Notebook personal computer PCL304

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Service
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Service Manual

Personal Information Products - Service Quality Support

PCL 304 is a small size, high performance notebook computer using the newest technology. It is a 80C386 based PC/SX with a high contrast VGA LCD display, a high speed 40 MB harddisk and a floppy diskette drive for 1.44 MB or 720 KB diskette.
An AC adapter is supplied which both powers the system and also recharges the internal NiCad battery. The system typically offers 2 hours of battery operations and is designed for professionals who travel frequently yet require a high performance PC/SX.

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Safety Precaution

There are special components used in the computer which are important for safety. These parts are shaded on the schematic diagram and indicated by a safety mark ! On the replacement parts list, It is essential that these critical parts should be replaced with the manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without written permission of the manufacturer or this will void the original parts and labor guarantee.

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TABLE OF CONTENTS

		page
1.	**SYSTEM UNIT**	
1.1	**Technical specifications**	1-1
1.2	**Description of controls and terminal sockets**	1-2
1.3	**Input/output specification**	1-4
2.	**GENERAL SYSTEM DESCRIPTION**	
2.1	**Introduction**	2-1
2.2	**Main board**	2-1
2.2.1	Processor	2-2
2.2.2	Memory	2-2
2.2.3	RAM	2-3
2.2.4	ROM	2-3
2.2.5	I/O connections	2-4
2.2.6	Serial & parallel port assignments	2-4
2.2.7	Video graphics adapter	2-5
2.2.8	Video BIOS ROM	2-5
2.3	**Power supply**	2-5
2.3.1	Power low indicator	2-5
2.3.2	Recharging a battery	2-5
2.3.3	Power conservation	2-6
2.3.4	Standby mode	2-6
2.4	**Keyboard**	2-7
2.5	**Video**	2-8
2.6	**Hard disk drive**	2-8
2.6.1	Conner CP4044	2-8
2.7	**Floppy disk drive**	2-8
2.7.1	Sony MPF-220	2-8
3	**CONFIGURATIONS**	
3.1	**System upgrades**	3-1
3.2	**System memory configurations**	3-1
3.2.1	Expanded memory	3-2
3.2.2	Address map	3-2
4.	**SYSTEM UTILITY**	
4.1	**Setup**	4-1
4.1.1	Setup page	4-2
5.	**SYSTEM UNIT ASSEMBLY/DISASSEMBLY**	
5.1	**Assembly/Disassembly**	
5.1.1	Top cover removal	5-1
5.1.2	Keyboard removal	5-2
5.1.3	Power board removal	5-3
5.1.4	Mother board removal	5-4
5.1.5	Floppy disk drive removal	5-4
5.1.6	Hard disk removal	5-4
5.2	**Mechanical**	
5.2.1	Parts list cabinet	5-6
5.2.2	Exploded view	5-7
5.3	**Interconnections**	
5.3.1	Wiring diagram	5-8

		page
6.	**DIAGNOSTICS**	
6.1	**Functional testprogram**	6-1
6.2	**Error messages**	6-2
6.2.1	Power On Test messages	6-2
6.2.2	User diagnostic messages	6-3
6.3	**Outline diagnostic test**	
6.4	**Diagnostic description**	6-4
6.4.1	Main board	6-4
6.4.2	RAM diagnostics	6-5
6.4.3	Keyboard diagnostics	6-5
6.4.4	Video diagnostics	6-5
6.4.5	Floppy disk diagnostics	6-5
6.4.6	Serial port diagnostics	6-5
6.4.7	Printer port diagnostics	6-5
6.5	**Power on selftest error codes**	6-6
6.6	**Tools and test equipment**	6-6
7	**VOLTAGE ADAPTER**	
7.1	**Specifications**	7-1
7.2	**Parts list**	7-1
8	**CIRCUIT BOARD ASSEMBLIES (CBA)**	
8.1	**Main board**	
8.1.1	Main board assembly	8-1
8.1.2	Connector pin assignment	8-2
8.1.3	Block diagram	8-6
8.1.4	CBA component layout	
	1. Top side	8-7
	2. Bottom side	8-8
8.1.5	Circuit diagrams	
	1. AT control section	8-9
	2. Processor section	8-10
	3. Keyboard interface	8-11
	4. Clock & Buffer section	8-12
	5. BIOS module connector	8-13
	6. Memory slot circuitry	8-14
	7. Supply connector	8-15
	8. Keyboard controller & interface	8-16
	9. VGA controller	8-17
	10. Video DRAM circuitry	8-18
	11. Buffer section	8-19
	12. CRT interface & LCD connection	8-20
	13. Serial & parallel interface	8-21
	14. FDD & HDD circuitry	8-22
	15. Connector circuitry	8-23
	16. Expansion circuitry	8-24
	17. VGA interface circuitry	8-25
8.1.6.	Parts list	8-26
8.1.7.	Troubleshoot flow chart	8-28
8.2	**Power board**	
8.2.1	Power supply assembly	8-31
8.2.2	Connector pin assignment	8-31
8.2.3	Block diagram	8-32

