A Surgical Guide To The Amstrad Notepad Computer

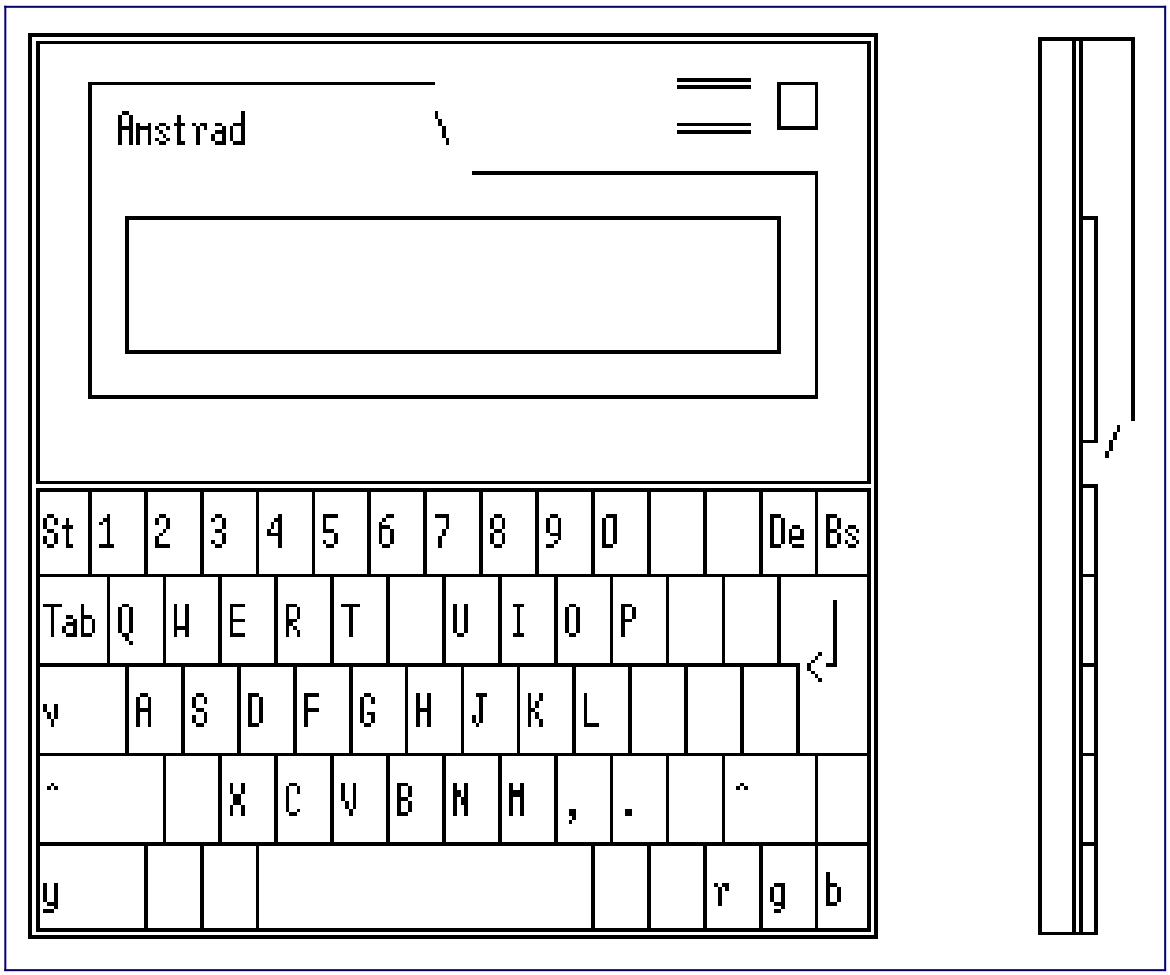
This page is based on Hans-Jürgen Böhling's "surgical guide to the Amstrad NC". The original document is avaliabe here [1] (author's website) or here Media:sg-nc100.zip (local copy)

Amstrad Notepad Computer - What is it?

The model NC100 is about DIN A4 size with a LCD 8 lines * 80 characters screen, nearly full size keyboard, a PCMCIA memory card slot on the right hand side and four coloured keys. The Notepads have standard Centronics parallel port (DB-25 pin famale connector) and RS232 (DB 9 pin male) serial port. The system has drivers for 9 and 24 pin dot matrix, Canon inkjet and Laserjet printers. The serial connector support 300, 1200, 2400, 4800, or 9600 bps. As power supply the NC100 use 4 * AA sice batteries or an AC adapter. As backup battery ther is also a CR2032 3 Volt lithium cell.

