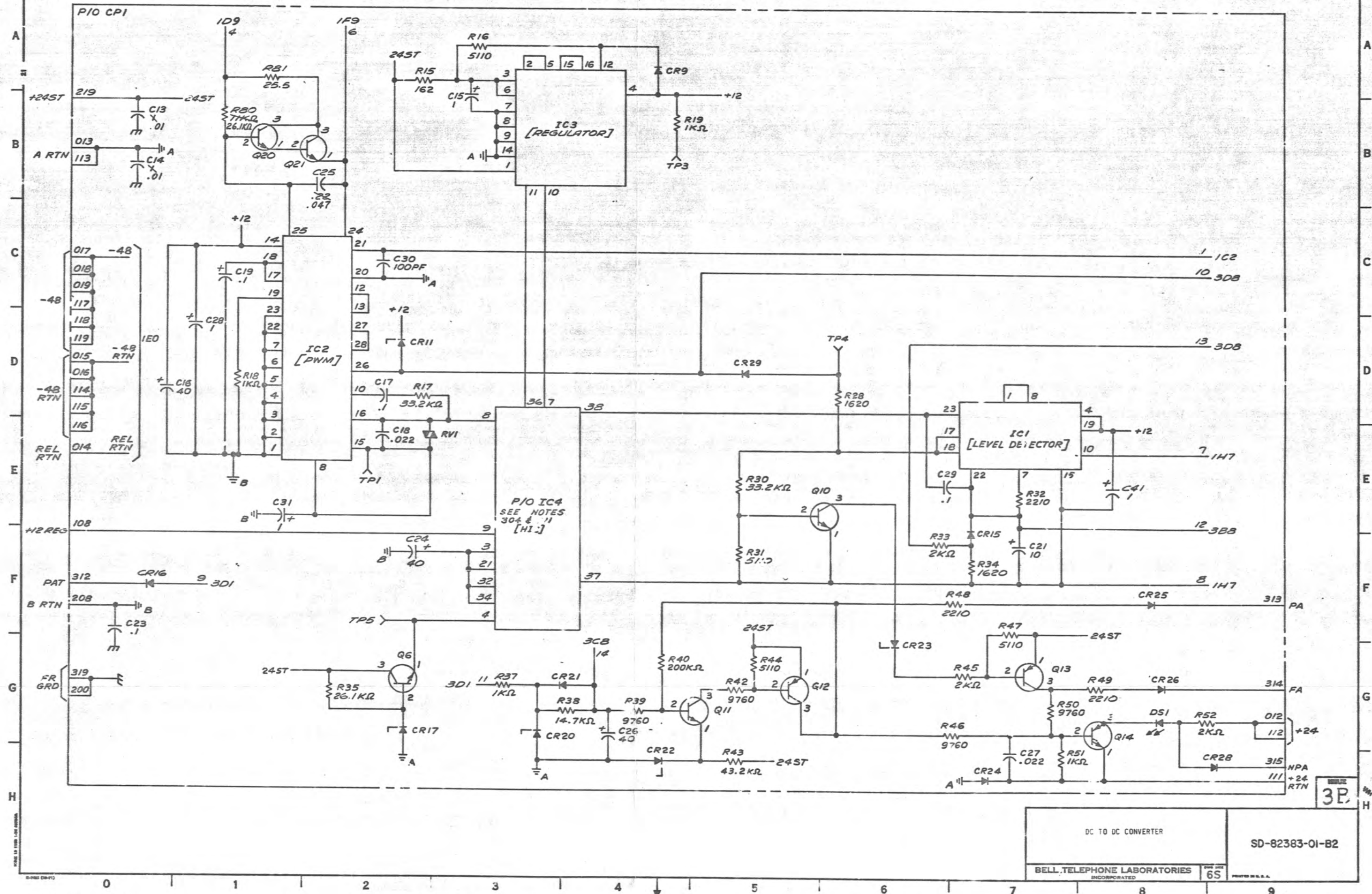
10 SHEETS

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