		page
8.2.4	CBA component layout	
	1. Top side	8-33
	2. Bottom side	8-34
8.2.5	Circuit diagrams	
	1. Power management	8-36
	2. Drive circuitry	8-37
	3. Stabilizer circuitry	8-38
8.2.6	Parts list	8-40
8.2.7	Troubleshoot flow chart	8-41
8.3	**Keyboard**	
8.3.1	Keyboard assembly	8-43
8.3.2	Scan code	8-43
8.3.3	Connector pin assignment	8-43
8.3.4	CBA component layout	
	1. Top side	8-45
	2. Bottom side	8-46
8.3.5	Circuit diagram	8-47
8.3.6	Parts list	8-48
9	**DEVICES**	
9.1	**Hard disk drive**	
9.1.1	PCL304 HDD assembly specification	9-1
9.1.2	Pin assignment	9-1
9.1.3	Installing instructions	9-1
9.2	**Floppy disk drive**	
9.2.1	FDD assembly specification	9-2
9.2.2	Pin asignment	9-2
9.2.3	Installing instructions	9-2
9.3	**LCD assembly**	
9.3.1	Specifications	9-4
9.3.2	Theory of the LCD operation	9-4
9.3.3	Pin asignment	9-6
9.4	**Battery pack**	9-6
10	**MODIFICATION**	
10.1	**General information.**	**10-1**

1 SYSTEM UNIT

1.1 Technical specifications

General

Adapter:

Mains voltage	:	90-270 V (Universal)
Mains frequency	:	48-63 Hz
Max output power	:	22 Watt (Cont)

System:

Ambient temperature	:	+5 to +35C
Relative humidity	:	20% to 80%
Altitude	:	8.000 ft.
Weight	:	3.03 kg
Dimensions	:	280x220x50 mm (WxDxH)

LCD:

Type	:	VGA B/W LCD with backlight
Dot pixels	:	640 x 480
Dot size	:	0.24 x 0.24 mm
Dot pitch	:	0.27 mm
Display area	:	180 x 133 mm (WxH)
Display mode	:	VGA mode (CGA/EGA/MDA emul)
Charater mode	:	80 columns x 25/43 lines
	:	40 columns x 25/43 lines
Graphics mode	:	640 x 480 dots

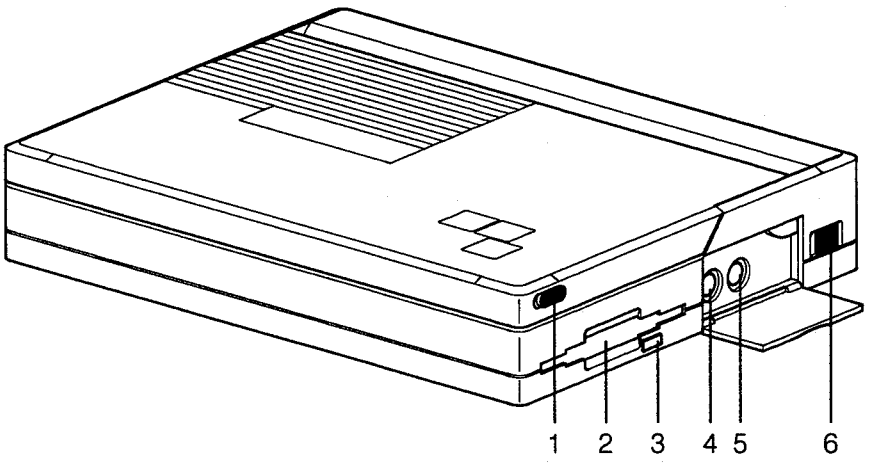
Specification

Processor	:	80386SX 16MHz
Coprocessor	:	80387SX (option)
Clock Speed	:	16 MHz or 8 MHz, software selectable
Extended Memory	:	3 MB, 5 MB
Display	:	640x480 pixels LCD panel, IBM VGA compatible
Sound	:	Buzzer
Floppy Disk Drive	:	3.5", 1.44 MB, double side, high density floppy disk drive
Hard Disk	:	3.5", 42.9 MB hard disk with 29 ms average access time.
Keyboard	:	79/80 keys, 101/102-key keyboard compatible
External Key	:	Numeric Keypad or IBM compatible keyboard, 6-pin female mini DIN connector
PS/2 Mouse Port	:	PS/2 Mouse, 6-pin female mini DIN connector
Serial Port	:	1 asynchronous serial RS-232C port,,9-pin male D-sub connector
Parallel Port	:	Centronics-type parallel port, 25-pin female D-sub connector
Video Port	:	15-pin female D-sub connector for external monitor; IBM VGA compatible
Internal Modem port	:	20-pin male connector for internal 2400 bps modem (option).
External Floppy	:	External Floppy Disk Drive port, Disk Drive 25-pin female D-subconnector.
Expansion Bus	:	Provides a 16-bit interface to the Notebook system, 96-pin male D-sub connector
AC Power	:	90V-270V full range adapter
Main Battery	:	4.8V, 5.0Ahr NiCd battery pack with over-charge protection

