

NEWBRAIN SERVICE MANUAL Rev 4

By Colin Appleby 20 April 2014

NewBrain

Technical Specification Sheet

Hardware

Model A

- | | |
|--------------------|---|
| 1. Z80A | 7. Video 40 or 80 characters x 25 lines |
| 2. 32K RAM | 8. Resolution 256, 320, 512, 640 x 250 |
| 3. 24K ROM | 9. Dual Cassette. Port. |
| 4. Expansion Port. | 10. V24 Bi-directional Port. |
| 5. T.V. Port | 11. V24 Printer Port. |
| 6. Monitor Port. | |

Model AD

As above, and additionally an on-board blue-green vacuum fluorescent 16 character, 14 segment display behind a brown tinted polarizing filter.

Expansion Module

This module is mandatory for all expansions (excluding the battery module) and contains:-

Paging for additional memory

5 ROM sockets

4 inputs (multiplexed) and 1 output analogue port

User ports - 8 bit parallel input, 8 bit parallel output

2 x V24 bi-directional ports (H/W – autonomous)

Store Expansion Modules

These modules contain either, 64K, 128K, 256K or 512K of RAM.

A maximum of 4 x 512K byte RAM modules can be attached to the system. No module can have further RAM added after the manufacture.

Battery Module

This module provides security from mains fluctuation, using rechargeable Nickel Cadmium batteries. When fully charged the

module provides a life of at least one hour when mains current is not applied. Recharge from a fully discharged state takes 14 hours.

Input/Output Modules

Multiple V24 Modules: These modules contain either, 8, 16 or 32 channels. No module can have further channels added after the manufacture and each module will terminate expansion.

Software

Enhanced ANSI BASIC

- * Independent operating system.
- * Unlimited length string handling.
- * Uniform I/O commands to handle up to 255 active streams.
- * Chaining and run time program generation.
- * Full user proofing of applications programs.
- * External call capability.
- * All major routines RAM vectored.
- * Direct interrupt handling capability.

Screen Editor

- * Up to 255 pages each with up to 255 lines of 40 or 80 characters
- * or continuous lines.
- * Insert and delete lines and characters.
- * Send page, line and character.
- * Selectable character sets.

Maths Pack

- * 10 significant figure floating point arithmetic
- * 2ms multiply.

Graphics

- * Absolute and relative plotting.
- * Scaling and linear transformation.
- * Line and arc drawing.

Statistics Pack

- Later development.

CP/M operating system version 2.2

- Requires Disk Drives and Expansion Module.

Assembler and COMAL

Other Hardware

Disk Drives, PI Box, ROM Box, Videotext Module and Printers.

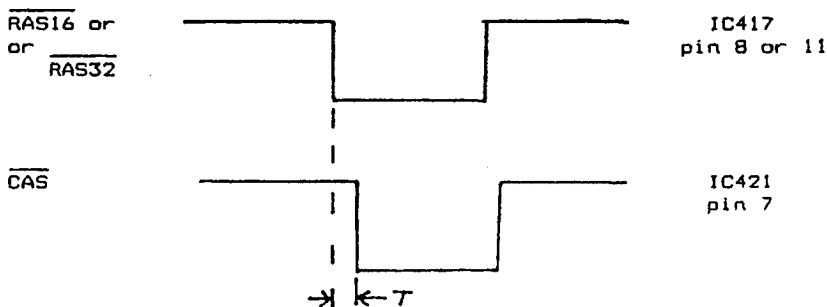
Monitor

12" green phosphor monitor displays 80 characters by 25 line text and high resolution graphics with precision and high readability.

Excerpts From Service Manual (Issue A, 21/7/83)

.... by GBS (via R Bury)

RAM Board Timing (RAS, CAS)



Capacitor (*) value is modified if necessary to trim T (the $\overline{\text{RAS}}$ to $\overline{\text{CAS}}$ timing) to 80 - 140 nS measured on the -ve going edges.

Oscilloscope beam 1 on IC417 pin 11 ($\overline{\text{RAS16}}$).

Beam 2 on IC421 pin 7 ($\overline{\text{CAS}}$). Trigger from IC418 pin 8 (RFRSHB+CPRQ).

(If beam 1 does not display correct waveform try IC417 pin 8 ($\overline{\text{RAS32}}$).

(*) Issue:	5	6	8
Capacitor:	49	49	57

RAM Board Modifications

(NB 12118/*5)

(NB 12118/*6)

1. 33R resistors are to be inserted in series with the tracks from pin 2 of the following IC's 409, 410, 411, 412, 413, 414, 415, 416. This is achieved by cutting the tracks from the pin 2 and soldering the resistor from pin 2 to the plated through hole of the cut track.
2. Solder a 100pF capacitor from IC422 pin 7 to the plated through hole on the track connected to IC422 pin 13.
3. Solder a diode (1N914/4148 type) across resistor 48 (150R). Band mark to the left.
4. Add a Sil pad to the top of the board to insulate around the fixing hole between IC417 and IC410.
5. Link IC423 pin 3 to the track running between IC423 pins 2 and 3.
6. Cut track from IC423 pins 3 and 4.
7. Add resistor pack (4K7 commoned) on IC421 on main board. Resistor pack pins 2 to 9 soldered to IC421 pins 18 to 11 in sequence. Also solder resistor pack pin 1 to IC421 pin 20.

Check $\overline{\text{RAS}}$, $\overline{\text{CAS}}$ timing

.... continued

RAM Board Modifications (NB 12118/*/8)

1. Solder a 100pF capacitor from IC422 pin 7 to the plated through hole on the track connected to IC422 pin 13.
2. Solder a diode (1N914/4148 type) across resistor S6 (150R). Band mark to the left.
3. There should not be a resistor pack (4K7) soldered to IC421 pins 11 to 18 and 20 on the main board.
4. Solder a resistor (470R) from IC401 pin 6 to IC401 pin 9.

Check RAS, CAS timing.

EPROM/ROM Links Issue 6 Main Board (NB 12117/*/6)

1. If using CD and EF EPROMS in IC407/408 positions use a wire link from 5v to the hole near IC408 pin 28. (If the board previously held an NEC ROM then remove the link IC408 pin 26 to IC428 pin 4 and repair track IC428 pin 4 to resistor pack 54 pin 4).

If using NEC ROM in IC408 (No CD in IC407) use a 4K7 resistor in place of the wire link. Then wire the end of the resistor connected to IC408 pin 26 to IC428 pin 4. Cut track IC428 pin 4 to resistor pack 54 pin 4.

2. If using character EPROM in IC453 then use two long links (horizontal) near IC453 pin 28.

If using NEC ROM in IC453 then use two short links (vertical) near IC453 pin 28.

EPROM/ROM Links Issue 7 Main Board (NB 12117/*/7)

1. If using NEC ROM in IC408 (No CD in IC407) use a 4K7 resistor from 5v to the hole near IC408 pin 28. Wire from resistor pack 54 pin 4 to the end of the 4K7 resistor connected to the ROM IC408 pin 26 (near pin 28). Remove link next to resistor pack 54.

If using CD and EF EPROMS in IC407/408 positions use a wire link from 5v to the hole near IC408 pin 28. (There is no wire on the back of the board as is used with the NEC ROM). Replace link next to resistor pack 54.

2. If using character EPROM in IC453 then use two short links (vertical) near IC453 pin 28.

If using NEC ROM in IC453 then use two long links (horizontal) near IC453 pin 28.

3. Connect pin 14 of IC408 (EF) to the adjacent ground track.

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Modifications to Issue 6 Main Board (NB 12117/*/6)

1. Relay 416 is type HE751A05-10.
2. Sil pads to insulate tracks from power transistor leads (8,22).
3. Resistor 121 is 330R.
4. Capacitor 50 is 33pF.
5. There is no capacitor 40 to be used.
6. Check sticky pad holds the crystal to the board.
7. Capacitor 104, -ve terminal to near IC417 pin 9, +ve terminal to near IC417 pin 10.
8. Resistor pack 134 4.7K add on IC421, resistor pack pins 2 to 9 connected to IC421 pins 2 to 9, resistor pack pin 1 connected to IC421 pin 20.
9. 330pF capacitor soldered to IC449 pins 4 and 8.
10. 470pF capacitor soldered to IC463 pins 3 and 7.
11. 330pF capacitor soldered to IC434 pins 7 and 11.
(if vertical lines on graphics fade then change to 220pF).
12. Cut track leaving IC402 pin 5.
13. Cut track leaving IC402 pins 10, and 11.
14. Cut track joining IC413 pin 1 to IC413 pin 16.
15. Wire IC402 pin 5 to IC428 pin 4.
16. Wire IC402 pins 10 and 11 to IC428 pin 7.
17. Connect IC413 pin 1 to adjacent track (bend pin 1).
18. Replace resistor 25 with 1K2, connected from resistor 25 hole near diode 31, to capacitor 29 wire near Extension connector.
Sleeve to avoid short circuits to other components.
19. Resistor 4K7 added to IC425 pins 10 and 14.

Read instructions on EPROMS/NEC ROMS in conjunction with this sheet.

Modifications to Issue 7 Main Board (NB 12117/*/7)

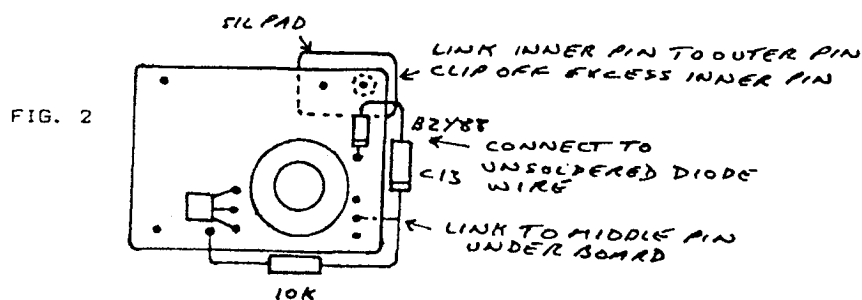
1. Relay 416 is type HE751A05-10.
2. Sil pads to insulate tracks from power transistor leads (8,22).
3. Resistor 121 is 330R.
4. Capacitor 50 is 33pF.
5. There is no capacitor 40 to be used.
6. Check sticky pad holds the crystal to the board.
7. Capacitor 104, -ve terminal to near IC417 pin 9, +ve terminal to near IC417 pin 10.
8. 330pF capacitor soldered to IC449 pins 4 and 8.
9. Replace resistor 25 with 1K2, connected from resistor 25 hole near diode 31 to capacitor 29 wire near Extension connector.
Sleeve to avoid short circuit to other components.