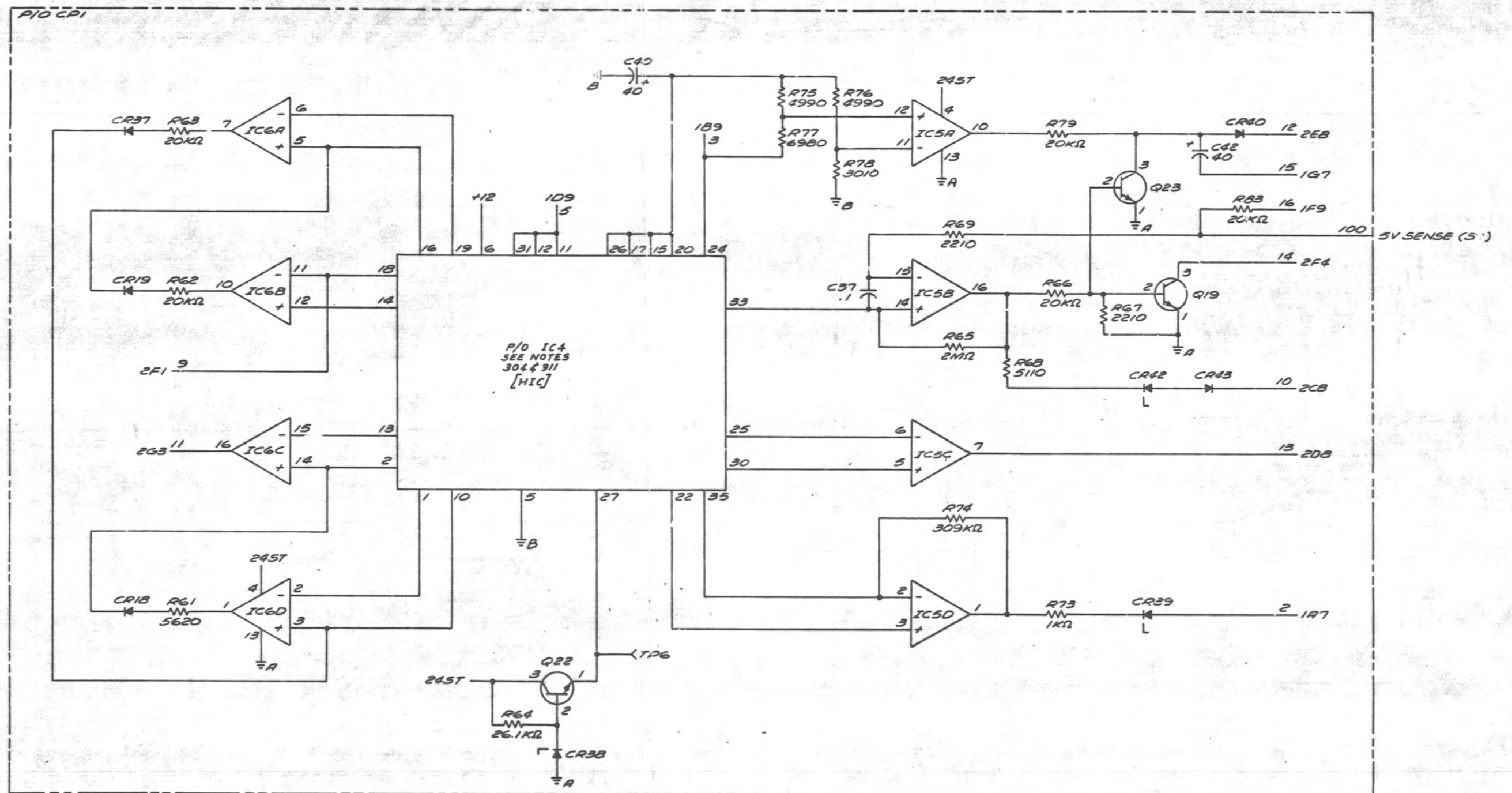
PART OF FS1