1.2 Description of controls and terminal sockets

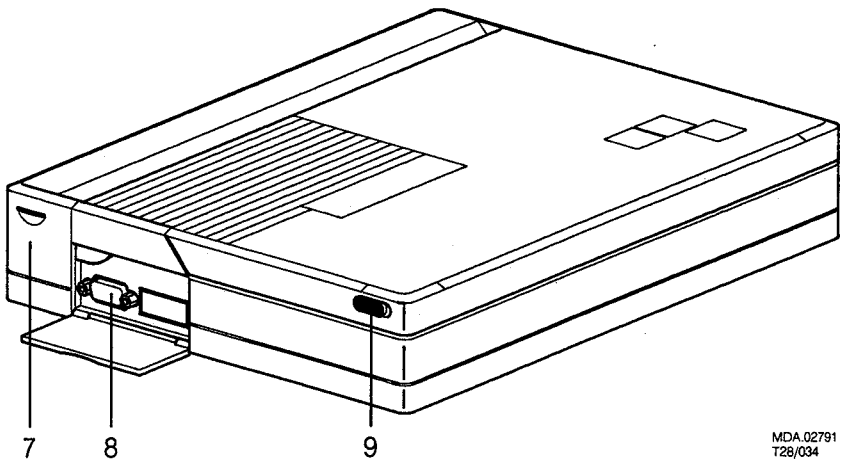
Right side panel

1. Screen latch right
2. Diskette slot
3. Eject button
4. External keyboard connector
5. Mouse connector
6. Power switch



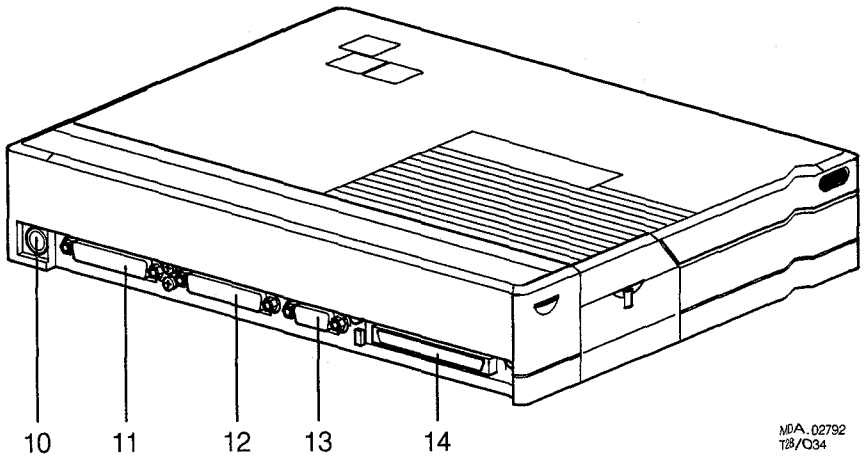
Left side panel

7. Battery compartiment
8. External Video connector
9. Screen latch left



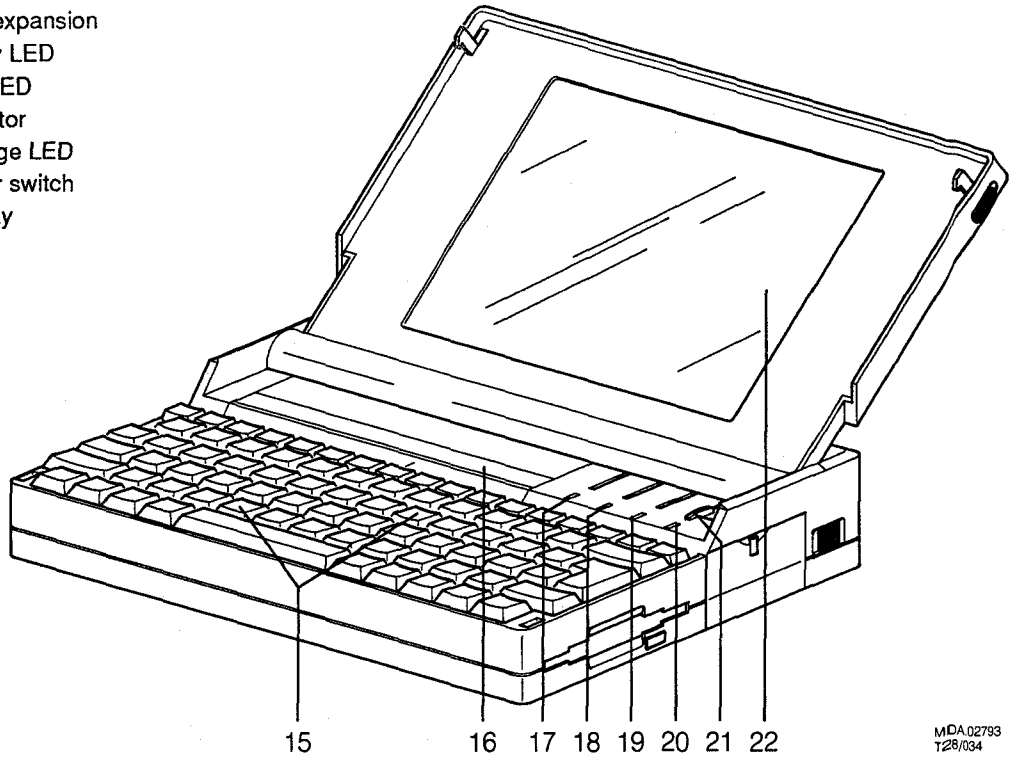
Rear panel

10. Battery-charger connector
11. External diskdrive connector (D-Shell)
12. Parallel port Centronics (D-Shell)
13. Serial port RS-232 (D-Shell)
14. Expansion connector



Inside the Notebook

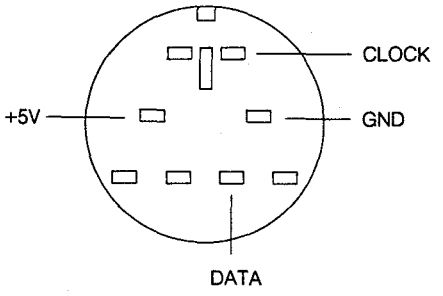
15. 80 key keyboard
16. Cover memory expansion
17. Harddisk activity LED
18. Floppy activity LED
19. Power on indicator
20. Stand-by / Charge LED
21. Stand-by / cover switch
22. VGA LCD display



1.3 Input/ouput specification

External keyboard connector (4):

