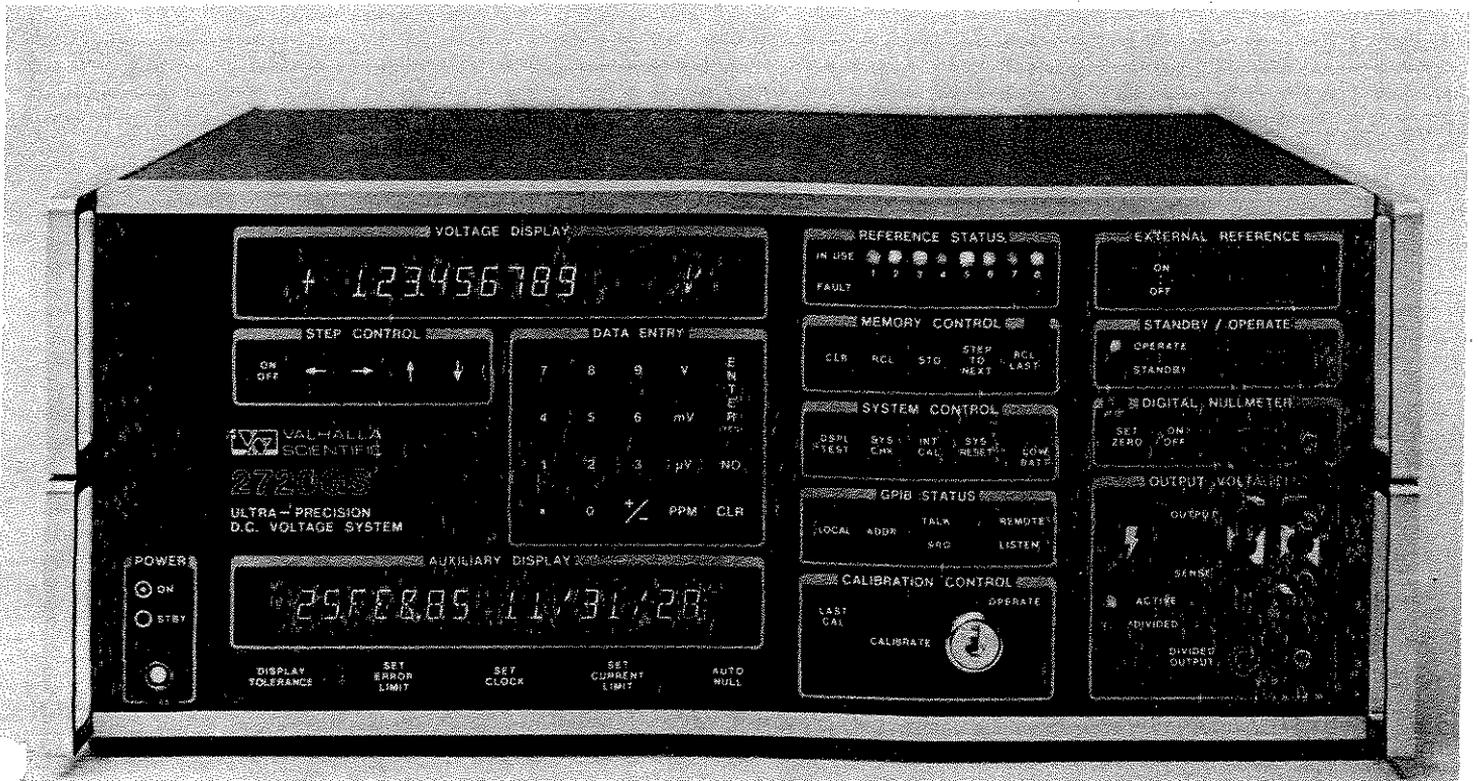


VOLUME 2

2720 GS ULTRA-PRECISION DC VOLTAGE SYSTEM --- OPERATION AND MAINTENANCE MANUAL



**VALHALLA
SCIENTIFIC**

9955 Mesa Rim Rd
San Diego, Ca 92121
Telex 181750

REVISED 07/18/85

NOTES: (UNLESS OTHERWISE SPECIFIED)

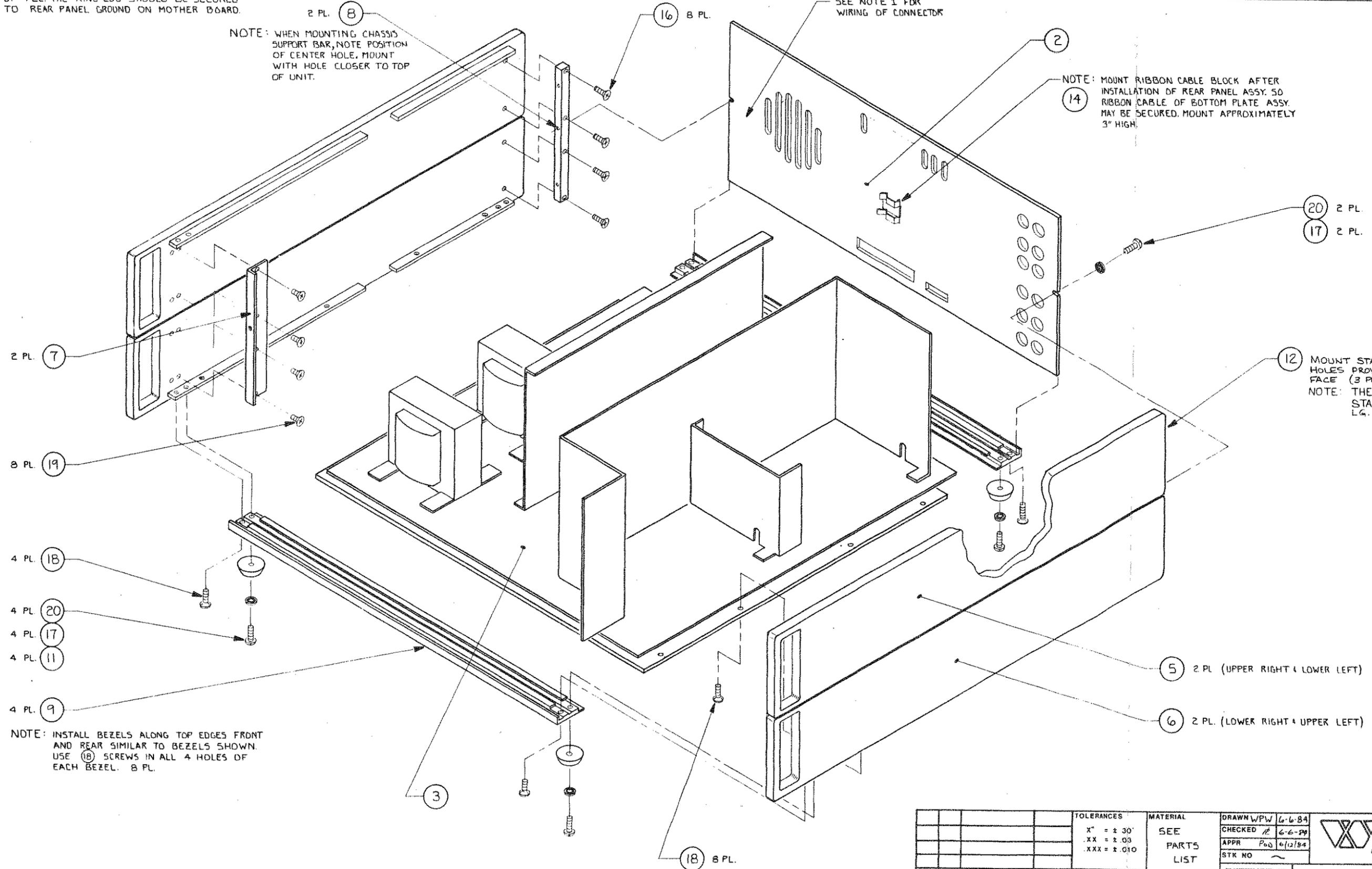
1. WHEN INSTALLING REAR PANEL ASSY CONNECT THE PANEL'S SOCKET TO PLC OF MOTHER BOARD MATCHING PIN 1 OF SOCKET TO PIN 1 OF PLC. THE RING LUG SHOULD BE SECURED TO REAR PANEL GROUND ON MOTHER BOARD.

NOTE: WHEN MOUNTING CHASSIS SUPPORT BAR, NOTE POSITION OF CENTER HOLE. MOUNT WITH HOLE CLOSER TO TOP OF UNIT.

SEE NOTE 1 FOR WIRING OF CONNECTOR

NOTE: MOUNT RIBBON CABLE BLOCK AFTER INSTALLATION OF REAR PANEL ASSY. SO RIBBON CABLE OF BOTTOM PLATE ASSY. MAY BE SECURED. MOUNT APPROXIMATELY 3" HIGH.

NOTE: MOUNT STANDOFFS INTO #8-32 HOLES PROVIDED ON THE INSIDE FACE (3 PLACES). NOTE: THESE ARE MODIFIED STANDOFFS WITH .20 LG. THREADS.



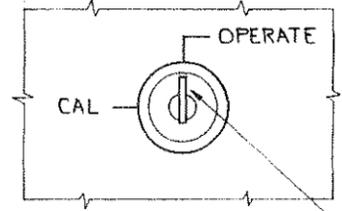
NOTE: INSTALL BEZELS ALONG TOP EDGES FRONT AND REAR SIMILAR TO BEZELS SHOWN. USE (8) SCREWS IN ALL 4 HOLES OF EACH BEZEL. 8 PL.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
470	A	RELEASED	WPW 6-6-84	PL
545	B	MODIFIED STANDOFF (.20 LG.) RDN	12-10-84	PL
647	C	DELETED HOLE PLUGS.	RDN 1-7-84	PL

DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES X" = ± .30 .XX = ± .03 .XXX = ± .010	MATERIAL SEE PARTS LIST	FINISH ~	DRAWN WPW 6-6-84	CHECKED PL 6-6-84	APPR Poo 6/12/84	STK NO ~	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>	
					BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES			INITIAL CHASSIS ASSY.	SCALE 1:2	CODE IDENT 53504	SIZE D		DRAWING NO 2720-404

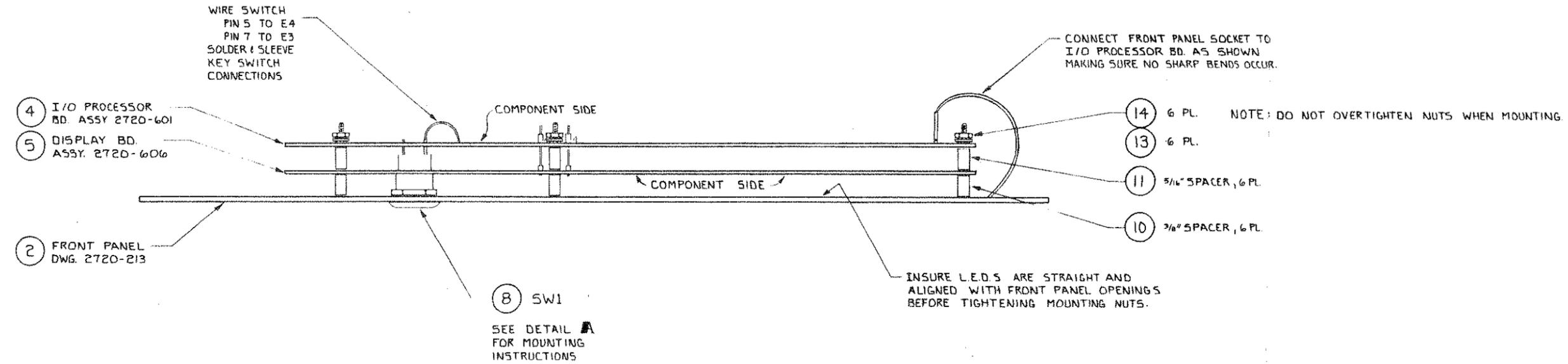
NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
424	A	RELEASED	4-27-84	WFW
633	B	DELETE REALTIME CLOCK BD. RDN	12-10-84	WFW



DETAIL A
SCALE: NONE

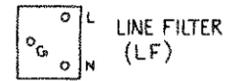
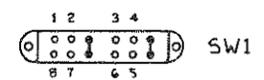
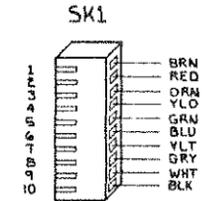
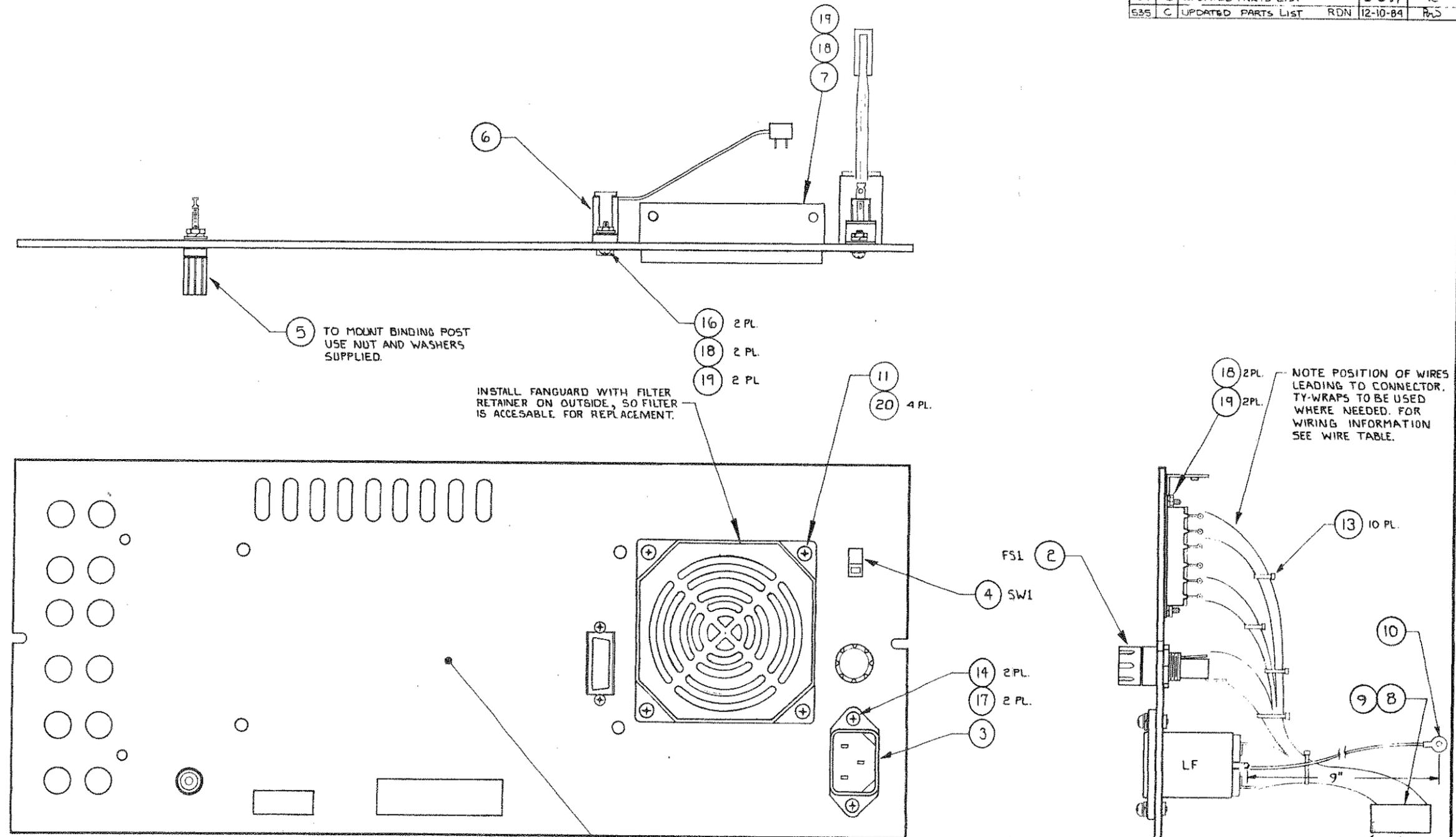
NOTE POSITION OF KEYHOLE
RELATIVE TO FRONT PANEL MARKS.
MOUNT SWITCH WITH NUT PROVIDED.
DO NOT OVERTIGHTEN NUT.



DASH NO		QTY RECD	NEXT ASSEMBLY	USED ON	TOLERANCES X° = ± 30° .XX = ± .03 .XXX = ± .010	MATERIAL SEE PARTS LIST	FINISH ~	DRAWN WFW 4-25-84 CHECKED R 4-27-84 APPR WFW 4-27-84 STK NO	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>	FRONT ASSY.		
SCALE 1:1		CODE IDENT 53504	SIZE D	DRAWING NO 2720-401	REV B	SHEET 2 OF 2						

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS					
ECO	LTR	DESCRIPTION	DATE	APPROVED	
420	A	DWG. RELEASED	4-20-84	WPW	FDS
424	B	UPDATED PARTS LIST	6-6-84		R
535	C	UPDATED PARTS LIST	12-10-84	RDN	RJS



WIRE TABLE

FROM	TERMINATION	TO	TERMINATION	AWG	COLOR
SK1-1	CT	SW1-2	S-S	18	BRN
SK1-2	CT	SW1-7	S-S	18	RED
SK1-3	CT	SW1-3	S-S	18	ORN
SK1-4	CT	SW1-5	S-S	18	YLO
SK1-5	CT	SW1-4	S-S	18	GRN
SK1-6	CT	SW1-6	S-S	18	BLU
SK1-7	CT	LF-N	S-S	18	VLT
SK1-8	CT	SW1-1	S-S	18	GRY
SK1-9	CT	FSL-2	S-S	18	WHT
SK1-10	CT	SW1-8	S-S	18	BLK
FSL-1	S-S	LF-L	S-S	16	BLK
LF-G	S-S	6 SOLDER LOG	S-S	16	GRN

NOTE: CT → CRIMP TERMINAL
S-S → SOLDER + SLEEVE

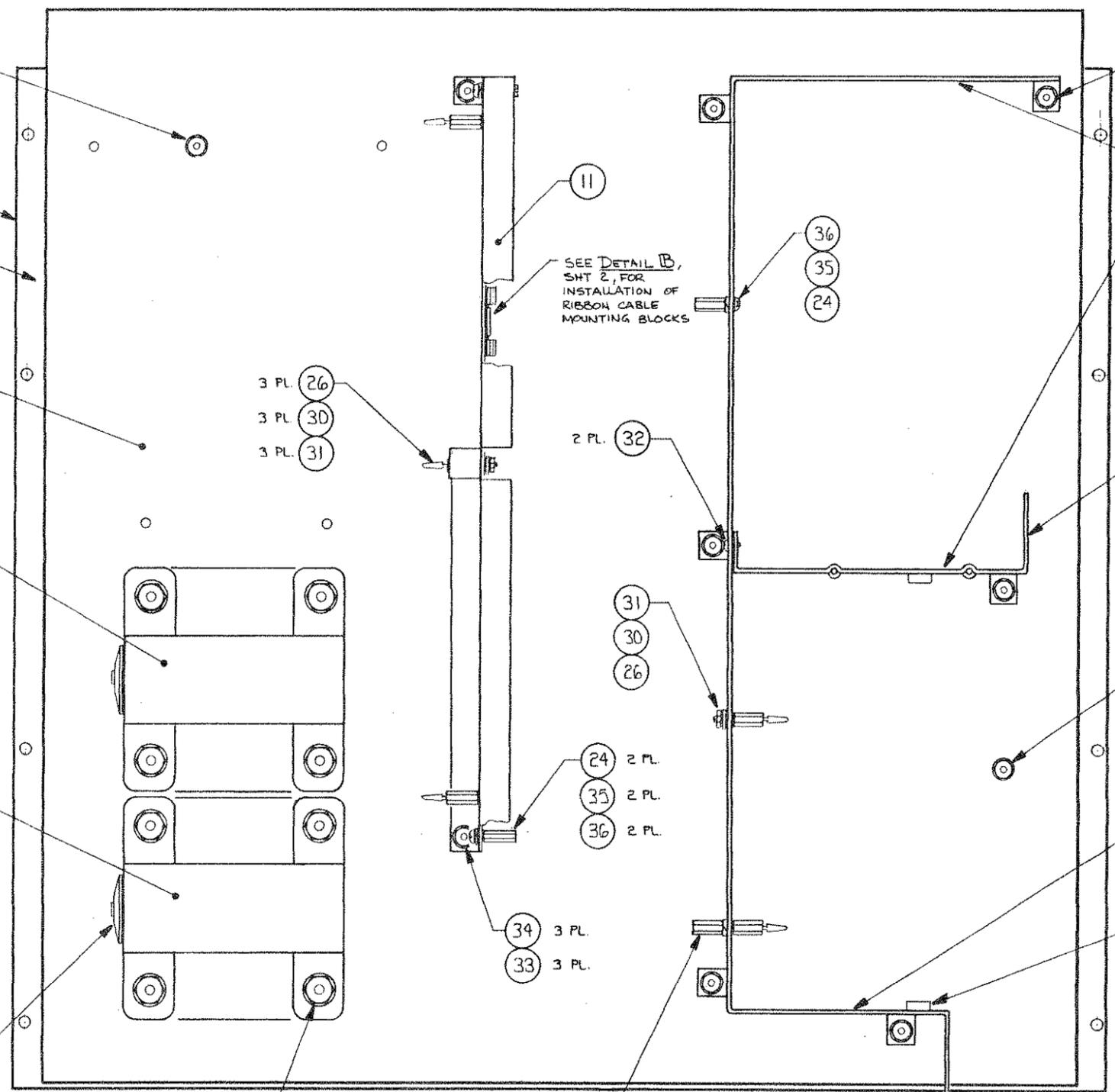


TOLERANCES		MATERIAL		DRAWN WPW 4-20-84	
X° = ± 30'	XX = ± .03	SEE PARTS LIST	SEE PARTS LIST	CHECKED R 4-20-84	APPR 12-10-84
XXX = ± .010				STK NO	
BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		FINISH		REAR PANEL ASSY	
64 ✓		~		SCALE NONE	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	CODE IDENT	SIZE
				53504	D
			DRAWING NO	REV	
			2720-402	C	



NOTES: (UNLESS OTHERWISE SPECIFIED)
 1. VISUALLY INSPECT MOTHER BD. ASSY FOR ANY DEFECTS BEFORE INSTALLING.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
457	A	RELEASED	WPW 5-21-84	[Signature]
544	C	REMOVE CLASPON SOCKET. RDN	12-10-84	[Signature]



NOTE: FIT LEFT AND RIGHT SPACERS TO BOTTOM PLATE BEFORE FITTING MOTHER BD. (4, 5)

NOTE: SEE SHT. 2 FOR TRANSFORMER MOUNTING INSTRUCTIONS.

NOTE: MOUNT TY-WRAP BLOCKS FLUSH TO TOP OF TRANSFORMERS. TY-WRAP THE FOUR PIN CONNECTOR WIRES TO THE BLOCKS CREATING A SERVICE LOOP IN THE WIRES, REFER TO SHT. 2.

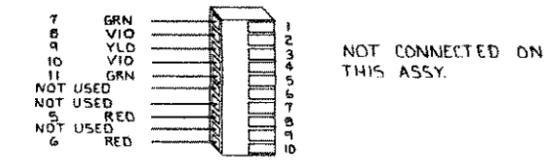
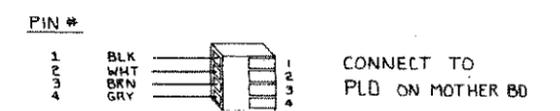
31 8 PL.
 30 6 PL. SOLDER LUGS ARE USED IN 2 PL SEE SHT. 2.

RUBBER CHANNEL (16) IS TO FIT FLUSH WITH TOP & BOTTOM OF WRAP TO SECURE. USE RTV GLUE.

WHEN ASSEMBLING WRAP INSERT GROMMETS ON MOTHER ASSY INTO APPROPRIATE SLOTS.

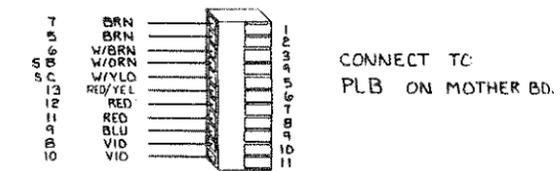
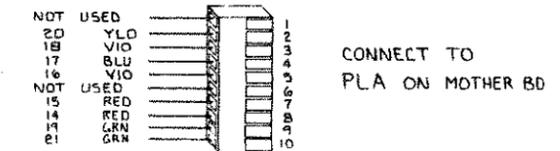
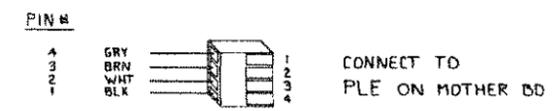
TRANSFORMER WIRING

(12) HIGH VOLTAGE TRANSFORMER



5A WHT/ORN — SOLDER LUG TO TRANSFORMER MOUNT
 5B WHT/YEL — SOLDER TO BEAD PIN (E9)
 5C WHT/GRN — SOLDER TO BEAD PIN (E10)

(13) LOW VOLTAGE TRANSFORMER



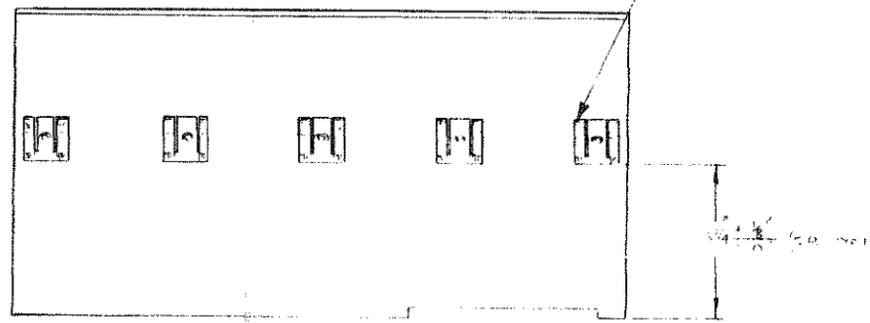
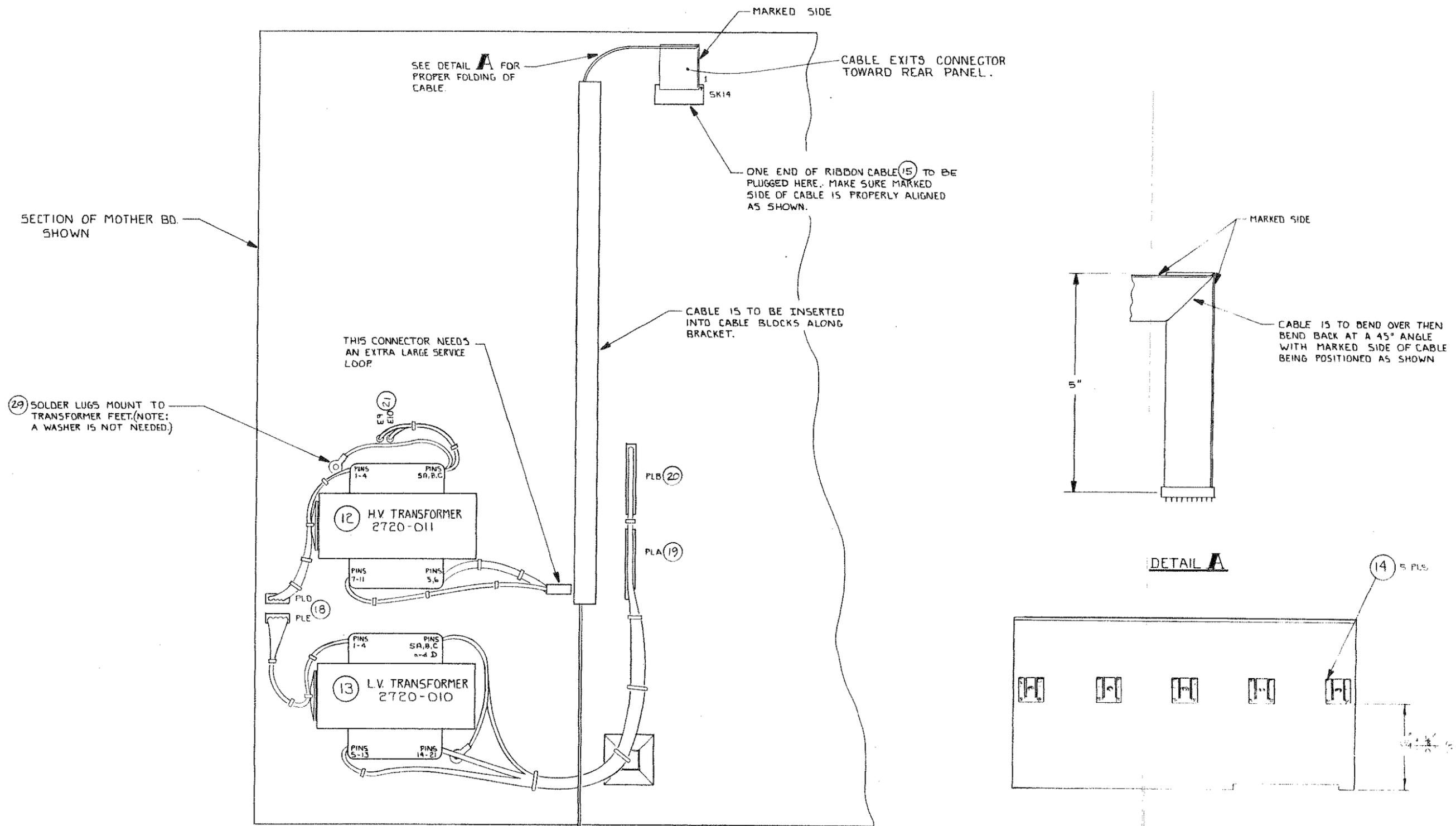
5A and D (W/GRN) — SOLDER LUG TO TRANSFORMER MOUNT

DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES	MATERIAL	DRAWN WPW 5-21-84	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
					X' = ± .30' .XX = ± .03 .XXX = ± .010	SEE PARTS LIST	CHECKED PL 5-25-84	
					BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES	FINISH	APPR RWL 12/12/84	BOTTOM PLATE ASSY. SCALE 1:1 CODE IDENT 53504 SIZE D DRAWING NO 2720-405 REV C
					64		STK NO	

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL WIRING MUST ALLOW FOR SERVICING LOOPS.

ECO		LTR		REVISIONS		DATE	APPROVED
				DESCRIPTION			
				SEE SHT. 1			



DETAIL B
SPACE 5 EA. ITEM (14) EVENLY ACROSS BRACKET POINTING UPWARD AS SHOWN.

DASH NO		QTY RECD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30 .XX = ± .03 .XXX = ± .010	MATERIAL	FINISH	DRAWN WPW 5-21-84	CHECKED R 5-25-84	APPR POW 6/1/84	STK NO	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
					BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES			SCALE 1:1	CODE IDENT 53504	SIZE D	DRAWING NO 2720-405	
BOTTOM PLATE ASSY.												
SHEET 2 OF 4												

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. AFTER ASSEMBLING ENTIRE BOARD, CUT ALL PINS & WIRES BACK SO THAT NO PIN OR WIRE IS LONGER THAN 1/8" (ON THE SOLDER SIDE OF THE BOARD).
 2. TIGHTEN DOWN ALL HARDWARE BEFORE SOLDERING THE PINS OF SK6,7,8,9 & 15.
3. CUT THE TOP PINS OFF OF THE POWER SWITCH AND COVER WITH ELECTRICAL TAPE.

SW1
LEAVE HARDWARE ATTACHED

16

MOUNT SPACER BETWEEN SWITCH & MOTHER BOARD. (ENSURE SWITCH IS PARALLEL WITH BOARD).