P10 CPI





PART OF FS1



DC TO DC CONVERTER

BELL TELEPHONE LABORATORIES
INCORPORATED

SD-82383-01-B3

6S

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ISSUE
33

PART OF APP FIG. 1

RELAY		
DESIG	K1	
CODE	ALLIED CONTROL T154X-1096	
OPTION		
	CONT ARR	LOC
8,9,10	EMB	1F1
5,6,7	EMB	1.1
3		
2		
1,4	COIL	ID1

RELAY NOT ADJUSTABLE. REPLACE
WHEN THERE IS MALFUNCTION

CABLE		
DESIG	LOC	CODE
W1	1A7,1F2, 1G7,1G8	FST-42A-18 ANSLEY ELECTRONICS (SEE NOTE 202)

CAPACITOR		
DESIG	LOC	CODE
C9	1D1	8731-100-651-44H, ER15
C10	1F1	KS-20480, L1, 0.01
C11	1D9	KS-20736, L1, 1
C12	1F9	KS-20736, L1, 1
C13	2B0	KS-20736, L1, 1
C14	2B0	KS-20480, L1, .01
C15	2B3	KS-20736, L1, 1
C16	2D1	602A, 40
C17	2D2	KS-19774, L5, .1
C18	2E2	KS-19774, L5, .022
C19	2C1	KS-20736, L1, 1
C21	2F7	602A, 40
C22	1D1	KS-19774, L5, .47
C23	2F0	KS-20736, L1, .1
C24	2F2	602A, 40
C25	2B2	KS-20736, L1, .22
C26	2G4	602A, 40
C27	2H7	KS-19774, L5, .022
C28	2D1	KS-20736, L1, 1
C29	2E6	KS-20736, L1, .1
C30	2C2	KS-19774, L2, 100PF
C31	2E1	KS-20736, L1, 1
C36	1C9	KS-20736, L1, 1
C37	3C6	KS-20736, L1, .1
C40	3B4	602A, 40
C41	2E8	KS-20736, L1, 1
C42	3B8	602A, 40

CONNECTOR ON FRAME
SEE NOTE 303

DIODE		
DESIG	LOC	CODE
CR2	1G0	458A
CR6	1E9	485F
CR9	2A4	458C
CR11	2D2	459AA
CR15	2F7	458D
CR16	2F0	458C
CR17	2G2	459AA
CR18	3F1	458C
CR19	3C1	458C
CR20	2G3	459J
CR21	2G4	458C
CR22	2H4	459B
CR23	2G6	459AC
CR24	2H7	458C
CR25	2F8	458C
CR26	2G8	458C
CR28	2H9	458C
CR29	2D5	449A
CR37	3B1	458C
CR38	3G4	459AA
CR39	3F7	459B
CR40	3B8	458D
CR42	3D7	459B
CR43	3D8	458C
DS1	2G8	541G (LED)

INTEGRATED CIRCUIT		
DESIG	LOC	CODE
IC1	2E7	555A (NOTE 1)
IC2	2D2	526A (NOTE 2)
IC3	2B4	535A
IC4	3D4, 2E3	567AU (NOTE 304 & 311)
IC5A	3F4	LM124D, NATIONAL SEMICONDUCTOR OR SG124J, SILICON GEN.
IC5B	3C6	
IC5C	3E6	
IC5D	3F6	
IC6A	3B2	
IC6B	3C2	
IC6C	3E2	
IC6D	3F2	

