

# **SERVICE MANUAL**

## **COMMODORE**

PC 10/20

DEUTSCH/ENGLISCH

## INHALTSVERZEICHNIS

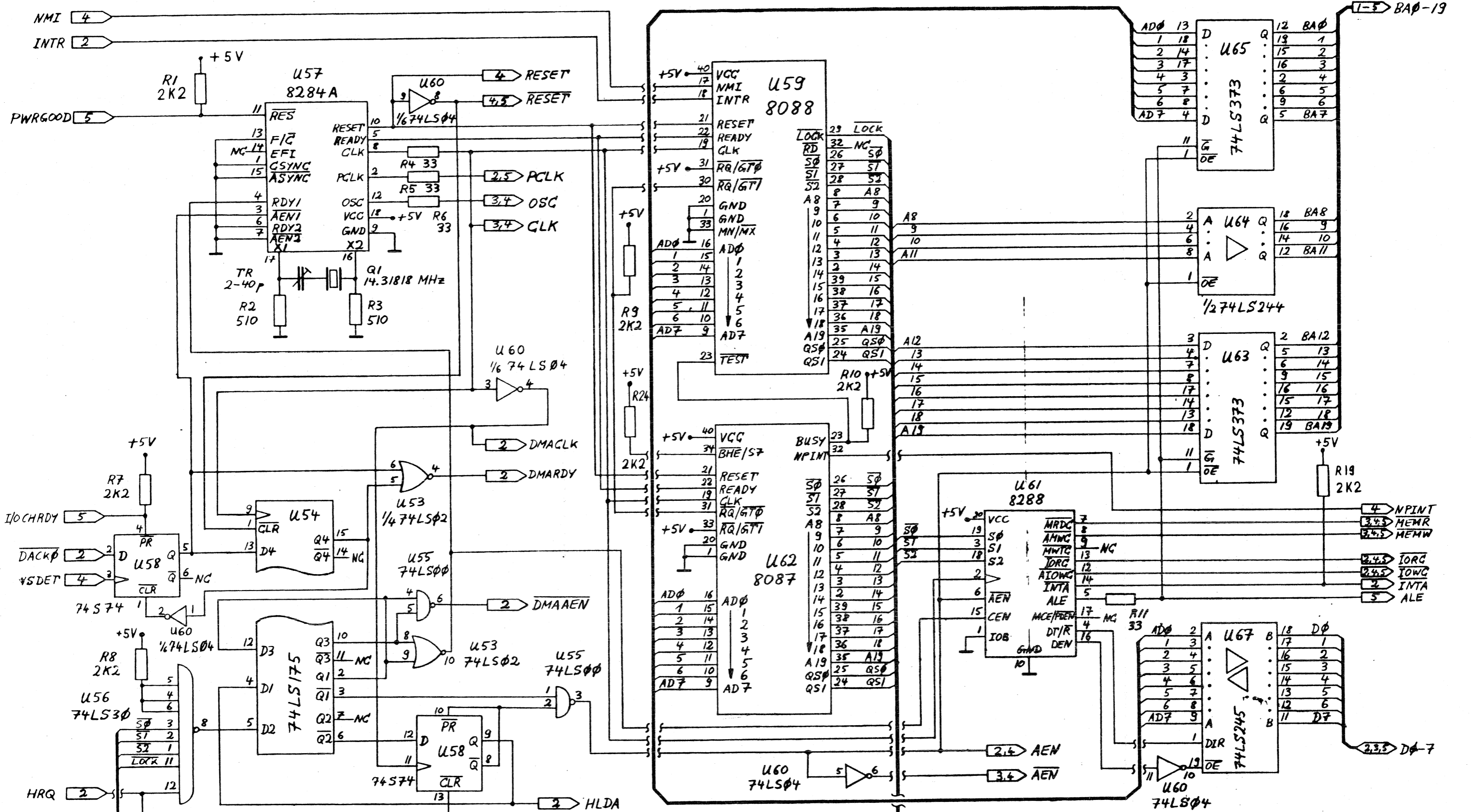
=====

### MANUAL PC 10/20 UND PC10/20 II

A. SCHEMATIC	SEITE VON	SEITE
CPU PCB	1 - 5	1
I/O PCB	1 - 4	5
COMBINED MAINBOARD	1 - 9	9
RAM EXTENSION CARD 384 KB	1 - 1	18
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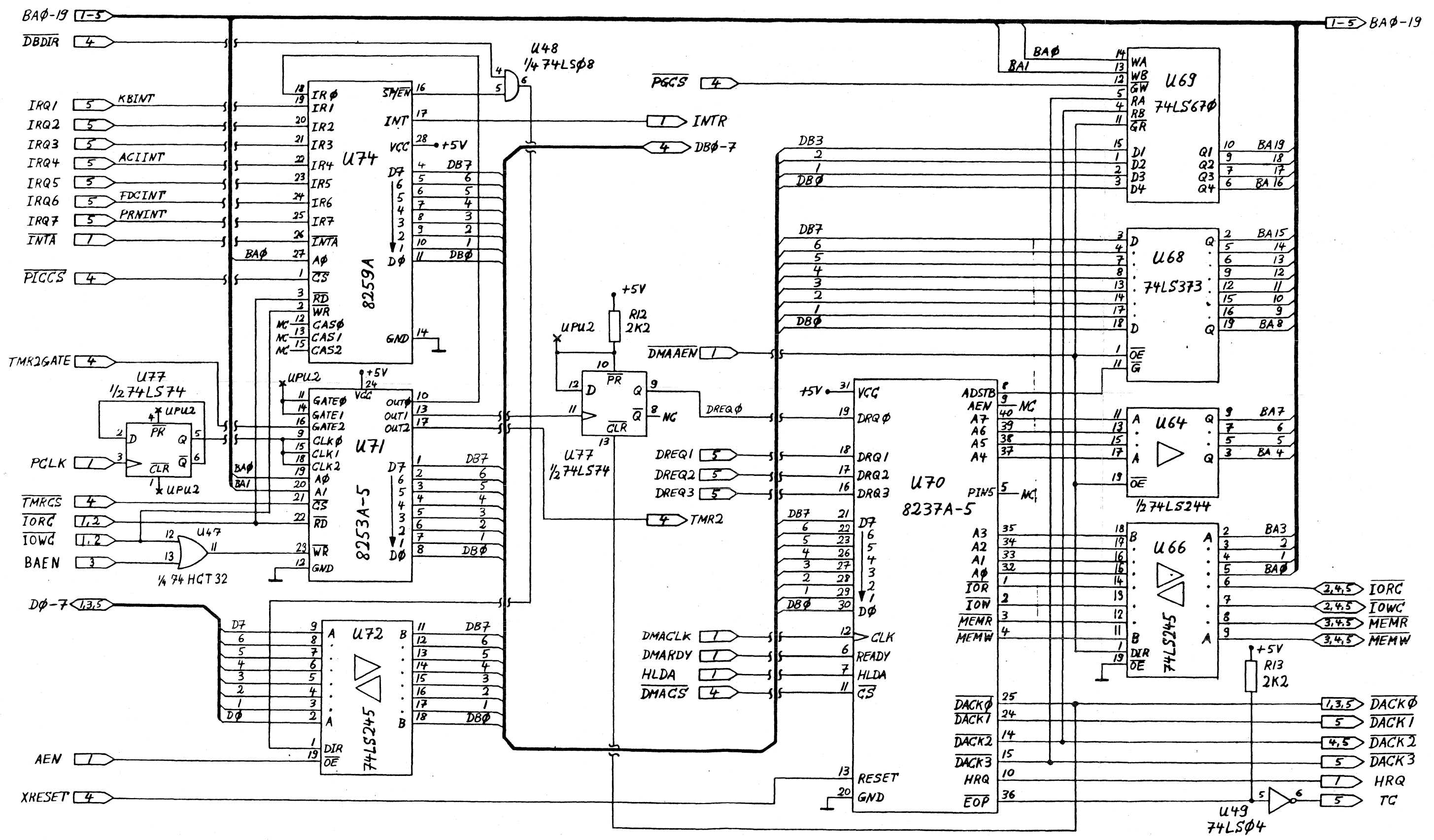
05/86

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVE
I		PRODUCTION RELEASE		
J		REVISED PER ECO 850134	9-12-85	X & [Signature]



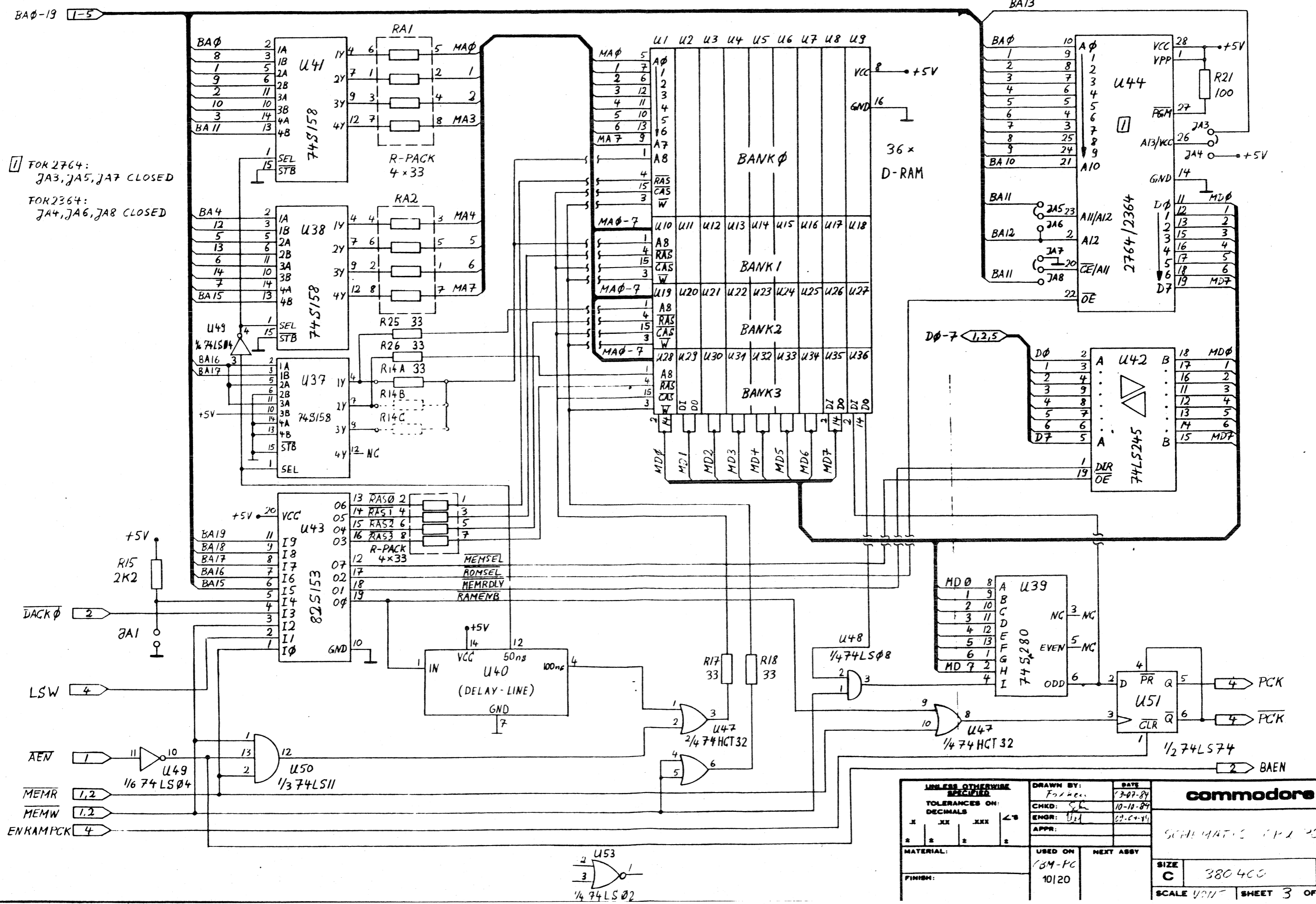
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TOLERANCES ON DECIMALS		CHEK: [Signature]	10-10-84
X XX XXX		ENGR: [Signature]	09-07-84
MATERIAL:		APPR:	
FINISH:		USED ON: CBM-PC	NEXT ASSY:
		10/20	
commodore			SCALE: 1/8" = 1"
			REV: J
SCHEMATIC CPU PCB			SIZE: C 380 400

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



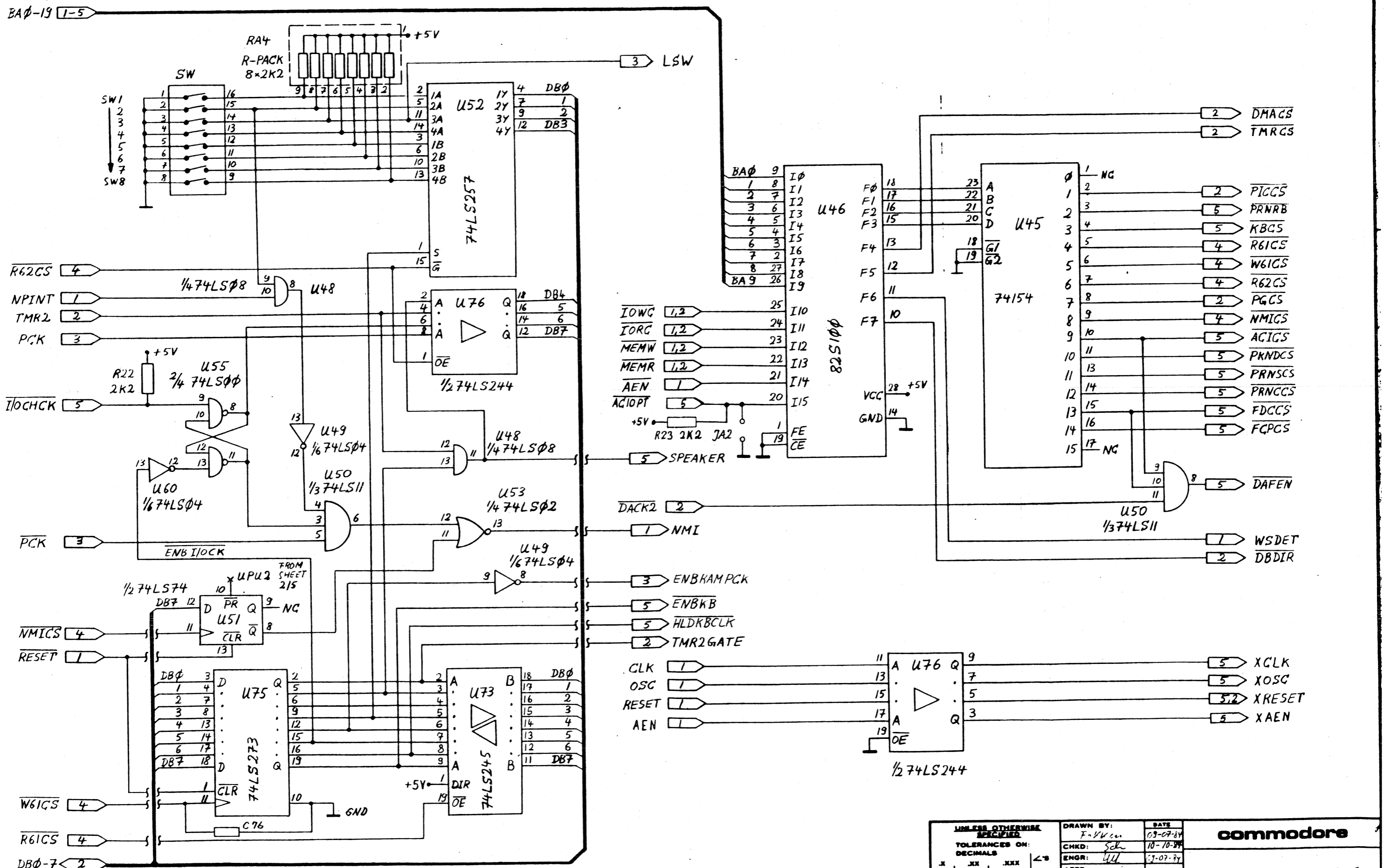
UNLESS OTHERWISE SPECIFIED	DRAWN BY: <i>Folkien</i>	DATE: 09-07-84	<b>commodore</b>
TOLERANCES ON DECIMALS	CHKD: <i>SP</i>	10-10-84	
.X .XX .XXX .4"	ENGR: <i>Ull</i>	09-02-84	SCHEMATIC CPU PCB
MATERIAL:	USED ON: CBM-PC 10120	NEXT ASSY:	
FINISH:	SIZE: C	380 400	REV: J
	SCALE: NONE	SHEET: 2 OF 5	

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



UNLESS OTHERWISE SPECIFIED	DRAWN BY: Forher	DATE: 7-07-84	<b>commodore</b>
TOLERANCES ON DECIMALS	CHKD: SK	10-10-84	
.X .XX .XXX ←"	ENGR: UH	02-C-74	SCHEMATIC COPY PCB 3
MATERIAL:	APPR:		
FINISH:	USED ON: 10M-PC	NEXT ASSY: 10120	SIZE C 380400 REV J
			SCALE 400% SHEET 3 OF 5

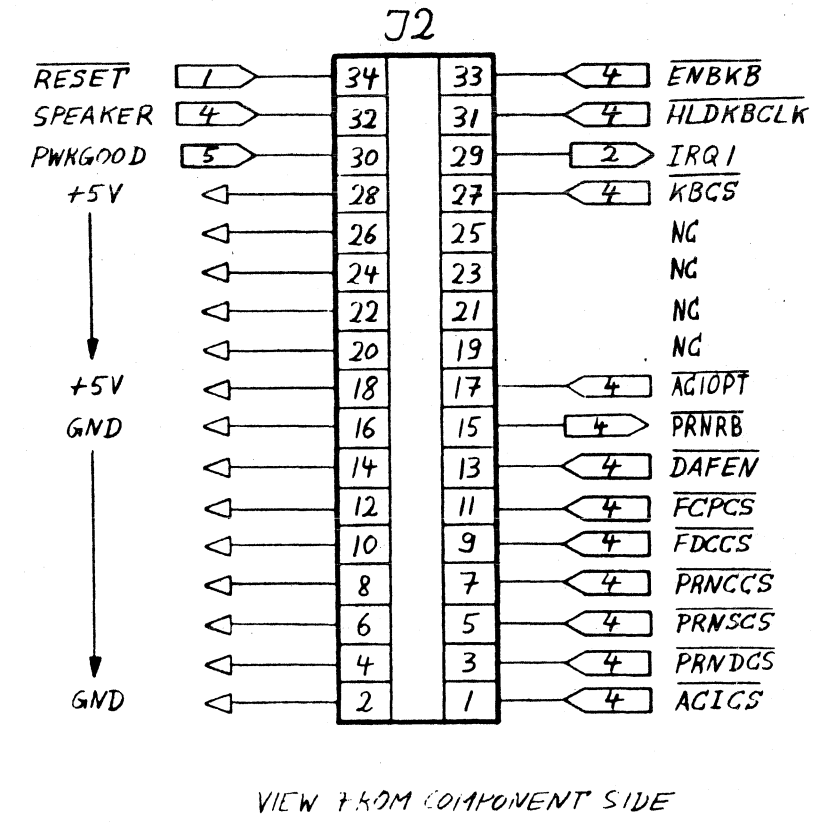
REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
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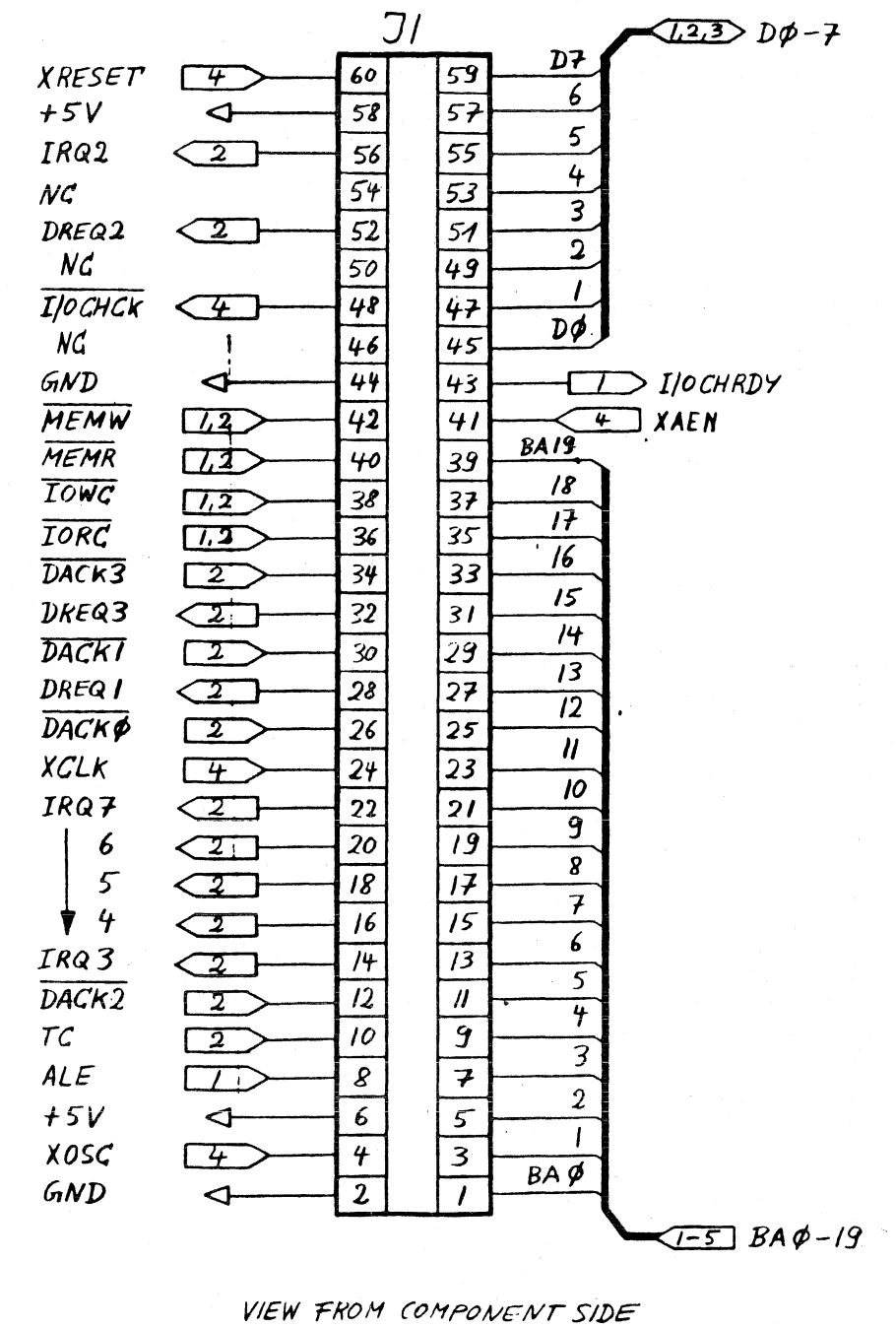
UNLESS OTHERWISE SPECIFIED		DRAWN BY: F. V. W.	DATE: 03-09-84	commodore
TOLERANCES ON DECIMALS		CHKD: Sch	10-10-84	
.X	.XX	.XXX	<'S	ENGR: WU
±	±	±	±	APPR:
MATERIAL:		USED ON: CBM-PC	NEXT ASSY:	SCHEMATIC CPU PCB 4
FINISH:		10120		
SIZE: C	380400	REV: J	SCALE NONE SHEET 4 OF 5	

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

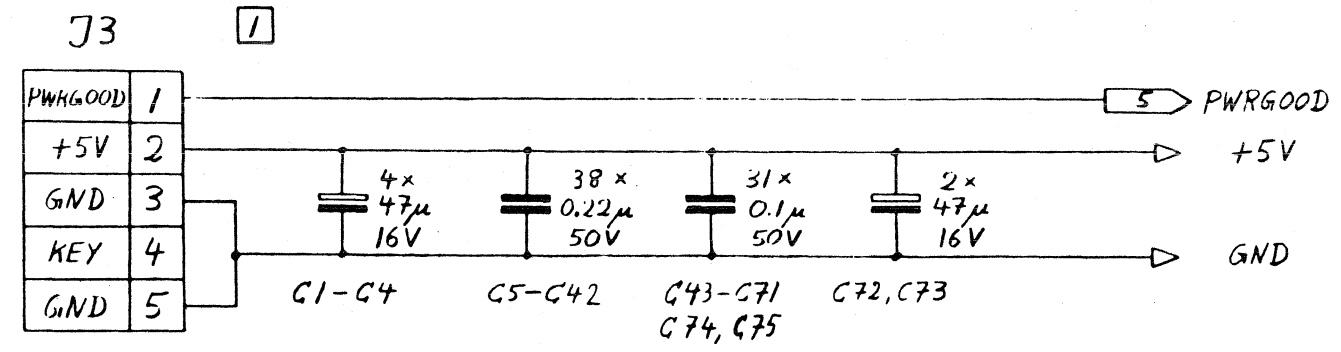
CPU-I/O-CONNECTOR II



CPU-I/O-CONNECTOR I



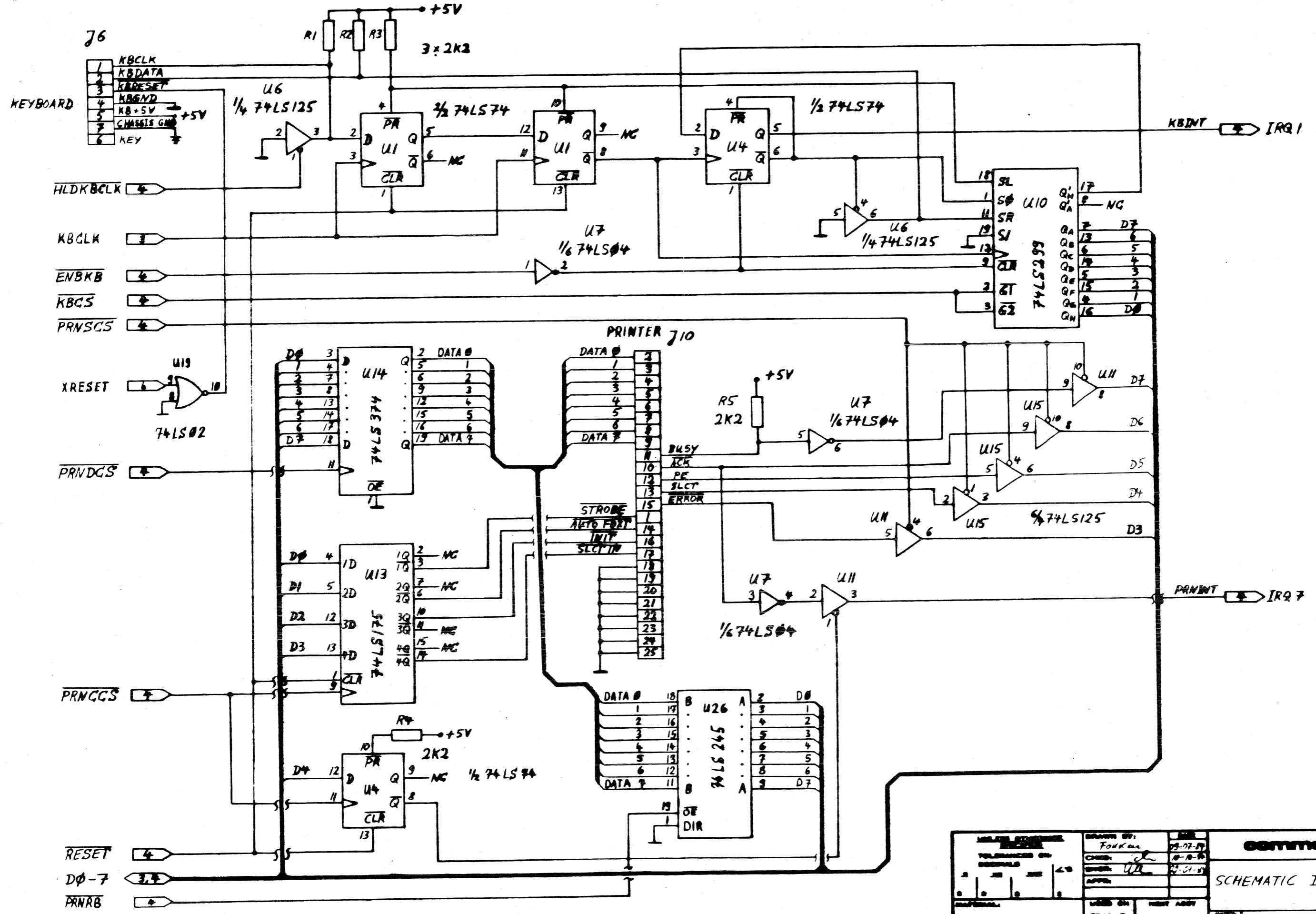
CPU-POWER-CONNECTOR



1 J3 NOT USED ON DESKTOP VERSION

UNLESS OTHERWISE SPECIFIED TOLERANCES ON: DECIMALS	DRAWN BY: <i>Falken</i>	DATE 09-07-84	<b>commodore</b>
	CHKD:	ENGR: <i>Uiz</i>	
.X .XX .XXX	APPR:		SCHMATIC CPU PCB
MATERIAL:	USED ON CBM-PC	NEXT ASSY	5
FINISH:	10/20		SIZE C 380400 REV J
SCALE N/A			SHEET 5 OF 5

REVISIONS			
LTR	ZONE	DESCRIPTION	DATE

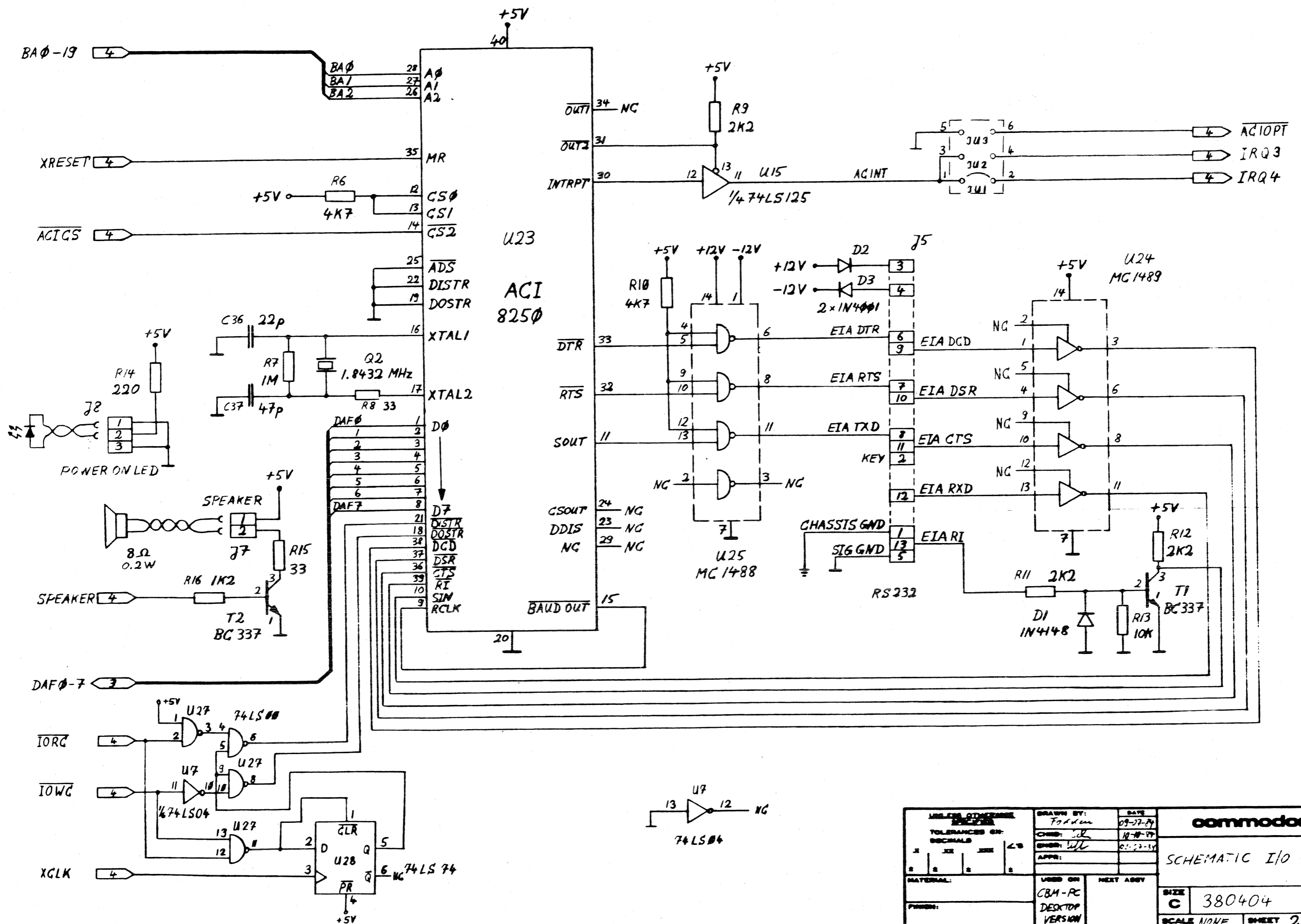


DESIGNER: TOLERANCES UNLESS SPECIFIED: .1" .125" .156" .25" .5" 1"	DRAWN BY: FORK... CHECKED: SPEC: U2... APPR:	DATE: 75-07-19 10-0-80 12-01-81	<b>Commodore</b> SCHEMATIC I/O PCB3 6 REV K
PARTS LIST: QTY: PART: DESC: VER: UNIT: PRICE: TOTAL: COMMENTS:	USED ON: CBM-PC DESKTOP VERSION:	PART NO: 380404	SCALE: NONE SHEET 1 OF 4



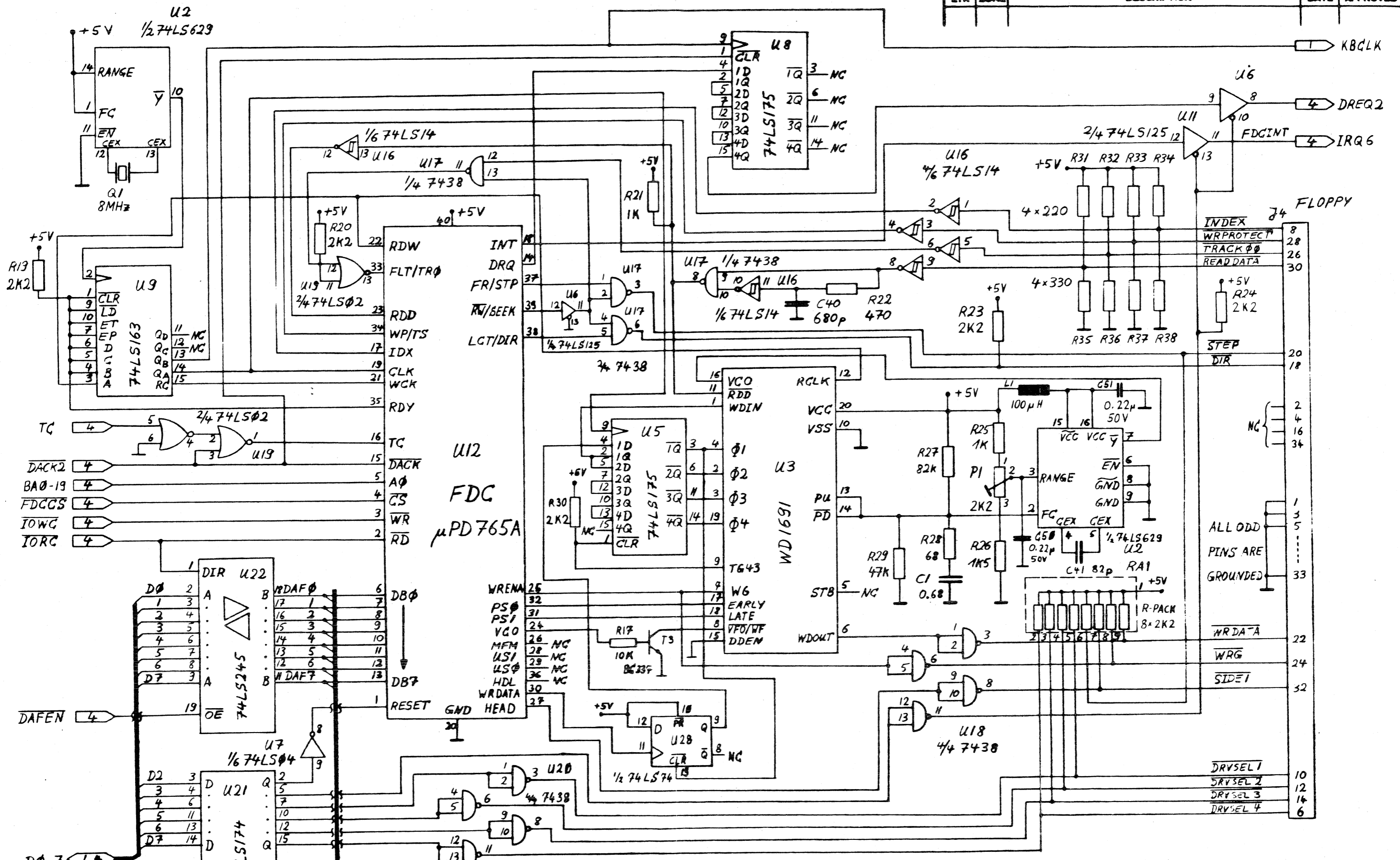
REVISIONS

LTR	ZONE	DESCRIPTION	DATE	APPROVED



UNLESS OTHERWISE SPECIFIED TOLERANCES IN DECIMALS .1 .2 .5 1 2 5 10 20 50 100 PERCENT	DRAWN BY: <i>F. J. ...</i> DATE: 09-27-84 CHECKED: <i>...</i> DATE: 10-10-84 DESIGNED: <i>...</i> DATE: 08-22-84 APPR:	<b>commodore</b> SCHEMATIC I/O PCB SIZE C 380404 SCALE NONE SHEET 2 OF 4
MATERIAL:	USED ON: CBM-PC DESKTOP VERSION	REV: K

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED

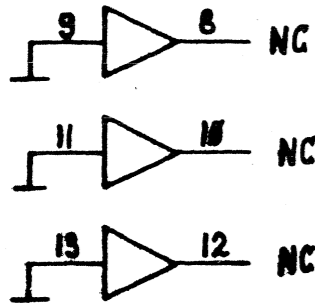


TOLERANCES UNLESS SPECIFIED RESISTORS: 1% CAPACITORS: 5% DIMENSIONS: 0.005"	DRAWN BY: Fjddm CHECKED: SCL DATE: 09-07-84 10-0-84 03-07-84	<b>commodore</b> SCHEMATIC I/O PCB 8 SIZE C 380404 SCALE NONE SHEET 3 OF 4
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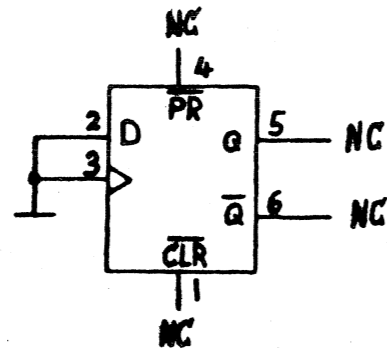


SPARES:

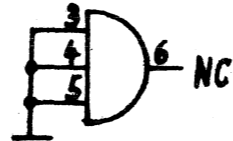
U3  
3/6 7407



U69  
1/2 74LS74



U31  
1/3 74LS11

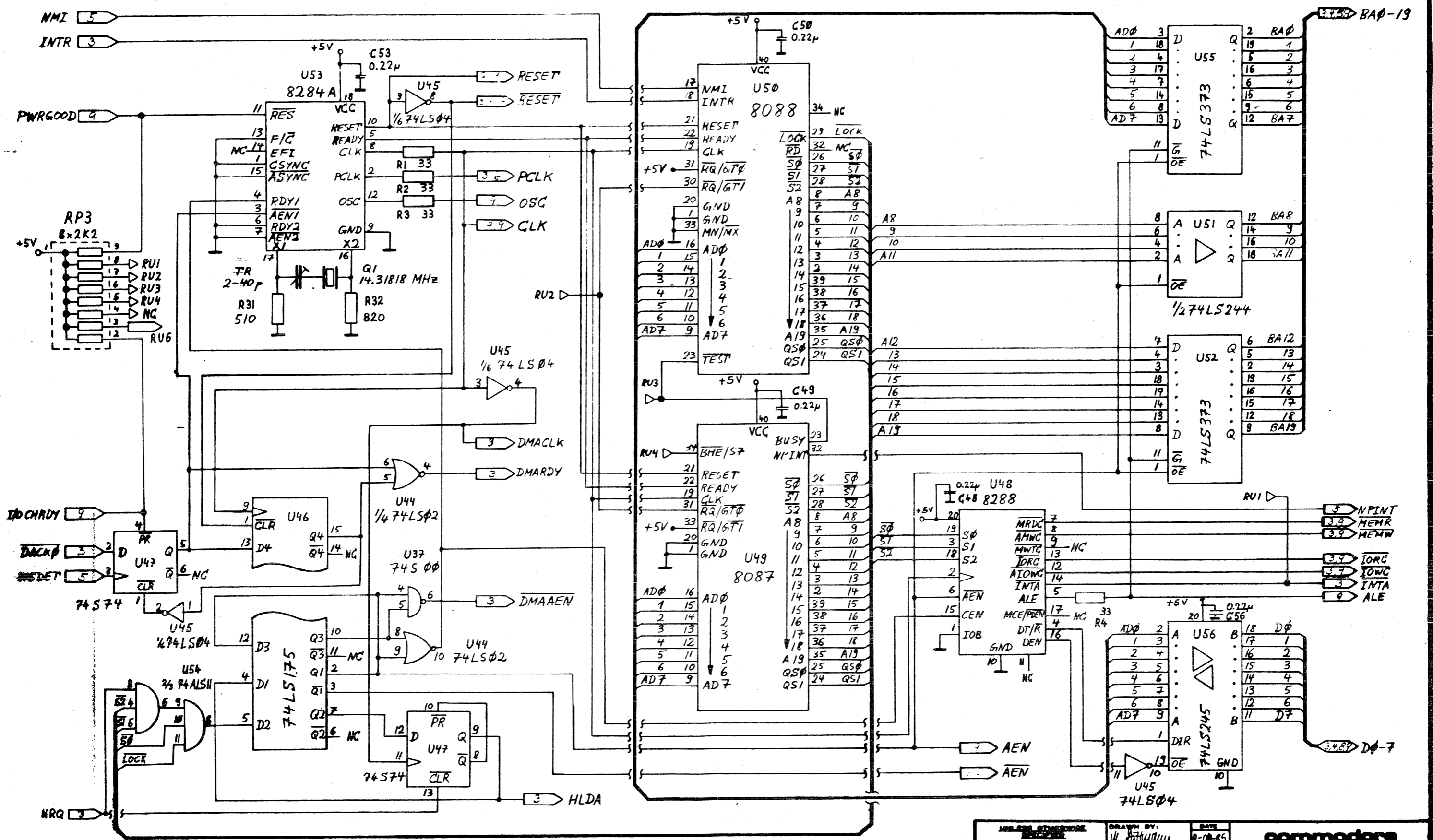


**REVISIONS**

LTR	ZONE	DESCRIPTION	DATE	APPROVED
Ø		ADVANCED ENGINEERING RELEASE	09-13-85	
1		UPDATE	10-1-85	
2		UPDATE	10-17-85	
3		UPDATE	11-05-85	
4		PILOT PRODUCTION RELEASE	11-14-85	<i>Slr</i>

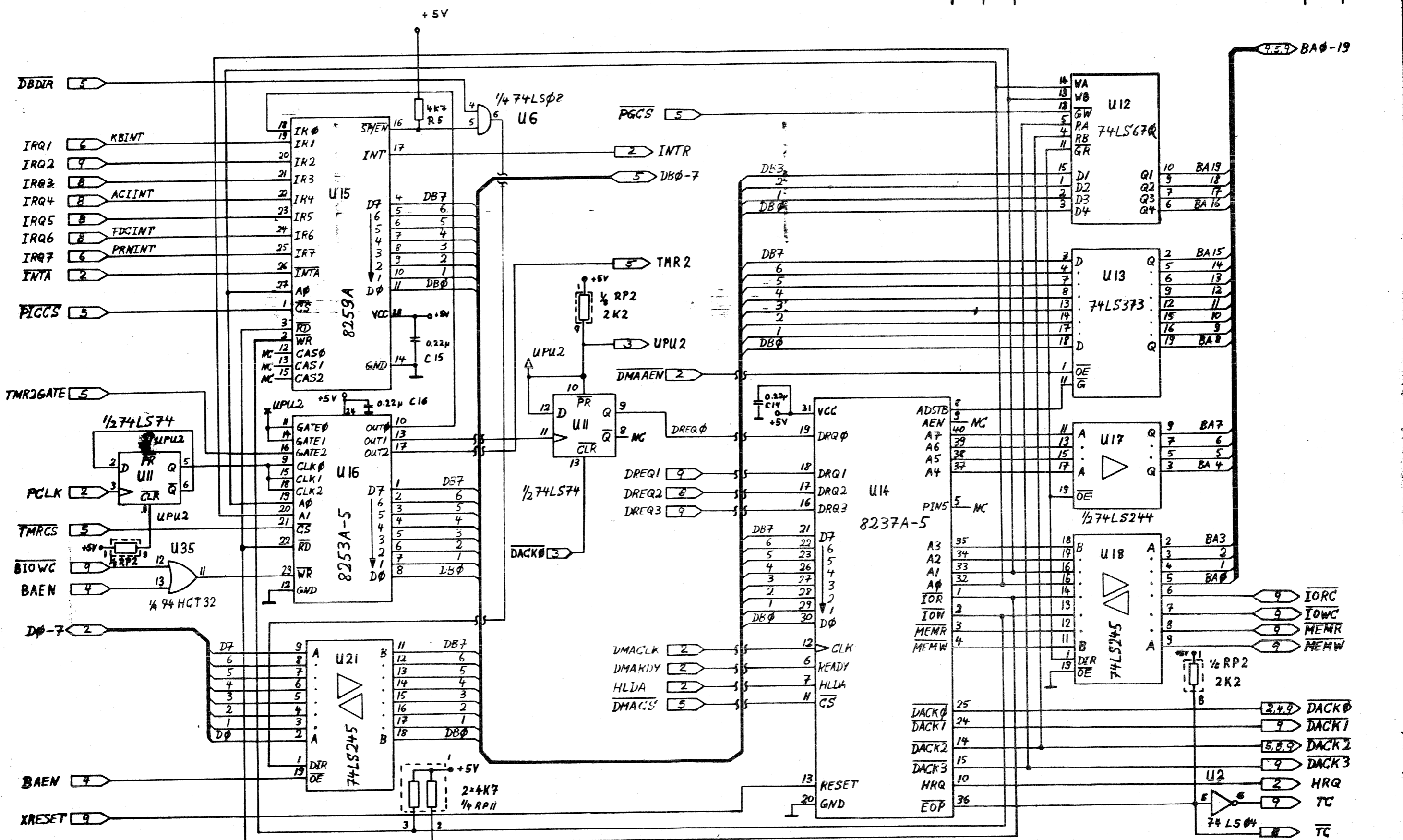
UNLESS OTHERWISE SPECIFIED TOLERANCES ON: DECIMALS X .XX .XXX .4'S		DRAWN BY: <i>H. Hoffmann</i>	DATE: 09-12-85	<b>commodore</b>		
MATERIAL: FINISH:		CHKD: ENGR: <i>U...</i> APPR: <i>Slr</i>	DATE: 11-14-85			SCHEMATIC 10 COMBINED MAINBOARD
		USED ON: PC 10/20	NEXT ASSY:	SIZE: B	380504	REV: 4
				SCALE:	SHEET 1 OF 9	

REVISIONS			DATE	APPROVED
LTR	ZONE	DESCRIPTION		
		SEE SHEET 1		



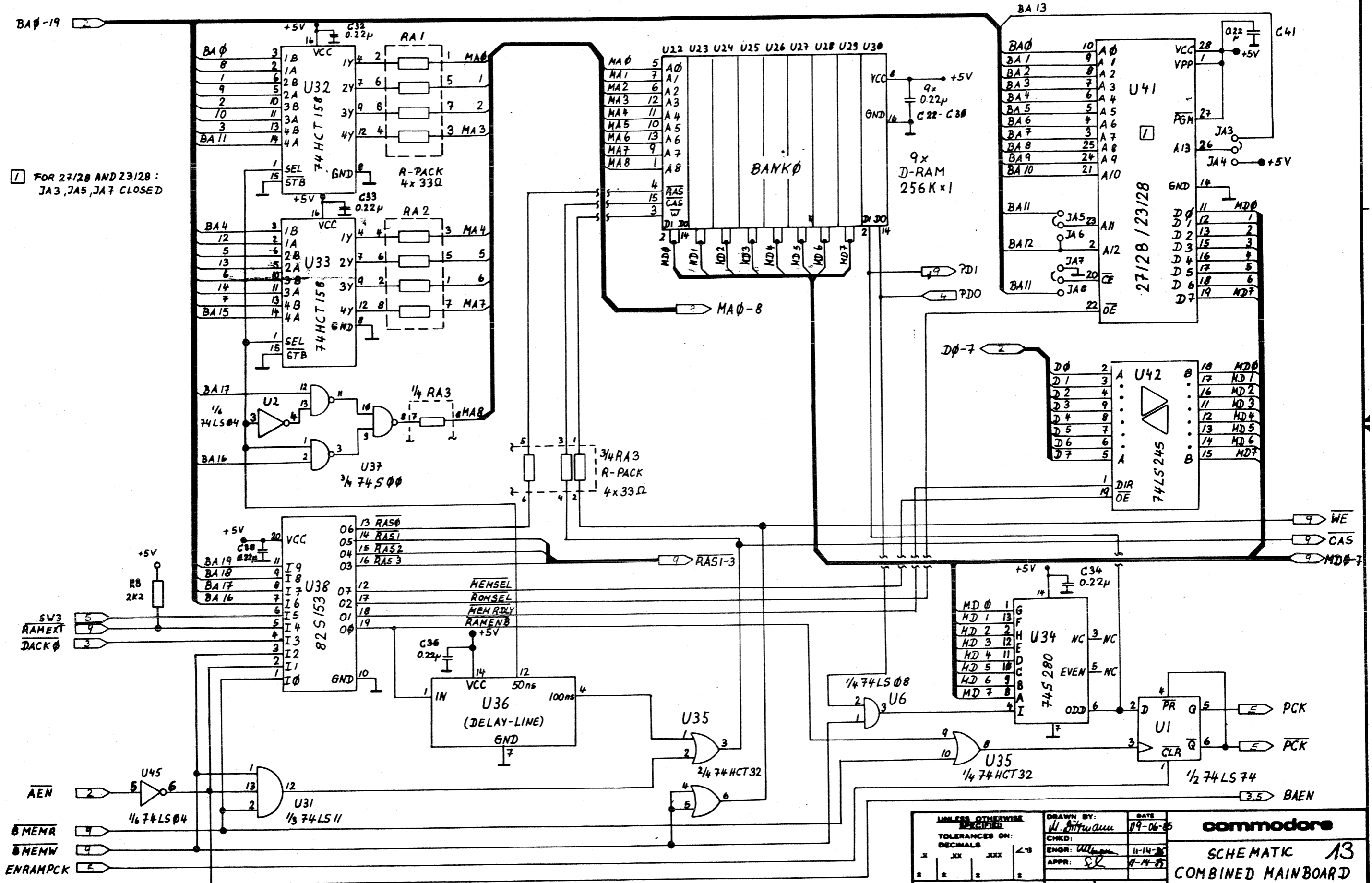
UNLESS OTHERWISE SPECIFIED TOLERANCES ON: DIMS: MILLIMETERS ANGLES: DEGREES	DRAWN BY: <i>V. Antikarov</i> CHECKED: <i>Kernik</i> ENGR: <i>Ullrich</i> APPR: <i>S.K.</i>	DATE: 8-04-85 07-05-85 11-14-85 11-19-85	<b>Commodore</b> SCHEMATIC COMBINED MAIN BOARD <i>AA</i>
MATERIAL: FINISH:	USED ON: PC 10/20 CDMB	NEXT ASSY:	SIZE: <b>C</b> 380504 SCALE: NONE SHEET 2 of 9