Read instructions on EPROMS/NEC ROMS in conjunction with this sheet.

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Keyboard Modifications

1. Capacitor 4 (100MFD) is replaced by a ZN404 (note polarity, + to +). A 1 nF capacitor is soldered across the ZN404.
2. Replace resistor 8 (3K9) by a 680R resistor from resistor 8 + hole to capacitor 5 wire near the edge of the board.
3. The convertor (voltage) should be modified as in the diagram below. A Sil pad should be used on the main board at the top right corner of the convertor to insulate the wire link.



Power Supply Test Load

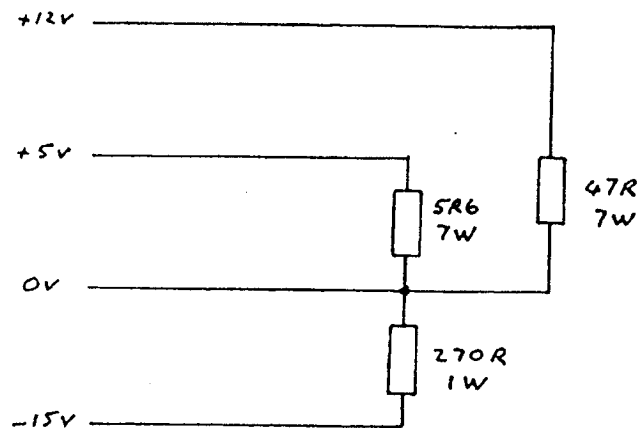


FIG 3

The COP-420 Micro-controller

.... Andrew Fay

The COP-420 is a 4-bit micro-controller which handles the cassette interface, keyboard, and line-display.

It is manufactured by The National Semiconductor Corporation as part of their COPS (*) family of micro-controllers. For further details, copies of the data sheet are available on request from Ron Bury (price 90p to cover copying & postage costs).

Referring to the section of the NewBrain circuit diagram, Fig 1, one output of the COP420 is used to clock a 7-bit counter which in turn provides the input to a 4 to 16-line decoder. The output from the decoder is 16 lines, only one of which is active at any one time, as defined by the address on the input (ie the counter). Thus on each pulse from the COP the decoder moves on one, and the data from the keyboard switches is latched into four D-type flip-flops and their outputs 'enabled'. The switches are in a matrix (16 by 4) and by looking at the results it can be determined which switch was pressed.

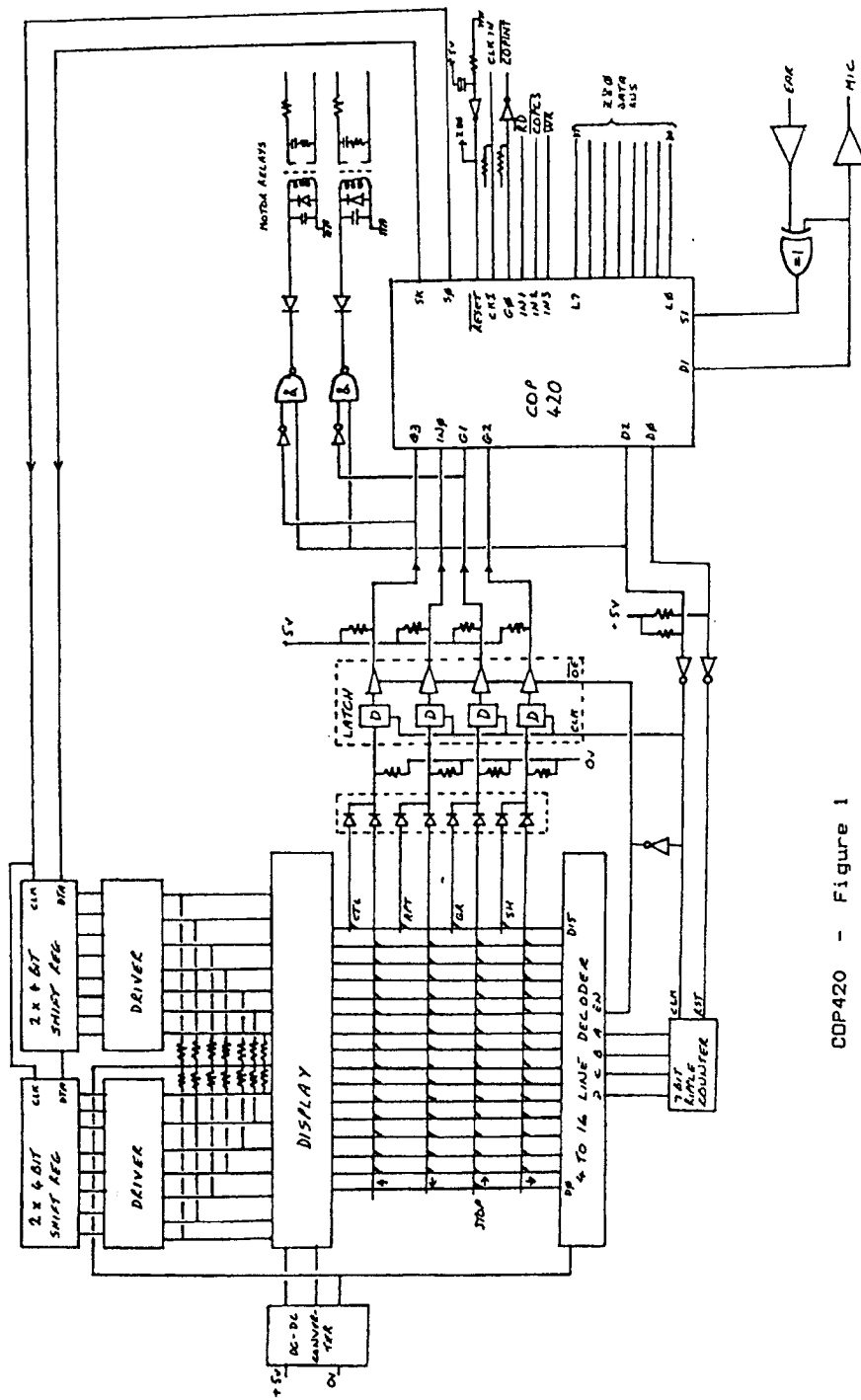
The output from the decoder also drives the line-display by selecting one character position at a time. Whilst one position is selected, data is clocked out by the COP into two CD4015s which are configured as a 16-bit shift register. This data drives the 14 segments of each character (shown on the right) via a driver.



The MICROBUS (*) option has been used to interface the COP to the Z80 via an I/O port using the L-port on the COP and \overline{RD} , \overline{WR} , \overline{CS} , and interrupt lines. The clock for the COP is supplied from the main clock circuit and their resets are both supplied from the same power-up circuit.

The cassette interface is simple, all the work being done in software. There is only an op-amp on the input, and an inverter and transistor buffer on the output.

(*) COPS and MICROBUS are trademarks of the National Semiconductor Corporation.



COP420 - Figure 1

Fitting a UHF Modulator to the 'Brain.

.... Ron Bury

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Anyone having purchased the NewBrain kit from Jon Doar will be aware that the UHF modulator is absent, thus making it impossible to use with a TV. If you were able to construct the "kit" you will easily be able to install your own modulator.

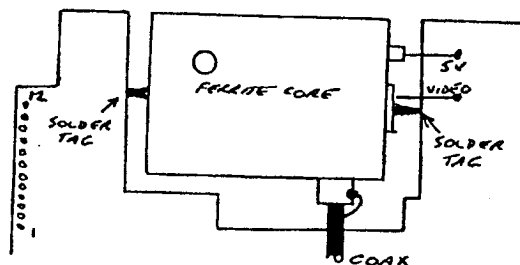
The modulator used is the Astec UM1233 (Radio Spares stock No. 300-316 or Maplin order No. FT30H). This is listed at around £4.85 but should be available cheaper if you shop around.

In order to install the modulator it is necessary to remove the circuit boards from the case. If you constructed your own kit you should be able to do this and so I do not intend to go into details here.

The first step is to solder a co-ax cable onto the modulator. Carefully prise the top off the modulator. Strip one end of a 10" length of co-ax cable. TV aerial down lead is really physically too large and makes re-assembly difficult - try to find something around 3 to 4 mm. dia., the impedance for this situation isn't too critical. The central core is passed up the centre of the phono socket on the modulator and soldered to the terminal inside the case. The co-ax sheath is soldered to the outside of the phono socket. Replace the top on the modulator.

Remove the keyboard from the top half of the case and place key side up. Put the modulator in the cutout in the top left hand corner of the circuit board with the two wires to the right. The top wire solders to the hole labelled "5v". The bottom wire, coming out through the polythene insulator, solders to the hole labelled "VIDEO" or "IN" depending which version you have.

Refix the keyboard onto the case temporarily. Sit the modulator on the case and solder the two spikes at each end to the tinned areas adjacent to the cutout on the underside of the board. Note that the tinned areas are connected to core 12 of the ribbon cable connecting the keyboard to the processor board.



The earlier circuit boards don't have the two tinned areas. In this case, solder one end of a short piece of stiff copper wire onto the tag on the left hand side of the modulator and solder the other end to the adjacent track on the back of the circuit board connected to core 12 of the ribbon cable.

Remove the keyboard from the case and connect the other end of the co-ax to the UHF socket on the back of the 'Brain. Connect up the 'Brain using the UHF socket and switch on.