RESISTOR		
DESIG	LOC	CODE
R1	1E1	G1, 806, $\pm 1\%$, DALE (NOTE 4)
R2	1D0	KS-20616, L1A, 332
R3	1C0	KS-20616, L1A, 1210
R4	1E0	KS-20616, L1A, 20K Ω
R12	1F0	KS-20616, L1A, 137
R13	1F0	KS-20616, L1A, 10K Ω
R15	2A2	KS-20810, L1A, 162
R16	2A3	KS-20616, L1A, 5110
R17	2D4	KS-20616, L1A, 33.2K Ω
R18	2D1	KS-20616, L1A, 1K Ω
R19	2B4	KS-20616, L1A, 1K Ω
R28	2D6	KS-20616, L1A, 1620
R30	2E5	KS-20616, L1A, 33.2K Ω
R31	2F5	KS-20616, L1A, 5110
R32	2E7	KS-20616, L1A, 2210
R33	2F6	KS-20616, L1A, 2K Ω
R34	2F7	KS-20616, L1A, 1620
R35	2G2	KS-20616, L1A, 26.1K Ω
R37	2F3	KS-20616, L1A, 1K Ω
R38	2G4	KS-20616, L1A, 14.7K Ω
R39	2G4	KS-20616, L1A, 9760
R40	2G4	KS-20616, L1A, 200K Ω
R42	2G5	KS-20616, L1A, 9760
R43	2H5	KS-20616, L1A, 43.2K Ω
R44	2G5	KS-20616, L1A, 5110
R45	2G7	KS-20616, L1A, 2K Ω
R46	2G7	KS-20616, L1A, 9760
R47	2F7	KS-20616, L1A, 5110
R48	2F7	KS-20616, L1A, 2210
R49	2G8	KS-20616, L1A, 2210
R50	2G7	KS-20616, L1A, 9760
R51	2H7	KS-20616, L1A, 1K Ω

RESISTOR (CONT)		
DESIG	LOC	CODE
R52	2G8	KS-20616, L1A, 2K Ω
R53	1D0	KS-20616, L1A, 590
R61	3F1	KS-20616, L1A, 5620
R62	3C1	KS-20616, L1A, 20K Ω
R63	3B1	KS-20616, L1A, 20K Ω
R64	3G3	KS-20616, L1A, 26.1K Ω
R65	3D6	KS-20810, L1A, 2H Ω
R66	3C7	KS-20616, L1A, 20K Ω
R67	3C7	KS-20616, L1A, 2210
R68	3D7	KS-20616, L1A, 5110
R69	3C6	KS-20616, L1A, 2210
R73	3F7	KS-20616, L1A, 1K Ω
R74	3E6	KS-20616, L1A, 309K Ω
R75	3B5	KS-20616, L1A, 4990
R76	3B5	KS-20616, L1A, 4990
R77	3B5	KS-20616, L1A, 6980
R78	3B5	KS-20616, L1A, 3010
R79	3B7	KS-20616, L1A, 20K Ω
R80	2A1	KS-20616, L1A, 26.1K Ω
R81	2A1	447-S, OHMITE, 25.5, $\pm 5\%$
R82	1E9	KS-20810, L1A, 500
R83	3C8	KS-20616, L1A, 20K Ω

TRANSISTOR		
DESIG	LOC	CODE
Q1	1E0	66U
Q6	2G2	66J
Q10	2E6	66J
Q11	2G5	66U
Q12	2G5	51A
Q13	2G7	51A
Q14	2G8	27A
Q19	3C8	66J
Q20	2B1	66J
Q21	2B2	70L, 108A
Q22	3F4	66J
Q23	3C7	66J

VARISTOR		
DESIG	LOC	CODE
RV1	2E3	100A

NOTES:

1. ONLY 555A INTEGRATED CIRCUITS DATE CODED 1174 OR LATER MAY BE USED WITH THIS CONVERTER.
2. ONLY 526A INTEGRATED CIRCUITS DATE CODED 1074 OR LATER MAY BE USED WITH THIS CONVERTER.
3. EARLY PRODUCTION UNITS MAY BE EQUIPPED WITH THE FOLLOWING SPAGUE CAPACITORS:
604D209 FOR C1
604D213 FOR C2
604D210 FOR C4
4. RESISTOR 250-SB, 806, $\pm 1\%$ BY NITRONICS MAY BE USED FOR (R1).
5. EARLY PRODUCTION UNITS MAY BE EQUIPPED WITH THE FOLLOWING RESISTOR SHUNT: SPR-676-1, .0137, DALE FOR R11.