Pin	Description
1.	Data
2.	Nc
3.	Ground
4.	+5V DC
5.	Clock
6.	Nc



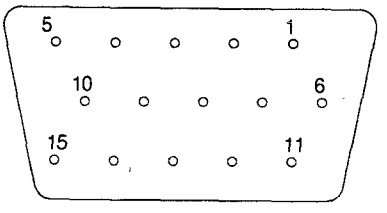
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Mouse connector (5):

Pin	Description
1.	Data
2.	Nc
3.	Ground
4.	+5V DC
5.	Clock
6.	Nc

Video connector (8):

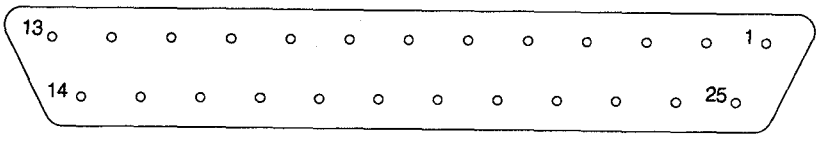
Pin	Description
1.	Red
2.	Green
3.	Blue
4.	Nc
5.	Analogue ground
6.	Analogue ground
7.	Analogue ground
8.	Analogue ground
9.	Nc
10.	Analogue ground
11.	Nc
12.	Nc
13.	Horizontal sync.
14.	Vertical sync.
15.	Nc



VIDEO CONNECTOR

External diskdrive connector (11):

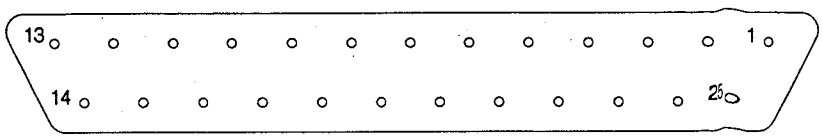
Pin	Description
1.	Ground
2.	Index*
3.	Track 0*
4.	Write Protect*
5.	Read Data*
6.	Disk Change*
7.	+5V DC
8.	+5V DC
9.	+5V DC
10.	Drive Select*
11.	Motor On*
12.	Write Data*
13.	Write Enable*
14.	Reduce Write Curr.*
15.	Head Select*
16.	Direction*
17.	Step*
18-25	GND