14

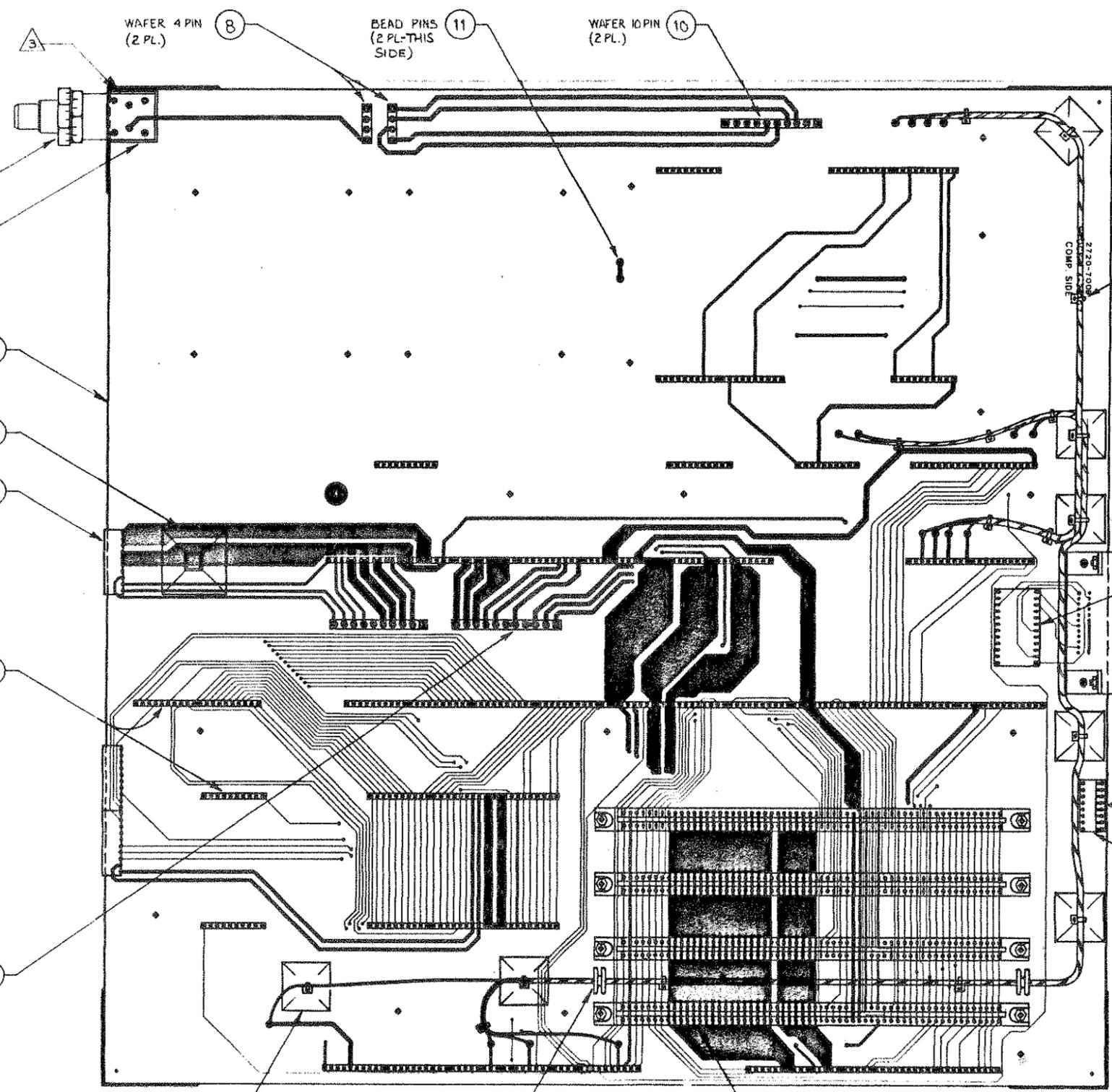
MOTHER BOARD 3

TY BLOCK (LARGE) 23

SK13 (3 PL.) 6

PL1-5,10-12 (50 PL.) 7

WAFER 11 PIN 9



REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
349	A	RELEASED	4-23-84	CRE
532	B	REMOVE #29 AND 30	8-10-84	RDN
693	C	REMOVED KEYS	3-14-85	CRJ

WIRE TABLE
USE TEFLON WIRE ONLY

FROM	TO	COLOR
E1	E11	RED
E2	E12	BLACK
E3	E13	WHITE
E4	E14	GREEN
E5	E15	RED
E6	E16	BLACK
E7	E17	WHITE
E8	E18	GREEN

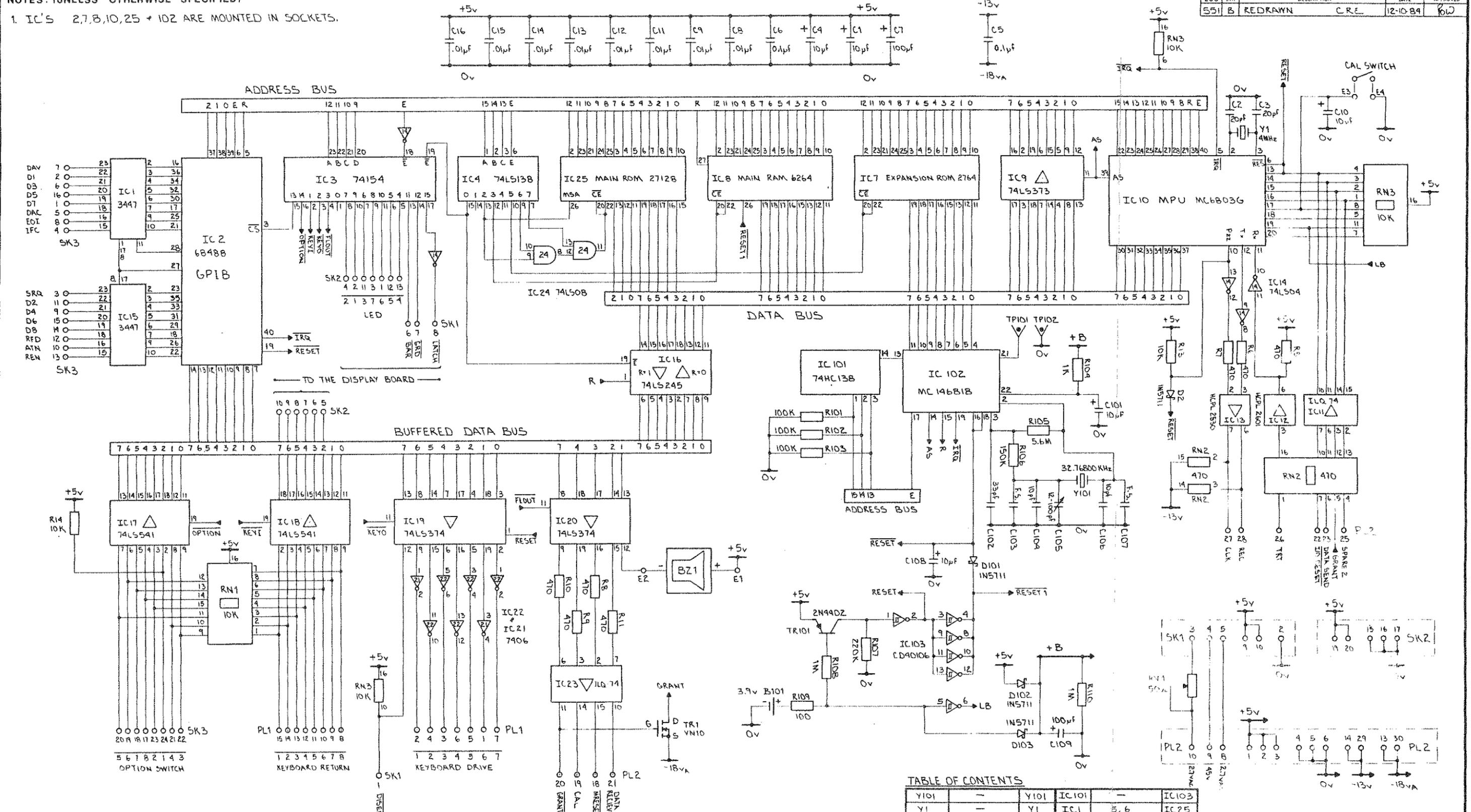
(SLIGHTLY TWIST WIRE BUNDLES)

DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES	MATERIAL	FINISH	DRAWN CRE	CHECKED	APPR	STK NO	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
1			2720		X = ± .30' .XX = ± .03 .XXX = ± .010			4-23-84	4-24-84	6-1-84		
					BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES			CODE IDENT		SIZE	DRAWING NO	REV
					84			53504		D	2720-600	C

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. IC'S 2,7,8,10,25 + 102 ARE MOUNTED IN SOCKETS.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
551	B	REDRAWN	C.R.E.	12-10-84



IC #	+5v	0v
1	24	12,13,14
2	20	1,2
3	24	12
4	16	4,5,8
14	14	7
7	1,26,27,28	14

IC #	+5v	0v
9,17,18,20	20	1,10
10	4,7,9,21	1,8
15	1,24	11,12,13,14
16,19	20	10
21,22,24	14	7

IC #	+5v	0v
25	1,27,28	14

IC #	+B	0v
101	6,16	4,5,8
102	1,20,24	12
103	14	7
8	1,28	14

IC #	+5v	0v	-13v	-18v
11	-	9,12,13,16	1,4,5,8	-
12	7,8	5	2	-
13	1,4	-	8	5
23	1,4,5,8	-	-	9,12,13,16

TABLE OF CONTENTS

Y101	Y101	IC101	IC103
Y1	Y1	IC1	IC25
TP101	TP102	E1	E4
TR101	TR101	D101	D103
TR1	TR1	D2	D2
SK1	SK3	C101	C109
RN1,R	RN3,RV1	C1	C16
R101	R110	BZ1	BZ1
RS	R14	B101	B101
PL1	PL2	FIRST	LAST

Valhalla Scientific Inc. SAN DIEGO, CA

I/O PROCESSOR

CODE IDENT 53504 SIZE D DRIVING NO 2720-071

SHEET 1 OF 2

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

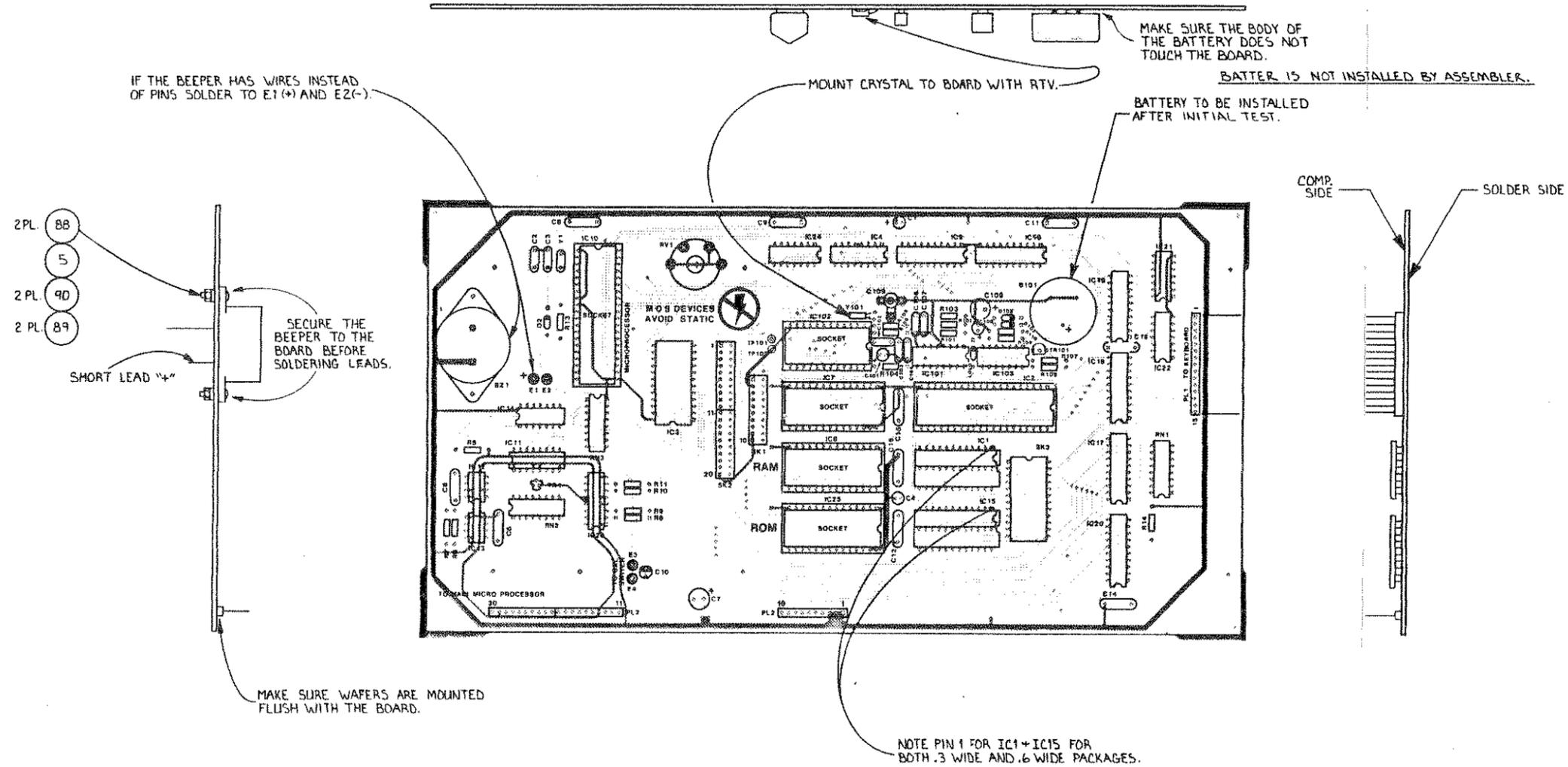
KEY BOARD TABLE

PINS ON PL 1	8 (D0)	9 (D1)	10 (D2)	11 (D3)	12 (D4)	13 (D5)	14 (D6)	15 (D7)
1 (D1)	ON/OFF EXT. REF.	RCL LAST	STEP TO NEXT	ENTER (TOP HALF)	STO (MEM)	RCL (MEM)	CLR (MEM)	V
2 (D6)	ON OFF	←	→	↑	↓/S	7	8	9
3 (D4)	S BELOW- EXT. REF. ON	SET ZERO	RESET	ENTER YES	INT CAL	SYS CHECK	DSPL TEST	mV
4 (D5)	ON/OFF NULL MTR	ADDR	LOCAL	S LOGO	S LEFT-4	4	5	6
5 (D2)	NO	S BELOW- ADDR	S BELOW- LOCAL	μV	S LEFT-1	1	2	3
6 (D3)	CLR	S RIGHT- LAST-CAL	LAST CAL	PPM	S LEFT-■	■	0	+/-
7 (D0)	ON STBY	S-BOTTOM RIGHT IN CAL. CONTR	S BELOW- LAST-CAL.	AUTO NULL	DISPLAY TOL	SET ERROR LIMIT	SET CLOCK	SET CURRENT LIMIT

DASH NO		QTY	RECD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010	MATERIAL	FINISH	DRAWN RDN 12-11-64	CHECKED	APPR	STK NO	 Valhalla Scientific Inc. SAN DIEGO, CA
						BREAK ALL SHARP CORNERS AND EDGES MACH SURFACES			I/O PROCESSOR				
SCALE		CODE IDENT		SIZE	DRAWING NO	REV		SHEET 2 OF 2		53504	D	2720-071	1

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
551	D	INC. DESIGN CHANGE	DPM 3-1-85	Paw
	E	P/L CHG. ITEMS 9,10,11	DPM 4-4-85	Paw



NOTE PIN 1 FOR IC1-IC15 FOR BOTH .3 WIDE AND .6 WIDE PACKAGES.

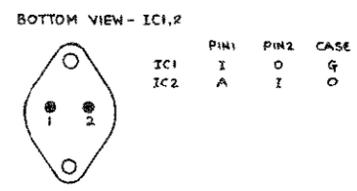
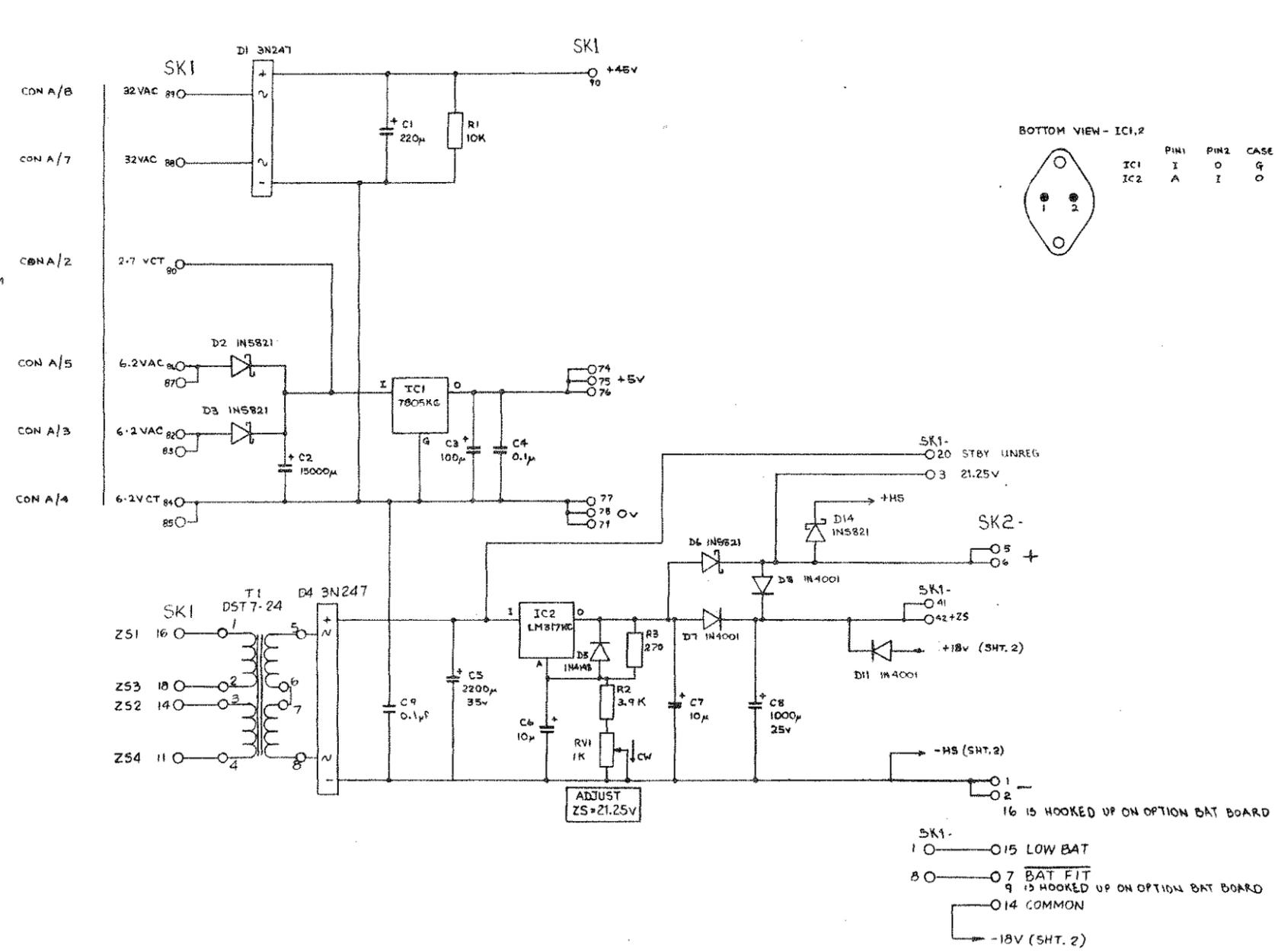
DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30 .XX = ± .03 .XXX = ± .010	MATERIAL FINISH	DRAWN DPM 3-1-85 CHECKED E 3-1-85 APPR Paw 3-1-85 STK NO	 SAN DIEGO, CA	I/O PROCESSOR ASSY. DWG.	
SCALE 1:1		CODE IDENT 53504	SIZE D	DRAWING NO 2720-601			REV E			

NOTES: (UNLESS OTHERWISE SPECIFIED)

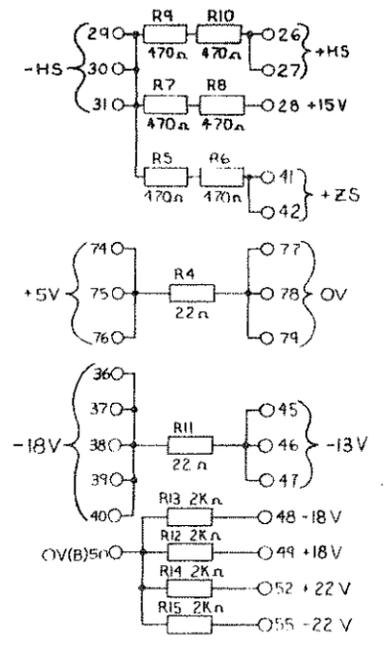
1. IC1,2 ARE MOUNTED ON HEATSINK.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
0332	A	RELEASE	SW 3-1-84	[Signature]
536	B		DPM 1-23-85	[Signature]

T2
SECONDARY SYSTEM
A



PARTIAL EXTENDER BOARD



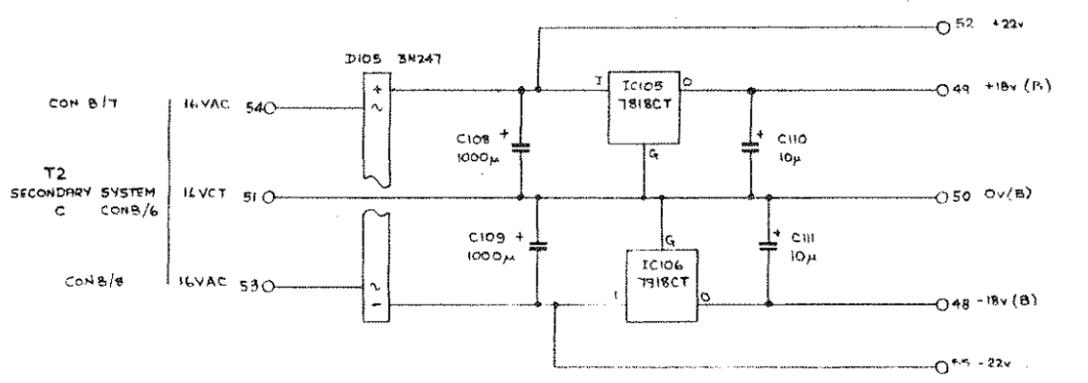
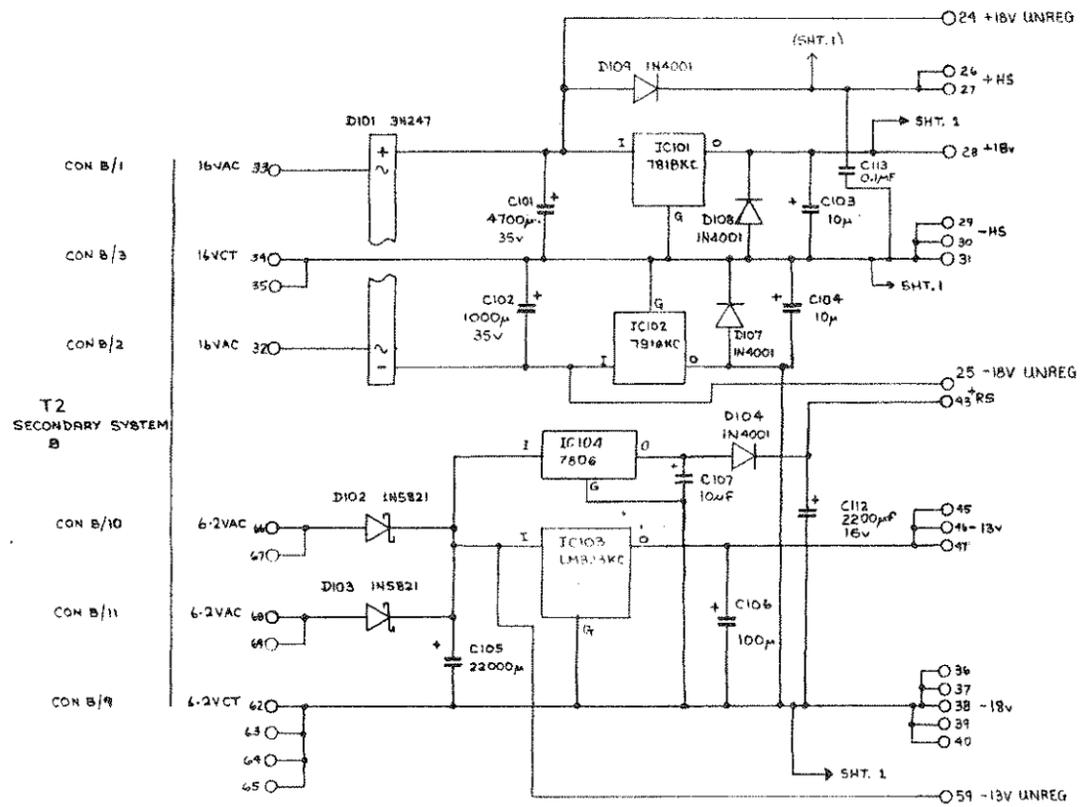
- SK1- 1 0 - 15 LOW BAT
- 8 0 - 07 BAT FIT
- 9 15 HOOKED UP ON OPTION BAT BOARD
- 0 14 COMMON
- 18V (SHT. 2)

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-5-83	Valhalla Scientific Inc. SAN DIEGO, CA		
C1	C9-C12	C8	X = ± 30' .XX = ± 03 .XXX = ± 010		CHECKED POW	5-13-83			
D1	D9, D10, D12, D13	D14			APPR	5-29-84			
IC1	IC3, IC4	IC2			STK NO				
R1	R4-R6, R1A	R3	BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES	FINISH	POWER SUPPLY - LOW VOLTAGE				
RV1	-	RV1			SCALE	CODE IDENT	SIZE	DRAWING NO	REV
T1	-	T1			SHEET 1 OF 2	53504	D	2720-072	B

NOTES: (UNLESS OTHERWISE SPECIFIED)

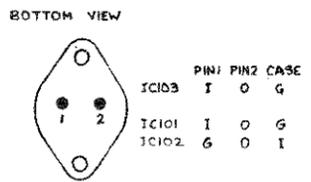
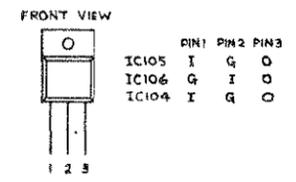
1. IC101-103 ARE MOUNTED ON HEATSINK.

ECO		LTR		REVISIONS		DATE	APPROVED
				DESCRIPTION			
				SET SHEET #			



REFERENCE SUPPLIES

OUTPUT SYSTEM SUPPLIES

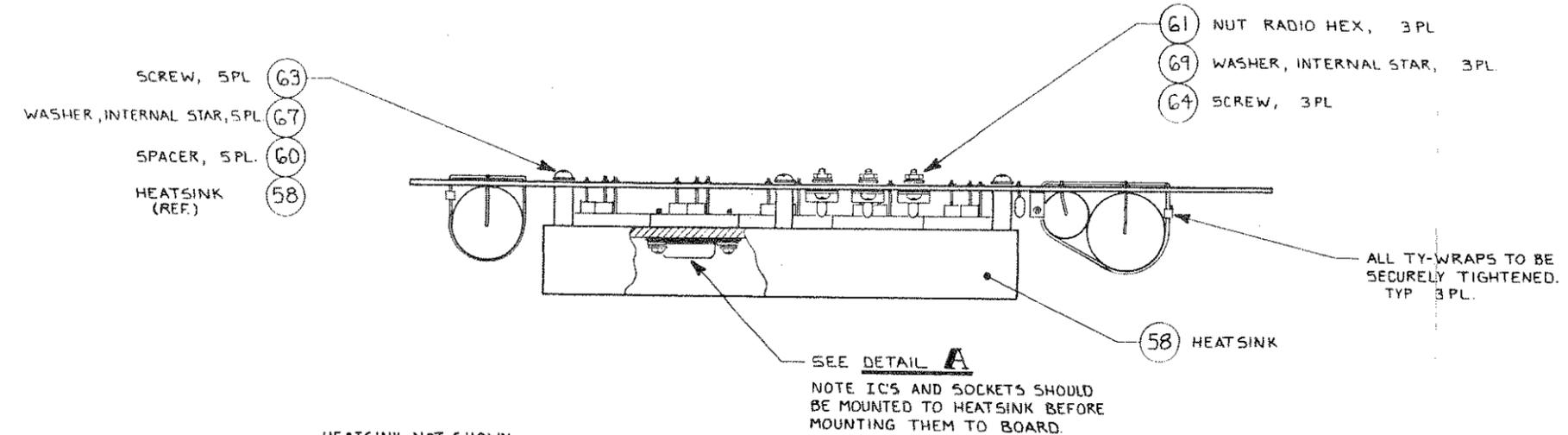


FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-5-83			
C101	-	C112	X = ± .30'	/	CHECKED POW	5-13-83			
D101	D106	D107	.XX = ± .03		APPR	RLW	5-29-84		
IC101	-	IC106	.XXX = ± .010		STX NO	-	-		
			BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	FINISH	POWER SUPPLY - LOW VOLTAGE				
			64 ✓	/	SCALE	CODE IDENT	SIZE	DRAWING NO	REV
					SHEET 2 OF 2	53504	D	2120-072	B

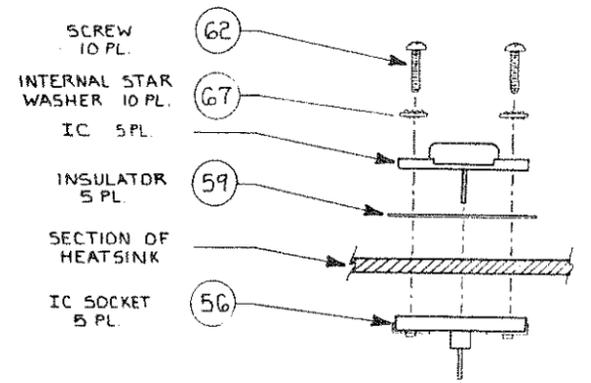


NOTES: (UNLESS OTHERWISE SPECIFIED)

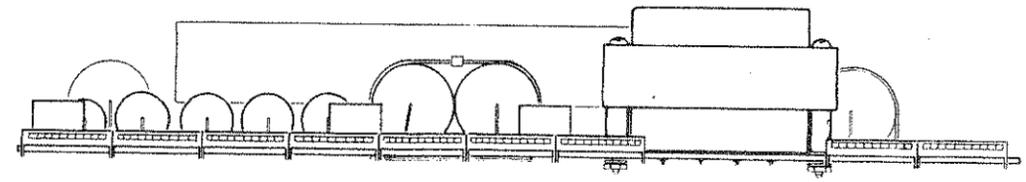
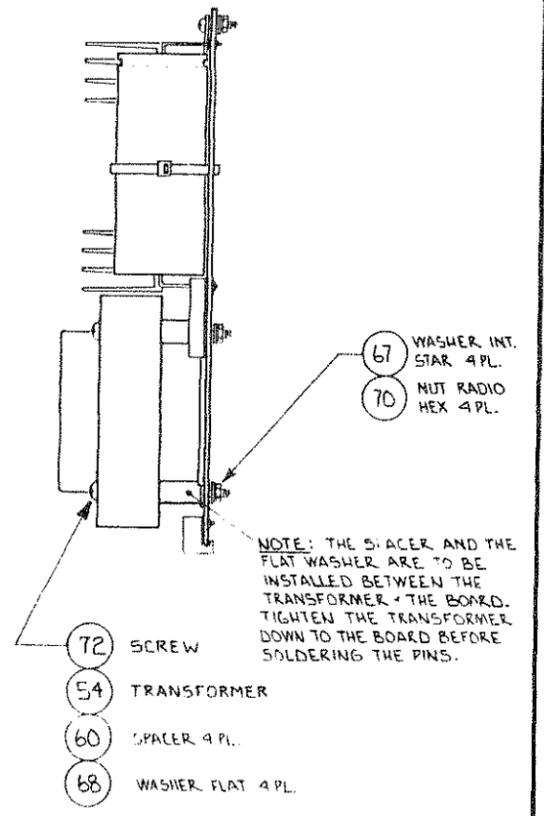
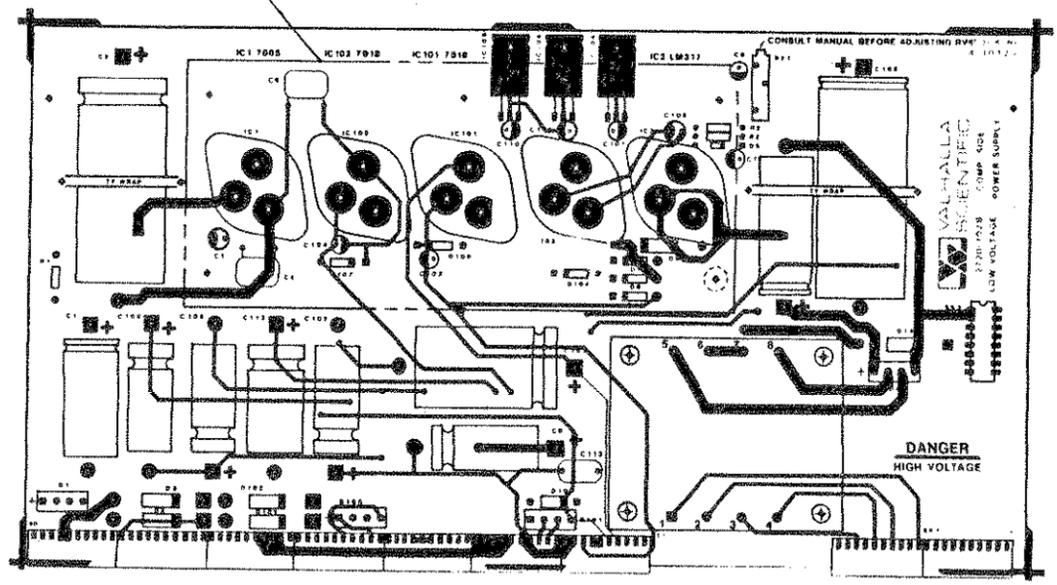
		REVISIONS		
ECD	LTR	DESCRIPTION	DATE	APPROVED
332	A	RELEASED FROM PROTO	3-15-84	R
4169	B	UPDATED PARTS LIST	6-6-84	R
536	C	INCORPORATED DESIGN CHANGES	2-22-85	R



HEATSINK NOT SHOWN IN THIS VIEW.



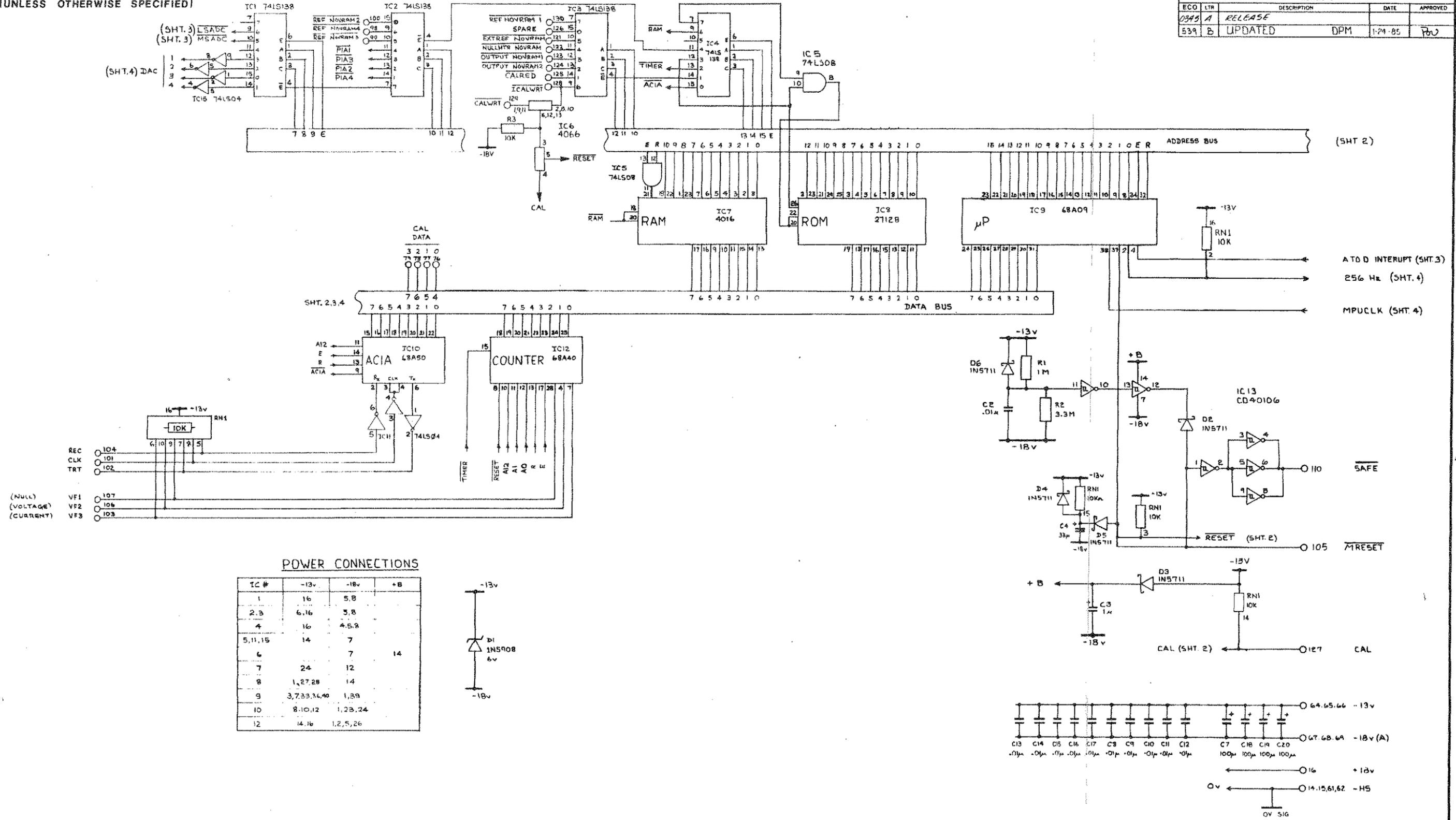
DETAIL A
 SCALE: NONE
 VIEW SHOWN IS PERPENDICULAR TO IC.
 NOTE ALL IC'S ON HEATSINK ARE MOUNTED THE SAME WAY.