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By using a non-ferrous screwdriver (either a ground down plastic knitting needle or brass or copper wire about 3mm dia), the ferrite core visible through the hole in the top of the modulator may be screwed in or out to tune the modulator onto any UHF TV channel you wish. Replace the circuit boards in the case, connect up, switch on and away you go.

Disclaimer

NB Neither the author nor NSG can accept responsibility or liability for damage to equipment or loss of software or data due to use of the modulator described in the preceding article. Anyone requiring further information on this item is welcome to contact me.

Debugging Hardware faults **by John Kelly**

From nbug172.17

Faulty RAM chips

RAM chip failures in the NewBrain usually result in one of the outputs being set permanently high or low. The NewBrain has 2 banks of 16K RAM chips. A failure of one of the chips in the 16-32K Bank will result in TOP returning 16K. If a chip fails in the lower bank then the NewBrain will fail to power up. To overcome this problem in order to discover which chip has failed simply short pin 6 to pin 1 on the 50 way expansion connector (before switching on). This causes the 2 banks of RAM to be exchanged and will allow the NewBrain to power up.

Next

POKE 20000,0:?PEEK(20000)

This should return 0

POKE 20000,255:?PEEK(20000)

This should return 255

If a single RAM chip has failed (which is usual) then the first value returned may be 1,2,4,8,16,32,64 or 128 if the chip has failed 'high' or the second value returned will be 255 minus 1,2,4,8,16,32,64 or 128. Reference to the circuit diagram should now reveal the chip's position on the RAM board. [Circuits published with NBUG6.]

ICs 401 to 408 are the RAM chips in the lower 16K bank. If 64 is returned instead of 0 IC402 is the one at fault if pin6 to pin1 on the 50 way is shorted.

If the problem is not failure to power up but TOP reduced to 16K the POKE and PEEKs above will show the faulty chip in the upper RAM bank. If 64 is returned instead of 0, then IC 410 is at fault.

To remove the faulty RAM chip, use a good pair of snips to cut the pins close to the IC body. With the body removed heat the pins remaining, one by one, with a soldering iron. When the solder melts grip the pin and the iron with a small pair of pliers and gently pull the pin from the PCB. A solder sucker should now be used to suck the remaining solder from the hole. (melting fresh solder onto the hole sometimes helps to heat the solder within the hole quickly) Overheating the plated through hole may cause it to become disconnected from the tracks.

Having cleaned all the holes drop in the new chip and solder to the board. (ensure it is the same way round as the other ICs.) Warning RAM chips are easily damaged by static electricity and should be handled carefully.

Model AD Ghosting

An incorrect DC-DC converter was used by GBS to generate the voltages necessary to drive the fluorescent display on the model AD. On some machines ghosting occurs. i.e. segments being faintly illuminated which shouldn't be. This is because of too high a voltage which causes a small leakage current to flow. This voltage can easily be reduced by tacking a zener diode BZY 88 C24 across the existing zener on the small sub-board which is on the keyboard.

NEWBRAIN COMPONENTS (Rev 4)

Main Motherboard NB12117/A/7

Location	Component	Description
1	1N4733A Typical	5.1V Zener Diode 1 watt
2	820 ohms	Resistor
3	150 K ohms	Resistor
4	47 K ohms	Resistor
5	680 pF	Capacitor
6	22 uF 35V Elect	Capacitor Electrolytic
7	47 uF 16V Elect	Capacitor Electrolytic
8	2N5193	PNP Transistor (BD438, BD186, BD786)
9	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
10	4K7 ohms	Resistor
11	560 ohms	Resistor
12	680 pF	Capacitor
13	4K7 ohms	Resistor
14	41K2 ohms	Resistor
15	39K ohms	Resistor
16	4K7 ohms	Resistor
17	ZTX650	Transistor NPN Bipolar
18	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
19	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
20	ZTX107	Transistor Low current NPN Bipolar
21	ZN404	Precision Reference 2.45V ECB
22	2N5193	PNP Transistor (BD438, BD186, BD786)
23	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
24	1N4001	Diode Rectifier 1 Amp
25	1.2K ohms	Resistor
26	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
27	4K7 ohms	Resistor
28	100 ohms	Resistor
29	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
30	4K7 ohms	Resistor
31	IN4001	Diode Rectifier 1 Amp
32	56 ohms	Resistor
33	47 uF 16V Elect	Capacitor Electrolytic
34	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
35	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
36	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
37	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
38	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
39	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
40		
41	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
42	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
43	47 ohms	Resistor
44	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
45	47 ohms	Resistor
46	1K2 ohms	Resistor
47		
48	16MHz	16MHz Crystal SEI
49	BC546	Transistor NPN
50	100pF	Capacitor

51	27pF	Capacitor
52	47K ohms	Resistor
53	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
54	4K7 ohms X8 Multi	Resistor Multi Type
55	100pF	Capacitor
56	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
57	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
58	1K ohms	Resistor
59	4K7 ohms X8 Multi	Resistor Multi Type
60	1K ohms	Resistor
61	22K ohms Multi	Resistor Multi Type
62	120 ohms	Resistor
63	22 ohms	Resistor
64	33pF	Capacitor
65	220 ohms	Resistor
66	2N3906	Transistor PNP General Purpose
67	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
68	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
69	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
70	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
71	150 ohms	Resistor
72	220pF	Capacitor
73	470pF	Capacitor
74	2K ohms Variable	Resistor
75	2K ohms Variable	Resistor
76	22K ohms	Resistor
77	10 ohms	Resistor
78	22K ohms	Resistor
79	10 ohms	Resistor
80		Link
81	3.3 ohms	Resistor
82	0.47uF	Capacitor
83	47 ohms	Resistor
84	3.3 ohms	Resistor
85	0.47uF	Capacitor
86	47 ohms	Resistor
87	10nF	Capacitor
88	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
89	10nF	Capacitor
90	0.33uF	Capacitor
91		
92	47K ohms	Resistor
93	1N4148	Diode for Switching and General purpose
94	47uF Elec	Capacitor Electrolytic
95	47uF Elec	Capacitor Electrolytic
96	1N4148	Diode for Switching and General purpose
97	33 ohms	Resistor
98	39K ohms	Resistor
99	39K ohms	Resistor
100	ZTX107	Transistor Low current NPN Ic=2mA Bipolar
101	10M ohms	Resistor
102	1K ohms	Resistor
103	680pF	Capacitor
104	47uF Elect	Capacitor Electrolytic
105	43 ohms	Resistor
106	1K ohms	Resistor

107	IN914	Diode High Speed, High Conductance
108	15K ohms	Resistor
109	IN914	Diode High Speed, High Conductance
110	ZTX212	Transistor Low Sat PNP
111	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
112	1K ohms	Resistor
113	4K7 ohms	Resistor
114	15K ohms	Resistor
115	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
116	68 ohms	Resistor
117	47uH +/- 10%	Inductor
118	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
119	47uF Elect	Capacitor Electrolytic
120	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
121	270 ohms	Resistor
122	75 ohms	Resistor
123	470 ohms	Resistor
124	150pF	Capacitor
125	10uF 25V Elect	Capacitor Electrolytic. Change to Tantalum
126	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
127	10uF 25V Elect	Capacitor Electrolytic. Change to Tantalum
128	220K ohms	Resistor
129	560K ohms	Resistor
130	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
131	100 ohms	Resistor
132	680pF	Capacitor
133	470pF	Capacitor
134	4K7 ohms X8 Multi	Resistor Multi Type
401	CA358E	Amplifier same as LM358 Type
402	SN74LS153N	Dual 4-to-1 multiplexer
403	SN74LS153N	Dual 4-to-1 multiplexer
404	SN74LS153N	Dual 4-to-1 multiplexer
405	SN74LS153N	Dual 4-to-1 multiplexer
406	8250	UART Serial 9600 Bits/Second 40Pin DIL
407	Not populated	
408	D23128C	PROM 28 Pin DIL
409	Z80 CPU	Microprocessor Z80
410	MC1489P	Quad RS232 Line Receiver
411	MC1488P	Quad RS232 Line Driver
412	SN74LS257AN	Quad 2 - input Multiplexer Tri-State
413	SN74LS174N	Hex D flip-flop with clear
414	CA358E	Amplifier
415	HAMLIN HE751A5409	DIL Relay
416	HAMLIN HE751A5409	DIL Relay
417	MM74C14N	Hex Schmitt Trigger (MC14584BCP)
418	DM7400N	Quad 2 Input NAND
419	COP420	COP Microcontroller
420	74LS374N	Octal D-Type Flip-Flop 3 State
421	74LS245N	Octal Bus Transceiver NonInv
422	74LS161AN	4-Bit binary counter
423	74LS161AN	4-Bit binary counter
424	74LS161AN	4-Bit binary counter
425	SN74LS74AN	Dual D-type flip-flop w/preset and clear
426	SN74LS86H	Quad 2 - input XOR gate
427	SN74LS174N	Hex D flip-flop with clear
428	SN74LS257AN	Quad 2 - input Multiplexer Tri-State