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Parallel port (12):

Pin	Description
1.	Strobe*
2.	Data 0
3.	Data 1
4.	Data 2
5.	Data 3
6.	Data 4
7.	Data 5
8.	Data 6
9.	Data 7
10.	Ack*
11.	Busy
12.	Paper end
13.	Select
14.	Auto linefeed*
15.	Error*
16.	Initialize*
17.	Select in*
18-25	GND

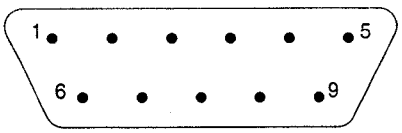


PARALLEL CENTRONICS

* Active low

Serial port RS-232C (13):

Pin	Description
1.	CD (carrier detected)
2.	RXD (received data)
3.	TXD (transmitted data)
4.	DTR (data terminal ready)
5.	GND
6.	DSR (data set ready)
7.	RTS (request to send)
8.	CTS (clear to send)
9.	RI (ring indicator)

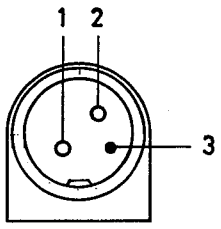


SERIAL CENTRONICS

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Supply connector (10):

Pin	Description
1.	Va (5.6V DC +3/-6%
2.	Vb (6.1V DC +/- 5%
3.	POK (7.15V DC - 7.65V DC 0A - 50 mA)
	Outer shield = Ground



45 711 A14

EXPANSION BUS CONNECTOR



Expansion Bus connector (14):

1.	GND	33.	SD7	65.	IRQ10
2.	RESETDRV	34.	SD6	66.	IRQ11
3.	+ 5V	35.	SD5	67.	IRQ12
4.	IRQ9	36.	SD4	68.	IRQ15
5.	N.C.	37.	SD3	69.	IRQ14
6.	DREQ2	38.	SD2	70.	DACK0 *
7.	+ 5V	39.	SD1	71.	DREQ0
8.	OWS *	40.	SD0	72.	DACK5 *
9.	+5V	41.	BIOCH	73.	DREQ5
10.	GND	42.	AEN	74.	DACK6 *
11.	SMEMW **	43.	SA19	75.	DREQ6
12.	SMEMR *	44.	SA18	76.	DACK7 *
13.	IOW *	45.	SA17	77.	DREQ7
14.	IOR *	46.	SA16	78.	MASTER *
15.	DACK3 *	47.	SA15	79.	SBHE *
16.	DREQ3	48.	SA14	80.	LA23
17.	DACK1 *	49.	SA13	81.	LA22
18.	DREQ1	50.	SA12	82.	LA21
19.	RFF *	51.	SA11	83.	LA20
20.	BSYSCLK	52.	SA10	84.	LA19
21.	IRQ7	53.	SA9	85.	LA18
22.	IRQ6	54.	SA8	86.	LA17
23.	IRQ5	55.	SA7	87.	MEMR *
24.	IRQ4	56.	SA6	88.	MEMW *
25.	IRQ3	57.	SA5	89.	SD8
26.	DACK2	58.	SA4	90.	SD9
27.	TC	59.	SA3	91.	SD10
28.	BALE	60.	SA2	92.	SD11
29.	+ 5V	61.	SA1	93.	SD12
30.	DOSC	62.	SA0	94.	SD13
31.	GND	63.	MEMCS16 *	95.	SD14
32.	IOCHECK *	64.	IOCS *	96.	SD15

* Active "low"
** aActive "high"

2. GENERAL SYSTEM DESCRIPTION

2.1 Introduction

The system features a 16 Mhz 80C386 based PC/AT compatible main board placed in a high performance small size laptop chassis.

The basic system includes:

* Main board assembly,.
* Power board assembly,
* Keyboard assembly,
* Floppy disk drive,
* Hard disk drive,
* LCD assembly,
* Main battery
* Adapter.

2.2. Main board

The main board compromises the following logic:

* CPU (Central Processing Unit)
  The 80C386SX is used for the system CPU (32 bit microprocessor) and the CPU clock frequency can be switched for low speed operation from the standard 16 Mhz to 8 Mhz.

* System logic (HT-21)
  The HT-21 performs CPU and peripheral support functions including that of DMA Controllers, a Memory mapper, Timers, Counters, Interupt controllers, a Bus controller and their supporting circuitry.
  This chip also includes address buffers, data tranceivers, memory drivers, parity checking and supporting circuitry.
  An asynchronous AT Bus clock allows for a constant 8 Mhz clock rate.

* ROM (Read Only Memory)
  The ROM BIOS consists of one 128 x 8 bit EPROM module.

* RAM (Random Access Memory)
  The 1 MB on board standard RAM is factory installed.