TOLERANCES		MATERIAL		DRAWN WPW 3-15-84	
X° = ± .30°		SEE PARTS LISTS		CHECKED JMW 3/15/84	
.XX = ± .03				APPR R 3/15/84	
.XXX = ± .010				STK NO	
BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		FINISH		Valhalla Scientific Inc. SAN DIEGO, CA	
1 2720- 2720				LOW VOLTAGE POWER SUPPLY ASSY.	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	SCALE 1:1	CODE IDENT
					53504
				SIZE D	DRAWING NO 2720-602
					REV C
				SHEET 5 OF 5	

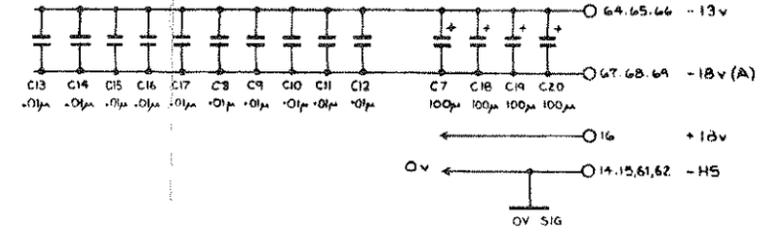
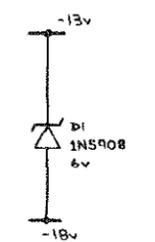
NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
0349	A	RELEASE		
539	B	UPDATED	DPM 1-24-85	FW



POWER CONNECTIONS

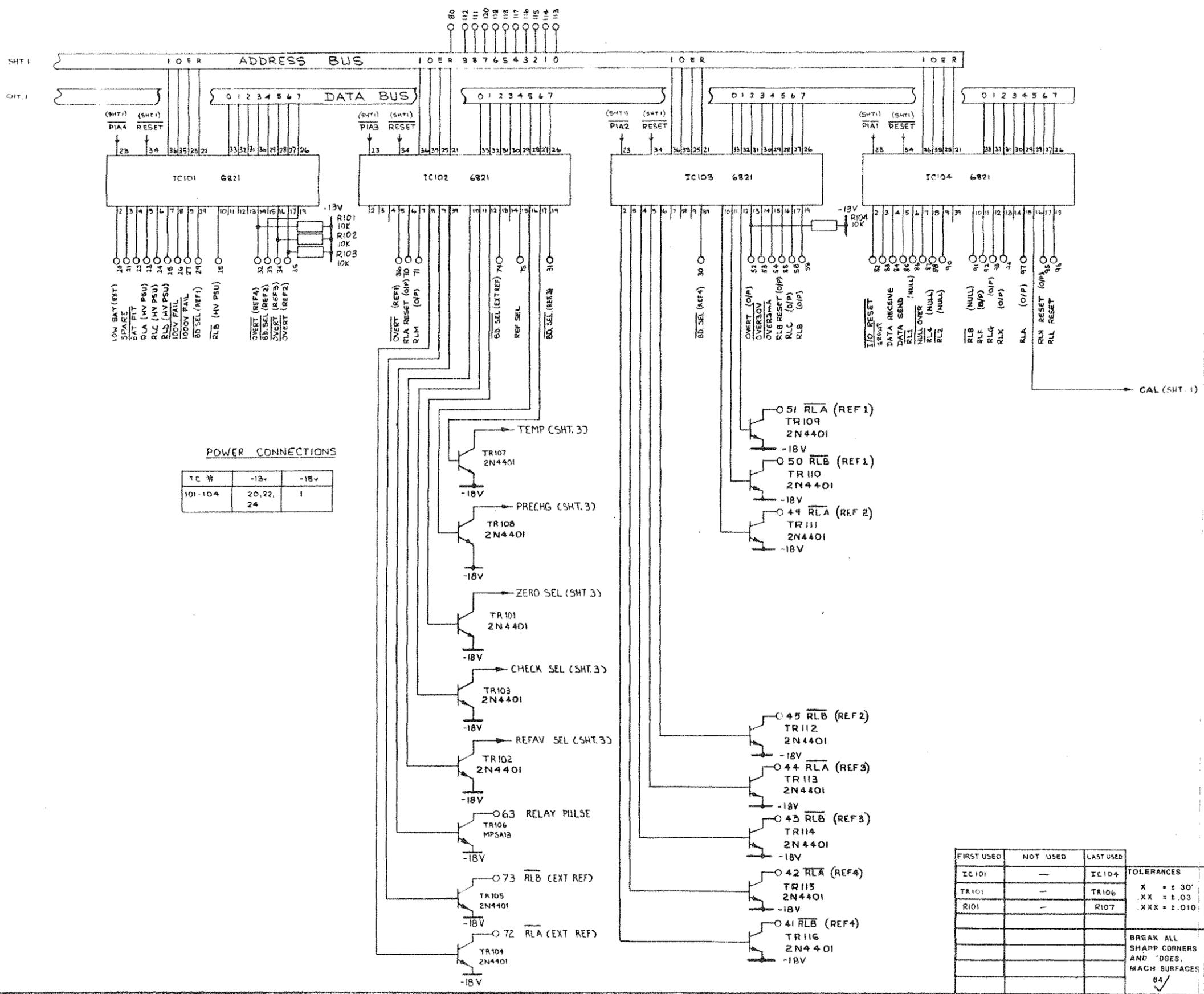
IC #	-13v	-18v	+B
1	16	5,8	
2,3	6,16	3,8	
4	16	4,5,8	
5,11,15	14	7	14
6		7	
7	24	12	
8	1,2,28	14	
9	3,7,33,34,40	1,39	
10	8,10,12	1,23,24	
12	14,16	1,2,5,26	



FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-4-83
C2	C1, C5, C6	C12	X = ± 30 .XX = ± 0.3 .XXX = ± 0.010		CHECKED POW	5-15-83
D1		D6			APPR	FW 5-29-84
IC1	IC14	IC15			STK NO	
R1		R2				
RN1		RN1	BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	FINISH	OUTPUT MICROPROCESSOR	
			SCALE	CODE IDENT	SIZE	DRAWING NO
			SHEET 1 OF 4	53504	D	2720-073
						REV B

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
		SET SHEET # 1		



POWER CONNECTIONS

TC #	-12v	-18v
101-104	20, 22, 24	1

FIRST USED	NOT USED	LAST USED
IC101	—	IC104
TR101	—	TR106
R101	—	R107

TOLERANCES
X = ± .30'
.XX = ± .03
.XXX = ± .010

MATERIAL
BREAK ALL SHARP CORNERS AND DGES. MACH SURFACES

DRAWN RDH 5-24-84
CHECKED PBL 5-30-84
APPR PBL 5-30-84
STK NO

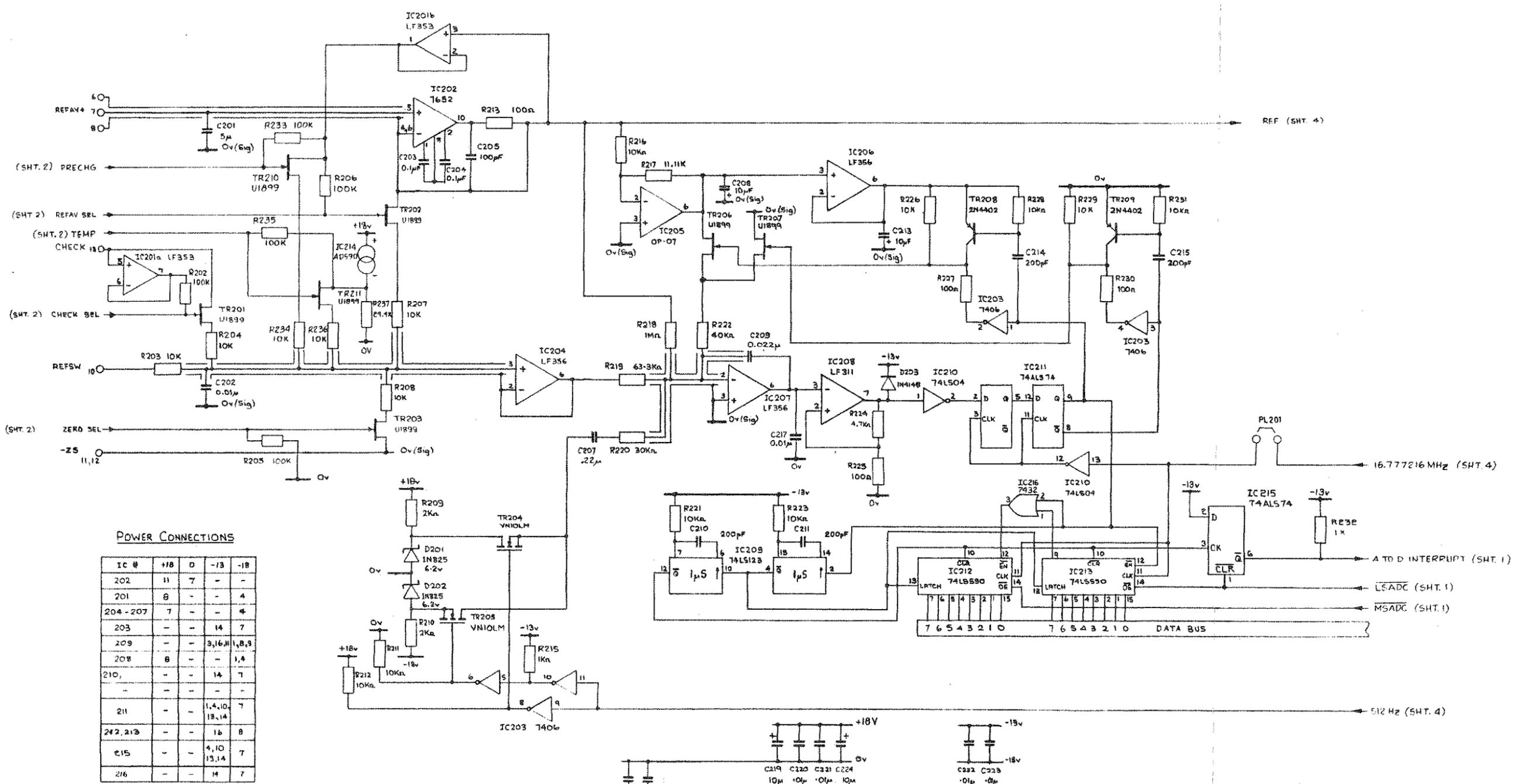
Valhalla Scientific Inc.
SAN DIEGO, CA

OUTPUT MICROPROCESSOR (INTERFACE)

SCALE	CODE IDENT	SIZE	DRAWING NO	REV
SHEET 2 OF 4	53504	D	2720-073	B

NOTES: (UNLESS OTHERWISE SPECIFIED)

ECO		LTR		REVISIONS		DATE	APPROVED



POWER CONNECTIONS

IC #	+18	0	-18	-18
202	11	7	-	-
201	8	-	-	4
204 - 207	7	-	-	4
203	-	-	14	7
209	-	-	3,16,11,18,14	7
208	8	-	-	1,4
210,	-	-	14	7
-	-	-	-	-
211	-	-	1,4,10,13,14	7
212, 213	-	-	16	8
215	-	-	4,10,13,14	7
216	-	-	14	7

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL
C 201	C206, 212, 217, 218	C223	X = ± 30' .XX = ± 0.1 .XXX = ± 0.010	
D 201	-	D 203		
IC 201	-	IC 215		
R 201	-	R 237	BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	FINISH
TR 201	-	TR 211		

DRAWN	POW	5-6-83
CHECKED	POW	5-13-83
APPR	POW	5-29-84
STK NO		

Valhalla Scientific Inc.
SAN DIEGO, CA

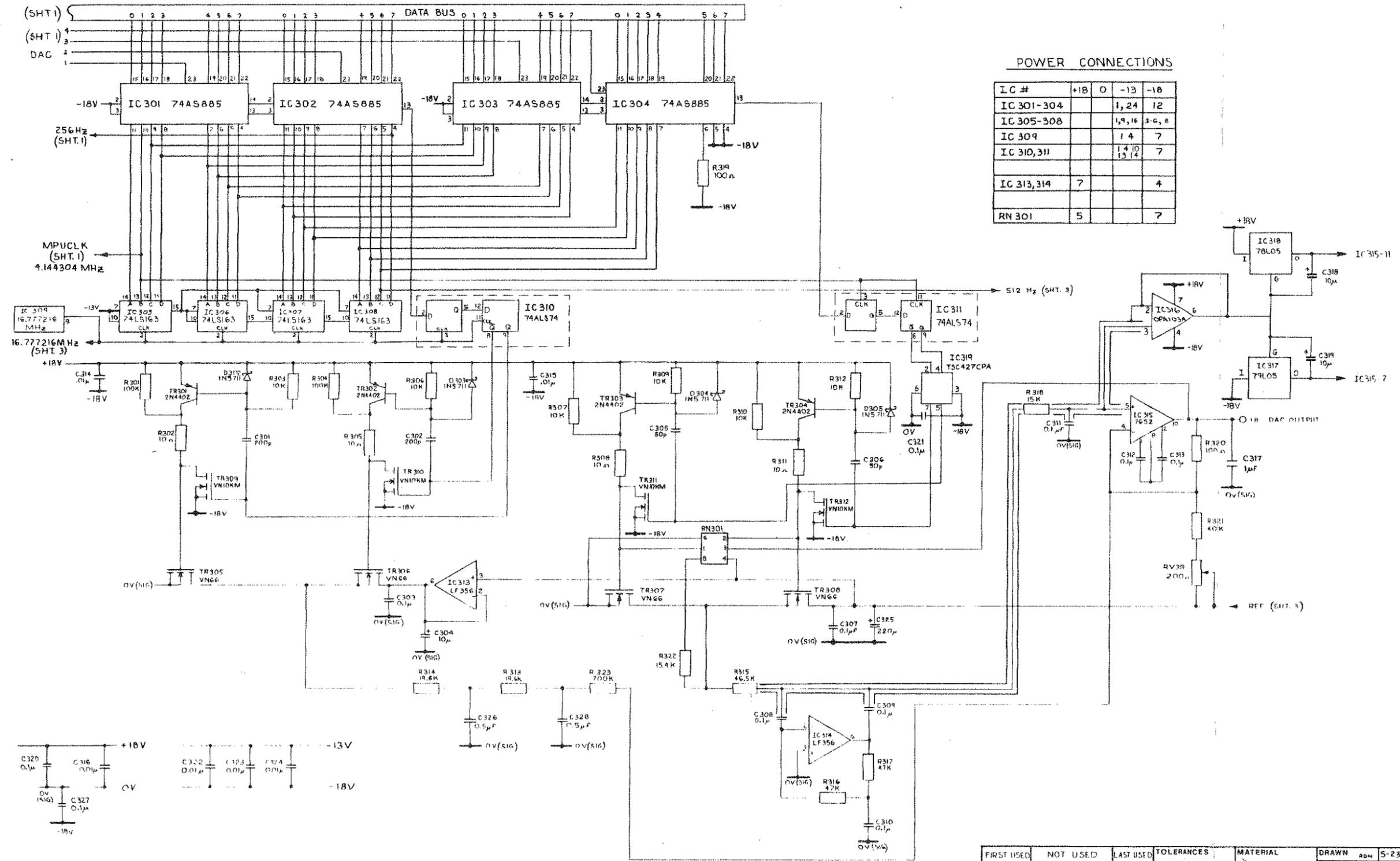
REFERENCE GENERATOR

SCALE	CODE IDENT	SIZE	DRAWING NO	REV
SHEET 3 OF 4	53504	D	2720-073	E

NOTES: (UNLESS OTHERWISE SPECIFIED)

I, TR 307 AND 308 ARE MOUNTED ON BERYLLIA WASHERS.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
		REF SHEET #1		



POWER CONNECTIONS

IC #	+18	0	-13	-18
IC 301-304			1, 24	12
IC 305-308			1, 9, 16	3-6, 8
IC 309			1, 4	7
IC 310, 311			1, 4, 10, 13, 14	7
IC 313, 314	7			4
RN 301	5			7

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL
C 301	C 317-C 321	C 328	X = ± 30'	
D 301		D 305	.XX = ± 0.3	
			.XXX = ± 0.10	
IC 301		IC 315		
R 301		R 323		
RN 301		RN 301	BREAK ALL SHARP CORNERS AND EDGES.	
RV 301		RV 301	MACH SURFACES	
TR 301		TR 314	64	

DRAWN	ADH	5-23-84
CHECKED	RWS	5-30-84
APPR	RWS	5-30-84
STK NO		

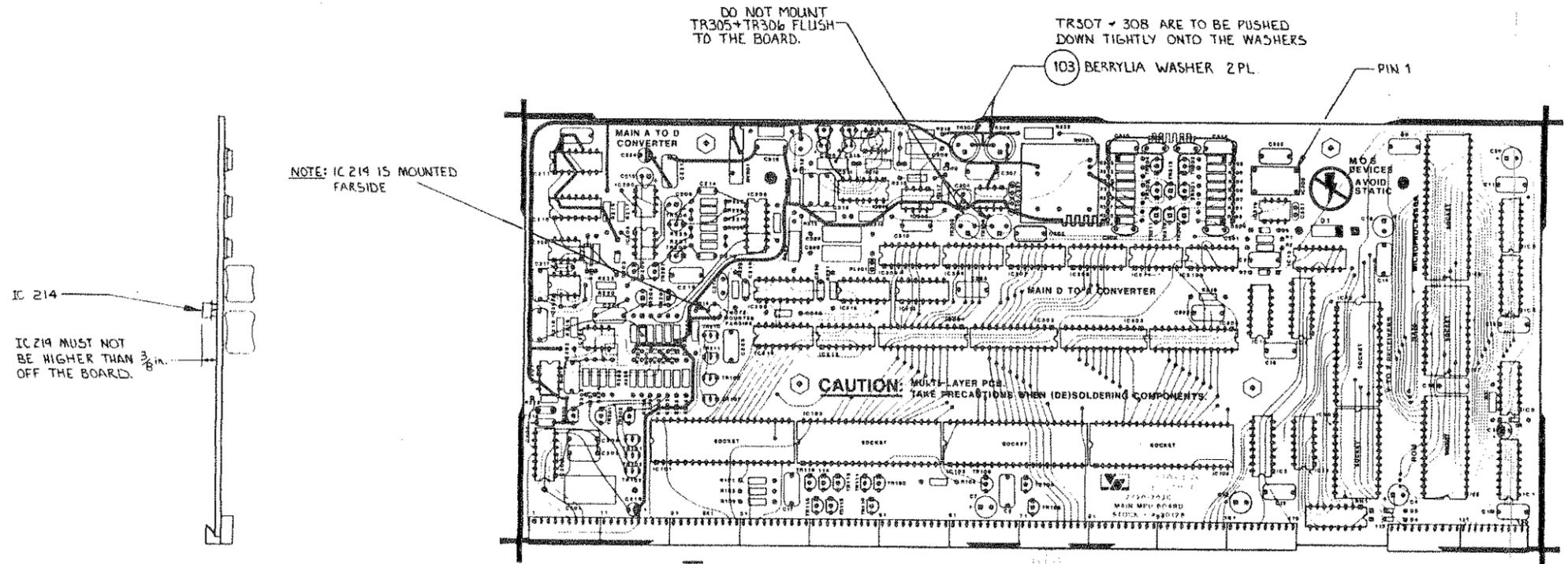
Valhalla Scientific Inc.
SAN DIEGO, CA

DIGITAL TO ANALOG CONVERTOR

SCALE	CODE IDENT	SIZE	DRAWING NO	REV
	53504	D	2720-073	B

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS					
ECO	LTR	DESCRIPTION	DATE	APPROVED	
345	A	RELEASED	RDN	3-26-84	RL
469	B	UPDATE DRAWING	RDN	6-11-84	RL
539	C	INC. DESIGN CHANGE	DPM	3-1-85	PW



MOD. FOR REV. "A" BOARDS ONLY
 JUMPER PINS 1 & 2 TOGETHER ON IC12. (USE 30 AWG KYNAR ON BACK SIDE OF BOARD)

NOTE: REV "A" PCB'S ONLY

JUMPER AS FOLLOWS, ON CIRCUIT SIDE (OPPOSITE SHOWN) USING 30 AWG KYNAR. GLUE WIRE TO PCB WITH RTV AS REQUIRED:

- | | |
|-----------|-----------|
| IC 101-11 | IC101-39 |
| IC 101-12 | IC 103-39 |
| IC 101-13 | IC 102-19 |
| IC 101-15 | IC 101-19 |
| IC 102-2 | IC 102-16 |
| IC 102-3 | IC 102-17 |
| IC 102-14 | IC 102-13 |
| IC 103-7 | IC 102-10 |
| IC 103-8 | IC 102-11 |
| IC 103-9 | IC 102-12 |

REV. A PCB'S ONLY

SHORT PIN 12 TO PIN 14 ON SK1 USING 30 AWG KYNAR WIRE.

CAUTION: RN301, IC6 + IC13 ARE STATIC SENSITIVE DEVICES

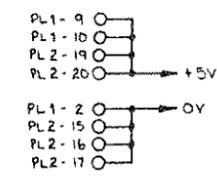
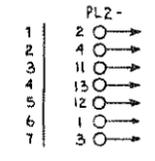
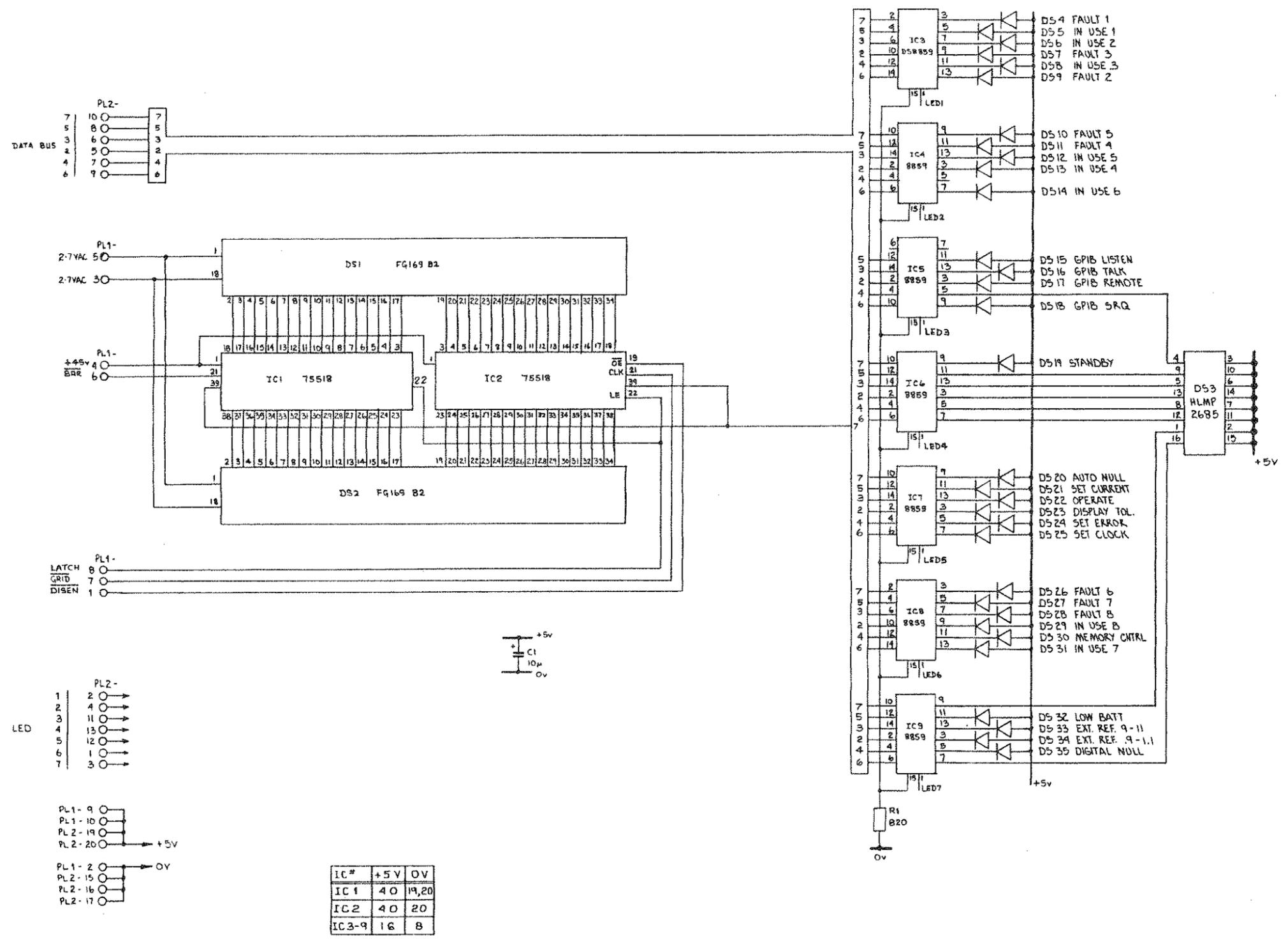
RN301, TR305 - TR308, IC6 + IC13 ARE TO BE THE LAST COMPONENTS INSTALLED INTO THE BOARD.

DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010	MATERIAL	FINISH BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES 64 ✓	DRAWN RDN 3-26-84 CHECKED [Signature] 3-27-84 APPR [Signature] 6/12/84 STK NO	Valhalla Scientific Inc. SAN DIEGO, CA	MAIN MICROPROCESSOR ASSEMBLY DRAWING	SCALE 1=1	CODE IDENT 53504	SIZE D	DRAWING NO 2720-603	REV C
SHEET 6		OF 6													

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL DIODES ARE L.E.D.'s.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
0330	A	RELEASED	SW 9-28-89	JCN



IC#	+5V	0V
IC1	40	19,20
IC2	40	20
IC3-9	16	8

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	FINISH
DS1	-	DS35	X = ± .30'		
IC1	-	IC9	.XX = ± .03		
R1	-	R1	.XXX = ± .010		
C1	-	C1			
			BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		

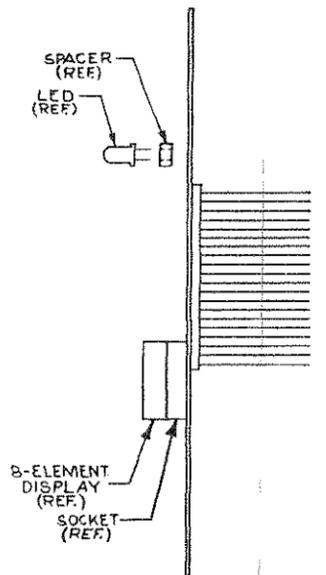
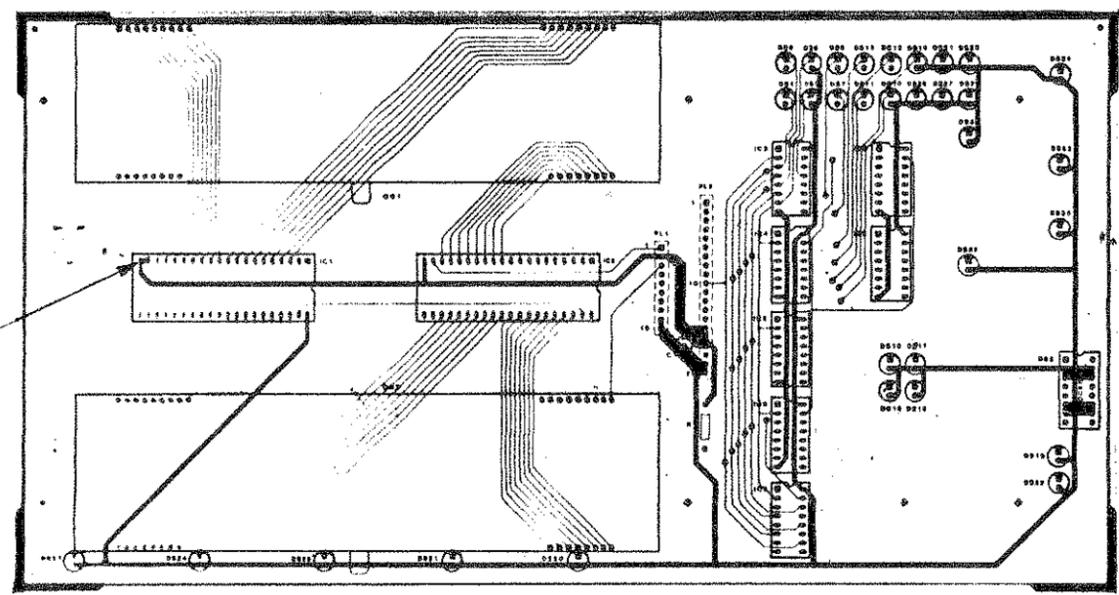
DRAWN POW	5-12-83	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>			
CHECKED POW	5-13-83				
APPR	PSW 9-21-83				
STK NO					
SCALE		CODE IDENT	SIZE	DRAWING NO	REV
SHEET 1 OF 1		53504	D	2720-076	

NOTES: (UNLESS OTHERWISE SPECIFIED)

① INSURE ALL COMPONENTS ARE FLAT TO PCB AND FULLY INSERTED. NOT CROOKED.

ECO		REVISIONS		
ECO	LTR	DESCRIPTION	DATE	APPROVED
330	A	RELEASED	3-1-84	RE
550	B	MODIFIED P.C.B.	12-7-89	CRE

JUMPER PINS 19 AND 20 ON IC 1. ('A' REV. ONLY)



DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES	MATERIAL	FINISH	DRAWN RDN	CHECKED	APPR	STK NO	CODE IDENT	SIZE	DRAWING NO	REV
				X = ± .30 .XX = ± .03 .XXX = ± .010			3-1-84	RE	RE		53504	D	2720-606	B



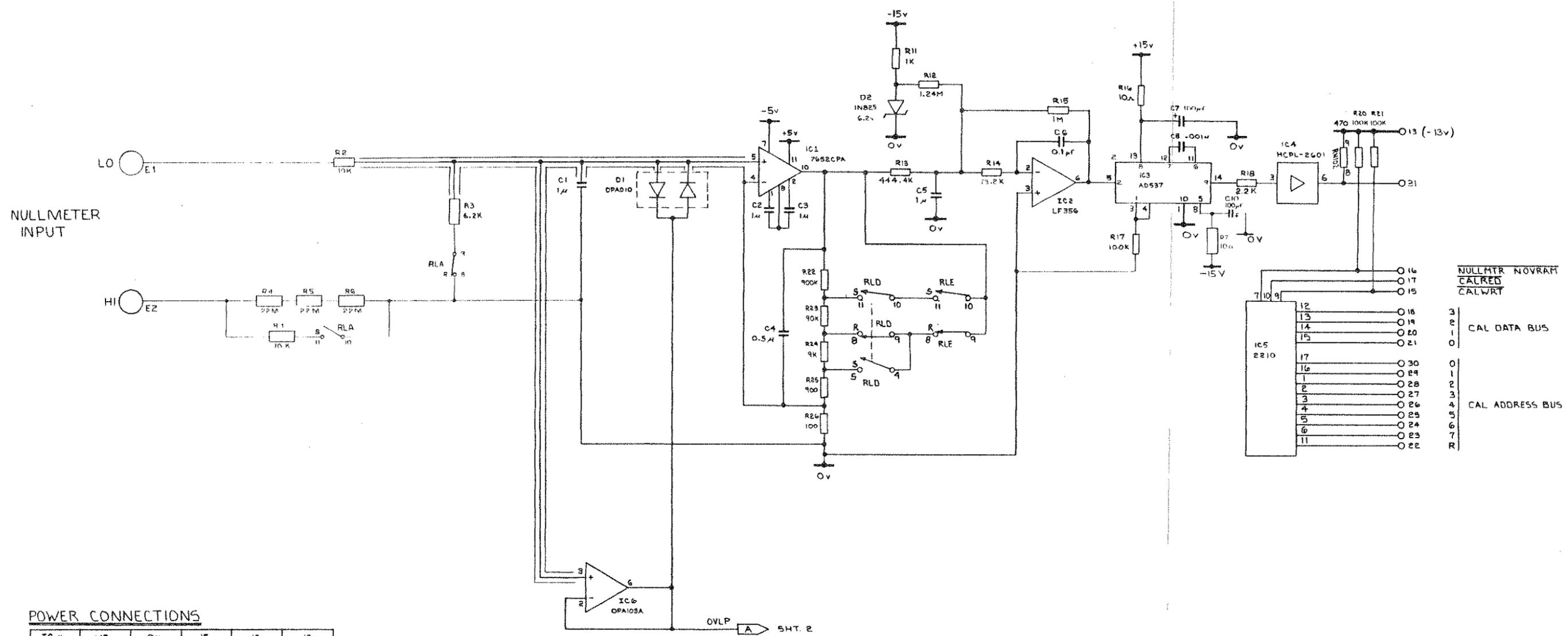
2720 DISPLAY BOARD ASSY. DWG.

SCALE 1/1

SHEET 2 OF 2

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
327	A	RELEASED	WPW 2-24-84	FW
527	B	UPDATED	RDN 1-23-85	RW
69B	C	CHANGED C4 TO 5uF • TRIZ TO MP5A13	3.25.85	POW



POWER CONNECTIONS

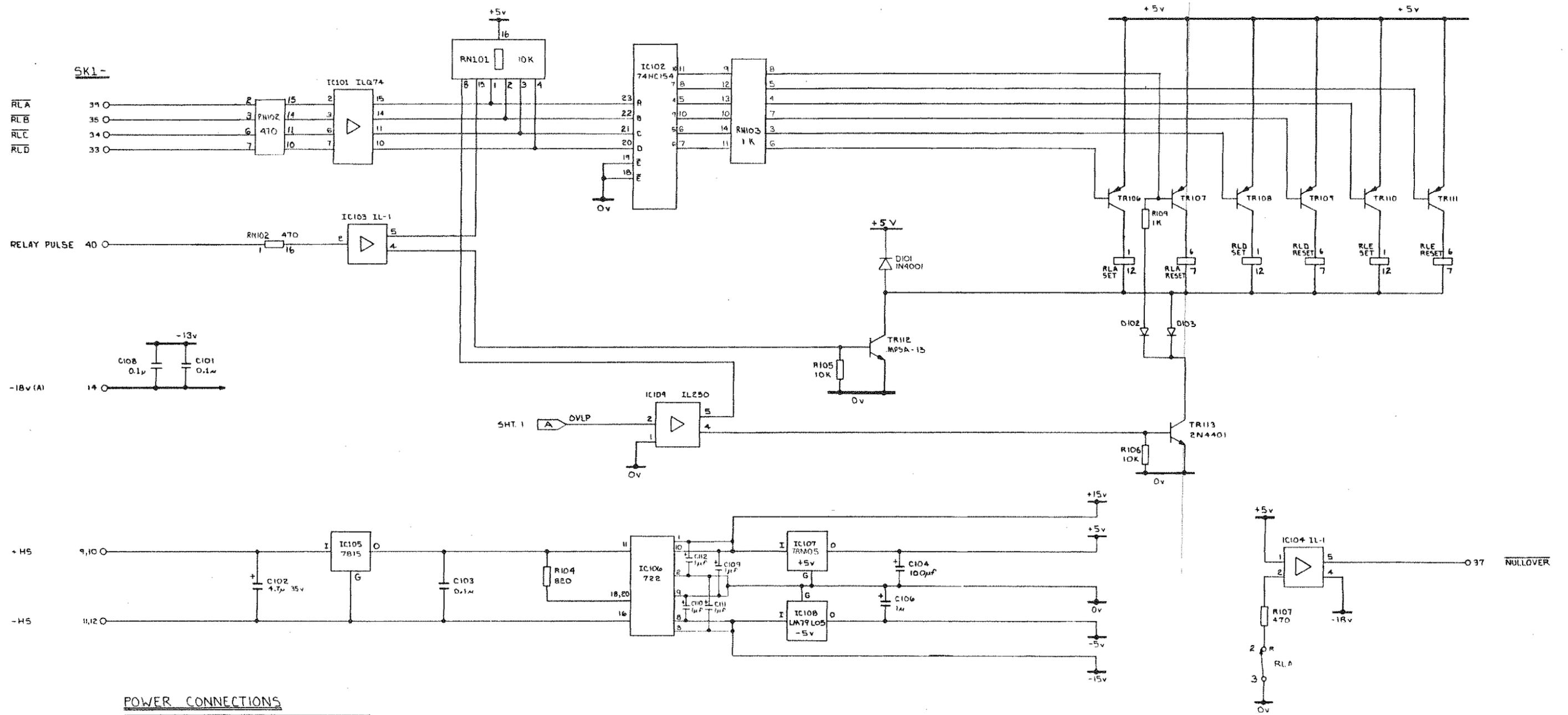
IC #	+15v	0v	-15v	-13v	-10v
2,6	7	--	4	--	--
4	2	--	--	7,8	5
5	--	--	--	18	8

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN WPW 2-24-84	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
C1	--	C8	X" = ± .30"	FINISH BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES.	CHECKED RW 3/1/85	
D1	--	D2	.XX = ± .03		APPR RW 3/1/85	
IC1	--	IC6	.XXX = ± .010		STK N°	
R2	R7-10, R19	R26			SCALE ---	NULLMETER CODE IDENT 53504 SIZE D DRAWING NO 2720-077 REV
RLA	--	RLE			SHEET 1 OF 2	
--	--	--				

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL UNMARKED TR's ARE 2N4402
2. ALL UNMARKED DIODES ARE IN4148

REVISIONS			
ECO	LTR	DESCRIPTION	DATE
		- SEE SHT. 1.	