ISSUE
3B

DC TO DC CONVERTER

SD-82383-01-C1

BELL TELEPHONE LABORATORIES
INCORPORATED

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PART OF APP FIG. 1

CP1 (CONTINUED)

E/W

CIRCUIT MODULE

DESIG	LOC	CODE
CM1	1A3	ED-82780-()

CAPACITOR

DESIG	LOC	CODE
C1	1E4	KS-21190, L9, 1000
C2	1E7	KS-21190, L13, 10,000
C4	1E8	KS-21190, L10, 4200
C5	1G6	KS-19708, L3K, 1000PF
C6	1D6	KS-19708, L3K, 1000PF
C7	1C5	601A, 5
C8	1C4	KS-19774, L5, .015
C20	1C2	KS-20676, L3, 1000PF
C32	1D7	KS-19774, L1, .001
C35	1B8	602A, 40
C38	1C7	KS-19774, L1, .001
C39	1B7	KS-19658, L35, 500
C43	1B5	KS-19771, L2, .01

(NOTE 3)

DIODE

DESIG	LOC	CODE
CR1	1F3	746E, 533F
CR3	1G6	426L
CR4	1A5	459B
CR5	1D7	485AU
CR8	1B6	746A, 533G
CR10	1D5	746A, 533G
CR12	1B3	459F
CR13	1C4	746C, 808CF
CR36	1B7	726AC, 813A

INDUCTOR

DESIG	LOC	CODE
L1	1D7	DELEVAN, BP2929, 6.5
L2	1F3	NYTRONICS, RFC-M-10

RESISTOR

DESIG	LOC	CODE
R5	1C6	KS-20616, L1A, 90.9
R6	1G6	KS-20616, L1A, 10
R7	1D6	KS-20616, L1A, 10
R8	1B5	KS-20289, L6C, 61.9
R9	1C5	KS-20289, L6C, 68.1
R10	1B5	KS-16312, L4F, 61.9
R14	1E6	KS-20616, L1A, 10
R20	1B4	KS-16312, L4F, 3970
R21	1B4	KS-16312, L4F, 3010
R22	1B2	KS-20616, L1A, 12.1KΩ
R23	1C2	KS-20616, L1A, 9760
R24	1B3	KS-20616, L1A, 49.9KΩ
R25	1B4	KS-20616, L1A, 2KΩ
R26	1B3	KS-20616, L1A, 1620
R27	1B3	KS-20616, L1A, 5110
R36	1B8	KS-20810, L1A, 4.99
R60	1B8	KS-20810, L1A, 1KΩ
R70	1B4	KS-16312, L4F, 12.7KΩ
R72	1B7	KS-20616, L1A, 2KΩ

RESISTOR SHUNT

DESIG	LOC	CODE
R11	1F7	KS-21592, L16, (SEE NOTE 5)

TRANSFORMER

DESIG	LOC	CODE
T1	1B6	3002AJ
T2	1B5	3000E
T3	1B5, 1F6	3000T

TRANSISTOR

DESIG	LOC	CODE
Q2	1D6	KS-20837, L2
Q3	1C6	46C
Q4	1B4	20A, 108A
Q7	1B4	51C
Q8	1B4	51A
Q9	1C4	66J
Q17	1B7	20J
Q18	1B8	66J

VARISTOR

DESIG	LOC	CODE
R12	1B6	100J

ISSUE
3B

DC TO DC CONVERTER

SD-82383-01-C2

BELL TELEPHONE LABORATORIES
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CIRCUIT NOTES:

101.

DESIG	FUSE AMP	POTENTIAL	QUANTITY

102.