LTR		ZONE	DESCRIPTION	DATE	APPROVED



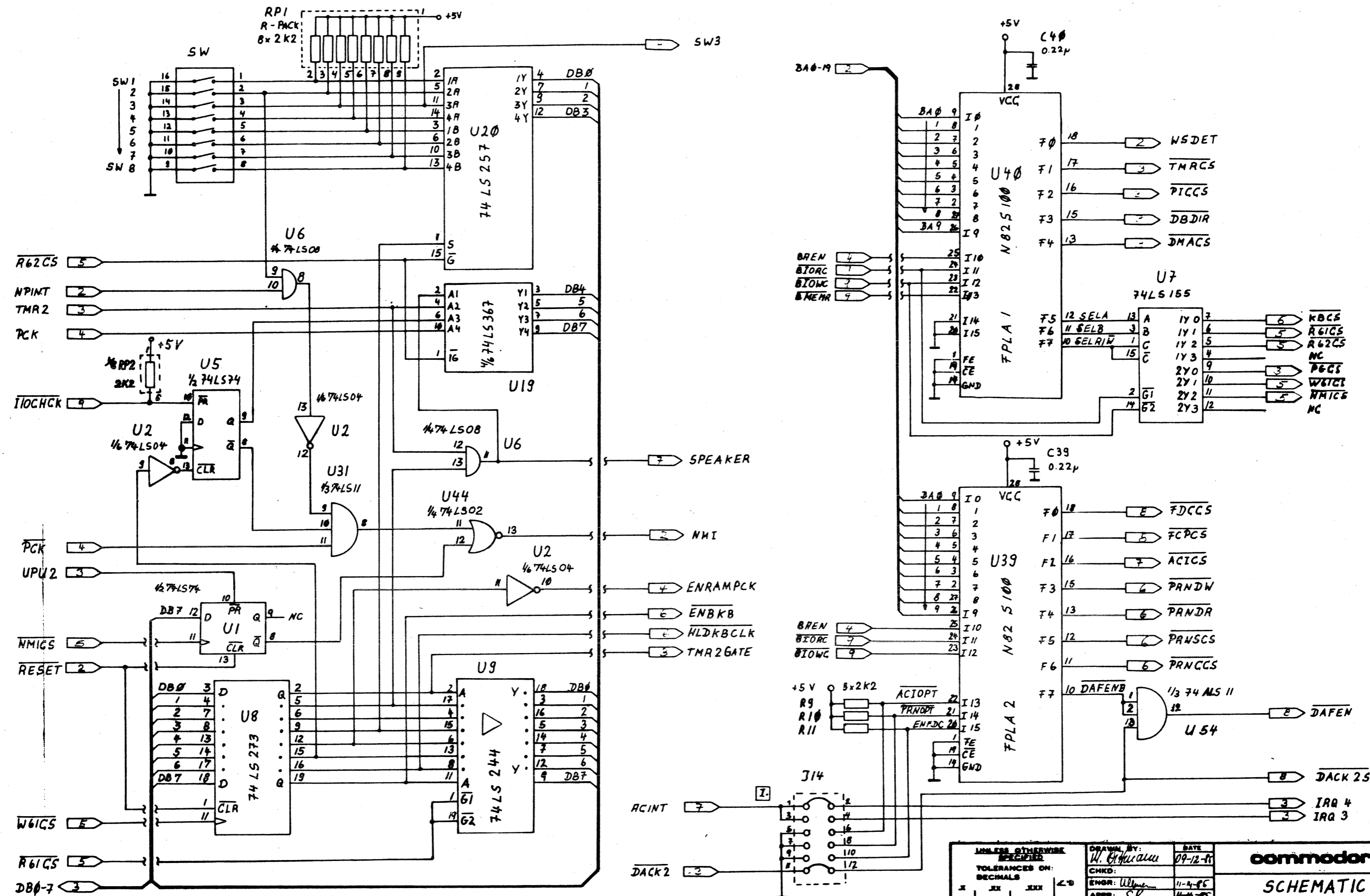
MILLER STANDARD TOLERANCES ON: DIMENSIONS FRACTIONS DECIMALS ANGLES .	DRAWN BY: <i>W. A. ...</i> CHECKED: <i>R. ...</i> ENGR: APPR: <i>S. ...</i>	DATE: 10-05-85 10-05-85 1-14-85 1-14-85	<b>Commodore</b> SCHEMATIC 12 COMBINED MAINBOARD SIZE C 380504 SCALE NONE SHEET 3 OF 3
MATERIAL:	USED ON: PC10/20 COMB	NEXT ASSY:	

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>M. Pittman</i>		DATE: 09-06-85	
TOLERANCES ON:		CHKD: <i>W. [unclear]</i>		ENGR: <i>W. [unclear]</i>	
DECIMALS		APPR: <i>SL</i>		11-14-85	
X	XX	XXX	°		
±	±	±	±		
MATERIAL:		USED ON: CBM		NEXT ASSY:	
FINISH:		PC10/20			
commodore				SCHEMATIC 13	
				COMBINED MAINBOARD	
SIZE C		380504		REV 4	
SCALE NONE		SHEET 4 OF 9			

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
SEE SHEET 1				

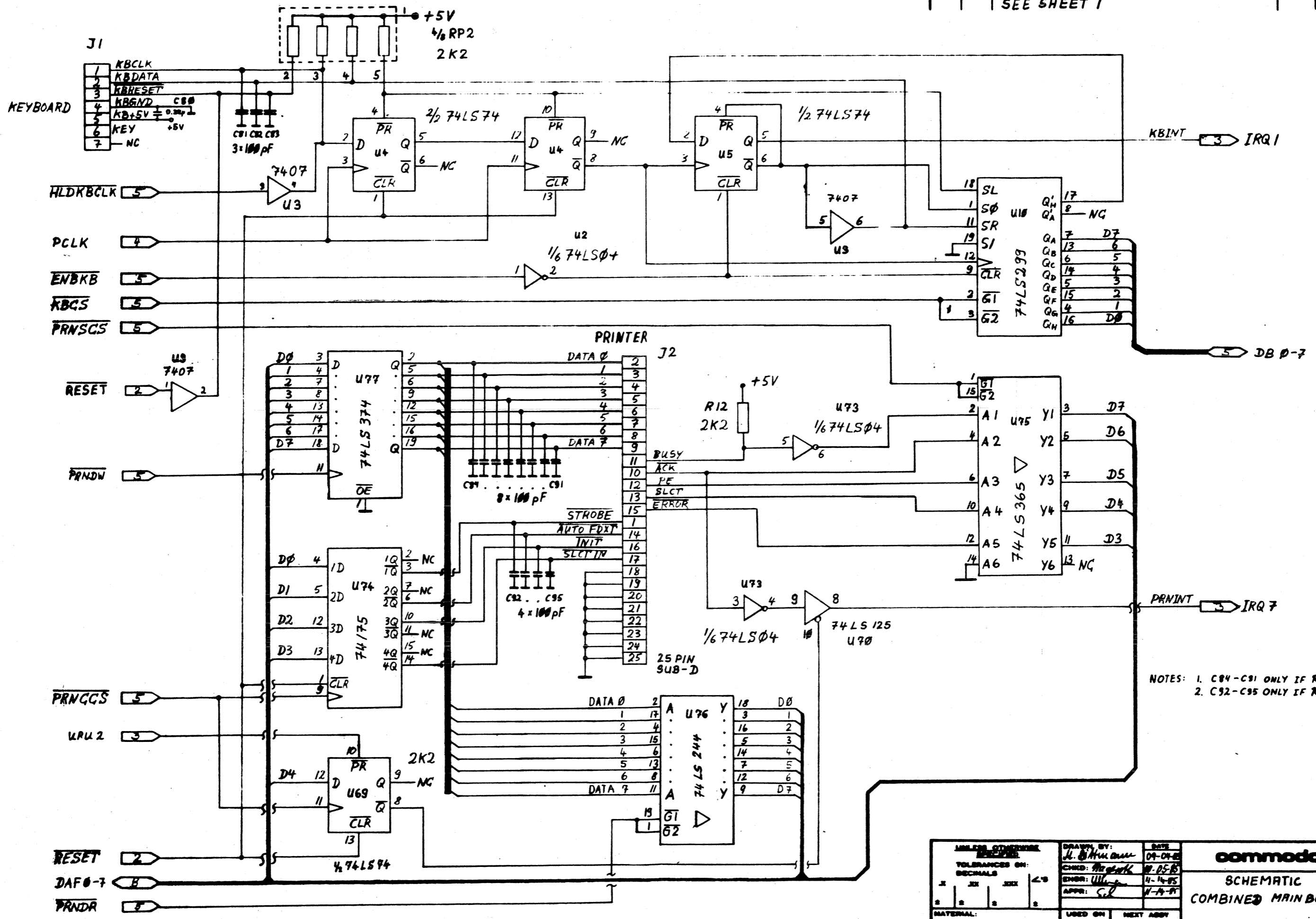


NOTES: [I] DISABLE FDC : OPEN J14 (11,12) & CLOSE J14 (9,10)  
 SWITCH PRINTER BASE ADDRESS TO 3BC HEX : CLOSE J14 (7,8)  
 SWITCH ACIA BASE ADDRESS TO 2FB HEX : CLOSE J14 (5,6) & J14 (13,4) - OPEN J14 (1,2)

UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>W. Chiriac</i>	DATE: 09-12-81	<b>commodore</b>
TOLERANCES ON DECIMALS		CHKD: <i>W. Chiriac</i>	ENGR: <i>W. Chiriac</i>	
X XX XXX <'S		APPR: <i>SL</i>	DATE: 11-4-85	
MATERIAL:		USED ON: CBM	NEXT ASSY:	
FINISH:		PC10/20		<b>SCHEMATIC A4</b>
				<b>COMBINED MAINBOARD</b>
SIZE C		380 504	REV 4	
SCALE NONE		SHEET 5 OF 9		



REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



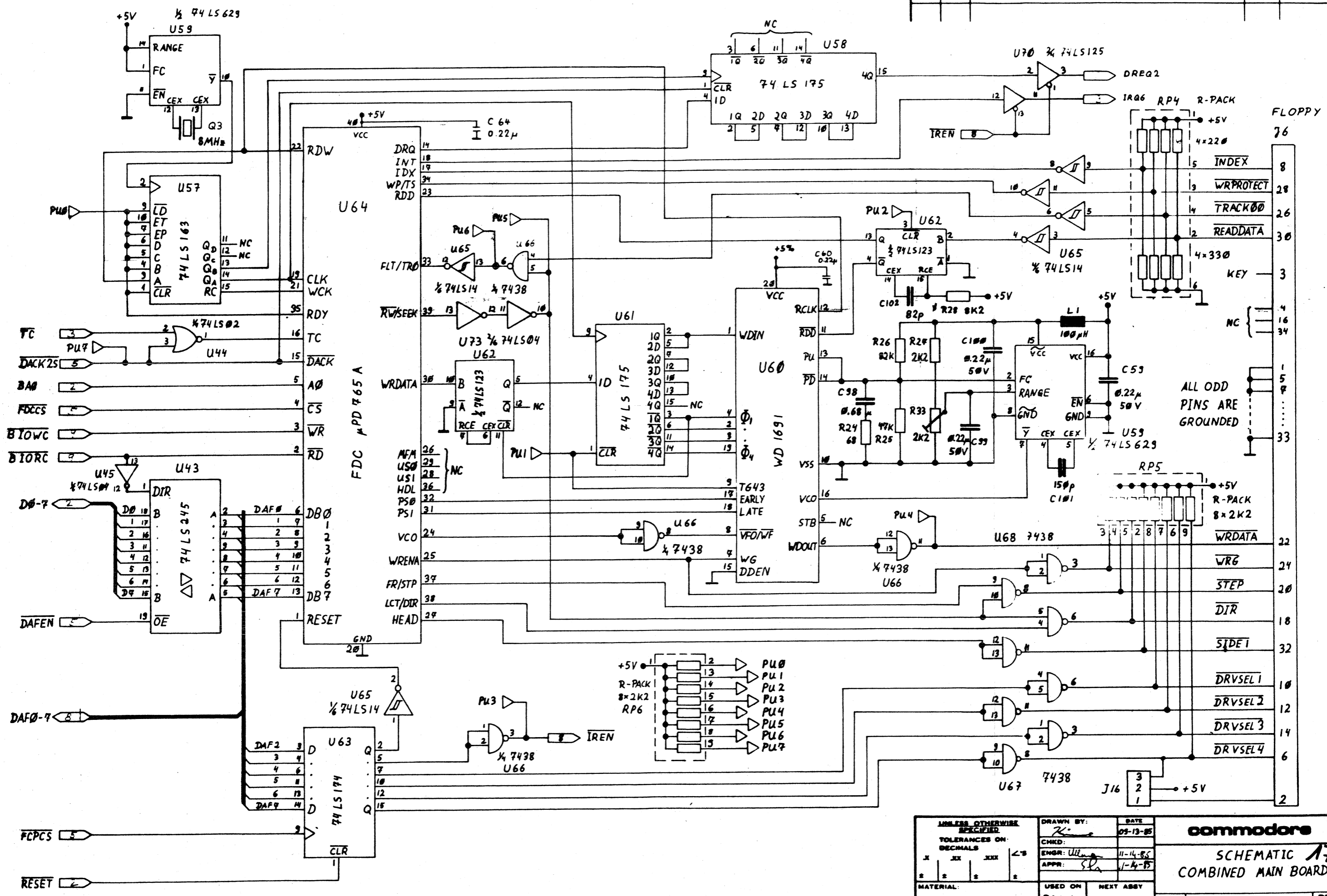
NOTES: 1. C84-C91 ONLY IF REQUIRED  
2. C92-C95 ONLY IF REQUIRED

UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>J. Williams</i>	DATE: 09-04-85
TOLERANCES ON DECIMALS		CHKD: <i>W. Smith</i>	DATE: 09-05-85
		ENGR: <i>U. ...</i>	DATE: 11-14-85
		APPR: <i>G.L.</i>	DATE: 11-14-85
MATERIAL:		USED ON: PC10/20	NEXT ASSY:
FINISH:		COMB	
		SIZE: C	380504
		SCALE: NONE	SHEET: 6

**commodore**  
SCHEMATIC 15  
COMBINED MAIN BOARD



REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED

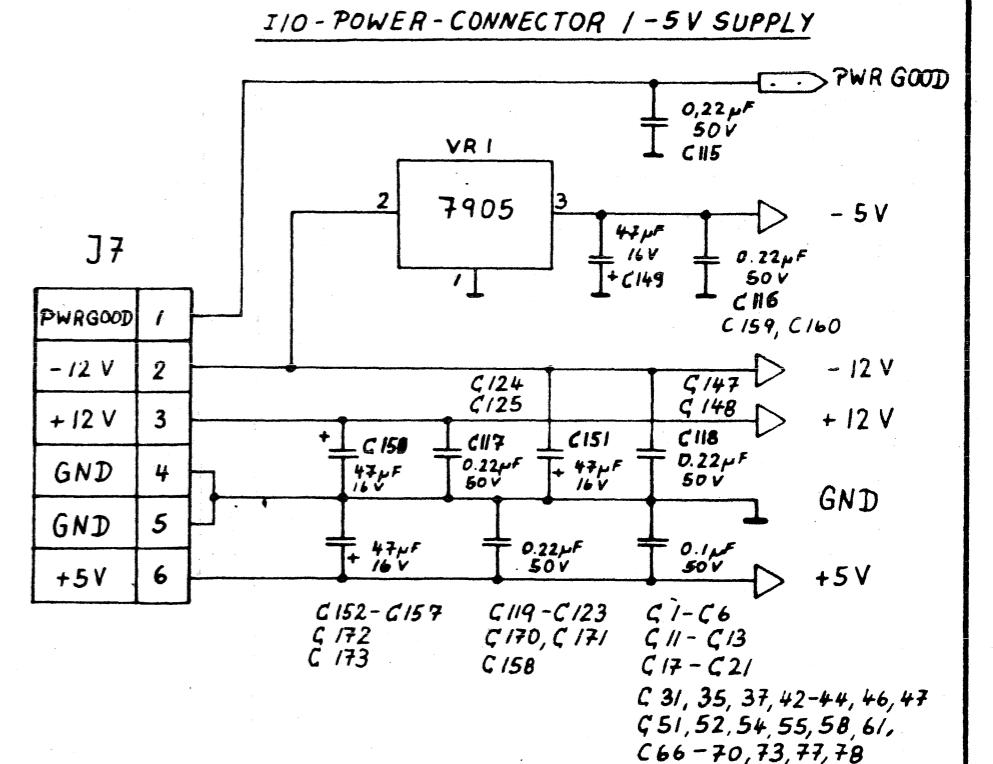
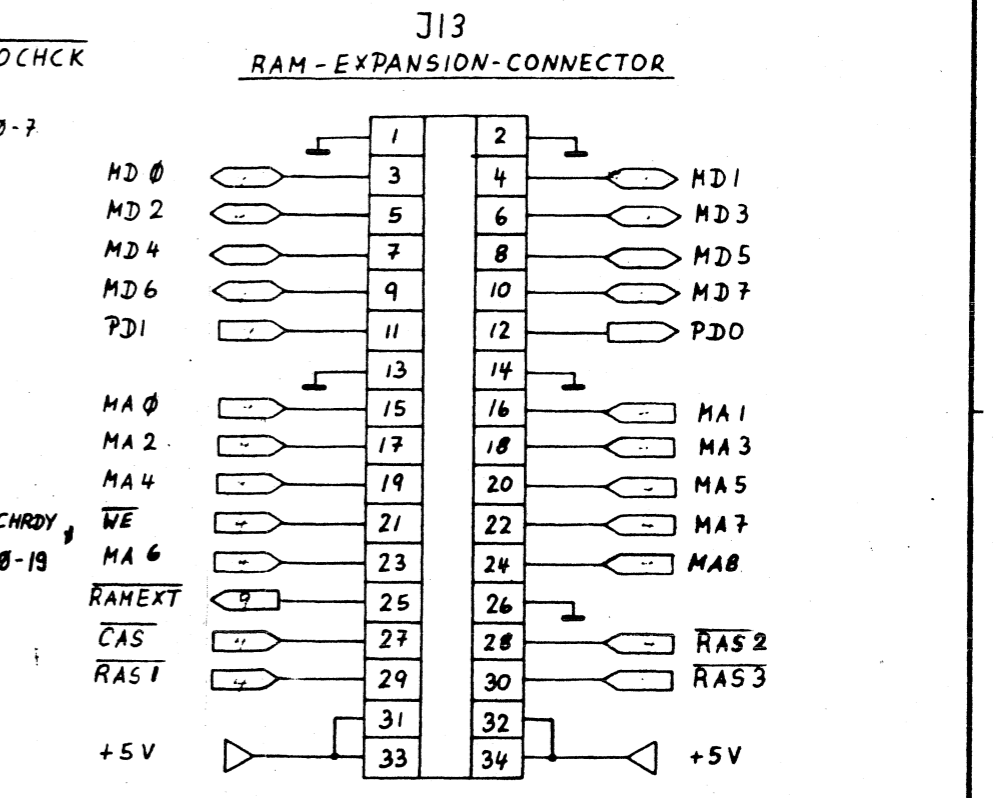
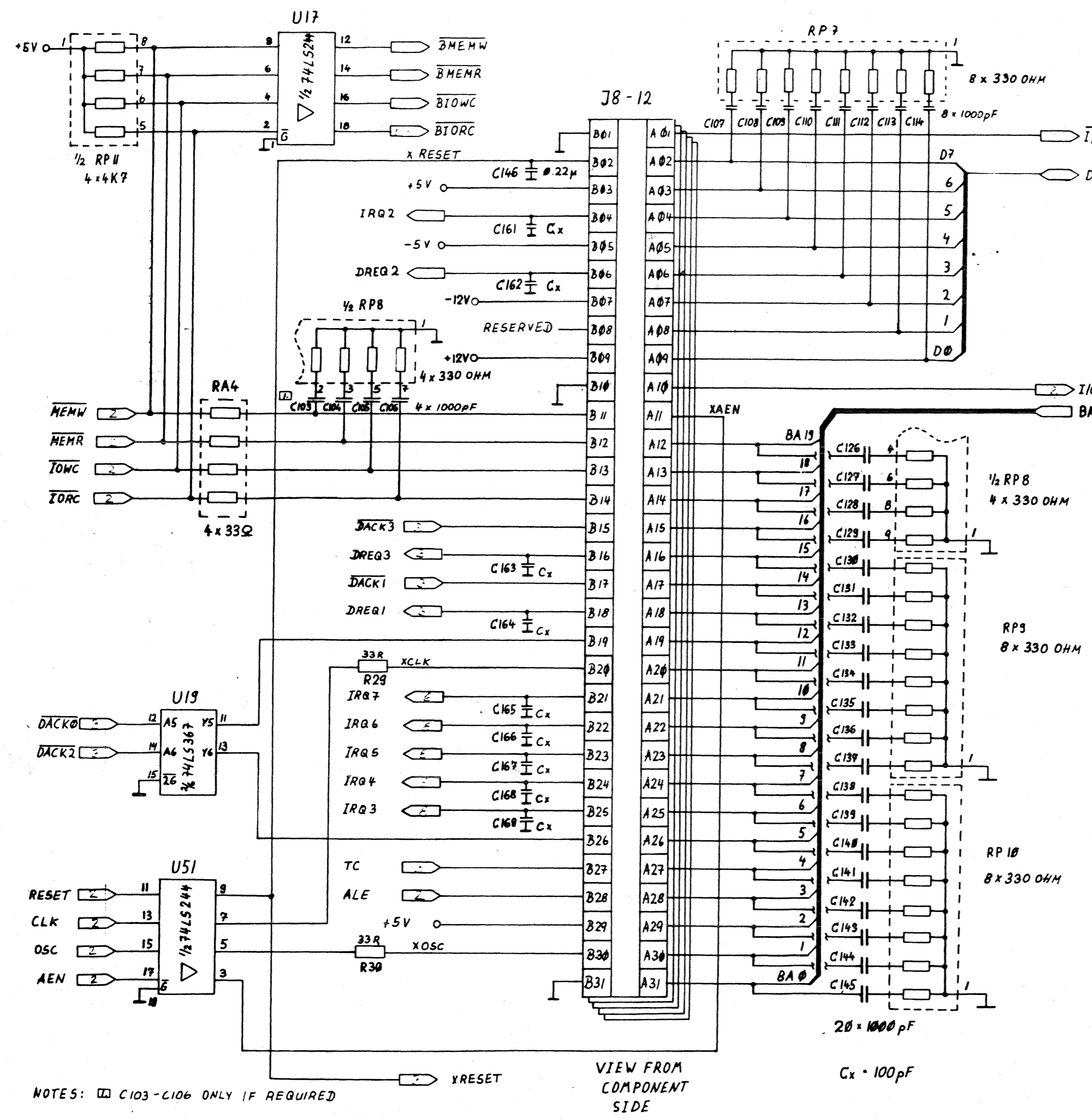


ALL ODD PINS ARE GROUNDED

NOTE: 1. J16 ONLY IF REQUIRED

UNLESS OTHERWISE SPECIFIED TOLERANCES ON DECIMALS .X .XX .XXX .4 .5	DRAWN BY: <i>R...</i> DATE: 09-13-85	<b>commodore</b>  SCHEMATIC 17 COMBINED MAIN BOARD
	ENGR: <i>W...</i> DATE: 11-14-85	
	APPR: <i>S...</i> DATE: 1-4-86	
MATERIAL: FINISH:	USED ON: PC 10/20 COMBI	NEXT ASSY: SIZE: C 380504 SCALE: NONE SHEET: 8 OF 9

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
SEE SHEET 1				



NOTES: □ C103-C106 ONLY IF REQUIRED

VIEW FROM COMPONENT SIDE

20 x 1000 pF  
Cx = 100 pF

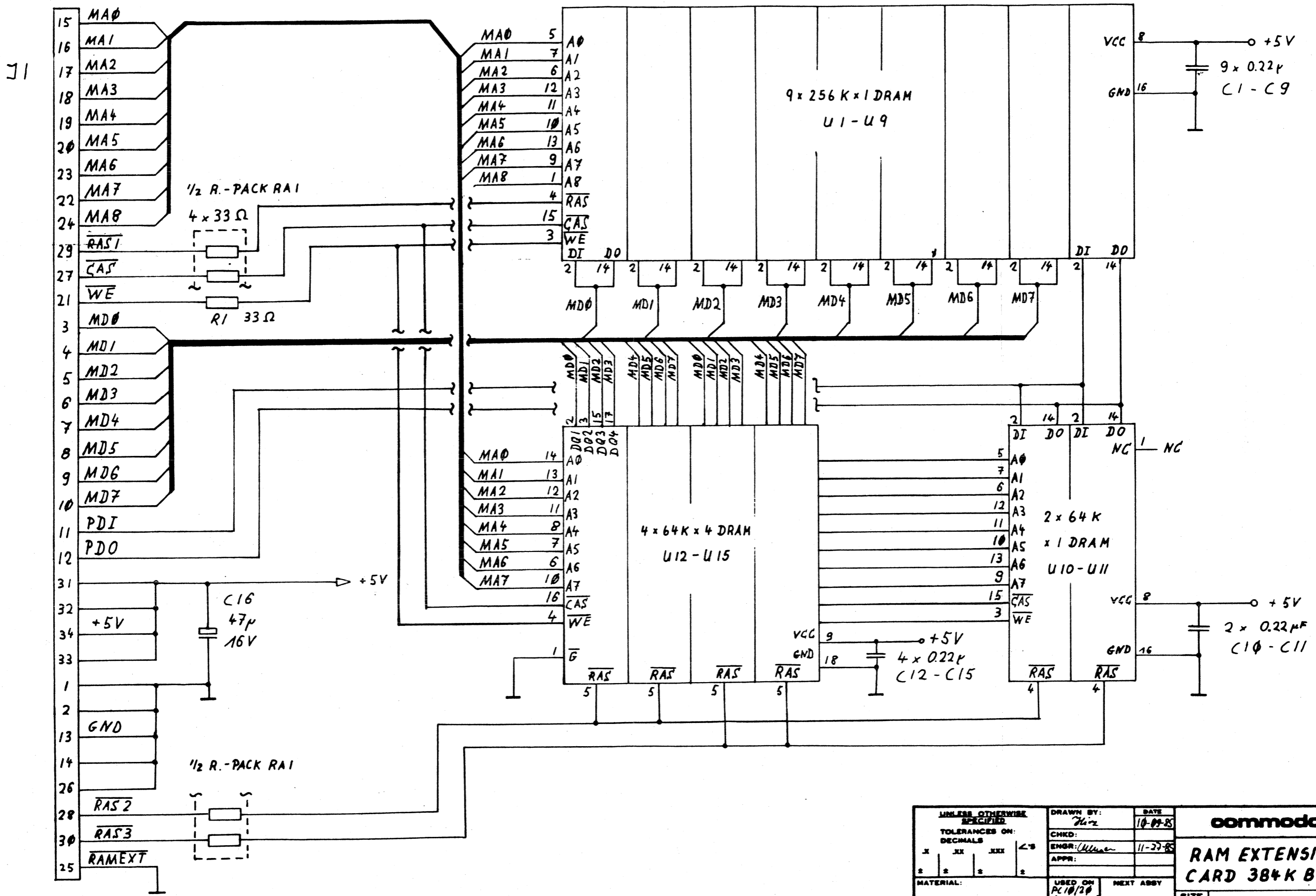
UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>M. Bittmann</i>	DATE: 09-13-85	commodore
TOLERANCES ON DECIMALS		ENGR: <i>Ullmann</i>	11-14-85	
X	XX	XXX	<'S	SCHEMATIC 18 COMBINED MAINBOARD
±	±	±	±	
MATERIAL:		USED ON: PC10/20	NEXT ASSY:	SIZE: C 380 504
FINISH:				REV: 4
				SCALE: SHEET 9 OF 9

REVISIONS

LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

RAM EXPANSION CONNECTOR

34 Pin



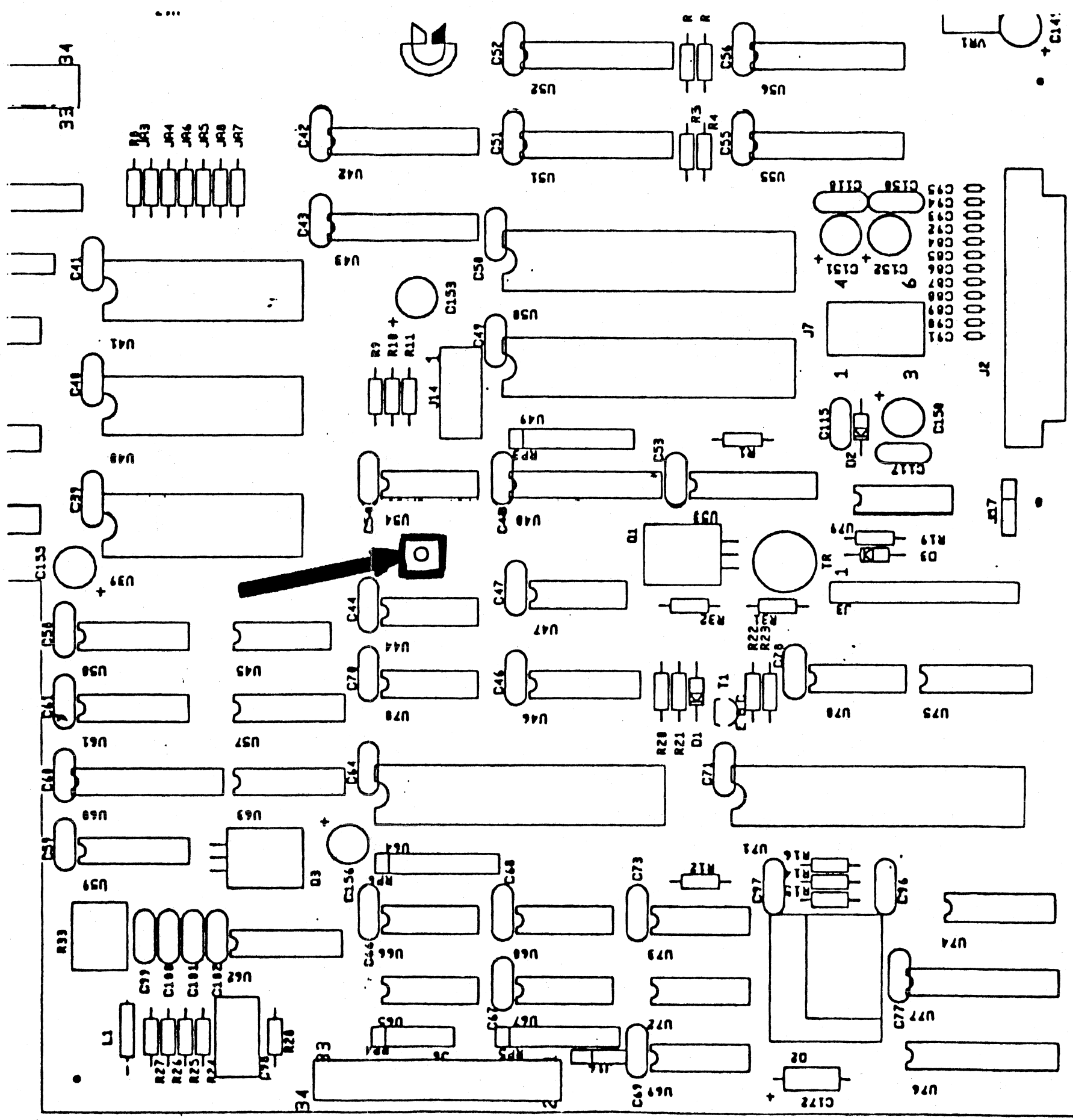
UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>Hz</i>	DATE: <i>10-09-85</i>	<b>commodore</b>
TOLERANCES ON DECIMALS		CHKD:	ENGR: <i>Ullmer</i>	
X	XX	XXX	✓S	DATE: <i>11-27-85</i>
2	2	2	2	APPR:
MATERIAL:		USED ON: <i>PC10/20 Combined Board</i>	NEXT ASSY:	<b>RAM EXTENSION 19 CARD 384K BYTE</b>
FINISH:				
		SIZE: <b>C</b>	380506	REV: <b>1</b>
		SCALE: <b>NONE</b>	SHEET: <b>1</b>	OF: <b>1</b>

MOUNTING THE NEW COMBINED BOARD INTO THE PC HOUSING

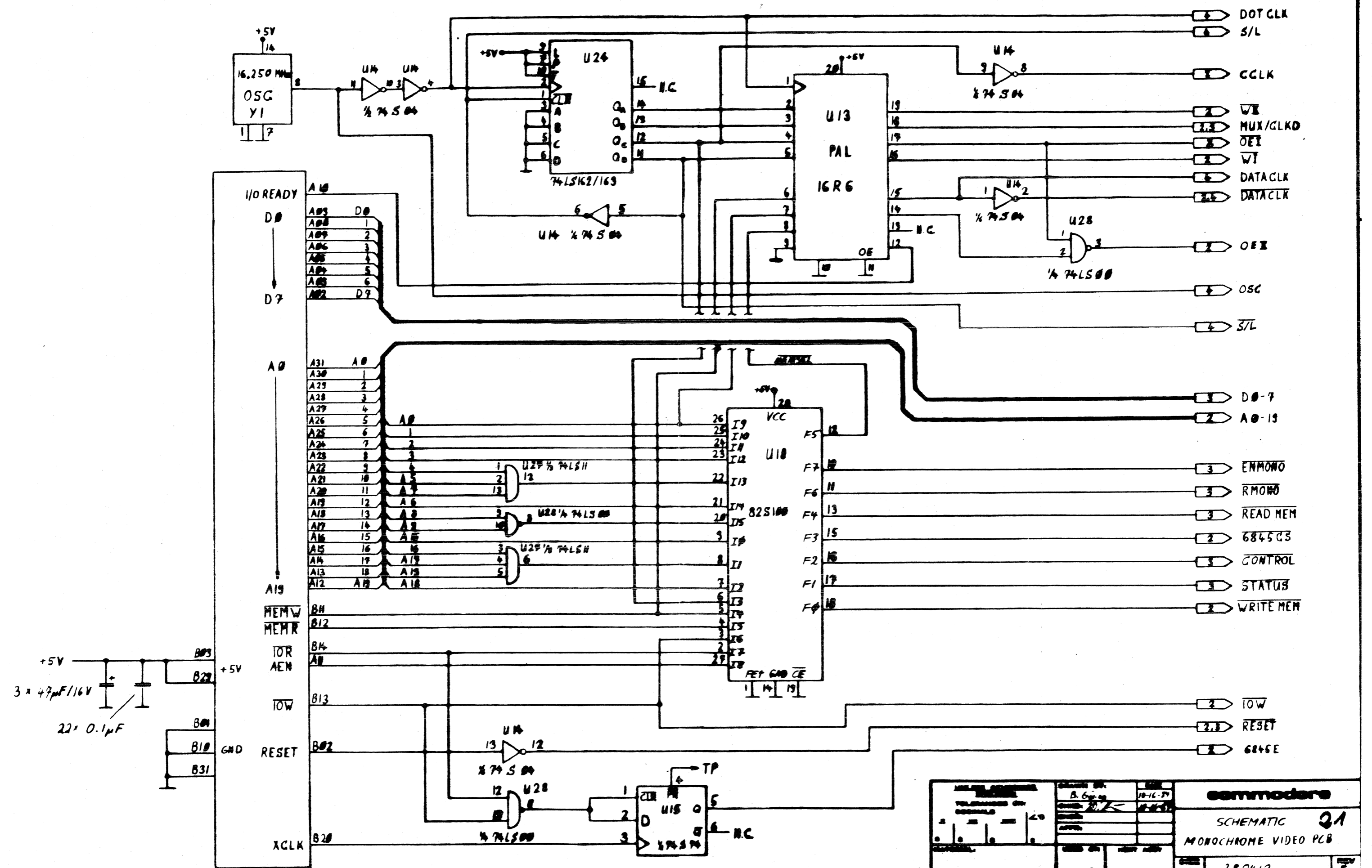
For the new PC COMBINED BOARD an additional metal stand-off is required at the mounting hole indicated by an arrow on the drawing below. At this location the PCB is locked by a screw. This is used to connect CHASSIS GND to the PCB.

At production start this stand-off will be welded at the bottom of the PC housing.

For mounting the PC COMBINED board into the existing PC housings, an appropriate metal stand-off can be provided, which can be fitted by a screw to the housing bottom, like done in this engineering sample.



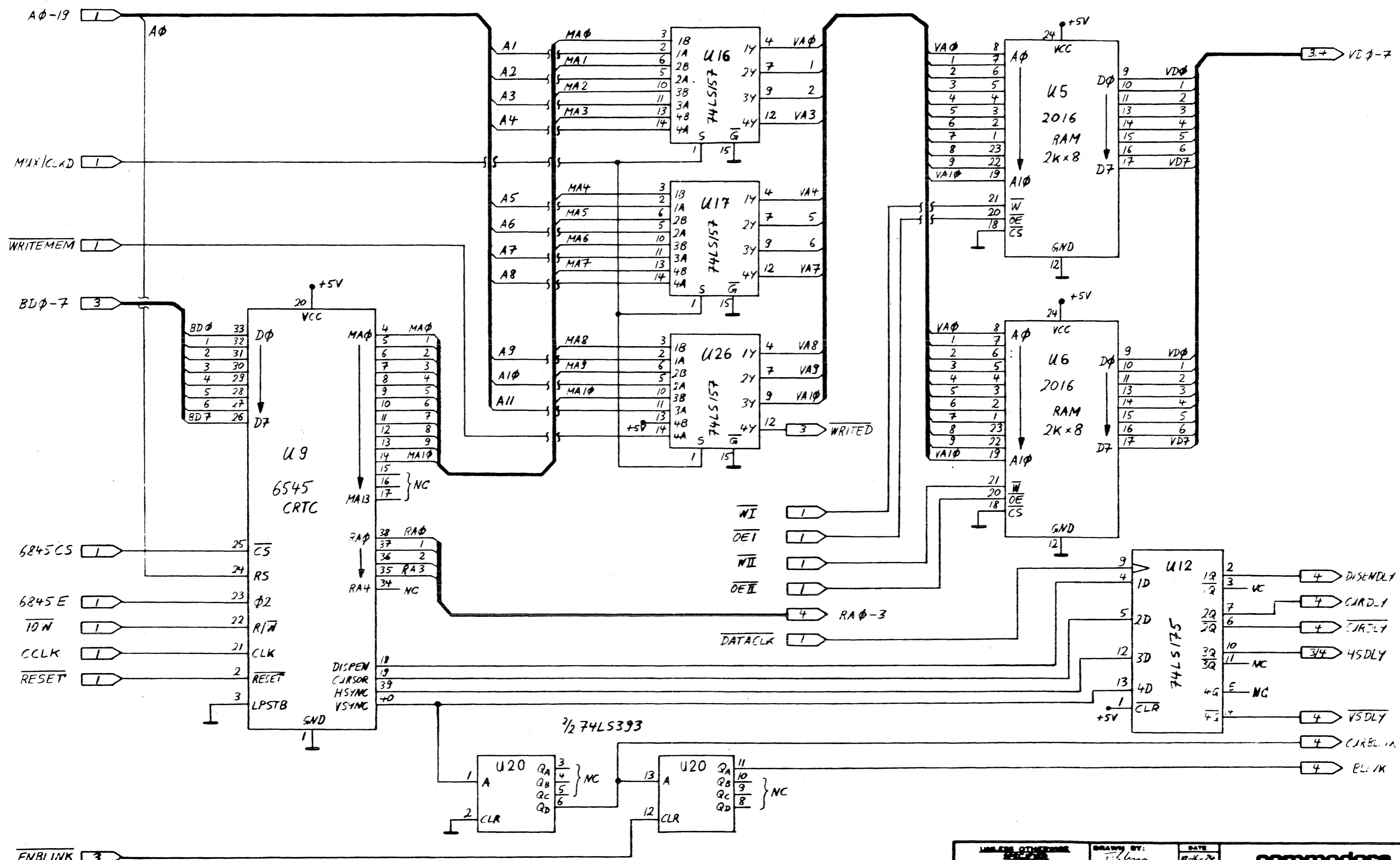
REVISIONS			
DATE	DESCRIPTION	DATE	APPROVED



	<b>Commodore</b> SCHEMATIC 31 MONOCHROME VIDEO PCB
DATE: 10-16-77 DRAWN BY: B. G. ... CHECKED BY: ... APPROVED BY: ...	REV: E SCALE: 1 OF 4

71

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED

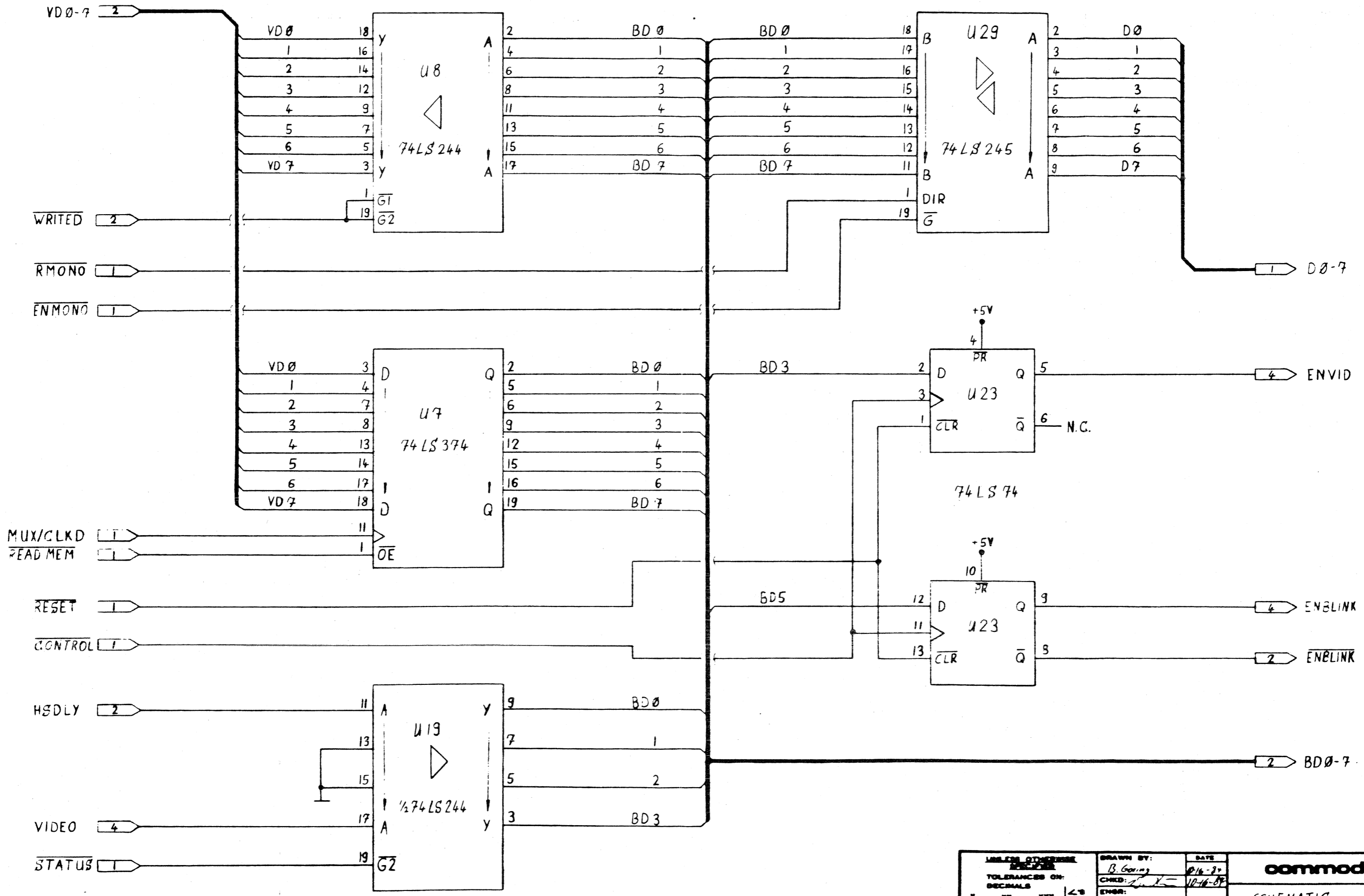


DIMENSIONS TOLERANCES ON: DECIMALS .X .XX .XXX .4	DRAWN BY: <i>[Signature]</i> DATE: 10-16-74 CHECKED: <i>[Signature]</i> APPR:	<b>commodore</b> SCHEMATIC 22 MONOCHROME VIDEO PCB SIZE C 380 412 SCALE NONE SHEET 2 OF 4
MATERIAL:	USED ON: CBM-PC	NEXT ASSY:



REVISIONS

LTR	ZONE	DESCRIPTION	DATE	APPROVED

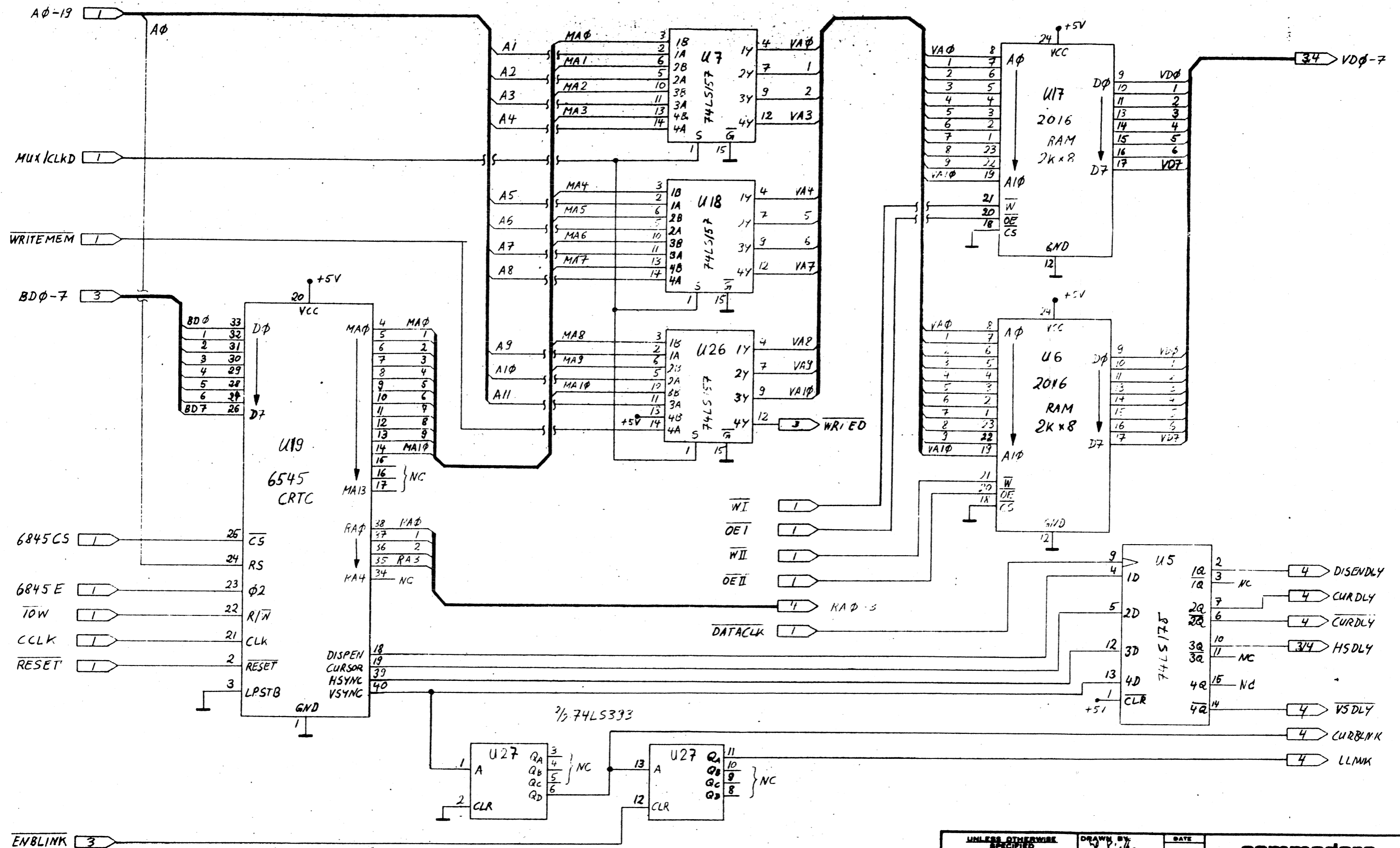


UNLESS OTHERWISE SPECIFIED TOLERANCES ON: DECIMALS .X .XX .XXX .X .XX .XXX .X .XX .XXX	DRAWN BY: <i>B. Goring</i> CHKD: <i>[Signature]</i> ENGR: APPR:	DATE: 10-16-89	<b>Commodore</b> SCHEMATIC <b>23</b> MONOCHROME VIDEO PCB
MATERIAL:	USED ON: CBM-PC	NEXT ASSY:	SIZE <b>C</b> 380412 SCALE NONE
FINISH:			REV <b>E</b> SHEET 3 OF 4



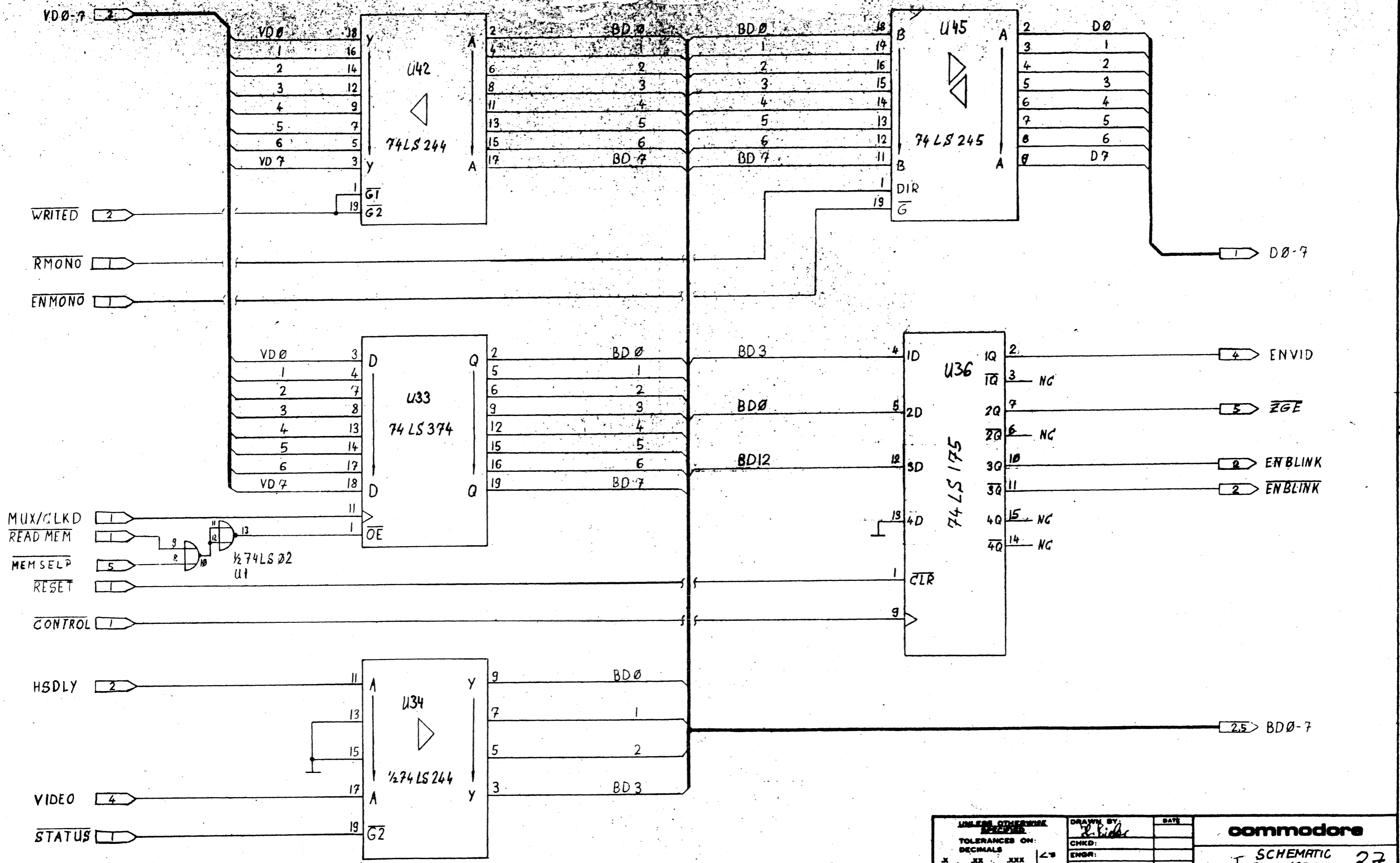


REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SEHT 1		



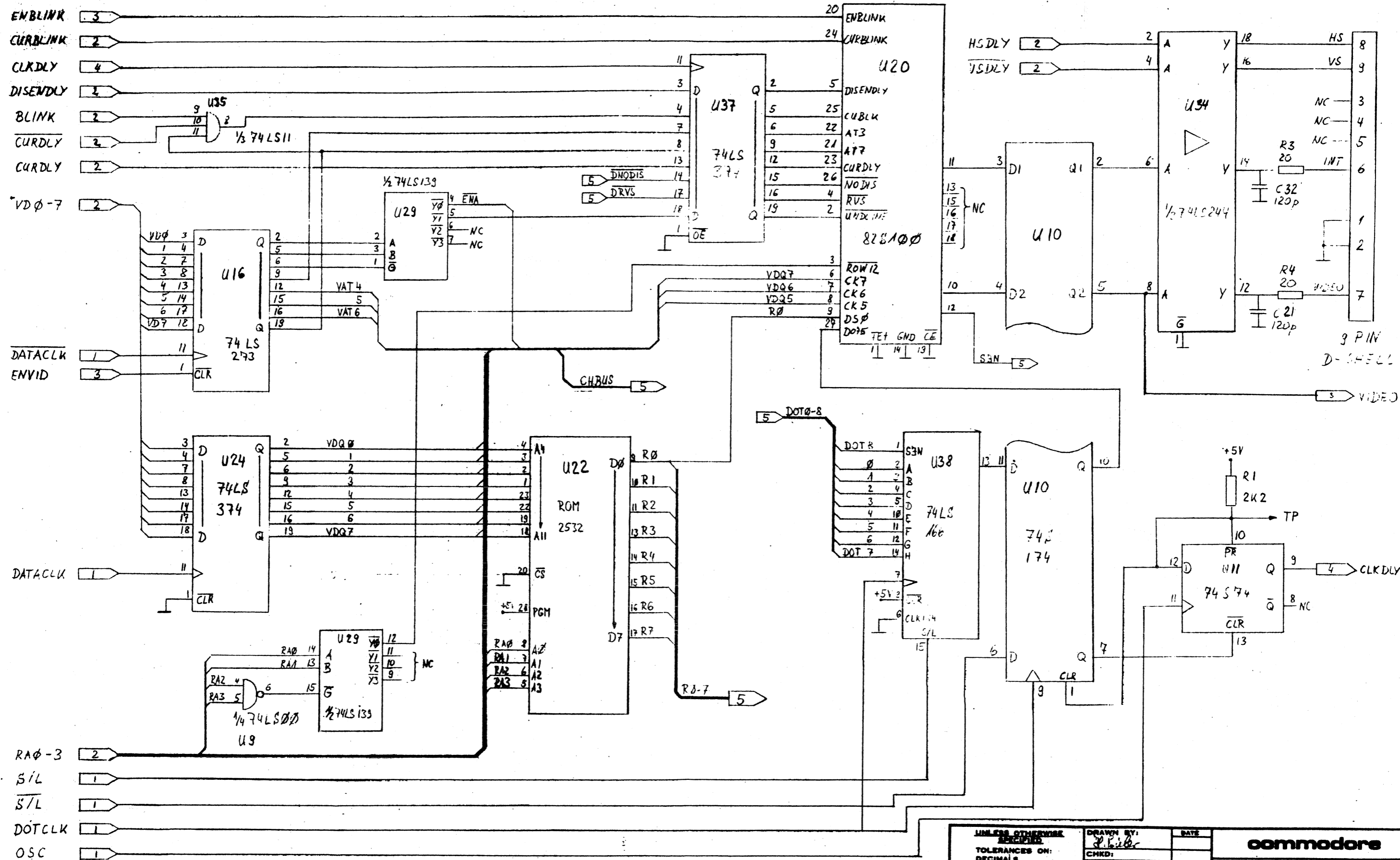
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TOLERANCES ON DECIMALS		CHKD:	
.X	.XX	ENGR:	
.XX	.XXX	APPR:	
MATERIAL:		USED ON:	NEXT ASSY:
FINISH:		CBM-PC	PCB ASSY
		380 053	
commodore			26
SCHEMATIC			
ADVANCED			
MONOCHROME VIDEO PCB			
SIZE	380470	REV	F
SCALE	NONE	SHEET	3 OF 6