429	DM74LS139N	Dual 1-of-4 Dcdr Demultiplexer
430	SN74LS138N	1-of-8 Dcdr Demultiplexer
431	SN74LS32N	Quad 2 - input pos. OR gate
432	DM74LS04N	Hex inverter
433	SN74LS32M	Quad 2 - input pos. OR gate
434	DM74LS86N	Quad 2 - input XOR gate
435	SN74LS06N	Hex inverter buffer/driver
436	SN74LS166AN	8-bit par. Load shift register
437	SN74LS08N	Quad 2 - input AND gate
438	SN74LS08N	Quad 2 - input AND gate
439	DM74LS08N	Quad 2 - input AND gate
440	SN74LS02N	Quad 2 - input NOR gate
441	DM74LS00N	Quad 2 Input NAND
442	SN74LS138N	1-of-8 Dcdr Demultiplexer
443	DM74LS11N	Triple 3 - input AND gate
444	DM74LS157N	Quad 2-to-1 data selector/mux
445	SN74LS112AN	Dual J-K negative edge - Triggered Flip-Flop
446	SN74LS08N	Quad 2 - input AND gate
447	SN74LS393N	Dual 4BIT Binary Up Counter
448	DM74LS10N	Triple 3 - input NAND gate
449	DM74LS157N	Quad 2-to-1 data selector/mux
450	DM74LS04N	Hex inverter
451	DM74LS279N	Quad Set/Reset Latch
452	MC14584BCP	Hex Schmitt Trigger
453	EPROM 8248R7	NewBrain Character Set
454	SN74LS166AN	8-bit par. Load shift register
455	DM74LS27N	Triple 3 - input pos. NOR gate
456	SN74LS32N	Quad 2 - input pos. OR gate
457	DM74LS10N	Triple 3 - input NAND gate
458	SN74LS90N	Decade counter
459	SN74LS32N	Quad 2 - input pos. OR gate
460	SN74LS112AN	Dual J-K negative edge - Triggered Flip-Flop
461	SN74LS95BN	Shift Register Single Parallel I/O
462	SN74LS32N	Quad 2 - input pos. OR gate
463	SN74LS32N	Quad 2 - input pos. OR gate
464	DM74LS27N	Triple 3 - input pos. NOR gate
465	DM74LS11N	Triple 3 - input AND gate
466	DM74LS21N	Dual 4 - input AND gate
467	DM74LS04N	Hex inverter
468	SN74LS393N	Dual 4BIT Binary Up Counter
469	DM74LS10N	Triple 3 - input NAND gate
470	DM74LS00N	Quad 2 Input NAND
471	DM74LS11N	Triple 3 - input AND gate

Keyboard Display AD Model NB12125/B/3

1	8x22K ohms	Resistor Multi
2	47uF 16V Elect	Capacitor Electrolytic
3	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
4	100uF 6.3V Elect	Capacitor Electrolytic
5	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
6	47uF 16V Elect	Capacitor Electrolytic
7	10 ohms	Resistor
8	3K9 ohms	Resistor
9	10uF 50V Elect	Capacitor Electrolytic

10	10uF 50V Elect	Capacitor Electrolytic
11	KV-12A94V-0	Small circuit board
12	47uH +/- 10%	Inductor
13	4x270K ohms	Resistor Multi
14	1N4148	Diode for Switching
15	1N4148	Diode for Switching
16	1N4148	Diode for Switching
17	1N4148	Diode for Switching
18	1N4148	Diode for Switching
19	1N4148	Diode for Switching
20	1N4148	Diode for Switching
21	1N4148	Diode for Switching
22	7x100K ohms	Resistor Multi
23	16-SY-03	16 Character VF Display
24	4x22K ohms	Resistor Multi
25	7x100K ohms	Resistor Multi
	ZN404	Precision Reference 2.45 V
		RF Modulator Size 40mmx27mmx15mm
		NewBrain Keys Total 62
401	DS8654N	8-Output Display Driver for VF
402	CD4015BCN	Dual 4-Bit Static Register (MM5615BN)
403	CD4076	4-Bit D-Type Registers (MM74C173)
404	MM74C14N	Hex Schmitt Trigger Inverter
405	CD4024BCN	7-Bit Binary Ripple Carry Counter (MM5624BN)
406	DS8881N	Vacuum Fluorescent Display Driver
407	DS8654N	8-Output Display Driver for VF
408	CD4015BCN	Dual 4-Bit Static Register (MM5615BN)

Keyboard A Model NB12127/A1

1	100K ohms	Resistor
2	4K7 ohms	Resistor
3	100K ohms	Resistor
4	4K7 ohms	Resistor
5	100K ohms	Resistor
6	4K7 ohms	Resistor
7	100K ohms	Resistor
8	1N4148	Diode for Switching
9	1N4148	Diode for Switching
10	1N4148	Diode for Switching
11	1N4148	Diode for Switching
12	1N4148	Diode for Switching
13	1N4148	Diode for Switching
14	1N4148	Diode for Switching
15		
16	47uF 16V Elect	Capacitor Electrolytic
17	3K9 ohms	Resistor
18	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
19	10uF 50V	Capacitor Electrolytic
20	10 ohms	Resistor
401	CD4051	Single 8-Channel Analog Multiplexer/Demultiplexer
402	CD4024BCN	7-Bit Binary Ripple Carry Counter (MM5624BN)
403	CD4051	Single 8-Channel Analog Multiplexer/Demultiplexer
404	CD4024BCN	7-Bit Binary Ripple Carry Counter
		RF Modulator Size 40mmx27mmx15mm
		NewBrain Keys Total 62

Memory Board NB12118/B/8

401	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
402	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
403	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
404	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
405	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
406	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
407	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
408	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
409	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
410	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
411	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
412	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
413	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
414	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
416	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
417	SN74LS00N	Quad 2 Input NAND
418	SN74LS00N	Quad 2 Input NAND
419	SN74LS08N	Quad 2 - Input AND
420	SN74LS04N	Hex Inverter
421	SN74LS112AN	Dual J-K negative edge - Triggered Flip-Flop
422	SN74LS74N	Dual D-type flip-flop w/preset and clr
423	SN74LS10N	Triple 3 - Input NAND
424	SN74LS32N	Quad 2 - Input Pos. OR gate

Memory Board NB12114/A/1

IC1	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC2	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC3	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC4	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC5	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC6	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC7	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC8	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC9	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC10	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC11	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC12	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC13	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC14	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC15	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC16	MM5290N-2 (2117)	16Kx1 Dynamic RAM 150nS Memory Chip
IC17	DM74LS00N	Quad 2 Input NAND
IC18	DM74LS00N	Quad 2 Input NAND
IC19	DM74LS112N	Dual J-K negative edge - Triggered Flip-Flop
IC20	DM74LS112N	Dual J-K negative edge - Triggered Flip-Flop
IC21	DM74LS08N	Quad 2 - Input AND Gate
IC22	DM74LS04N	Hex Inverter
IC23	DM74LS04N	Hex Inverter

Power Supply NB11000/1

DC Output 7.5V at 1.2 A, 13.5V at 0.3A and 14.3V at 0.1A

Rita PZB4003/3

Netfilter 2x0.047uF - 0.1uF MP 250V

Transformer	Primary 240V Secondary +/- 8.6V at 1.2 A and +/- 16V
B40/C700	Bridge Rectifier
TIP31A	Power Transistor NPN General Purpose 3 Amp
TIP31A	Power Transistor NPN General Purpose 3 Amp
BC327	Transistor PNP
IN4002	Silicon Diode
IN4002	Silicon Diode
BZX61C13	Zener Diode
BZX85 8V2	Zener Diode
BZX85B15	Zener Diode
100uF 35V Elect	Electrolytic Capacitor
1000uF 35V Elect	Electrolytic Capacitor
4700uF 16V Elect	Electrolytic Capacitor
0.5uH	Inductor
0.5uH	Inductor
100 ohm	Resistor
680 ohm	Resistor
330 ohm	Resistor
220 ohm	Resistor

Battery Unit NB12126/3

1	AA Type NiCad	Ni Cadmium Battery for Group 1
2	AA Type NiCad	Ni Cadmium Battery for Group 1
3	AA Type NiCad	Ni Cadmium Battery for Group 1
4	AA Type NiCad	Ni Cadmium Battery for Group 1
5	AA Type NiCad	Ni Cadmium Battery for Group 1
6	AA Type NiCad	Ni Cadmium Battery for Group 2
7	AA Type NiCad	Ni Cadmium Battery for Group 2
8	AA Type NiCad	Ni Cadmium Battery for Group 2
9	AA Type NiCad	Ni Cadmium Battery for Group 2
10	AA Type NiCad	Ni Cadmium Battery for Group 2
11	AA Type NiCad	Ni Cadmium Battery for Group 3
12	AA Type NiCad	Ni Cadmium Battery for Group 3
13	AA Type NiCad	Ni Cadmium Battery for Group 3
14	AA Type NiCad	Ni Cadmium Battery for Group 3
15	AA Type NiCad	Ni Cadmium Battery for Group 3
16	AA Type NiCad	Ni Cadmium Battery for Group 4
17	AA Type NiCad	Ni Cadmium Battery for Group 4
18	AA Type NiCad	Ni Cadmium Battery for Group 4
19	AA Type NiCad	Ni Cadmium Battery for Group 4
20	AA Type NiCad	Ni Cadmium Battery for Group 4
21	470uF 10V Elect	Capacitor Electrolytic
22	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
23	LED Green	Light Emitting Diode
24	180 ohms	Resistor
25	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
26	150 ohms	Resistor
27	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
28	4uH	Inductor
29	10uF 16V Elect	Capacitor Electrolytic
30	4uH	Inductor
31		
32	10uF 16V Elect	Capacitor Electrolytic
33	10uF 16V Elect	Capacitor Electrolytic
34	5uH	Inductor

35	5uH	Inductor
36	1N4148	Diode
37	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
38	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
39	BZY61 13V	Diode Zenner
40	120 ohms	Resistor
41	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
42	18 ohms	Resistor
43	1N4148	Diode
44	Triple Inductor	Inductor
45	470uF 10V Elect	Capacitor Electrolytic
46	100uF Elect	Capacitor Electrolytic
47	ZTX650	Transistor
48	103486	Diode Zenner
49	1N4001	Diode
50	1N4001	Diode
51	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
52	10uF 16V Elect	Capacitor Electrolytic
53	100 ohms 1/2 Watt	Resistor
54	100 ohms 1/2 Watt	Resistor
55	1N4001	Diode
56	2N5792	Transistor NPN
57	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
58	103454	Diode Zenner
59	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
60	2N5193	Transistor PNP
61	2N5193	Transistor PNP
62	2N5193	Transistor PNP
63	1N4001	Diode
64	1N4001	Diode
65	1N4001	Diode
66	1N4001	Diode
67	330 ohms	Resistor
68	1K5 ohms	Resistor
69	330 ohms	Resistor
70	330 ohms	Resistor
71	1K5 ohms	Resistor
72	330 ohms	Resistor
73	330 ohms	Resistor
74	1K5 ohms	Resistor
75	330 ohms	Resistor
76	330 ohms	Resistor
77	1K5 ohms	Resistor
78	330 ohms	Resistor
79	1N4001	Diode
80	1N4001	Diode
81	1N4001	Diode
82	BZY88 10V	Diode Zenner
83	1K ohms Var	Resistor Variable
84	390 ohms	Resistor
85		Transistor PNP
86	47pF	Capacitor
87	1N4148	Diode
88	1N4148	Diode
89	ZTX107	Transistor NPN
90	ZTX107	Transistor NPN