POWER CONNECTIONS

IC #	0v	-15v	-13v	+5
101	9,12,13,16	-	1,4,5,8	-
103	-	-	1	-
102	12	-	-	24

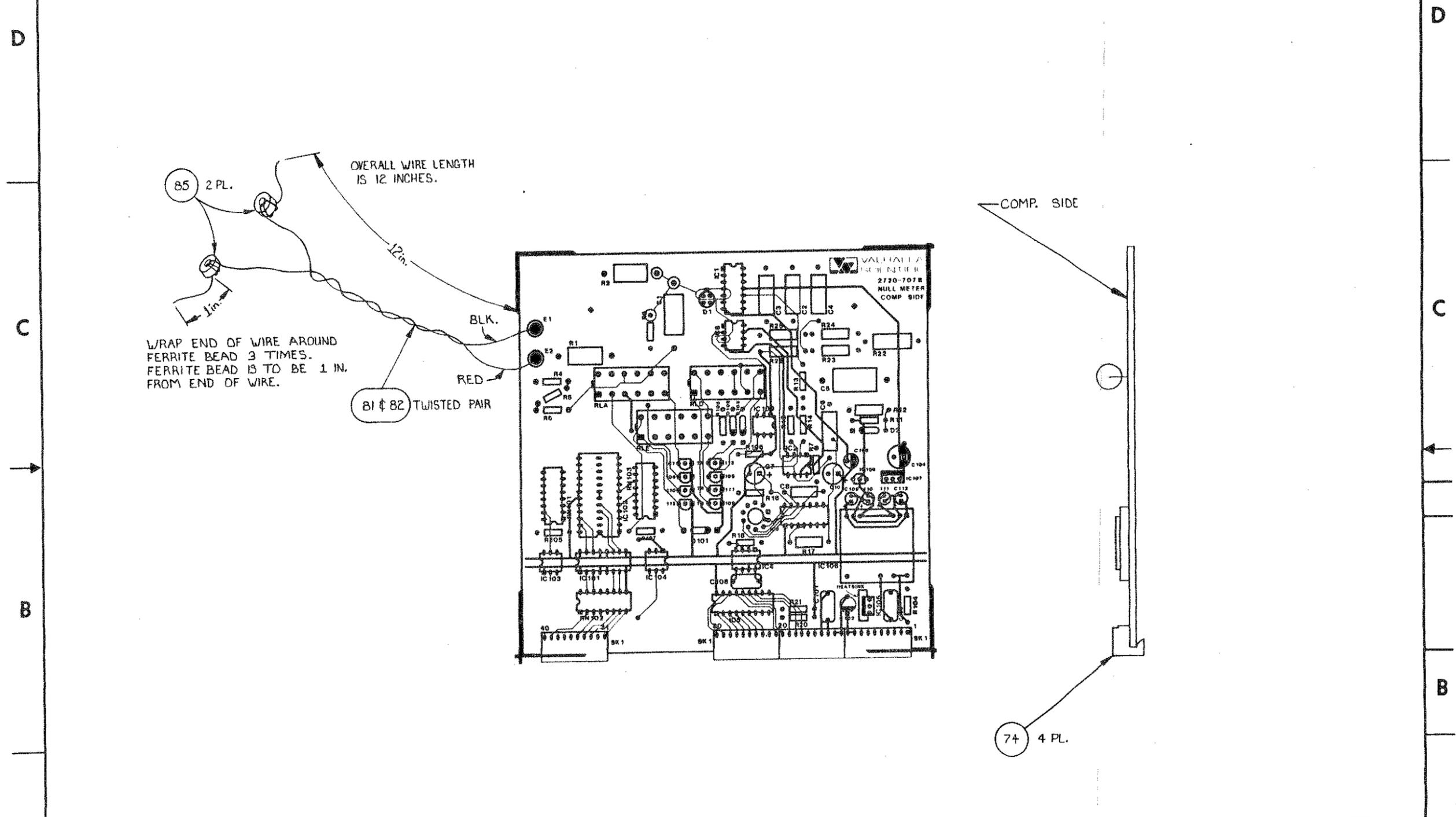
FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN WPJ 2-24-84
C101	-	C108	X = ± 30'	✓	CHECKED DW 3/1/85
D101	-	D103	.XX = ± 03		APPR DW 3/1/85
IC101	-	IC109	XXX = ± 010		STK NO
R101	-	R106	BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	✓	SCALE
RN101	-	RN103	64		SHEET 2 OF 2
TR101	-	TR113			CODE IDENT
RLA	-	RLE			SIZE

Valhalla Scientific Inc.
SAN DIEGO, CA

NULLMETER

DRAWING NO: 2720-077
DATE: 2/24/84

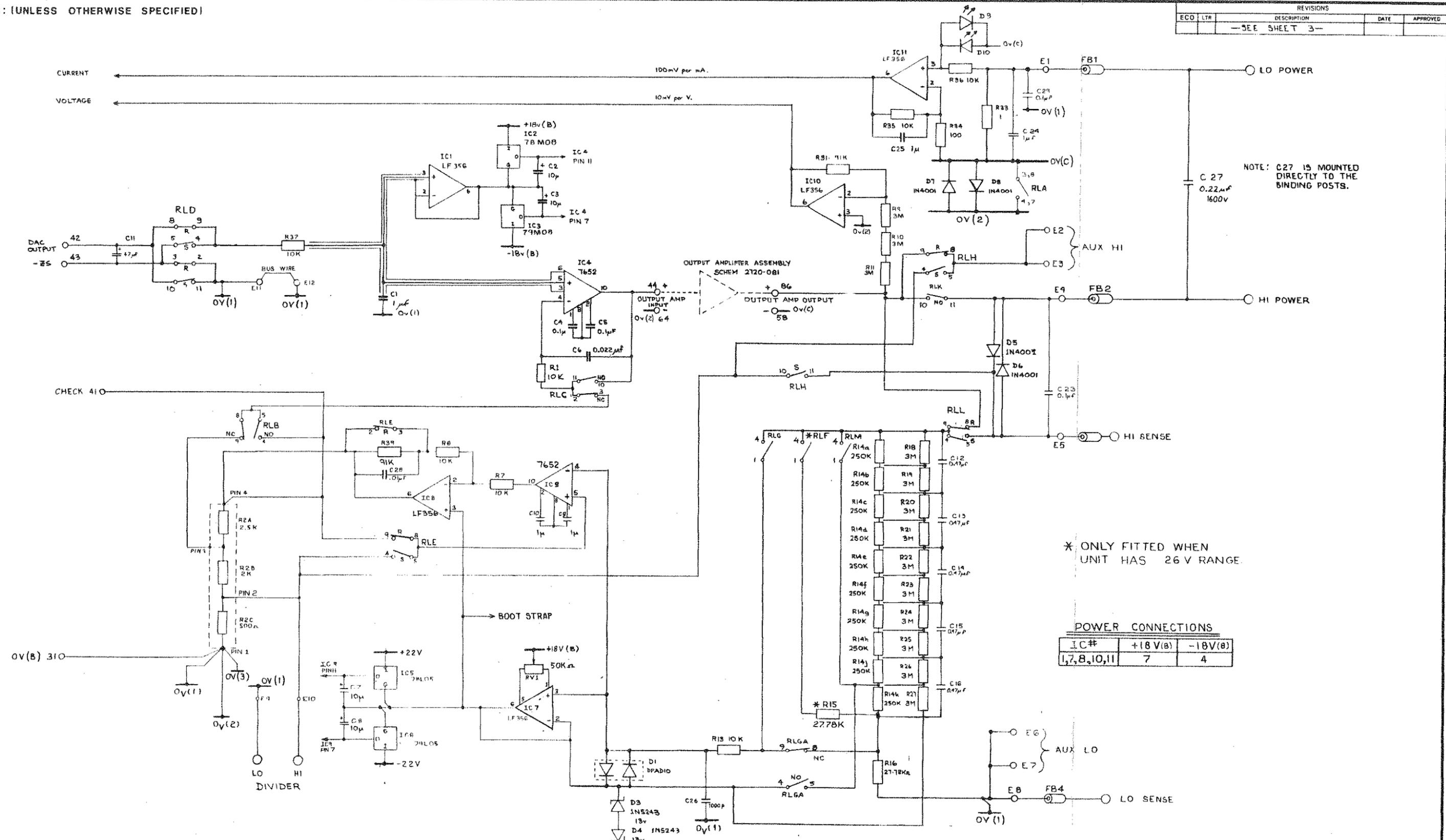
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
527	B	UPDATED	DPM	1-25-85
69B	C	CHANGED C9 TO .5UF + TR11Z TO MP5A-13 CRL	3-25-85	DL



TOLERANCES				MATERIAL		DRAWN DPM 1-29-85		 Valhalla Scientific Inc. SAN DIEGO, CA	
X = ± .30' .XX = ± .03 .XXX = ± .010				FINISH		CHECKED JWA 3/1/85 APPR DL 3/1/85 STK NO			
BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES				64 ✓		SCALE 1:1		NULL METER ASSY.	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	CODE IDENT 53504		SIZE	DRAWING NO	REV	
				SHEET 1 OF 5		C	2720-607	C	

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS			
ECO	LTR	DESCRIPTION	DATE
		- SEE SHEET 3 -	



NOTE: C27 IS MOUNTED DIRECTLY TO THE BINDING POSTS.

* ONLY FITTED WHEN UNIT HAS 26 V RANGE.

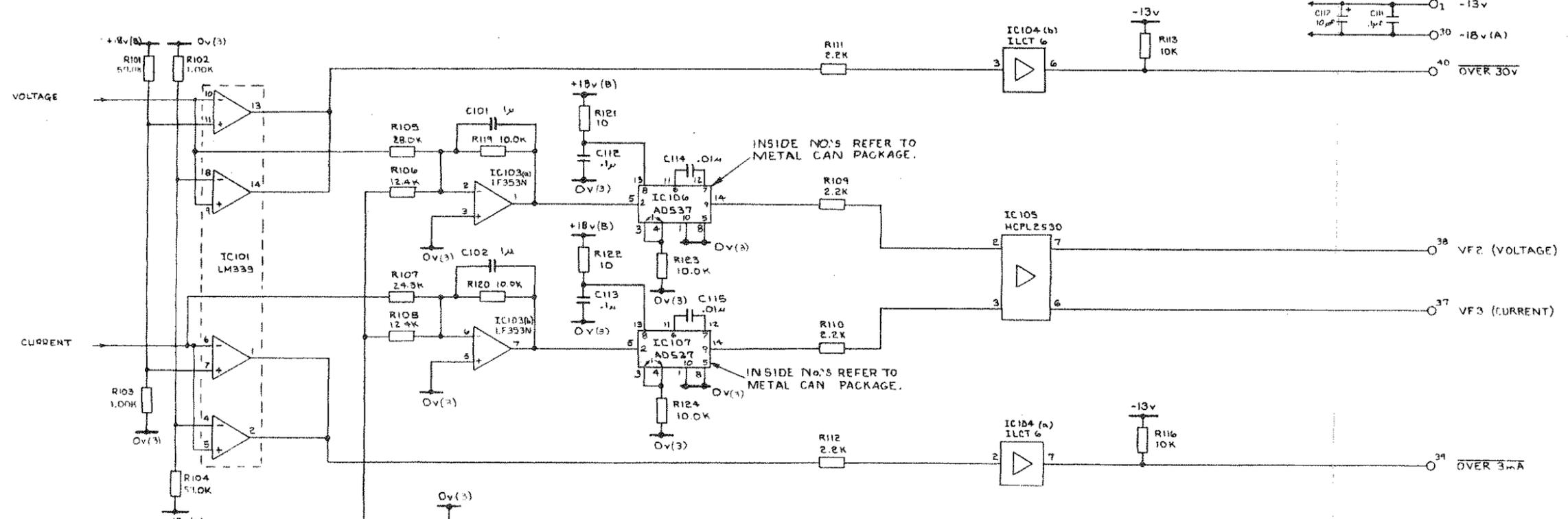
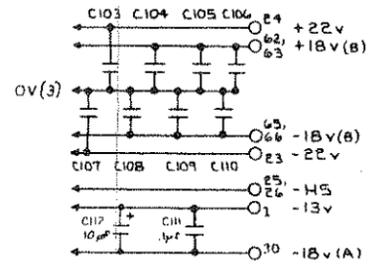
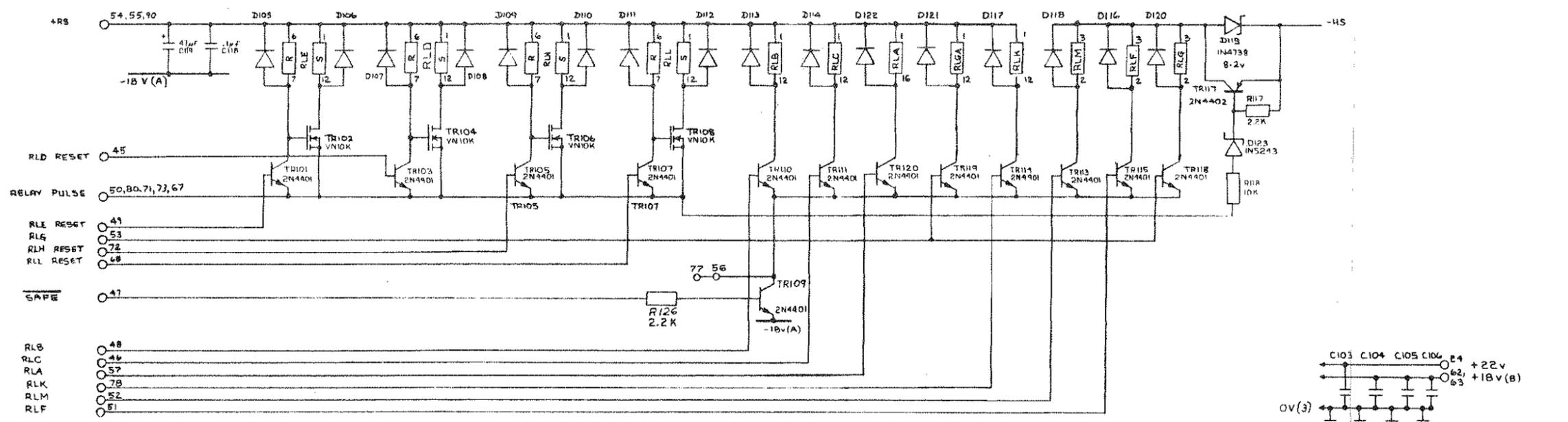
POWER CONNECTIONS		
IC#	+18V(B)	-18V(B)
1,7,8,10,11	7	4

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-8 83
C1	C23	C25	X = ±.00"		CHECKED POW	5-16 83
D1	D2	D10	XX = ±.03		APPR Rtd	5-29 84
IC1	-	IC11	XXX = ±.010		STK NO	
R1	R5,8,30,9-11,228,32	R36	BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES	FINISH		
RLA	RLI,J	RLM			OUTPUT SYSTEM	
FB1	-	FB6			SCALE	CODE IDENT SIZE DRAWING NO REV
					SHEET 1 OF 3	53504 D 2720-079 C

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL DIODES ARE 1N4148
2. ALL C's ARE 0.01μF

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
		-SEE SHT. 3-		



POWER CONNECTIONS
 IC101 PIN 3- +18V(B) PIN 12- -18V(B)
 IC103 PIN 8- +18V(B) PIN 4- -18V(B)
 IC104 PIN 1,4- OV(3); PINS 8- -18V(A)
 IC105 PIN 1,4- +18V(B) PIN 8- -13V; PINS 5- -18V(A)

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-9-83
C101	-	C111	X = ± 30'		CHECKED POW	5-16-83
D105	-	D122	.XX = ± .03		APPR PCD	5-24-84
IC101	-	IC105	.XXX = ± .010		STK NO	
R101	R114, 115	R127				
TR101	TR112, 116	TR120				
RLA	RLI, J	RLM				

Valhalla Scientific Inc.
 SAN DIEGO, CA

OUTPUT SYSTEM LOGIC

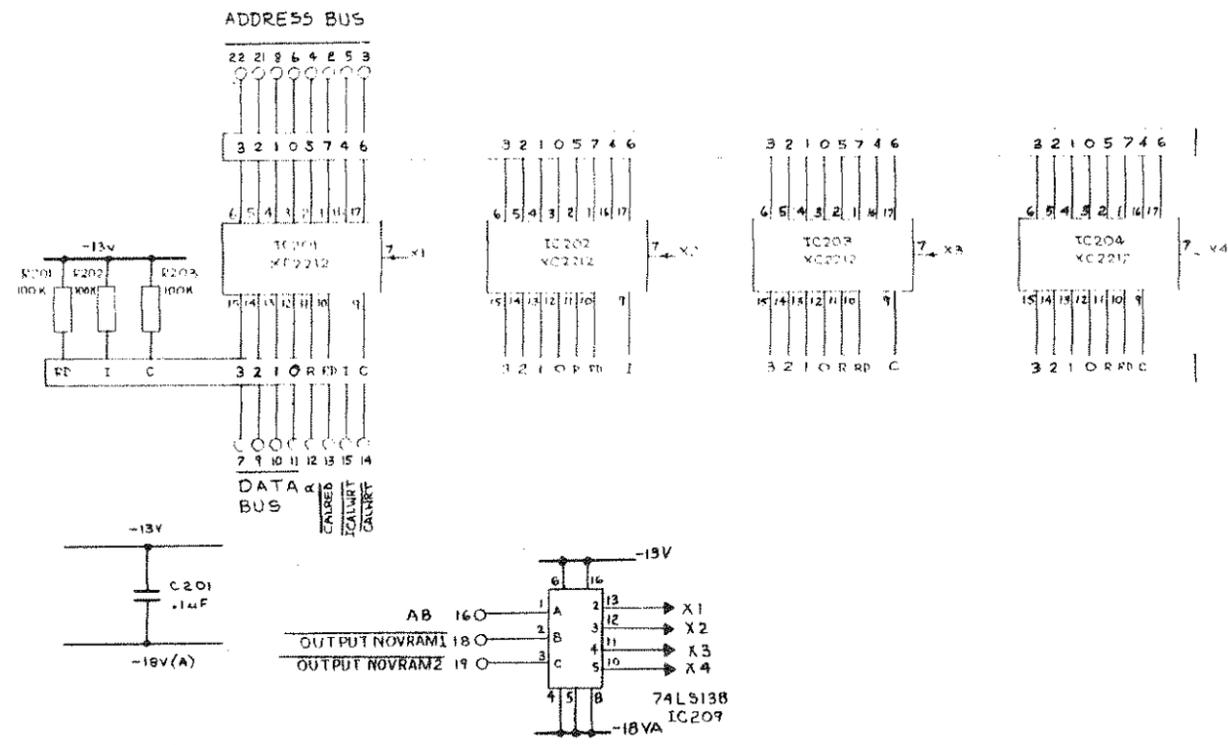
SCALE: _____ CODE IDENT: 53504 SIZE: D DRAWING NO: 2720 079 REV: C

SHEET 2 OF 3

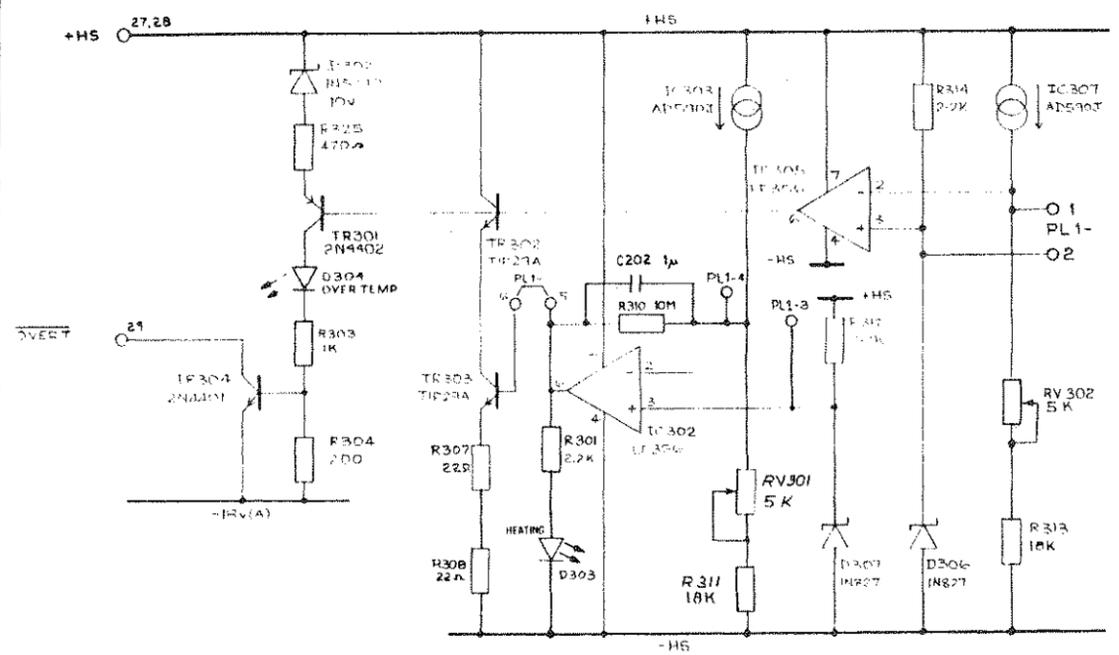
NOTES: UNLESS OTHERWISE SPECIFIED

1. IC201-204 ARE MOUNTED IN SOCKETS.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
	A			
547	B	UPDATED.	RDN 1-4-85	JWA
675	C		DPM 2-25-85	JW



	-13v	-18V(A)
IC201-204	18	8



NOTE:
 ADJUST RV301 FOR -.5V BETWEEN PL1 PIN 4(+) AND PL1 PIN 3 (-) WITH THE OVEN OFF.
 ADJUST RV302 FOR -.8V BETWEEN PL1 PIN 1(+) AND PL1 PIN 2 (-) WITH THE OVEN OFF.
 TO TURN OFF THE OVEN REMOVE THE SHORTING PLUG FROM PL1 PINS 5+6.

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN	DATE
C201	-	C201	X = ±.30'		PWJ	5-29-84
D301	D304, D305	D307	.XI = ±.03		PWJ	5-29-84
IC201	IC205, 206, 304, 310, 301, 306	IC207	.XXX = ±.010			
R201	R204-300, 302-305	R325*				
RV301	-	RV301				
TR301	-	TR304				

SCALE	CODE IDENT	SIZE	DRAWING NO	REV
	53504	D	2720-079	C

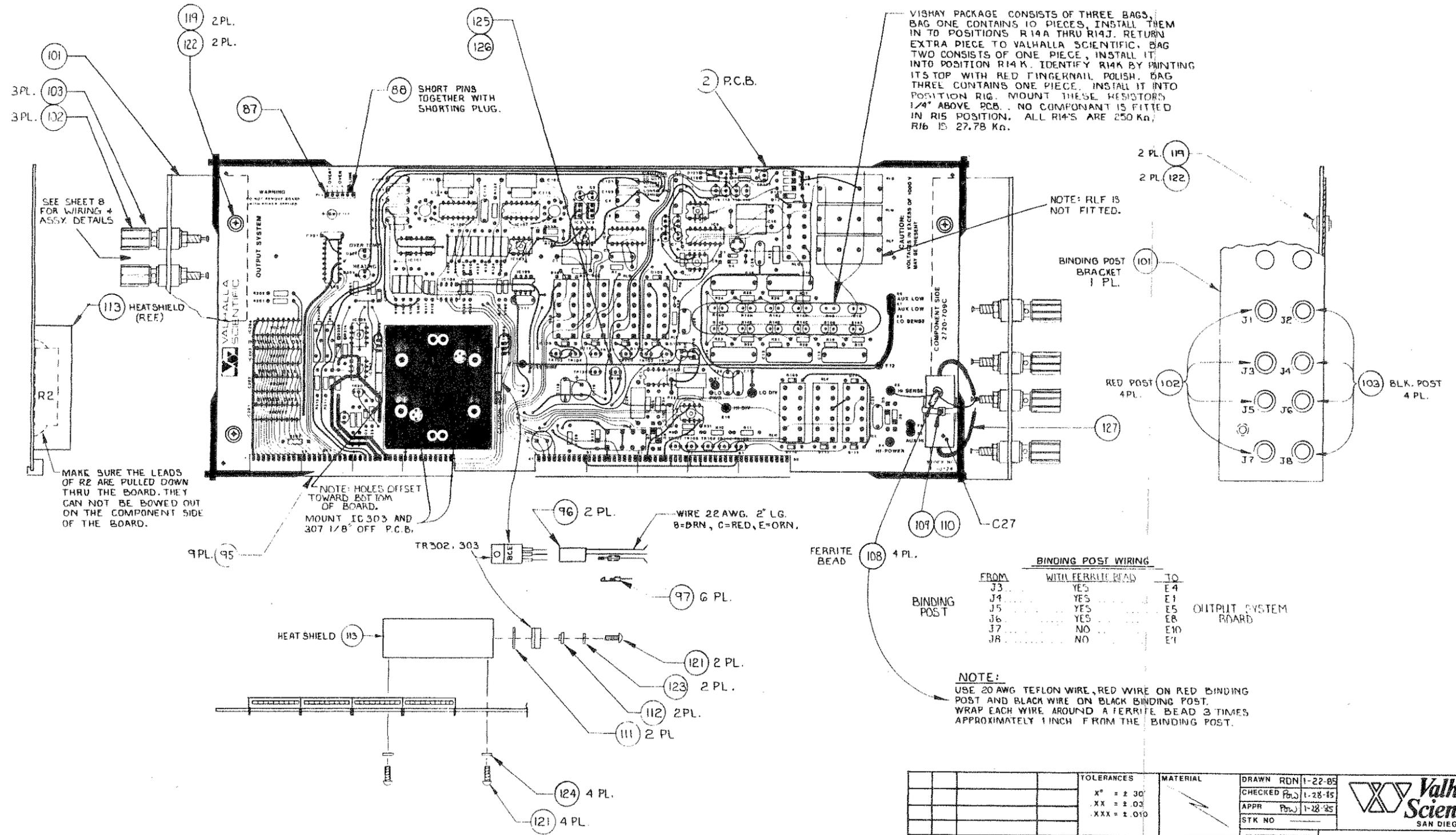
FINISH	
BREAK ALL SHARP CORNERS AND EDGES.	MACH SURFACES

Valhalla Scientific Inc.	
SAN DIEGO, CA	

OUTPUT SYSTEM	
SHEET 3 OF 3	

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
547	B	UPDATED	RDN 1-22-85	FBL
675	C	INCORPORATED DESIGN CHANGES	1-28-85	FBL



BINDING POST WIRING

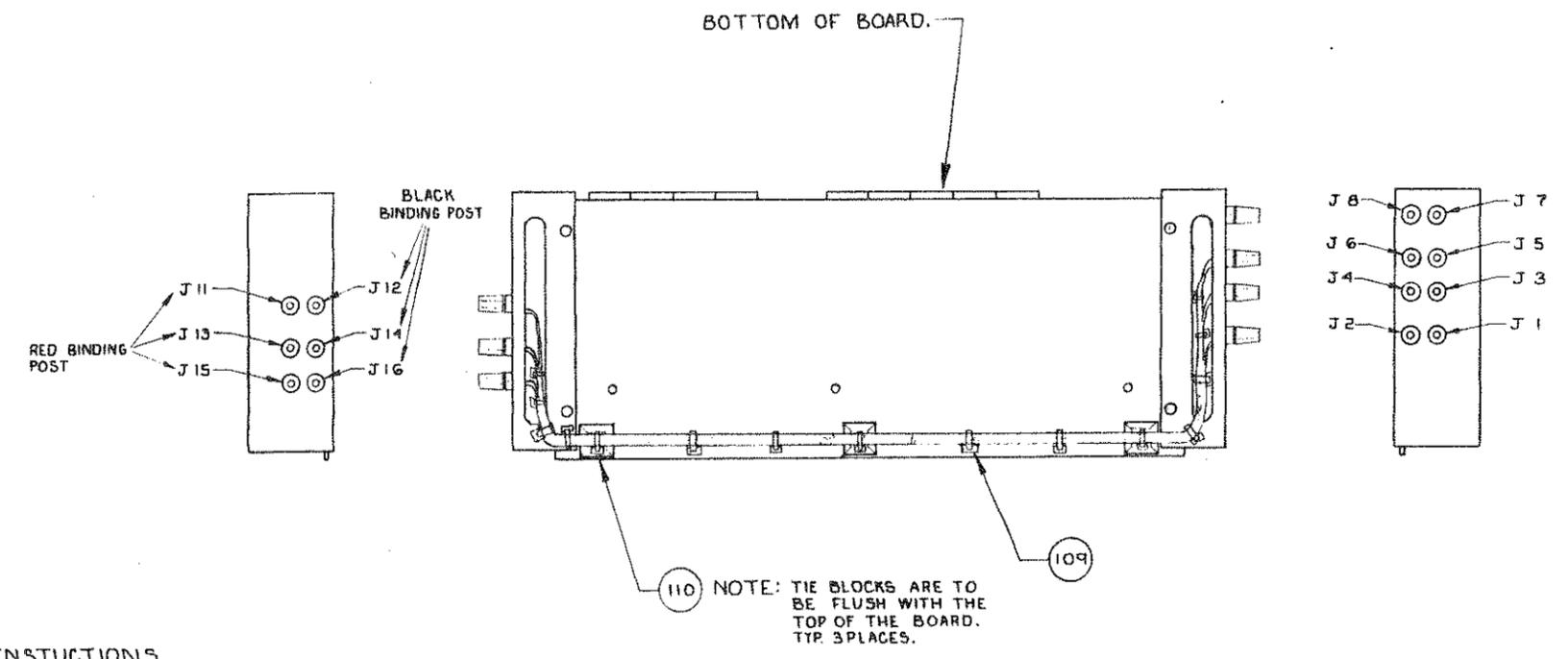
FROM	WITH FERRITE BEAD	TO
J3	YES	E4
J4	YES	E1
J5	YES	E5
J6	YES	E8
J7	NO	E10
J8	NO	E1

NOTE: USE 20 AWG TEFLON WIRE. RED WIRE ON RED BINDING POST AND BLACK WIRE ON BLACK BINDING POST. WRAP EACH WIRE AROUND A FERRITE BEAD 3 TIMES APPROXIMATELY 1 INCH FROM THE BINDING POST.

TOLERANCES		MATERIAL		DRAWN RDN 1-22-85	
X" = ± .30				CHECKED FBL 1-28-85	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
.XX = ± .03				APPR FBL 1-28-85	
.XXX = ± .010				STK NO	
BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		FINISH		OUTPUT SYSTEM P.C.B. ASSY.	
DASH NO	QTY RECD	NEXT ASSEMBLY	USED ON	SCALE 1:1	CODE IDENT
				7 OF 8	53504
					SIZE D
					DRAWING NO 2720-609
					REV C

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS			
ECO	LTR	DESCRIPTION	DATE
		— SEE SHEET 7 OF 8 —	
			APPROVED



INSTRUCTIONS FOR WIRING

FROM	COLOR	TO	NOTES
J 1	RED	J 11	TWISTED PAIR
J 2	BLACK	J 12	
J 3	RED	J 13	TWISTED PAIR
J 4	BLACK	J 14	
J 5	RED	J 15	TWISTED PAIR
J 6	BLACK	J 16	

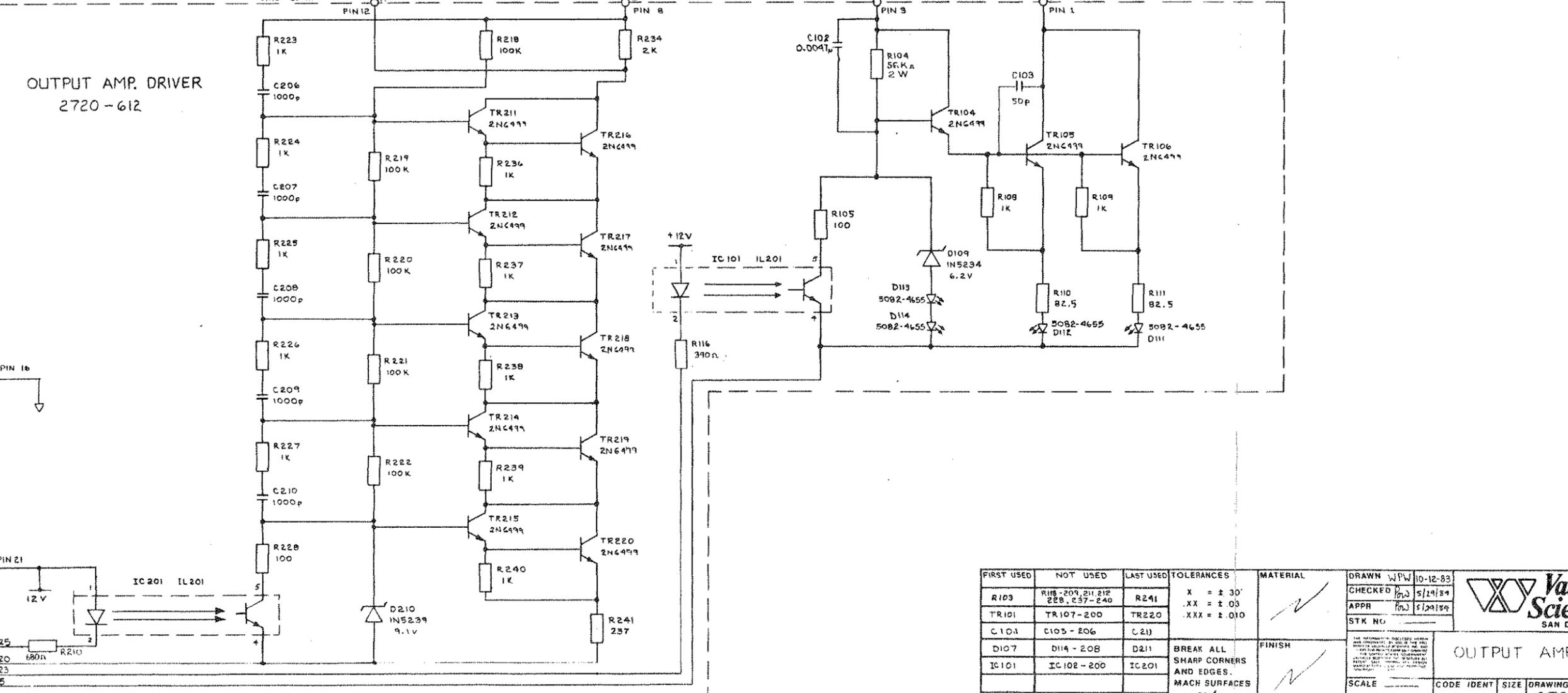
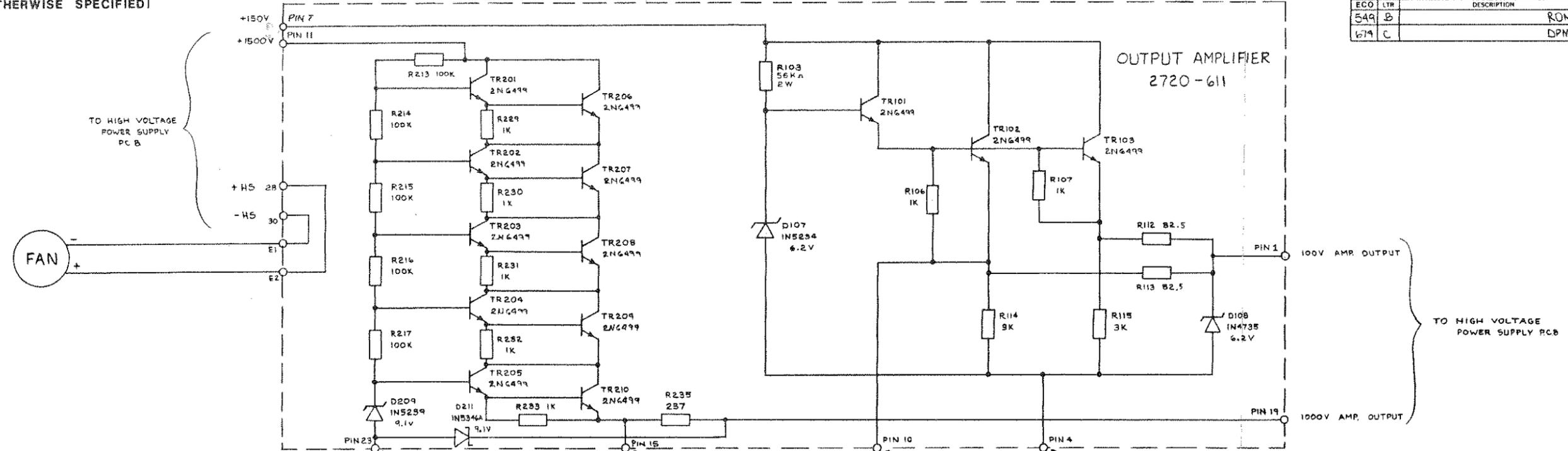
NOTE: USE TEFLON WIRE ONLY.

(110) NOTE: TIE BLOCKS ARE TO BE FLUSH WITH THE TOP OF THE BOARD. TYP. 3 PLACES.

DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010	MATERIAL	DRAWN RDN 1-2-85	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
				BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	FINISH	CHECKED	
				64 ✓		APPR	
						STK NO	OUTPUT SYSTEM, P.C.B. ASSY.
						SCALE 1:2	CODE IDENT 3504
						SHEET 8 OF 8	SIZE D
							DRAWING NO 2720-609
							REV C

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
549	B		1-25-85	JM
679	C	RON	2-21-85	WJ



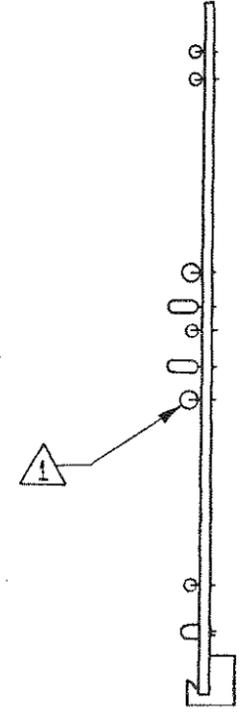
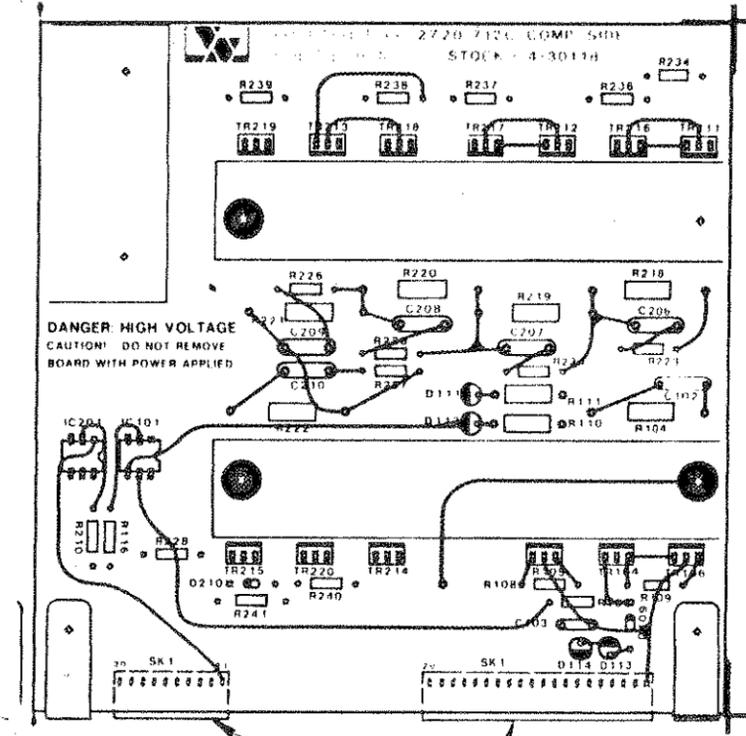
FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL
R103	R103-209, 211, 212, 228, 237-240	R241	X = ± 30'	
TR101	TR107-200	TR220	.XX = ± 0.3	
C104	C103-206	C211	.XXX = ± 0.10	
D107	D114-208	D211	BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	
IC101	IC102-200	IC201		

DRAWN	W/PW	10-12-83	<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
CHECKED	W/PW	5/29/84	
APPR	W/PW	5/29/84	
STK NO			
<p>OUTPUT AMPLIFIER</p>			
SCALE	CODE IDENT	SIZE	DRAWING NO
	53504	D	2720-081
SHEET	1 OF 1	REV	C

NOTES:

- 1. RESISTORS AND DIODES ARE TO BE MOUNTED 1/8" FROM BOARD.
- 2. TRANSISTORS ARE NOT MOUNTED ON THIS ASSEMBLY.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
541	D	UPDATED	RDN 1-24-85	JW
674	E	INCORPORATED MODS	DPM 2-22-85	RD



CONNECTORS ARE TO BE MOUNTED ON FAR SIDE OF BOARD.

DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON
-	1	2720-403	2720

TOLERANCES
 X = ± .30'
 .XX = ± .03
 .XXX = ± .010

BREAK ALL SHARP CORNERS AND EDGES.
 MACH SURFACES

64
 ✓

MATERIAL

FINISH

DRAWN RDN 1-24-85
CHECKED
APPR
STK NO
SCALE 1:1
SHEET 1 OF 3

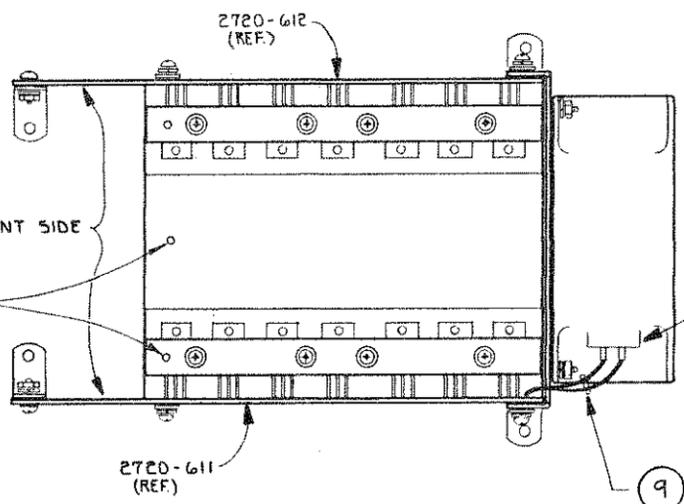


OUTPUT AMP DRIVER ASSY.

CODE IDENT 53504	SIZE C	DRAWING NO 2720-612	REV E
------------------	--------	---------------------	-------

NOTES: (UNLESS OTHERWISE SPECIFIED)

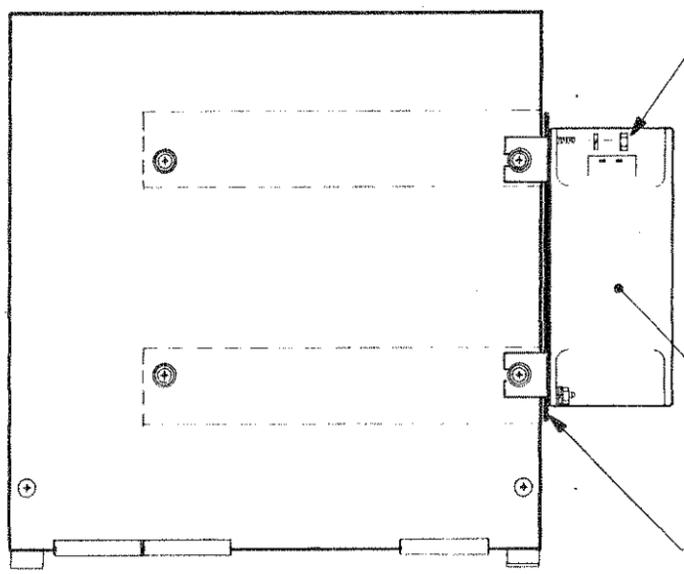
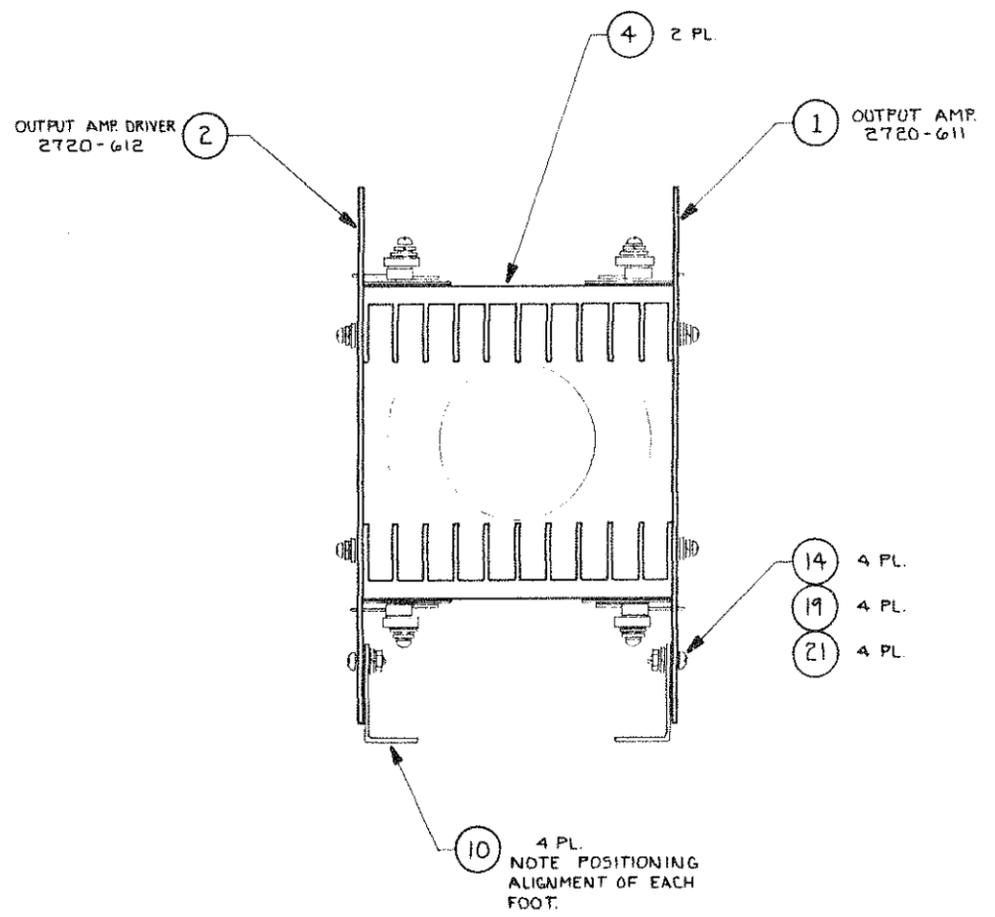
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
430	A	RELEASED	WPW 5-1-84	For
461	B	PARTS LIST CHG.	WPW 5-25-84	R
469	C	UPDATED PARTS LIST	6-6-84	R
546	D	ADDED ALIGNMENT HOLES.	RDN 12-10-84	For
711	D1	ADDED TRANSISTOR NOTE	1 30-85	JM



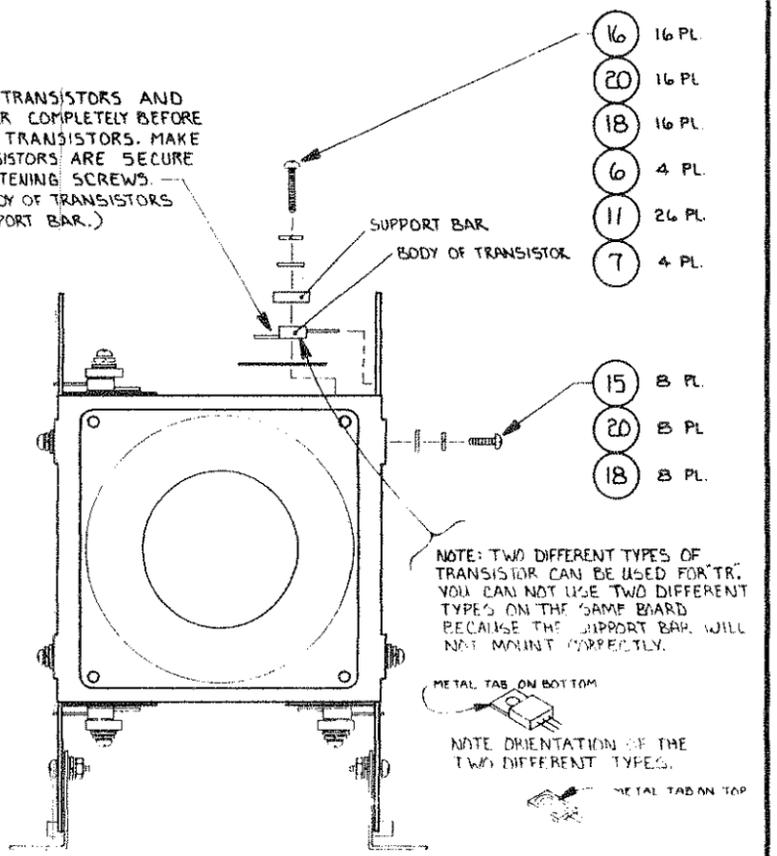
NOTE: FAN MAY OR NOT COME PRE-WIRED. IF NOT WIRED USE A 3"-4" LG WIRE OF APPROPRIATE COLOR. SOLDER AND SLEEVE TO PLUGS SOLDER WIRE LEADS AS FOLLOWS:

RED (+) TO E2 } ON 1 OUTPUT AMP BOARD
 BLK (-) TO E1 }

MAKE SURE TO POSITION FAN CONNECTORS AS SHOWN.



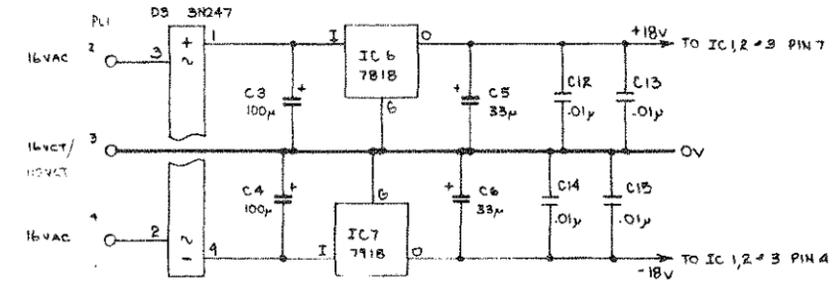
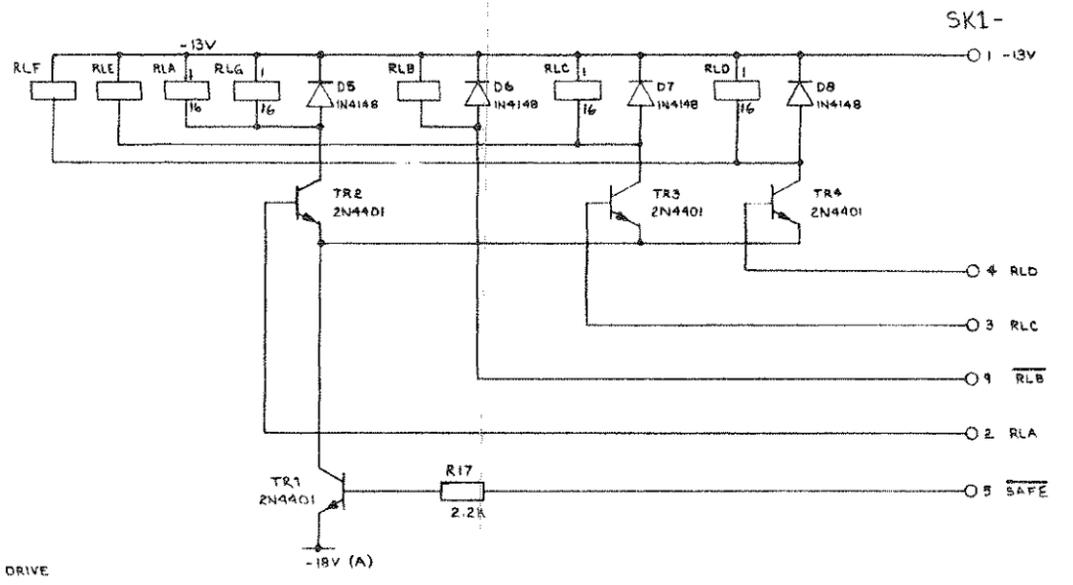
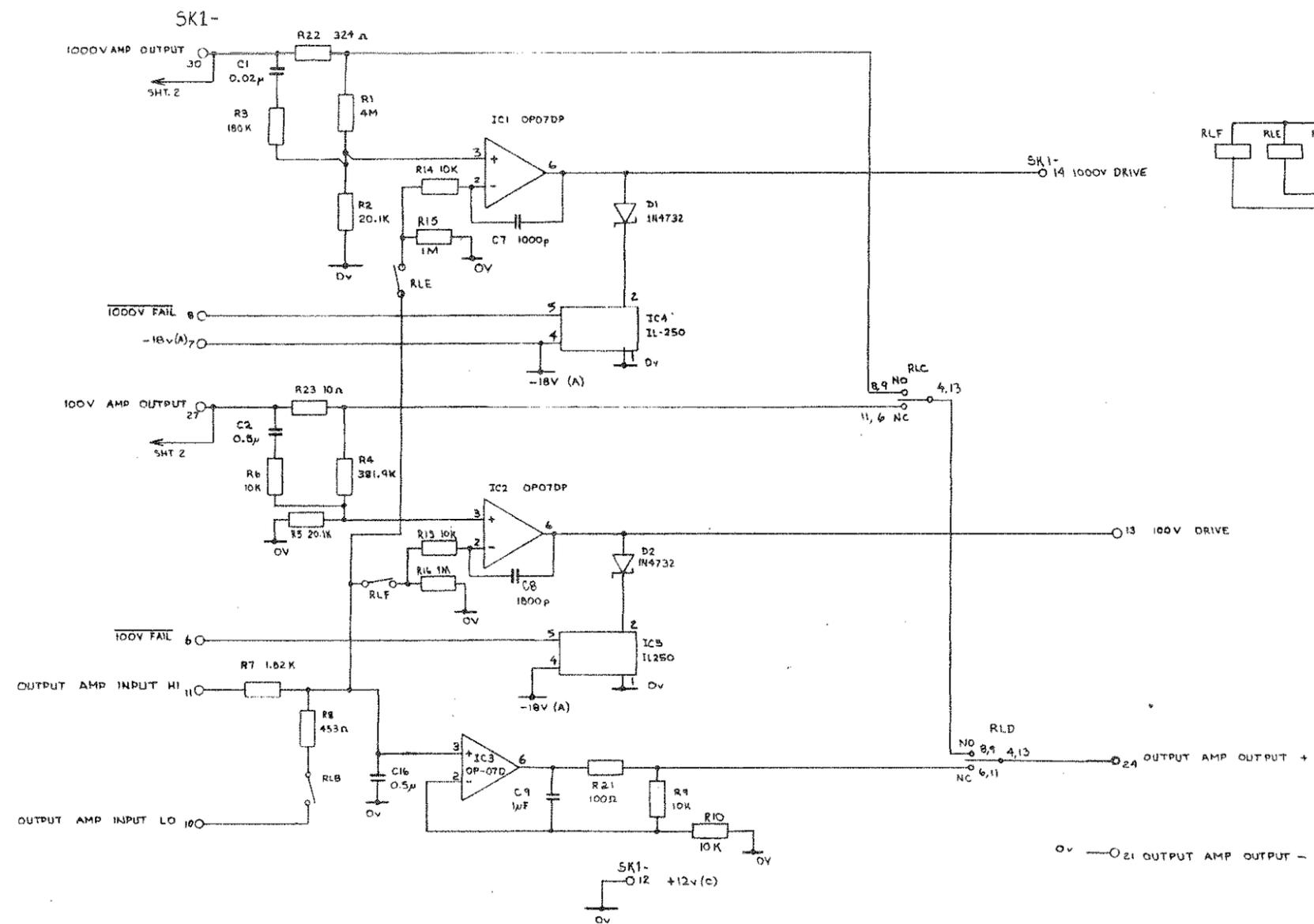
ASSEMBLE TRANSISTORS AND SUPPORT BAR COMPLETELY BEFORE SOLDERING TRANSISTORS. MAKE SURE TRANSISTORS ARE SECURE WHEN TIGHTENING SCREWS. (CENTER BODY OF TRANSISTORS UNDER SUPPORT BAR.)



TOLERANCES:		MATERIAL		DRAWN WPW 4-30-84		<p>Valhalla Scientific Inc. SAN DIEGO, CA</p>
X' = ± .30'		SEE PARTS LIST		CHECKED CM 5/1/84		
.XX = ± .03				APPR For 5-1-84		
.XXX = ± .010				STK NO		OUTPUT AMPLIFIER ASSY. SCALE 1:1 CODE IDENT 53504 SIZE D DRAWING NO 2720-403 REV D1
BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		FINISH		SHEET 1 OF 3		
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES: X' = ± .30', .XX = ± .03, .XXX = ± .010		

NOTES: (UNLESS OTHERWISE SPECIFIED)

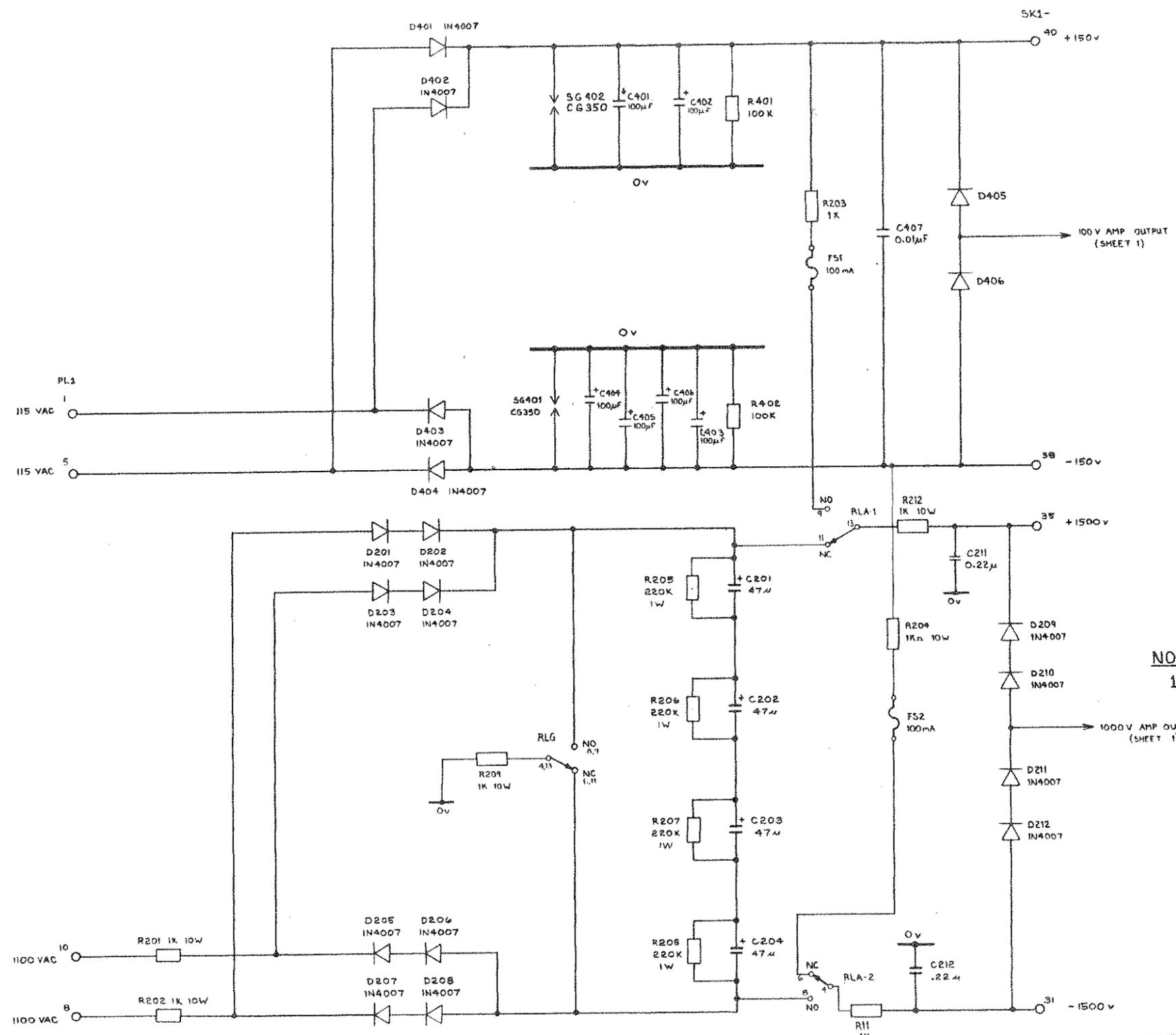
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
537	B	INC. DESIGN CHANGE	DPM 2-26-85	δW



FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-16-83
R1	-	R20	X = ± 30'		CHECKED POW	6-16-83
C1	-	C15	.XX = ± 03		APPR POW	5-29-84
D1	-	D7	.XXX = ± 010		STK NO	
IC1	-	ICB		FINISH		
RLA	-	RLF	BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES		HIGH VOLTAGE POWER SUPPLY	
			94		SCALE	CODE IDENT
					SHEET 1 OF 2	53504
						D 2720-083
						REV B

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHT. 1		



NOTE:
1. RLA-1 & RLA-2 COILS ARE SHOWN ON SHT. 1.

FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL
C201	C205-210, 213-400	C404	X* = ± 30' XX = ± 03 XXX = ± 010	
D201	D209-400	D406		
R201	R209, 213-400	R40E		
RLA		RLA	BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES	FINISH

Valhalla Scientific Inc.
SAN DIEGO, CA

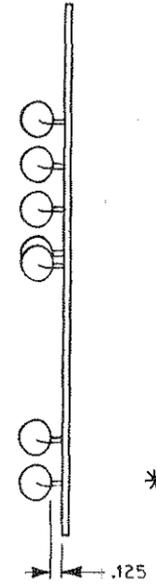
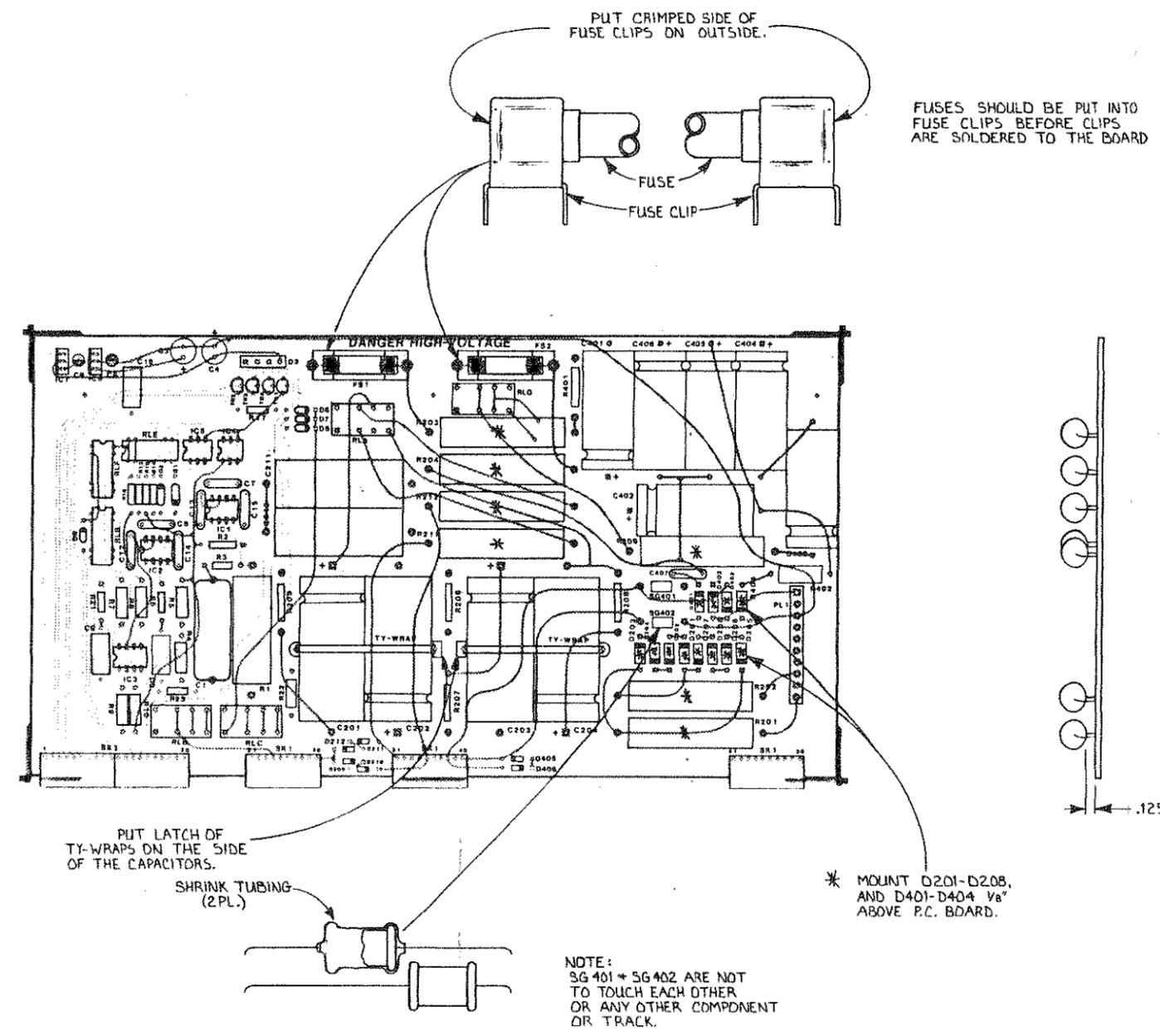
HIGH VOLTAGE POWER SUPPLY

DRAWN W.P.L. 10-24-83
CHECKED P.L.S. 5-29-84
APPR. P.M. 5-29-84
STK NO. _____

SCALE _____ CODE IDENT 53504 SIZE D DRAWING NO. 2720-083 REV B
SHEET 2 OF 2

NOTES: (UNLESS OTHERWISE SPECIFIED)

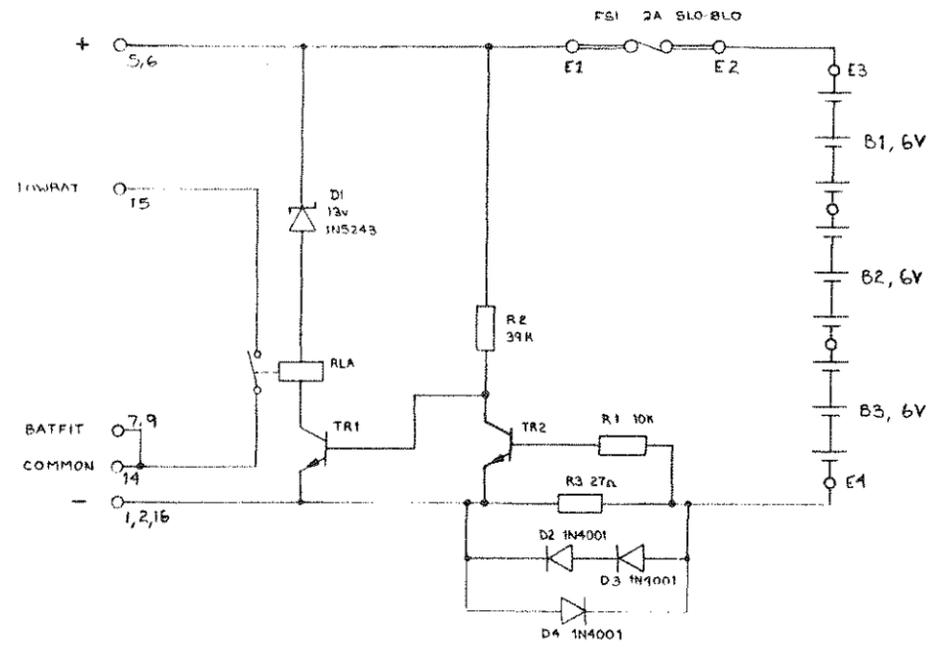
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
537	C	INCORPORATED MODS./ REDRAWN DPM	3-1-85	DGM



DASH NO		QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010	MATERIAL	FINISH	DRAWN DPM 3-1-85 CHECKED SW 3-1-85 APPR DGM 3-1-85 STK NO	 Valhalla Scientific Inc. SAN DIEGO, CA			
					BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	64	SCALE 1:1	CODE IDENT 53504	SIZE D	DRAWING NO 2720-613	REV C	
								HIGH VOLTAGE POWER SUPPLY ASSY. DWG				
								SHEET 1 OF 4				

NOTES: (UNLESS OTHERWISE SPECIFIED)

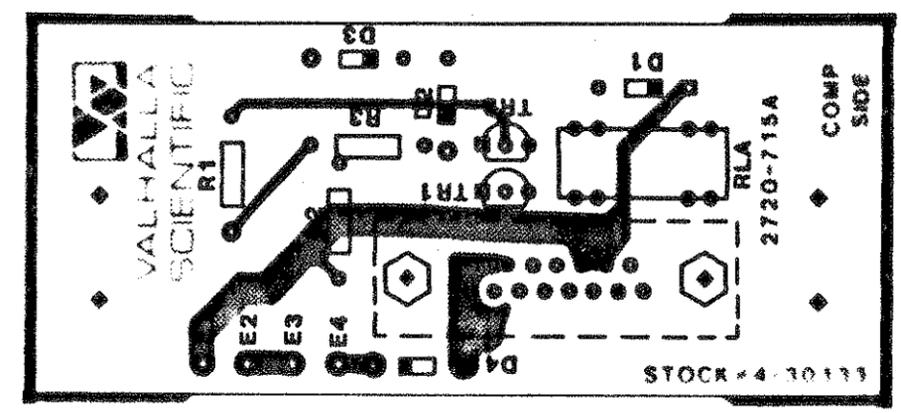
REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
676	A	RELEASED	RDN 2-28-85	PWD



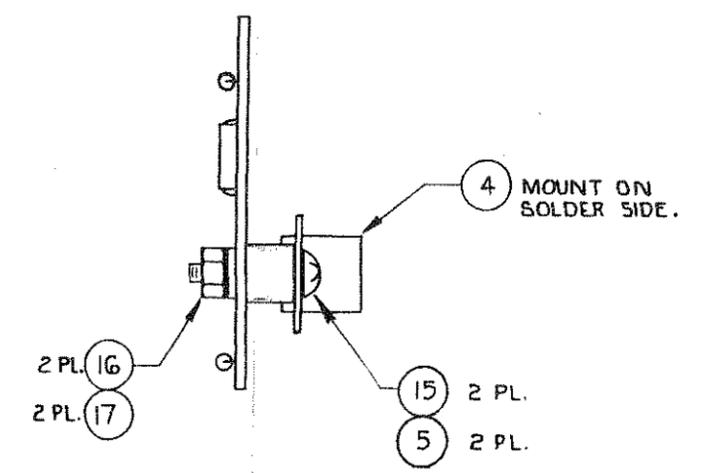
TOLERANCES				MATERIAL		DRAWN P.W. 8-31-83		 Valhalla Scientific Inc. SAN DIEGO, CA
X = ± .30'				BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES 04 ✓		CHECKED P.W. 8-31-83		
.XX = ± .03						APPR P.W. 8-31-83		
.XXX = ± .010				FINISH		STK NO		
DASH NO				QTY RECD		NEXT ASSEMBLY		SCALE NONE SHEET 1 OF 1
USED ON				CODE IDENT		SIZE DRAWING NO		RFV
				53504		D 2720-085		A

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
676	C	REDESIGNED	RDN 3-1-85	JM

COMP. SIDE SHOWN



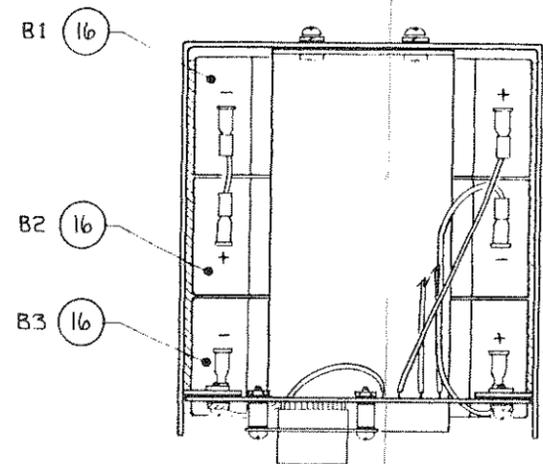
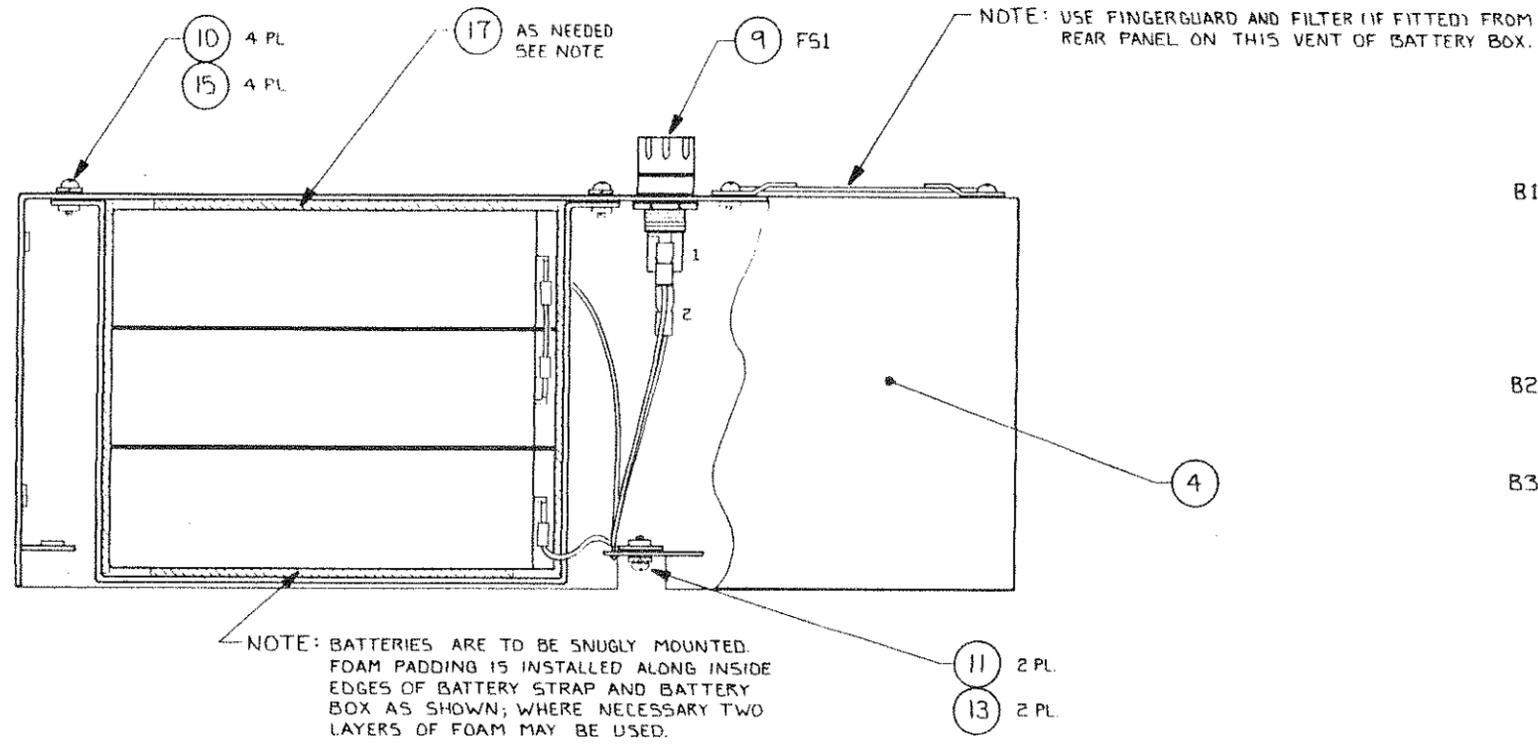
SECURE CONNECTOR BEFORE SOLDERING



				TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010		MATERIAL 		DRAWN RDN 3-1-85 CHECKED BW 3-1-85 APPR BW 3-1-85 STK NO		 Valhalla Scientific Inc. SAN DIEGO, CA	
				BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES 64 ✓		FINISH 		THE INFORMATION DISCLOSED HEREIN WAS OBTAINED BY AND IS THE PROPERTY OF VALHALLA SCIENTIFIC INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE EXPRESS WRITTEN PERMISSION OF VALHALLA SCIENTIFIC INC. VALHALLA SCIENTIFIC INC. RESERVES ALL PATENT, TRADE SECRET, AND PROPRIETARY DESIGN RIGHTS THEREIN.		OPTION "BAT" P.C.B. ASSEMBLY	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	SCALE 1:1		CODE IDENT	SIZE	DRAWING NO	REV		
				SHEET 1 OF 2		53504	C	2720-615	C		

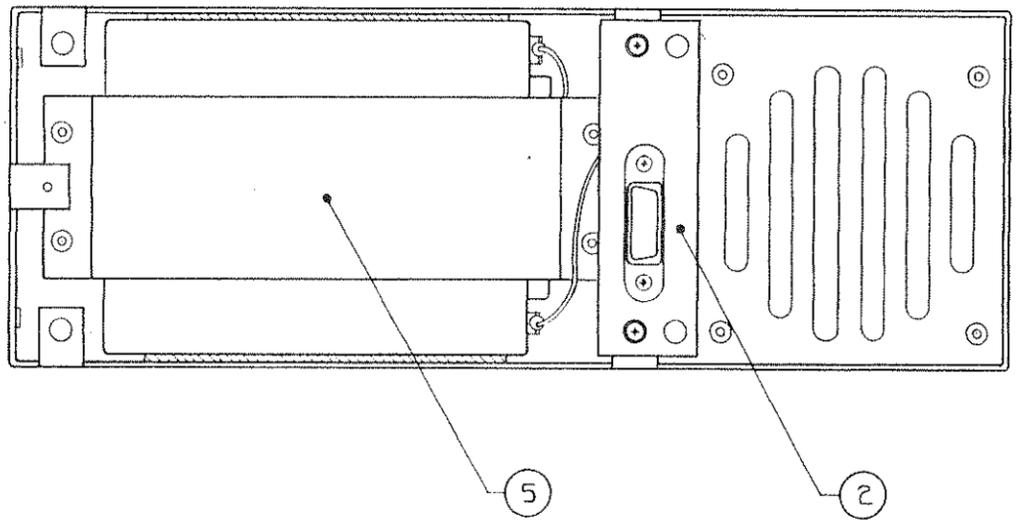
NOTES: (UNLESS OTHERWISE SPECIFIED)
 1 USE HOLE PLUGS IN UNUSED HOLES OF BATTERY BOX.