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



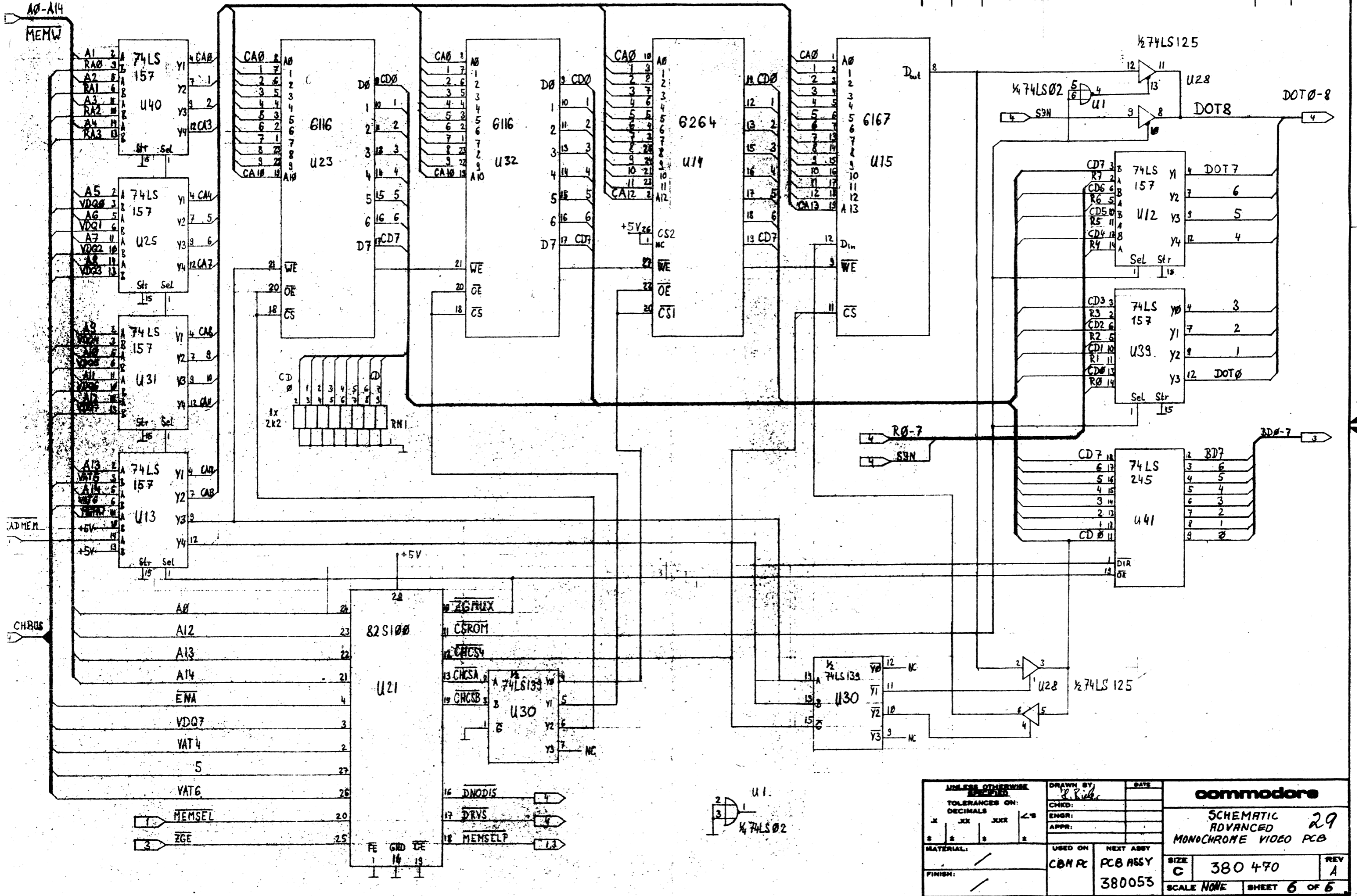
UNLESS OTHERWISE SPECIFIED		DRAWN BY:	DATE:
TOLERANCES ON DECIMALS		CHKD:	
X	XX	XXX	∠'S
∅	∅	∅	∅
MATERIAL:		USED ON	NEXT ASSY
FINISH:		CBN-PC	PCB ASSY
		380 053	
<b>commodore</b> SCHEMATIC ADVANCED 27 MICROPHONE VIDEO PCB			REV A
SIZE C	380 470	SHEET 5 OF 5	

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>[Signature]</i>		DATE: _____	
TOLERANCES ON DECIMALS		CHKD: _____		ENGR: _____	
.X .XX .XXX <math>\frac{1}{16}</math>		APPR: _____			
MATERIAL:		USED ON		NEXT ASSY	
FINISH:		CBM PC		PCB ASSY 380053	
commodore			28		
SCHEMATIC ADVANCED MONOCHROME VIDEO PCB			REV A.		
SIZE C		380 470		SCALE NONE SHEET 5 OF 6	

REVISIONS				
LTR	ZONE	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

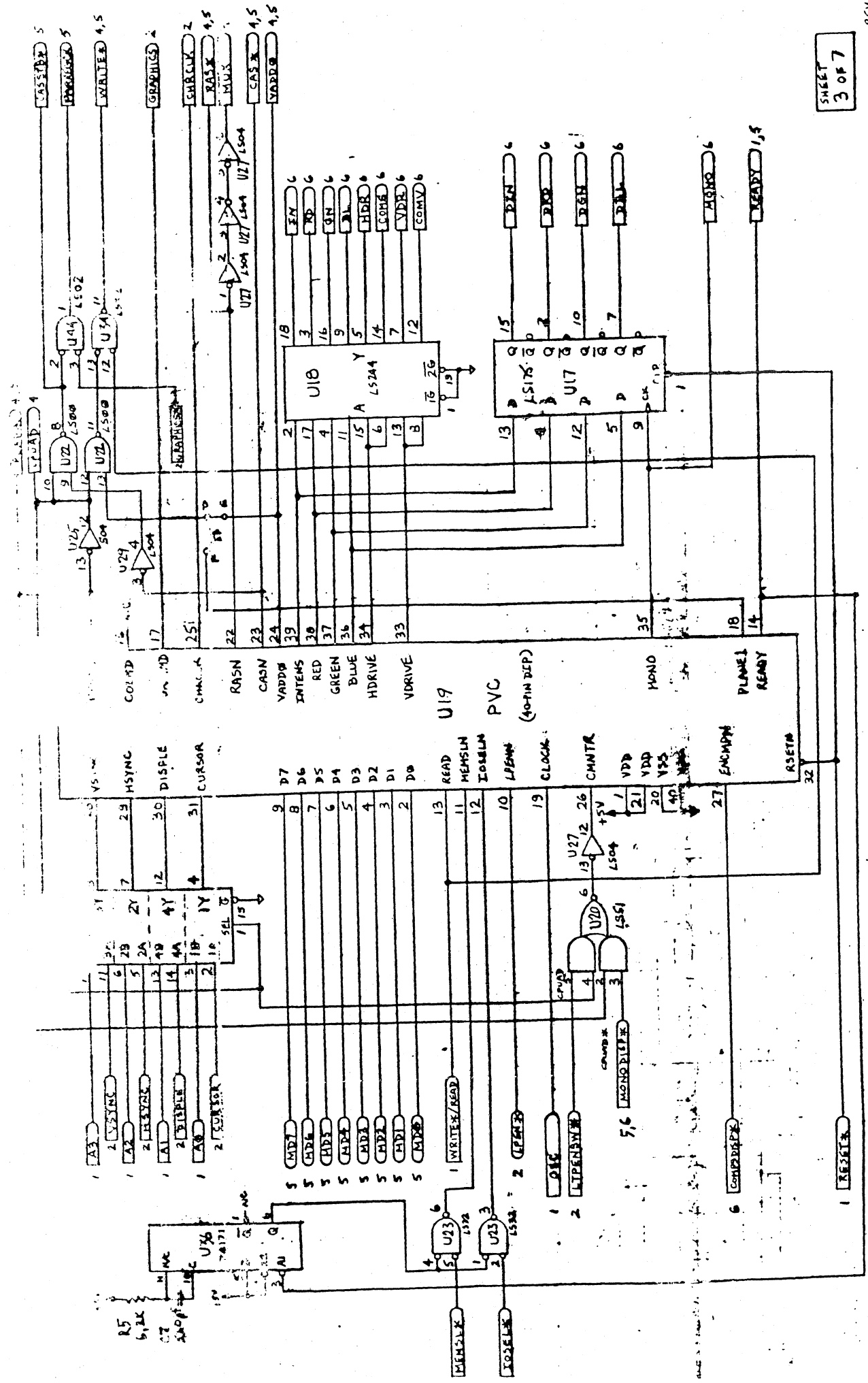


UNLESS OTHERWISE SPECIFIED		DRAWN BY: <i>J. R. R.</i>		DATE:	
TOLERANCES ON DECIMALS:		CHKD:			
.X	.XX	.XXX	ENGR:		
		APPR:			
MATERIAL:		USED ON:		NEXT ASSY:	
		COM PC		PCB ASSY	
FINISH:				380053	
COMMODORE			SCHEMATIC 29		
			ADVANCED		
			MONOCHROME VIDEO PCB		
SIZE C		380 470		REV A	
SCALE NONE		SHEET 6 OF 6			









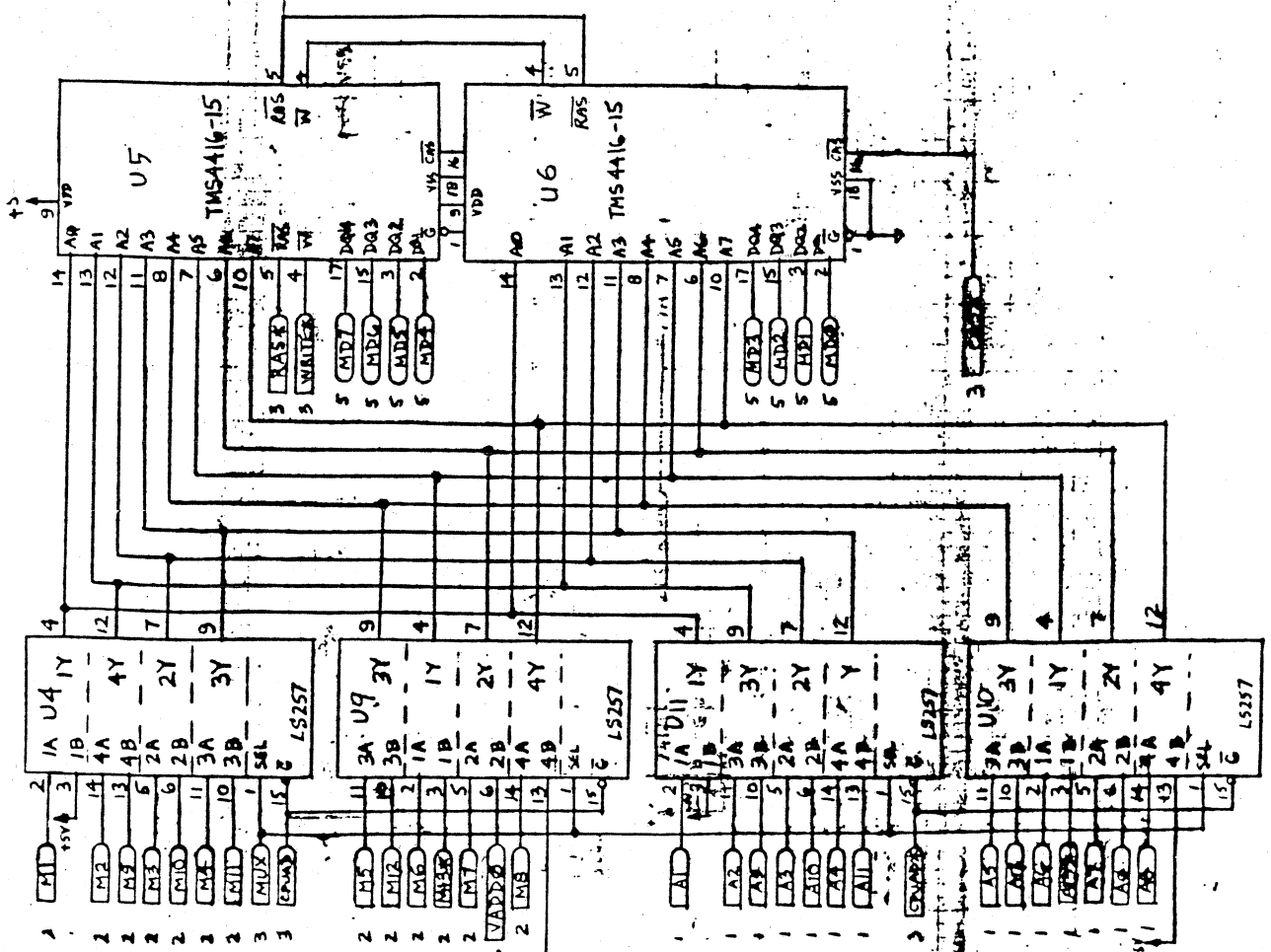
SHEET 3 OF 7

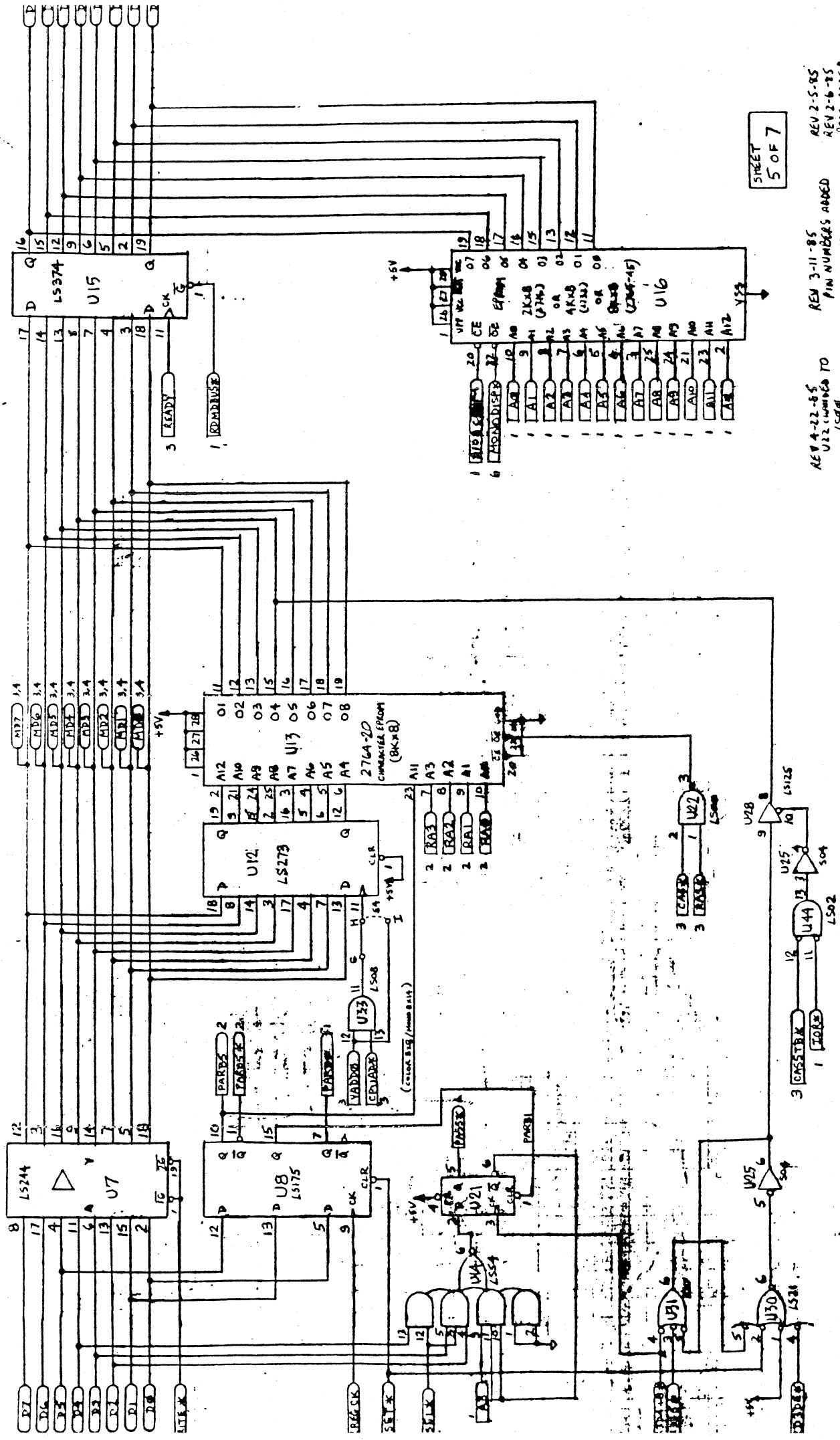
REV 2-5-85  
 REV 2-6-85  
 REV 2-28-85  
 CAS106

REV 4-22-85  
 U12 changed to LS04  
 REV 3-7-85  
 PIN NUMBERS  
 ADDED  
 REV 3-26-85

SHEET  
4 of 7

REV 3-11-85 MEMORY MODULES  
REV 3-11-85 Pin numbers  
ADDED





REV 4-22-85  
U12 CONNECTED TO  
LS08

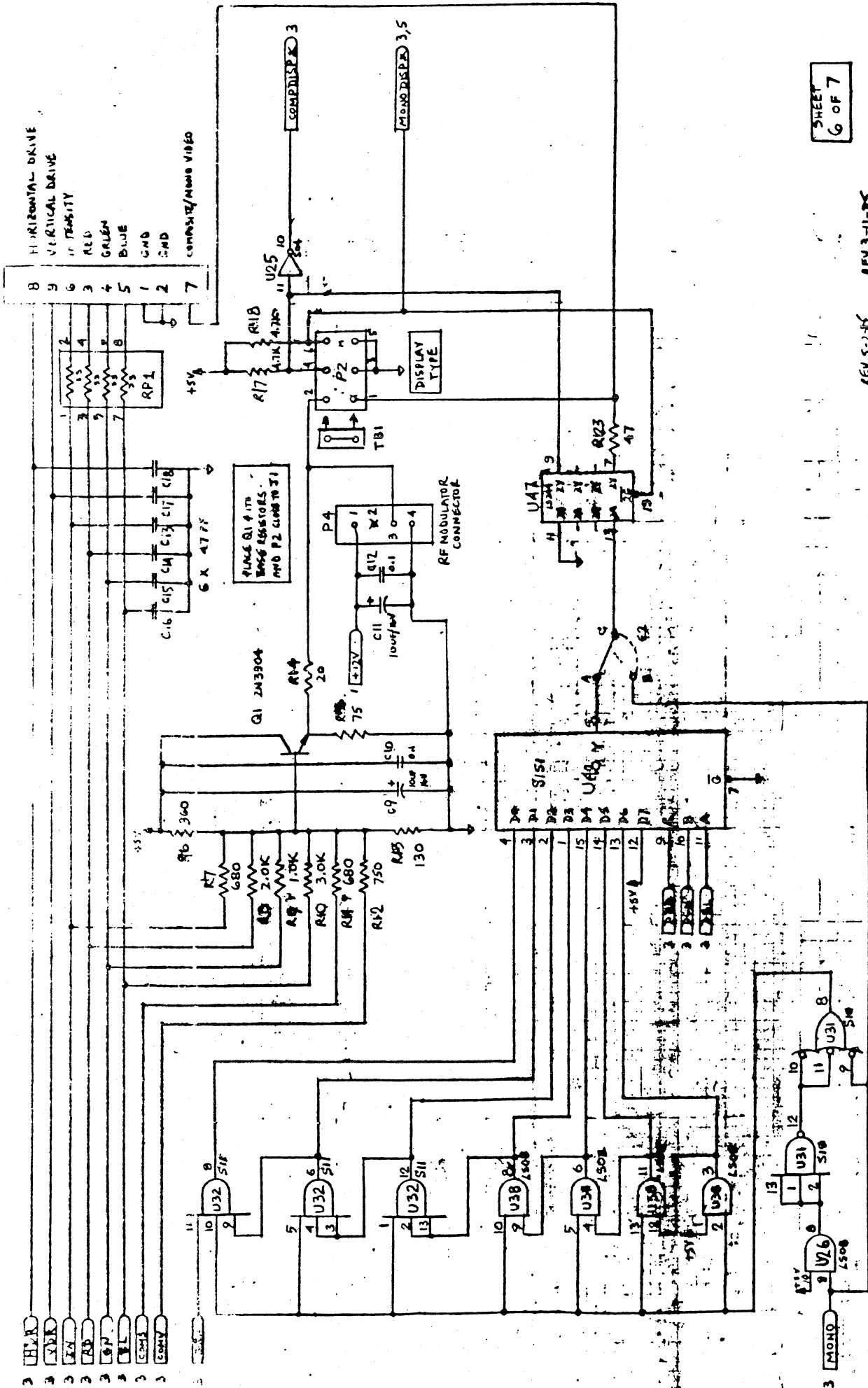
REV 3-11-85  
PIN NUMBERS ADDED

REV 3-12-85  
PARTIAL ADDRESS  
U8 CONNECTED TO LS175  
PARTIAL ADDRESS

REV 2-5-85  
REV 2-6-85  
PARTIAL ADDRESS  
REV 2-12-85  
REV 2-13-85  
REV 2-28-85

3 PIN D-SHELL

- 8 HORIZONTAL DRIVE
- 9 VERTICAL DRIVE
- 6 INTENSITY
- 3 RED
- 4 GREEN
- 5 BLUE
- 1 GND
- 2 GND
- 7 COMPOSITE/MONO VIDEO

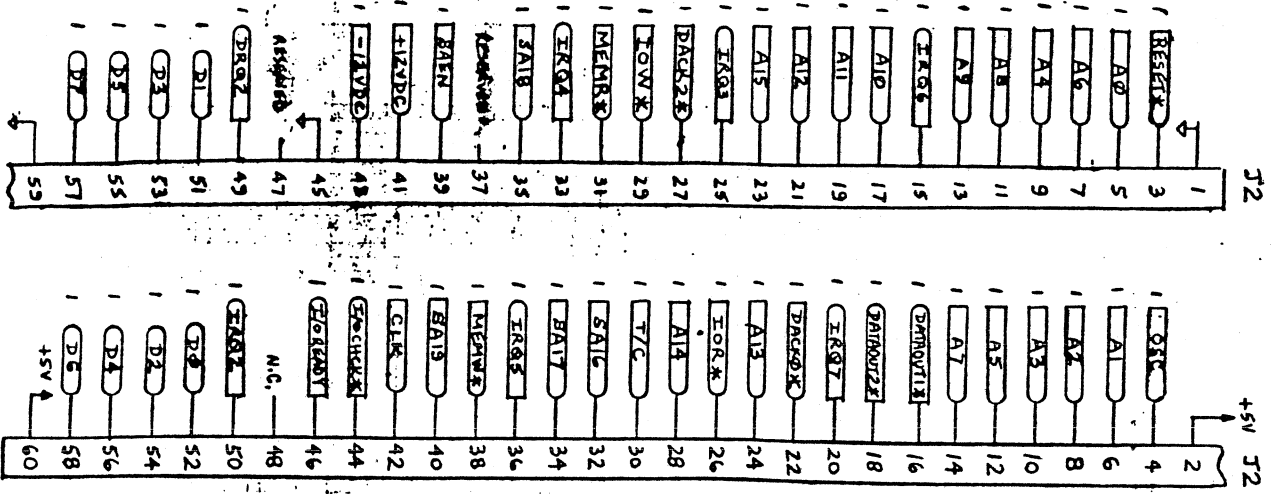


SHEET 6 OF 7

REV 5-2-75  
COMPUTER 40480  
AGS1045C/40480

REV 3-11-75  
PIN NUMBERS  
AS B6B

REV 4-22-77  
GARY Sample changed  
TO PAPER FROM 100 SHEET

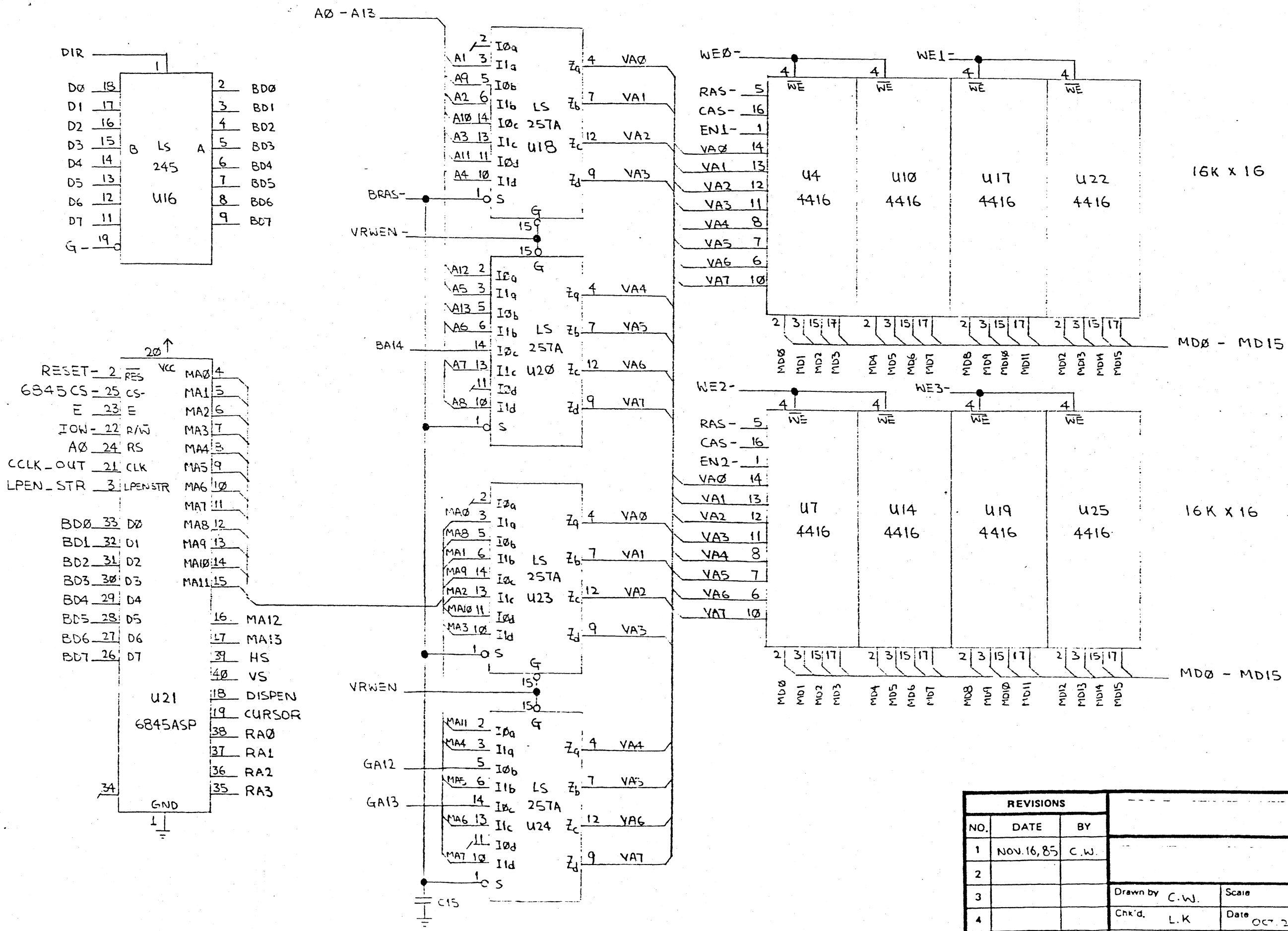


NOTES  
 PIN 37 SUPPLIES SIGNAL FROM I/O CARD CONNECTOR TO MODULES AND PREVIOUS PDC CARDS.  
 PIN 47 SUPPLIES -5V ON PREVIOUS PDC CARDS.

I.C. VOLTAGE AND DESIGNATION				
TYPE	DESIGNATION	+5V	GND	SPARE
LS74	U9	14	7	
LS367A	U13	14	7	
LS273	U2	20	10	
LS166	U6	16	8	
LS257A	U18,20,23,24	16	8	
P16L8A	U1,5,8,12,15	20	10	
LS245	U16	20	10	
4416	U4,7,10,14,17,19 22,25	9	18	
2764	U3	28	14	
68A45	U21	20	1	
CW16800	U11	45	13,34,76	
CRYSTAL	XTAL1	14	7	

COMPONENT LIST	
TYPE	DESIGNATION
RESISTORS	
20 OHM	R6, R11
75 OHM	R5
360 OHM	R4
680 OHM	R1
750 OHM	R3, R10
1.1K OHM	R8
2.2K OHM	R7
3.3K OHM	R9, R10A
CAPACITORS	
10 $\mu$ F	C1, C21, C22
0.1 $\mu$ F	C2, C20, C4, C7, C8A, C15, C18, C19
0.01 $\mu$ F	C8A
120 pF	C6, C6A, C9, C10
470 pF	C11, C12, C13
C3	
TRANSISTOR	
2N3904	Q1
CONNECTORS	
1x2 BERG	P1
1x4 BERG	P2
1x6 BERG	P3
9 PIN D.TYPE	S1
25 PIN D.TYPE	S2
62 PIN SOCKET STRIP	P5
20 PIN SOCKET STRIP	P4
DIP SWITCH	
8 POSITION	SW

REVISIONS					
NO.	DATE	BY			
1	NOV 16, 85	C.W.			
2					
3			Drawn by	C.W.	Scale
4			Chk'd.	L.K.	Date
5			Traced		App'd.
					Material
					Drawing No.
					1 OF 7

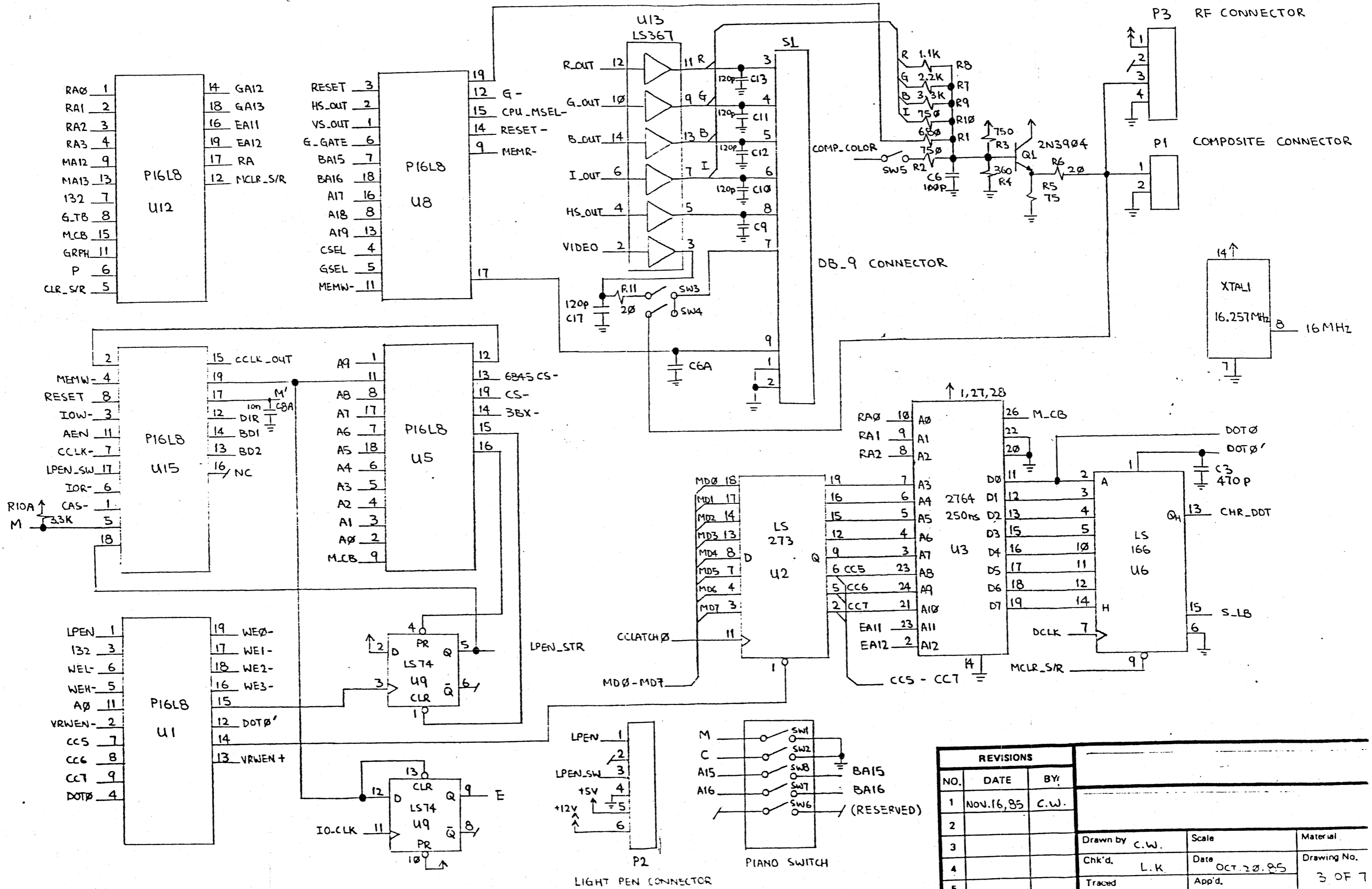


REVISIONS		
NO.	DATE	BY
1	NOV. 16, 85	C.W.
2		
3		
4		
5		

Drawn by	C.W.	Scale	Material
Chk'd.	L.K.	Date	OCT. 28, 85
Traced		App'd.	



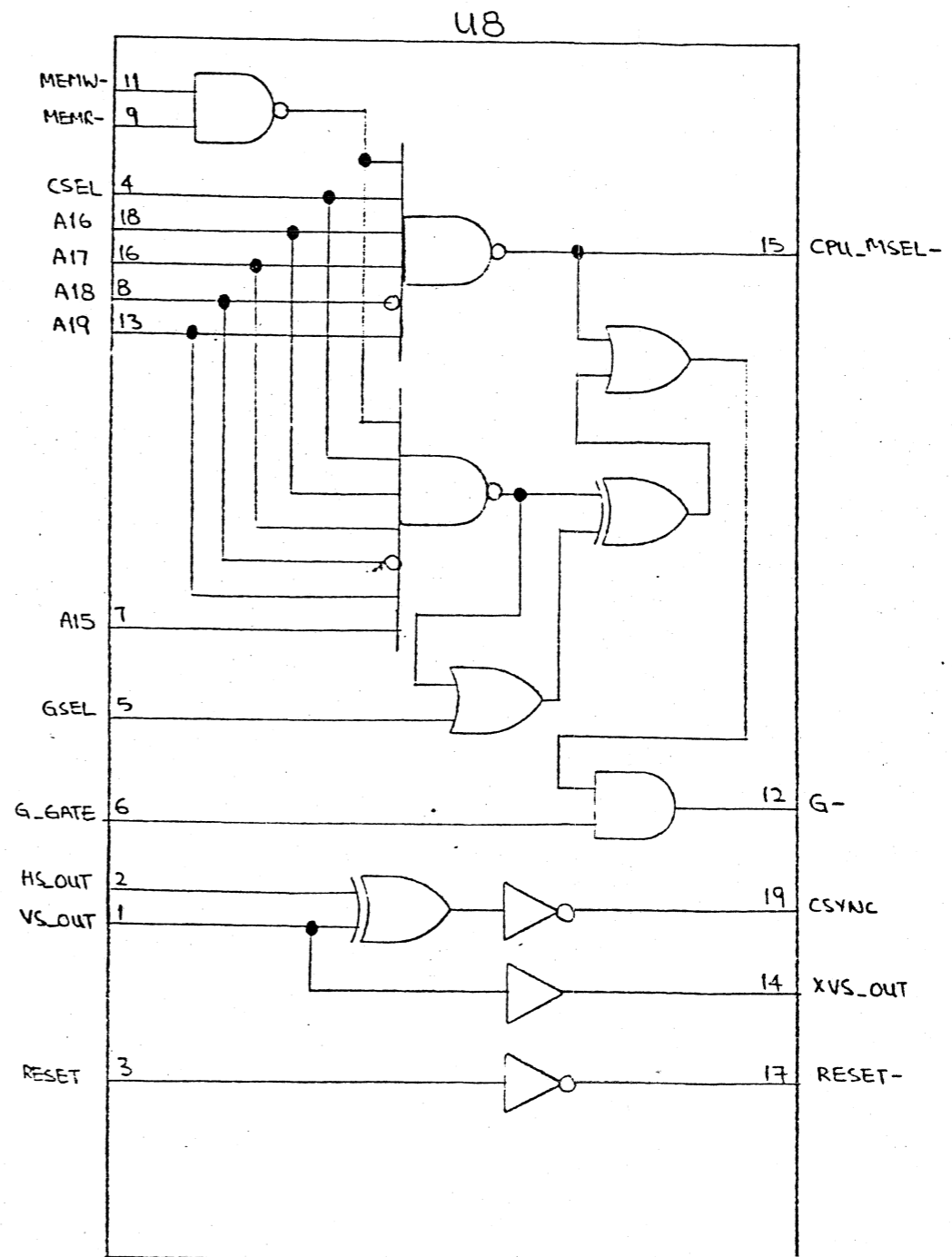
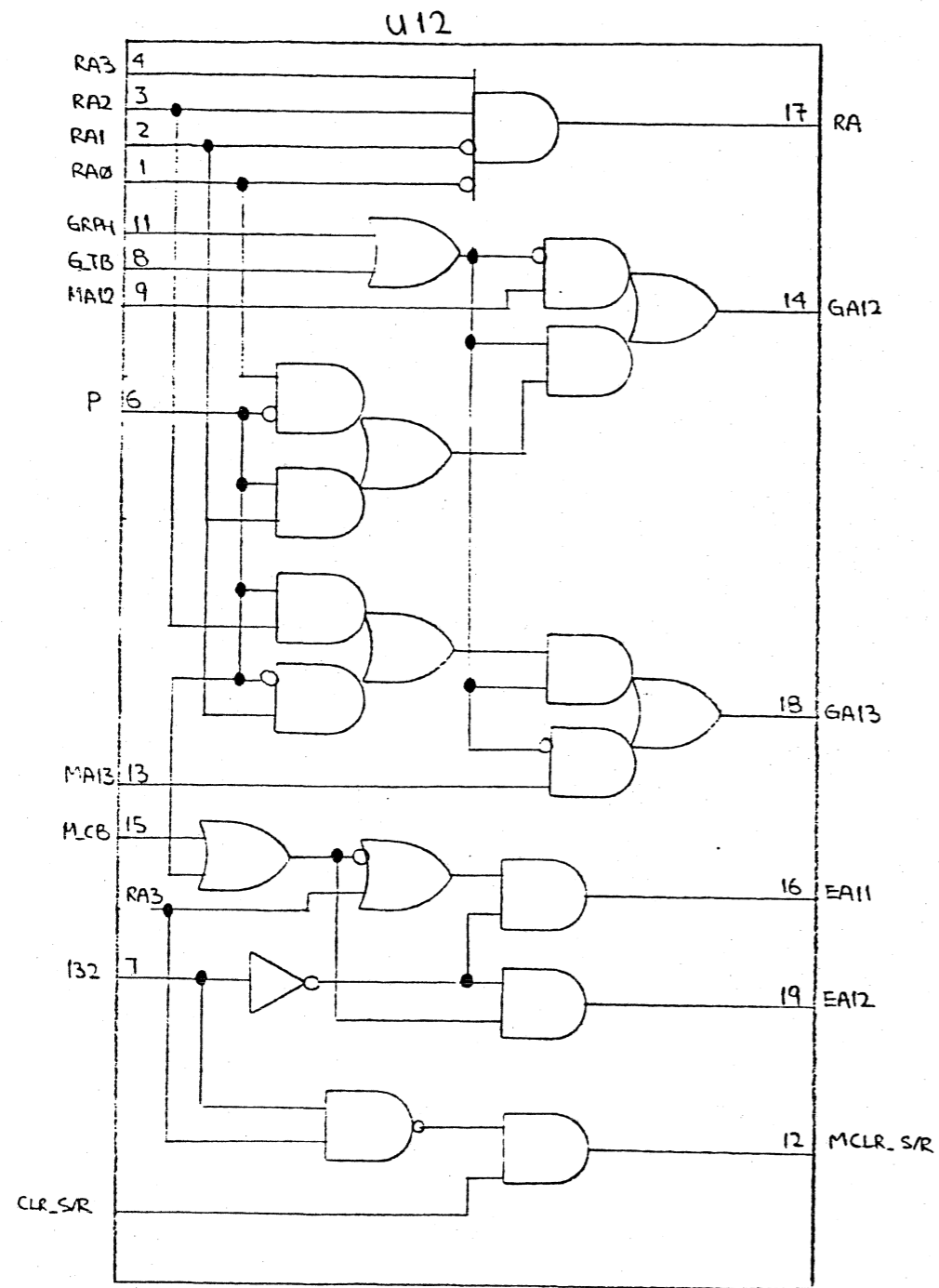


REVISIONS		
NO.	DATE	BY:
1	NOV.16,85	C.W.
2		
3		
4		
5		

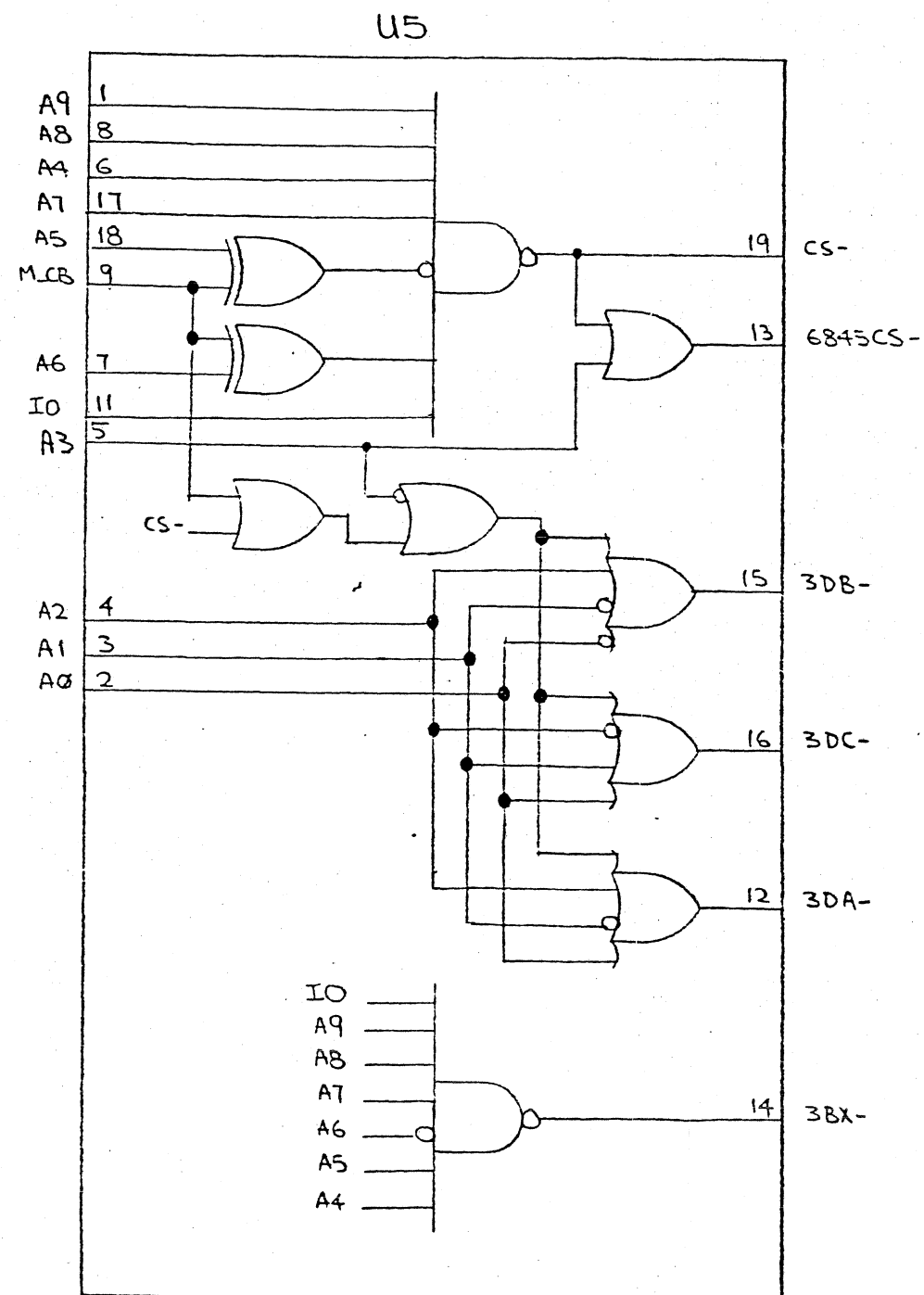
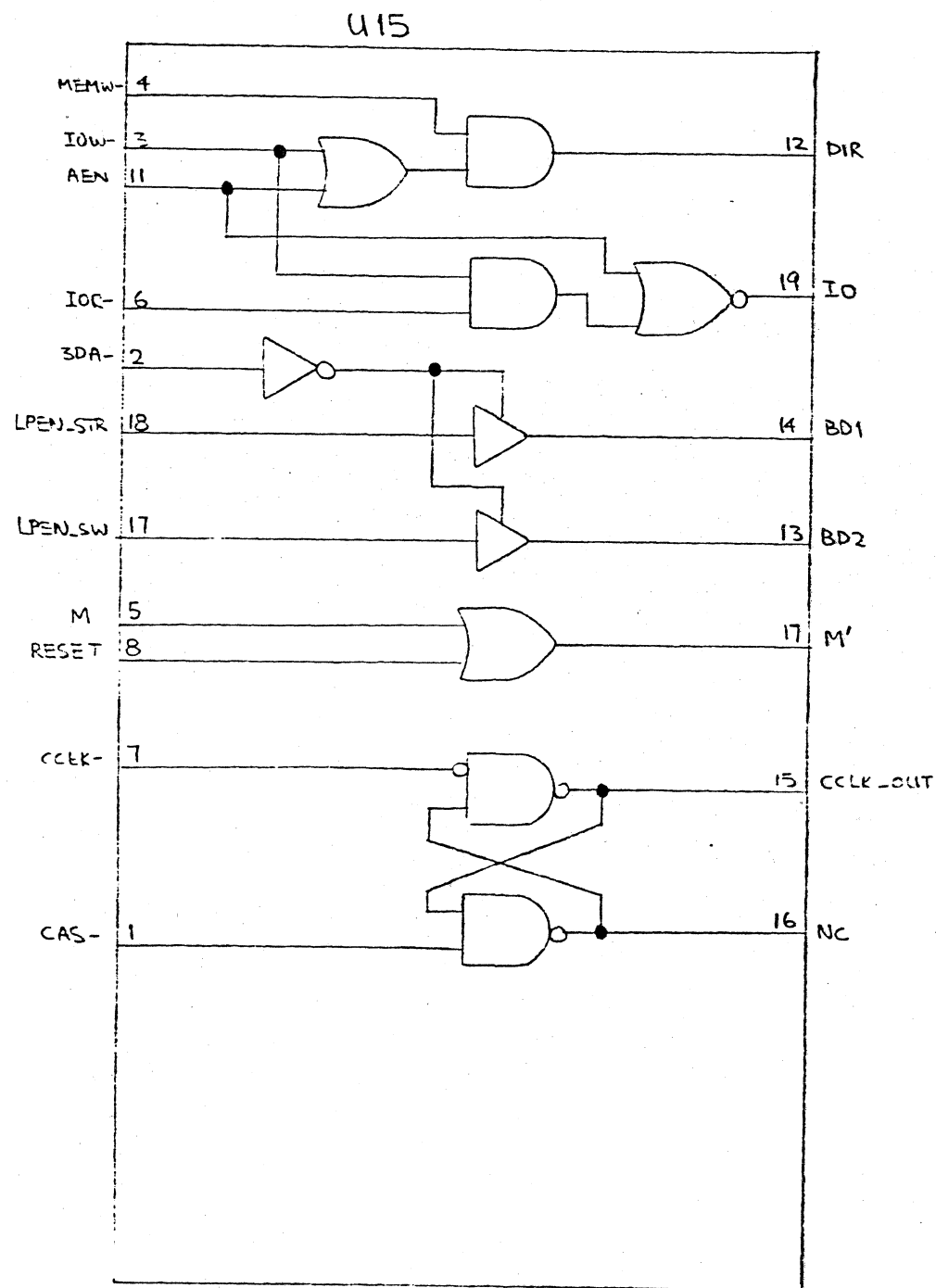
  

Drawn by	C.W.	Scale	Material
Chk'd.	L.K.	Date	OCT.20.85
Traced		App'd.	