91	0.1uF 50V	Capacitor Ceramic Monolithic Type 104
92	4K7 ohms	Resistor
93	15nF	Capacitor
94	10K ohms	Resistor
95	10K ohms	Resistor
96	2K2 ohms	Resistor
97	3K9 ohms	Resistor
98	6K3 ohms	Resistor
99	1uF	Capacitor
100	10K ohms	Resistor
101	4K7 ohms	Resistor
102	1nF	Capacitor
103	1K ohms	Resistor
104	1K ohms	Resistor
105	100K ohms Var	Resistor Variable for Set Pulse Width
106	1K ohms	Resistor
107	LED Discharge	Light Emitting Diode
108	150 ohms	Resistor for LED
109	LED Green	Light Emitting Diode
110	Battery Isolator	2-Way Switch
401	CA3046 (CA3086)	General Purpose NPN Transistor Array 5 Trans

Circuit Diagrams and PCB Boards for NewBrain Computer

Content

Newbrain

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Schematic for Memory Storage Board	3
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Disk Controller

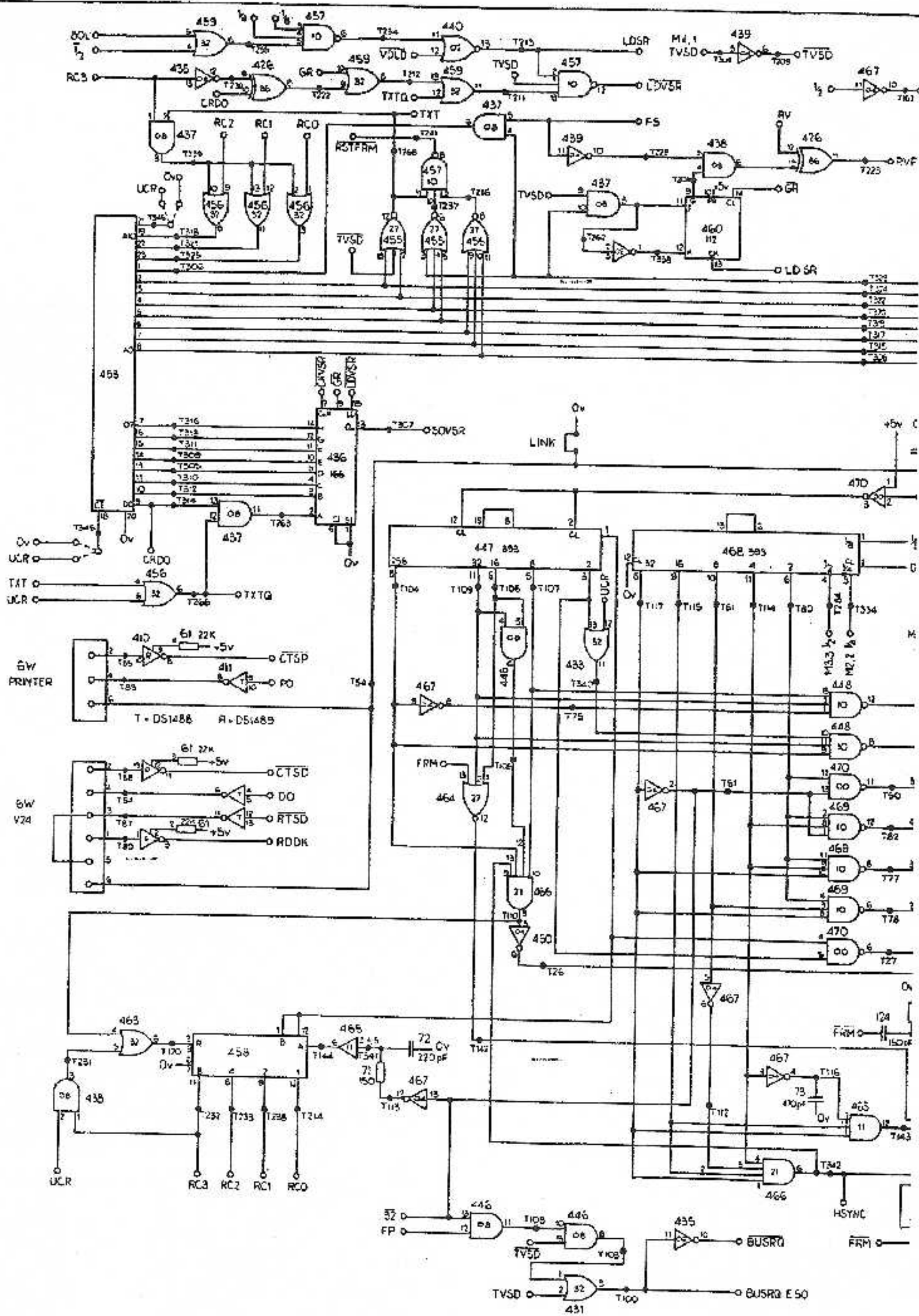
Schematic for Model 3	6
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Expansion Module

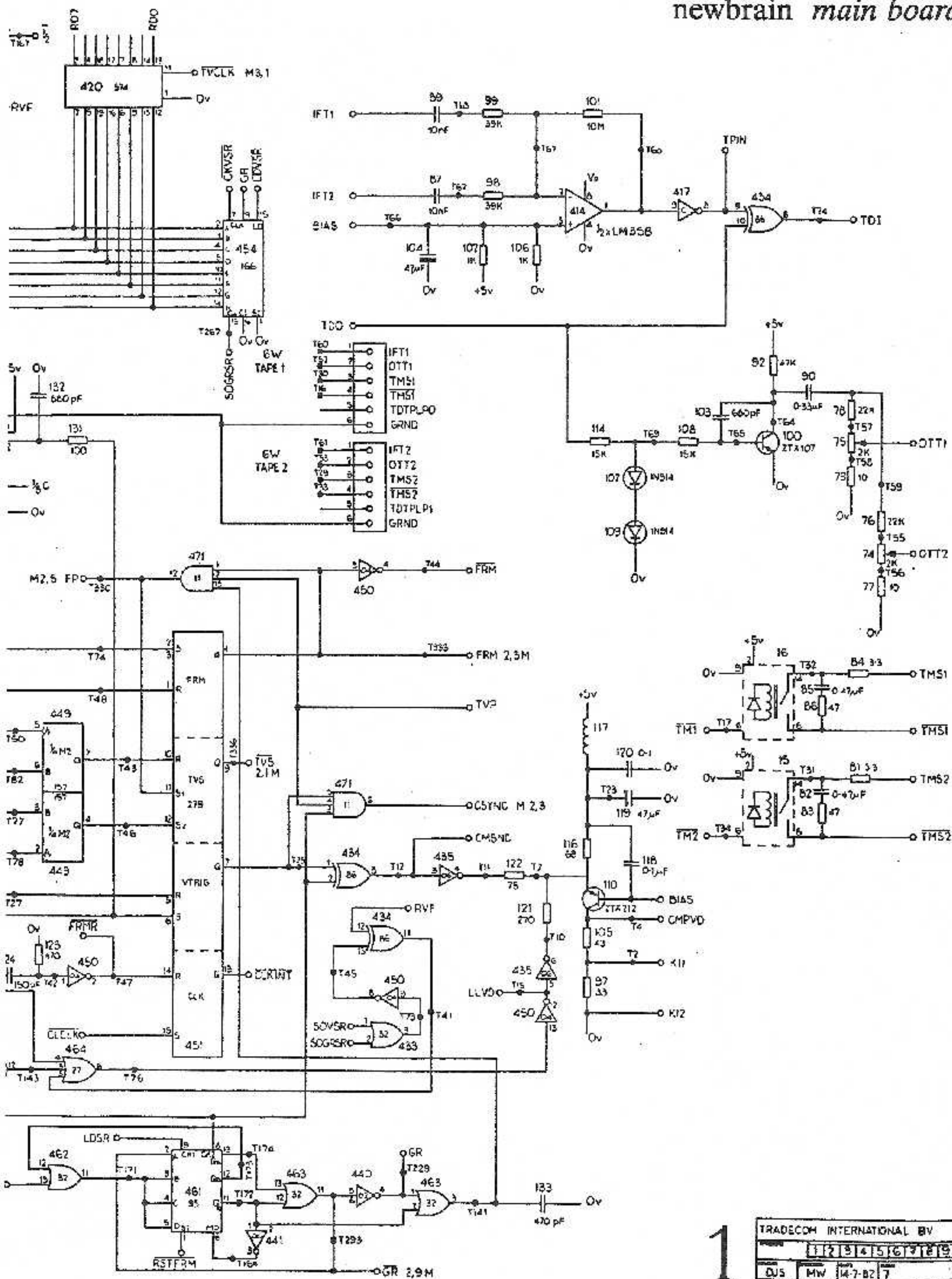
Schematic for Main Board	7
Main PCB (component side)	8
Main PCB (solder side)	9