The model NC150 (it seems) is retailing only in Italy and Fance. It has 512K bytes firmware ROM and 128K RAM. The extra 256K bytes ROM contains a spreadsheet and the arcade game 'BLOCKADE' (similar to TETRIS).

The model NC200 include the additional features of the NC150 but also a 720K MS-DOS compatible 3.5 inch floppy disk drive and a 16 lines by 80 characters screen witch had to be fold up like a laptop.



Specifications

```
Model                : NC100
Processor            : Z80 compatible CMOS
Operating
frequency            : 4.606 MHz
Memory               : 64K byte internal
                       (15K system-, 11K upper-, 38K lower memory)
Storage              : PCMCIA/JEIDA Memory Cards (PC-Cards) Type I
                       max. 1M byte SRAM 5 Volt
Display              : 480*64 pixel display (usually 80*8 characters)
Weight               : 930 g
Height               :  22 mm
Width                : 295 mm
Length               : 210 mm
Power Consumption ON : 40 - 60 mA
Built in firmware    : 256K byte with

        - Texteditor with mailmerge and spellchecker
        - Address book
        - Time manager (diary with alarm-clock)
        - Calculator
        - Terminal-programm (serial Tranfer with ASCII or XModem)
        - BBC-BASIC with Assembler support
```

How to get the Firmware Number?

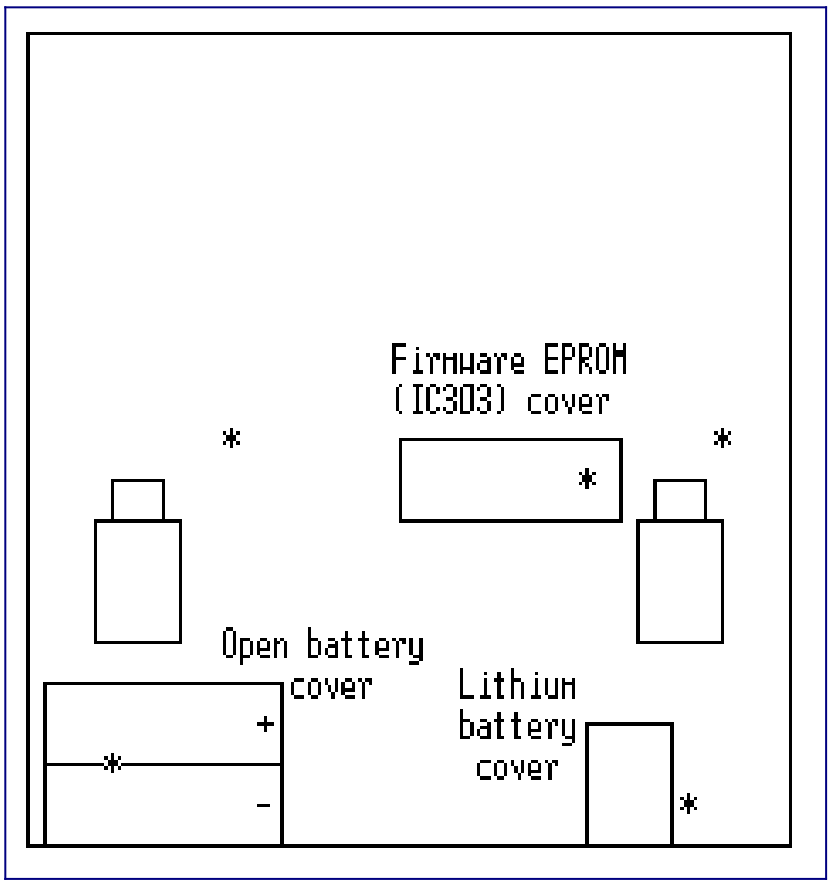
When you are in the main Menu (text editor, calculater, calender) push the secret-button and the system-settings menu appears, the version number will be shown in the first line of the sceen. I have a german NC100 and the firmware number is v1.06.