Drawing No.  
3 OF 7

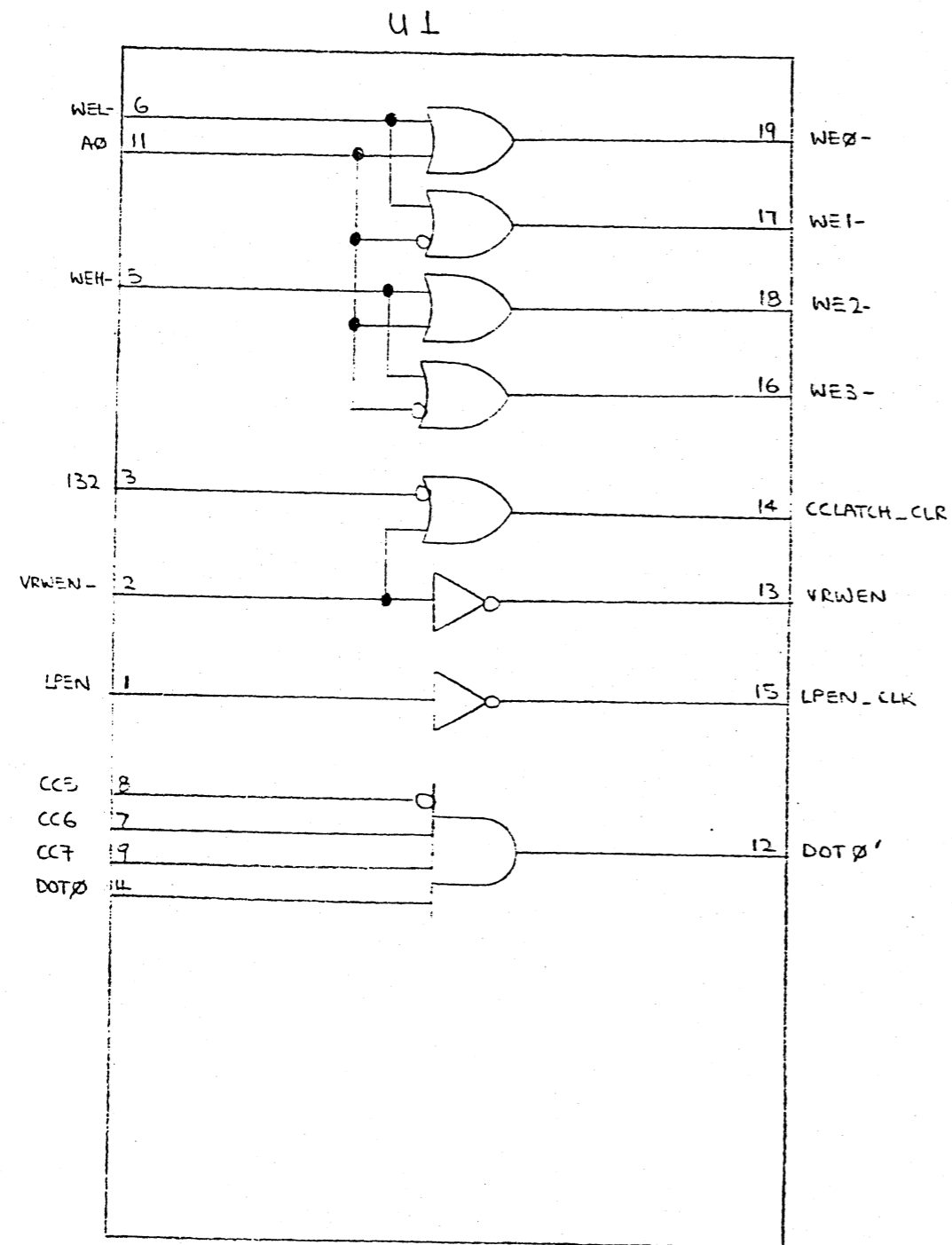


REVISIONS					
NO.	DATE	BY			
1	NOV. 16, 85	C.W.			
2					
3			Drawn by C.W.	Scale	Material
4			Chk'd. L.K.	Date OCT. 20, 85	Drawing No.
5			Traced	App'd.	4 OF 7

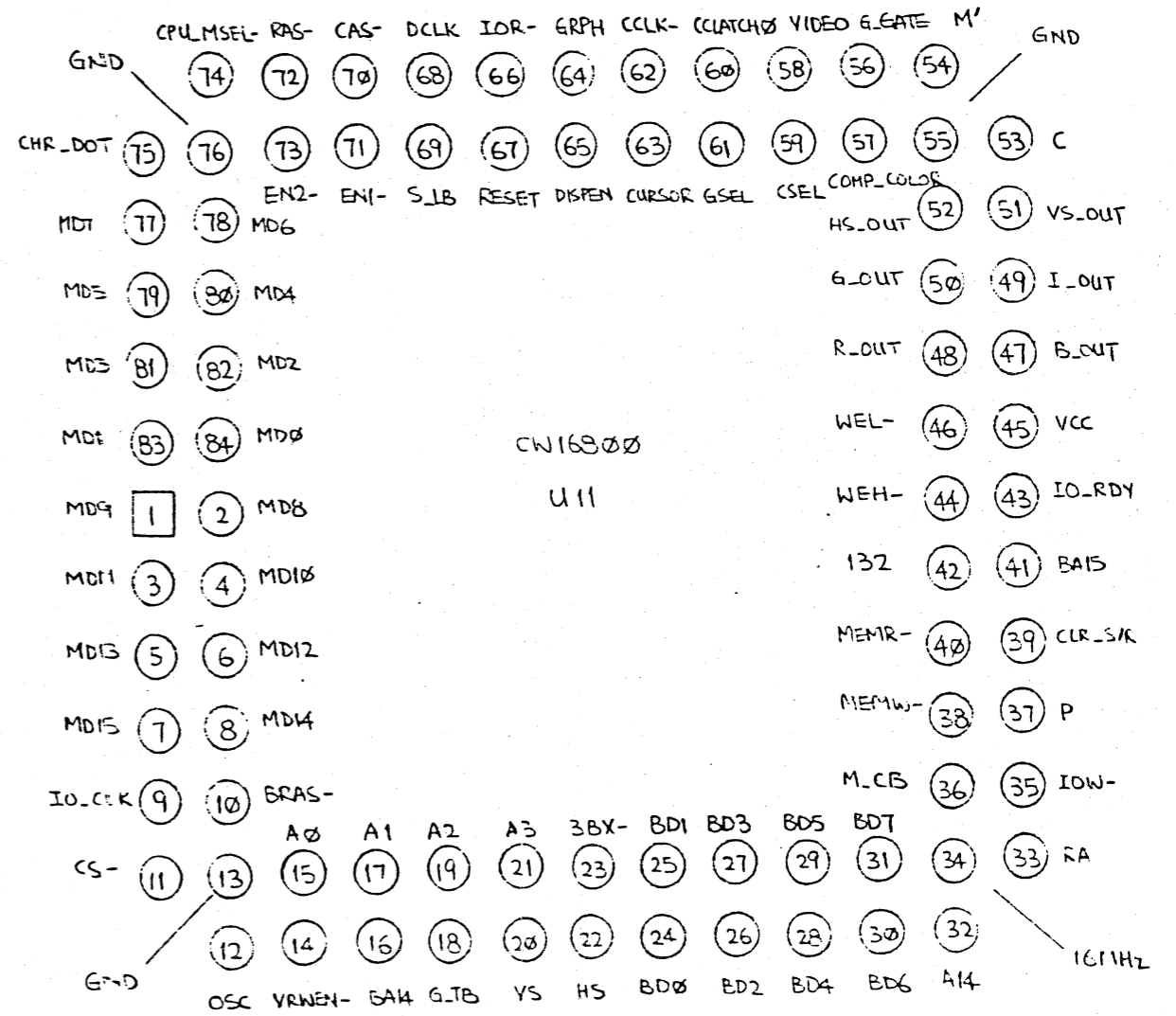
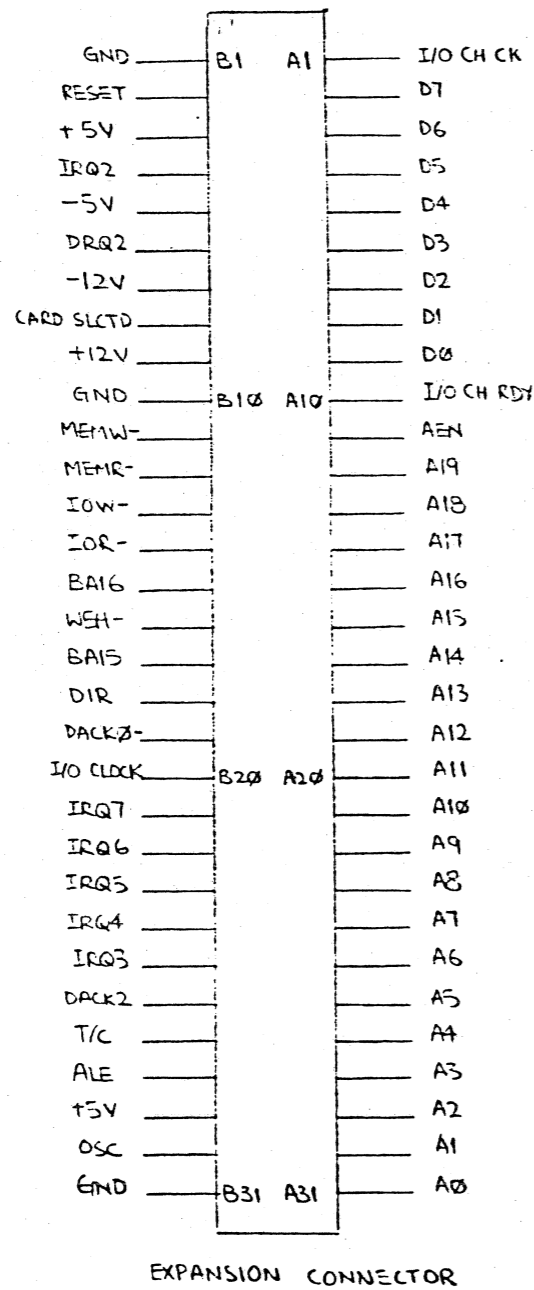


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NO.	DATE	BY				
1	NOV.16, 85	C.W.				
2						
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5			Traced		App'd.	

Drawing No. 5 OF 7

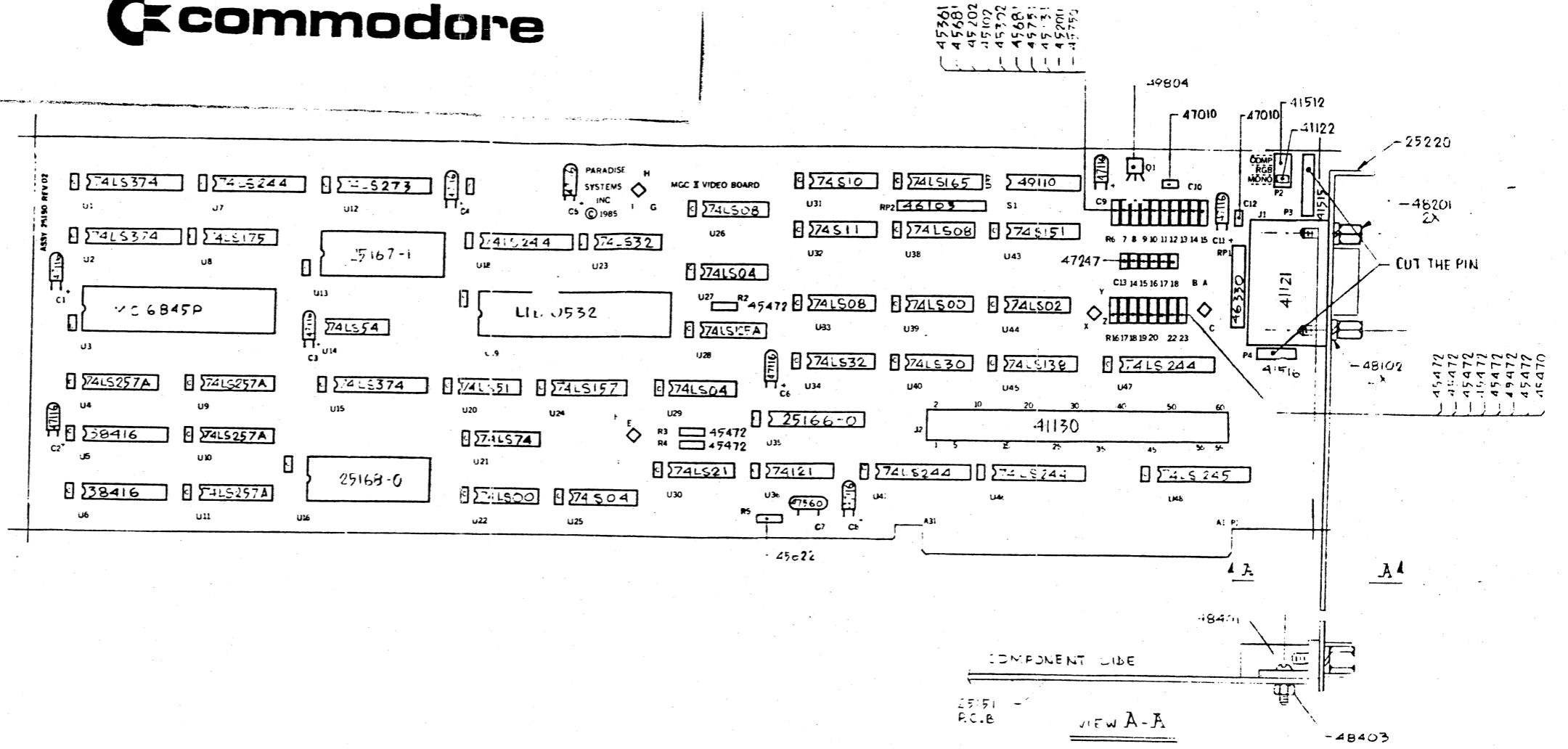


REVISIONS						
NO.	DATE	BY				
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2						
3			Drawn by	C.W.	Scale	Material
4			Chk'd.	L.K.	Date	Oct. 20, 85
5			Traced		App'd.	



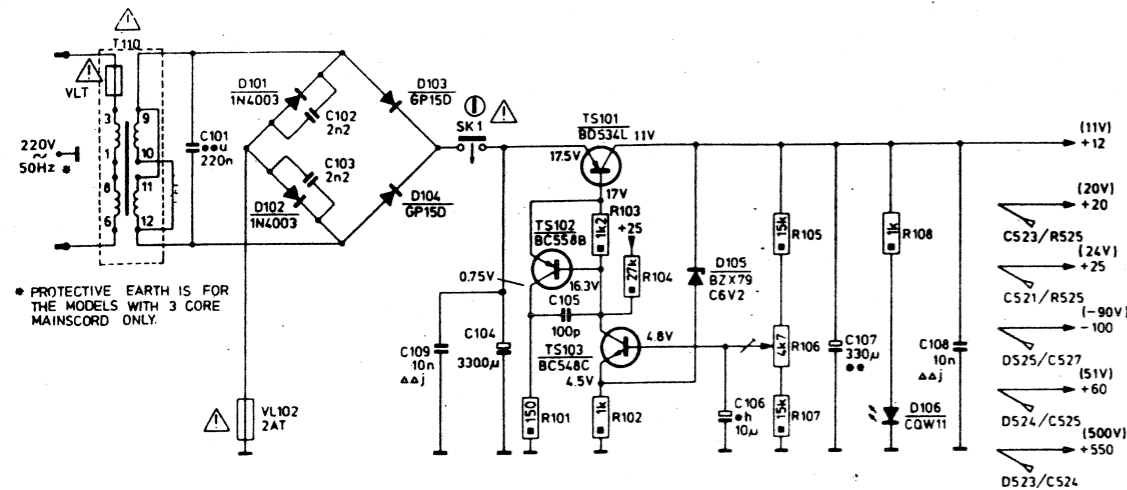
REVISIONS							
NO.	DATE	BY					
1	NOV. 16, 85	C.W.					
2							
3			Drawn by	C.W.	Scale	Material	
4			Chk'd.	L.K.	Date	OCT. 28, 85	Drawing No.
5			Traced		App'd.		7 OF 7

With the Compliments  
of  
**Commodore**



NOTES:  
 1. DO NOT INSTALL RES STOR RIG.  
 2. SET ALL SWITCH LEVERS TO THE DEF.  
 OR OPEN POSITION PRIOR TO SHIPMENT.

DRAWN	NS	DATE	11/4/85
CHECKED		DATE	
		DATE	16 MAR 1985
SIZE	FSC/MNC	EWG. NO.	25150



**SAFETY RESISTOR**  
RESISTENZA DI SICUREZZA

- SFR25 - 0.25W 5%
- CR37 - 0.25W 5-10%
- CERAMIC - CERAMICO
- FLAT - FOIL - PIATTO
- ELECTROLYTIC

OSCILLOGRAMMI: (PM5519)  
REGOLARE L USCITA VIDEO S4  
CON IL GENERATORE SULLA  
SCALA DEI GRIGI

● MASSIMO ☉ MASSIMO

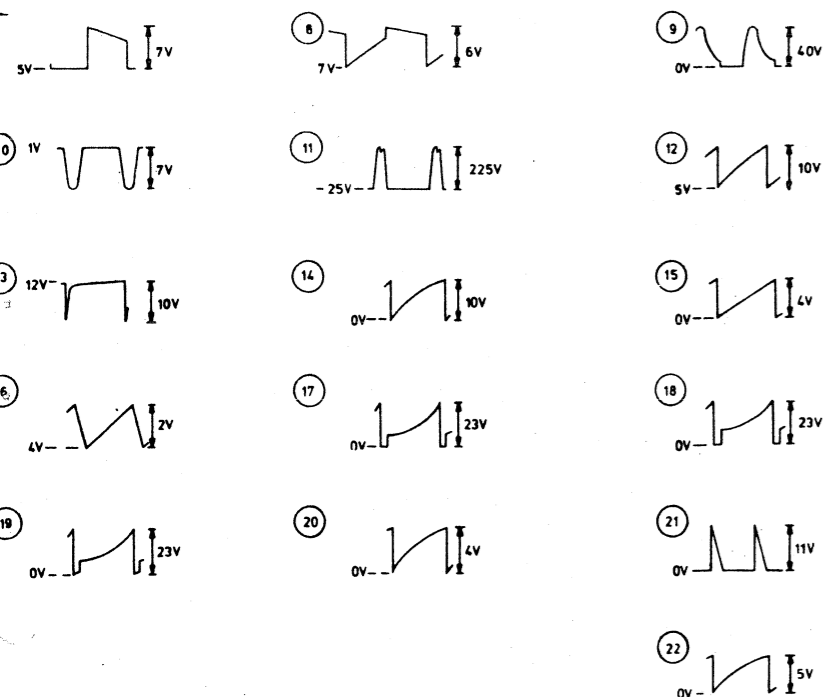
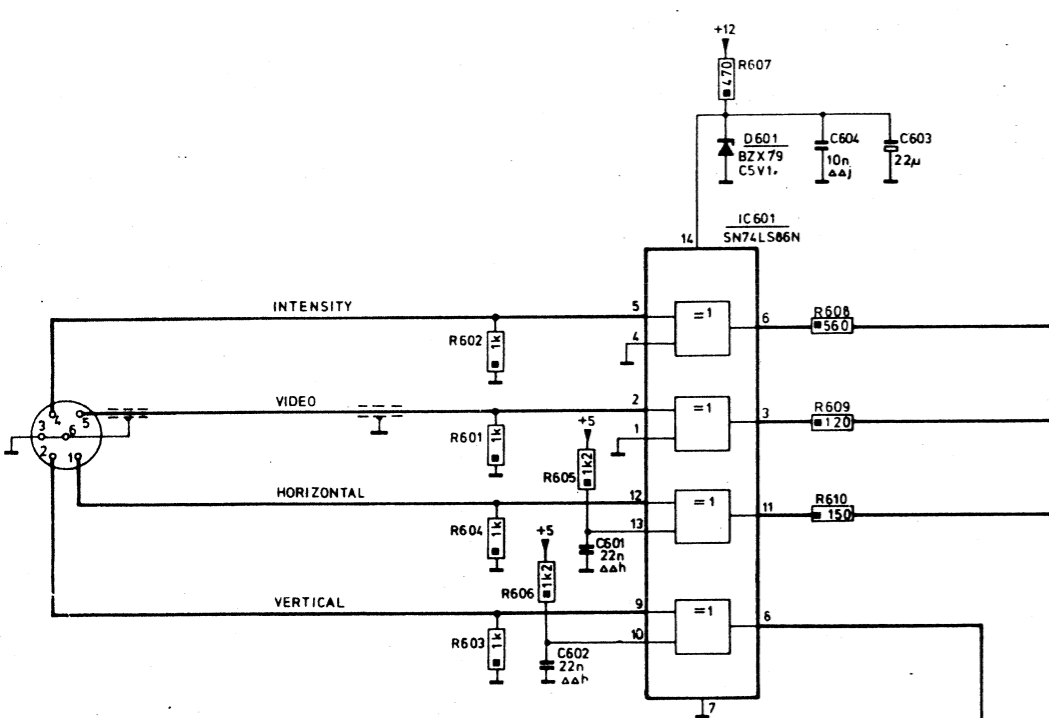
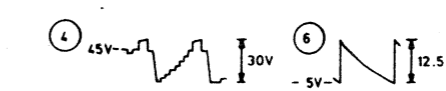
40kΩ/V (PM2411) MAX. MIN.

● 16V  
f 25V  
h 63V  
j 100V  
r 250V  
w 600V

→ AC  
→ DC

OSCILLOGRAMMI: (PM5519)  
GENERATOR ON GREY SCALE AND  
VIDEO OUTPUT ADJUST ON 0.4Vpp

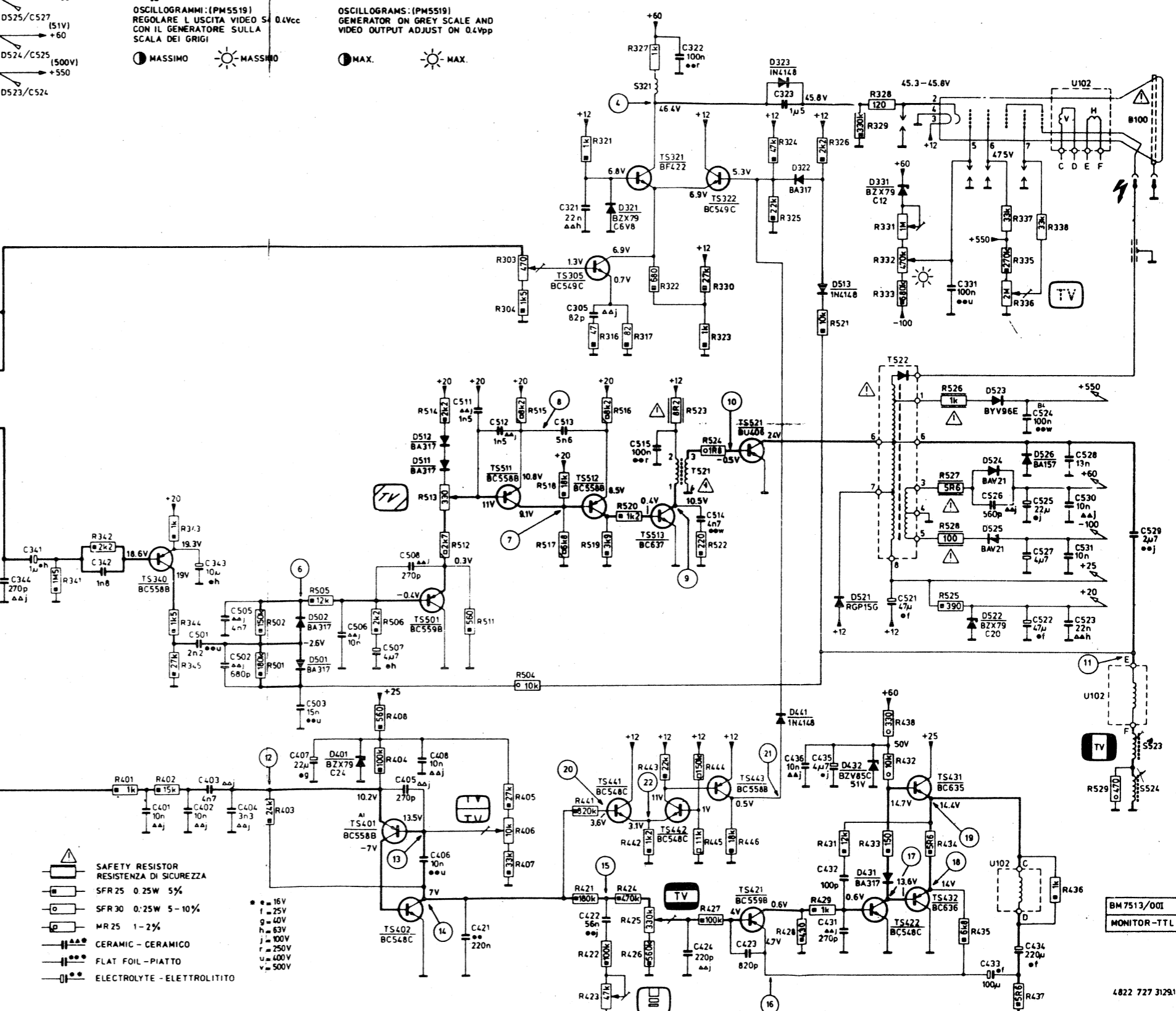
● MAX. ☉ MAX.



**SAFETY RESISTOR**  
RESISTENZA DI SICUREZZA

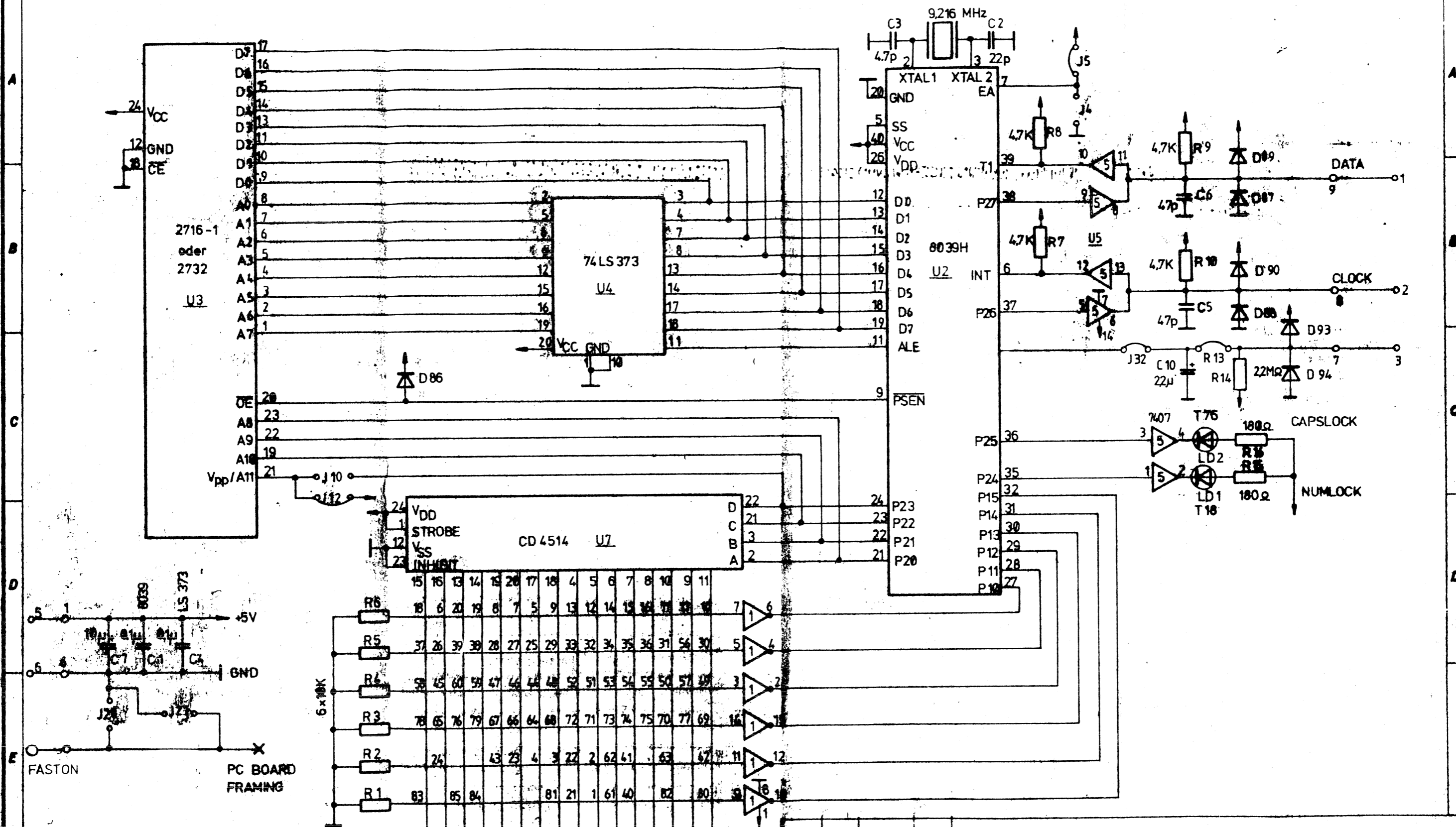
- SFR 25 0.25W 5%
- SFR 30 0.25W 5-10%
- MR 25 1-2%
- CERAMIC - CERAMICO
- FLAT FOIL - PIATTO
- ELECTROLYTE - ELETTROLITTO

● 16V  
f 25V  
g 40V  
h 63V  
j 100V  
r 250V  
w 600V  
v 500V



BM 7513/001  
MONITOR-TTL

4822 727 31291  
36374 E12



oder Verwendet nach ersten Personen zur  
 Nach- oder in anderen Zwecken übertragen  
 sich unversiegelt mitbrüchlich benutzt werden.  
 18.11.83

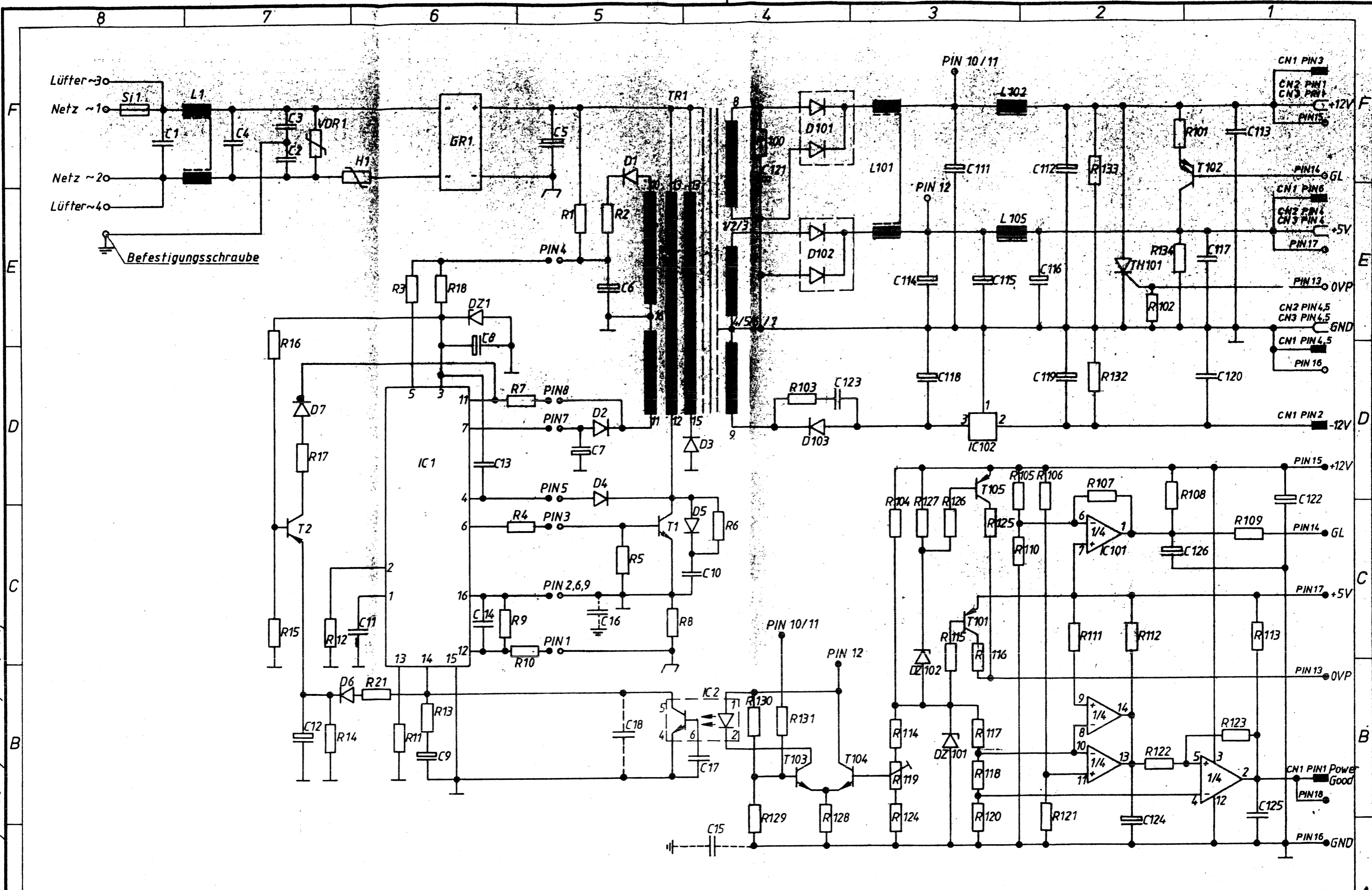
alle DIODEN  
1N4148

TASTEN 1-85

Index	Index Samstag	Datum	Name	Änderung	
Zul. Abweichung für Maße ohne Toleranzangabe nach DIN				Werkstoff	DIN
Nennmaßbereich in mm				Abmessung	DIN
klein	± 0,05	± 0,1	± 0,15	± 0,2	gepr. 18.12.1984
mittel	± 0,1	± 0,2	± 0,3	± 0,5	gepr. 18.12.1984
Winkel				± 2°	± 1°
Normwerte für Winkel beziehen sich auf die Länge des kürzeren Schenkels				Zul. Mittelabweichung IT 10	
Material				G80-0499 COMMODORE	
Hersteller				CHERRY-MIKROSWALTER G. m. b. H. Industriestraße 19 4572 Auerbach (Ost)	
Ers. f.				Ers. d.	
				620-012131	



gezeichnet am 21.12.84 Sr. 10.1.85 Sr. 4.2.85 Sr. 1.2.85 Sr.



BV 223-5-04004

Werkstoff	Oberfläche	Gezeichnet	18.12.84	Br.	2-64-332
		Geprüft			
Maßstab	Stromlaufplan 120W - Schaltnetzteil			VDE-Version	<b>Schaller</b>

D Y S A N Fachhändler in Deutschland

=====

BERLIN

SSB Software Studio  
Tempelhofer Damm 157  
1000 Berlin 42  
Tel.: 030/7512089  
(Kontakt: Hr. Fügart)

HAMBURG

Herz & Ervertz  
Spaldingstr. 160 A  
2000 Hamburg 1  
Tel.: 040/232783  
(Kontakt: Hr. Evertz)

SEELZE

Giesecke EDV-Zubehör  
Am Kalkhofen 14/15  
3016 Seelze 2  
Tel.: 0511/402058/59  
(Kontakt: Frau Giesecke)

HERNE

Jöllenbeck & Kasten  
Forellstr. 120  
4690 Herne 1  
Tel. 02323/204-1  
(Kontakt: Hr. Graus)

BOCHUM

Thomas Kleinfeld  
Joachimstr. 16  
4630 Bochum 1  
Tel.: 0234/34387  
(Kontakt: Hr. Kleinfeld)

BENSHEIM

Eckhard Balke  
Ernst-Moritz-Arndt-Str. 12A  
6140 Bensheim 3  
Tel.: 06251/79832  
(Kontakt: Hr. Balke)

KÖNIGSTEIN/TS.

Omnitek  
Wiesbadener Str. 45  
6240 Königstein/Ts.  
Tel.: 06174/1779  
(Kontakt: Hr. Dziubek)

MAINZ

Elphotec GmbH  
Schießgartenstr. 7  
6500 Mainz 1  
Tel.: 06131/231947  
(Kontakt: Hr. Staubitz)

SAARBRÜCKEN

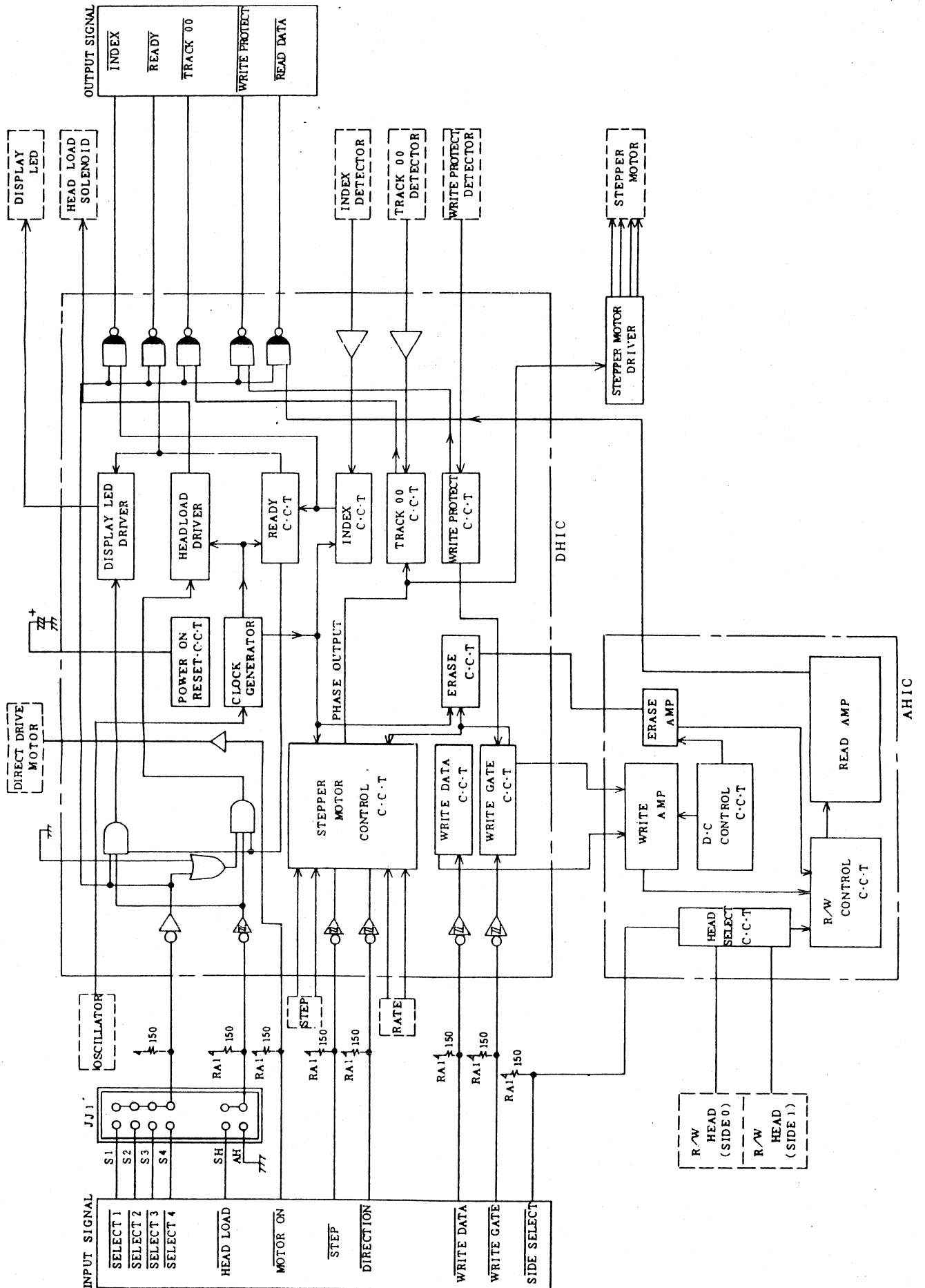
C.O.S.  
Stengelstr. 2  
6600 Saarbrücken  
Tel.: 0681/52035  
(Kontakt: Hr. Bender)

NÜRNBERG

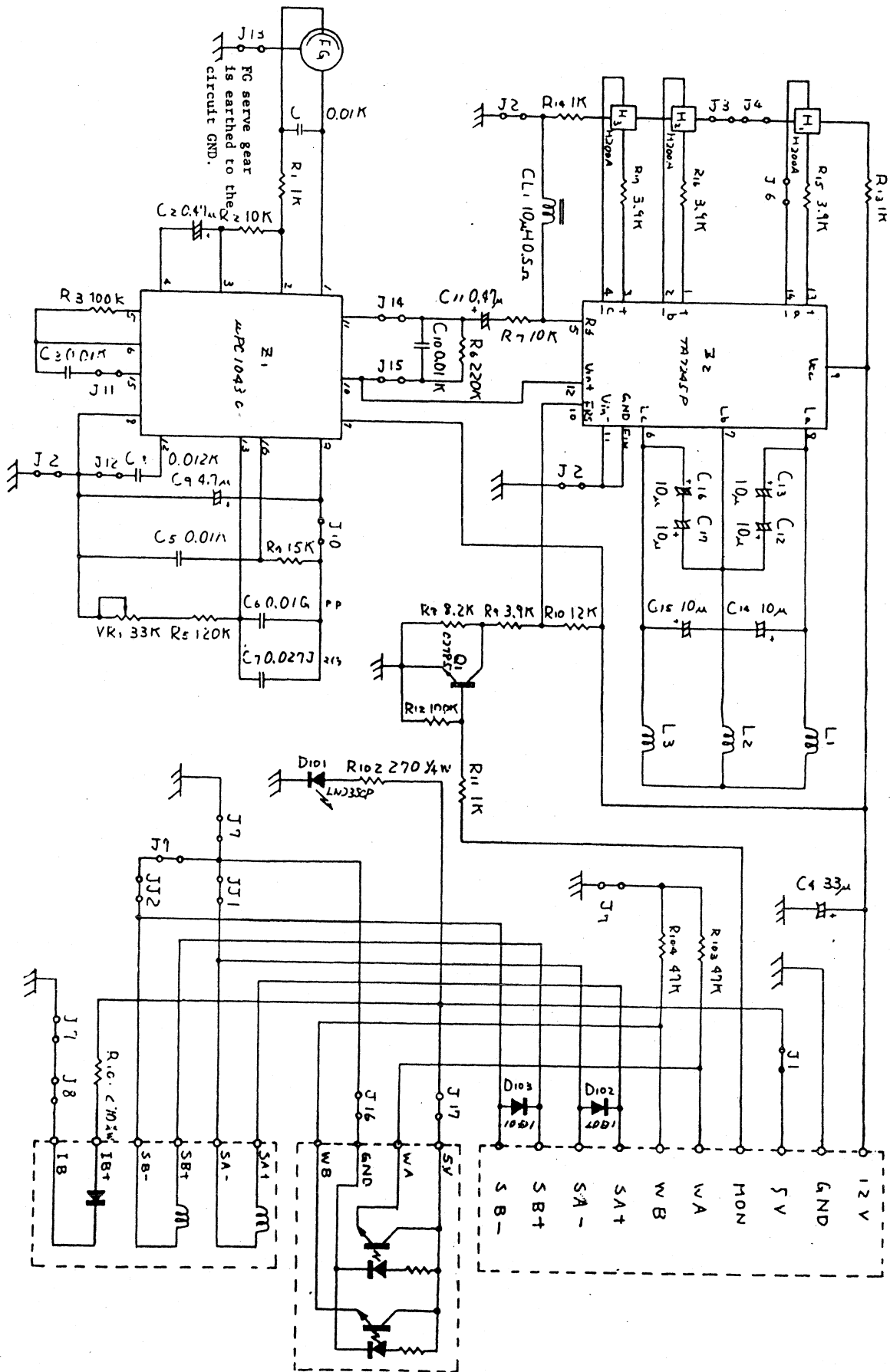
Habermann & Harder GmbH  
Kirschgartenstr. 41  
8500 Nürnberg 90  
Tel.: 0911/37183  
(Kontakt: Hr. Habermann)

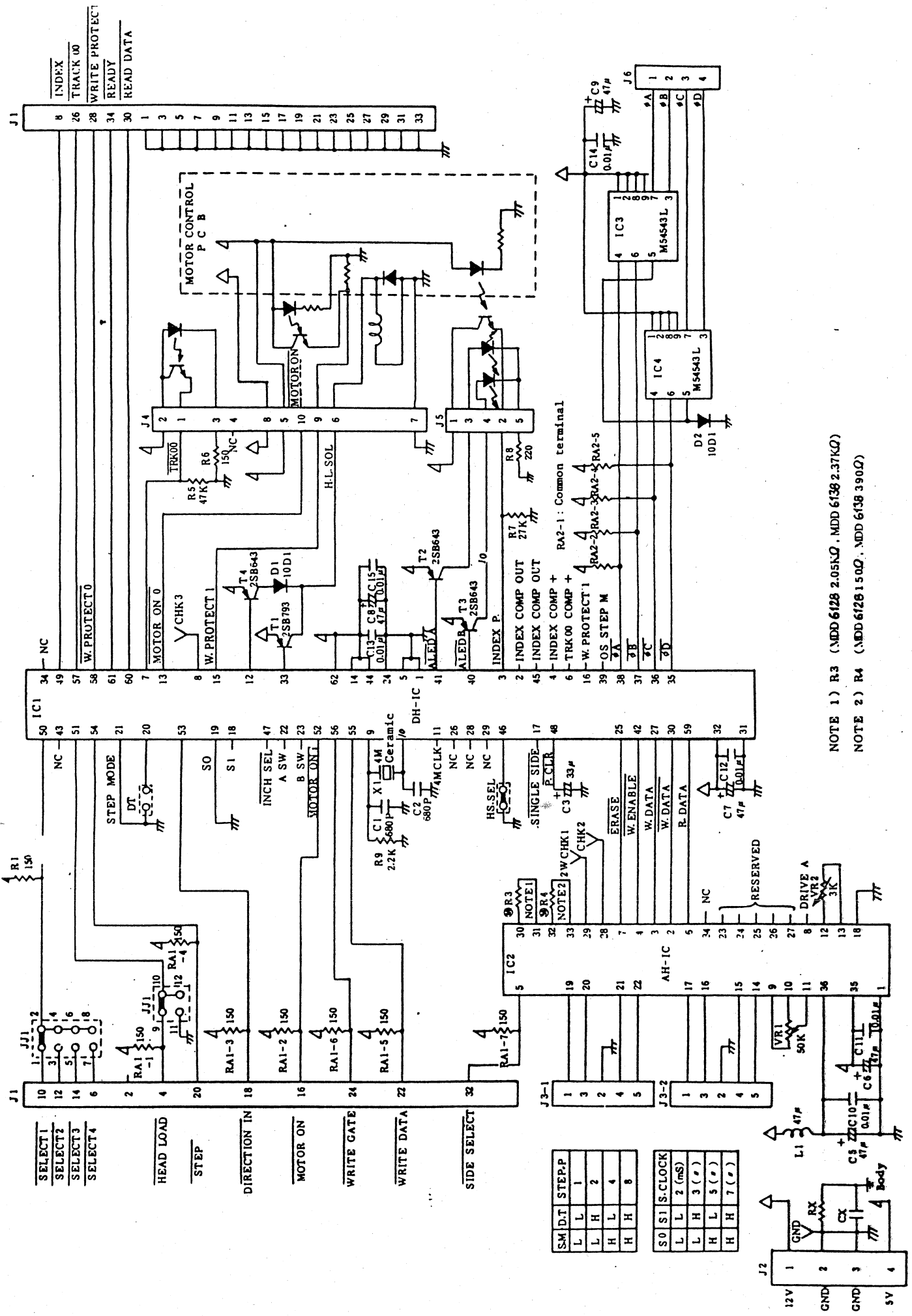
MÜNCHEN

Macrotron GmbH  
Stahlgruberring 28  
8000 München 82  
Tel.: 089/4208-0  
(Kontakt: Frau Harms)

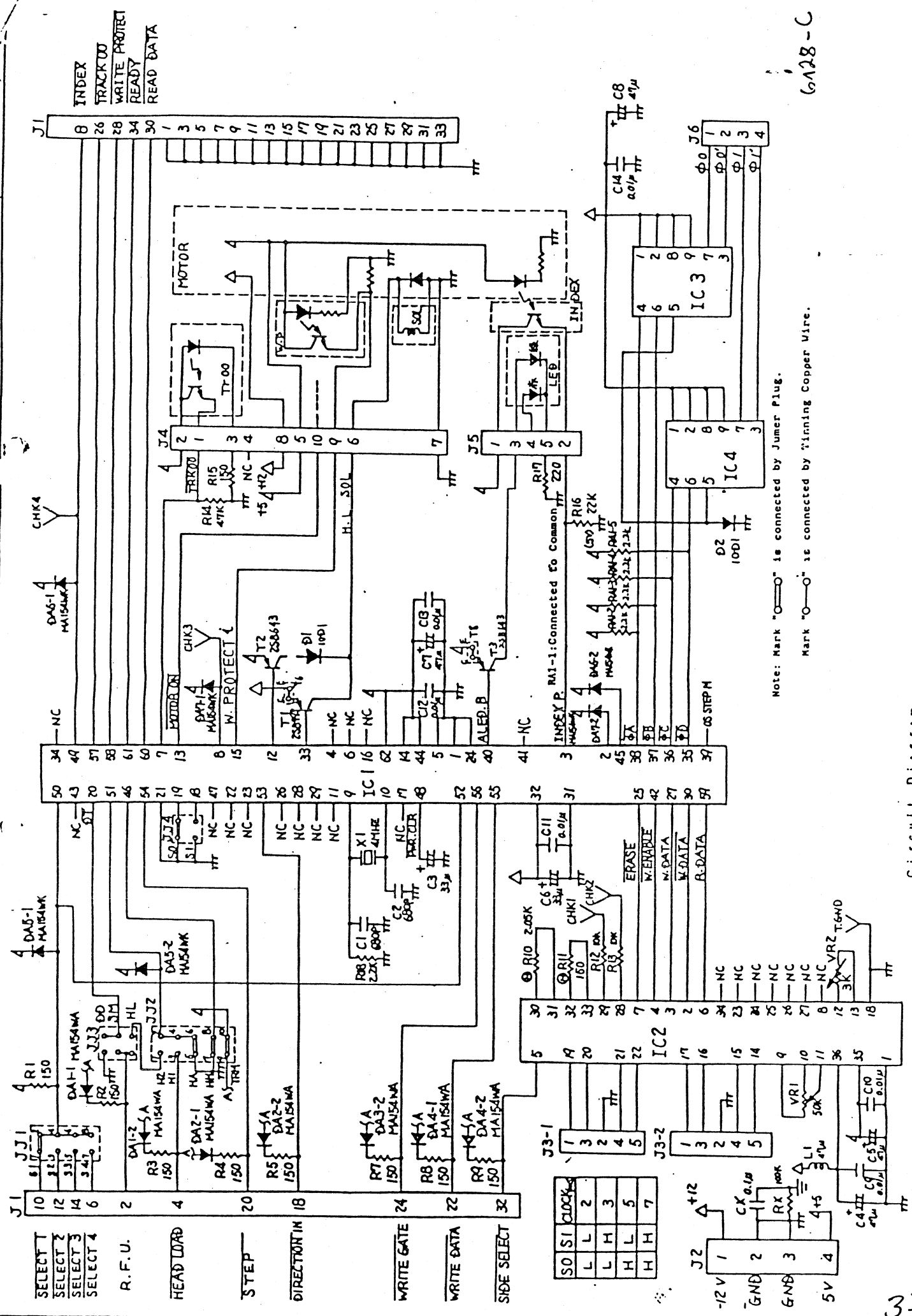


Circuit Block Diagram





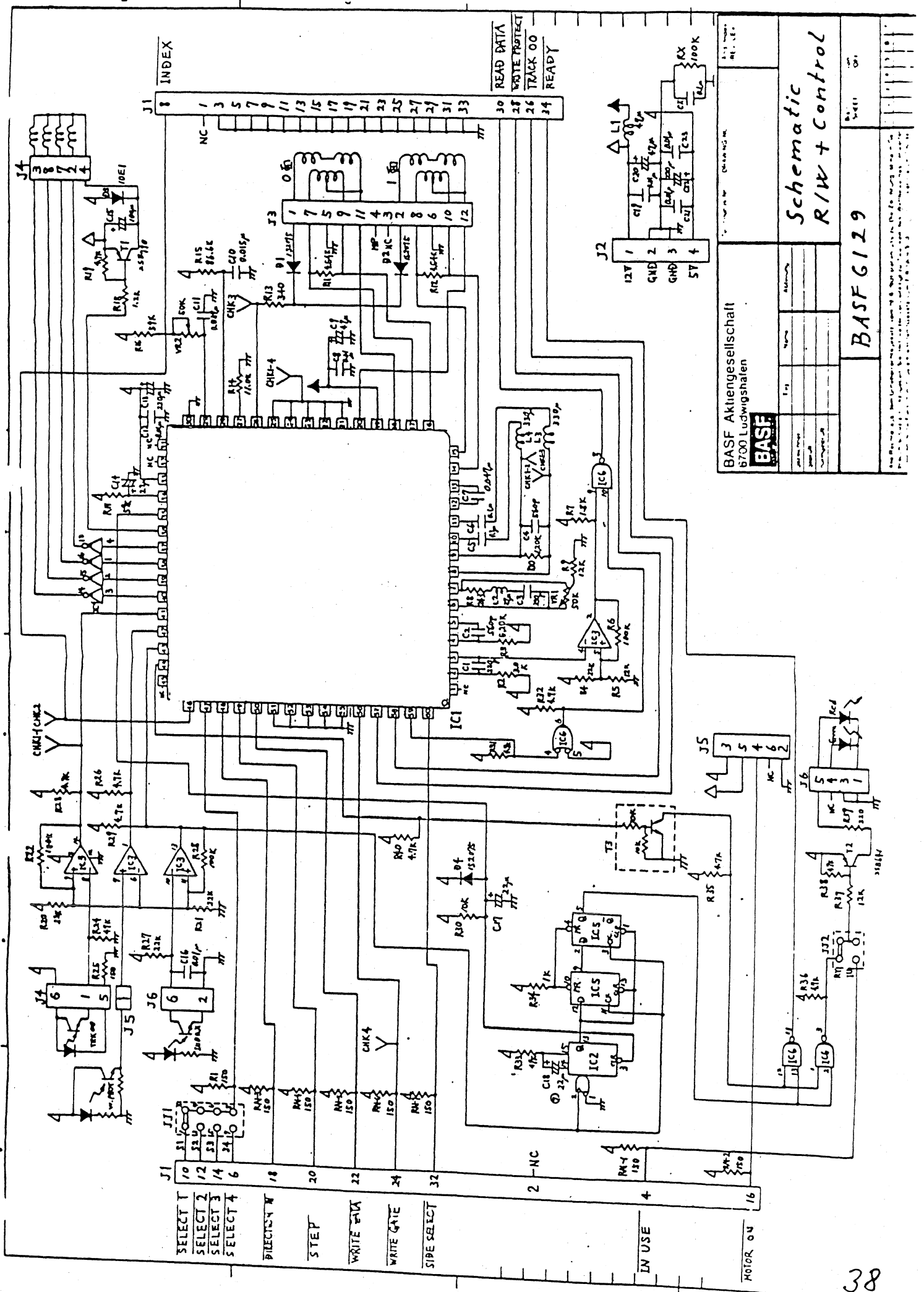
NOTE 1) R3 (MDD 6128 2.05KΩ, MDD 6136 2.37KΩ)  
 NOTE 2) R4 (MDD 6128 150Ω, MDD 6138 390Ω)



Note: Mark "O" is connected by Jumper Plug.  
 Mark "O-O" is connected by Tinning Copper Wire.