FEATURE OR OPTION	PROVIDE		
	APP FIG.	APP OR MRG	QUANTITY
DC TO DC CONVERTER	1		1 PER CKT

103.

RECORD OF APP. 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
2AR			203			
3B			204			

CIRCUIT NOTES: (CONT'D)

104. THE LEAD BETWEEN THE ANODE OF (CR5) AND TERMINAL E20 SHALL BE DRESSED ALONG THE BODY OF (CR5).
105. THE CONVERTER OUTPUTS ARE NOT INTERNALLY GROUNDED. THE V_0 RETURN LEAD MUST BE CONNECTED AT THE LOAD TO A GROUND COMMON TO THE 24 VOLT INPUT.
106. CONVERTER INPUT CURRENT IS A FUNCTION OF OUTPUT CURRENT AND INPUT VOLTAGE, LIST 1 DRAIN (FOR SIZING BATTERY PLANT, STANDBY AC PLANTS, AND AIR CONDITIONING EQUIPMENT) AND LIST 2 DRAIN (FOR SIZING FEEDERS AND PROTECTION DEVICES) MAY BE CALCULATED FROM THE FORMULA BELOW. APPROPRIATE VALUES OF LOAD CURRENT AND INPUT VOLTAGE SHALL BE OBTAINED FROM THE ASSOCIATED SYSTEM APPLICATION SCHEMATIC AND INPUT DISTRIBUTION CIRCUIT RESPECTIVELY.

FOR THE 48 VOLT BATTERY:

$$I_{IN} = \frac{16}{E_{IN}} \times I_{+12}$$

WHERE I_{IN} = CONVERTER INPUT CURRENT IN AMPERES
 I_{+12} = +12 VOLT OUTPUT CURRENT IN AMPERES

E_{IN} = CONVERTER INPUT VOLTAGE AT THE CONVERTER INPUT TERMINALS

FOR THE 24V INPUT:

I_{IN} = APPROXIMATELY 0.065 AMPERES FOR NORMAL OPERATION AND 0.080 AMPERES FOR ALARM CONDITIONS.

107. THE 12 VOLT OUTPUT OF THE CONVERTER IS REGULATED AT THE FRAME SIDE OF THE TERMINAL STRIP (CONNECTOR). FOR PROPER OPERATION THE TERMINAL STRIP IN THE FRAME HAS TO BE WIRED AS SHOWN ON SHEET G1. THE -5 VOLT OUTPUT OF THE CONVERTER IS REGULATED AT THE CONVERTER SIDE OF THE TERMINAL STRIP (CONNECTOR).

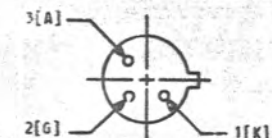
108. WIRE BETWEEN (CR6) AND THE CONTROL BOARD SHALL BE 16 GA.

EQUIPMENT NOTES:

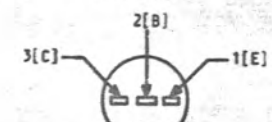
201. WIRE BETWEEN (CR5) AND THE POWER BOARD SHALL BE KS-19195 L1, 16 GA SOLID.
202. CONNECTIONS MADE BETWEEN CM1 AND CP1 ARE MADE BY MEANS OF A FLEX JUMPER W1 (P/N FST-424-18) ANSLEY ELECTRONICS.
203. ON ISSUE 2AR, IN APP FIG. 1, REMOVED R59 (KS-20616, L1A, 3010) AND C34 (KS-19774, L5, .47) ON SD-82383-01-E, AND SD-82383-01-C1.
204. ON ISSUE 3B, IN APP FIG. 1, CODES OF CR1, CR8, CR10, CR13, CR36, Q4, Q21, C9, C10, C13, C14, C15, C19, C22, C28, C31, C41, C25 AND R80 REVISED AS SHOWN.