* Real Time Clock Generator (DS-1287)
  The DS-1287 is a complete subsystem in a typical application. A lithium energy source, quartz crystal and write-protection circuitry are contained within the 24-pin dual in-line package.
  The functions include a nonvolatile time-of-day clock, an alarm, a one hundred-year calender, programmable interrupt, square wave generator, and 50 bytes of nonvolatile static RAM.
  The Real Time Clock plus RAM is distinctive in that time-of-day and memory are maintained even in the absence of power.

* Keyboard Controller & Encoder (8042 & 80C51)
  Controller is the 8042 and encoder is 80C51

* LCD/CRT Controller Interface (CL-GD 610, 620)
  The CL-GD610 graphics/attributes chip and the CL-GD620 Sequencer/CRT controller chip are hardware compatible with the IBM VGA, EGA, CGA and MDA standard.

* Parallel Port & Serial Port interface (82C601)
  The 82C601 chip features drivers for the output buffers, such as the host data bus and parallel port data bus. It incorporates two 16450 compatible UARTs, one enhanced parallel port and various chip selects.

* Floppy disk interface (8473)
  The floppy disk controller provided with two floppy disk drivers through an internal FDD interface and the other external FDD interface.

* The system has a built-in hard disk with a capacity of 40 Megabytes (MB), average access time is 29 ms.

2.2.1 Processor

The central processing unit consists out of a 80C386SX microprocessor and an optional 80C387SX numeric coprocessor.
The 80C386 generates 24 address bits and 16 data bits. The 24 address bits are generated by 23 dedicated address lines A1 - A23, with A0 being derived from the microprocessor byte low enable signal. The 80C386SX instruction set is a superset of the 8086/8088 and also includes the instruction set of the 80186. The 80C386SX is object code compatible with the 8086, 80286 and 80386 microprocessor.

2.2.2 Memory

The 80C386SX has a physical address space of 16 Mbytes in protected mode and of 1 Mbyte in real mode. Figure XXX shows how this address space is utilized. The protected mode additional address space is a continuation of the real mode address space with one exception, the BIOS ROM is present at the top of the 16 Mbyte address space (it has two locations in protected mode).

2.2.3 RAM

The notebook can carry up to 5MB RAM internally, which is most sufficient memory to run the most demanding applications or to use the most powerful operating systems.

The notebook mainboard is socketed for one SIMM (Single In line Memory Modules), which can hold 2MB or 4 MB of memory.

The on board standard 1MB RAM can be expanded to 3 or 5MB.