6A28-C

Circuit Diagram



BASF Aktiengesellschaft  
 6700 Ludwigshafen

Schematic R/W + Control		BASF 6129	
		Rev. 01	01

FORMAT 10 MB FESTPLATTE (HARDWARE)

WD CONTROLLER      DEBUG            ( CR )  
-----  
                  -RAX            ( CR )  
                  :0003            ( CR )  
                  -G =C800:5      ( CR )  
                  Y

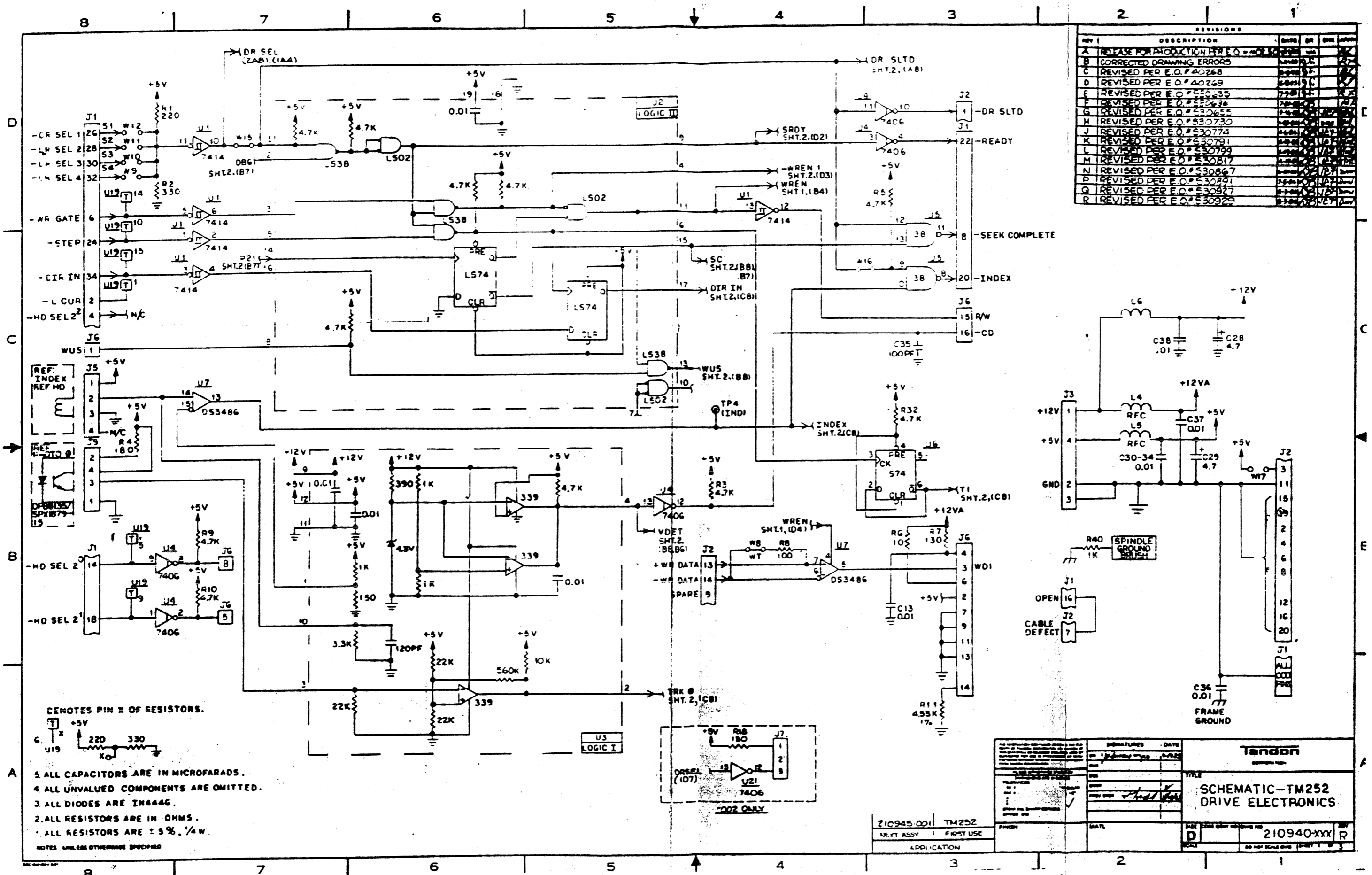
XEBEC CONTROLLER    DEBUG            ( CR )  
-----  
                  o322 00            ( CR )  
                  o320 04            ( CR )  
                  o320 00            ( CR )  
                  o320 00            ( CR )  
                  o320 00            ( CR )  
                  o320 05            ( CR )  
                  o320 07            ( CR )

---

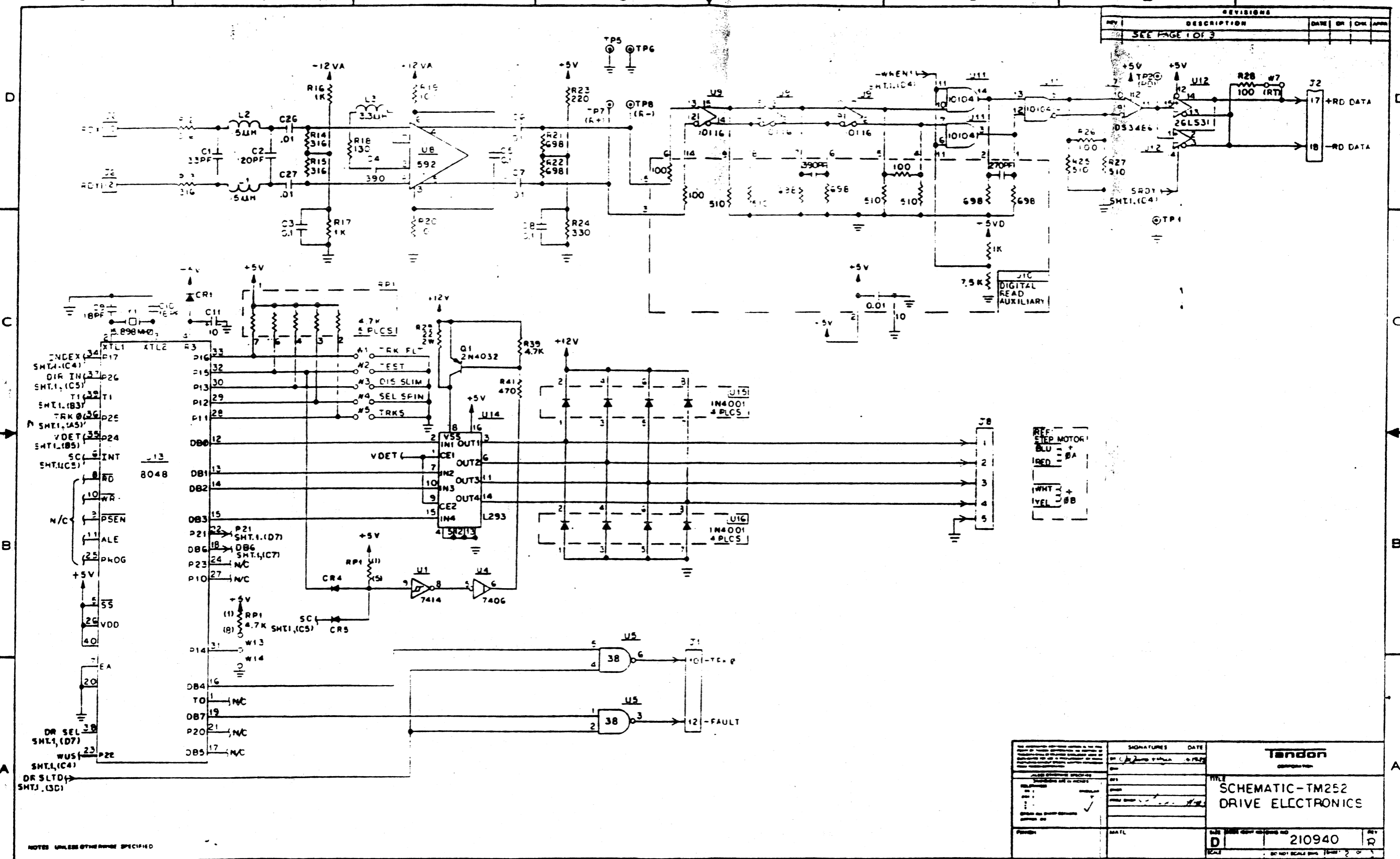
SOFTWARE FORMAT

- 1) ERSTELLEN EINER NEUEN DOS PARTITION      ( CR ) ( CR ) ( CR ) ( ESC )
- 2) AKTIVIEREN EINER PARTITION              ( 1 ) ( ESC ) ( ESC )
  
- 3) FORMAT C: /V/S
- 4) COPY \*.\* C:





REVISIONS			
REV	DESCRIPTION	DATE	BY / APPR
1	SEE PAGE 1 OF 3		

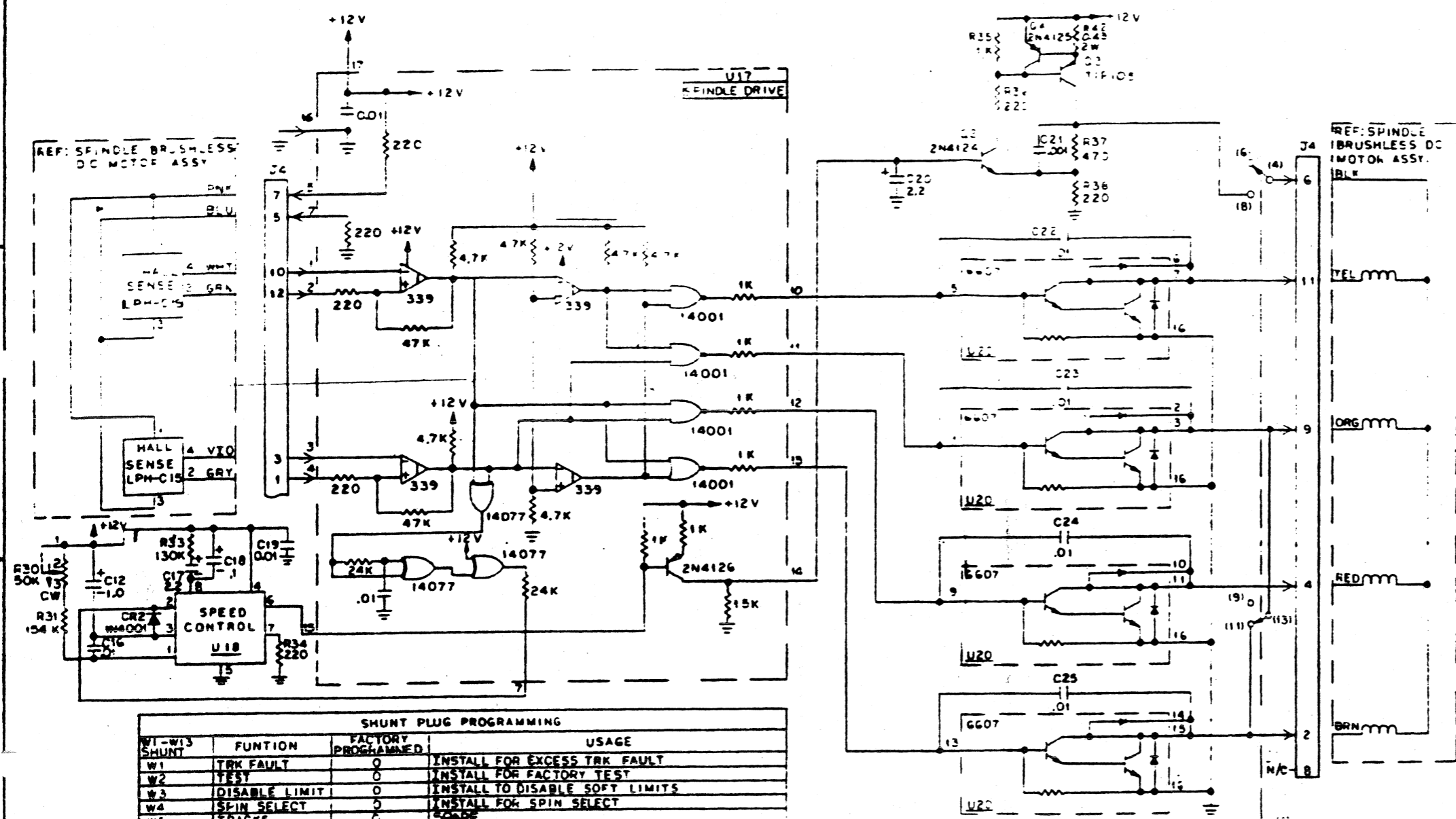


REF. STEP MOTOR  
 BLU = +A  
 IRED = +B  
 WHT = +C  
 IYEL = +D

SIGNATURES		DATE	Tandon	
BY: [Signature]		DATE: [Date]	CORPORATION	
TITLE		SCHEMATIC-TM252 DRIVE ELECTRONICS		
PARTS		SCALE		
MATERIAL		210940		
REVISIONS		D		

NOTES UNLESS OTHERWISE SPECIFIED

REVISIONS		
REV	DESCRIPTION	DATE
1	SEE PAGE 1 OF 3	



I.C. LOCATION AND VOLTAGE CHART

LOCATION	TYPE	+5V	+12V	GROUND
U1	7414	14		7
U2	210933 HYBRID I.C.	19		16
U3	210932 HYBRID I.C.	8	5	7
U4	7406	14		7
U5	7438	14		7
U6	74574	14		7
U7	DS3486	16		8
U8	592		6	3
U9	10116	1,16		6
U10	210932 HYBRID I.C.	12		10
U11	10104	1,16		8
U12	26LS31	16		8
U13	8048	26,40		20
U14	L293	16		8
U15	210936 HYBRID I.C.		12,46	
U16	210931 HYBRID I.C.			
U17	210931 HYBRID I.C.		15	14
U18	MS1970L		4	5
U19	220330 TERM PAK	16		8
U20	6607			16
U21	7406	14		7
QP1	4.7K RES/PAK	1		

SHUNT PLUG PROGRAMMING

W1-W13 SHUNT	FUNTION	FACTORY PROGRAMMED	USAGE
W1	TRK FAULT	0	INSTALL FOR EXCESS TRK FAULT
W2	TEST	0	INSTALL FOR FACTORY TEST
W3	DISABLE LIMIT	0	INSTALL TO DISABLE SOFT LIMITS
W4	SPIN SELECT	0	INSTALL FOR SPIN SELECT
W5	TRACKS	0	SPARE
RTW7	READ TERMINATOR	1	CLOSE ONLY AT END DRIVE OF DAISYCHAIN DATA
WTW6	WRITE TERMINATOR	1	CLOSE FOR RADIAL DATA
S4W9	DRIVE SELECT 4	0	INSTALL 1 OF 4 PLUGS ONLY
S3W10	DRIVE SELECT 3	0	PLUG CORRESPONDS TO DRIVE ADDRESS
S2W11	DRIVE SELECT 2	0	
S1W12	DRIVE SELECT 1	1	INSTALL FOR NO BACKLASH
W14		1	INSTALL FOR BACKLASH
W13		0	
W15	DRIVE SELECT	1	OPEN-ENABLES CRIVE TO CONTROLLER LINES WHEN NOT SELECTED
W16	INDEX		
W17	+5V TO J2-3	0	
U15	TERMINATOR PAK		

0=OMIT  
1=INSTALL

REFERENCE DESIGNATORS

LAST USED	UNUSED
C37	C14,15
CR5	
J9	J7
L5	
Q4	
R42	
RP1	
TP8	TP3
U21	
W17	WG
K1	

Signature and Date: \_\_\_\_\_ DATE: \_\_\_\_\_

**Tandon**

SCHEMATIC-TM252 DRIVE ELECTRONICS

DATE: 10/11/84

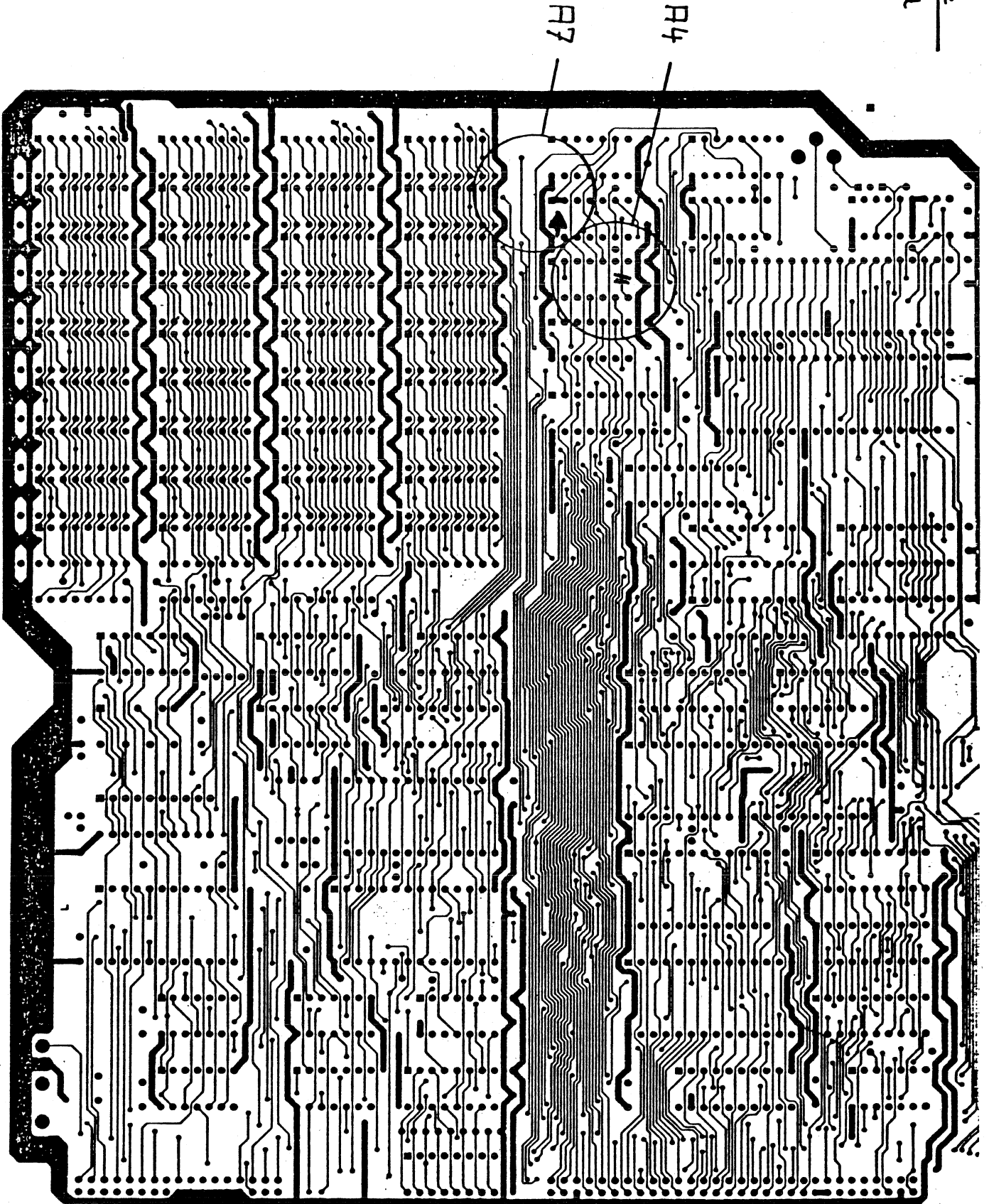
210940

Rev R

NOTES: UNLESS OTHERWISE SPECIFIED



Solder side  
CPU - Board

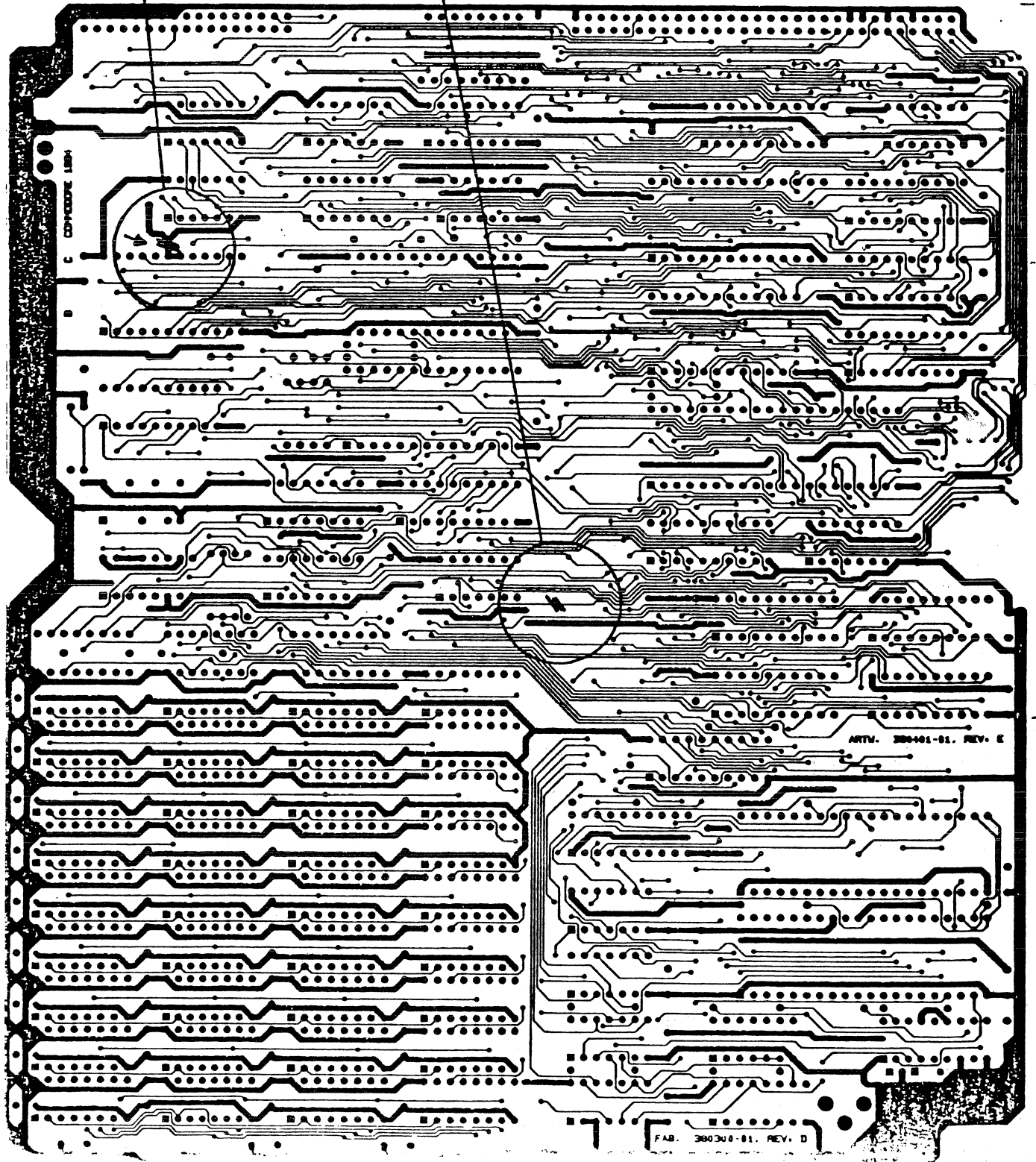


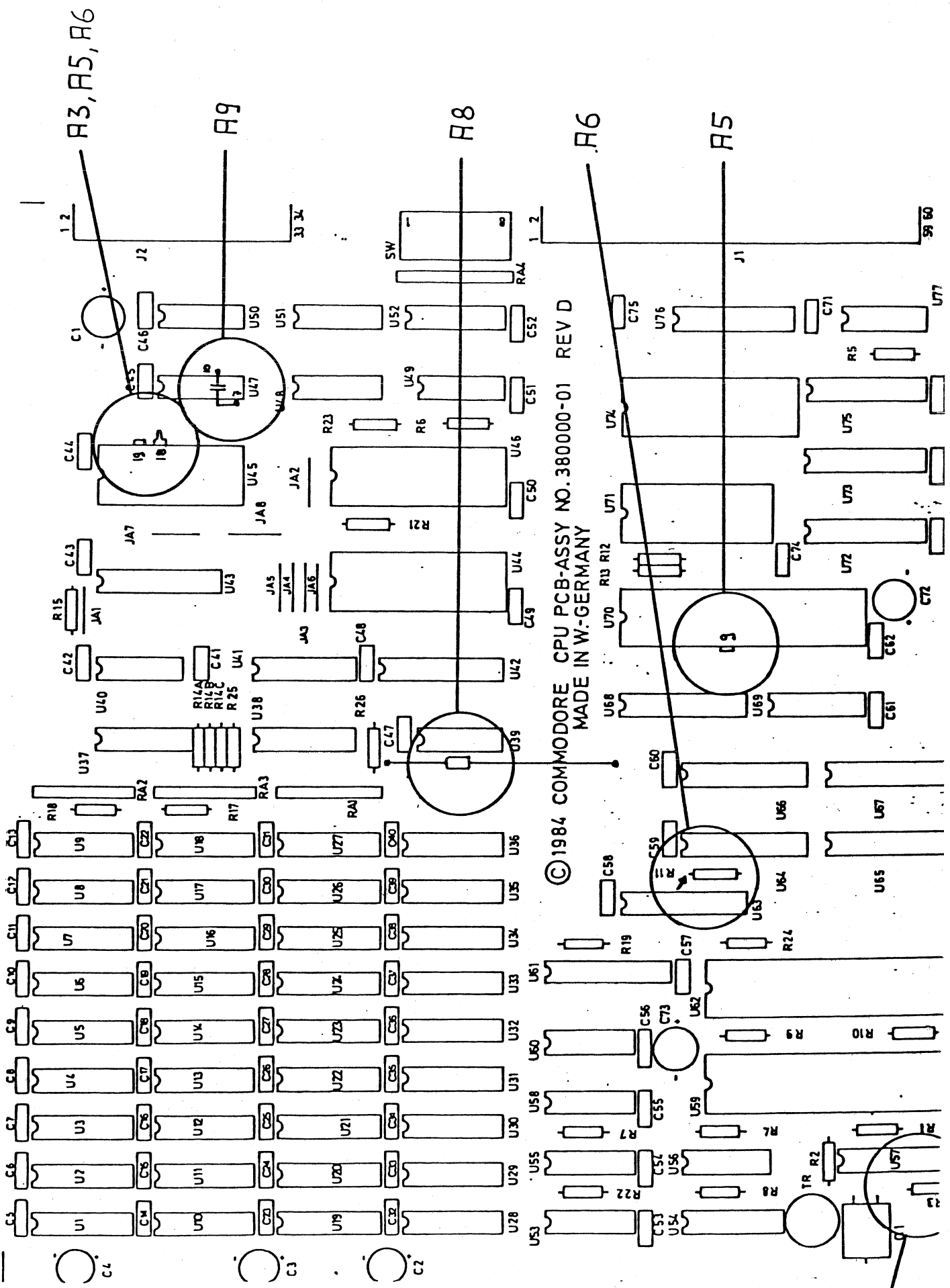
Component side

CPU - Board

A2

A1





© 1984 COMMODORE CPU PCB-ASSY NO. 380000-01 REV D  
 MADE IN W-GERMANY

A3, A5, A6

A9

A8

A6

A5

Sales Support Information

Umbau PC-Monitor für  
Paradise- u. AGA-Karte

25.3.86  
HB

Um bei älteren PC's die Paradise- oder AGA-Karte ohne Probleme nutzen zu können, sollte am PC-Monitor folgender Umbau vorgenommen werden:

Teil	alt	neu
R344	1K5	1K2
R405	27K	16K
R438	330R	820R o. 1K
R501	180K	150K
R505	12K	5K6
R514	2K2	2K
C403	4nF7	15nF
C507	4 $\mu$ F7	1 $\mu$ F
C528	13nF	10nF +/- 5%, 400 V DC, -40°C bis +85°C
D441	1N4148	Entfernen

Justagen:

- a) OHNE RECHNER! Mit R106 die +12V auf 11.65V regeln.
- b) Rechner anschliessen und 80x25 Emulation Text-Mode einstellen.  
Mit R513 den "horizontal hold" einstellen.
- c) 320x200 Graphik-Mode einstellen und mit R406 "vertical hold" justieren.
- d) Die externen Brightness und Kontrastregler auf maximum stellen.  
Mit R331 solange regeln, bis in einem normal beleuchteten Raum der horizontale Rücklaufstrahl gerade zu sehen ist.
- e) Mit den Reglern auf der Rückseite, die Breite und Höhe wie folgt einstellen:  
Breite 215mm bis 225mm  
Höhe 160mm bis 170mm

Hartmut Bützer  
Sales Support  
Systeme





## Sales Support Information

FTZ-Nummern für PC 10/20

1.4.86  
HB

Nachfolgend eine Aufstellung der uns bekannten FTZ-Nummern für den PC und deren Inhaber.

Nr.: 04362D

Inhaber: COMMODORE Büromasch.

Erlaubte Anschlüsse: Duplex asynchron

Direktrufnetz (Standleitung) 300 u. 1200 Baud

Fernsprechnet 300 u. 1200 Baud

Datex-L 300 Baud

Datex-P 300 u. 1200 Baud

SDLC synchron mit IBM SDLC-Adapter

Direktrufnetz 1200, 2400, 4800, 9600 Baud

Fernsprechnet 1200, 2400, 4800 Baud

Datex-L 2400, 4800, 9600 Baud.

Nr.: 04602D

Inhaber: Dr. W. Stopp, Stiftshof 10, 7150 Backnang, 07191/8158

Erlaubte Anschlüsse: Modem MDB 1200-01 (Einschubmodem)

Nr.: 04353D

Inhaber: Exycon, Grunerstr. 46, 4000 Düsseldorf, 0211/632083

Erlaubte Anschlüsse: Asynchron Datex-L 2400 Baud

Nr.: 02786D

Inhaber: DeTeWe, Wrangelstr. 100, 1000 Berlin 30, 030/61041

Erlaubte Anschlüsse: Teletex

Nr.: 02498D

Inhaber: Com-M-Tex AG, Auenstr. 25, 8000 München, 089/2013984

Erlaubte Anschlüsse: Telex

Nr.: 07169D (in Vorbereitung)

Inhaber: isi Computer GmbH, Otto-Hahn-Str. 34, 8012 Ottobrunn,  
089/600100

Erlaubte Anschlüsse: BTX



## 1901 Monitor an PC

Der 1901 Farbmonitor des 128 läßt sich auch an einem PC mit AGA-Karte betreiben.

Der Anschluß erfolgt mit der beigelegten Videoleitung des 1901.

### 1. Hardwaremäßiges Festlegen des Colormode

Dip-Schalter 5 des SW1 auf der CPU-Platine ist auf ON zu stellen.  
Der AGA-Dip sieht wie folgt aus:

1	2	3	4	5	6	7	8	
off	on	on	off	on	off	on	on	(Color Text 80 x 25)

Testen des Color Mode mit dem Programm AGA-Test

### 2. Softwaremäßiges Umschalten monochrom/color-mode

Softwaremäßiges Umschalten von dem Monchrom-Mode in den Color-Mode erfolgt mit dem Programm Vset.

Color Text 80 x 25 wählen (7) und den Anweisungen des Programms folgen.

Hierzu ist keine Veränderung eines Dip-Switches nötig.

Testen des Color-Mode mit dem Programm AGA-Test.

Axel Krämer  
Techn. Schulung

1. DIAGNOSTIC

1.1 DIAGNOSTIC I/O-Board

1.2 DIAGNOSTIC Video-Board

1.3 SYSTEM-DIAGNOSTIC

## 1.1 DIAGNOSTIC I/O-Board

Die I/O-DIAGNOSTIC testet folgende Baugruppen des PC10/PC20:

- Keyboard-Interface
- Disketten-Interface
- Parallel-Interface
- Seriell-Interface

Die Diagnostic-Software wird in zwei Versionen geliefert:

- A : Als ROM-Software auf dem Diagnostic-Board zum Einstecken in einen Extension-Slot des PC10/PC20.
- B : Als Programm auf der I/O-DIAGNOSTIC Diskette.

Beide Versionen werden automatisch vom PC-BIOS gestartet. Die ROM-Version wird durch die Rom-Search-Routine des BIOS gefunden und gestartet, die Disk-Version wird nach der System-Initialisierung automatisch von der Diskette geladen und gestartet.

Zum Testen der Parallel- und Seriell-Ports werden zwei Jumper mit den folgenden Kurzschlußbrücken benötigt :

- Parallel-Port-Jumper :
  - 1 - 13
  - 2 - 15
  - 10 - 16
  - 11 - 17
  - 12 - 14
  
- Seriell-Port-Jumper :
  - 1 - 7
  - 2 - 3
  - 4 - 5 - 8
  - 6 - 20

#### Testvorbereitung:

- PC10/PC20 in Standard-Konfiguration (ohne Erweiterungen)
- I/O-DIAGNOSTIC Diskette in Laufwerk A einlegen
- SYSTEM-DIAGNOSTIC Diskette in Laufwerk B einlegen
- Jumper auf Parallel- und Seriell-Port aufstecken
- (Diagnostic-Board in einen der Slots stecken)

#### Testdurchführung:

Nach dem Starten der Diagnostic muß das Keyboard entfernt werden, um ein Testen der Keyboardschnittstelle zu ermöglichen. (Das Keyboard selber wird beim Power-Up des PC10/PC20 getestet.) Die Diagnostic startet nun den Test der I/O-Board-Baugruppen, dessen Ablauf auf dem Monitor verfolgt werden kann. Dabei werden alle Testschritte im folgenden Format dargestellt:

Testcode, Baugruppe, Testergebnis, (Fehlerstatus)

Der nur im Fehlerfall ausgegebene Fehlerstatus besteht aus dem Fehlercode, der auch auf dem Diagnostic-Display ausgegeben wird, und dem eigentlichen Status der getesteten Baugruppe, der im folgenden weiter spezifiziert wird. Der gesamte Fehlerstatus kann so als Fehler-Kurzmeldung für weitere Analysen in einer Log-Datei gespeichert werden.

Nach etwa zwei Minuten ist ein Diagnosticlauf beendet und nach Ausgabe einer Abschlußmeldung startet das Programm erneut. Dieser Dauertest kann nur durch das Abschalten des Systems abgebrochen werden.

Folgende Tests werden während eines Laufes durchgeführt :

#### 1.1.1. Keyboard-Interface:

Fehlercode : "AA"

Test : Bei abgezogenen Keyboard wird das Keyboard-Latch sieben mal getaktet und so mit sieben "1" = FE hex gefüllt. Danach das Keyboard-Latch gelesen und auf "FE" geprüft.

Fehlerstatus : Latch-Inhalt, wenn nicht FEH.

Fehlercode : "AB"

Test : Ist das Keyboard-Latch gefüllt, wird ein Interrupt erzeugt, dessen Auftreten getestet werden kann.

Fehlerstatus : CPU-Register 'AH' nach dem Interrupt

#### 1.1.2. Floppydrive-Interface:

Fehlercode : "D1" o. "D2" für Drive A und Drive B

Test : - Reset FDC  
- Linear Seek  
- Random Seek  
- Read-Test  
- Write/Verify-Test

Fehlerstatus : 80H - Time Out  
40H - Bad Seek Operation  
20H - Bad FDC  
10H - Bad CRC on Read  
09H - DMA Boundary across 64K  
08H - DMA Overrun  
04H - Sector not found  
03H - Write protect  
02H - Address mark not found  
01H - Bad command

### 1.1.3.Parallel-Interface:

Fehlercode : "E7"  
Test : R/W-Test des Daten-Registers  
Testmuster FFH...00H  
Fehlerstatus : FFH - Bad Compare

Fehlercode : "E8"  
Test : Testet die Handshake-Leitungen mit Hilfe  
des Jumpers.  
Fehlerstatus : 07H - Error Line (Bit3)  
50H - Select Line (Bit4)  
60H - Paper-empty Line (Bit5)  
00H - Acknowledge Line (Bit6)  
COH - Busy Line (Bit7)

Fehlercode : "E9"  
Test : Durch eine Jumperverbindung kann durch  
Setzen von Bit2 des Printer-Kontroll-  
Registers ein Interrupt ausgelöst  
werden, dessen Funktion getestet wird.  
Fehlerstatus : CPU-Register 'AH' nach dem Interrupt

### 1.1.4.Seriell-Interface:

Fehlercode : "EA"  
Test : Tranfer von 256 Testbytes über Trans-  
mitter - Jumper - Receiver mit unter-  
schiedlichen Übertragungsformaten.  
1. 1200 Bd; odd Parity; 1 Stop; 8 Daten  
2. 9600 Bd; even Parity; 2 Stop; 7 Daten  
Fehlerstatus : 80H - Time Out  
40H - Transmitter shift register empty  
20H - Transmitter holding register empty  
10H - Break detected  
08H - Framing Error  
04H - Parity Error  
02H - Overrun Error  
01H - Data not ready



## 1.2 DIAGNOSTIC Video-Board

Die VIDEO-DIAGNOSTIC ist als Programm auf der I/O-DIAGNOSTIC Diskette vorhanden und kann von dort gestartet werden.

### Testvorbereitung:

- System mit DOS-Diskette in Drive A initialisieren

### Testdurchführung:

- I/O-DIAGNOSTIC Diskette in Drive B einlegen
- "B:VDIAG <Return>" eingeben

### Testablauf:

Nach dem Start der Video-Diagnostic wird der Bildschirm gelöscht und der das erste Testbild dargestellt. Durch Drücken einer Taste kann von einem Testbild ins andere gesprungen werden. Durch zweimaliges Drücken einer Taste kann die Video-Diagnostic verlassen werden.

Folgende Testbilder können aufgerufen werden :

1. PC10/PC20 Character Set
2. Darstellung aller möglichen Attribute mit freigegebenen Blinkmodus
3. wie 2. jedoch mit gesperrtem Blinkmodus
4. R/W-Test des Video-RAMs (\$B0000-B3FFF)

### 1.3 SYSTEM-DIAGNOSTIC

Die SYSTEM-DIAGNOSTIC dient zum Testen aller Komponenten des PC10/PC20. Alle Tests können hintereinander oder einzeln, einfach oder mehrfach ausgeführt werden. Die Auswahl der Tests und ihre Wiederholungen werden menuegesteuert eingegeben. Alle Testergebnisse werden in einem Log-File abgespeichert und können nach Ablauf der System-Diagnostic auf dem Bildschirm oder einem Drucker ausgegeben werden.

Folgende Tests sind in der System-Diagnostic enthalten:

- System-Switch, System-Port, System-Timer
- RAM
- Keyboard
- Floppy-Disk-Laufwerke
- Harddisk-Laufwerk
- Parallel-Port
- Seriell-Port
- Video-Interface

Testvorbereitung:

- System ausschalten
- SYSTEM-DIAGNOSTIC-Diskette in Laufwerk A einlegen
- I/O-DIAGNOSTIC oder 2. SYSTEM-DIAGNOSTIC Diskette in Laufwerk B einlegen
- Jumper auf Parallel- und Seriell-Port aufstecken

Testdurchführung:

- System einschalten
- Steuerung der Testschritte über das Menue

### Testablauf:

Die Steuerung der SYSTEM-DIAGNOSTIC erfolgt über drei Menues, die im folgenden beschrieben werden.

#### 1. Menue - Diagnostic-Mode:

- F1 - Alle Tests - bis auf den Videotest - werden in einer Schleife durchlaufen.
- F2 - Aufruf des 2. Menues.
- F9 - Das Logfile auf der in Laufwerk A eingelegten Diskette wird gelöscht, d.h. alle Einträge werden Null gesetzt.
- F10 - Das Logfile auf der in Laufwerk A eingelegten Diskette wird auf dem Monitor ausgegeben und kann mit "Print-Screen" - Anweisung (Shift/PrtSc) auf einem angeschlossenen Drucker ausgegeben werden.

Hinweis: Die Menuepunkte F9 und F10 sind nicht nur für die SYSTEM-DIAGNOSTIC nutzbar, sondern ermöglichen ebenso die Behandlung von Logfiles, die z.B. vom SYSTEM-BURNIN erstellt wurden.

#### 2. Menue - Test-Mode:

- F1 - System-Port : s. Seite 9, 1.3.1.
- F2 - System-Ram : s. Seite 9, 1.3.2.
- F3 - Keyboard : s. Seite 9, 1.3.3.
- F4 - Floppy-Drive A : s. I/O-DIAGNOSTIC Seite 4, 1.1.2.
- F5 - Floppy-Drive B : s. I/O-DIAGNOSTIC Seite 4, 1.1.2.
- F6 - Harddisk : s. Seite 10 1.3.4
- F7 - Parallel-Port : s. I/O-DIAGNOSTIC Seite 5, 1.1.3.
- F8 - Serial-Port : s. I/O-DIAGNOSTIC Seite 5, 1.1.4.
- F9 - Videocard : s. VIDEO-DIAGNOSTIC Seite 6, 1.2.
- F10 - Rückkehr zum 1. Menue.

#### 3. Menue - Execution-Mode:

- F1 - Ausgewählte Tests werden in einer Endlosschleife durchlaufen. ACHTUNG: Abruch nur durch Ausschalten des Systems möglich !
- F2 - Ausgewählte Tests werden einmal ausgeführt. Danach Rückkehr zum 1. Menue.
- F3 - Ausgewählte Tests werden mehrfach durchlaufen. Die Anzahl der Tests kann 1...9999 betragen. Die Eingabe kann mit <Backspace> korrigiert werden und wird mit <Return> abgeschlossen. Sind alle Wiederholungen ausgeführt erfolgt der Rücksprung zum 1. Menue.
- F10 - Rückkehr zum 1. Menue ohne einen Test auszuführen.

### 1.3.1. System-Switch, -Port, -Timer

Testcode : "22"  
Test : Lesen des Dip-Switch und vergleichen  
mit der Default-Einstellung.  
Fehlerstatus : Gesetzte Bits geben Position von  
fehlerhaften Schaltern wieder.

Testcode : "23"  
Test : Überprüfung der Timer-Freigabeleitung  
GATE2 mit Hilfe des System-Ports.  
Fehlerstatus : 00 - OK ; FF - Fehler.

### 1.3.2. System-Speicher

Testcode : "68"  
Testmuster : Bank# + Adress#  
Testbereich : \$10000H...\$9FFFFH  
Test : Adress-Test  
Muster werden in Testbereich geschrie-  
ben, zurückgelesen und verglichen.  
Fehlerstatus : 1.Byte Fehlersegment  
2.Byte Fehleradresse

Testcode : "6B"  
Test : R/W-Test  
Testmuster : 00H, 55H, AAH, FFH  
Testbereich : \$10000H...\$3FFFFH (256kB)  
Fehlerstatus : 1.Byte Fehlersegment  
2.Byte Fehleradresse

### 1.3.3. Keyboard

Testcode : "AC"  
Test : Keyboard-Reset;  
Erwartet 'AA' vom Keyboard  
Fehlerstatus : FFH - Keyboard sendet 'AB' => Fehler  
XXH - Keyboard sendet 'AA'+ 'XX'  
=> XX - Scancode einer def. Taste

#### 1.3.4. Harddisk (nur PC20)

Testcode : "C2"  
Test : - read harddisk parameters  
- reset controller  
- linear seek cylinder 0...max. cyl.  
- random seek (30 times)  
- read data from every seventh cylinder  
- controller ram diagnostic  
- drive diagnostic  
- controller internal diagnostic

Fehlerstatus: FFH - Sense operation failed  
CCH - Controller ram error  
BBH - Undefined error occurred  
80H - Time out  
40H - Bad seek operation  
20H - Bad HDC  
11H - ECC corrected data  
10H - Bad ECC on read  
0BH - Bad track flag detected  
09H - DMA boundary across 64K  
07H - Drive parameter aktivitiy failed  
05H - Reset failed  
04H - Sector not found  
02H - Address mark not found  
01H - Bad command

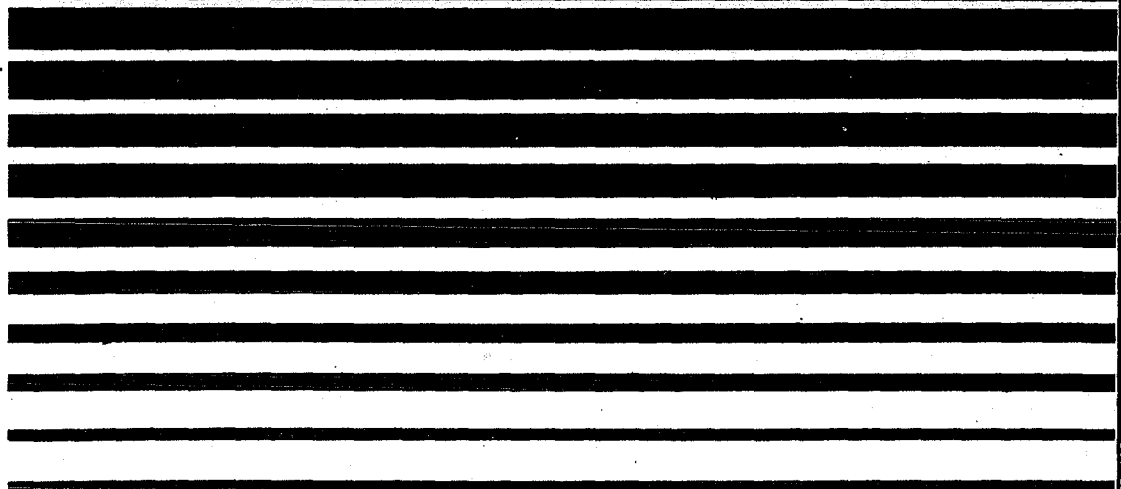
# Ersatzteilkatalog

Spare parts catalogue  
Catalogue de pièces de rechange  
Catálogo de Repuestos

## commodore

PC 10

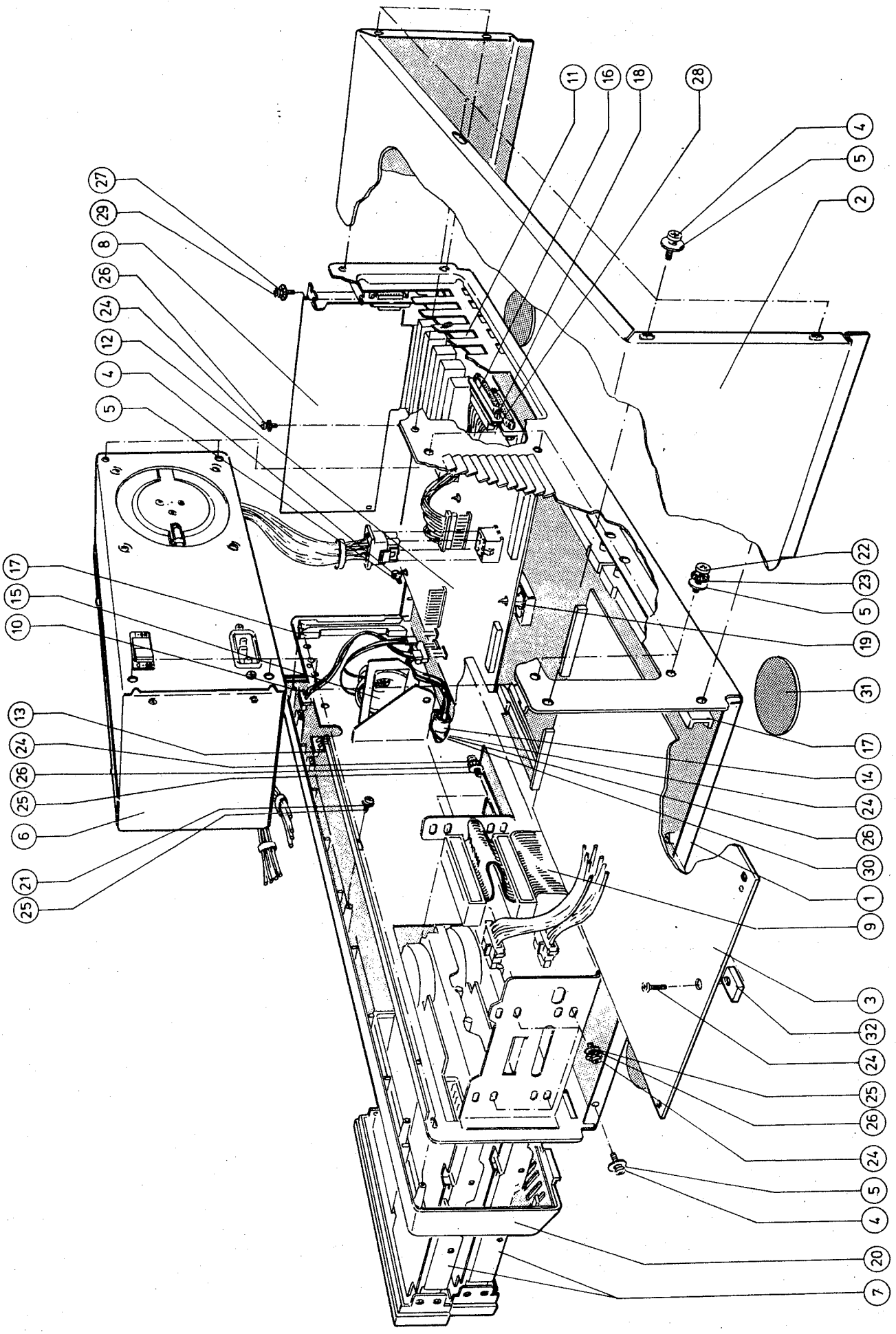
PC 20



 **commodore**  
COMPUTER

# PC IV CPU MAIN ASSY

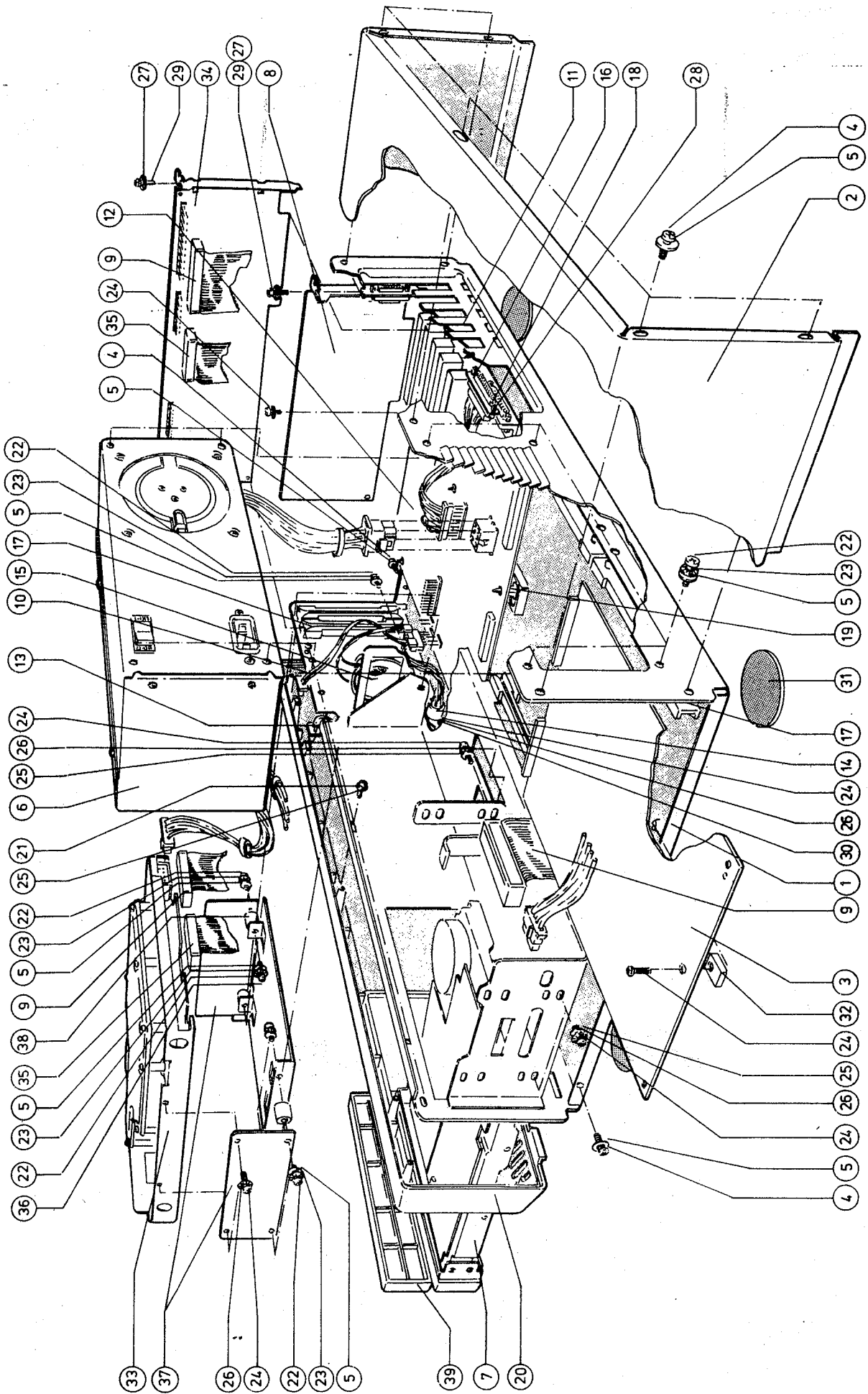
PC IV CPU MAIN ASSY				Ersatzteilnummer			
Position	Benennung	Ersatzteilnummer	Position	Benennung	Ersatzteilnummer	Position	Benennung
Position	Term	Spare Parts No.	Position	Term	Spare Parts No.	Position	Term
Position	Désignation	No. de pieces de rechange	Position	Désignation	No. de pieces de rechange	Position	Désignation
Posición	Denominación	No de requesto	Posición	Denominación	No de requesto	Posición	Denominación
1	Housing, Bottom	380100-01	21	3 x Screw, self tapping, 2,9 x 9,5 mm DIN 7981	906883-04		
2	Housing, Top	380101-01	22	14 x Screw M4x5mm DIN 7985	906810-09		
3	CPU PCB Assy	380000-01	23	14 x Lockwasher ø 4,3 ext. tooth DIN 6797	905655-04		
4	7 x Screw, M4x8mm DIN 7958	906810-01	24	11 x Screw M3x8mm DIN 7958	906800-03		
5	11 x Washer Flat ø 4,3 DIN 125	907272-06	25	9 x Washer Flat ø 3,2 DIN 125	907272-02		
6	Power Supply, VDE/BSI	380021-01	26	9 x Lockwasher ø 3,2 ext. tooth DIN 6797	905652-04		
7	Power Supply, UL	380021-02	27	5 x Lockwasher ø 3,7 ext. tooth DIN 6797	905650-07		
8	2 x Floppy Disk Drive	380111-01	28	2 x Kep Nut 4-40*	905970-05		
9	Monochrome Video PCB Assy	380003-01	29	5 x Screw M3 x5mm DIN 7985	324465-01		
10	Drive Cable Assy	380012-02	30	2 x Nut M3 DIN 934	905960-03		
11	Power On LED Assy	380016-01	31	4 x Foot, self adhesive	380128-01		
12	4 x Extension Card Panel	380120-01	32	1 x Distance Plate, Trovidur	380115-01		
13	I/O PCB Assy	380001-01					
14	Harddisk LED Assy	380020-01					
15	Keyboard Cable Assy I	380017-01					
16	Speaker Assy	8256099-03					
17	RS 232 Cable Assy	380014-01					
18	9 x Guide-PCB	251118-01					
19	4 x Stand Off	380121-01					
20	8 x Stand Off	380122-01					
	Front Panel	380102-01					