PCMCIA Memory Cards

A battery buffered PCMCIA SRAM-Memory Card will preserve you from data loss even if your Notepad crashes and increases the available memory. It also allows you to create a file with BBC-BASIC bigger than 1024 bytes. This is because BBC-BASIC allocates all available memory on startup except 1024 bytes. The maximum size to use with the NC100 is up to 1M byte.

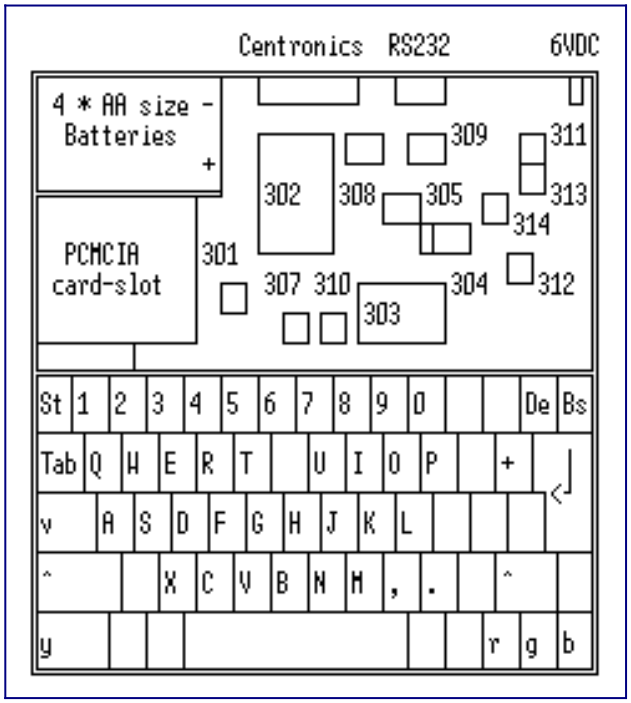
How to open the NC100?

Before disassembling the Notepad you should save all your data! Then put the Notepad on the table face down. Remove the four AA size batteries, then unscrew the five screws (one under the battery cover). In the drawing below they are marked with a "*"-sign. One screw fixes the cover of the firmware EPROM.Place the Notepad the right way up and lift off the upper part of the case. Be careful, because the display is still connected to the main-board via a folio-flat-cable and so is the speaker! Don't be nervous, the cables can be simply pulled out of their sockets. Now you can separate the covers.



What is inside?