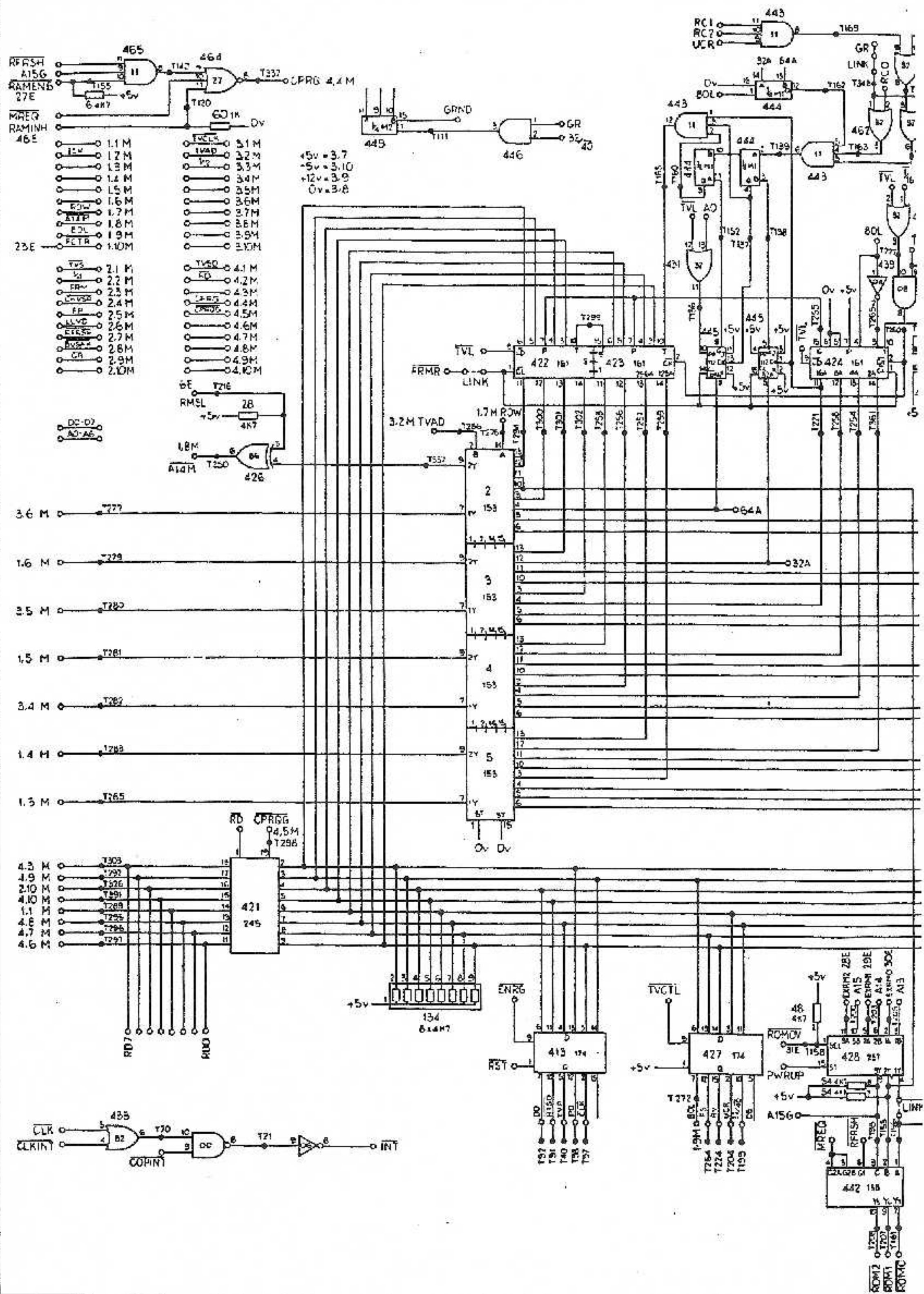
Power Supply Module

Battery Module

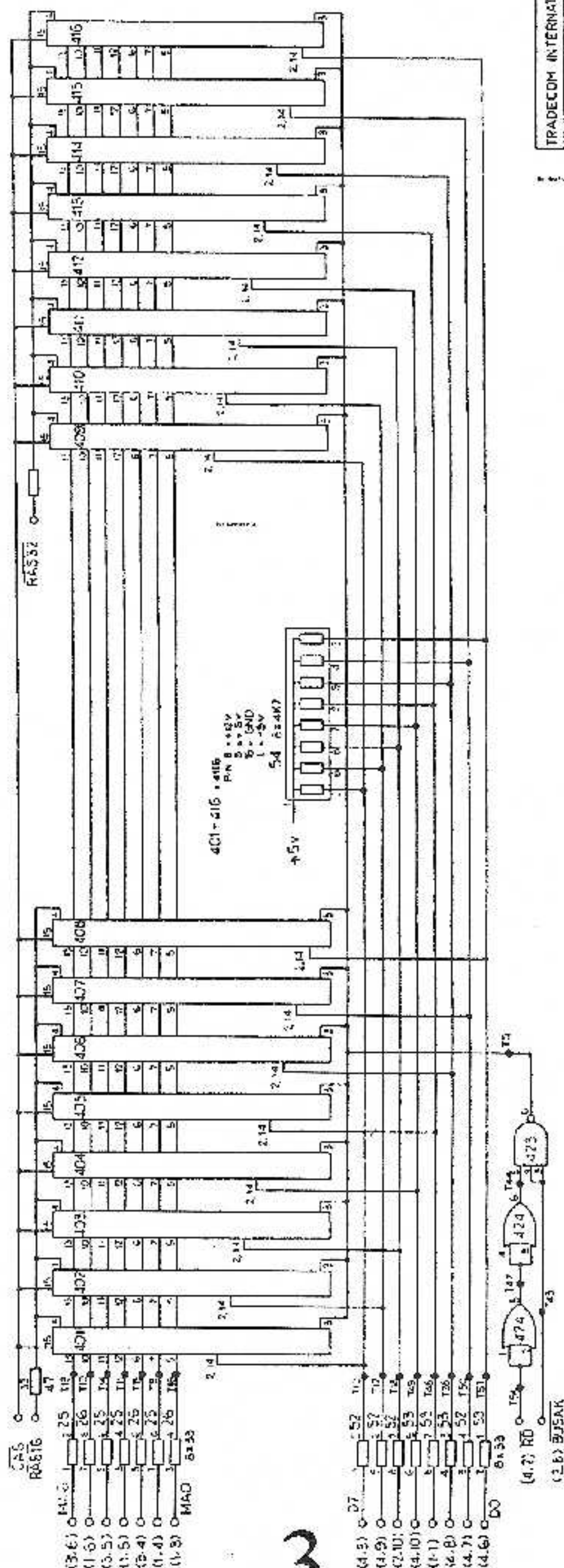


newbrain *main board*



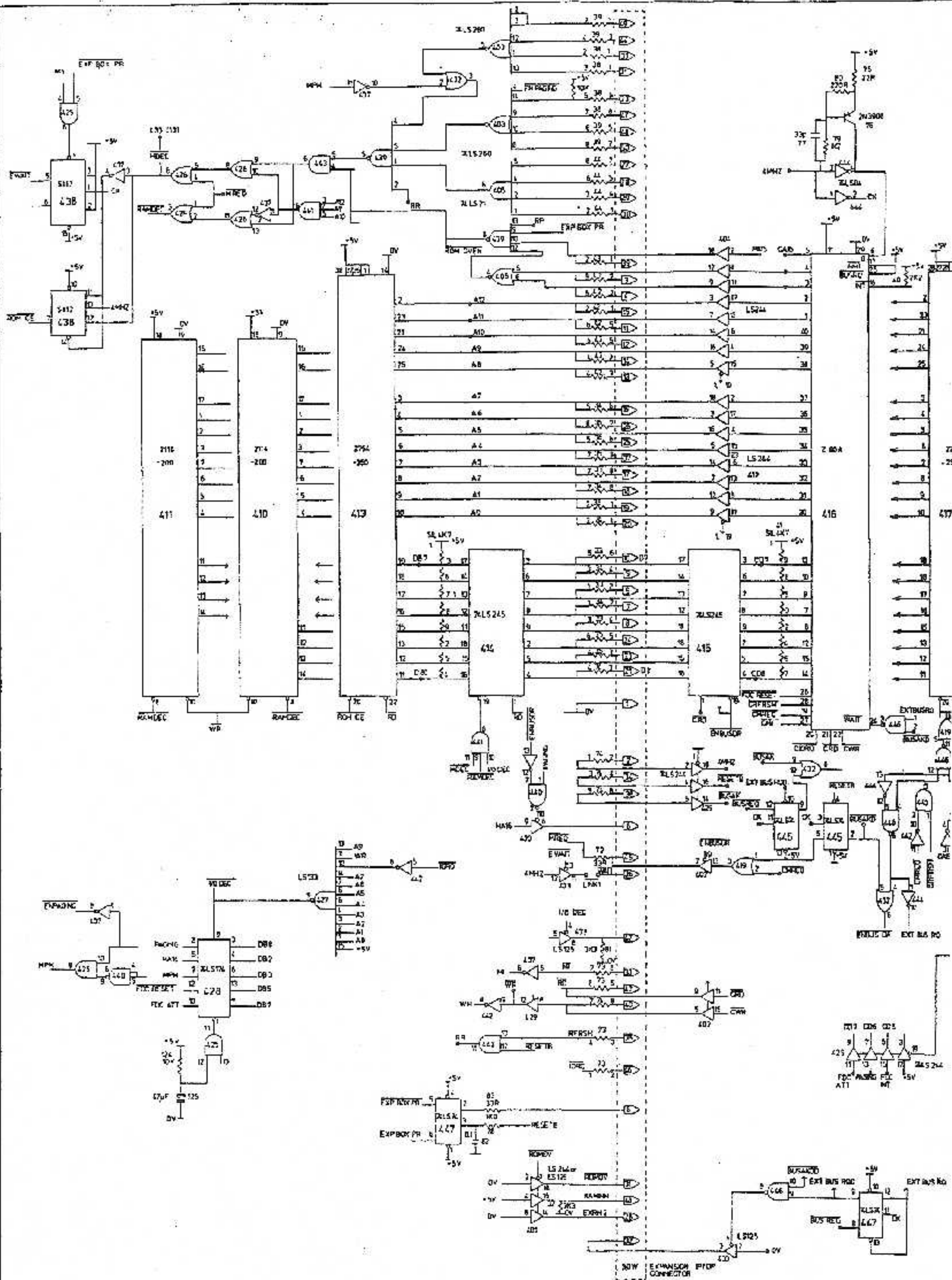


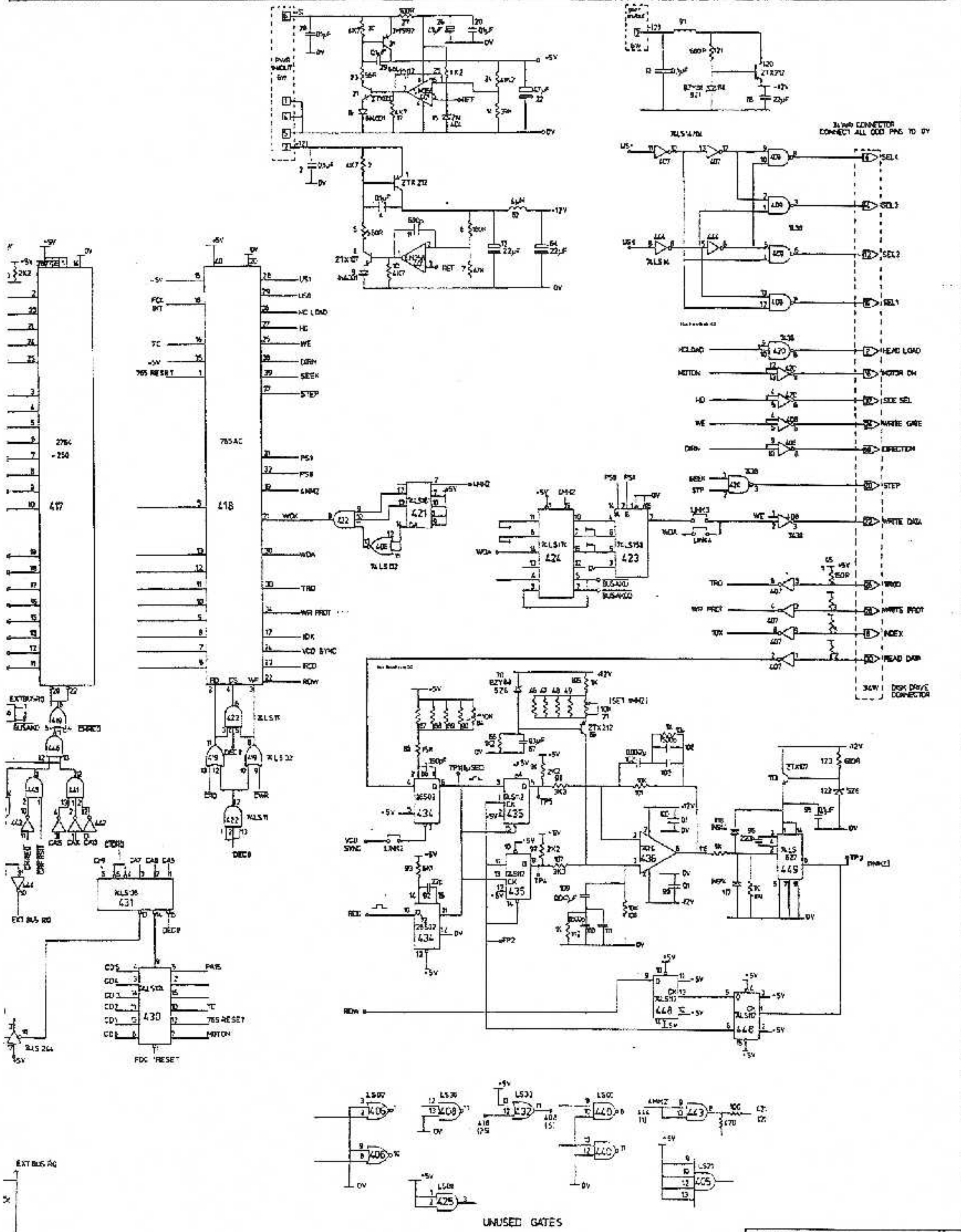
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BUS	MW	Q702 8
STORE BOARD	N52118	