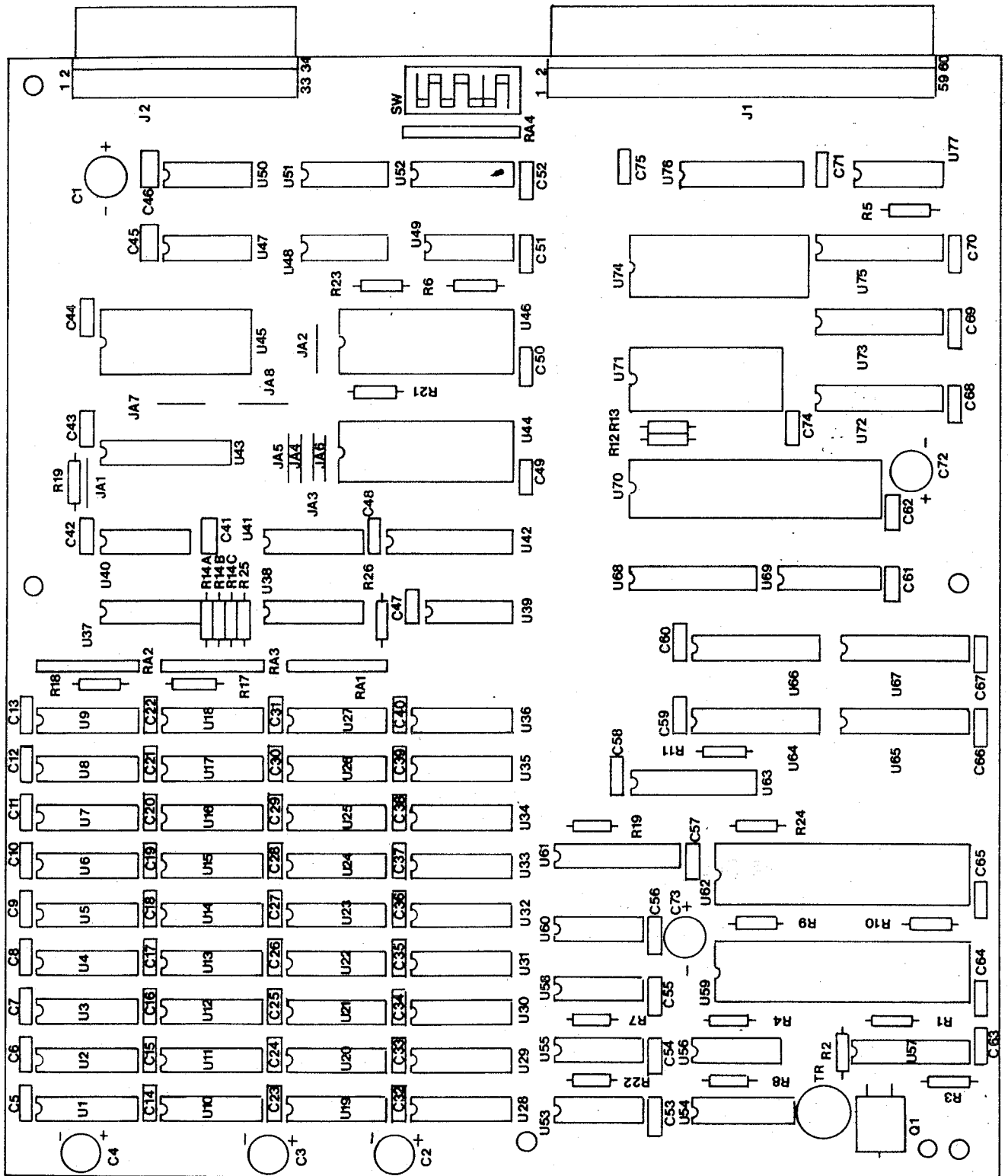
# PC2 CPU MAIN ASSY

Position	Benennung	Ersatzteilnummer	Position	Benennung	Ersatzteilnummer
Position	Term	Spare Parts No.	Position	Term	Spare Parts No.
Position	Désignation	No. de piezas de rechange	Position	Désignation	No. de piezas de rechange
Posición	Denominación	No de requesto	Posición	Denominación	No de requesto
1	Housing, Bottom	380100-01	21	3 x Screw, self tapping, 2,9 x 9,5 mm DIN 7981	906883-04
2	Housing, Top	380101-01	22	4 x Screw M4x5mm DIN 7985	906810-09
3	CPU PCB Assy	380000-01	23	14 x Lockwasher ø 4,3 ext. tooth DIN 6797	905655-04
4	7 x Screw, M4x8mm DIN 7958	906810-01	24	10 x Screw M3x8mm DIN 7958	906800-03
5	21 x Washer Flat ø 4,3 DIN 125	907272-06	25	9 x Washer Flat ø 3,2 DIN 125	907272-02
6	Power Supply, VDE/BSI	380021-01	26	9 x Lockwasher ø 3,2	905652-04
7	Power Supply, UL	380021-02	27	ext. tooth DIN 6797	905650-07
8	Floppy Disk Drive	380111-01	28	5 x Lockwasher ø 3,7 ext. tooth DIN 6797	905970-05
9	Monochrome Video PCB Assy	380003-01	29	2 x Kep Nut 4-40*	324465-01
10	Drive Cable Assy	380012-02	30	5 x Screw M3 x5mm DIN 7985	905960-03
11	Power On LED Assy	380016-01	31	2 x Nut M3 DIN 934	380128-01
12	3 x Extension Card Panel	380120-01	32	4 x Foot, self adhesive	380115-01
13	I/O PCB Assy	380001-01	33	1 x Distance Plate, Trovidur	380112-01
14	Harddisk LED Assy	380020-01	34	Hard Disk Drive	380113-01
15	Keyboard Cable Assy I	380017-01	35	Hard Disk Controller Card	380013-01
16	Speaker Assy	8256099-03	36	Hard Disk Cable Assy	380124-01
17	RS 232 Cable Assy	380014-01	37	Hard Disk Subchassis	380125-01
18	9 x Guide-PCB	251118-01	38	2 x Hard Disk Holding Plate	380123-01
19	4 x Stand Off	380121-01	39	4 x Shock Absorber, Rubber	380119-01
20	8 x Stand Off	380122-01		Shutter Cover, Floppy	
	Front Panel	380102-01			



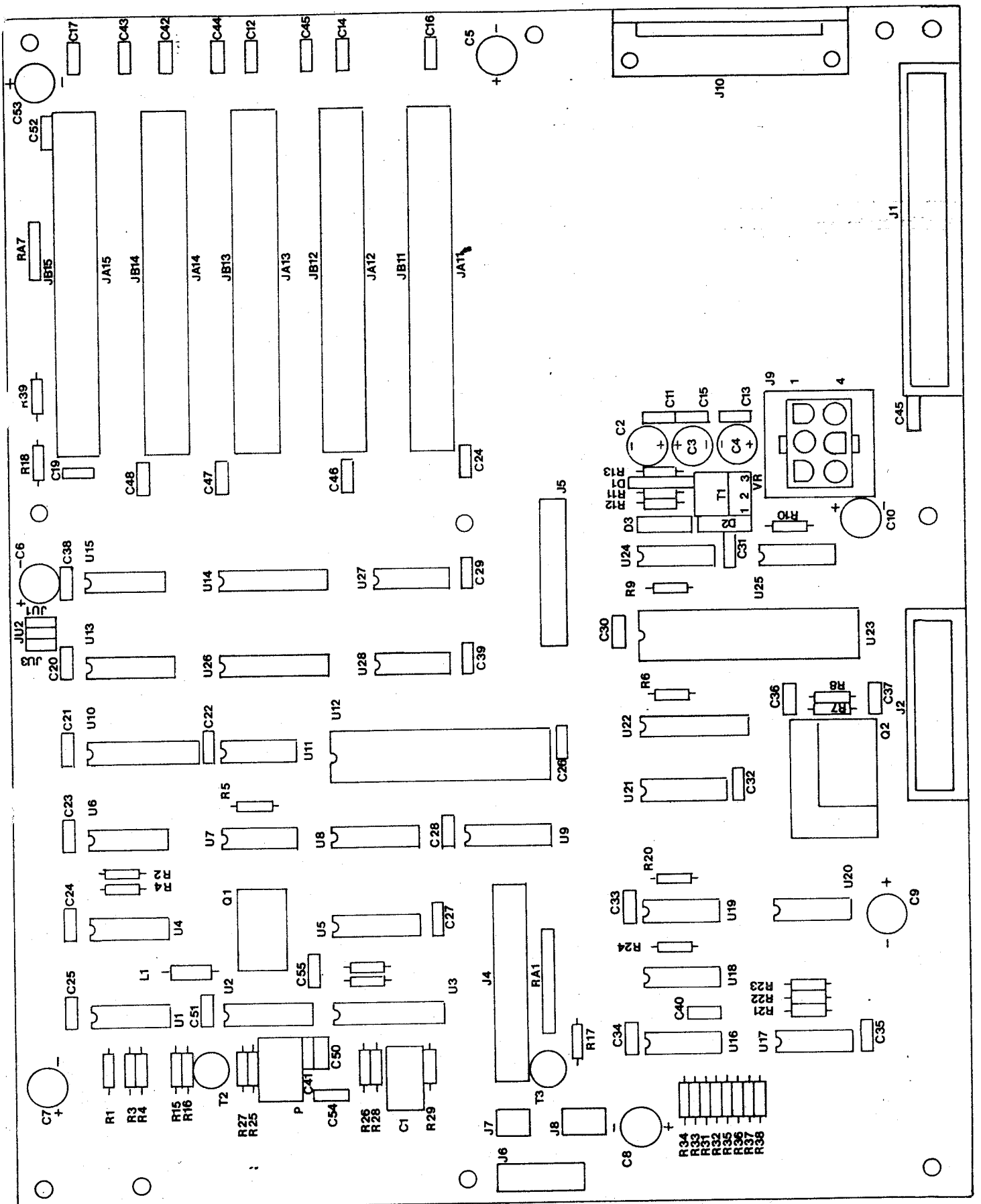
# PC 10/20 CPU PCB ASSY (LAYOUT OF COMPONENTS)

Schaltbildangabe		Benennung		Ersatzteilnummer		Schaltbildangabe		Benennung		Ersatzteilnummer	
Circuit diagram information		Term		Spare Parts No.		Circuit diagram information		Term		Spare Parts No.	
Repère schéma		Désignation		No. de Pieces de rechange		Repère schéma		Désignation		No. de Pieces de rechange	
Designacion del diagrama de circuito		Denominacion		No de requesto		Designacion del diagrama de circuito		Denominacion		No de requesto	
U59		IC 8088	CPU	380200-01	5MHz	C5-13, C23-42	CAP RADIAL CERAMIC	0.22µF/50V	900022-01		
U62		IC 8087	CO-PROCESSOR	380201-01	5MHz	C14-22	CAP RADIAL CERAMIC	0.22µF/50V	900022-01		
U57		IC 8284A	CLK-GENERATOR	901875-01	5MHz	C43-71, C74, C75	CAP RADIAL CERAMIC	0.1 µF/50V	900020-01		
U61		IC 8288	BUS-CONTROLLER	901876-01	5MHz	C1-4, C72, C73	CAP ELECTR. RADIAL	47µF/16V	900100-27		
U74		IC 8259A	INTERRUPT-CONTR.	901874-01	5MHz	J1	HEADER ASSY	DUAL ROW 90°	380302-02		
U71		IC 8253A-5	TIMER	380202-01	5MHz	J2	HEADER ASSY	DUAL ROW 90°	380302-02		
U70		IC 8237A-5	DMA-CONTROLLER	380203-01	5MHz	JA4, JA6, JA8	WIRE JUMPER		903781-01		
U1-18		IC 4228-NL3	128Kx1 BIT DRAM	380222-01		JA3, JA5, JA7	WIRE JUMPER		903781-01		
U1-9		IC 4228-NL4	128Kx1 BIT DRAM	380222-02		JAI	WIRE JUMPER		903781-01		
U44		IC 4256	256Kx1 BIT DRAM	380223-01		SW	DIP SWITCH (16 PIN)		904776-08		
U43		IC 2364	8K-ROM	380204-01		U59, U62	SOCKET IC	40 PIN	904150-06		
U43		IC 2764	8K-EPROM "Bios"	380211-03		U44, U46	SOCKET IC	28 PIN	904150-05		
U43		IC N82S153	FPLA	380211-04		U43	SOCKET IC	20 PIN	904150-08		
U46		IC 16L8	PLA	380212-01		U19-36	SOCKET IC	16 PIN	904150-02		
U46		IC 7700	PLA	380212-01							
U45		IC N82S100	FPLA	901522-13							
U45		IC 74154	DECODER	324667-01							
U40		DIGITAL DELAY LINE		901521-42							
U75		IC 74LS273		901521-29							
U63, U65, U68		IC 74LS373		901521-46							
U42, U66, U67, U72		IC 74LS245		901521-13							
U64, U76		IC 74LS244		901521-46							
U73		IC 74LS245		901521-22							
U69		IC 74LS670		901521-34							
U54		IC 74LS175		901521-06							
U51, U77		IC 74LS74									



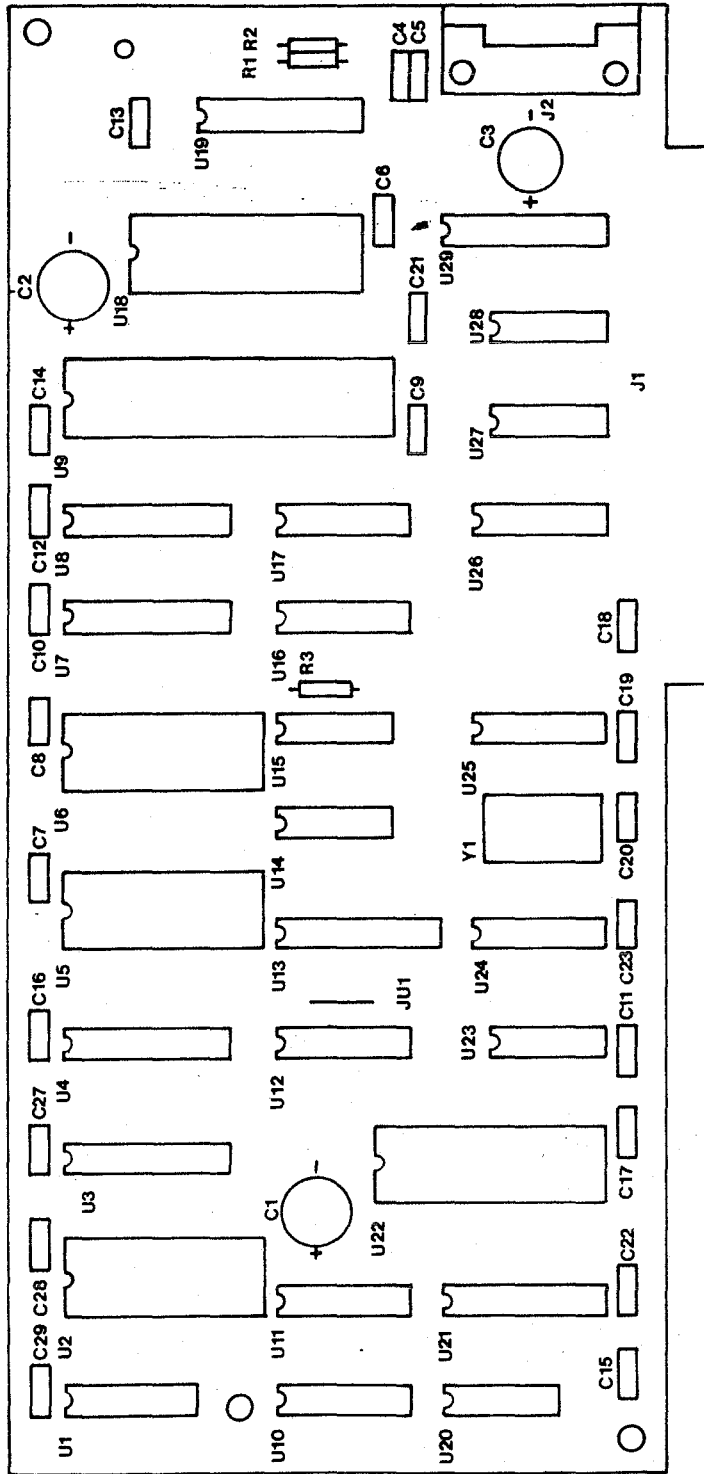
PC 10/20 I/O PCB ASSY  
(LAYOUT OF COMPONENTS)

Schaltbildangabe Circuit diagram information Repère schéma Designacion del diagrama de circuito		Benennung Term Désignation Denominacion		Ersatzteilnummer Spare Parts No. No. de Pieces de rechange No de requesto		Schaltbildangabe Circuit diagram information Repère schéma Designacion del diagrama de circuito		Benennung Term Désignation Denominacion		Ersatzteilnummer Spare Parts No. No. de Pieces de rechange No de requesto	
J23		IC 8250	ACI 5 MHz	380205-01		C11-19, C42-51	CAP RADIAL CERAMIC	0.22µF/50V	900022-01		
J12		IC µPD 756 A	FLOPPY CONTROLLER	380206-01		C1	CAP RADIAL POLYESTER	0.68µF/63V	900150-13		
U3		IC WD 1691	DATA SEPARATOR	380207-01		C20-35, C38, C39, C52, C54, C55	CAP RADIAL CERAMIC	0.1 µF/50V	900020-01		
U25		IC MC 1488	LINE DRIVER	901524-06		C2-10, C53	CAP ELECTROLYTIC RADIAL	47µF/16V	900100-27		
U24		IC MC 1489	LINE RECEIVER	901524-07		J10	CONNECTOR 25 PIN SUB-MINI-"D"		380307-02		
U2		IC 74LS629		901521-68		J11-15	CARD-EDGE-CONNECTOR	.100 CENTER	903446-02		
U5, U8, U13		IC 74LS175		901521-34		J6	HEADER ASSY POLARIZED	.100 CENTER	903326-07		
U1, U4, U28		IC 74LS74		901521-06		J5	HEADER ASSY POLARIZED	.100 CENTER	903331-13		
U21		IC 74LS174		901521-63		J7	HEADER ASSY SINGLE ROW	.100 CENTER	903326-02		
U14		IC 74LS374		901521-43		J8	HEADER ASSY SINGLE ROW	.100 CENTER	903326-03		
U6, U11, U15		IC 74LS125		901521-20		J4	HEADER ASSY DUAL ROW, POLARIZED	.100 CENTER	903345-17		
U22, U26		IC 74LS245		901521-46		J1	HEADER ASSY DUAL ROW, 90°	.100 CENTER	380311-02		
U10		IC 74LS299		901521-72		J2	HEADER ASSY DUAL ROW, 90°	.100 CENTER	380311-01		
U9		IC 74LS163		901521-33		J9	CONNECTOR 6 PIN FEMALE		903349-01		
U7		IC 74LS04		901521-02		J16	HEADER ASSY DUAL ROW	.100 CENTER	903345-03		
U16		IC 74LS14		901521-30			STANDOFF		380121-01		
U19		IC 74LS02		901521-21			LOCKWASHER, EXT. TOOTHED	Ø 3.2	905652-04		
U27		IC 74LS00		901521-01			NUT, HEX 4-40 #		905970-05		
U17, U18, U20		IC 7438		901521-09			SCREW, PAN HEAD M3x6		906800-05		
VRI		7905 VOLTAGE REGULATOR		901527-03			NUT, HEX M3		905960-03		
Q2		CRYSTAL 1.8432 MHz		900555-02							
Q1		CRYSTAL 8.0000 MHz		900556-01							
T1, T2, T3		TRANSISTOR NPN BC 337-16		324220-01							
D2, D3		DIODE, SILICON IN4001		900750-01							



PC 10/2 MONOCHROME VIDEO PCB ASSY  
(LAYOUT OF COMPONENTS)

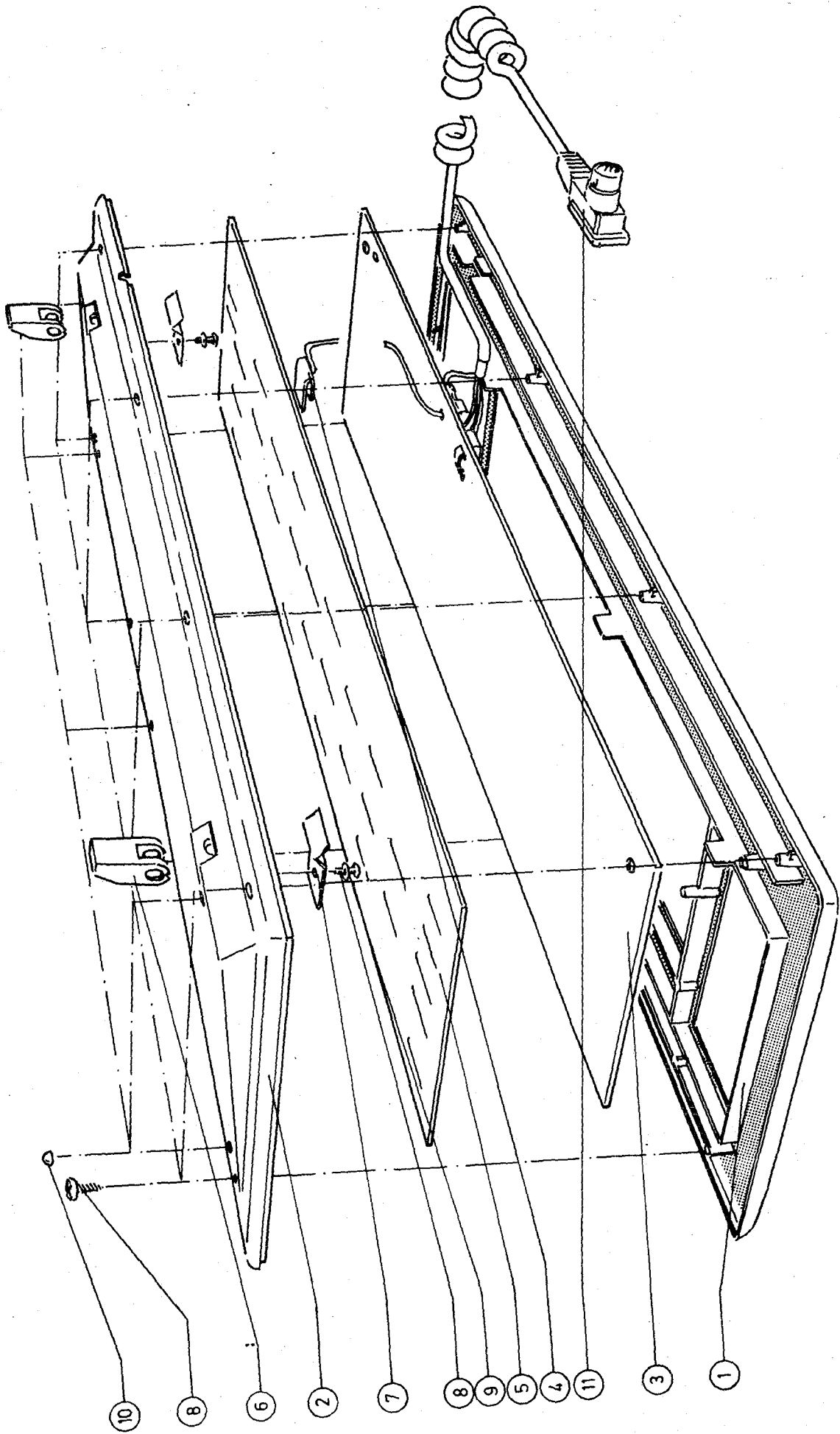
Schaltdiagrammangabe Circuit diagram information Repère schéma	Benennung Term Désignation Denominacion	Ersatzteilnummer Spare Parts No. No. de Pieces de rechange No de requesto	Schaltdiagrammangabe Circuit diagram information Repère schéma Designacion del diagrama de circuito	Benennung Term Désignation Denominacion	Ersatzteilnummer Spare Parts No. No. de Pieces de rechange No de requesto
U9	IC 6545A-1 CRT-CONTROLLER	901479-02	U14	IC 74S04	901525-01
U22	IC 7700 PLA IC N82S100 FPLA	380212-02	U15	IC 74S74	901525-09
U18	IC 7700 PLA IC N82S100 FPLA	380212-03	U21	IC 74S374	901525-22
U13	IC 16R6 PLA	380216-01	U25	IC 74S174	901525-30
U5, U6	IC 2016 2 K x 8 BIT STAT. RAM	325502-03	R1, R2	RESISTOR CARBON 5% 0.25W 22K 0hm	901550-63
U2	IC 2332 4K ROM IC 2532-35 4K EPROM	380217-01	R3	RESISTOR CARBON 5% 0.25W 1K 0hm	901550-01
U20	IC 74LS393	901521-45	C1-10, C13-23	CAP RADIAL CERAMIC 0.1µF/50V	900020-01
U3, U7	IC 74LS374	901521-43	C25, C26	CAP RADIAL CERAMIC 120pF/25V	900010-57
U16, U17, U26	IC 74LS257	901521-57	C11, C12, C24	CAP ELECTROLYTIC 47µF/16V	900100-27
U29	IC 74LS245	901521-56	U2	SOCKET IC 24-PIN	904150-04
U8, U19	IC 74LS244	901521-13		CONNECTOR 9 PIN, SUB-MINI-"D"	380307-01
U4	IC 74LS273	901521-42		SCREW, PAN HEAD M3x4	906800-01
U12	IC 74LS175	901521-34		SCREW, PAN HEAD M3x8	906800-03
U1	IC 74LS166	901521-71		NUT, HEX M3	905960-03
U24	IC 74LS163 IC 74LS162	901521-33 901521-83		LOCKWASHER, EXT-TOOTHED Ø 3,2	905652-04
Y1	OSCILLATOR, 16.257 MHZ	325566-12		STANDOFF	380121-01
U16, U17, U26	IC 74LS157	901521-11		EXTENSION-CARD-PANEL	380120-02
U11	IC 74LS139	901521-18		NUT, HEX 4-40 #	905970-05
U10	IC 74LS138	901521-16			
U23	IC 74LS74	901521-06			
U27	IC 74LS11	901521-80			
U28	IC 74LS00	901521-01			





# PC 10/20 KEYBOARD ASSY

Position	Benennung	Ersatzteilnummer
Position	Term	Spare Parts No.
Position	Désignation	No. de pieces de rechange
Posición	Denominación	No de requesto
1	Keyboard Housing, Top	380104-01
2	Keyboard Housing, Bottom	380105-01
3	Keyboard, PCB UK	380106-01
	Keyboard, PCB US	380106-02
	Keyboard, PCB German	380106-03
	Keyboard, PCB Italy	380106-04
	Keyboard, PCB France	380106-05
	Keyboard, PCB Spain	380106-06
	Keyboard, PCB Swiss	380106-07
	Keyboard, PCB Denmark	380106-08
	Keyboard, PCB Norway	380106-09
	Keyboard, PCB Finland/Sweden	380106-10
	Keyboard, PCB Icelandic	380106-11
4	Cable Assy for Keyboard	380452-01
5	Screen Shield	380451-01
6	2 x Foot, adjustable	380130-01
7	2 x Plate Spring	380131-01
8	10 x Screw, self tapping, 2,9 x 9,5 mm DIN 7981	906883-04
9	2 x Washer Flat Ø 4,3 DIN125	907272-06
10	5 x Foot plastic, self adhesive	380129-01
11	Keyboard Cable Assy II	380018-01



# ALPS

DFC222A

MAINTENANCE MANUAL

ALPS ELECTRIC CO., LTD.

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1. Introduction

This maintenance manual is for the maintenance of DFC222A.

1-1 General

The floppy disk drive is a high precision equipment and requires the following jigs, tools, measuring instruments, and adjustments when repairing or changing parts.

2. Special Jigs, Tools and Measuring Instruments

2-1 List of Special Jigs and Tools

- CE diskette
- Blank diskette
- Test pin connector
- Alignment adjusting jig
- 0 track adjusting jig

2-2 List of Measuring Instruments

- Oscilloscope
- Brikon
- Frequency counter

2-3 CE Diskette (Alignment Diskette)

This diskette is used for the following adjustments and inspection.

- (1) R/W head radial position
- (2) R/W head azimuth
- (3) Index position

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3. Diagnosis Procedure

3-1 General

Errors caused by an incorrect operating procedure, erroneous programming, damaged diskette, and soft errors caused by dirty air, random electric noise, and other external factors are often considered to be drive failures or incorrect adjustments. Check that errors are repetitively produced with the first diskette and that similar errors are also produced with other diskettes, unless obvious assembly trouble and damage are found in visual inspection.

3-2 Soft Error Detection and Correction

Soft errors are generally caused by the following.

- (1) Dirty air between the R/W head and disk. Normally, this dirt is cleaned by the liner in the diskette.
- (2) Random electrical noise less than several microseconds.
- (3) Delicate track misalignment and writing timing misalignment that are not detected during writing may cause soft errors during reading.
- (4) Improper ground of the drive or host system power supply.
- (5) Improper motor speed.

The following actions are required on the control side to recover the foregoing soft errors.

- 1) Reread the track ten times or until data recovers.

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- 2) Access the head to an adjacent track in the same direction as the track if the error is not recovered by Step 1). Then return the head to the previous track.
- 3) Repeat Step 1).
- 4) Errors that cannot be recovered after taking these steps cannot be recovered.

### 3-3 Write Error

Operate READ-AFTER-WRITE if an error occurs during the write operation.

If the error cannot be recovered after operating READ-AFTER-WRITE more than four times, operate READ-AFTER-WRITE on another track to determine whether the diskette or drive is responsible for the error. Change the diskette and repeat these steps if the same error remains. If the error still remains, the drive has some fault and if the error is erased, the diskette is defective and should be discarded.

### 3-4 Read Error

Most errors are soft errors. Data can be recovered by following the error recovery steps (3-2).

### 3-5 Seek Error

- (1) Trouble with the stepping motor or stepping motor drive circuit
- (2) Carriage trouble

Seek error is recovered by system soft. There are two recovering ways.

- 1) Recalibrate
- 2) Detect ID field

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3-6 Compatibility Error

In some cases, data written by one drive cannot be read by another drive. This is due mainly to the following reasons:

The check points are listed below.

- (1) Improper head alignment ..... 5-2
- (2) The head output is low ..... 5-6
- (3) Motor speed irregularity ..... 5-1
- (4) Check if the recommended sector format is set up.

3-7 List of Test Points (See Figure 3-7)

Test Point	Signal Name
TP1	AMP OUT +
TP2	AMP OUT -
TP3	GND
TP4	STEP
TP5	READ DATA
TP6	INDEX
TP7	WRITE PROTECT
TP8	TRACK 0
TP9	GND

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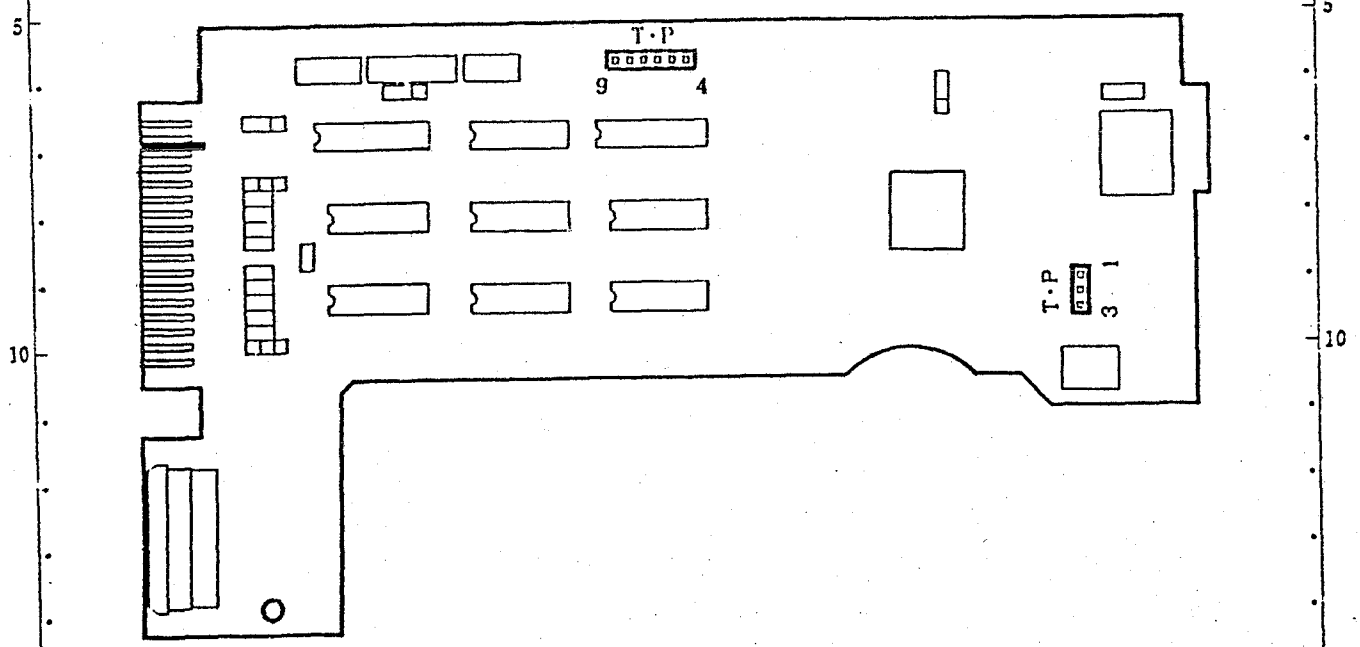


Fig. 3-7 Test Point Layout

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4. Parts Exchange

4-1 Printed Circuit Board Exchange (See Figure 4-1)

4-1-1 Printed Circuit Board Removal

- a) Expand the two shield board pins.
- b) Unfasten the three fix screws and remove the shield board.
- c) Disconnect the connectors (head, stepping motor, spindle motor, 0 track sensor, index sensor, and write protect sensor).
- d) Unfasten the four printed circuit board fix screws.
- e) Lift the rear edge of the printed circuit board and pull it back.

4-1-2 Printed Circuit Board Mounting and Adjustment

- a) Tilt the printed circuit board as if to lower the front edge, insert the front LED into the LED insertion hole on the front plate, then lower the rear edge.
- b) Fix the printed circuit board with four screws.
- c) Secure the shield board with three fix screws.
- d) Reconnect the disconnected connectors (head, stepping motor, spindle motor, 0 track sensor, index sensor, and write protect sensor).
- e) Bend the two shield board pins and fix the head cable.

Note: Insert the head cord under the shield board.

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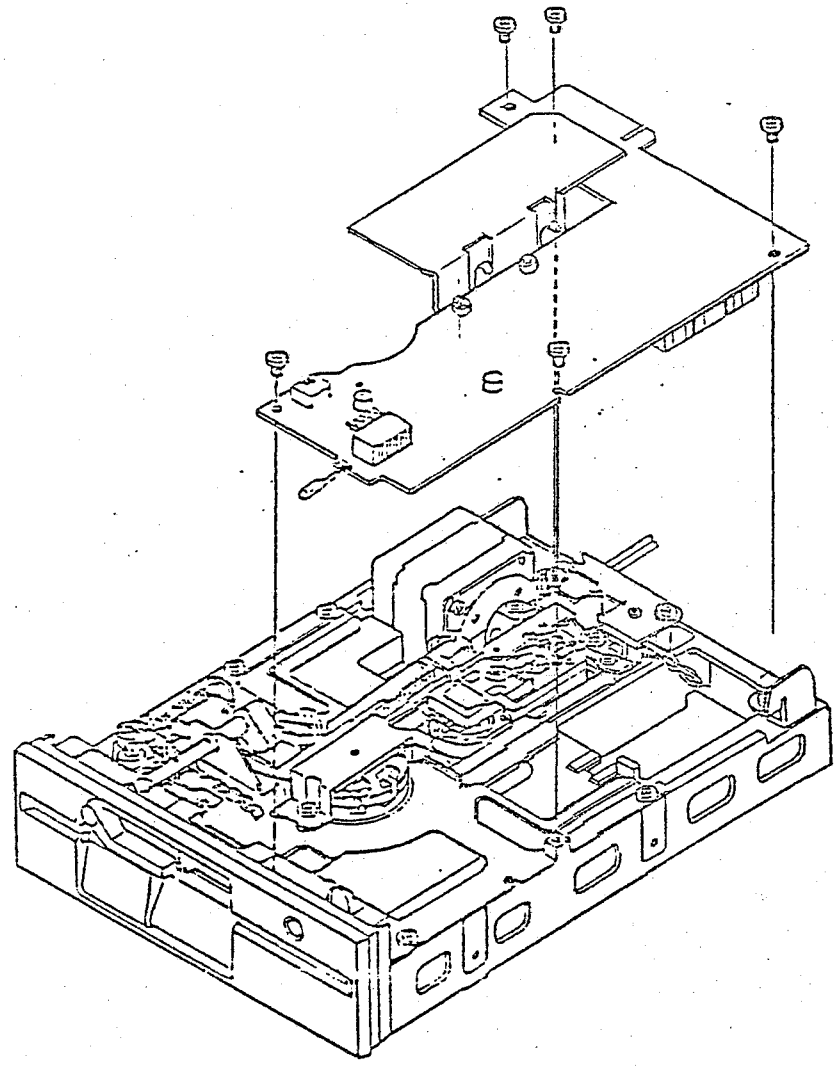


Fig.4-1 Printed Circuit Board Removal

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4-2 Lever Exchange(See Figura 4-2)

4-2-1 Lever Removal

- a) Set the lever horizontally.
- b) Unfasten the fix screw of the lever.
- c) Pull the lever forward.

4-2-2 Lever Mounting

- a) Place the wide part of the lever cam on the hub side and check that the lever shaft hole can be seen from above. (Hub open state)
- b) Set the lever horizontally and insert from the front.
- c) Secure the lever with a screw.

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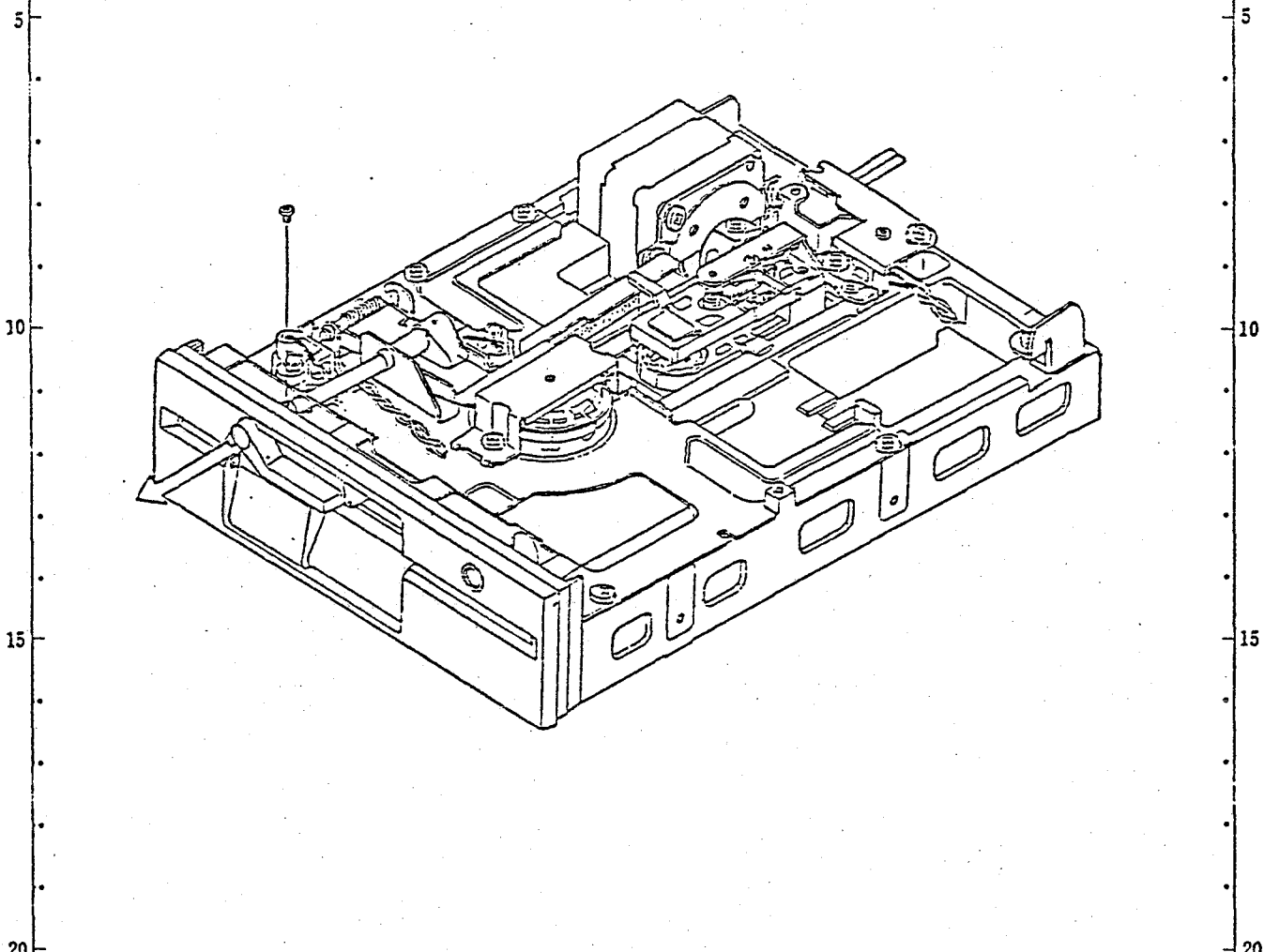


Fig.4-2 Lever Exchange

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4-3 Front Plate Exchange(See Figure 4-3)

4-3-1 Front Plate Removal

- a) Remove the lever as described in 4-2-1.
- b) Unfasten the two front plate fix screws.
- c) Pull the front plate forward.

4-3-2 Front Plate Mounting

- a) Insert the front plate from the front.
- b) Secure the front plate with two screws.
- c) Mount the lever as described in 4-2-2.

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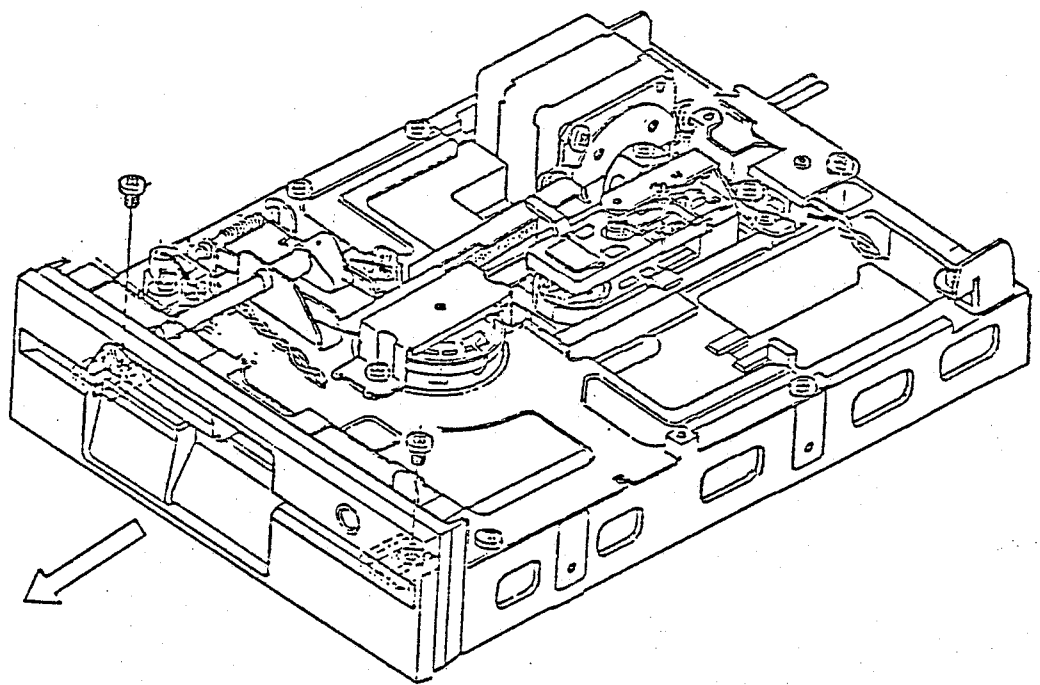


Fig.4-3 Front Plate Exchange

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4-4 Lever Frame Assy Exchange (See Figure 4-4)

4-4-1 Lever Frame Assy Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Remove the lever as described in 4-2-1.
- c) Remove the front plate as described in 4-3-1.
- d) Insert protection paper (high quality white paper approximately 10 x 30 mm) between two heads to protect them.
- e) Unfasten the five lever frame assy fix screws.
- f) Lift the lever frame assy slightly, making sure that the top head is not raised, and remove the sliding to the left.

4-4-2 Lever Frame Assy Mounting and Adjustment

- a) Lift the top head slightly and slide the pad mounting part of the lever frame assy under the top head.
- b) Secure the lever frame assy with five screws.
- c) Remove the protection paper.
- d) Mount the front plate as described in 4-3-2.
- e) Mount the lever as described in 4-2-2.
- f) Mount the printed circuit board as described in 4-1-2.
- g) After mounting, adjust the index burst time. (Refer to 5-5.)

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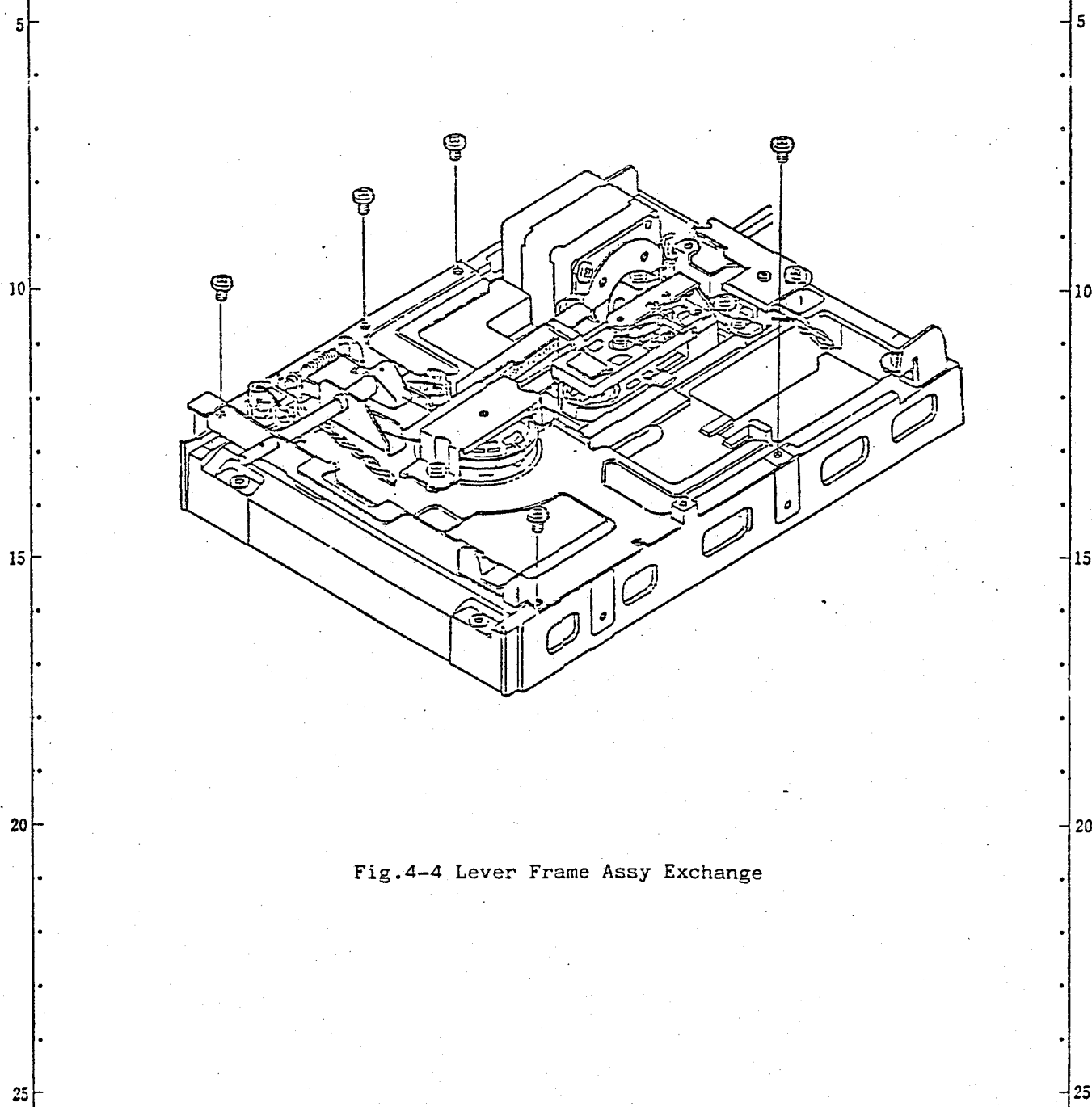


Fig.4-4 Lever Frame Assy Exchange

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4-5 Stepping Motor Assy Exchange (See Figure 4-5)

4-5-1 Stepping Motor Assy Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Unfasten the head assy metal belt fix screw.
- c) Unfasten the stepping motor metal belt fix screw and remove the keep plate.
- d) Unfasten the two stepping motor assy fix screws.
- e) Lift the stepping motor assy upward, then slide it to the left to remove from the metal belt.
- f) Disconnect the stepping motor assy cord from the hook.

4-5-2 Stepping Motor Assy Mounting Adjustment

- a) Keep the metal belt in the loop form, insert the stepping motor assy, mount the metal belt and keep plate with screw.
- b) Align the oval hole of the stepping motor mounting plate with the guide pin and mount the stepping motor assy with two screws. Temporary tightening of screws are required.
- c) Pull the tip of the metal belt and mount the metal belt on the tip of the head assy with a screw.
- d) Move the head assy back and forth and check that the metal belt is not twisted. If twisted, slightly loosen the metal belt fix screws on the stepping motor assy and head assy, and move the head assy back and forth several times. Fasten tightly the screws.
- e) Place the stepping motor assy cord on the hook.
- f) Mount the printed circuit board as described in 4-1-2.
- g) Adjust the radial track after mounting. (Refer to 5-2.)

Caution: Do not reuse the metal belt removed from the head assy.

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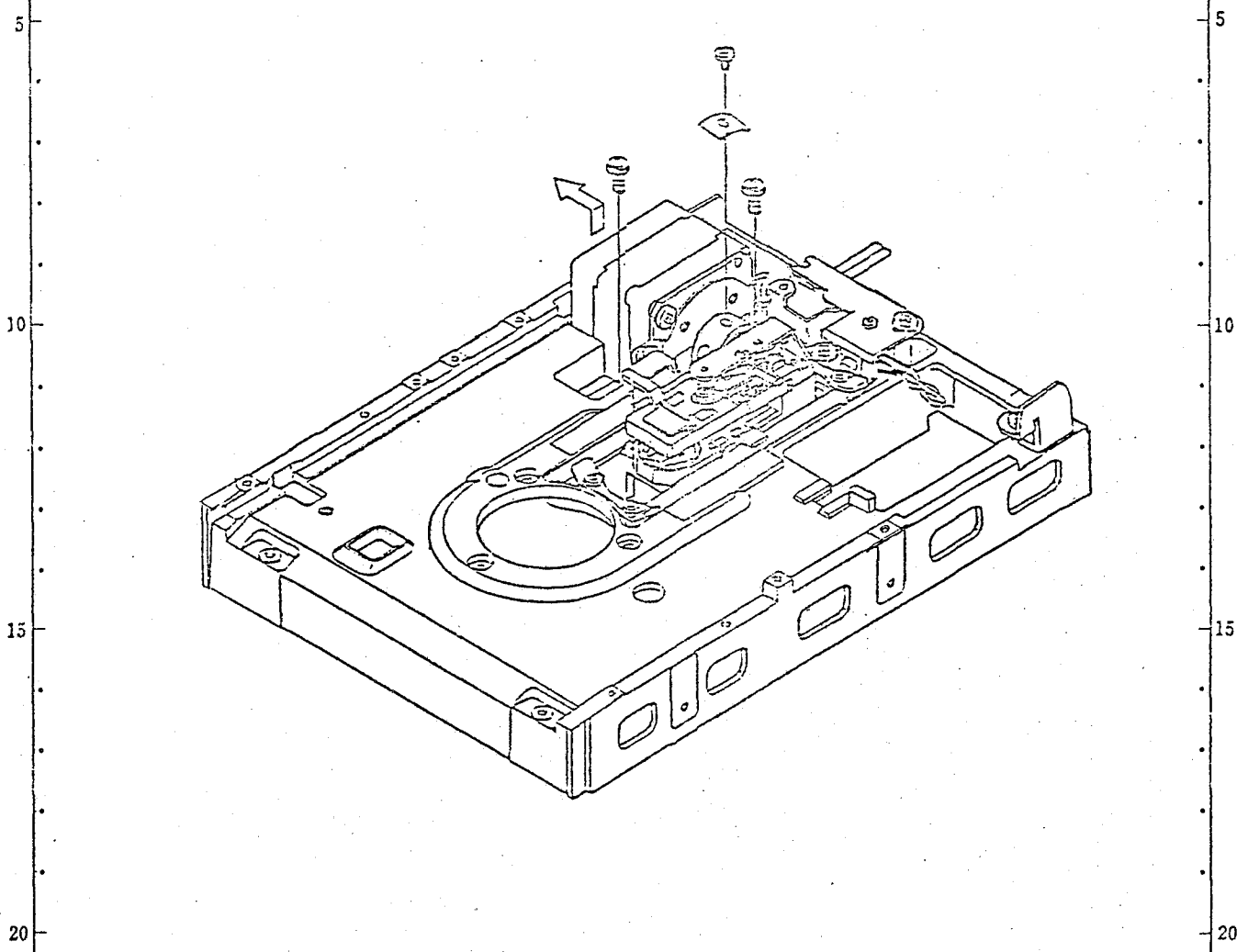


Fig.4-5 Stepping Motor Assy Exchange

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4-6 Head Assy Exchange(See Figure 4-6)

4-6-1 Head Assy Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Remove the lever as described in 4-2-1.
- c) Remove the front plate as described in 4-3-1.
- d) Remove the lever frame assy as described in 4-4-1.
- e) Remove the stepping motor assy as described in 4-5-1
- f) Unfasten the PCB post fix screws and remove the PCB post.
- g) Unfasten the two screws fastening the guide shaft keepers A and B and remove keepers A and B.
- h) Lift the guide shaft rear edge and remove the guide shafts in a backward direction, individually. Be careful not to damage the guide shafts or mix the right and left shafts.
- i) Carefully remove the head assy.