On board	SLOT 1	Total Memory
1MB	----	1MB (default)
1MB	2MB	3MB
1MB	4MB	5MB

Fig. 2-2

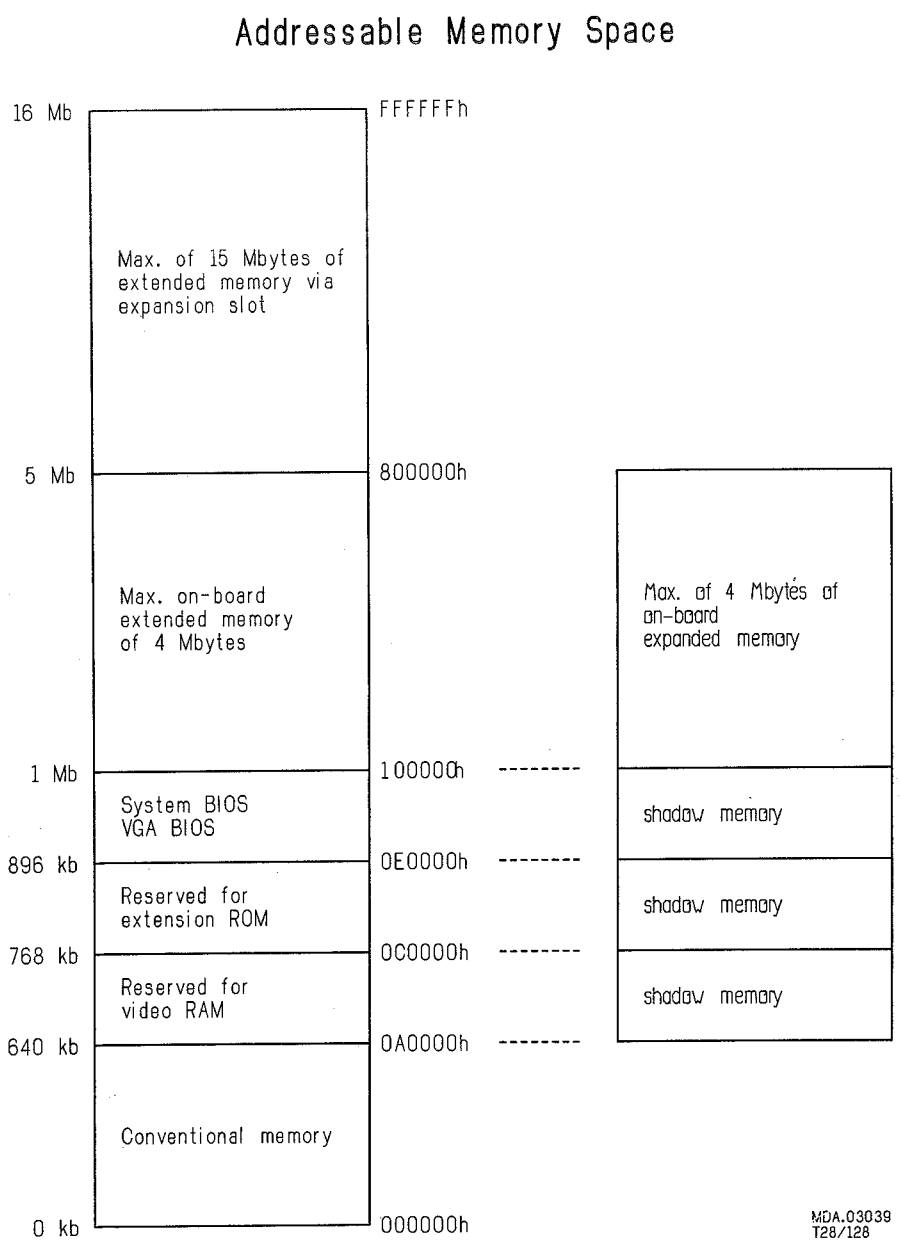


Fig. 2-1

The system board can consists of the following memory types:

Conventional Memory:
This is the memory from 0KB to 640KB and is used in Real Mode by, e.g., DOS.

Extended Memory:
This is all addressable memory above the 1MB border and can only be accessed by the CPU when it is working in protected mode.

Expanded Memory:
Expanded memory is not addressable by the CPU, but must be mapped via I/O into addressable memory within the first 1MB of address space in memory page frames of 16KB. The chips in this system support LIM-EMS 4.0.

Shadow Memory:
This is memory between 640KB and 1MB which is normally not accessible unless the chips in the system are programmed to enable this memory to copy ROM into. It can also be mapped to addressable memory for use as normal RAM.

NOTE:
An expansion board, connected via an expansion box, with expanded memory can NOT co-exist with the on-board expanded memory. Only one of the two, together with its driver, may be installed.

2.2.4 ROM

The system board contains one, 128K by 8-bit EPROM module. The ROM is not parity checked and has an access time of 200ns. The ROM is a combined BIOS containing the system BIOS and video BIOS.
It also contains the power on testing and boot loader.
To gain faster access, the BIOS can be copied to RAM during power on (refer to section 4.1).

The system BIOS is present at the following location:

At the top of the first 1 Mbyte of address space (0F0000 h - 0FFFFF h)

The video BIOS is present at the following location:

In the area from 512 Kbyte to 576 Kbyte
(0E0000 h - 0EFFFF h)

2.2.5 I/O Connections

On the main board, the following Input/Output connections are provided:

CN2: Expansion slot connector. This connector is located at the rear side of the notebook.

CN11: 20-pin flexible flat cable diskette drive control/data connector.

CN6: 44-pin header, AT-bus connector, used to connect AT-embedded hard disk drives

CN3: DB-9P, serial port connector. Via the SETUP program this port can be disabled, or can be configured as PORT 1. PORT 1 has the base I/O address 3F8h. For COM port assignments, refer to subsection 2.2.4.1.

J1: DP-25P, serial port connector. Via the SETUP program this port can be disabled, or can be configured as PORT 2. PORT 2 has the base I/O address of 2F8h. For COM port assignments, refer to subsection 2.2.4.1.

CN4: DB-25S, parallel port connector. Via the SETUP program this port can be disabled, or can be configured as PORT 2. PORT 2 has the base I/O address 378h. For LPT port assignments, refer to subsection 2.2.4.1.

CN1: DB-15S, analog video connector. This port can be disabled/ enabled via software, [Fn] + [F10].

CN14: 6-pin, Mini-Din type keypad connector. This port supports AT compatible types only.

CN13: 6-pin, Mini-Din type PS/2 Mouse connector. This port supports PS/2 compatible types only.