TRADECOM INTERNATIONAL BV									
123456789									
DU5 127-62 2									
KEYBOARD									

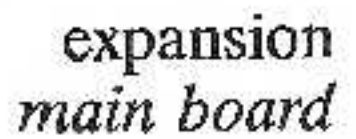






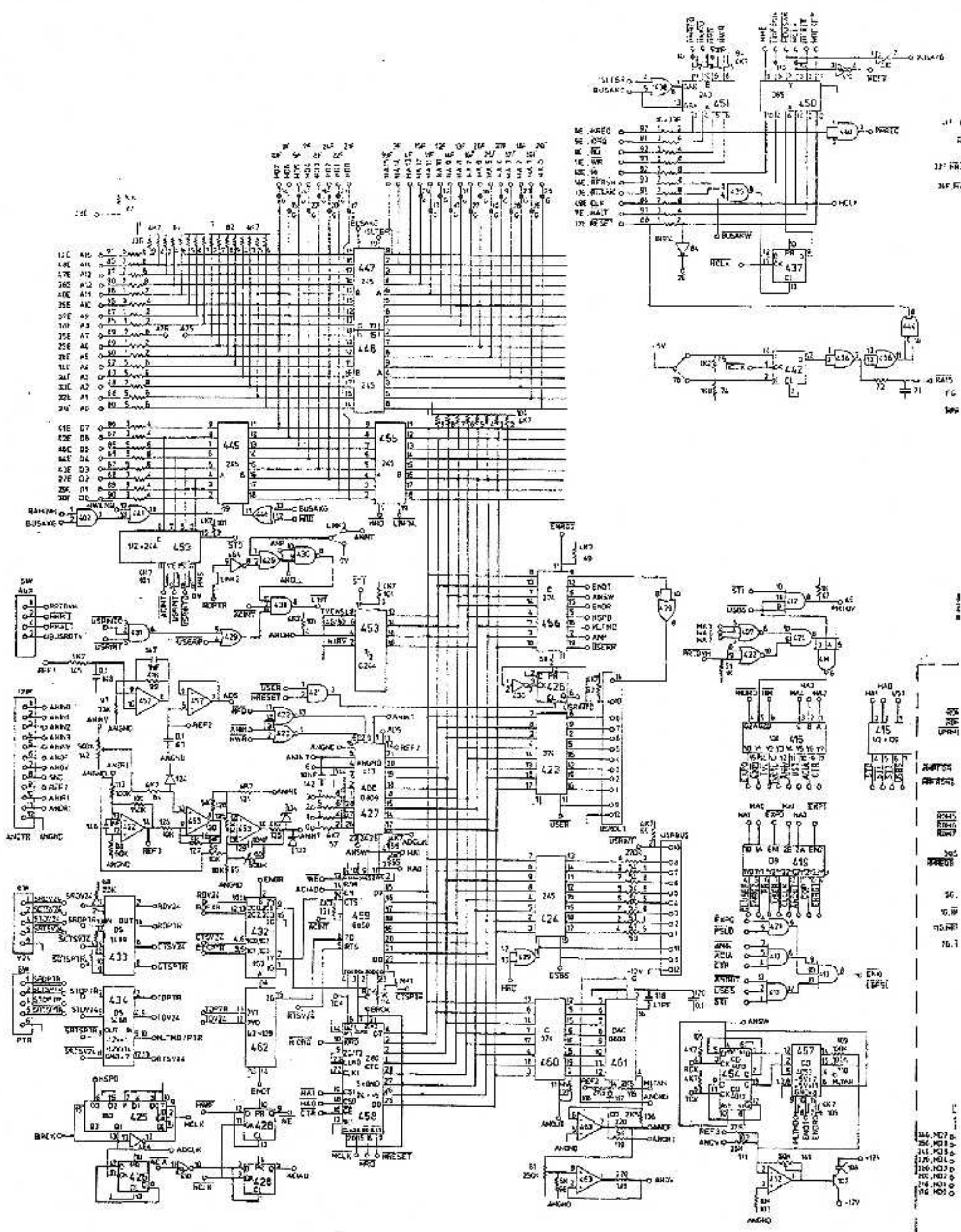
disk controller 6

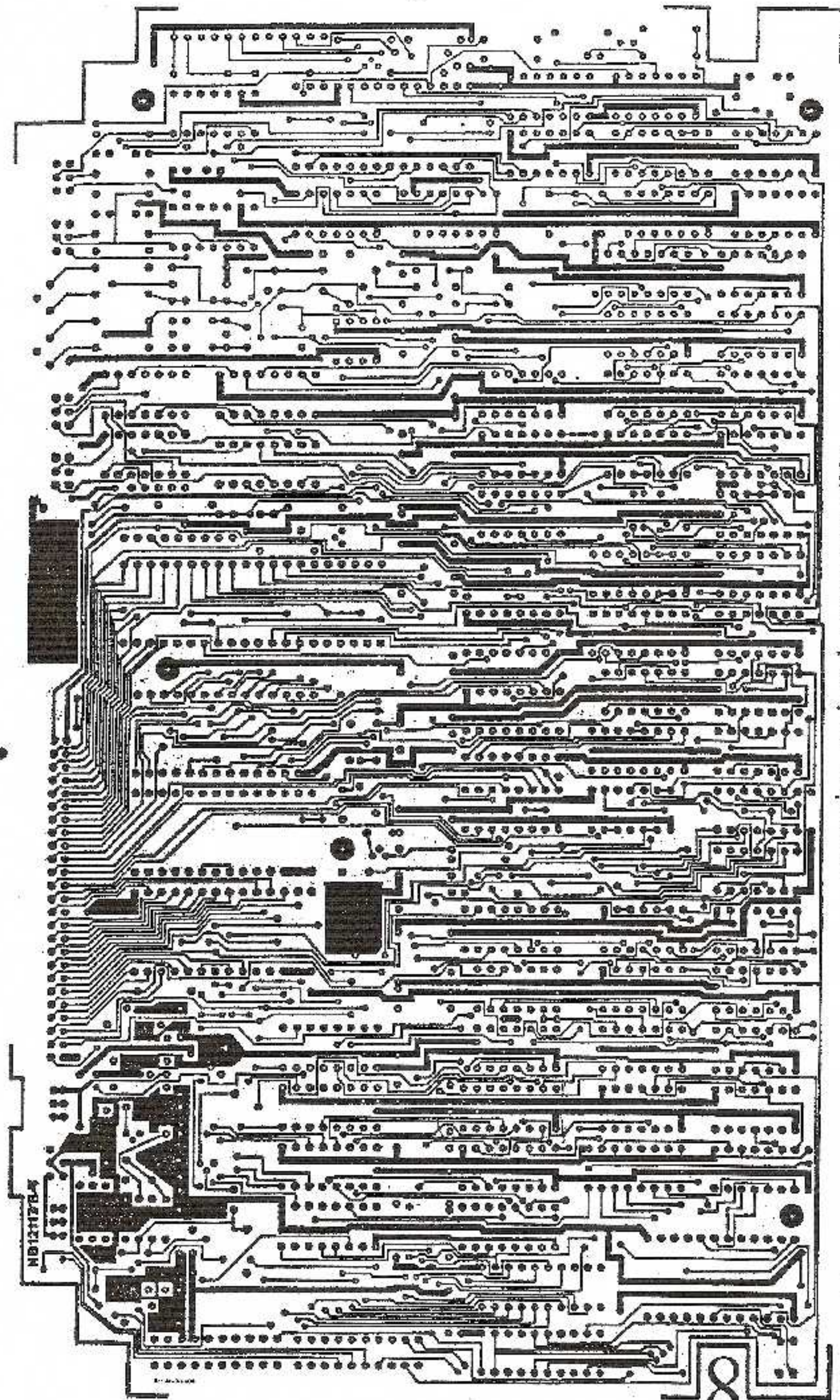
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© 1984 TRADECOM INTERNATIONAL			