4-6-2 Head Assy Mounting and Adjustment

- a) Fit the two guide shafts in the head assy without mixing the right and left, and mount in the housing while holding the guide shafts.
- b) Secure guide shaft keepers A and B using four screws.
- c) Secure the PCB post using screws.
- d) Mount the stepping motor assy as described in 4-5-2.
- e) Mount the lever frame assy as described in 4-4-2.
- f) Mount the front plate as described in 4-3-2.
- g) Mount the lever as described in 4-2-2.
- h) Place the printed circuit board as described in 4-1-2.
- i) Adjust the radial track (5-2) and index burst time (5-6), and check the  $\phi$  track sensor (5-3), azimuth (5-4), level (5-6), and resolution (5-7) after mounting.

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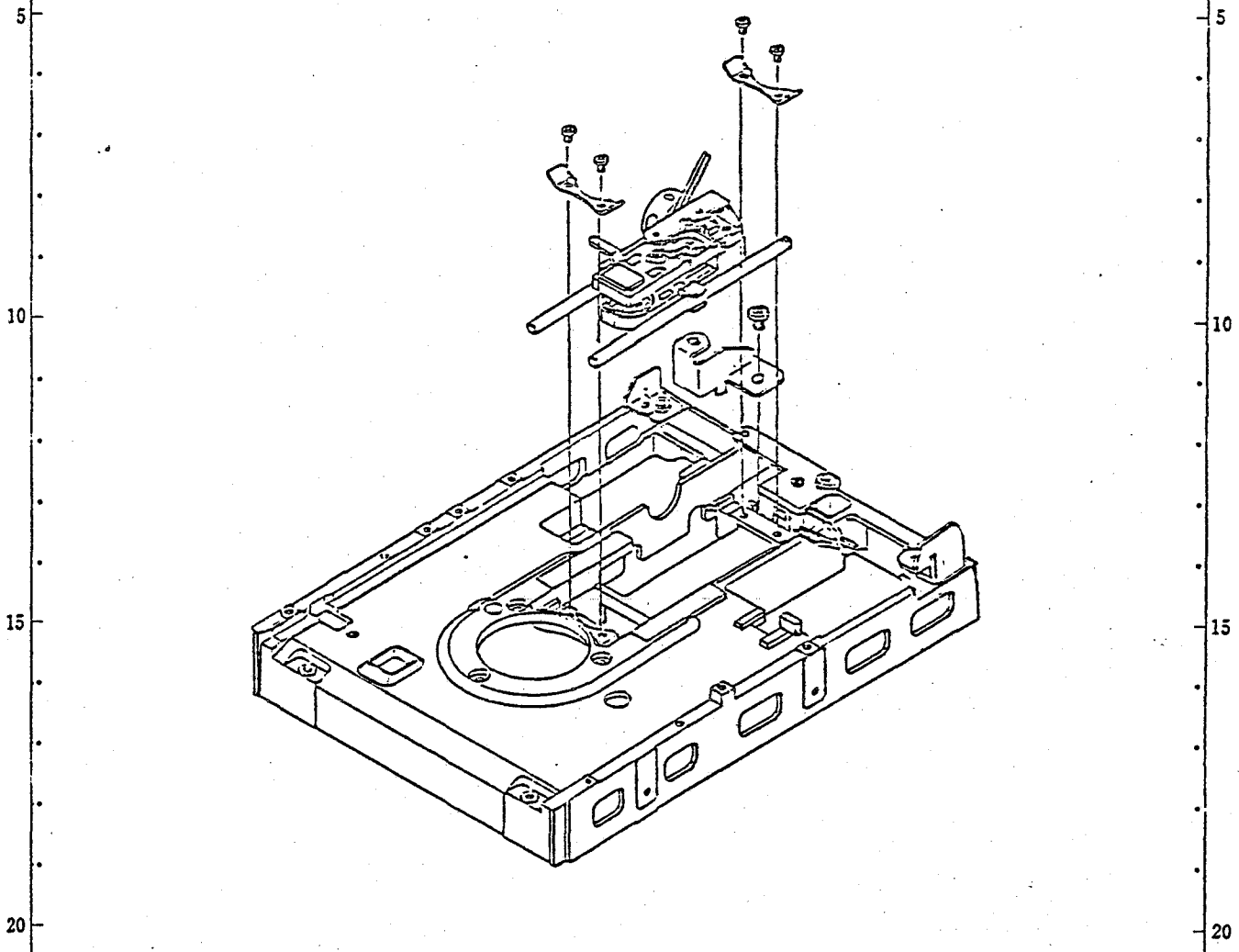


Fig.4-6 Head Assy Exchange

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4-7 Spindle Motor Assy Exchange (See Figure 4-7)

4-7-1 Spindle Motor Assy Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Remove the lever as described in 4-2-1.
- c) Remove the front plate as described in 4-3-1.
- d) Remove the lever frame assy as described in 4-4-1.
- e) Unfasten the seven spindle motor fixing screws (three screws on the top and four screws on the bottom).
- f) Remove out the spindle motor in a downward direction. Be careful not to damage the top surfaces of the spindle.

4-7-2 Spindle Motor Assy Mounting Adjustment

- a) Secure the spindle motor with seven screws. Align the W/P LED at approximately the center of the housing hole.
- b) Mount the lever frame assy as described in 4-4-2.
- c) Mount the front plate as described in 4-3-2.
- d) Mount the lever as described in 4-2-2.
- e) Place the printed circuit board as described in 4-1-2.
- f) Adjust the index burst time after mounting. (Refer to 5-5.)

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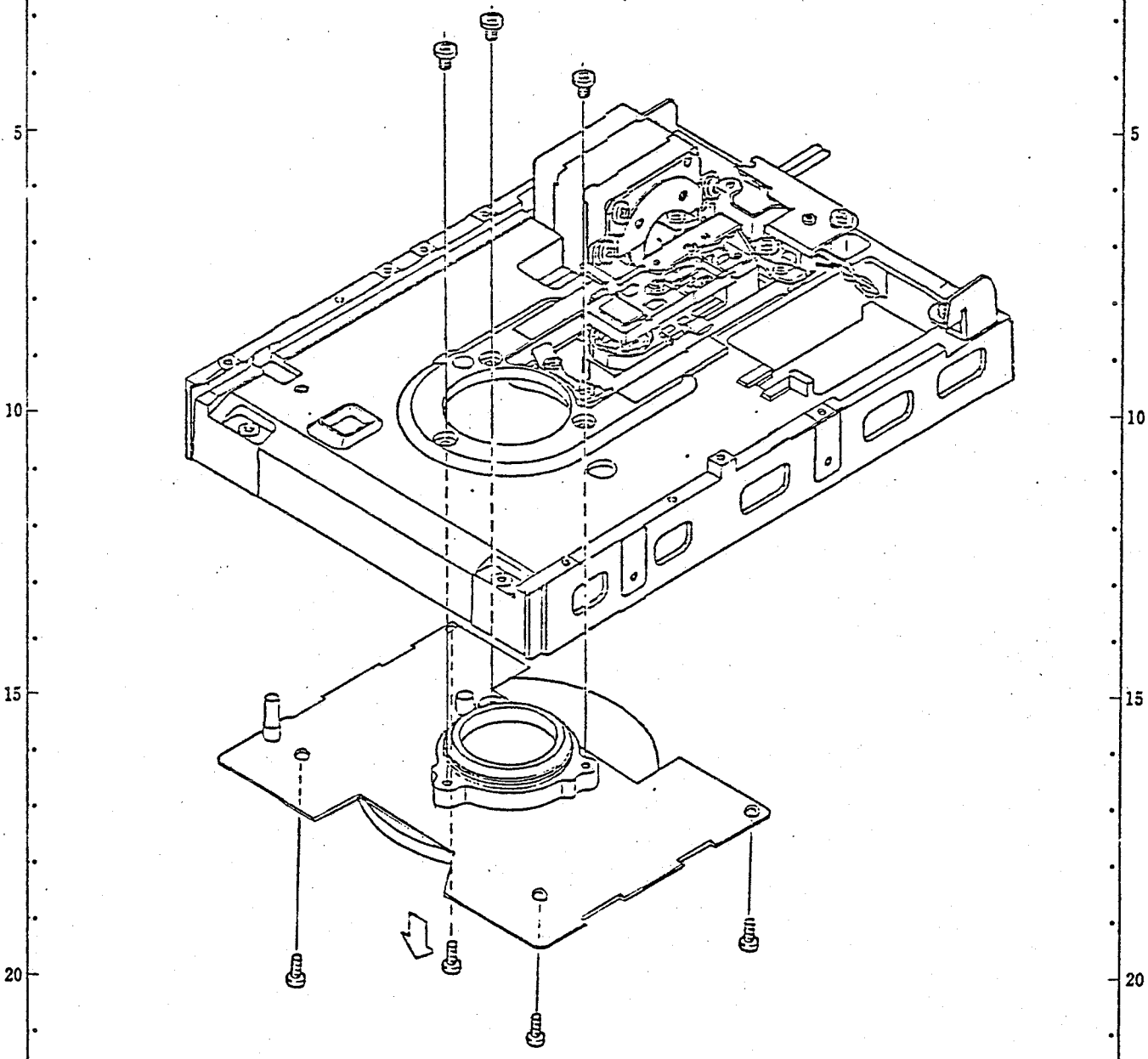


Fig.4-7 Spindle Motor Assy Exchange

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					H. Nakaya	DOCUMENT NO.
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4-3 0 Track Sensor Assy Exchange (See Figure 4-3)

4-8-1 0 Track Sensor Assy Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Unfasten the 0 track sensor assy fix screw.
- c) Remove the 0 track sensor assy.

4-8-2 0 Track Sensor Assy Mounting and Adjustment

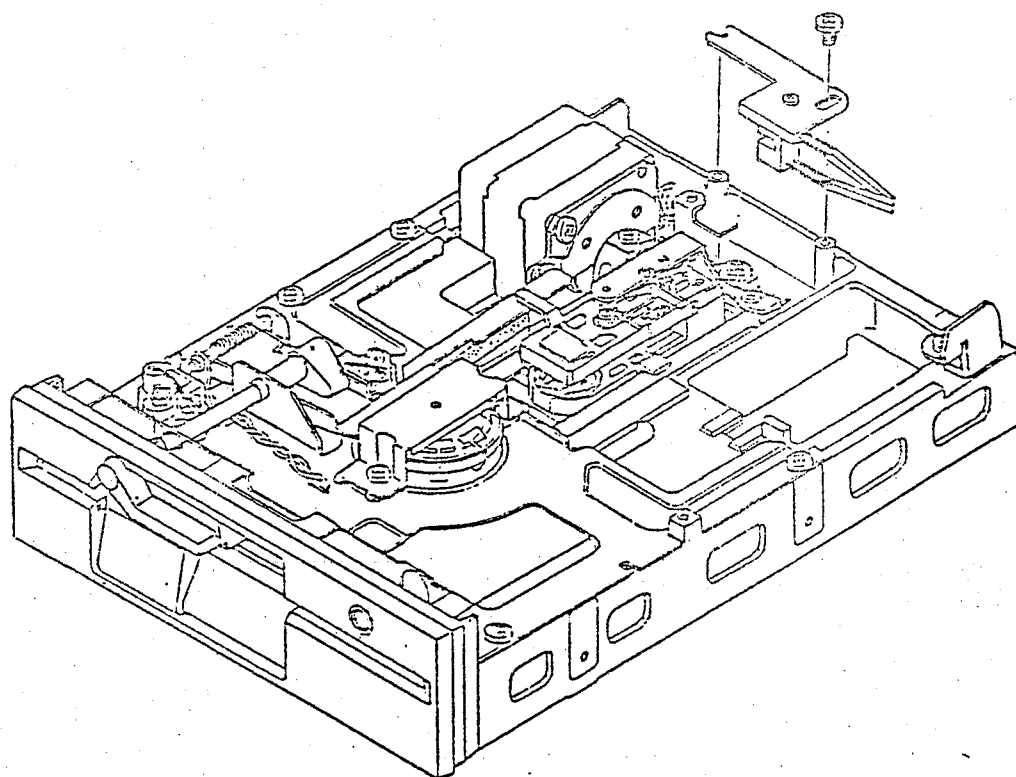
- a) Mount the 0 track sensor assy with screw.  
Temporary tightening of screws are required.
- b) Place the printed circuit board as described in 4-1-2.
- c) Adjust the 0 track sensor after mounting. (Refer to 5-3.)

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Fig.4-8  $\emptyset$  Track Assy Exchange

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4-9 Metal Belt Exchange(See Figure 4-9)

4-9-1 Metal Removal

- a) Remove the printed circuit board as described in 4-1-1.
- b) Remove the lever as described in 4-2-1.
- c) Remove the front plate as described in 4-3-1.
- d) Remove the lever frame assy as described in 4-4-1.
- e) Remove the stepping motor assy as described in 4-5-1.
- f) Remove the head assy as described in 4-6-1.
- g) Unfasten the metal belt fix screw and remove the metal belt from the head assy.

4-9-2 Metal Belt Mounting and Adjustment

- a) Mount the metal belt on the head assy using screws. (Be careful of the metal belt direction.)
- b) Mount the head assy as described in 4-6-2.
- c) Mount the stepping motor assy as described in 4-5-2.
- d) Mount the lever frame assy as described in 4-4-2.
- e) Mount the front plate as described in 4-3-2.
- f) Mount the lever as described in 4-2-2.
- g) Mount the printed circuit board as described in 4-1-2.
- h) Adjust the radial track (refer to 5-2), index burst time (5-5), and 0 track sensor (5-3) after mounting.

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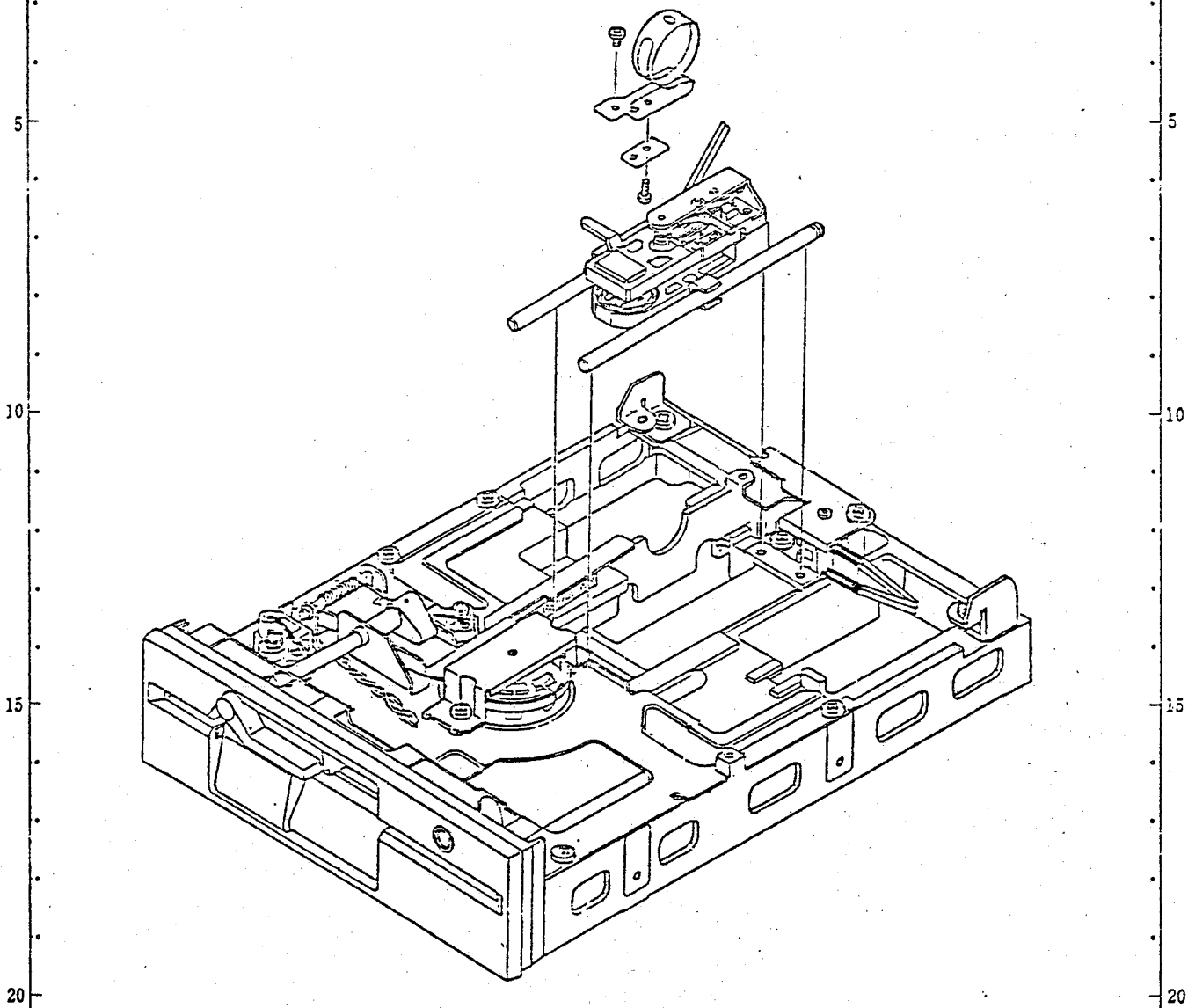


Fig.4-9 Metal Belt Exchange

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						4/1/65	DOCUMENT NO.
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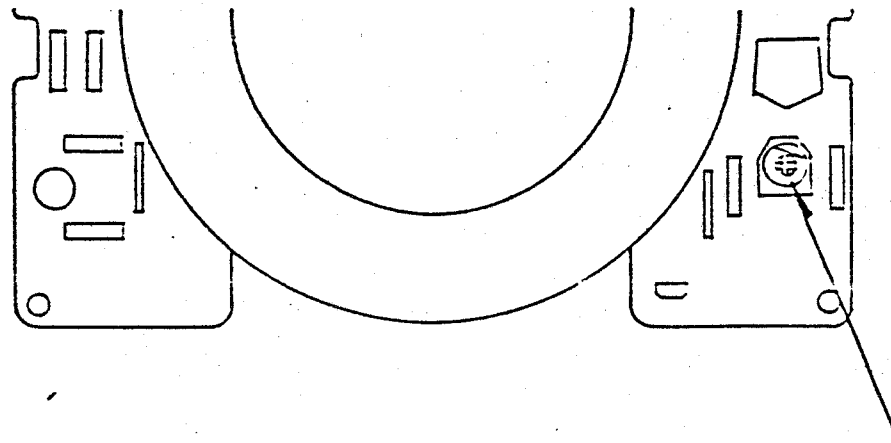


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5. Adjustments and Checks

5-1 Spindle Speed Adjustment

- a) Insert and clamp a blank diskette by rotating the motor.
- b) Stop on 0 Track.
- c) Connect the frequency counter to TP6.
- d) Rotate the speed adjusting variable resistor on the spindle-motor printed circuit board and adjust so that the counter shows 200  $\pm$  2 ms.



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5-2 Radial Track Adjustment

- a) Insert a CE diskette.
- b) Move the head to Track 16 and check the cat's-eye waveforms of the top and bottom heads.
- c) Adjust as follows if one of the top or bottom heads is not more than 75% in an amplitude ratio of two waveforms.
- d) Slightly loosen the fix screws of the stepping motor assy and move the stepping motor assy back and forth to adjust the amplitudes. The amplitudes of two waveforms should be nearly the same. Then tighten the rear screw.
- e) Check the cat's-eye waveforms of the top and bottom heads.
- f) Repeat from d) if adjustment fails.

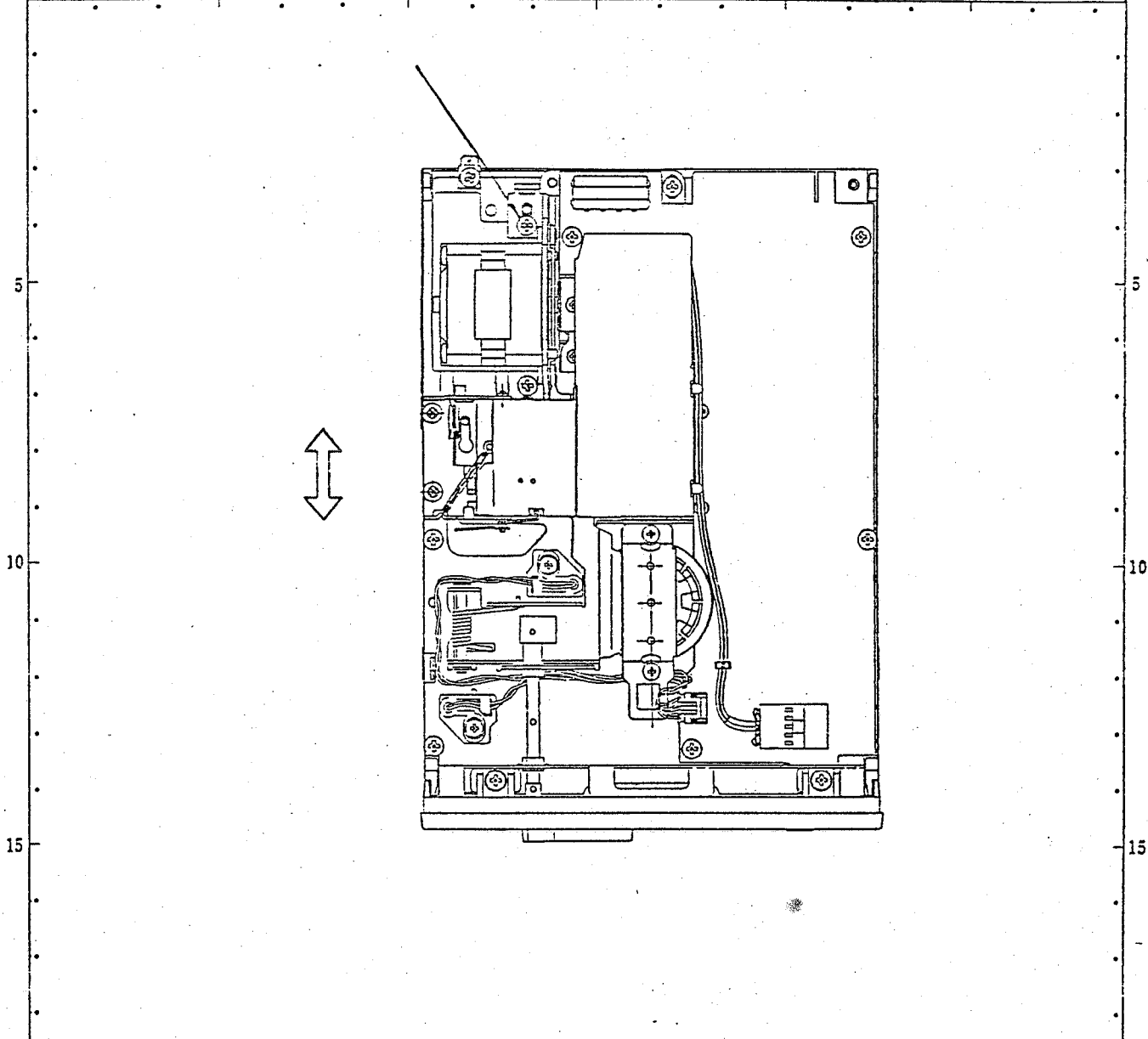
Measuring Conditions

Channel 1-TP1 (10mV/div) MODE--ADD

Channel 2-TP2 (10mV/div) Sweep-20ms/div

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Head Reading Output Signal (TP1-TP2)

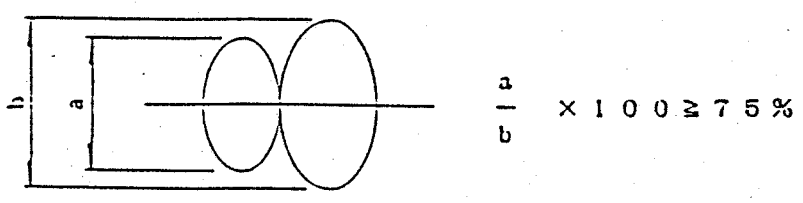


Fig. 5-2

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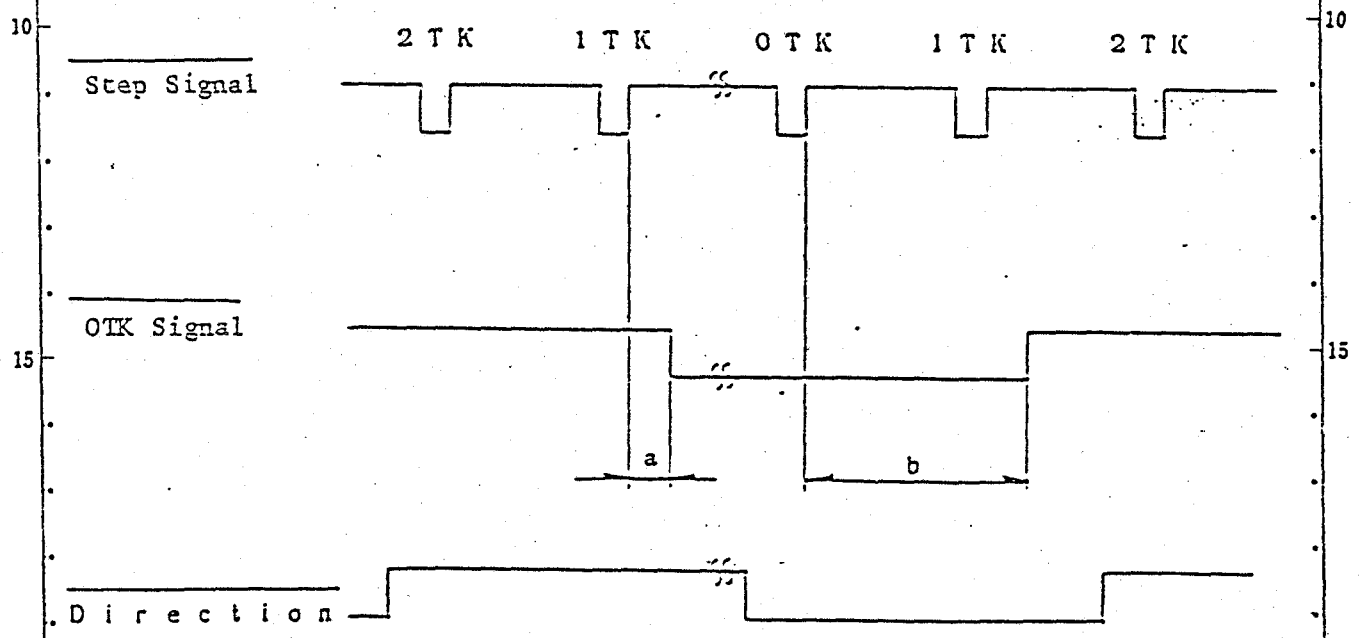
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5-3 0 Track Sensor Adjustment

- a) Insert a CE diskette.
- b) Continuously seek between 0 and 2 Tracks at 6 ms.
- c) Adjust the 0 track sensor assy so that the step signal and 0 Track one. are always on the timing as shown in Figure 5-3. Then secure with a acrew.

Measuring Conditions

Channel 1-TP4 (0.2V/div) MODE--DUAL  
 Channel 2-TP8 (0.2V/div) Sweep-10ms/div



a = 3 m s m a x  
 b = 8 m s m i n

Fig. 5-3

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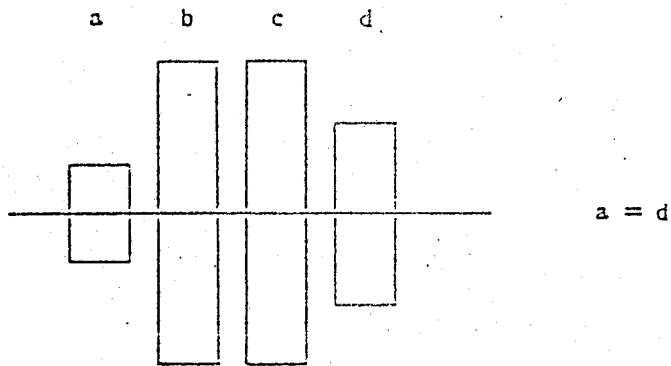
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5-4 Azimuth Check

- Insert a CE diskette.
- Move the head to Track 34 and check that the azimuth waveforms of the top and bottom heads are as described in Figure 5-4.
- Exchange the head assy if the azimuth of one of the top and bottom heads is not as shown in Figure 5-4.

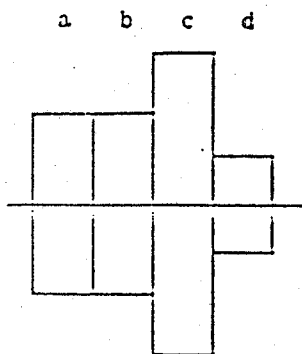
Measuring Conditions

Channel 1-TP1 (10mV/div) MODE--ADD  
 Channel 2-TP2 (10mV/div) Sweep-1ms/div  
 Trigger---TP6

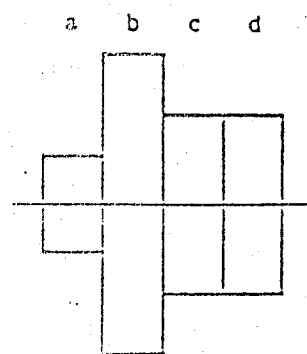


Shows 0 minute

- When  $a > d$  (negative) Must be  $a \leq b$ .
- When  $a < d$  (positive) Must be  $c \geq d$ .



Shows misalignment by -18'.



Shows misalignment by +18'.

Head azimuth =  $0^\circ + 18'$ .

Fig. 5-4

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5-5 Index Burst Time Adjustment

- a) Insert a CE diskette.
- b) Move the head to Track 34 and check the index burst times of the top and bottom heads. Adjust as follows if the timing of one of the top or bottom heads is not as shown in Figure 5-3.
- c) Move the index sensor assy back and forth by slightly loosening the index sensor assy fix screws to adjust the index burst time.
- d) Check the index burst times of the top and bottom heads.
- e) Repeat from c) if adjustment has been unsuccessful.

Measuring Conditions

Channel 1-TP1 (10mV/div) MODE--ADD  
 Channel 2-TP2 (10mV/div) Sweep-0.1ms/div  
 Trigger---TP6

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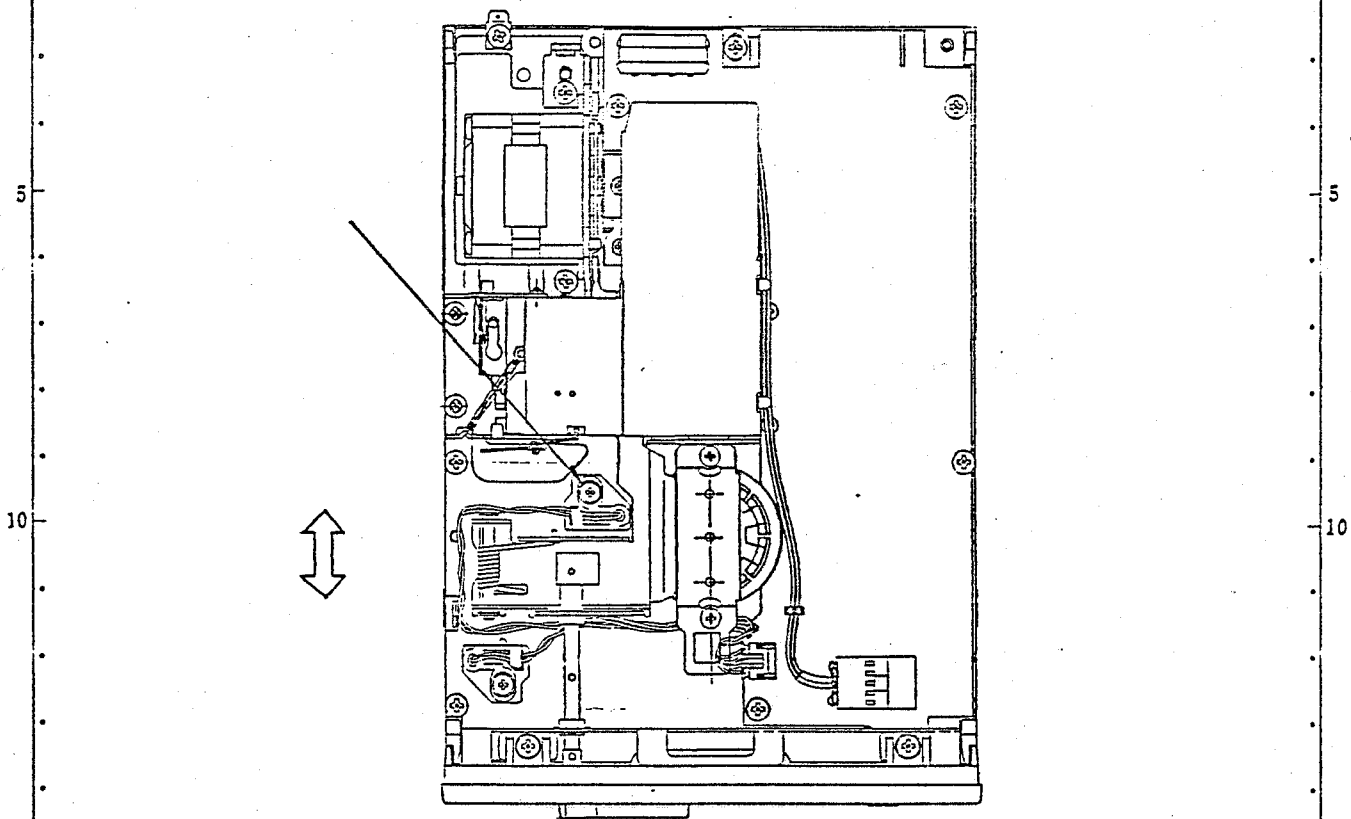


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I N D E X

Head Reading Output Signal  
( T P 1 - T P 2 )

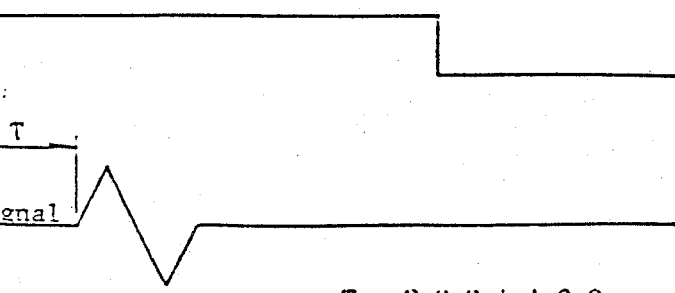


Fig. 5-5

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5-6 Level Check

- a) Insert a blank diskette.
- b) Move the head to Track 39 and write 2F by the top and bottom heads.
- c) Check that the average output level of the top and bottom heads is more than 350 mV. Perform the following if the output level is below the required standard.
- d) Insert another blank diskette and reconfirm.
- e) Check the spindle speed as described in 5-1.
- f) Change the oscilloscope to the CHOP mode and check the TP1 and TP2 outputs. Exchange the printed circuit board if one output is small or missing, even if the probes are normal.
- g) Exchange the head assy if no problems are encountered in d), e), and f) above.

Measuring Conditions

Channel 1-TP1 (10mV/div) MODE--ADD  
 Channel 2-TP2 (10mV/div) Sweep-20ms/div  
 Trigger---TP6

Head Reading Out Signal (TP1-TP2)

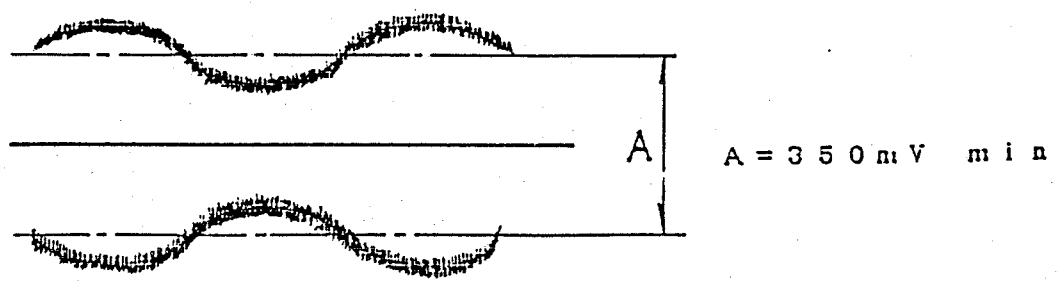


Fig. 5-6

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5-7 Resolution Check

- a) Insert a blank diskette.
- b) Move the head to Track 39, write 1F and 2F by the top and bottom heads, then measure the average output level.
- c) The resolution is higher than 65%, and calculations shall be made as follows:

$$2F \text{ output (mV)} / 1F \text{ output (mV)} * 100 \geq 65\%$$

Measuring Conditions

Channel 1-TP1 (10mV/div) MODE--ADD

Channel 2-TP2 (10mV/div) Sweep-20ms/div

Trigger---TP6

$$\text{Resolution} = \frac{2F \text{ average output level}}{1F \text{ average output level}}$$

95% or less with TK0

65% or more with TK39

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5-8 Symmetry Adjustment

- a) Insert a blank diskette.
- b) Move the head to Track 39 and write 1F by the top and bottom heads.
- c) Adjust VRI to reduce to a minimum the time lags for the top and bottom heads shown in Figure 5-8.

Measuring Conditions

Channel 1-TP5 (0.1V/div)    MODE--CH1  
 Trigger---INT.CH1        Sweep-0.5ms/div

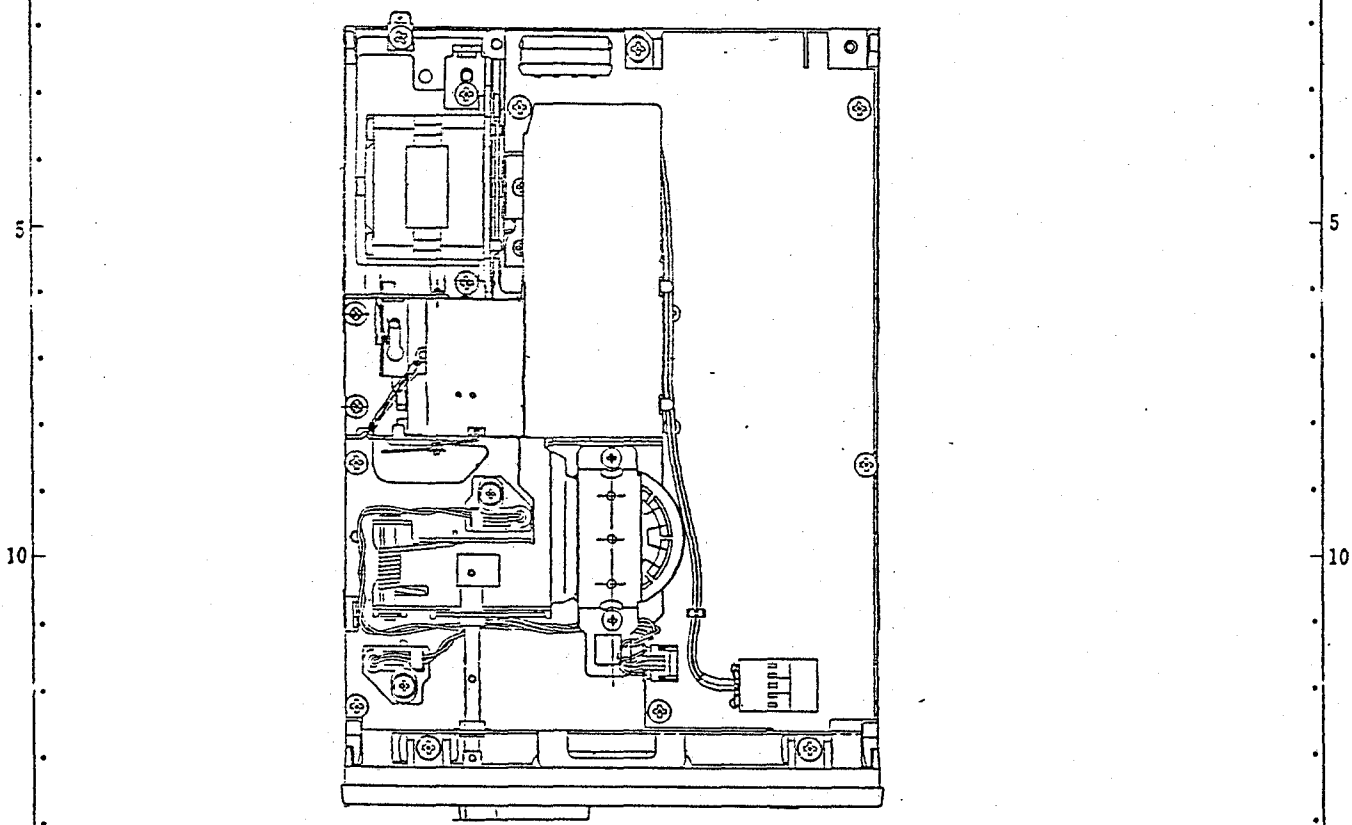
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T = 400 ns or less

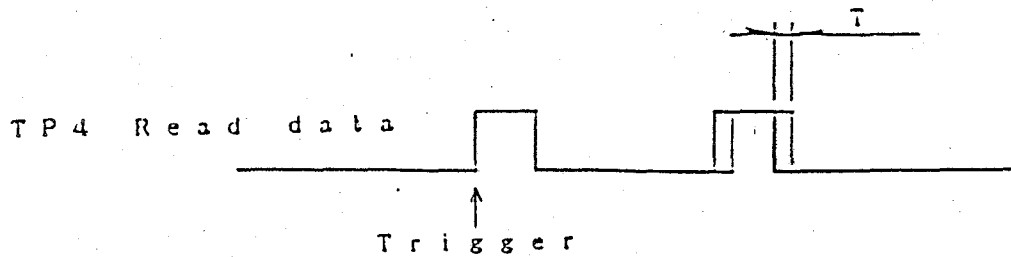


Fig. 5-8

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5-9 Write Protect Sensor Check

Load and unload a diskette and check that write protect sensing is definitely made using Brikon.

5-10 Head Cleaning

Check for excessive dust or oxidized magnetic iron powders on the load pad using such a dentist's mirror. Clean the heads using a cloth that produces no flues or an applicator dipped in 91% isopropyl alcohol. Clean the heads carefully and remove accumulated dust and oxidized magnetic iron powders. Wipe the head using a cloth that produces no flues.

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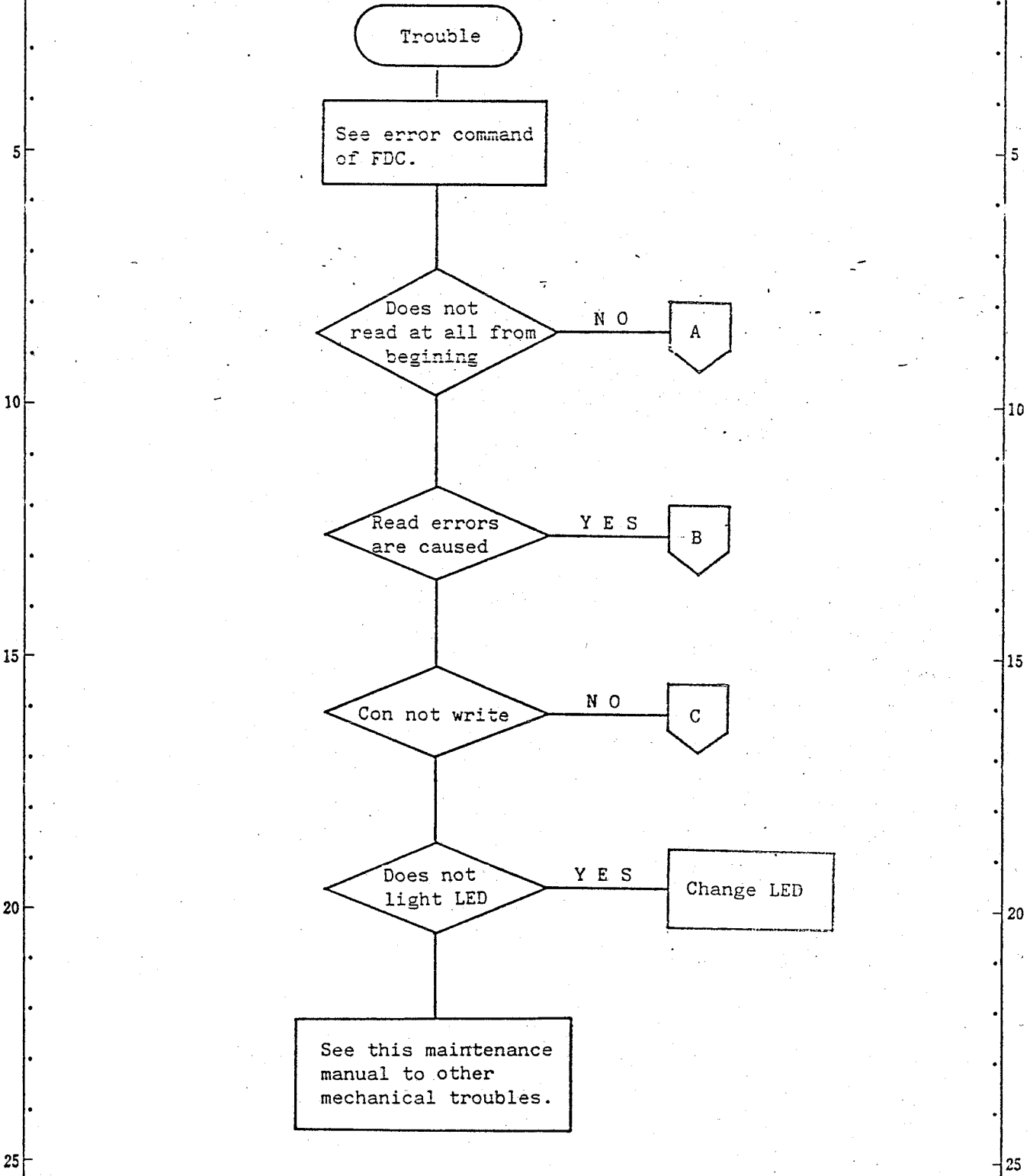
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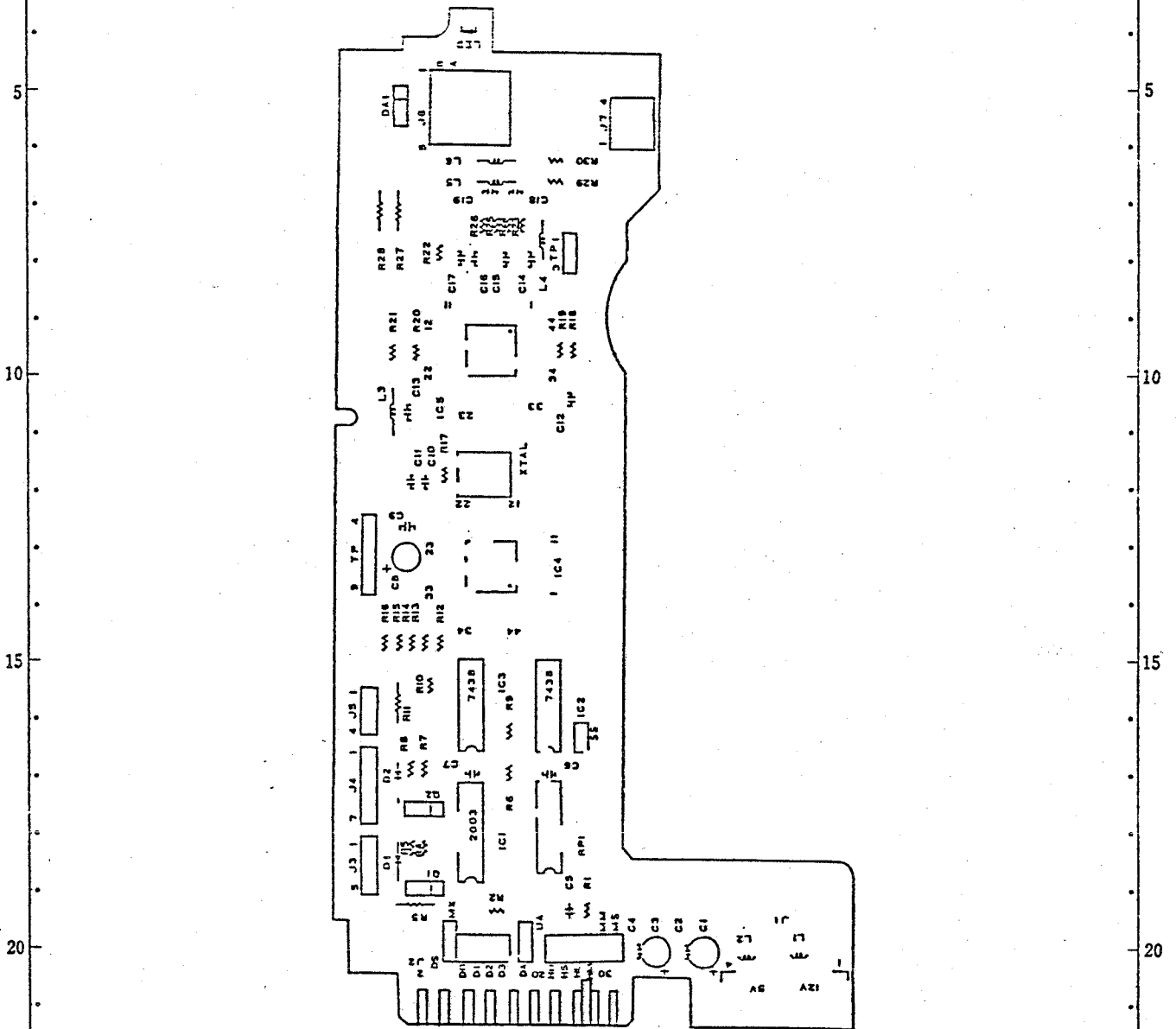
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6. Troubleshooting Hints