		REVISIONS		
ECO	LTR	DESCRIPTION	DATE	APPROVED
44P	A	RELEASED	WPW 5-11-84	P
44P	B	UPDATED PARTS LIST	R 6-16-84	R

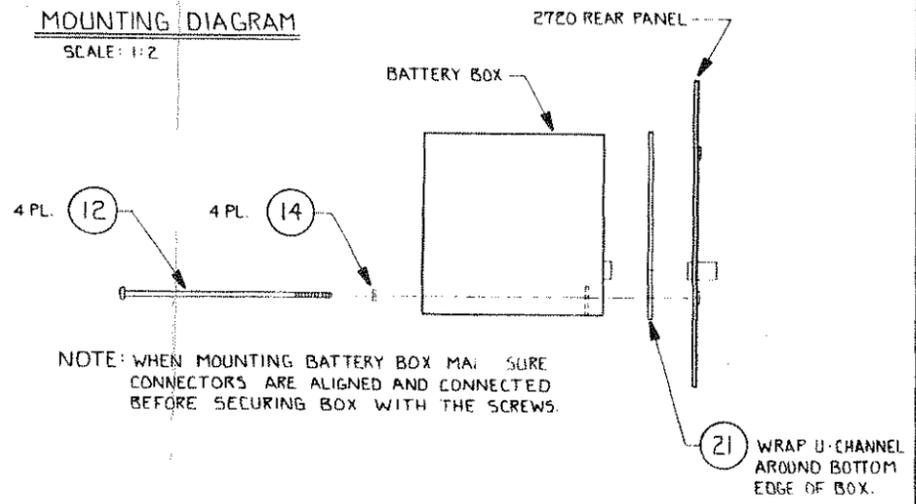


WIRE TAB

FROM	TERMINATION	TO	TERMINATION
E1	SOLDER	F51-2	SOLDER SLEEVE
E2	SOLDER	F51-1	SOLDER SLEEVE
E3	SOLDER	B1+	CRIMP TERMINAL
E4	SOLDER	B3-	CRIMP TERMINAL
B1-	CRIMP TERMINAL	B2+	CRIMP TERMINAL
B2-	CRIMP TERMINAL	B3+	CRIMP TERMINAL

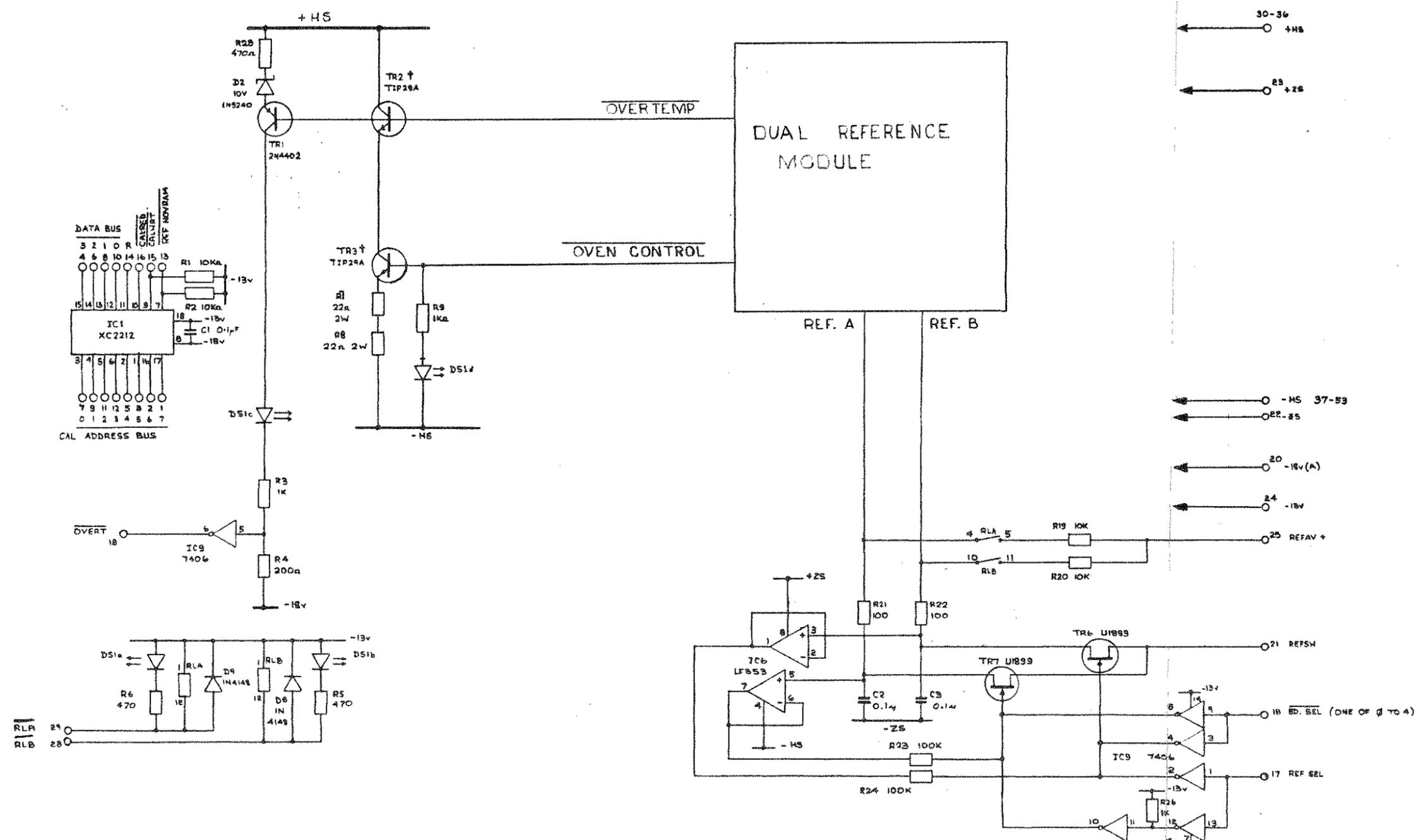


MOUNTING DIAGRAM
SCALE: 1:2



		TOLERANCES		MATERIAL		DRAWN WPW 5-11-84		 Valhalla Scientific Inc. SAN DIEGO, CA	
		X ^o = ± .30'		SEE PARTS LIST		CHECKED R 5-14-84			
		.XX = ± .03				APPR R 5-14-84		OPTION "BAT" ASSY.	
		.XXX = ± .010				STK NO			
		BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES		FINISH		SCALE 1:1		CODE IDENT SIZE DRAWING NO	
		64 ✓				SHEET 1 of 2		53504 D 2720-407	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON					REV B	

REVISIONS			
ECO	LTR	DESCRIPTION	DATE



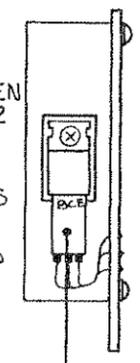
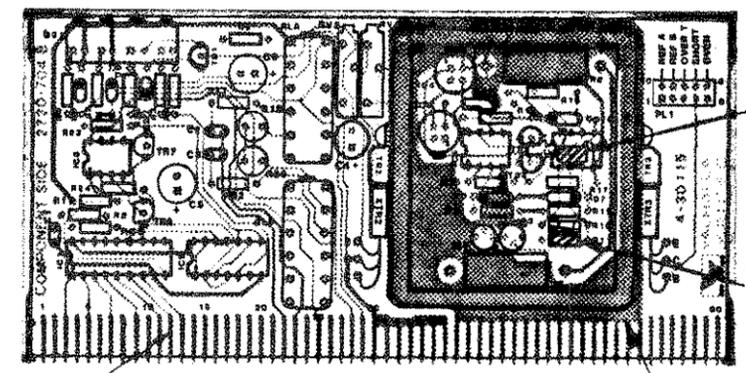
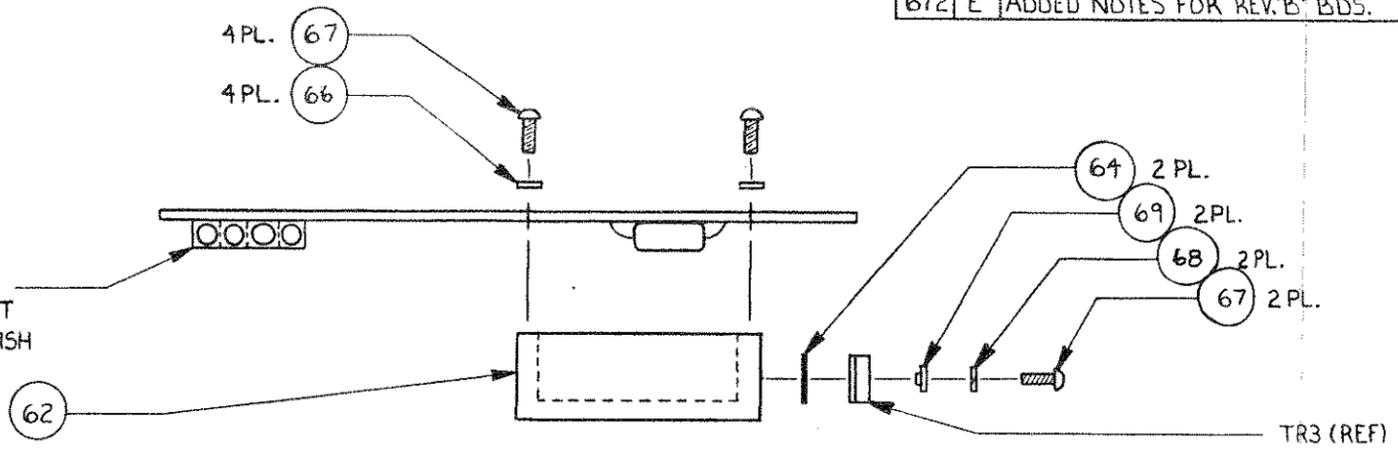
FIRST USED	NOT USED	LAST USED	TOLERANCES	MATERIAL	DRAWN POW	5-5-83
RV1	-	RV1	X = ± 30'	/	CHECKED POW	5-15-83
CI	-	CE	.XX = ± 03		APPR	5-29-84
DE	D3, D4, D5	D10	.XXX = ± 010		STK NO	
DS1	-	DS1				
IC1	-	IC3	BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES	FINISH		
RI	-	R26	04			
TR1	-	TR7				
RLA	-	RLB				

Valhalla Scientific Inc. SAN DIEGO, CA			
REFERENCE MODULE			
SCALE	CODE IDENT	SIZE	DRAWING NO
	53504	D	2720-574
SHEET 1 OF 1			REV A

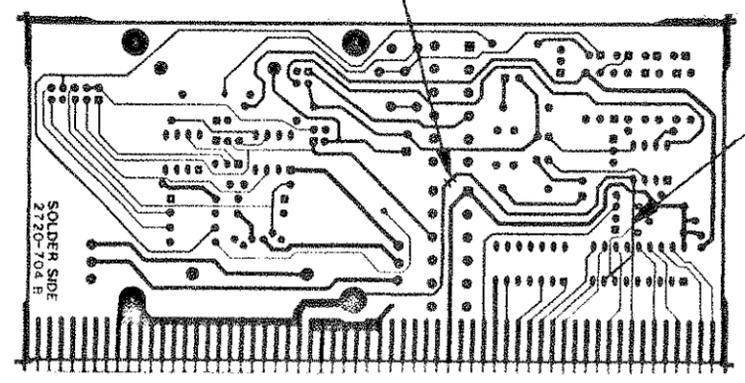
NOTES:

- 1. NO COMPONENTS CAN PROTRUDE MORE THAN .75 FROM PCB.
- 2. COMPONENTS INSIDE ITEM (62) (HEAT SHIELD) TO BE AS CLOSE TO PCB AS POSSIBLE.

IF SINGLE HOUSINGS ARE USED, ENSURE UNIFORM ALIGNMENT AND POSITION (FLUSH TO PCB)



REVISION "B" BOARDS ONLY
CUT TRACK ON THE PCB IN THIS AREA



MAKE SURE THAT GOLD FINGERS ARE FREE OF SOLDER AFTER BOARD IS COMPLETELY ASSEMBLED.

SEE NOTE 2

REVISION "B" BOARDS ONLY
JUMPER PIN 4 OF IC6 TO PIN 8 OF IC1 USING KYNAR WIRE.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
341	D	UPDATED / REDRAWN	DPM 1-25-85	FD
672	E	ADDED NOTES FOR REV. B BDS.	DPM 2-20-85	FD

				TOLERANCES X = ± .30" .XX = ± .03 .XXX = ± .010		MATERIAL 		DRAWN DPM 1-25-85 CHECKED JWM 1/28/85 APPR FDW 1/28/85 STK NO		 Valhalla Scientific Inc. SAN DIEGO, CA	
				BREAK ALL SHARP CORNERS AND EDGES, MACH SURFACES 64 ✓		FINISH 		THE INFORMATION DISCLOSED HEREIN WAS ORIGINATED BY AND IS THE PROPERTY OF VALHALLA SCIENTIFIC INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM. VALHALLA SCIENTIFIC INC. RESERVES ALL PATENT, TRADE SECRET, AND COPYRIGHT RIGHTS.		2720 REFERENCE PCB ASSEMBLY	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	SCALE 1:1		CODE IDENT	SIZE	DRAWING NO	REV		
				SHEET 4 OF 4		53504	C	2720-604	E		

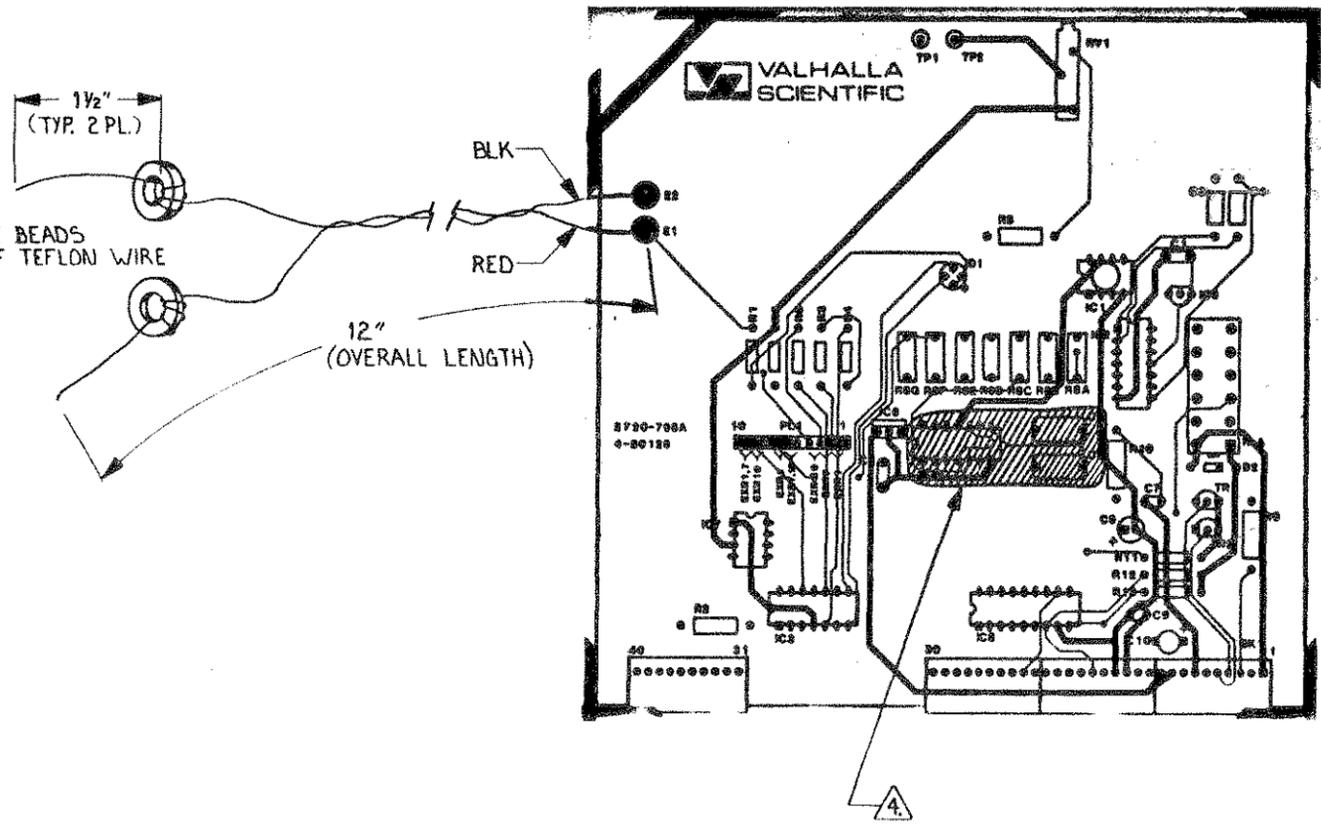
NOTES:

1. RB IS A MATCHED SET OF SEVEN RESISTORS. ONE OF THESE RESISTORS IS SEPERATE FROM THE OTHER SIX. THIS SINGLE RESISTOR SHOULD BE INSTALLED IN THE RBG LOCATION, THE OTHERS IN THE RBA-F LOCATIONS.
2. RBA-G SHOULD BE MOUNTED 1/4" ABOVE PCB.
3. INSTALL SHORTING LINKS BETWEEN PL1 PINS 1+2, 6+7 AND 9+10.
4. IC4, C5 AND C6 ARE NOT FITTED.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
351	A	RELEASED	DPM 6-7-85	Pow

1 1/2" (TYP. 2 PL.)

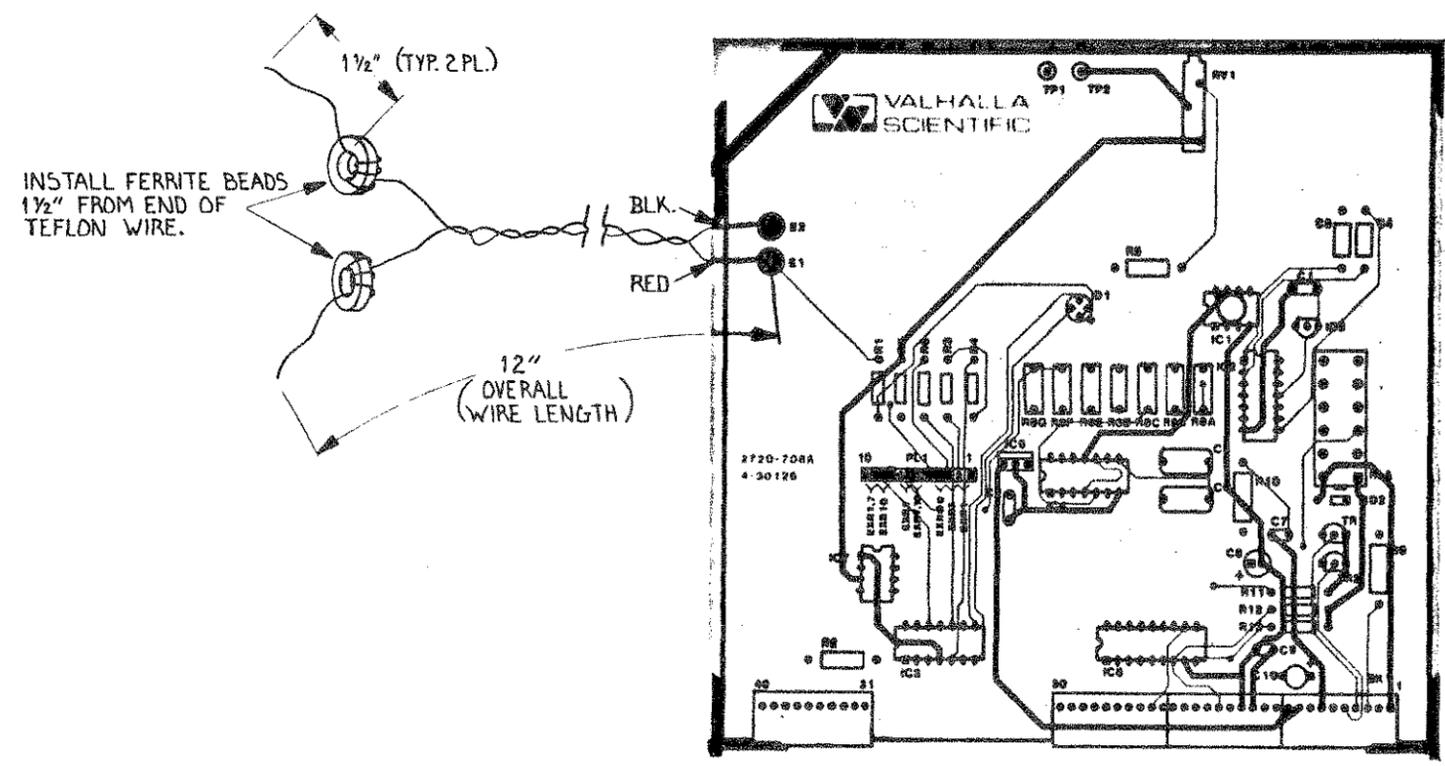
INSTALL FERRITE BEADS 1 1/2" FROM END OF TEFLON WIRE



				TOLERANCES X = ± .30' .XX = ± .03 .XXX = ± .010		MATERIAL 		DRAWN <i>(DPM)</i> 6/6/85 CHECKED <i>(DPM)</i> 6/11/85 APPR <i>(DPM)</i> 6/11/85 STK NO.		 Valhalla Scientific Inc. SAN DIEGO, CA	
				BREAK ALL SHARP CORNERS AND EDGES. MACH SURFACES 64 ✓		FINISH 		THE INFORMATION DISCLOSED HEREIN WAS OBTAINED BY AND IS THE PROPERTY OF VALHALLA SCIENTIFIC INC. AND IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF VALHALLA SCIENTIFIC INC.		OPTION EXR 1	
DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON			SCALE 1:1		CODE IDENT 53504	SIZE C	DRAWING NO 2720-605	REV A
						SHEET 3 OF 3					

- NOTES:**
1. R8 IS A MATCHED SET OF SEVEN RESISTORS. ONE OF THESE RESISTORS IS SEPERATE FROM THE OTHER SIX. THIS SINGLE RESISTOR SHOULD BE INSTALLED IN THE R8G LOCATION, THE OTHERS IN THE R8A-F LOCATIONS.
 2. R8A-G SHOULD BE MOUNTED 1/4" ABOVE PCB.
 3. INSTALL SHORTING LINKS BETWEEN PL1, PINS 3+4, PINS 5+6 AND PINS 8+9.

REVISIONS				
ECO	LTR	DESCRIPTION	DATE	APPROVED
351	A	RELEASED	DPM	6-7-85



DASH NO	QTY REQD	NEXT ASSEMBLY	USED ON	TOLERANCES	MATERIAL	FINISH	DRAWN	CHECKED	APPR	STK NO	Valhalla Scientific Inc. SAN DIEGO, CA				
				X = ± .30'			6/5/85	6/11/85	6/11/85		OPTION EXR 10				
				.XX = ± .03							SCALE	CODE IDENT	SIZE	DRAWING NO	REV
				.XXX = ± .010							1:1	53504	C	2720-608	A
											SHEET				
											3 OF 3				



PARTS LIST

FINAL CHASSIS ASSY.

MODEL
2720GS

DWG NO
2720-400

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2			Initial Chassis Assy.	Valhalla	2720-404	1				
3			Front Assy.	Valhalla	2720-401	1				
4		5-10291	Plug, Hole, .375", black	SMith	3091	6				
5			Output Amplifier Assy.	Valhalla	2720-403	1				
6			H. V. Power Supply Assy.	Valhalla	2720-613	1				
7			L. V. Power Supply Assy.	Valhalla	2720-602	1				
8			Main Microprocessor Assy.	Valhalla	2720-603	1				
9			Reference Module Assy.	Valhalla	2720-604	3				
10			Nullmeter Assy.	Valhalla	2720-607	1				
11			Output System Assy.	Valhalla	2720-609	1				
12		4-10582	High Voltage Cover	Valhalla	2720-225	1				
13		5-10489	Output Sys. Insulator	Valhalla	2720-223	1				
14		4-10440	Ref PCB Enclosure Cover	Valhalla	2720-204	1				
15		4-10466	Baffle-Airstream	Valhalla	2720-218	1				
16			Screw Phil flat 82°		4-40 x 1/4	5				
17			Screw, Phil pan blk		6-32 x 3/8	2				
18		5-10496	Standoff, Modified 8-32	Valhalla	2720-226	7				
19			Screw, Phil pan, SS		6-32 x 3/8"	7				
20			Washer, internal star		#6	12				
21			Nut, Radio Hex		6-32	7				
22			Washer, split lock		#6	2				
23			Washer, flat		#6	2				

NOTES: Sheet 1 is assembly drawing

SHT 2 OF 2



PARTS LIST

FRONT ASSEMBLY

MODEL
2720

DWG NO
2720-401

REV
B

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-10451	Front Panel	53504	2720-213	1				
3										
4		--	I/O Processor Board	53504	2720-601	1				
5		--	Display Board	53504	2720-606	1				
6										
7										
8	SW1	5-03062	Key Operated Switch	C & K	Y201-13-0-A1-01-Q4	1				
9										
10		5-10101	Spacer, 3/8"Lg, 1/4"Dia. #6	Smith	2101	6				
11		5-10465	Spacer, 5/16"Lg, 1/4"Dia. #6	Smith	9208	6				
12										
13		--	Washer Internal Star	--	#6	6				
14		--	Nut, Radio Hex	--	6-32	6				
15										
16		--	Shrink Tube, 1/8" dia.	--		1 1/2"				
17		--	Wire, Brown, 22AWG	--		6"				
18										
19										
20										
21										
22										
23										

NOTES: Sheet 2 of 2 is assembly drawing

SHT 1 OF 2



PARTS LIST

REAR PANEL ASSY.

MODEL

2720

DWG NO

2720-402

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1		4-10447	Rear Panel	53504	2720-209	1				
2		5-10018	Fuse Holder, panel	75915	342004A	1				
3		5-10166	Receptacle, AC Filter	CORCOM	6EF1	1				
4		5-03034	Switch, Slide 115/230	82389	47227LFR	1				
5		5-10137	Binding Post, Gold	83330	151B	1				
6		5-10333	Cable assy. 15 pin	53504	2703-055	1				
7		4-10580	Support Bracket H.V.cover	Valhalla	2720-224	1				
8		5-10302	Housing 10 way	Molex	09-50-7101	1				
9		5-10301	Terminal	Molex	08-50-0106	10				
10		5-10086	Solder Lug #8	Smith	1412-6	1				
11		5-10491	Filter fan guard 3 1/4		FF325A/30 or 45PPI	1				
12										
13		5-10019	Ty-wraps, 4" x 1/8"	16956	WRN-4	10				
14			Screw, Phil, pan, SS		6-32 x 3/8"	2				
15										
16			Screw, Phil, pan SS		4-40 x 1/2"	2				
17			Washer split lock		#6	2				
18			Washer, split lock		#4	6				
19			Nut, radio hex		#4-40	6				
20			Screw Phil, flat 82°		6-32 x 3/8	4				
21										

NOTES: Sheet 3 is assembly drawing

SHT 1 OF 3



PARTS LIST

REAR PANEL ASSY.

MODEL
2720

DWG NO
2720-402

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
22										
23	5-04011	5-04011	Fuse, 3 amp, slo-blo	75915	313-003	1				
	or	5-04013	Fuse, 1.5 amp, slo-blo	75915	313-01.5					
25			Shrink tubing		1/4 dia.	2"				
26			Shrink Tubing		1/8 dia	12"				
27			Wire:							
28			BRN 12"		18 AWG	12"				
29			RED 12"		18 AWG	12"				
30			ORN 12"		18 AWG	12"				
31			YLO 12"		18 AWG	12"				
32			GRN 12"		18 AWG	12"				
33			BLU 12"		18 AWG	12"				
34			VLT 12"		18 AWG	12"				
35			GRY 12"		18 AWG	12"				
36			WHT 12"		18 AWG	12"				
37			BLK 12"		18 AWG	12"				
38			GRN 12"		16 AWG	12"				
39			BLK 4"		16 AWG	4"				
40										
41										
42										
43										
44										

NOTES:



PARTS LIST

AMPLIFIER ASSY.

MODEL
2720

DWG NO
2720-403

REV
D

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1			Output Amp. Assy.	Valhalla	2720-611	1				
2			Output Amp. Driver Assy.	Valhalla	2720-612	1				
3										
4		4-10450	Heatsink, output	Valhalla	2720-212	2				
5		4-10449	Fan Bracket	Valhalla	2720-211	1				
6		4-10501	Transistor Support Bar	Valhalla	2720-222	4				
7		4-10536	Insulator, Heatsink	Valhalla	2720-220	4				
8		5-10469	Fan, 3 1/8", 24VDC	Rotron	5D24B2	1				
9		5-10019	Cable Tie, 4" x 1/8"	Panduit	WRN-4	2				
10		5-10328	Bracket, Angle	Zierick	251	4				
11	TR101-106,201-220	3-10030	NPN Transistor	--	2N6499	26				
12										
13										
14			Screw, Phil, Pan SS		6-32 x 3/8"	4				
15			Screw, Phil, Pan SS		4-40 x 3/8"	8				
16			Screw, Phil, Pan SS		4-40 x 1/2	16				
17										
18			Washer, flat		#4	16				
19			Washer, split lock		#6	8				
20			Washer, split lock		#4	16				
21			Nut, Radio Hex		6-32	8				
22										

NOTES: Sht. 1 of 3 is assembly drawing

SHT 2 OF 3



PARTS LIST

INITIAL CHASSIS ASSY.

MODEL

2720

DWG NO

2720-404

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2			Rear Panel Assy.	Valhalla	2720-402	1				
3			Bottom plate assy.	Valhalla	2720-405	1				
4										
5		4-10456	Side Rail	Valhalla	2300-223	2				
6		4-10457	Side Rail	Valhalla	2300-224	2				
7		4-10437	Support Angle	Valhalla	2720-201	2				
8		4-10370	Chassis Support Bar	Valhalla	2703-212	2				
9		4-10333	Bezel (4-hole)	Valhalla	2724-205	4				
10										
11		5-10361	Foot, hard, rubber, gray	Acc.Rub.	2095W-017-Grey	4				
12		5-10496	Standoff Modified 8-32	Valhalla	2720-226	3				Made from 5-10438
13										
14		5-10437	Block, Adhesive, Ribbon, cable	Icorally	FRC-1	1				
15										
16			Screw Flat, 82°, Stain		6-32 x 9/16"	8				
17			Washer, Internal Star		#6	6				
18			Screw, Flat, 82°, Stain		6-32 x 3/8"	20				
19			Screw, Flat, 82°, Stain		6-32 x 1/4"	8				
20			Screw, Phil, Pan, Stain		6-32 x 1/2"	6				
21										
22										
23										

NOTES: Sheet 1 is assembly drawing

SHT 2 OF 2



PARTS LIST

BOTTOM PLATE ASSY.