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CIRCUIT DIAGRAM			
REV 12115/02/73			



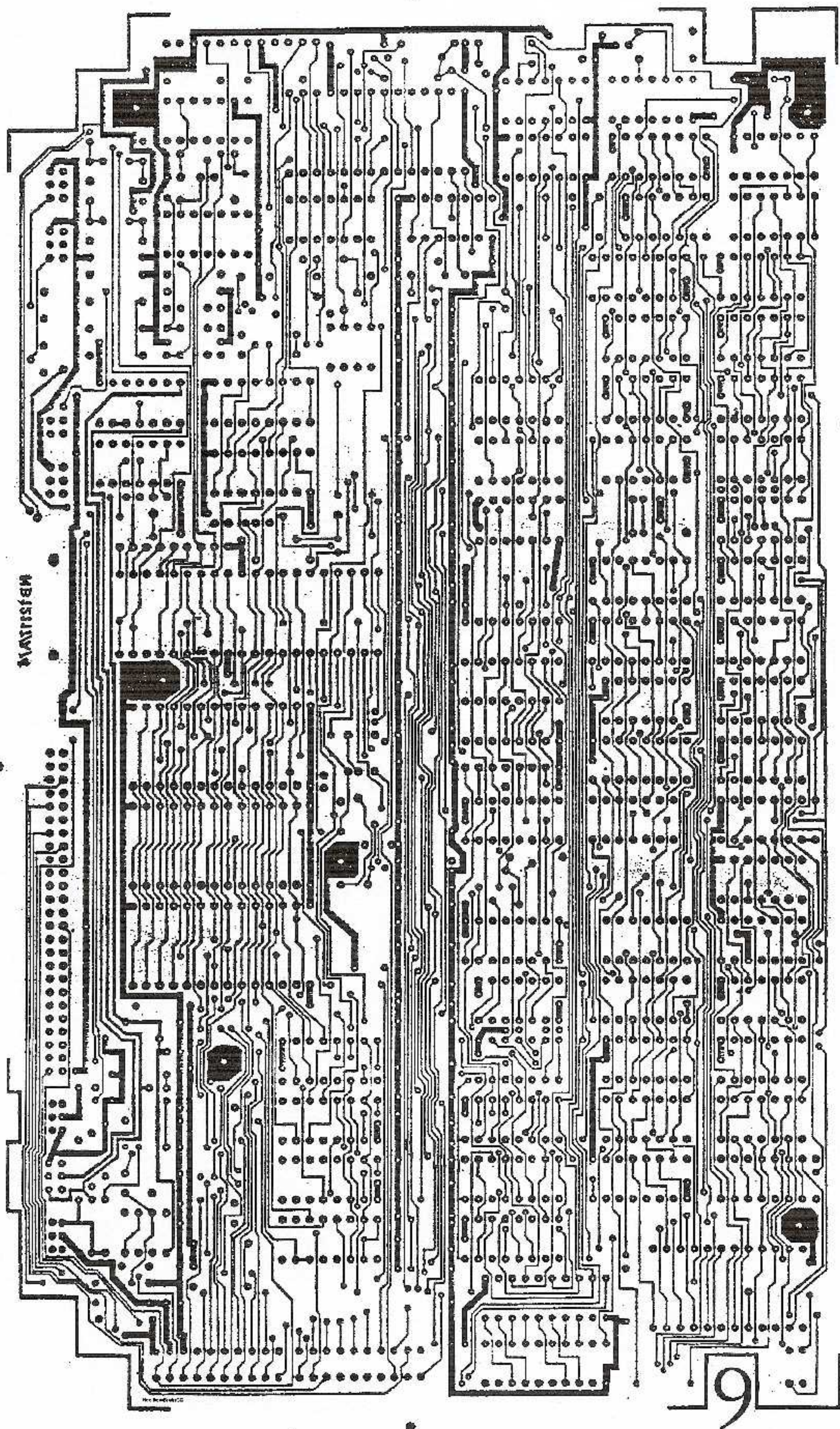
sub board





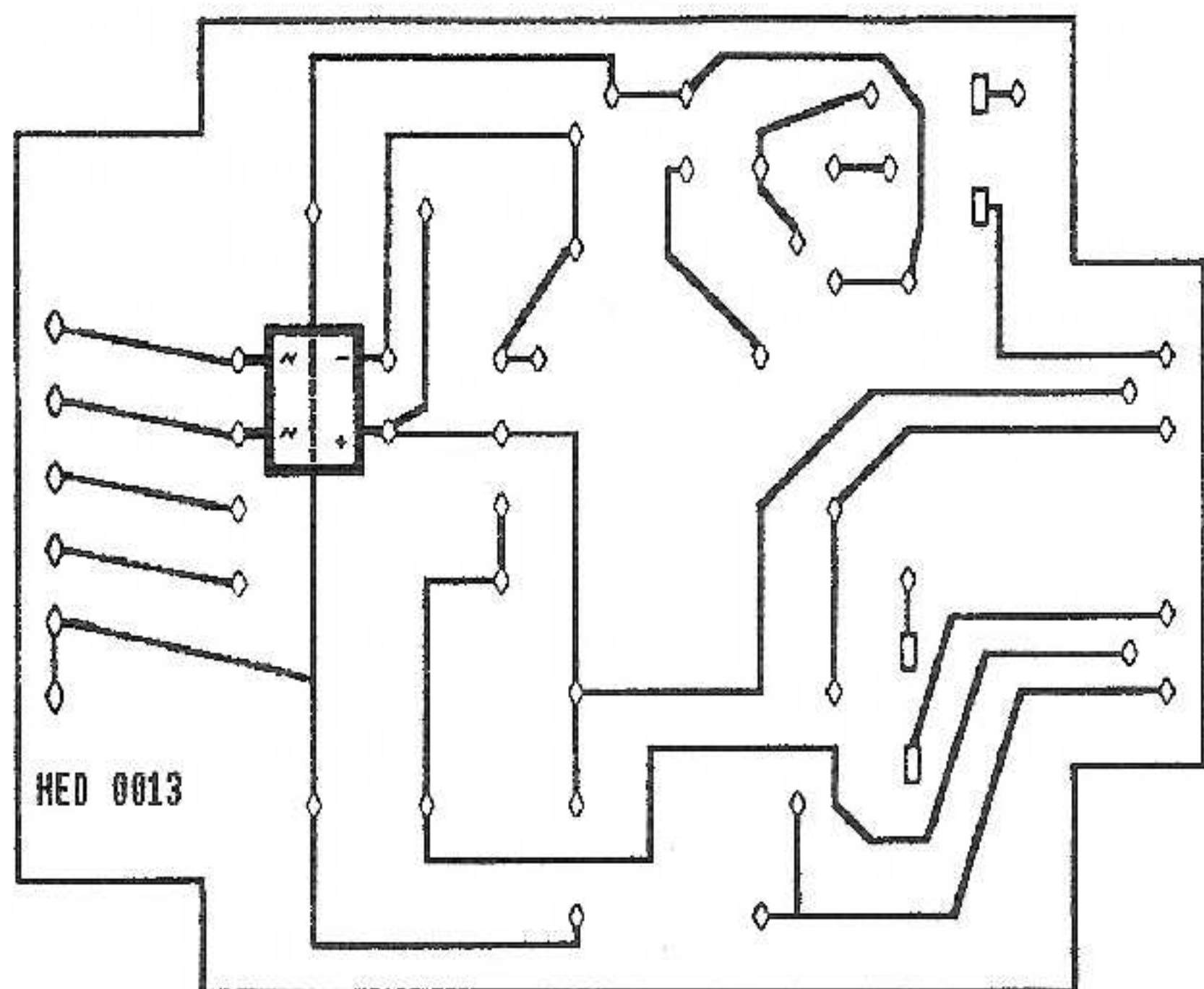


expansion main pcb - componentzijde



MBJ511W14

expansion main pcb - soldeerzijde (spiegelbeeldig)



**steker voor voeding NewBrain
aanzicht op de bussen**