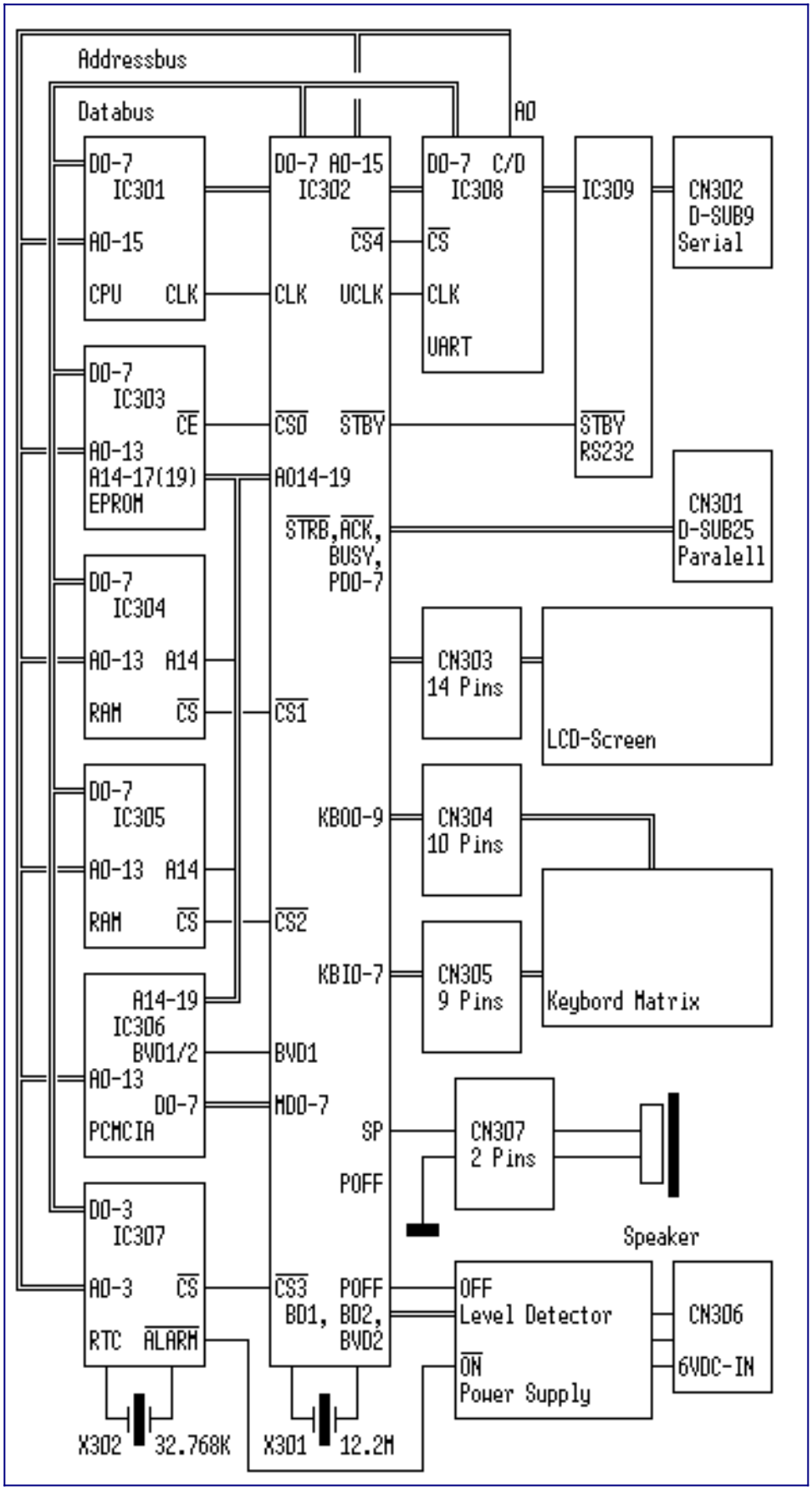
Inside the NC100 is a SMD layout. I have a german NC100 and the circuit board is labeled Amstrad plc 4500-001P-1, NA999-32142, manual marked C (A-H) and 1 (1-8). All IC's are SMD apart from IC303 which is on the backside of the NC100 (behind the firmware EPROM cover). On the drawing below I have labeled all ICs, but you can find it on the layout also!



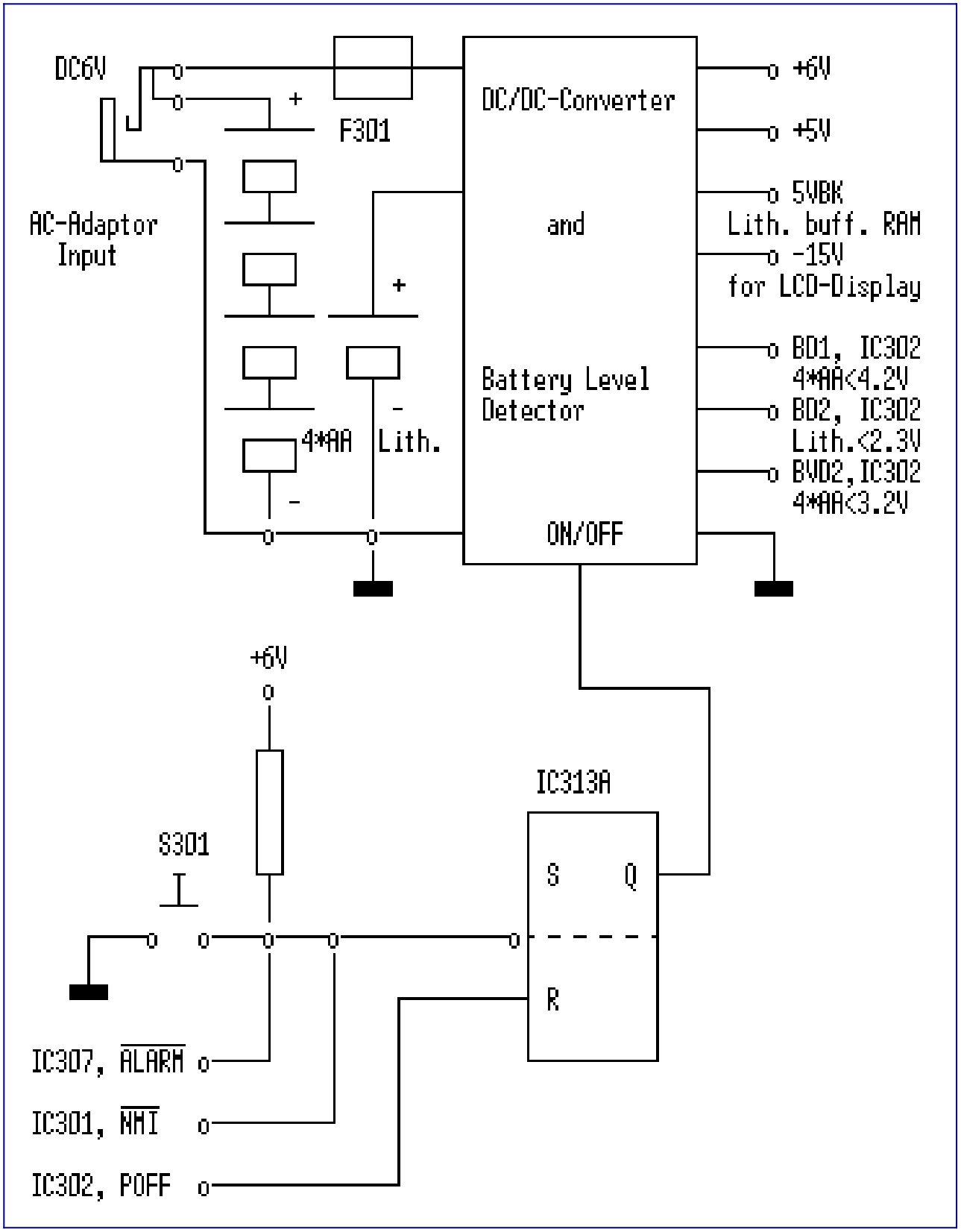
The table below gives a description of the IC's in the NC100:

IC-#	Label	Pin's	Description
301	ZILOG Z84C0006FEC Z80 CPU	4*11= 44 PLCC 44	Z84C00 CMOS, 6 MHz Z80 compatible Microprocessor
302	NEC Japan D65034GD093	4*34=136 PLCC 136	µPD 65034 Custom ASIC
303	NEC Japan D27C2001	2*16= 32 DIL 32	27C2001 = CMOS EPROM 256K*8 bit Firmware EPROM
304	NEC JAPAN D43257AGU-10LL	2*14= 28 SO 28	µPD 43257 A = CMOS SRAM 32K*8 bit Memory layouted as an SO 32 (32 pin)!
305	NEC Japan D43257AGU-10LL	2*14= 28 SO 28	µPD 43257 A = CMOS SRAM 32K*8 bit Memory
306	MEMORY CARD	2*34= 68 PCMCIA	PCMCIA/JEIDA Memory Cards Slot Type I for max. 1M byte SRAM Memory, 5 Volt
307	T 9224 HB 8521 AM	2*10= 20 SO 20	TC8521 Real-Time-Clock
308	NEC Japan D71051 GU	2*14= 28 SO 28	µPD 71051 UART (parallel to seriell transpose)
309	NEC Japan D4711 AG	2*10= 20 SO 20	µPD 4711 RS232-driver (shift level to +/- 10V)
310	not placed	2* 7= 14 SO 14	74HC00 = CMOS-Logic 4 * NAND (only used if IC304/IC305 = 43256)
311	D4584G	2* 7= 14 SO 14	4584 = CMOS-Logic 6 * Schmitt-Trigger
312	C339 G	2* 7= 14 SO 14	LM339 = 4 * Comparator (used for battery level detection)
313	D4013G	2* 7= 14 SO 14	4013 = CMOS-Logic 2 * D-Flip Flop with set and reset
314	D4584G	2* 7= 14 SO 14	4584 = CMOS-Logic 6 * Schmitt-Trigger

Amstrad NC100/NC150 Simplfied Bock Diagram



Amstrad NC100/150 Power Supply Bock Diagram



IC Pinouts

On the next pages folowing the pinouts off the most important ICs used in the NC100. '*' indicates active Low and 'NC' is Not Connected in the NC100