MODEL
2720

DWG NO
2720-405

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3		4-10448	Bottom Plate	53504	2720-210	1				
4		4-10462	P. C. B. Spacer L.	53504	2720-214	1				
5		4-10461	P. C. B. Spacer R.	53504	2720-215	1				
6			Mother Bd. Assy.	53504	2720-600	1				
7		4-10443	Analog Wrap	53504	2720-205	1				
8		4-10444	Enclosure Ref. Bd.	53504	2720-206	1				
9										
10										
11		4-10439	LV-HV PCB Bracket	53504	2720-203	1				
12		4-20047	HV Transformer	53504	2720-011	1				
13		4-20046	LV Transformer	53504	2720-010	1				
14		5-10437	Ribbon Cable TY-Block	Icorall	FRC-1	5				
15		5-10423	Ribbon Cable Assy.	53504	2720-050	1				
16		5-10468	U-Channel, Rubber, .15x.12	Accu-Rub.	924	12"				
17										
18	PLD, PLE	5-10439	Molex Housing, 4 Pin	Molex	09-50-7041	2				
19	PLA	5-10302	Molex Housing, 10 pin	Molex	09-50-7101	2				
20	PLB	5-10440	Molex Housing, 11 Pin	Molex	09-50-7111	1				
21										
22		5-10261	Ty-Wrap Block, Large	06383	ABM25-A	2				
23		5-10019	Ty-Wrap 4" x 1/8"		WRN-4	36				

NOTES: Shts 1 & 2 are assembly drawings

SHT 3 OF 4



PARTS LIST

BOTTOM PLATE ASSY.

MODEL
2720

DWG NO
2720-405

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24		5-10485	Standoff, 1/4Hex,1/2Lg.,8-32 Smith		8443 or 2327	4				
25		5-10409	Card Guide 2.5"	Amerlok	PCG-5250	2				
26		5-10318	Stand off, snap-in	83330	3922	5				
27		5-10301	Molex Terminal	Molex	08-50-0106	34				
28			Shrink Tubing		1/8" diameter	2"				
29		5-10354	Solder Lub #8	Smith	1412-8	2				
30			Washer, Int. Star		#8	12				
31			Nut, Raido Hex		8-32	12				
32			Screw, self tapping		#4 x 1/4"	2				
33			Washer, Int. Star		#6	11				
34			Nut, Radio, Hex		#6	11				
35			Washer, split		#8	4				
36			Screw, Phil, Pan SS		#8 x 1/4"	3				
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										

NOTES:



PARTS LIST

OPTION "BAT"

MODEL

2720

DWG NO

2720-407

REV

B

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2			Bat Board Assy.	Valhalla	2720-615	1				
3										
4		4-10452	Battery Pack Box	Valhalla	2720-207	1				
5		4-10500	Battery Strap	Valhalla	2720-221	1				
6										
7										
8		5-10250	Hole Plug	Smith	3090 BLK	2				
9		5-10018	Fuse Holder, Panel Mt.	Little	Fuse 342004A	1				
10			Screw, Phil pan, SS		8-32 x 1/2"	4				
11			Screw, Phil pan, SS		6-32 x 3/8"	2				
12			Screw, Phil pan, SS		10-24 x 4 1/2"	4				
13			Washer, Internal Star		#6	2				
14			Washer split lock		#10	4				
15			Washer, split lock		#8	4				
16	B1, 2, 3	5-10457	BATTERY, 6V, lead acid 4.8 AHK	Panasonic	LCR-456P	3				
17		5-10266	Rubber Strip, 1/2W	Acc. Rub.	1/2 x 3/16 Neoprene	36"				
18		5-04001	Fuse 2 amp	Little	Fuse 312-002	1				
19			Shrink tubing 1/4" dia.		Black, 1/4" dia.	3"				
20		5-10395	Disconnect Insulated	Waldom	KST-2188	6				
21		5-10468	Rubber "U" Channel	Acc.Rub.	924	36"				
22			Wire, Red, 16 AWG, 48"			1				
23										

NOTES: Sheet 1 is the assembly drawing

SHT 2 OF 2



PARTS LIST

MOTHER BOARD

MODEL

2720

DWG NO

2720-600

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3		4-30127	PCB Mother Board	53504	2720-700	1				
4										
5										
6	SK 13	5-10310	10 Way Socket	Molex	22-16-2101	3				
7	PL1-5, 10-12	5-10313	10-way pins, .56 lg.	Molex	22-10-2101	50				
8	PLD, E	5-10427	4 pin wafer assy.	Molex	09-67-1043	2				
9	PLB	5-10428	11 pin wafer assy.	Molex	09-6701113	1				
10	PLA, C	5-10300	10 Pin Wafer Assy.	Molex	09-6701113	2				
11		5-10330	Bead Pin	Molex	R62-3	2				
12	SK14	5-10042	24 Pin IC Socket	T. I.	8524-01	1				
13	SW2	5-03080	8 Pos. Rgt. angle switch	Grayhill	1 76PSB08	1				
14		4-10463	Spacer, Power Switch	Valhalla	2720-216	1				
15	SK15	5-10243	Connector, GPIB	AMP	552791-1	1				
16	SW1	5-03061	Switch, power, 4A	Schadow	ZFNE152U	1				
17					EE11010106B					
18	SK6, 7, 8, 9	5-10453	Connector 120 pin	EDAC	345-120-524-2-78	4				
19										
20		5-10464	Grommet Rubber	Smith	91118	2				
21		5-10019	Cable Tie 4"	Panduit	WRN-4	18				
22		5-10441	Tie Wrap Block Small	Panduit	ABMM-AT	7				
23		5-10261	Tie Wrap Block, Lg.	Panuit	ABM25-A	1				

NOTES: Sht. 3 of 3 is assembly drawing

SHT 1 OF 3



PARTS LIST

I/O PROCESSOR

MODEL
2720

DWG NO
2720-601

REV
E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-30121	I/O Processor PCB	Valhalla	2720-701	1				
3										
4	B101	5-10458	Batter 3.9V 1Ahr.	Elect. Indust.	BCX72-3B50		1			
5	B21	5-10442	Beeper Piezo PCB Mount	TDK	PB3120UP002A	1				
6										
7										
8	C1, 4	2-30001	10uf 25V TANT	--	--	2				
9	C2, 3	2-20014	20pf 500V MICA	--	CM05FD200J03	2				
10	C8, 9, 11-16	2-60004	0.01uf 630V Mylar	--	--	8				
11	C5, 6	2-60002	0.1uf 100V Mylar	--	--	2				
12										
13	C10,101, 108	2-40026	10uf 50V Alum Radial	--	--	3				
14	C102	2-20018	33pf Mica 500V	--	CM05FD330J03	1				
15	C103, 107	2-2	Factory Select	--	CM05		2			
16	C104, 106	2-20012	10pf MICA 500V	--	CM05FD100J03	2				
17	C105	2-70004	12-100pf VAriable	Mouser	24AA067	1				
18	C7, 109	2-40029	100uf 25V Alum Radial	--	--	2				
19										
20										
21										
22	D2, 101,102,103	3-20028	Diode Signal Schottky	--	1N5711	4				
23										

NOTES: Sht. 1 is the assy. drawing

SHT 2 OF 5



PARTS LIST

I/O PROCESSOR

MODEL 2720

DWG NO
2720-601

REV
E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24										
25	IC1, 15	3-30157	Octal GPIB Transceiver	Moto	MC3447P3					
26	May use either one	3-30332	Octal GPIB Transceiver	Moto	MC3447P	2				
27	IC2	3-30158	GPIB/MPU Interface	Moto	MC68488P	1				
28	IC3	3-30182	Binary 1 of 16 Decoder	T. I.	SN74154N	1				
29	IC4	3-30155	1 of 8 Decoder	T. I.	SN47LS138N	1				
30										
31	IC8	3-30373	CMOS 8K x 8 static RAM	Hitach	HM6264LP-15	1				
32	IC9	3-30344	Octal Latch, Trans, 3-state	T.I.	74LS373N	1				
33	IC10	3-30342	Micro-P+RAM/PTM/ACIA/PIA	Moto	MC6803G	1				
34	IC11, 23	3-30185	Quad Opto-Isolator	Litron	x ILQ-74	2				
35	IC12	3-30093	Fast Opto Isolator	H. P.	HCPL-2601	1				
36	IC13	3-30375	Dual Med Opto Isolator	H. P.	HCPL-2530	1				
37	IC14	3-30184	HEX Inverter	T. I.	74LS04N	1				
38	IC16	3-30162	Octal Transceiver 3 state	T. I.	74LS245N	1				
39	IC17, 18	3-30156	Octal 3 state Buffer	T. I.	74LS541N	2				
40	IC19, 20	3-30177	Octal Latch 3 state	T. I.	74LS374N	2				
41	IC21, 22	3-30173	Hex Inverter 15V O/C	T. I.	7406 or 7416	2				
42	IC24	3-30061	Quad 2 I/P AND	T. I.	74LS08N	1				
43	IC25	3-50028	2720/IC25 (Main ROM)	Valhalla	3-30367		1			Programmed in test
44	IC101	3-30362	CMOS 1 of 8 Decoder	T. I.	74HC138	1				
45	IC102	3-30363	Real time clock & RAM	Moto	MC146818	1				
46	IC103	3-30149	CMOS HEX inverter		CD40106	1				

NOTES:

SHT 3 OF 5



PARTS LIST

I/O PROCESSOR

MODEL
2720

DWG NO
2720-601

REV
E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
47										
48	PL1	5-10443	Wafer 15 way .1sp.,.56Lg.	Molex	22-03-2151	1				
49	PL2	5-10360	Wafer 10 way .1sp.,.70Lg.	Molex	22-03-2102	3				
50										
51										
52										
53	R5-11	1-01033	470 ohm 5% 1/4W	--	RC07GF471J	7				
54	R13, 14	1-01061	10K ohm 5% 1/4W	--	RC07GF103J	2				
55	R101,102,103	1-01081	100K ohm 5% 1/4W	--	RC07GF104J	3				
56	R104	1-01041	1 K ohm 5% 1/4W	--	RC07GF102J	1				
57	R105	1-01113	5.6M ohm 5% 1/4W	--	RC07GF565J	1				
58	R106	1-01083	150 K ohm 5% 1/4W	--	RC07GF154J	1				
59	R107	1-01086	220 K ohm 5% 1/4W	--	RC07GF224J	1				
60	R108, 110	1-01100	1 M ohm 5% 1/4W	--	RC07GF105J	2				
61	R109	1-01021	100 ohm 5% 1/4W	--	RC07GF101J	1				
62										
63										
64	RN1, 3	1-40003	15 x 10K ohm	--	316A-103	2				
65	RN2	1-40001	8 x 470 ohm	--	316B-471	1				
66										
67										
68	RV1	1-50010	50 ohm single turn	CTS	110-50 ohm	1				
69										

NOTES:

SHT 4 OF 5



PARTS LIST

I/O PROCESSOR

MODEL 2720

DWG NO 2720-601

REV E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
70										
71	SK1, 2	5-10321	Socket 10 way bottom entry Molex		22-17-2102	3				
72	SK3, XIC102	5-10042	Socket 11 24 Pin	T. I.	8524-01	2				
73	XIC2, 10	5-10246	Socket DIL 40 pin	Burndy	DILB40P-11	2				
74	XIC7, 8, 25	5-10295	Socket DIL 28 Pin	Burndy	DILB28P-108	3				
75										
76										
77	TR1	3-10026	N-Channel VMOS	--	VN10KM	1				
78	TR101	3-10010	Transistor PNP	--	2N4402	1				
79										
80										
81	TP101, 102	5-10290	Test Point Hook	Vector	K32-2	2				
82										
83										
84	Y1	5-02004	Crystal MPU 4 MHz.	--	HC18-4MHz.	1				
85	Y101	5-02009	Crystal 32.76800KHz.	--	--	1				
86										
87										
88		--	Screw Phil pan SS	--	4-40 x 3/8	2				
89		--	Nut Radio Hex	--	4-40	2				
90		--	Washer Internal Star	--	#4	2				
91										
92		--	R. T. V.	--	--	A/R				

NOTES:



PARTS LIST

LOW VOLTAGE
POWER SUPPLY

MODEL
2720

DWG NO
2720-602

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3		4-30123	PCB, Low Voltage P. S.		2720-702	1				
4										
5										
6										
7	C2	2-40012	15000uf, 10V, Alum.		159TTA010	1				
8	C1	2-40036	220uf, 63V, Alum.		227TTA063	1				
9	C105	2-40016	22000uf, 10V, Alum.		229TTA010	1				
10	C106, C3	2-40029	100uf, 25V, Alum. Radial		--	1				
11	C4, 9, 113	2-60002	0.1uf, 100V, Mylar			3				
12	C5	2-40017	2200uf, 35V, Alum.		228TTA035	1				
13	C6, 7, 103	2-40026	10uf, 50V, Alum. Radial		--	7				
	104, 107, 110, 111									
15	C101	2-40018	4700uf, 35V, Alum.		478TTA035	1				
16	C112	2-40004	2200uf, 16V, Alum.		228TTA016	1				
17	C102, 108, 109	2-40035	1000uf, 35V, Alum.		108TTA035	3				
18										
19	C8	2-40010	1000uf, 25V, Alum.		108TTA025	1				
20										
21										
22										
23										

NOTES: Sheet 5 is the assembly drawing

SHT 1 OF 5



PARTS LIST

LOW VOLTAGE
POWER SUPPLY

MODEL

2720

DWG NO

2720-602

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24										
25	D1,4,101,105	3-20027	Bridge, 1A, 100V		3N247	4				
26	D2,3,6,14	3-20021	Rectifier, 3A, 30V		1N5821	6				
27	102, 103									
28	D5	3-20000	Diode, Signal		1N4148	1				
29	D7,8,11,104	3-20002	Diode Rectifier		1N4001-1N4007	7				
30	107-109									
31										
32	IC103	3-30355	Regulator,+5V,3A(to 3 STL)		LM323KC	1				
33	IC2	3-30356	Regulator,+Adj,1.5A,To 3		LM317KC	1				
34	IC104	3-30369	Regulator,+6V,1A		7806CT	1				
35	IC1	3-30042	Regulator,+5V, 1.5A		LM7805CK	1				
36	IC101	3-30370	Regulator,+18V,1.5A		7818CK	1				
37	IC102	3-30358	Regulator,-18V,1.5A		7918CK	1				
38	IC105	3-30171	Regulator,+18V,1.0A		7818CT	1				
39	IC106	3-30172	Regulator,-18V, 1A		7918CT	1				
40	R1	1-01061	10K ohm, 5%, 1/4W		RC07GF103J	1				
41	R2	1-01051	3.9K, 5%, 1/4W		RC07GF392J	1				
42	R3	1-01028	270 ohm, 5%, 1/4W		RC07GF271J	1				
43										
44										
45										
46										

NOTES:

SHT 2 OF 5



PARTS LIST

LOW VOLTAGE
POWER SUPPLY

MODEL
2720

DWG NO
2720-602

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
47										
48	RV1	1-50022	1K ohm End Adjust	Beckman	89PK1K	1				
49										
50										
51										
52	SK1	5-10310	Socket,Rt. Angle,10way,gold	Molex	22-16-2101	9				
53	SK2	5-10008	Socket,DIL, 16 pin	T. I.	C8516-01	1				
54	T1	4-20048	Pwr XFMR, 24VCT,1.5A	Signal	DST7-24	1				
55		5-10449	Cable tie, 14"x.15	Panduit	PLT41-M	2				
56		5-10315	Socket, To -3	Smith	6243	5				
57										
58		4-10446	Heatsink, Power Supply		2720-208	1				
59		5-10232	Washer, Insulator, to 3	Bergquist	7403-09FR-06	5				
60		5-10288	Spacer, 1/4"dia x 1/2" lg. x #6 Alum	Smith	8503	9				
61			Nut, Radio Hex		#4	3				
62			Screw, Phil pan, SS		6-32 x9/16"	10				
63			Screw, Phil pan, SS		6-32 x 3/4"	5				
64			Screw, Phil pan, SS		4-40 x 1/4"	3				
65										
66										
67			Washer, Internal Star		#6	19				
68			Washer, Flat		#6	4				
69			Washer, Int. Star		#4	3				

NOTES:

SHT 3 OF 5



PARTS LIST

MAIN MICROPROCESSOR

MODEL 2720

DWG NO 2720-603

REV C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1		4-30128	Main MPU PC Board	Valhalla	2720-703	1				
2	C208, 213, 219, 224 304, 318, 319	2-40026	10uf, 50V, Alum. Radial		--	7				
3	C207	2-60001	.22 uf, 100V, Mylar		--	1				
4	C218, 317'	2-10013	1uf, 50V, Ceramic		8131/050/651/105M	2				
5	C209	2-60009	0.022uf, 400V, Mylar	Wima	MKC-4 .022	1				
6	C217	2-10006	0.01uf, 100V, Ceramic		--	1				
7	C325	2-40037	220uf, 10V, Alum. Radial		--	1				
8	C3	2-30004	1 uf, 10V, Tantalum Bead			1				
9										
10	C4	2-40028	47 uf, Alum. Radial		--	1				
11	C18-20, 7	2-40029	100uf, 25V, Alum. Radial		--	4				
12	C2,8-17, 216	2-60004	0.01uf, 630V, Mylar			22				
	C220-223, 202, 314									
	C315, 316, 322-324									
15										
16	C203-204, 303	2-60002	0.1 uf, 100V, Mylar			7				
	307, 310, 312, 313									
18	C305, 306	2-20002	50pf, 500V, MICA			2				
19	C205	2-20013	100pf, 500V, MICA			1				
20	C210, 211, 214, 215	2-20019	200pf, 500V, MICA			6				
21	301, 302									
22	C328, 326	2-90002	0.5uf, 50V, Polycarbonate		--	2				
23	C308, 309, 311	2-90005	0.1uf, 50V, Polycarbonate		--	3				

NOTES: Sheet 6 of 6 is the assembly drawing

SHT 1 OF 6



PARTS LIST

MAIN MICROPROCESSOR

MODEL 2720

DWG NO
2720-603

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24	C201	2-90003	5uf, 50V, Polycarbonate		--	1				
25	D1	3-20036	Transient, Supply, 6V		1N5908	1				
26	D2-6, 302-305	3-20028	Diode, Signal, Schottky		1N5711	9				
27	D201, 202'	3-20041	Diode, Reference, 6.3V		1N825	2				
28	D203	3-20000	Diode, Signal		1N4148	1				
29										
30										
31	IC1-4	3-30155	1 of 8 Decoder		74LS138N	4				
32	IC5	3-30061	Quad 2 I/P AND		74LS08N	1				
33	IC6	3-30023	CMOS, Quad, Analog Switch		4066BF (Ceramic)	1				
34	IC7	3-30213	RAM, 2048X8, 300ns		TMS4016-30NL	1				
35	IC8	3-50031	2720 Main ROM		3-30367 (27128)	1				
36	IC9	3-30187	Microprocessor, 1.5MHz.		MC68A09P	1				
37	IC10	3-30350	A. C. I. A., 1.5MHz.		MC68A50P	1				
38	IC12	3-30351	PTM, 1.5MHz.		MC68A40P	1				
39	IC101-104	3-30159	Peripheral Interface Adapt.		MC6821P	4				
40	IC13	3-30149	CMOS Hex Invertor (Schmidt)		40106BE	1				
41	IC15, 11, 210	3-30184	Hex Invertor		74LS04N	3				
42	IC201	3-30322	Dual Op-Amp, JFET		LF353N	1				
43	IC202, 315	3-30336	Chopper Amp Lo Noise		ICL7652CPD	2				
44	IC203	3-30173	Hex Inverter, 15V, 0/C		7406-7416	1				
45	IC205	3-30170	OP-Amp, Low Noise		OP-07DP	1				
46	IC206, 207, 313	3-30090	Op-Amp, Bi-Fet		LF356N	5				

NOTES: 204, 314

SHT 2 OF 6



PARTS LIST

MAIN MICROPROCESSOR

MODEL
2720

DWG NO
2720-603

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
47	IC208	3-30073	Comparator, JFET		LF311H or TL311	1				
48	IC209	3-30175	Dual Monostable Retriggerable		74LS123N	1				
49	IC216	3-30174	Quad, 2 I/P OR		7432	1				
50	IC211, 215, 310, 311		Dual D-Type		74ALS74	4				
51	IC212, 213	3-30339	8 Bit Counter + Latch		74LS590N	2				
52	IC301-304	3-30340	8 Bit Comp. + Latch		74AS885N	4				
53	IC305-308	3-30194	4 Bit Sync. Counter		74LS163AN	4				
54	IC309	5-02008	Oscillator, 16.77216MHz, 0.01%			1				
55	IC214	3-30333	Temperature Sensor		AD590JH	1				
56	R101-104, R3, 203	1-01061	10K ohm, 5%, 1/4W	81349	RC07GF103J	25				
	204, 234, 236, 207, 226									
	208, 211, 212, 307									
	221, 223, 228, 231, 310									
	303, 306, 309, 312, 229									
61	R202, 205, 206	1-01081	100K ohm, 5%, 1/4W	81349	RC07GF104J	7				
	233, 235, 301, 304									
63	C320, 321, 327	2-10014	0.1uf, 50V, Ceramic			3				
64	R209, 210	1-01045	2K ohm, 5%, 1/4W	81349	RC07GF202J	2				
65	R213, 230, 227 225, 319	1-01021	100 ohm, 5%, 1/4W	81349	RC07GF101J	5				
66	R215, 232	1-01041	1K ohm, 5%, 1/4W	81349	RC07GF102J	2				
67	R216	1-10198	10K ohm, 1%, 10PPM	PRP	1/8W-10K-1%-10PPM	1				
68										
69	R219	1-10205	63.3K ohm, 0.05%, 5PPM	PRP	1/8W-63.3K-.05%-5PPM	1				

NOTES:

SHT 3 OF 6



PARTS LIST

MAIN MICROPROCESSOR

MODEL
2720

DWG NO
2720-603

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
70	R220	1-01069	30K ohm, 5%, 1/4W		RC07GF303J	1				
71										
72	R224	1-01053	4.7K ohm, 5%, 1/4W	81349	RC07GF472J	1				
73										
74										
75	R313, 314	1-10117	19.6K ohm, 1%		RN60C1962F	2				
76	R321, 222	1-10206	40K, .05%, 5PPM	PRP	18W-40K.05%-5PPM	2				
77	R315	1-10225	46.5K 1%		RN60C4652F	1				
78	R322	1-10226	15.4K 1%		RN60C1542F	1				
79	R316,317	1-01073	47K ohm, 5%, 1/4W	81349	RC07GF473J	2				
80	R323	1-20124	700K ohm,0.05%, 2PPM		GS802-700K-2PPM	1				
81	R320	1-20013	100 ohm, .05%, 5PPM 1°C	Goldsta	R127 100 ohm .05%	1				
82	RN1	1-40003	15x10K ohm		316A-103	1				
83	RV301	1-50043	200 ohm End adjust		89PR200 ohm	1				
84	SK1	5-10310	10-way socket	Molex	22-16-2101	13				
85	R1, 218	1-01100	1M ohm, 5%, 1/4W	81349	RC07GF0105J	2				
86	XIC7, 10	5-10042	Socket,DIL, 24 pin	T. I.	8524-01	2				
87	XIC8, 12	5-10295	Socket, DIL, 28 pin	Burndy	DILB28P-108	2				
88	XIC9,101-104	5-10246	Socket, DIL, 40 Pin	Burndy	DILB40P-11	5				
89	R318	1-10004	15K, 1%		RN60C1502F	1				
90	R2	1-01109	3.3M ohm, 5%, 1/4W	81349	RC07GF335J	1				
91	R237	1-10107	29.4K ohm, 1%	81349	RN60C2942F	1				
92	R302,305,308,311	1-01007	10 ohm, 5%, 1/4W	81349	RC07GF100J	4				

NOTES:

SHT 4 OF 6



PARTS LIST

MAIN MICRORPOCESSOR

MODEL 2720

DWG NO 2720-603

REV C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
93	TR101-105,107-116	3-10013	NPN Transistor (T092)		2N4401	15				
94	TR204,205	3-10033	N-Channel, UPIGFET		VN10LM	2				
95	TR309-312	3-10026	N-Channel, VMOS (T092)		VN10KM	4				
96	TR106	3-10032	NPN Darlington		MPSA-13	1				
97	TR201-203,211 206,207,210	3-10000	N-Channel JFET		U1899(E)	7				
98	TR208,209 301-304	3-10010	PNP Transistor (T092)		2N4402	6				
101										
102	TR305-308	3-10016	N-Channel VMOS (T05)		VN66AK	4				
103	XTR307,308	5-10229	Washer, Eeryllia, T05	Permag	CG-3835-1	2				
104										
105										
106	RN301	1-40011	Personality Res Net.	G. S.	2720-026	1				
107	IC316	3-30328	Op-Amp JFET		OPA103AM	1				
108	IC317	3-30169	Regulator, 5V, .1A		LM79L05CLP	1				
109	IC318	3-30168	Regulator, +5V, .1A		LM78L05ACLP	1				
110	R217	1-10185	11.11K ohm, 0.1%, 5PPM	PRP	1/8W-11.11K-0.1%-5PPM	1				
111	IC319	3-30376	Dual High Speed Driver	Teledyne	TSC427CPA	1				
112	PL201	5-10398	Wafer, 2 Pin .56	Molex	22-03-2021	1				
113	XPL201	5-10488	Shorting Plug .1 sp.	Molex	15-29-1024	1				
114										
115										

NOTES :



PARTS LIST

OPTION EXR 1

MODEL 2720

DWG NO 2720-605

REV A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3	C1,C2	2-10013	1 uf, 50V, Ceramic Disc		8131-050-651-105M	2				
4	C3, C4	2-90006	1 uf, 50V, Polycarb.			2				
5										
6	C7, C9	2-10014	0.1 uf, 50V, Ceramic Disc		8212-050-651-104M	2				
7	C8	2-40026	10 uf, 50V, Alum. Rad.			1				
8	C10	2-30011	4.7 uf, 35V, Tant.			1				
9										
10	D1	3-20024	Pair, Low leakage Diodes		DPAD10	1				
11	D2	3-20000	Diode, Signla		1N4148	1				
12										
13	IC1	3-30328	Op-Amp, JFET	Burr-Brown	OPA103AM	1				
14	IC2	3-30336	Chopper Amp, Low noise	Intersil	ICL7652CPD	1				
15	IC3	3-30031	Quad-Op Amp		LM324N	1				
16	IC5	3-30168	Reg., +5V, 0.1A, T092		LM78L05ACL	1				
17	IC6	3-30036	Reg., +15V, 0.5A, T0202		78M15CP	1				
18	IC7	3-30064	Reference, 2.5V, 1%	Motorola	MC1403	1				
19	IC8	3-30189	Novram, 256x4	Xicor	XC2212	1				
20										
21										
22										
23										

NOTES: Sheet 3 is the assembly drawing

SHT 1 OF 3



PARTS LIST

OPTION EXR 1

MODEL
2720

DWG NO
2720-605

REV
A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24		5-10488	Shorting Plug, .1sp, gold	Molex	15-29-1024	3				
25										
26	R1	1-10008	10K ohm, 1%	81349	RN60C1002F	1				
27	R2	1-10016	8.45K ohm, 1%	81349	RN60C8451F	1				
28	R3	1-10061	4.99K ohm, 1%	81349	RN60C4991F	1				
29	R4	1-10006	100K ohm, 1%	81349	RN60C1003F	1				
30	R5	1-10277	2.37K ohm, 1%	81349	RN60C2371F	1				
31	R6	1-10278	2.05 K Ohm, 1%	81349	RN60C2051F	1				
32	R7	1-10017	9.09K ohm, 1%	81349	RN60C9091F	1				
33	R8	1-30023	7x10K ohm, Set	Vishay	2720-024	1				
34	R9	1-01061	10K ohm, 5%, 1/4W	81349	RC07GF103J	1				
35	R10	1-01021	100 ohm, 5%, 1/4W	81349	RC07GF101J	1				
36	R11	1-01073	47K ohm, 5%, 1/4W	81349	RC07GF473J	1				
37	R12, 13	1-01081	100K ohm, 5%, 1/4W	81349	RC07GF104J	2				
38										
39	RLA	5-03083	Relay, 2A+2B, 5V	Aromat	S2EB-5V	1				
40										
41	RV1	1-50034	500 ohm, end adjust	Beckman	89PR500 OHM	1				
42	TR1	3-10000	N-Channel, JFET		U1899E	1				
43	TR2	3-10013	NPN Transistor (T092)		2N4401	1				
44	TP1, TP2	5-10290	Test Hook, PCB	Vector	K32-2	2				
45	PL1	5-10313	Wafer, 10 way, Gold.56 long	Molex	22-10-2101	1				
46	SK1	5-10310	Socket Rt. Angle 10 way	Molex	22-16-2101	4				

NOTES:



PARTS LIST

DISPLAY P. C. B. ASSY.

MODEL
2720

DWG NO
2720-606

REV
B

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3										
4		4-30120	P. C. B. Display		2720-706	1				
5										
6	C1	2-30001	10 uf, 25V TANT			1				
7										
8										
9	DS4-35	5-01011	Led, Red	H. P.	5082-4655	32				
10	DS1, 2	5-01022	Display, V-F, 14Seq., 16 digit Itron		FG169B2	2				
11	DS3	5-01023	Light Bar (16 pin DIL)	H. P.	HLMP2685	1				
12	XDS3	5-10008	Socket, 16 pin DIL		C8516-01	1				
13	IC1, 2	3-30353	32-bit VFD Driver	T. I.	SN75518N	2				
14	IC3-9	3-30354	6-bit LED driver & latch	National	DS8859 AN	7				
15										
16	R1	1-01039	8202, 5% 1/4W		RC07GF821J	1				
17										
18	PL1, 2	5-10332	Wafer, 10 pin, 1.23L, gold C. A.		CAS-10SP-230T -1.23	3				
19										
20	XDS4-35	5-10454	Spacer, Nylon, LED, 0.1" Lg Bivar		908-100	32				
21										
22										

NOTES: Sheet 2 of 2 is assembly drawing

SHT 1 OF 2



PARTS LIST

NULLMETER

MODEL
2720

DWG NO
2720-607

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1		4-30125	Null Meter P. C. B.	53504	2720-707	1				
2										
3	C7, 10, 104	2-40029	100uf 25V, Alum Radial			3				
4	C2, 3, 1, 5	2-90006	1uf, 50V, Polycarb			4				
5	C102	2-30011	4.7uf 35V, Tant Bead			1				
6	C101, 103, 108	2-60002	.1uf, 100V Mylar			3				
7	C8	2-90009	.001uf, 50V, Polycarb			1				
8	C106, 109-112	2-30004	1uf, 25V, Tant Bead			6				
9	C6	2-90005	0.1uf, 50V, Polycarb			1				
10	C4	2-90002	0.5uf, 50V, Polycarb			1				
11										
12	D1	3-20024	Pair, Low leakage, Diode		DPAD10	1				
13	D2	3-20041	Zener Reference 6.3V		1N825	1				
14	D101-103	3-2000	Diode, Signal		1N4148	3				
15										
16										
17										
18										
19										
20										
21										

NOTES: Sheet 1 of 5 is assembly drawing

SHT 2 OF 5



PARTS LIST

NULLMETER

MODEL
2720

DWG NO
2720-607

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
22										
23										
24										
25	IC1	3-30336	Chopper, Amp, lo-noise	Intersil	ICL7652CPD	1				
26	IC2	3-30090	Op-Amp, BIFET		LF356N	1				
27	IC3	3-30371	V-F Converter	A. D.	AD537KD	1				
28	IC4	3-30093	Fast Opto-Isolator	H. P.	HCPL-2601	1				
29	IC5	3-30374	Novram, 64 x 4	XICOR	XC2210	1				
30	IC6	3-30328	Op-Amp, JFET	Burr Brn	OPA 103AM	1				
31	IC109	3-30348	AC Opto-Isolator	Litronix	IL250	1				
32	IC101	3-30185	Quad Opto-Isolator	Litronix	ILQ-74A	1				
33	IC102	3-30372	CMOS, 1 of 16 decoder	T. I.	74HC154	1				
34	IC103, 104	3-30084	Opto-Isolator		IL1 or TIL 111	2				
35	IC105	3-30036	Regulator +15V 0.5A		78M15CP	1				
36	IC106	3-30349	Dual Power Supply	Burr Brn	722	1				
37	IC107	3-30034	Regulator, +5V, 0.5A		78M05CP	1				
38	IC108	3-30169	Regulator, -5V, 0.1A		LM79L05CLP	1				
39										
40										
41										
42										
43										
44										

NOTES:

SHT 3 OF 5



PARTS LIST

NULLMETER

MODEL
2720

DWG NO
2720-607

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
45	R1, 2	1-20127	10K 20% Low Thermal	G. S.	GS805-10K-20%	2				
46	R3	1-01056	6.2K ohm 5%, 1/4W	81349	RC07GF622J	1				
47	R4-6	1-01124	22M ohm, 5%, 1/4W	81349	RC07GF226J	3				
48	R105, 106	1-01061	10K ohm, 5%, 1/4W	81349	RC07GF103J	2				
50	R11, 109	1-01041	1 K Ohm, 5%, 1/4W	81349	RC07GF102J	2				
51	R12	1-10111	1.24M ohm, 1%	81349	RN60C1244F	1				
52	R13	1-10181	444.4K ohm, 1%, 10PPM	PRP	1/8W 444.4K 1% 10PPM	1				
53	R14	1-10154	73.2K ohm, 1%	81349	RN60C7322F	1				
54	R15	1-10007	1M ohm, 1%	81349	RN65C1004F	1				
55	R16, 7	1-01007	10 ohm, 5%, 1/4W	81349	RC07GF100J	2				
56	R17	1-10008	10K ohm, 1%	81349	RN60C1002F	1				
57	R107	1-01033	470 ohm, 5%, 1/4W	81349	RC07GF471J	1				
58	R20, 21	1-01081	100K 5%, 1/4W	81349	RC07GF104J	2				
59	R22	1-20007	900K ohm, 0.05%	Elliot	EI48-900K-.05%	1				
60	R23	1-20006	90K ohm, 0.05%	Elliot	EI27-90K-.05%	1				
61	R24	1-20005	9K ohm, 0.05%	Elliot	EI27-9K-.05%	1				
62	R25	1-20004	900 ohm, 0.05%	Elliot	EI27-900R-.05%	1				
63	R26	1-20013	100 ohm, 0.05%, 5PPM	G. S.	R127100R.05%5PPM	1				
64	R104	1-01039	820 ohm, 5%, 1/4W	81349	RC07GF821J	1				
65										
66										
67	R18	1-01046	2.2K, 5%, 1/4W	81349	RC07GF222J	1				

NOTES:



PARTS LIST

NULLMETER

MODEL
2720

DWG NO
2720-607

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
68	RN103	1-40008	8 x 1 K ohm	A. B.	316B-102	1				
69	RN102	1-40001	8 x 470 ohm	A. B.	316B-471	1				
70	RN101	1-40003	15 x 10K ohm	A. B.	316A-108	1				
71										
72	RLA, D, E,	5-03082	Relay, Latching, 2A+2B	Aromat	S2EBT-L2-5V	3				
73										
74	SK1	5-10310	Socket Rt. Angle 10 way, gold	Molex	22-16-2101	4				
76										
77	TR106-111	3-10010	PNP Transistor		2N4402	6				
78	TR113	3-10013	NPN Transistor		2N4401	1				
79	TR112	3-10032	NPN Darlington		MPSA-13	1				
80										
81			Wire Teflon, 20AWG		Red, Teflon	18				
82			Wire, Teflon, 20 AWG		Black, Teflon	18				
83										
84										
85		4-20043	Ferrite BEad	Amidon	FB-43-2401	2				
86										
87	XIC105	5-10404	Heatsink, T0202	Therm	6047B	1				
88										
89										
90										

NOTES:

SHT 5 OF 5



PARTS LIST

OPTION EXR. 10

MODEL

2720

DWG NO

2720-608

REV

A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3	C1, C2	2-10013	1uf, 50V, Ceramic Disc		8131-050-651-105M	2				
4	C3, C4	2-90006	1uf, 50V, Polycarb			2				
5	C5, C6	2-60002	0.1uf, 100V, Mylar			2				
6	C7, C9	2-10014	0.1uf, 50V, Ceramic Disc		8121-050-651-104M	2				
7	C8	2-40026	10uf, 50V, Alum. Rad.			1				
8	C10	2-30011	4.7uf, 35V, Tant.			1				
9										
10	D1	3-20024	Pair, Low Leadage Diodes		DPAD10	1				
11	D2	3-20000	Diode, Signal		1N4148	1				
12										
13	IC1	3-30328	Op-Amp JFET	Burr-Brown	OPA103AM	1				
14	IC2 and 4	3-30336	Chopper Amp, Low Noise	Intersil	ICL7652CPD	2				
15	IC3	3-30031	Quad-Op Amp		LM324N	1				
16	IC5	3-30168	Reg., +5V, 0.1A, T092		LM78L05ACLP	1				
17	IC6	3-30036	Reg.+15V, 0.5A, T0202		78M15CP	1				
18	IC7	3-30064	Reference, 2.5V, 1%	Motorola	MC1403	1				
19	IC8	3-30189	Novram, 256x4	Xicor	XC2212	1				
20										
21										
22										
23										