INFORMATION NOTES:

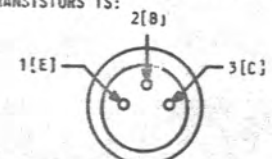
301. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.
302. INFORMATION SHOWN IN [] IS FOR REFERENCE ONLY.
303. CONNECTOR ON FRAME IS 946C.
304. TERMINALS 23, 28 AND 29 OF (ICA) HIC HAVE NO INTERNAL CONNECTIONS. TERMINALS 23, 28 AND 29 HAVE BEEN USED TO FACILITATE CIRCUIT CONNECTIONS EXTERNAL TO THE HIC.
305. THE TERMINAL NUMBER ASSIGNMENT OF THE 27A THYRISTOR IS:



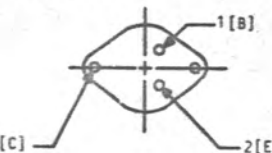
306. THE TERMINAL NUMBER ASSIGNMENT OF THE 51A, 51C, 66J AND 66U TRANSISTORS IS:



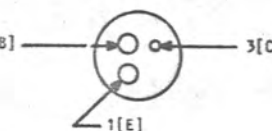
307. THE TERMINAL NUMBER ASSIGNMENT OF THE 46C TRANSISTORS IS:



308. THE TERMINAL NUMBER ASSIGNMENT OF THE KS-20837 TRANSISTOR IS:



309. THE TERMINAL NUMBER ASSIGNMENT OF 20J AND 20L TRANSISTOR IS:

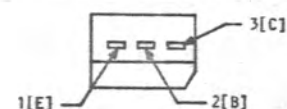


HIGHEST CAP., DIODE, RES, TRANSISTOR USED ON THIS DRAWING			
C43	CR43	R83	Q23
NOT USED			
C3, C33	CR7, CR14	R29, R41	Q5, Q15
C34	CR27, CR30	R54, R55	Q16
	CR31, CR32	R36, R57	
	CR33, CR34	R58, R71	
	CR35, CR41	R59	

INFORMATION NOTES: (CONT'D)

311. SEE SD-82383-01-D2

312. THE TERMINAL ASSIGNMENT OF THE 108A TRANSISTOR IS:



DC TO DC CONVERTER

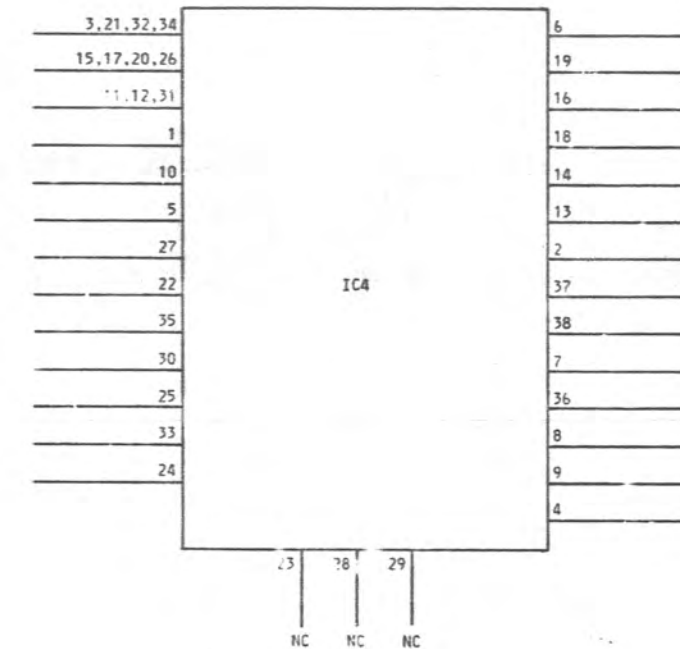
BELL TELEPHONE LABORATORIES

REV 65

SD-82383-01-D1

ISSUE
3B

311. 567AU HYBRID INTEGRATED CIRCUIT.