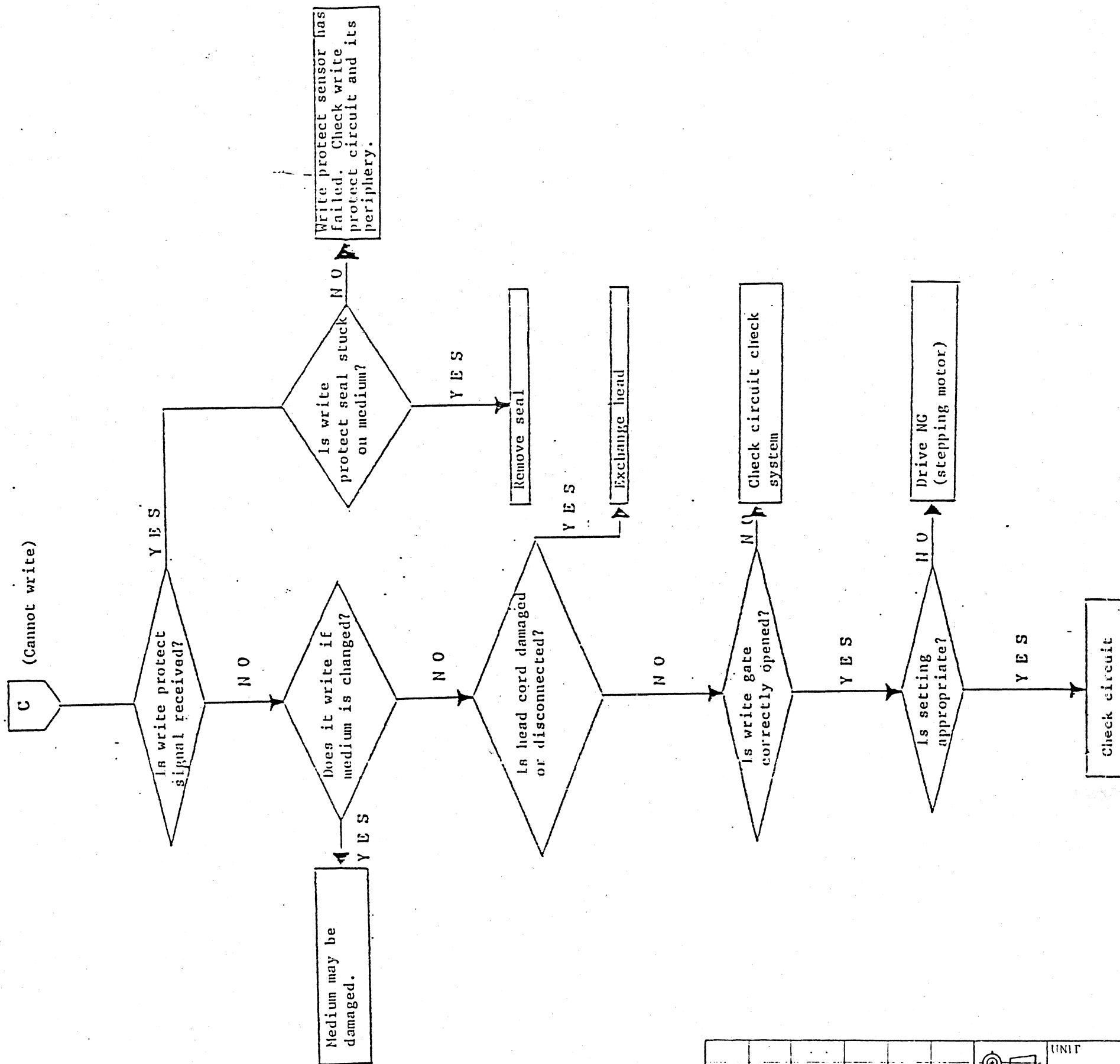
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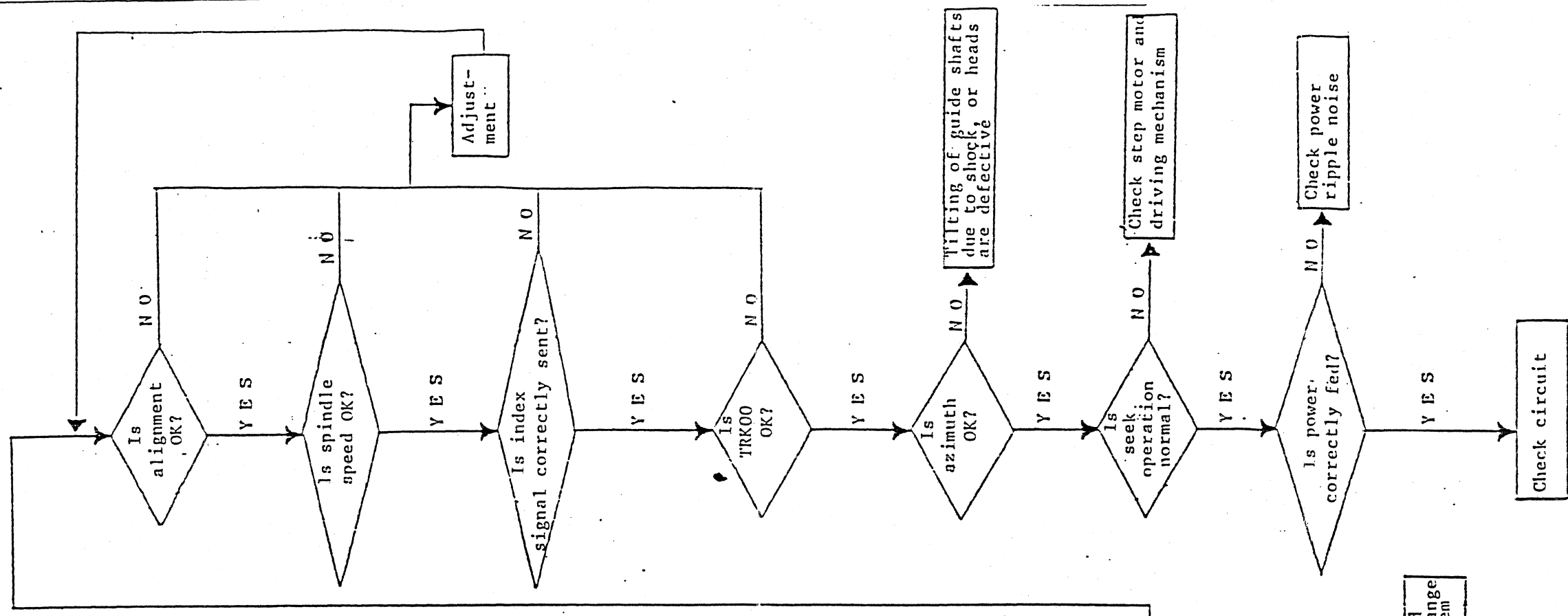
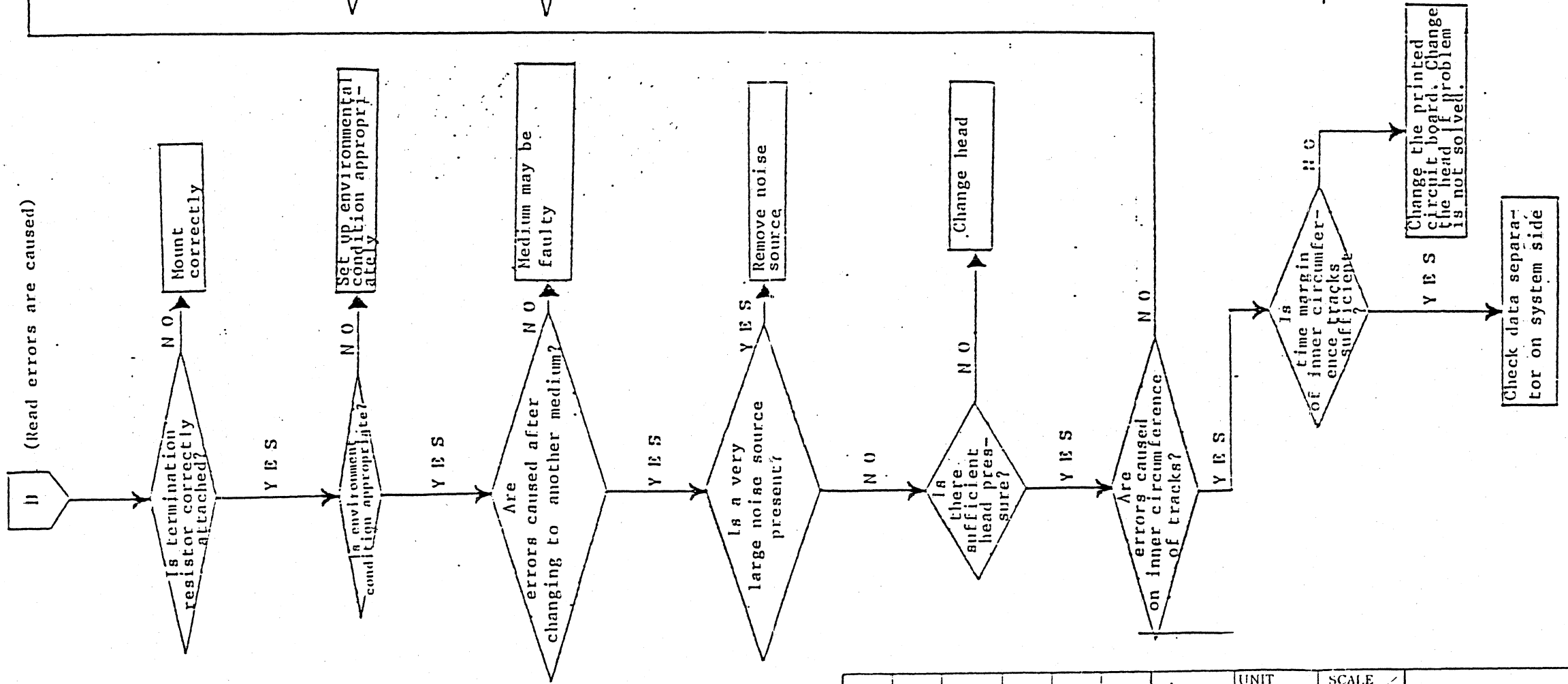


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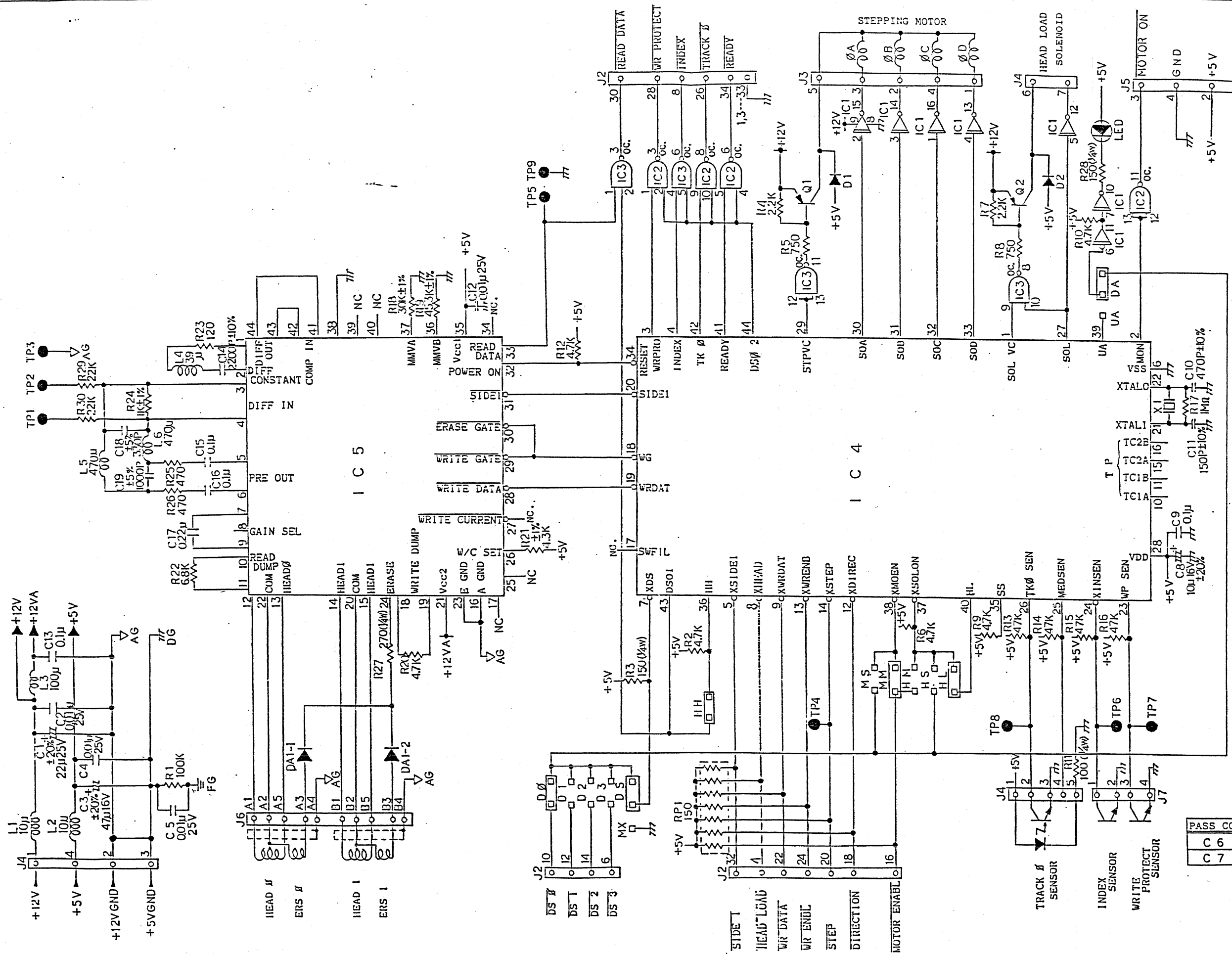


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								DOCUMENT NO.
								(39/44)



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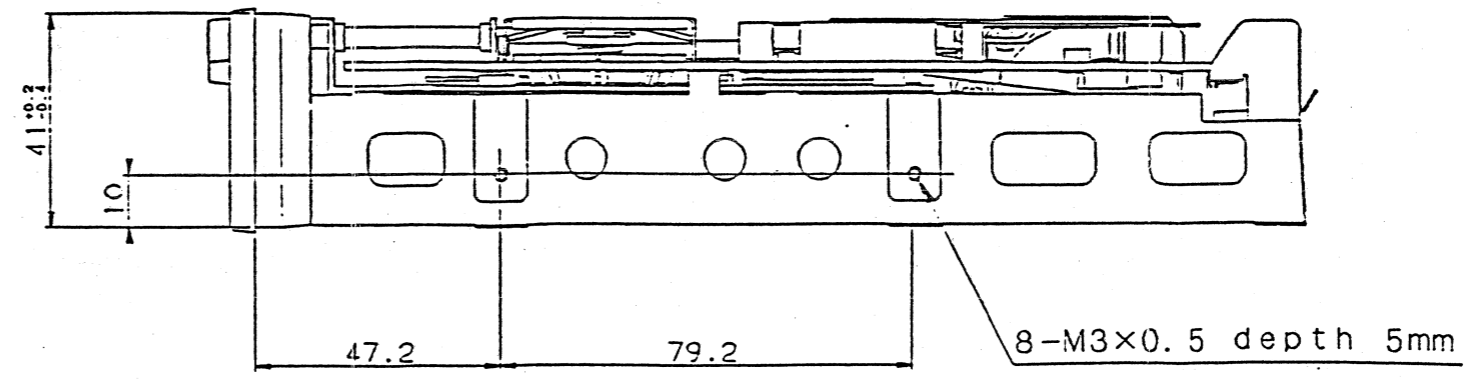
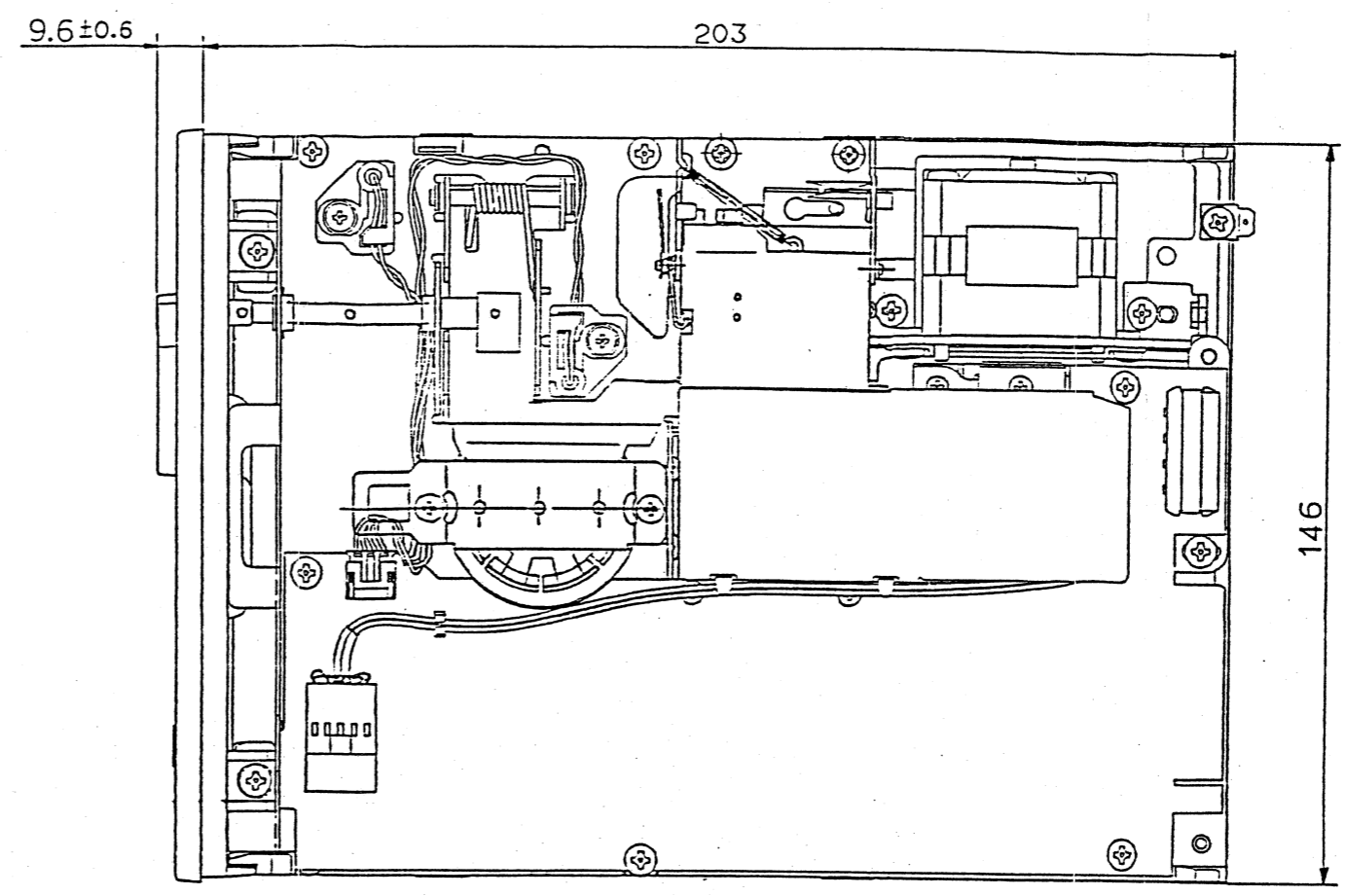
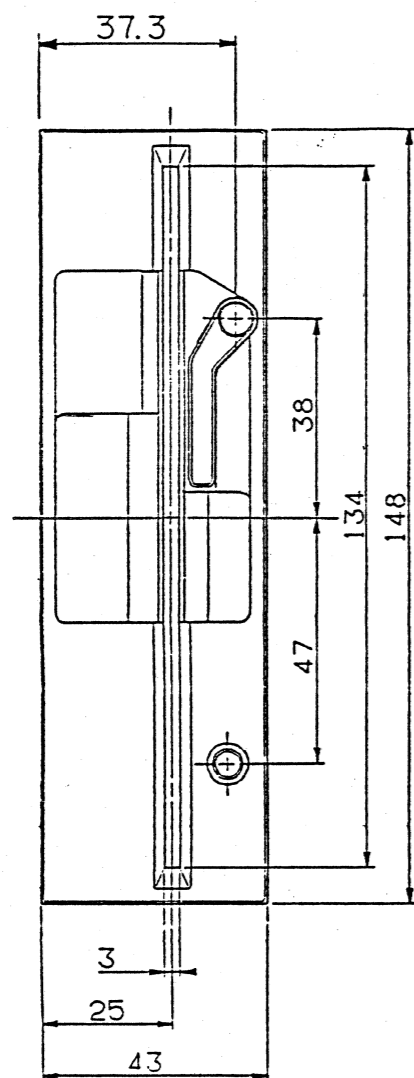
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IC1	2003
IC2	7438
IC3	7438
IC4	SC496-0A
IC5	CX20185

(ADD SOLENOID)

- NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL CAPACITORS ARE IN MICROFARADS. 50V. +80%20%.
  2. ALL INDUCTORS ARE IN MICROHENRIES. + 10%.
  3. ALL RESISTORS ARE IN OHMS. 1/6W. + 5%.

4. SOME PARTS VALUES MAY BE MODIFIED WITHOUT PRIOR NOTICE TO IMPROVE THE PERFORMANCE.
5. MAKERS OF IC S ARE "HITACHI", "TOSHIBA", ETC.

REV. NO.	SCALE	DATE	FILE NO.
1	1:1	11/2/81	DFC222A
APP'D.	CHK'D.	DESIGN	TITLE
			CIRCUIT DIAGRAM
DATE	DATE	DATE	DOCUMENT NO.
			(43/44)



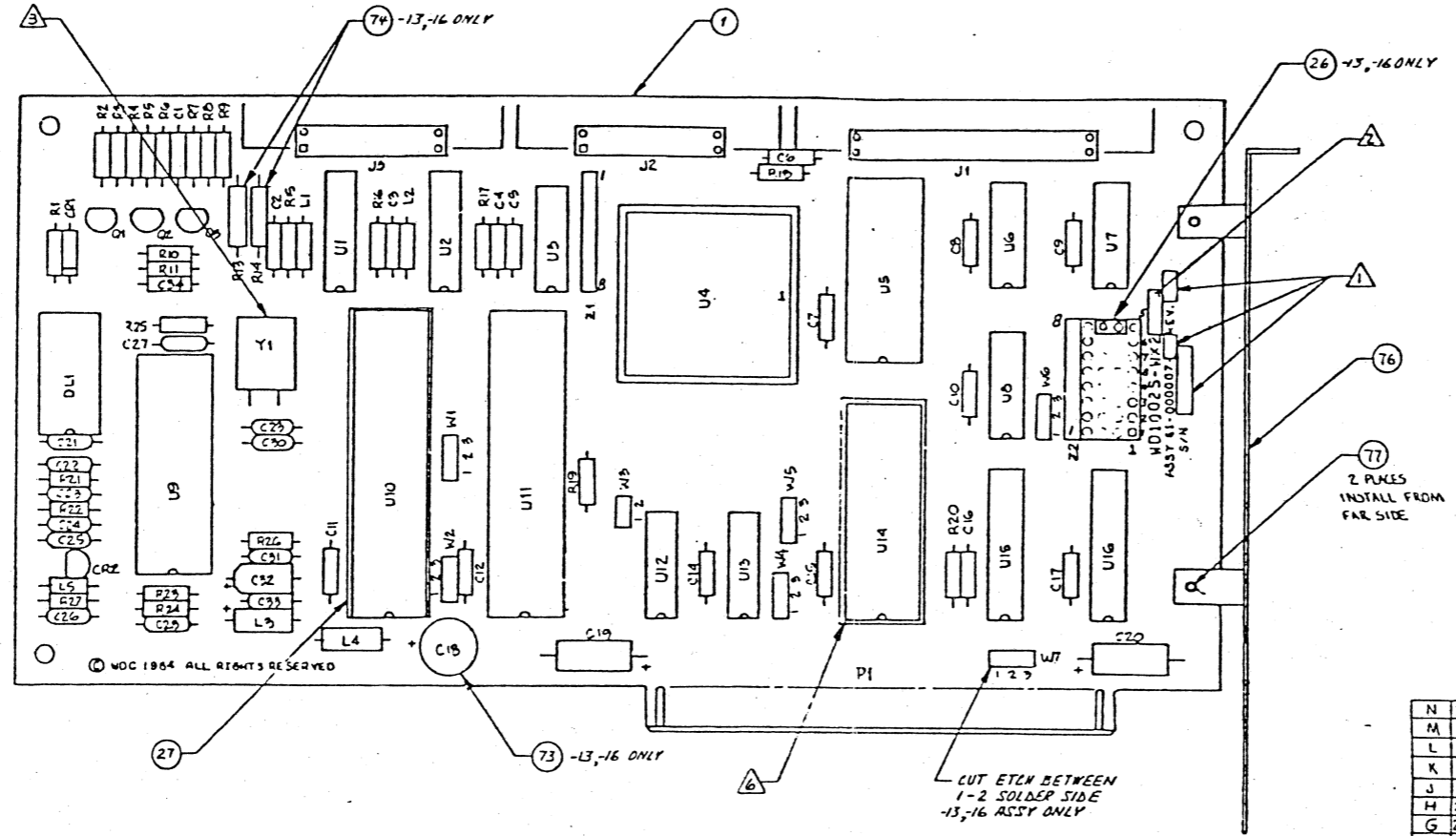
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<b>ALPS ELECTRIC CO., LTD.</b>				
		UNIT mm	SCALE /	DFC222A
		APPD.	CHKD.	TITLE PRODUCT DRAWING
			DSGD. May 17, '85 H. Nakaya	DOCUMENT NO. (44/44)
ZONE	SYMB.	DATE	APPD.	CHKD.
				DSGD.



TABULATION BLOCK			
PART NO.	REV	MODEL NO.	VARIABLE
61-000007-00	E	WD025-W1(F00)	8 HEAD, NO BIOS
-01	G	(F001)	8 HEAD, STD BIOS
-02	E	(F002)	8 HEAD, STD BIOS, MTE BKT
-03	F	(F003)	8 HEAD, NO BIOS, MTE BKT
-04	D	(F004)	16 HEAD, NO BIOS
-05	E	(F005)	16 HEAD, STD BIOS
-06	E	(F006)	16 HEAD, STD BIOS, MTE BKT
-07	E	(F007)	8 HEAD, STD BIOS, MTE BKT
-08	E	(C008)	8 HEAD, CUSTOM BIOS
-09	E	(C009)	8 HEAD, MTE BKT
-10	E	(C010)	8 HEAD, MTE BKT
-11	F	(C011)	8 HEAD, MTE BKT
-12	E	(C012)	8 HEAD, CUSTOM BIOS, MTE BKT
-13	F	(F013)	5 HEAD, CUSTOM BIOS, CUSTOM BRACKET
-14	G	(F014)	8 HEAD, STD BIOS, MTE BKT
-15	E	(F015)	8 HEAD, STD BIOS, MTE BKT
61-000007-16	D	WD025-W1(F016)	16 HEAD, CUSTOM BIOS, CUSTOM BRACKET
61-000007-17	G	WD025-W1(C017)	8 HEAD, CUSTOM BIOS, MTE BKT
61-000007-18	K	WD025-W1(C018)	8 HEAD, LATE BIOS, MTE BKT
61-000007-19	K	WD025-W1(C019)	8 HEAD, LATE BIOS, MTE BKT
61-000007-20	K	WD025-W1(C020)	8 HEAD, LATE BIOS, MTE BKT

JUMPER TABLE (1/16" MIN. LB. 1000)			
PART NO.	FROM	TO	SIDE
61-000007-13,16	U6-3	J1-25	SOLDER
61-000007-13,16	U6-6	J1-30	SOLDER

ETCH CUT TABLE	
PART NO.	LOCATION
61-000007-13,16	AT U6-3
61-000007-13,16	AT U6-6
61-000007-13,16	WT BETWEEN 1-2 SOLDER SIDE



JUMPER CONFIGURATION CHART							
PART NUMBER	W1	W2	W3	W4	W5	W6	W7
61-000007-00	1-2	1-2	1-2	2-3	-	2-3	-
01							
02							
03						2-3	
04						1-2	
05						1-2	
06						1-2	
07						2-3	
08						2-3	
09						2-3	
10						2-3	
11						2-3	
12	1-2	1-2	1-2	2-3	-	2-3	-
13						2-3	2-3
14						2-3	-
15						2-3	-
16						1-2	2-3
61-000007-17						2-3	-

JUMPER CONFIGURATION CHART							
PART NUMBER	W1	W2	W3	W4	W5	W6	W7
61-000007-18	1-2	1-2	1-2	2-3	-	2-3	-
61-000007-19	1-2	1-2	1-2	2-3	-	2-3	-
61-000007-20	1-2	1-2	1-2	2-3	-	2-3	-

N 2679	REMOVED 'C13'			
M 2516	REV TAB BLOCK			
L 2472	REV CHG ONLY			
K 2226	REV TAB BLOCK			
J 1731	REV. TAB. BLOCK			
H 2207	REV. TABULATION BLOCK - 2/10/82			
G 2168	REVISED TABULATION BLOCK			
F 2141	RELEASE - 20			
E 2092	RELEASE - 18 & -19			
D 2041	RELEASE - 17			
C 1925	UPDATE BIOS ON F001			
B 1900	RELEASE -15 & -16, REVISED U7			
A 1826	PILOT RELEASE			
- 1810	ADDED NOTE 6			
X10 1762A	REV CHANGE TO REFLECT REWORK			
X9 1763	REVISED TABULATION BLOCK - CB 11-25 X6			
X8 1703	ADD 61-000007-14 TO JUMPER CHART			
X7 1672	ADD SOCKET AT U10			
X6 1601	INCOMP - 81 PCB (UNUSUAL CHANGES ONLY)			
X5 1454	RELEASE -13 (02/83)			
X4 1371	REWORK ECO TO RELEASE 21			
X3 1386	RELEASE -07 THRU -12			
X2 1346	REV CHANGE ONLY			
X1 1460	INITIAL RELEASE			
Y0 1400	PROTOTYPE RELEASE			

REV	ECO	DESCRIPTION	BY	CHK	APPR	DATE

⚠ WHEN USING OPTIONAL 24 PIN IC - INSTALL PIN 1 OF IC INTO PIN 3 OF SOCKET.  
 ⚠ MODIFY ASSEMBLY PER JUMPER AND/OR ETCH CUT TABLE.  
 4. FOR SEPARATE PARTS LIST SEE PL 61-000007.  
 ⚠ SECURE CRYSTAL Y1 TO PCB PER MFG STANDARDS.  
 ⚠ IDENTIFY WITH APPLICABLE MODEL NO. APPROX AS SHOWN.  
 ⚠ IDENTIFY WITH APPLICABLE DASH NO., REV UTR AND SERIAL NO. APPROX AS SHOWN.  
 NOTES: UNLESS OTHERWISE SPECIFIED.

61-000007-17  
 61-000007-18  
 61-000007-19  
 61-000007-20

TOLERANCES: DIMENSIONS IN PARENTHESES ARE PERMITTED UNLESS OTHERWISE SPECIFIED.  
 UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.  
 SCALE: 2:1  
 SHEET 1 OF 1

8 7 6 5 4 3 2 1

J1

1	GND	
2	RWC-	3B1
3	GND	
4	HSEL2-	3B1
5	GND	
6	WG-	3B1
7	GND	
8	SEEK COMPLETE-	3B6
9	GND	
10	TRACK 000-	3B6
11	GND	
12	WRITE FAULT-	3B6
13	GND	
14	HSEL0-	3B1
15	GND	
16	GND	
17	HSEL1-	3B1
18	GND	
19	INDEX-	3B6
20	GND	
21	DRIVE READY-	3B6
22	GND	
23	STEP-	3B1
24	GND	
25	DSEL0-	3B1
26	GND	
27	DSEL1-	3B1
28	GND	
29	GND	
30	GND	
31	GND	
32	GND	
33	GND	
34	DIRECTION-	3B1

J2

1	GND	
2	GND	
3	GND	
4	GND	
5	GND	
6	RELAY DRV	6B1
7	RELAY DRY	6B1
8	GND	
9	GND	
10	GND	
11	GND	
12	WDATA0	6B1
13	WDATA0	6B1
14	WDATA1-	6B1
15	GND	
16	GND	
17	RDATA0	6D6
18	RDATA0	6D6
19	GND	
20	GND	

J3

1	GND	
2	GND	
3	GND	
4	GND	
5	GND	
6	RELAY DRV	6B1
7	RELAY DRY	6B1
8	GND	
9	GND	
10	GND	
11	GND	
12	WDATA	6B1
13	WDATA-	6B1
14	WDATA1-	6B1
15	GND	
16	GND	
17	RDATA1	6D6
18	RDATA1-	6D6
19	GND	
20	GND	

PI-A

1	D7	SC2
2	D6	SC2
3	D5	SC2
4	D4	SC2
5	D3	SC2
6	D2	SC2
7	D1	SC2
8	D0	SC2
9		
10		
11	AEN	4D8
12	A19	4D8
13	A18	4D8
14	A17	4D8
15	A16	4D8
16	A15	4D8
17	A14	4D8
18	A13	4D8
19	A12	4D8
20	A11	4D8
21	A10	4D8
22	A9	4D8
23	A8	4D8
24	A7	4D8
25	A6	4D8
26	A5	4D8
27	A4	4D8
28	A3	4D8
29	A2	4D8
30	A1	4D8
31	A0	4D8

PI-B

1	GND	
2	RESET	5B6
3	+5V	
4	IRQ2	4B6
5		
6		
7		
8		
9	+12V	
10	GND	
11	MEMR-	5B6
12	IQW-	5B6
13	IOR-	5B6
14	DACK3-	5B6
15	DRQ3	4B6
16		
17		
18		
19		
20		
21		
22	IRQ5	4B6
23		
24		
25		
26		
27		
28		
29	+5V	
30	GND	
31		

D  
C  
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D  
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WDI0025-WX2  
 68-000005-00  
 10/6

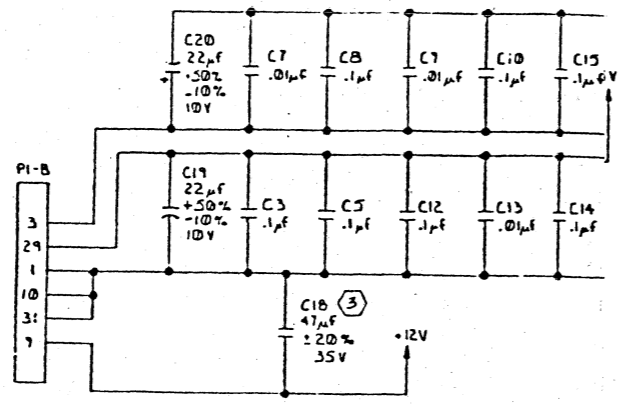
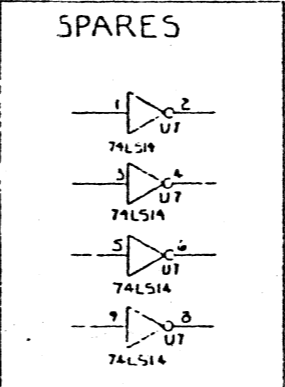
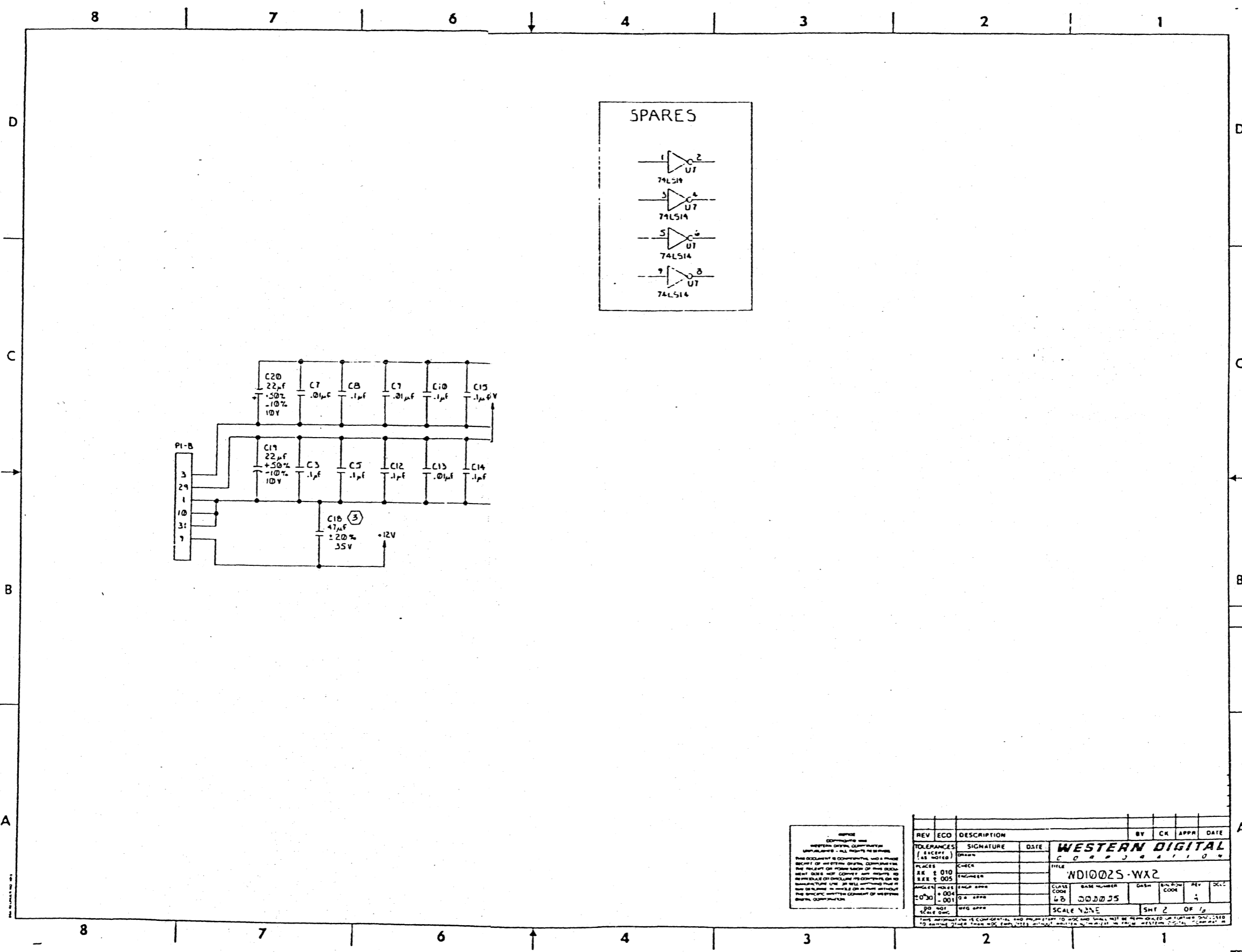
- ④ VALUE MAY VARY (TEST SELECT)  
 ③ OPTIONAL PART (SEE ASSEMBLY PARTS LIST)  
 2. ALL CAPACITORS ARE 50V, ±5%  
 1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, ±5%  
 NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS

REV	ECO	DESCRIPTION	BY	FW	APPR	DATE
A	1/26	PILOT RELEASE				5-22-55
X2	1/31	CHANGE ALL PIN NOS. OF 21 (+5V, DR, RW)				5-22-55
X1	1/31	INITIAL RELEASE				5-22-55
10	MEMO	PC-DISTTYPE RELEASE				1-22-55

A 1/26 PILOT RELEASE									
X2 1/31 CHANGE ALL PIN NOS. OF 21 (+5V, DR, RW)									
X1 1/31 INITIAL RELEASE									
10 MEMO PC-DISTTYPE RELEASE									
REV	ECO	DESCRIPTION	BY	FW	APPR	DATE			
TOLERANCES (SEE NOTES)		SIGNATURE	DATE						
CHECK		C. KUSUMI	6-8-55						
PLACES		WDI0025-WX2							
REV	ECO	DESCRIPTION	BY	FW	APPR	DATE			
1	010	ENGINEER							
2	008	DRG APPR							
3	001	MFG APPR							
SCALE		SCALE		SHT 1 OF 6					

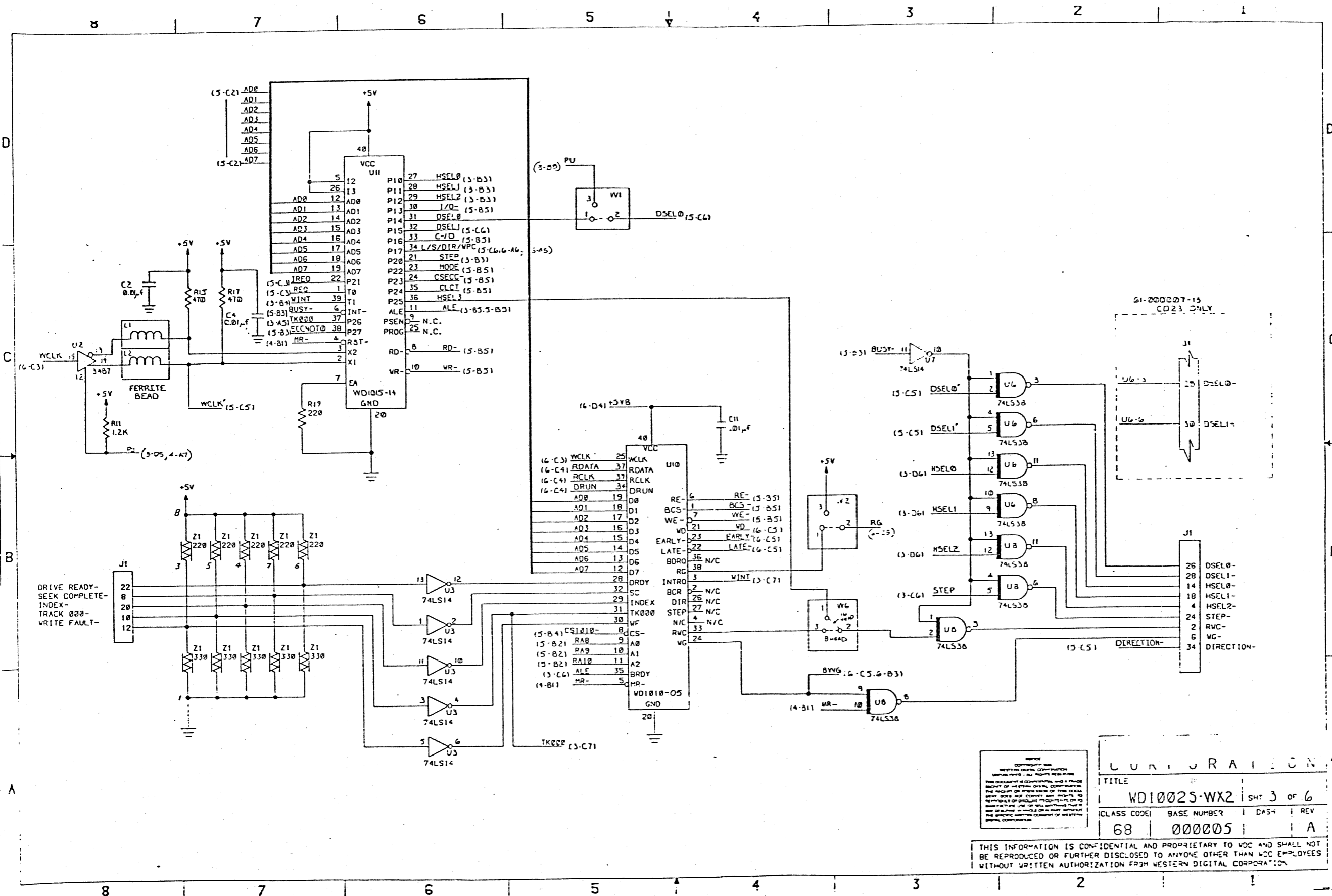
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 00-000005-00  
 WDM-500000  
 9/26/68

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REV	ECO	DESCRIPTION	BY	CK	APPR	DATE
TOLERANCES UNLESS OTHERWISE SPECIFIED		<b>WESTERN DIGITAL</b>				
PLACES		CORPORATION				
SEE 010	CHECK	TITLE				
SEE 005	ENGINEER	WD10025-WX2				
SCALE 1:1	DATE	CLASS CODE	BASIC NUMBER	QASH	EXTENSION CODE	REV
0030	0001	00	000005			1
DO NOT SCALE DIMS	WFO APPR	SCALE NONE		SHF 2 OF 3		
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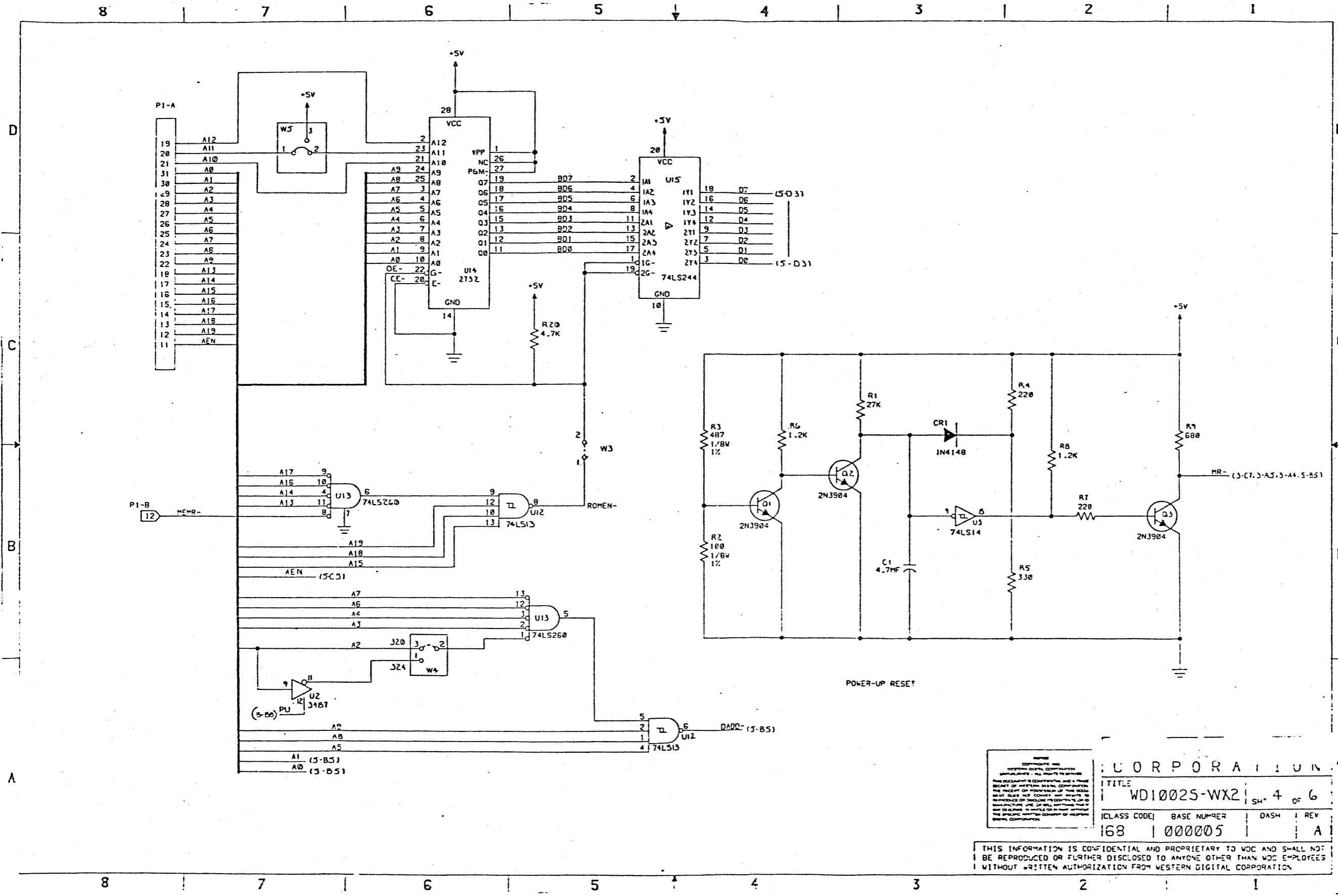


68-000005  
 WD10025-WX2  
 3 of 6

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TITLE			
WD10025-WX2 SH: 3 of 6			
CLASS CODE	BASE NUMBER	DASH	REV
68	000005		A

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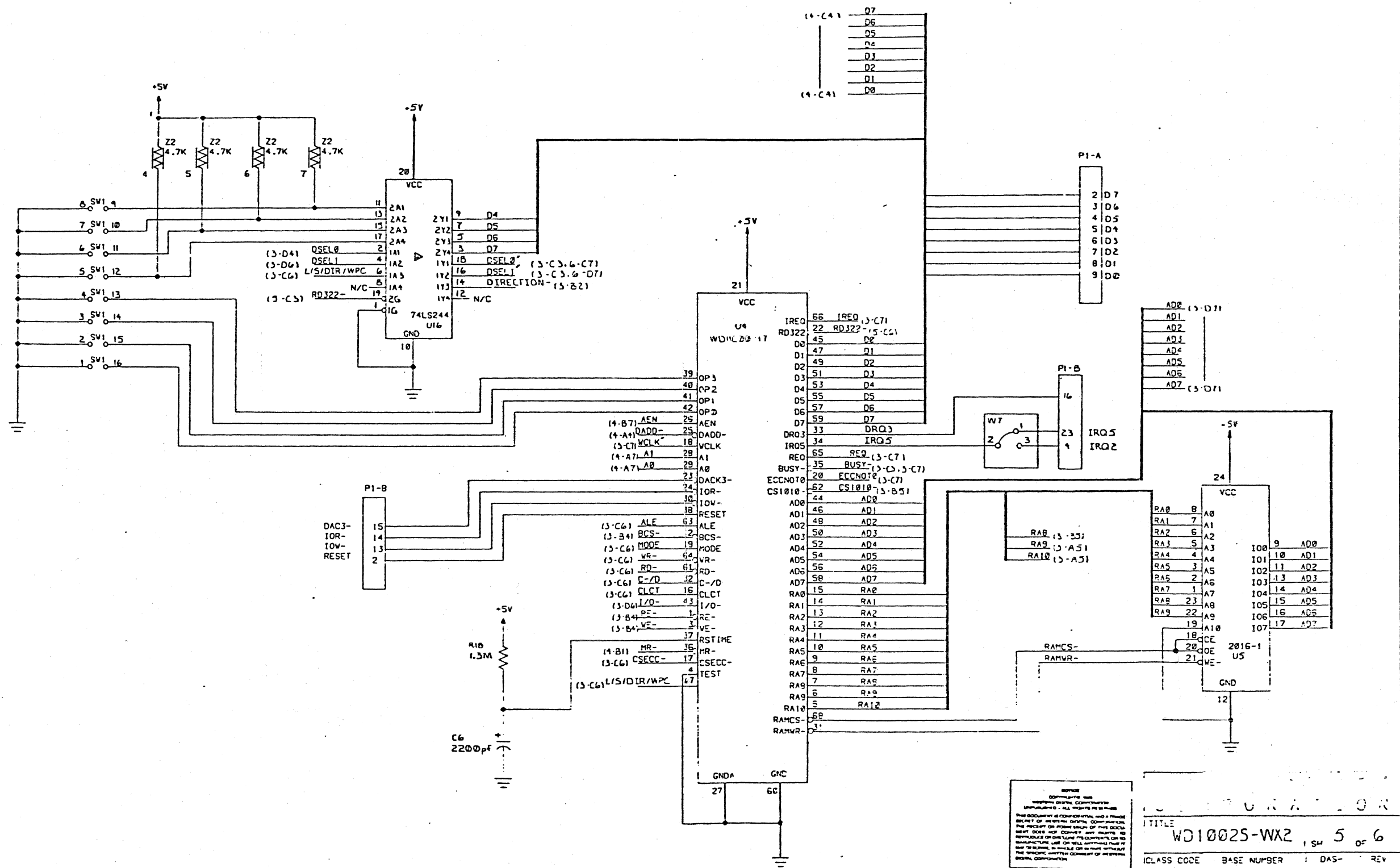
WD10025-WX2  
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 H 8/10

WESTERN DIGITAL CORPORATION			
TITLE			
WD10025-WX2 SH 4 OF 6			
CLASS CODE	BASE NUMBER	DASH	REV
168	000005		A

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8 7 6 5 4 3 2 1

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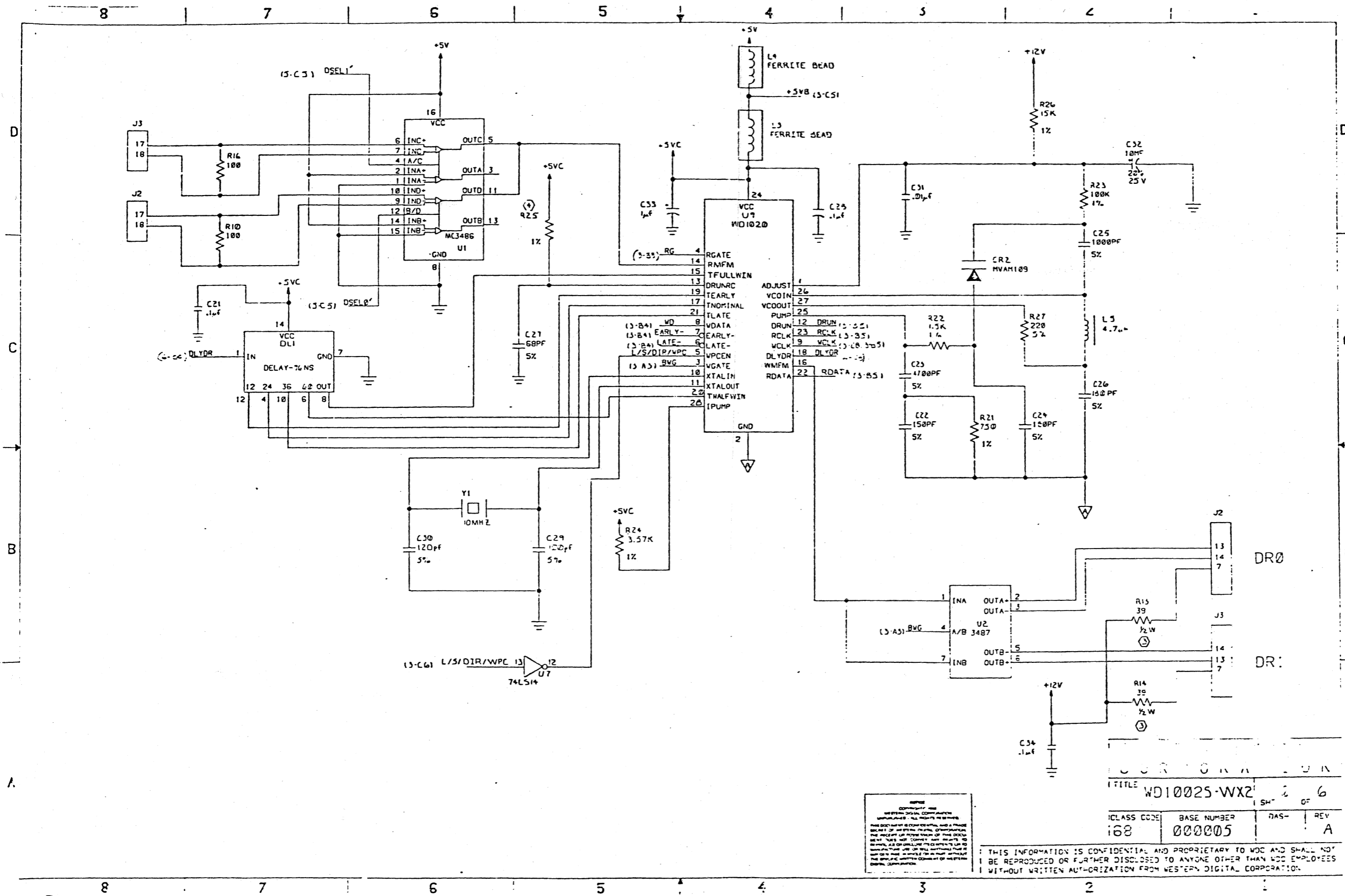


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TITLE  
 WD1025-WX2 1 of 6  
 CLASS CODE BASE NUMBER DAS- REV  
 68 1 000005 1 A

8 7 6 5 4 3 2 1



WD10025-WX2  
 68-000005-00  
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CLASS CODE		BASE NUMBER	REV
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