NOTES: Sheet 3 is the assembly drawing

SHT 1 OF 3



PARTS LIST

OPTION EXR 10

MODEL

2720

DWG NO
2720-608

REV
A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24		5-10488	Shorting plug, .1sp.Gold	Molex	15-29-1024	3				
25										
26	R1	1-10008	10K ohm, 1%	81349	RN60C1002F	1				
27	R2	1-10016	8.45K ohm, 1%	81349	RN60C8451F	1				
28	R3	1-10061	4.99K ohm, 1%	81349	RN60C4991F	1				
29	R4	1-10006	100K ohm, 1%	81349	RN60C1003F	1				
30	R5	1-10277	2.37K ohm, 1%	81349	RN60C2371F	1				
31	R6	1-10278	2.05K ohm, 1%	81349	RN60C2051F	1				
32	R7	1-10017	9.09K ohm, 1%	81349	RN60C9091F	1				
33	R8	1-30023	7 x 10K ohm set	Vishay	2720-024	1				
34	R9	1-01061	10K ohm, 5%, 1/4W	81349	RC07GF103J	1				
35	R10	1-01021	100 ohm, 5%, 1/4W	81349	RC07GF101J	1				
36	R11	1-01073	47K ohm, 5%, 1/4W	81349	RC07GF473J	1				
37	R12, R13	1-01081	100K ohm, 5%, 1/4W	81349	RC07GF104J	2				
38										
39	RLA	5-03083	Relay, 2A +2B, 5V	Aromat	S2EB-5V	1				
40										
41	RV1	1-50034	500 ohm, End Adjust	BEckman	89PR500ohm	1				
42	TR1	3-10000	N-Channel, JFET		U1899E	1				
43	TR2	3-10013	NPN Transistor (T092)		2N4401	1				
44	TP1, TP2	5-10290	Test Hook, PCB	Vector	K32-2	2				
45	PL1	5-10313	Wafer, 10Way, Gold, .5611	ong Molex	22-10-2101	1				
46	SK1	5-10310	Socket Rt. Angle 10 Way	Molex	22-16-2101	4				

NOTES:



PARTS LIST

OUTPUT SYSTEM

MODEL

2720

DWG NO

2720-609

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-30124	Output System P. C. B.		2720-709	1				
3	C6	2-60009	0.022uf, 400V, Mylar		--	1				
4	C202	2-10013	1 uf, 50V, Ceramic Disc							
5	C24,25,101,102 1, 9, 10	2-90006	1 uf, 50V, Polycarbonate			7				
6	C2, 3, 7, 8,117	2-40026	10 uf, 50V, Alum. Radial		--	5				
7	C4, 5, 23 112, 113, 201 29, 111, 118	2-60002	0.1 uf, 100V, Mylar			9				
8	C11, 119	2-40028	47 uf, 35V, Alum. Radial		--	2				
9	C103-110, 28	2-60004	0.01 uf, 630V, Mylar			9				
10	C114, 115	2-90004	0.01 uf, 50V, Polycarbonate			2				
11	C27	2-80003	0.22 uf, 20%, 1500V		EP37478	1				
12	C12-16	2-60010	0.47 uf, 250V, Mylar	Illinois	474MSR250K	5				
13	D1	3-20024	Pair Low-leakage diodes		DPAD10	1				
14	D3, 4, 123	3-20034	Diode, Zener,13V, 10%		1N5243	3				
15	D5-8	3-20002	Diode, Rectifier, 1A		1N4001-4007	4				
16	D9, 10,303,304	5-01011	LED, red	H. P.	5082-4655	4				
17	D105-114 116-118,120-122	3-20000	Diode, Signal		1N4148	16				
18	D119	3-20035	Diode, Zener,8.2V,10%,1W		1N4738	1				
19	D302	3-20003	Diode,Zener, 10V, 10%		1N5240	1				
20	D306,307	3-20007	Zener, reference, 6.3V		1N827	2				

NOTES: Sheets 7 and 8 are assembly drawings

SHT 1 OF 8



PARTS LIST

OUTPUT SYSTEM

MODEL

2720

DWG NO

2720-609

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
21	D115	3-20041	Zener Reference, 6.3V		1N825	1				
22	C26	2-20011	1000pf, 500V, Mica		CM06FD102J03	1				
23	IC103	3-30322	Dual Op-Amp, JFET		LF353N	1				
24										
25	IC5	3-30168	Regulator, +5V, 100mA		LM78L05ACLP	1				
26	IC6	3-30169	Regulator, -5V, 100mA		LM79L05CLP	1				
27	IC4, 9	3-30336	Chopper Amp, Low Noise		ICL7652CPD or IJD	2				
28										
29	IC1, 10, 11 302, 305	3-30090	Op-Amp, BIFET		LF356N	7				
31	IC101	3-30133	Quad Comparator		LM339N	1				
32	IC106, 107	3-30364	V-F Converter		AD537JH or D	2				
33	IC104	3-30201	Dual Opto-Isolator		ILCT-6 or MCT6	1				
34	IC105	3-30375	Dual med-speed Opto-isolator		HCPL2530	1				
35	IC201-204	3-30189	Novram 256x4		XC2212	4				
36	IC209	3-30155	1 of 8 decoder		74LS138N	1				
37	IC303, 307	3-30333	Temperature Sensor		AD590JH	2				
38	IC2	3-30085	Regulator +8V .5A		LM78M08CP	1				
39	IC3	3-30086	Regulator -8V .5A		LM79M08CP	1				
40	XIC 201-204	5-10293	Socket, DIL, 18 pin	Burndy	DILB18P-108	4				
41										
42										
43										

NOTES:

SHT 2 OF 8



PARTS LIST

OUTPUT SYSTEM

MODEL
2720

DWG NO
2720-609

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
44										
45	R201,202,203	1-01081	100K, 5%, 1/4W		RC07GF104J	3				
46	R6,7,35,36	1-01061	10K ohm, 5%, 1/4 W		RC07GF103J	7				
	113, 116, 118									
47	R2	1-30026	10:1 Divider Network	Vishay	2720-021	11				
48	R125, 303	1-01041	1K ohm, 5%, 1/4W		RC07GF102J	2				
49	R101, 104	1-10003	59.0K ohm, 1%		RN60C5902F	2				
50	R34	1-01021	100 ohm, 5%, 1/4W		RC07GF101J	1				
51	R14, 16	1-30028	100/10:1 Divider set	Vishay	2720-020	1				
52	R18-27,9,10,11	1-01108	3M ohm, 5%, 1/4W		RC07GF305J	13				
53										
54										
55	R33	1-30000	1 ohm, 3 watt, 5%	Mills	MRP-2A-A IR 5%	1				
56	R102, 103	1-10001	1.00K, 1%		RN60C1001F	2				
57	R105	1-10222	28K ohm, 1%	81349	RN60C2802F	1				
58	R106, 108	1-10223	12.4K ohm, 1%	81349	RN60C1242F	2				
59	R107	1-10224	24.3K ohm, 1%		RN60C2432F	1				
60	R109-112, 117, 301, 126, 314	2 1-01046	2.2K ohm, 5%, 1/4W		RC07GF222J	9				
61	R325	1-01033	470 ohm, 5%, 1/4W		RC07GF471F	1				
62	R39,31	1-01080	91K, 5%, 1/4W		RC07GF913J	2				

NOTES:

SHT 3 OF 8



PARTS LIST

OUTPUT SYSTEM

MODEL
2720

DWG NO
2720-609

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
63										
64	R121, 122	1-01007	10 ohm, 5%, 1/4W	81349	RC07GF100J	2				
65	R304	1-01025	200 ohm, 5% 1/4W		RC07GF201J	1				
66	R119, 120, 123 124, 1, 13, 37	1-10008	10K ohm, 1%	81349	RN60C1002F	7				
67	R307, 308	1-30021	22 ohm, 5%, 2W		RC42GF220C	2				
68	R310	1-01119	10M ohm, 5%, 1/4W	81349	RC07GF106J	1				
69										
70	R311, 313	1-01064	18K ohm, 5%, 1/4W	81349	RC07GF183J	2				
71										
72										
73	RLA	5-03072	Relay, 2PDT, 5V, 1500V	Omron	G2V-2PUSDC5	1				
74	RLB,C,K,RLGA	5-03083	Relay, 2A+2B, 5V	Aromat	S2EB-5V	4				
75	RLD, E, H, L	5-03082	Relay, Latching 2A+2B,5V	Aromat	S2EBT-L2-5V	4				
76	RLG, M	5-03043	Relay, Reed, 1KV, Lo-Thermal	12V COTO	Cr3221-12-810 or 812	2				
77										
78										
79										
80	RV1	1-50035	50K ohm, end-adjust	Beckman	89PR-50K	1				
81	RV301,302	1-50042	5K ohm, end-adjust	Beckman	89PR-5K	2				
82										
83										
84										

NOTES:

SHT 4 OF 8



PARTS LIST

OUTPUT SYSTEM

MODEL
2720

DWG NO
2720-609

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
85										
86										
87	TP1-6	5-10335	Wafer 6 pin, rt. angle	Molex	22-05-2061	1				
88		5-10488	Shorting Plug, .1 spacing	Molex	15-29-1024	1				
89	TR102,104,106 108	3-10026	N-Channel VMOS	--	VN10KM	4				
90	TR117, 301	3-10010	PNP Transistor		2N4402	2				
91	TR101,103,105 107,109,304 110,111,113,114 115,118,119,120	3-10013	NPN Transistor		2N4401	14				
93	TR302, 303	3-10024	NPN Transistor		TIP29A	2				
94										
95	SK1	5-10310	10 way rt. angle socket	Molex	22-16-2101	9				
96		5-10435	Connector,Housing,3 Way,0.1"	Molex	22-01-2031	2				
97		5-10340	Terminal, Crimp, Female	Molex	08-05-0114	6				
98										
99										
100										
101		4-10438	Binding Post-Bracket	53504	2720-202	2				
102		5-10191	Binding Post, Lt. Red	Pomona	3750-2	7				
103		5-10190	Binding post,Lt. Blk.	Pomona	3750-0	7				
104										
105										
106										

NOTES :

SHT 5 OF 8



PARTS LIST

OUTPUT SYSTEM

MODEL

2720

DWG NO

2720-609

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
107										
108	FB1-4	4-20043	Ferrite Beads	Amidon	FB-43-2401	4				
109		5-10019	Cable tie 4" x 1/8"	Panduit	WRN-4	16				
110		5-10441	Tie Wrap, block, small	Panduit	ABMM-AT	4				
111		5-10433	Insulator, to-220	Berquist	7403-09FR-51	2				
112		5-10434	Washer, shoulder, to-220	Therm Alloy	7721-7PPS	2				
113		4-10464	Heatshield		2720-217	1				
114			20AWG Teflon wire		20AWG, Red, Tef	11	ft			
115			20AWG Teflon Wire		20AWG, Blk., Tef.	11	ft			
116			Wire, Red, 22AWG		22AWG, red	6"				
117			Wire, Brn, 22AWG		22AWG, Brn.	6"				
118			Wire, ORN, 22AWG		22AWG, Orn	6"				
119			Screw, Phil, Pan, SS		6-32 x 1/4"	4				
120										
121			Screw, Phil pan, SS		4-40 x 1/4"	6				
122			Washer, Internal Star		#6	4				
123			Washer, split		#4	2				
124			Washer, Internal Star		#4	4				
125			Wire Buss 14 AWG		14AWG Buss	10"				
126			Sleeving Clear		14AWG	10"				
127			Sleeving Clear		22AWG	4"				
128										
129										

NOTE

SHT 6 OF 8



PARTS LIST

OPTION EXR 7

MODEL 2720

DWG NO 2720-610

REV A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3	C1, C2	2-10013	1uf, 50V, Ceramic disc		8131-050-651-105M	2				
4	C3, C4	2-90006	1uf, 50V, Polycarb.			2				
5										
6	C7, C9	2-10014	0.1uf, 50V, Ceramic disc		8121-050-651-104M	2				
7	C8	2-40026	10uf, 50V, Alum Rad.			1				
8	C10	2-30011	4.7uf, 35V, Tant.			1				
9										
10	D1	3-20024	Pair, Low Leakage Diodes		DPAD10	1				
11	D2	3-20000	Diode, Signal		1N4148	1				
12										
13	IC1	3-30328	Op-Amp, JFET	Burr-Brown	OPA103AM	1				
14	IC2	3-30336	Chopper Amp, Low Noise	Intersil	ICL7652CPD	1				
15	IC3	3-30031	Quad-Op Amp		LM324N	1				
16	IC5	3-30168	Reg., +5V, 0.1A, T092		LM78L05ACL	1				
17	IC6	3-30036	REG, +15V, 0.5A, T0202		78M15CP	1				
18	IC7	3-30064	Reference, 2.5V, 1%	Motorola	MC1403	1				
19	IC8	3-30189	Novram, 256x4	Xicor	XC2212	1				
20										
21										
22										
23										

NOTES: Sheet 3 is the assembly drawing SHT 1 OF 3



PARTS LIST

OPTION EXR 7

MODEL

2720

DWG NO

2720-610

REV

A

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24		5-10488	Shorting plug, .1 sp gold	Molex	15-29-1024	3				
25										
26	R1	1-10008	10K ohm, 1%	81349	RN60C1002F	1				
27	R2	1-10016	8.45 K ohm, 1%	81349	RN60C8451F	1				
28	R3	1-10061	4.99K ohm, 1%	81349	RN60C4991F	1				
29	R4	1-10006	100K ohm, 1%	81349	RN60C1003F	1				
30	R5	1-10277	2.37K ohm, 1%	81349	RN60C2371F	1				
31	R6	1-10278	2.05K ohm, 1%	81349	RN60C2051F	1				
32	R7	1-10017	9.09K ohm, 1%	81349	RN60C9091F	1				
33										
34	R9	1-01061	10K ohm, 5%, 1/4W	81349	RC07GF103J	1				
35	R10	1-01021	100 ohm, 5%, 1/4W	81349	RC07GF101J	1				
36	R11	1-01073	47K ohm, 5%, 1/4W	81349	RC07GF473J	1				
37	R12, R13	1-01081	100 K ohm, 5%, 1/4W	81349	RC07GF104J	1				
38										
39	RLA	5-03083	Relay, 2A+2B,5V	Aromat	S2EB-5V	1				
40										
41	RV1	1-50034	500 ohm, end adjust	Beckman	89PR5000HM	1				
42	TR1	3-10000	N-Channel, JFET		U1899E	1				
43	TR2	3-10013	NPN Transistor (T092)		2N4401	1				
44	TP1, TP2	5-10290	Test Hook, PCB	Vector	K32-2	2				
45	PL1	5-10313	Wafer, 10way, gold.56 long	Molex	22-10-2101	1				
46	SK1	5-10310	Socket Rt.Angle, 10 way	Molex	22-16-2101	4				

NOTES:

SHT 2 OF 3



PARTS LIST

OUTPUT AMPLIFIER

MODEL 2720

DWG NO 2720-611

REV E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2										
3		4-30119	Output Amplifier, PCB		2720-711	1				
4										
5										
6										
7	D107	3-20005	Diode, Zener, 6.2V, 10%		1N5234	1				
8	D108	3-20038	Diode, Zener, 6.2V, 10%, 1W		1N4735	1				
9	D209	3-20017	Diode Zener, 9.1V, 10%		1N5239	1				
10	D211	3-20030	Diode, Zener, 9.1V, 10% 5W		1N5346A	1				
11										
12	R103	1-30036	56K ohm, 5%, 2W		RC42GF563J	1				
13	R106, 107, 229-233	1-01041	1K ohm, 5%, 1/4W		RC07GF102J	7				
14	R112, 113	1-10010	82.5 ohm, 1%		RN60C82R5F	2				
15	R114, 115	1-01049	3K ohm, 5%, 1/4W		RC07GF302J	2				
16	R213-217	1-30033	100K ohm, 2W, 5%		RC42GF104J	5				
17	R235	1-10119	237 ohm, 1%		RN60C2370F	1				
18										
19	SK1	5-10310	Socket, Rt. Angle, 10way, gold Molex		22-16-2101	3				
20										
21										
22										
23										

NOTES: Sheet 1 is assembly drawing

SHT 2 OF 2



PARTS LIST

OUTPUT AMP DRIVER

MODEL

2720

DWG NO

2720-612

REV

E

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-30118	Output Amp Driver PCB		2720-712	1				
3	C102	2-60000	.0047uf 100V Mylar		--	1				
4	C206-210	2-20011	1000pf, 500V, MICA		CM06FD102J03	5				
5	C103	2-20002	50pf, 500V, MICA		CM05ED500J03	1				
6	C109	3-20005	Diode, Zener, 6.2V, 10%		1N5234	1				
7	D111-114	5-01011	LED, Red, Panel Mount	H. P.	5082-4655	4				
8	D210	3-20017	Diode, Zener, 9.1V, 10%		1N5239	1				
9										
10	IC101, 201	3-30359	Opto-Isolator, 75-150%CTR	Litronix	IL201	2				
11										
12	R104	1-30036	56 K Ohm, 5%, 2W		RC2GF563J	1				
13	R110,111	1-10010	82.5, 1%	B1349	RN60C82R5F	2				
14	R105, 228	1-01021	100 ohm, 5%, 1/4 W	B1349	RC07GF101J	2				
15	R116	1-01031	390 ohm 5% 1/4W	B1349	RC07GF391J	1				
16	R210	1-01037	680 ohm, 5%, 1/4W	B1349	RC07GF681J	1				
17	R218-222	1-30033	100K ohm, 2W, 5%	B1349	RC42GF104J	5				
18	R223-227	1-01041	1K ohm, 5%, 1/4W	B1349	RC07GF102J	12				
	236-240, 108,109									
19	R234	1-01045	2K ohm, 5%, 1/4W	B1349	RC07GF202J	1				
20	R241	1-10119	237 ohm, 1%	B1349	RN60C2370F	1				
21										
22										

NOTES: Sheet 1 is the assembly drawing

SHT 2 OF 3



PARTS LIST

HIGH VOLTAGE POWER SUPPLY

MODEL

2720

DWG NO

2720-613

REV

C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-30122	High Voltage Power Sup. PCB		2720-713	1				
3	C9	2-90006	1 uf, 50V, Polycarb.			1				
4	C1	2-80004	0.02uf, 1600V, 10%	Sprague	16PS-S20	1				
5										
6	C3, 4	2-40029	100uf, 25V, Alum Radial			2				
7	C5, 6	2-40026	10uf., 50V, Alum Radial			2				
8	C7	2-20011	1000pf, 500V, MICA		CM06F0102J03	1				
9	C201-204	2-40009	47uf, 450V, Aluminum	Illinois	476TTA450	4				
10	C211, 212	2-80003	.22uf, 1500V, 20% MYLAR	Electron	EP37478	2				
11	D1, D2	3-20025	Diode, Zener, 4.7V, 10%, W		1N4732	2				
12	D3	3-20027	Bridge 1A, 100V		3N247	1				
13	D8, 5,	3-20000	Diode, Signal		1N4148	4				
14	D201-212, 401-406	3-20015	Diode, Rectifier, 1A		1N40007	18				
15	C8	2-20001	1800pf, 500V, MICA		CM06FD182J03	1				
16	IC1, 2, 3	3-30170	Low noise op amp		Op-07DP	3				
17	IC4, 5	3-30348	AC Opto-Isolator		IL-250	2				
18	IC6	3-30171	+18V Regulator, 1.5A, to 220		MC7818CT	1				
19	IC7	3-30172	-18V Regulator 1.5A to 220		MC7918CT	1				
20	C401-406	2-40020	100uf, 250V, Alum	Illinois	107TTA250	6				
21	SG401, 402	3-20022	spark Gap, 350V	C.P.Clark	CG2-350L	2				
22	FS1, FS2	5-04000	Fuse .1A Slo-Blo	Little Fuse	313-.100	2				
23	FX1, FX2	5-10269	Fuse Clip, PCB Mtg.	Zierrick	926, 927 or 798	4				

NOTES: Sheet 1 is assembly drawing

SHT 2 OF 4



PARTS LIST

HIGH VOLTAGE
POWER SUPPLY

MODEL
2720

DWG NO
2720-613

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
24	R23	1-01007	Res., 10 ohm, 5% 1/4W		RC07GF100J	1				
25	R1	1-30020	4M ohm, 0.1%, 5PPM	Caddock	TF050N-4M-5PPM-.1%	1				
26	R2, 5	1-10212	20.1K ohm, 1%, 10PPM	PRP	18W 20.1K-1%-10PPM	2				
27										
28	R4	1-10213	381.9K ohm, 1%, 10PPM	PRP	18W-38.9K-1%-10PPM	1				
29	R6, 13, 14	1-01061	10K ohm, 5%, 1/4W		RC07GF103J	3				
30	R7	1-10137	1.82K ohm 1%	81349	RN60C1821F	1				
31	R8	1-10143	453ohm 1%	81349	RN60C4530F	1				
32										
33	R15, 16	1-01100	1M ohm, 5%, 1/4W	81349	RC07GF105J	2				
34	R201-204, 209, 212	1-30011	1K ohm, 10W (Axial)	Mills	MRP-10A	7				
35	R205-208	2-30030	220K ohm, 1W, 5%		RC32GF224J	4				
36	R9, 10	1-10008	10.0K ohm, 1%	81349	RN60C1002F	2				
37	R401, R402	1-30019	100K ohm, 1W, 5%	81349	RC32GF104J	2				
38	RLA, C, D, G	5-03072	Relay, 2PDT, 5V, 1500V	Omron	G2V-2PUSDC5	4				
39	RLB, E, F	5-03012	Relay, Reep, 5V, Coil, DIL	Sigma	191TE1A1-5S	3				
40	R3	1-01084	180K ohm, 5%, 1/4W		RC07G184J	1				
41	PL1	5-10300	Wafer, 10 pin, .156	Molex	09-67-1103	1				
42	SK1	5-10310	Socket, Rt. Angle, 10way, gold	Molex	22-16-2101	5				
43										
44										
45		5-10449	Cable tie, 14" x .15	Panduit	PLT 41-M	2				
46										

NOTES:

SHT. 3 OF 4



PARTS LIST

OPTION "BAT" P. C. B.
ASSEMBLY

MODEL
2720

DWG NO
2720-615

REV
C

#	REF DES	VALHALLA PART NO	DESCRIPTION	CODE IDENT	MFG PART NO	QTY.				REMARKS
						I	N	I	N	
1										
2		4-30133	Option "BAT" PCB	Valhalla	2720-715	1				
3										
4	PL1	5-10466	Connector, 15 pin, D, PC MNT, Male	Cannon	DA15PU	1				
5		5-10467	Spacer, 1/4 dia, 3/16Lg#4	Smith	9200	2				
6	RLA	5-03012	Relay, Reed, 5V	Sigma	191TE1A1 -5S	1				
7	D1	3-20034	Diode, Zener, 23V, 10%		1N5243	1				
8	D2, 3, 4	3-20002	Diode, Rectifier, 1A		1N4001	3				
9	TR1, 2	3-10013	NPN Transistor		2N4401	2				
10	R1	1-01061	10K ohm, 5%, 1/4W		RC07GF103J	1				
11	R2	1-01071	39K ohm, 5%, 1/4W		RC07GF393J	1				
12	R3	1-01012	27 ohm, 5%, 1/4W		RC07GF270J	1				
13										
14										
15			Screw, Phil, pan SS		4-40 x 5/16	2				
16			Washer Internal, S.		#4	2				
17			Nut Radio Hex		4-40	2				
18										
19										
20										
21										
22										
23										

NOTES:

SHT 2 OF 2

Federal Supply Codes for Manufacturers

00656 Aerovox Corp. New Bedford, Massachusetts	04713 Motorola Inc. Phoenix, Arizona	08261 Spectra Strip Corp. Garden Grove, California	12697 Clarostat Mfg. Co. Dover, New Hampshire
00686 Film Capacitors, Inc. Passaic, New Jersey	04946 Standard Wire & Cable Los Angeles, California	08530 Reliance Mica Corp. Brooklyn, New York	12969 Unitrode Corp. Watertown, Massachusetts
00779 AMP Inc. Harrisburg, Pennsylvania	05276 Pomona Electronics Co., Inc. Pomona, California	08806 General Electric Co. Cleveland, Ohio	13103 Thermalloy Co., Inc. Dallas, Texas
00853 Sangamo Electric Company Pickens, South Carolina	05277 Westinghouse Electric Corp. Youngwood, Pennsylvania	09026 Babcock Electronics Corp. Costa Mesa, California	13327 Solitron Devices Inc. Tappan, New York
01121 Allen-Bradley Co. Milwaukee, Wisconsin	05397 Kemet, Union Carbide Corp. New York, New York	09214 G. E. Co. Semi-Conductor Auburn, New York	13454 Texas Crystals River Grove, Illinois
01255 Litton Industries, Inc. Beverly Hills, California	05574 Viking Industries Chatsworth, California	09353 C and K Components Watertown, Massachusetts	13511 Amphenol Cadre Div. Los Gatos, California
01281 TRW Electronic Comp. Semiconductor Operations Lawndale, California	05820 Wakefield Engineering Inc. Wakefield, Massachusetts	09922 Burndy Corp. Norwalk, Connecticut	13606 Use 56289 Sprague Electric Co. Concord, New Hampshire
01295 Texas Instruments, Inc. Dallas, Texas	06001 General Electric Co. Columbia, South Carolina	09969 Dale Electronics Inc. Yankton, S. Dakota	14099 Semtech Corp. Newbury Park, California
01686 RCL Electronics Inc. Manchester, New Hampshire	06383 Panduit Corp. Tinley Park, Illinois	11236 CTS of Berne Berne, Indiana	14655 Cornell-Dublier Electronics Newark, New Jersey
02114 Ferroxcube Corp. Saugerties, New York	06473 Bunker Ramo Corp. Chatsworth, California	11403 Best Products Co. Chicago, Illinois	14752 Electro Cube Inc. San Gabriel, California
02131 General Instrument Corp. Westwood, Maine	06555 Beede Electrical Instrument Co. Penacook, New Hampshire	11503 Keystone Columbia Inc. Warren, Michigan	14936 General Instrument Corp. Hicksville, New York
02799 Aero Capacitors, Inc. Chatsworth, California	06743 Clevite Corp. Cleveland, Ohio	11532 Teledyne Relays Hawthorne, California	15801 Fenwal Electronics Inc. Framingham, Massachusetts
03508 General Electric Co. Syracuse, New York	07088 Kelvin Electric Company Van Nuys, California	11711 General Instrument Corp. Hicksville, New York	15818 Teledyne Semiconductors Mountain View, California
03797 Genisco Technology Corp. Compton, California	07256 Silicon Transistor Corp. Chelmsford, Massachusetts	12014 Chicago Rivet & Machine Co. Bellwood, Illinois	15849 Useco Inc. Van Nuys, California
03877 Transistron Electronic Corp. Wakefield, Massachusetts	07263 Fairchild Semiconductor Mountain View, California	12060 Diodes, Inc. Chatsworth, California	15898 International Business Machines Corp. Essex Junction, Vermont
03911 Clairex Corp. Mt. Vernon, New York	07344 Bircher Co., Inc. Rochester, New York	12136 Philadelphia Handle Co. Camden, New Jersey	16332 Replaced by 28478
04009 Arrow Hart Inc. Hartford, Connecticut	07597 Burndy Corp. Rochester, New York	12405 Hysol Corporation El Monte, California	16473 Cambridge Scientific Ind. Cambridge, Maryland
04217 Essex International Inc. Anaheim, California	07716 I R C Incorporated Burlington, Iowa	12406 Elpac, Incorporated Fullerton, California	16758 Delco Electronics Kokomo, Indiana
04222 AVX Corp. Myrtle Beach, Florida	07910 Teledyne Semiconductor Hawthorne, California	12615 U.S. Terminals Inc. Cincinnati, Ohio	17856 Siliconix, Inc. Santa Clara, California
04423 Telonic Industries Laguna Beach, California	08065 Accurate Rubber and Plastics Co. San Diego, California	12617 Hamlin Inc. Lake Mills, Wisconsin	18324 Signetics Corp. Sunnyvale, California

Federal Supply Codes for Manufacturers (cont.)

18612 Vishay Intertechnology Inc. Malvern, Pennsylvania	32539 Mura Corp. Great Neck, New York	63743 Ward Leonard Electric Co., Inc. Mount Vernon, New York	73899 JFD Electronics Co. Brooklyn, New York
18722 R C A Mountaintop, Pennsylvania	32897 Erie Technological Products, Inc. Carlisle, Pennsylvania	65092 Weston Instruments Inc. Newark, New Jersey	73949 Guardian Electric Mfg. Co. Chicago, Illinois
18927 GTE Sylvania Inc. Titusville, Pennsylvania	32997 Bourns Inc. Riverside, California	70563 Amperite Company Union City, New Jersey	74276 General Instrument Corp. Neptune, New Jersey
21604 Buchey Stamping Co. Columbus, Ohio	33173 General Electric Co. Owensboro, Kentucky	70903 Belden Corp. Geneva, Illinois	74306 Piezo Crystal Co. Carlisle, Pennsylvania
21845 Solitron Devices Inc. Riviera Beach, Florida	34333 Silicon General Westminster, California	71279 Cambridge Thermionic Corp. Cambridge, Massachusetts	74970 Johnson E.F., Co. Waseca, Minnesota
22767 ITT Semiconductors Palo Alto, California	34335 Advanced Micro Devices Sunnyvale, California	71400 Busmann Mfg. Saint Louis, Missouri	75042 TRW Electronics Components IRC Fixed Resistors Philadelphia, Pennsylvania
23936 Pamotor Div. Burlingham, California	34802 Electromotive Inc. Kenilworth, New Jersey	71450 CTS Corp. Elkhart, Indiana	75378 CTS Knights Inc. Sandwich, Illinois
24355 Analog Devices Inc. Norwood, Massachusetts	37942 P.R. Mallory & Co., Inc. Indianapolis, Indiana	71488 ITT Cannon Electric Inc. Santa Ana, California	75382 Kulka Electric Corp. Mount Vernon, New York
24655 General Radio Concord, Massachusetts	43543 Nytronics Inc. Geneva, New York	71482 Clare, C.P. & Co. Chicago, Illinois	75915 Littlefuse Inc. Des Plaines, Illinois
25088 Siemen Corp. Islen, New Jersey	44655 Ohmite Mfg. Co. Skokie, Illinois	71590 Centrelab Electronics Milwaukee, Wisconsin	76055 Mallory Controls Frankfort, Indiana
25403 Amperex Electronic Corp. Slatersville, Rhode Island	49671 RCA Corp. New York, New York	71707 Coto Coil Co., Inc. Providence, Rhode Island	76493 J.W. Miller Company Los Angeles, California
25684 Victoreen Instrument Co., Inc. Oak Lawn, Illinois	49956 Raytheon Company Lexington, Massachusetts	71744 Chicago Miniature Lamp Works Chicago, Illinois	76854 Oak Industries Inc. Crystal Lake, Illinois
27014 National Semiconductor Corp. Santa Clara, California	50088 Mostek Corp. Carrollton, Texas	71785 TRW Electronics Components Chicago, Illinois	77342 Potter & Brumfield Div. Princeton, Indiana
27556 IMB Electronic Products Santa Fe Springs, California	50579 Litronix Inc. Cupertino, California	72005 Wilber B. Driver Co. Newark, New Jersey	77638 General Instrument Corp. Rectifier Division Brooklyn, New York
27264 Molex Products Downers Grove, Illinois	51605 Scientific Components Inc. Linden, New Jersey	72259 Nytronics Inc. Pelham Manor, New Jersey	78488 Stackpole Carbon Co. Saint Marys, Pennsylvania
28213 Minnesota Mining & Mfg. Co. St. Paul, Minnesota	53021 Sangamo Electric Co. Springfield, Illinois	72619 Dialight Div. Brooklyn, New York	78553 Eaton Corp. Cleveland, Ohio
28480 Hewlett Packard Co. Palo Alto, California	53504 Valhalla Scientific, Inc. San Diego, California	72800 Erie Tech. Products Inc. Erie, Pennsylvania	80031 Electro-Midland Corp. Mepco Div. Norristown, New Jersey
29083 Monsanto Co., Inc. Santa Clara, California	54294 Cutler-Hammer Inc. Selma, North Carolina	73138 Bechman Instrument Inc. Helipot Division Fullerton, California	56289 Sprague Products North Adams, Massachusetts
29604 Stackpole Components Co. Raleigh, North Carolina	55026 Simpson Electric Co. Elgin, Illinois	73445 Amperex Electronic Corp. Hicksville, New York	80294 Bourns Inc., Instrument Div. Riverside, California
30323 Illinois Tool Works, Inc. Chicago, Illinois	56289 Sprague Electric Co. North Adams, Massachusetts	73734 Federal Screw Products, Inc. Chicago, Illinois	81073 Grayhill, Inc. La Grange, Illinois
30983 Electra/Midland San Diego, California	58474 Superior Electric Co. Bristol, Connecticut		

Federal Supply Codes for Manufacturers (cont.)

81095 Triad Transformer Corp. Venice, California	89730 G.E. Co. Newark, New Jersey	95348 Gordo's Corp. Bloomfield, New Jersey
81312 Winchester Electronics Div. of Litton Industries Inc. Oakville, Connecticut	90201 Mallory Capacitor Co. Indianapolis, Indiana	95712 Bendix Corp. Franklin, Indiana
81483 International Rectifier Corp. Los Angeles, California	56365 Square D Co. Chicago, Illinois	97913 Industrial Electronic Hardware Corp. New York, New York
81741 Chicago Lock Co. Chicago, Illinois	90303 Mallory Battery Co. Tarrytown, New York	97945 Penwalt Corp. SS White Industrial Products Div. Piscataway, New Jersey
82389 Switchcraft Inc. Chicago, Illinois	91094 Essex International Inc. Newmarket, New Hampshire	98278 Malco A. Microdot Co., Inc. Connector & Cable Div. Pasadena, California
82877 Rotron Inc. Woodstock, New York	91293 Johanson Mfg. Co. Boonton, New Jersey	98291 Seaelectro Corp. Mamaroneck, New York
82879 ITT Royal Electric Div. Pawtucket, Rhode Island	91506 Augat Inc. Attleboro, Massachusetts	98388 Royal Industries Products Div. San Diego, California
83003 Varo Inc. Garland, Texas	91637 Dale Electronics Inc. Columbus, Nebraska	98978 IERC Burbank, California
83298 Bendix Corp. Eatontown, New Jersey	91662 Elco Corp. Willow Grove, Pennsylvania	99120 Plastic Capacitors, Inc. Chicago, Illinois
83330 Herman H. Smith, Inc. Brooklyn, New York	71468 Gremar Mfg. Co., Inc. ITT Cannon/Gremar Santa Ana, California	99217 Bell Industries Elect Burbank, California
83594 Burrhoughs Corp. Plainfield, New Jersey	91802 Industrial Devices, Inc. Edgewater, New Jersey	99392 STM Oakland, California
83740 Union Carbide Corp. New York, New York	91833 Keystone Electronics Corp. New York, New York	99515 ITT Jennings Monrovia Plant Monrovia, California
84171 Arco Electronics Great Neck, New York	91929 Honeywell Inc. Micro Switch Div. Freeport, Illinois	99779 Use 29587 Bunker-Ramo Corp. Landsdowne, Pennsylvania
84411 TRW Electronic Components Ogallala, Nebraska	92194 Alpha Wire Corp. Elizabeth, New Jersey	99942 Centrelab Semiconductor El Monte, California
84613 Fuse Indicator Corp. Rockville, Maryland	93332 Sylvania Electric Products Woburn, Massachusetts	
84682 Essex International Inc. Peabody, Massachusetts	94988 Wagner Electric Corp. Tung-Sol Div. Newark, New Jersey	
86684 Radio Corp. of America Harrison, New Jersey	95146 Alco Electronic Products Inc. Lawrence, Massachusetts	
88219 Gould Inc. Trenton, New Jersey	95275 Vitramon Inc. Bridgeport, Connecticut	
88245 Litton Systems Inc. Useco Div. Van Nuys, California	95303 RCA Corp. Receiving Tube Div. Cincinnati, Ohio	
88419 Cornell-Dubilier Electronic Div. Fuquay-Varian, North Carolina		