The Microprocessor (MPU, IC301)

```
Type                          : Z84C00
Manufacturer                  : Zilog Inc.
Description                   : Microprocessor, 8-Bit
Power Consumption             : 15 mA typ. at 6 MHz
Process                       : CMOS
Supply Voltage                : +5V
Operating frequency max.      : 6 MHz
Package                       : PLCC 44 pin

Features :

 - Commands compatible with Zilog Z80 MPU
 - Powerful set of 158 instructions including the 78 of the 8080A
 - 10 addressing modes
 - Power down mode when the system clock is stopped

Pinout :

1        A11               23       *RD
2        A12               24       NC
3        A13               25       NC
4        A14               26       *WR
5        A15               27       *BUSACK
6        NC                28       *WAIT
7        CLK               29       *BUSREQ
8        D4                30       *RESET
9        D3                31       *M1
10       D5                32       *RFSH
11       D6                33       GND
12       NC                34       A0
13       VCC               35       A1
14       D2                36       A2
15       D7                37       A3
16       D0                38       A4
17       D1                39       A5
18       *INT              40       A6
19       *NMI              41       A7
20       *HALT             42       A8
21       *MREQ             43       A9
22       *IORQ             44       A10
```

The Custom Chip (IC302)

```
Type                        : µPD 65034
Manufacturer                : NEC Electronics
Description                 : Custom Chip with multiple funktions
Process                     : CMOS
Supply Voltage              : +5V
Package                     : PLCC 136
```

The chip has multiple functions:

- Clock generator for CPU and UART
- Peripher Interface Adaptor (to printer, LCD-screen, keybord,)
- Memory Management Unit
- PCMCIA-Interface
- Sound generator for speaker

Pinout :

1	VDD	35	GND	69	VDD	103	GND
2	KBI1	36	GND	70	TEMP	104	GND
3	KBI5	37	AO18	71	UCLK	105	*STRB
4	KBI7	38	AO19	72	RRDY	106	*CD2
5	KBI6	39	GND	73	TRDY	107	*CD1
6	KBI4	40	CLK	74	*STBY	108	*CE1
7	KBI3	41	HALT	75	LD0	109	*OE1
8	KBI2	42	*MREQ	76	LD1	110	*WE1
9	KBI0	43	*IORQ	77	LD2	111	*REG
10	A0	44	*BACK	78	LD3	112	BVD2
11	A1	45	*BREQ	79	FRM	113	BVD1
12	A2	46	*WAT	80	DF	114	WP
13	A3	47	*M1	81	LOAD	115	MD3
14	A4	48	*INT	82	CP	116	MD4
15	A5	49	*RD	83	POFF	117	MD5
16	A6	50	*WR	84	SP	118	GND
17	GND	51	DO	85	GND	119	MD6
18	GND	52	D1	86	GND	120	MD7
19	A7	53	D2	87	BD1	121	MD0
20	A8	54	D3	88	BD2	122	MD1
21	A9	55	GND	89	*NMIC	123	MD2
22	A10	56	D4	90	*RES	124	TEST (NC)
23	A11	57	D5	91	URES	125	KBO9
24	A12	58	D6	92	*BUSY	126	KBO8
25	A13	59	D7	93	*ACK	127	KBO7
26	A14	60	RRD	94	PD7	128	KBO6
27	A15	61	*CS0	95	PD6	129	KBO1
28	AO14	62	*CS1	96	PD5	130	KBO2
29	AO15	63	*CS2	97	PD4	131	KBO5
30	AO16	64	*CS3	98	PD3	132	KBO4
31	AO17	65	*CS4	99	PD2	133	KBO3
32	X2	66	TRXC	100	PD1	134	KBO0
33	X1	67	GND	101	PD0	135	GND
34	VDD	68	GND	102	VDD	136	GND

The Firmware EPROM (IC303)

```
Type                        : µPD 27C2001
Manufacturer                : NEC Electronics
Description                 : EPROM, 2Mb, 8-Bit, UV-eraseable
Org.                        : 256K x 8 Bit
Process                     : CMOS
Supply Voltage              : +5V
Standby                     : 0.5 mW
Operation                   : 150 mW
Package                     : DIL
```

Pinout :

1	NC (A19)	17	O3
2	A16	18	O4
3	A15	19	O5
4	A12	20	O6
5	A7	21	O7
6	A6	22	*CE
7	A5	23	A10
8	A4	24	*OE
9	A3	25	A11
10	A2	26	A9
11	A1	27	A8
12	A0	28	A13
13	O0	29	A14
14	O1	30	A17
15	O2	31	NC (A18)
16	GND	32	VCC

The NC100 can also control 27C4001 (512K), 23C2001 (256K), 23C4001 (512K), 23C8001 (1M byte) EPROM's! By the type of the EPROM there had to be set some different connections, this connections are set by zero Ohm SMD-resistors from the backside of the board close to IC303:

IC303	Kbyte	J301	J302	J303	J304
27C2001	256			+	+
27C4001	512	+		+	
23C2001	256			+	+
23C4001	512		+		+
23C8001	1024	+	+		

+ = use

I have double my ROM-space by set in a 27C4001 EPROM, remove J304 and set in J301 by a pice of wire.