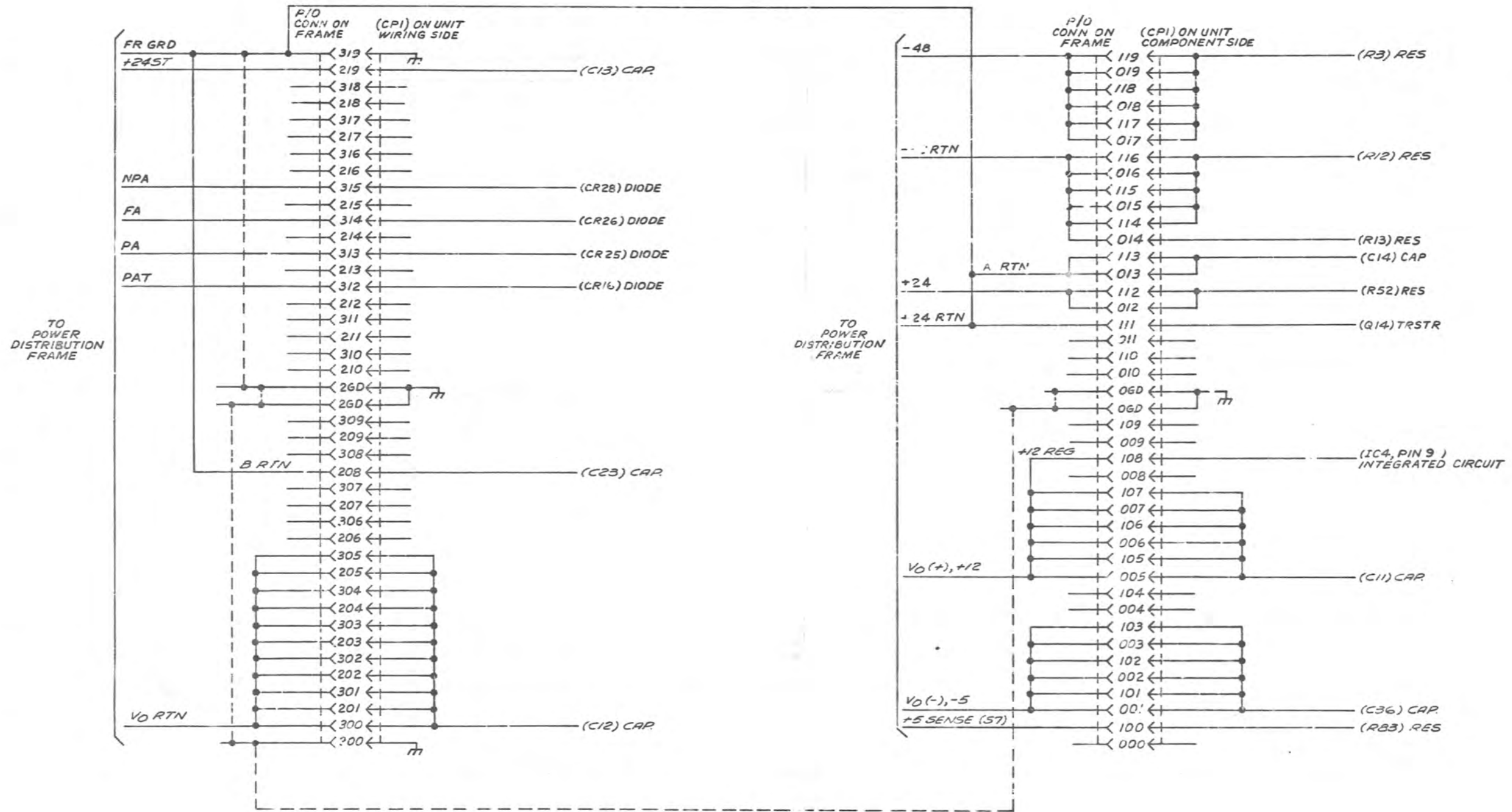
ISSUE
3B

SD-82383-01-D2

ENRG SIZE
6S

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CAD 1



BD 1