The Static Random Access Memory (SRAM, IC304 and IC305)

Type	: µPD 43257A
Manufacturer	: NEC Electronics
Description	: SRAM, 256K Bit
Org.	: 32K x 8 Bit
Process	: CMOS
Supply Voltage	: +5VBK (Lithium battery buffered)
Standby	: 0.5 mW
Operation	: 225 mW
Package	: SO 28

Pinout :

1	A14	15	DQ4
2	A12	16	DQ5
3	A7	17	DQ6
4	A6	18	DQ7
5	A5	19	DQ8
6	A4	20	*CS
7	A3	21	A10
8	A2	22	*OE
9	A1	23	A11
10	A0	24	A9
11	DQ1	25	A8
12	DQ2	26	A13
13	DQ3	27	*WE
14	GND	28	VCC

On my NC100 the IC304 is layouted as an SO 32 (32 pin). I belief you can put some bigger RAM-chip in the circuit, but there is nothing about that in the electronic diagram! There is only that the NC100 can control a 43256 RAM-chips. By the type of the RAM-chip there had to be set some different connections and use IC310:

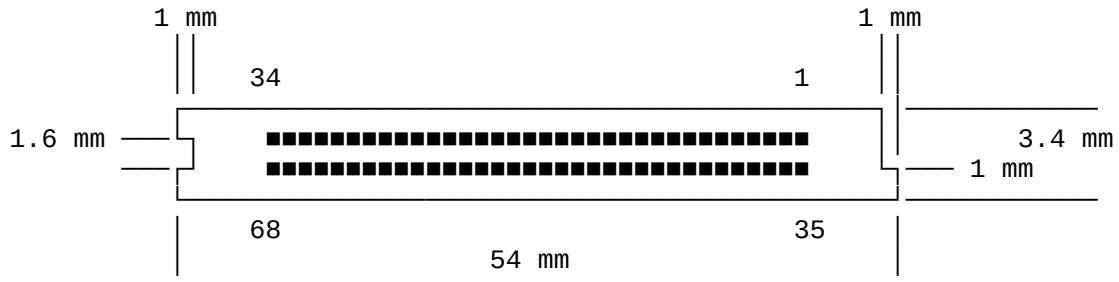
IC304, 305	J305	J306	J307	J308	IC310
43256	+				+
43257		+	+	+	

+ = use

The PCMCIA card slot (IC306)

The NC-100 can use PCMCIA/JEIDA Memory Cards (PC-Cards) Type I, max. 1024K (1M) byte static ram card, 5 Volts. You can bye them in 64Kb, 128Kb, 256Kb, 512Kb, and 1024Kb sizes. The flash memory cards are not suitable for the NC-100. These have a control register that must be written to before any read or write can take place. Data transfers are then be done in sector chunks.

PCMCIA Card Connector Type I, 5 Volts:



PCMCIA Version 2.0 Pinout:

1	GND		35	GND		
2	D3	I/O	36	*CD1	O	
3	D4	I/O	37	D11	I/O	(NC)
4	D5	I/O	38	D12	I/O	(NC)
5	D6	I/O	39	D13	I/O	(NC)
6	D7	I/O	40	D14	I/O	(NC)
7	*CE1	I	41	D15	I/O	(NC)
8	A10	I	42	*CE2	I	(NC)
9	*OE	I	43	RFSH	I	(NC)
10	A11	I	44	RFU	I	(NC)
11	A9	I	45	RFU	I	(NC)
12	A8	I	46	A17	I	
13	A13	I	47	A18	I	
14	A14	I	48	A19	I	
15	*WE/PGM	I	49	A20	I	(NC)
16	RDY/*BSY	O	50	A21	I	(NC)
17	VCC		51	VCC		
18	VPP1		52	VPP2		
19	A16	I	53	A22	I	(NC)
20	A15	I	54	A23	I	(NC)
21	A12	I	55	A24	I	(NC)
22	A7	I	56	A25	I	(NC)
23	A6	I	57	RFU		(NC)
24	A5	I	58	RESET	I	(NC)
25	A4	I	59	*WAIT	O	(NC)
26	A3	I	60	RFU		(NC)
27	A2	I	61	*REG	I	
28	A1	I	62	BVD2	O	
29	A0	I	63	BVD1	O	
30	D0	I/O	64	D8	I/O	(NC)
31	D1	I/O	65	D9	I/O	(NC)
32	D2	I/O	66	D10	I/O	(NC)
33	WP	O	67	*CD2	O	
34	GND		68	GND		

RFU = Reserved Future Use

The Real-Time-Clock (RTC, IC307)

```
Type                        : TC8521AP/AM
Manufacturer                : Toshiba Corporation
Description                 : Real Time Clock
Process                     : CMOS
Supply Voltage              : +5VBK (Lithium battery buffered)
Power Dissipat. max         : 1.25 mW
Package                     : SO 20
```

Features :

- Clock funktion (hr, min, sec, date, day of week, year and leap year) auto-calendar
- Clock system of 24-hour or 12-hour selectable
- +/- 30 sec correction funktion
- Alarm signal or pulse of 16Hz or 1Hz can be output
- Built-in 26*4 bit RAM
- 4-bit bidirectional data bus
- 4-bit address input
- Directly connectable with CPU bus
- Capable of battery backup

Pinout :

1	*CS
2	CS
3	ADJ
4	A0
5	A1
6	A2
7	NC
8	A3
9	*RD
10	GND
11	*WR
12	D0
13	D1
14	D2
15	D3
16	*ALARM
17	NC
18	XIN
19	XOUT
20	VCC

The Universal Asynchronous Receiver Transmitter (UART, IC308)

```
Type                        : µPD 71051
Manufacturer                : NEC Electronics
Description                 : UART Serial Control Unit
Process                     : CMOS
Supply Voltage              : +5V
Package                     : SO 28
```

Features :

- Synchronous and asynchronous operation
- Full duplex, double buffered transmitter / receiver
- Error detektion at parity, overrun and framing
- 5 to 8 bit characters
- Low power standby mode
- Functionally equivalant to the 8251A UART

Pinout :

1	D2	
2	D3	
3	RxDA TA	
4	GND	
5	D4	
6	D5	
7	D6	
8	D7	
9	*TxCLK	
10	*WR	
11	*CS	
12	C/*D	
13	*RD	
14	RxRDY	
15	TxRDY	
16	SYNCBRK	(NC)
17	*CTS	
18	TxE MP	
19	TxDA TA	
20	CLK	
21	RES ET	
22	*DSR	(NC)
23	*RTS	
24	*DTR	(NC)
25	*RxCLK	
26	Vdd	
27	D0	
28	D1	

The RS232-Driver (IC309)

```
Type                        : µPD 4711A
Manufacturer                : NEC Electronics
Description                 : RS232-Driver
Process                     : MOS-IC
Supply Voltage              : +5V
Power Dissipat.             : 60 mA
Package                     : SO 20
```

The RS232-driver shift up the TTL-level (0V/+5V) output from UART to RS232-level (+10V/-10V).

Pinout :

```
1       Vdd
2       C1+
3       Vcc
4       C1-
5       STB
6       Din1
7       Din2
8       Rout  1
9       Rout  2
10      GND
11      Rcon
12      Rin2
13      Rin1
14      Dout  2
15      Dout1
16      Dcon
17      Vss
18      C4-
19      GND
20      C4+
```

The RS232-connector pinout

(DTR just duplicates RTS)

```
Pin I/O Description
5       GND  Signal Ground
9   <-  RI   Ring Indicator (NC)
4   ->  DTR  Data Terminal Ready
8   <-  CTS  Clear To Send
3   ->  TD   Transmit Data
7   ->  RTS  Request To Send
2   <-  RD   Receive Data
6   <-  DSR  Data Set Ready (NC)
1   <-  CD   Carrier Detect (NC)
```

Author:

Hans-Jürgen Böhling
Bülowstr. 2
40476 Düsseldorf
Germany

e-mail : 101.107378@germanynet.de
homepage: http://www.germany.net/teilnehmer/101.107378/index.htm