2.2.6 Serial And Parallel Port Assignments

The serial ports require eight consecutive I/O addresses for access to the control and status registers. COM1 is always assigned to the highest I/O address (when using only one port, this may be either on 2F8h or 3F8h). If two serial ports are installed COM2 is assigned to the next lower I/O address (COM1 is assigned to 3F8h and COM2 is assigned to 2F8h). The table on the next page gives the three possible configurations:

Configuration	Base Addr.	Port	Base Addr.	Port
1	-	-	2F8h	COM1
2	3F8h	COM1	-	-
3	3F8h	COM1	2F8h	COM2

Fig. 2-3

The parallel ports require three consecutive I/O addresses for access to the control, status and data registers. LPT1 is always assigned to the highest I/O address available (when using one parallel port, this may be on 278h, 378h or 3BCh). If two parallel ports are installed, LPT2 is assigned to a lower I/O address. If three parallel ports are installed, LPT3 is assigned to the lowest I/O address. The following table gives the seven possible configurations:

Configuration	Base Addr.	Port	Base Addr.	Port	Base Addr.	Port
1	-	-	-	-	278h	LPT1
2	-	-	378h	LPT1	-	-
3	3BCh	LPT1	-	-	-	-
4	-	-	378h	LPT1	278h	LPT2
5	3BCh	LPT1	-	-	278h	LPT2
6	3BCh	LPT1	378h	LPT2	-	-
7	3BCh	LPT1	378h	LPT2	278h	LPT3

Fig. 2-4

2.2.7 Video Graphics Adapter

The on-board video graphics capability is incorporated using a Cirrus CL-GD610/620 graphics controller. The controller, with 256KB of video memory (2x256kx4 DRAM) supports VESA 1 (800x600 high resolution with 16 colors from a palette of 262,144 colors) and VGA resolutions and is also backwards compatible, emulating EGA, CGA, MDA and Hercules graphics standards.

2.2.8 Video BIOS ROM

The video BIOS is physically situated with the system BIOS in a 128KB EPROM on the motherboard. The logical address for this BIOS is located in system memory area E0000h to EFFFFh. The BIOS supports 132 column and 60 line text modes, 72x540 and 800x600 16-color graphics mode, and 800x600 16-color VESA 1 mode.

The BIOS accesses are limited to 8-bit accesses unless the BIOS is shadowed into RAM using the SETUP program. Then the accesses are of 16-bits.

2.3 Power supply

The power board houses a sophisticated power management which ensures that the NiCad battery can power the system for the maximum possible time.

2.3.1 Power low indication.

Under battery power, the Notebook will automatically monitor the battery.

* When it senses that the battery has about 20 minutes of power available, the power LED will begin to blink once every second, and the system buzzer will beep twice every 15 seconds.
  At this warning work should be finished within about 10 minutes.
* If the Notebook senses that the battery power is critical, the power LED will blink twice a second and the beeps will sound four times every ten seconds.
  Files must be saved immediately to disk(ette), or supply AC power.
* If the battery should "die" before time was left to shut down the Notebook, the system would have automatically powered down.

2.3.2 Recharging a battery

The Notebook always checks on the charge level of the battery via a sophisticated power management control. When the system is running under AC power the CHR/STB LED will be lit to show that the battery is being recharged (standby mode is disabled under AC power).

Remark:
NiCad batteries have a tendency to lose capacity in case they are not fully discharged. In other words, if they are always used for approximately the same time, such as 100 minutes, and then recharged, they will hold only a 100 minute charge. No more charge can be increased.
Once this situation occurs, it can not be corrected by simply discharging and recharging again.
This Notebook has the utility to solve this problem by using the program "DPDISCHG".
After running the "DPDISCHG" utility the power has to be turn off and on again for normal operation.

2.3.3 Power conservation.

The Notebook offers numerous power conservation features in order to prolong battery life to the maximum.

* Intelligent power saving
  This feature is automatic and requires no control from the user. It is functional at all times on battery power.
  1. A slower rate of DRAM refresh is used.
  2. The FDD will be monitered wether the drive is being used. If not the FDD controller will be shut down. Any instruction which requires access to the drive, the FDD controller will automatically be "woken up".
  3. The CPU monitors its own activity. If no operation is taking place, the PCU is slowered down from the 16Mhz or 8Mhz rate to 4Mhz.
     When CPU activity is resumed, the clock speed is automatically returned to the original speed.
     This feature will be overridden if the "Auto-standby disable" option in the Setup utility is selected.

* Selectable power down.
  This feature is encountered in the Setup utility.
  For a preset "trip time" which is specified in the Setup utility the system can be instructed to shut down power consuming components.
  1. Backlight power off:
     Screen backlight is powered down if the LCD power down time elapses with no srceen activity and no key stroke.
  2. LCD screen power off:
     LCD screen is powered down if the LCD power down time elapses with no srceen activity and no key stroke.
  3. HDD power down:
     The HDD power is shut down if the HDD power down time elapses with no hard disk activity.

2.3.4 Stanby Mode

Standby mode is only available, and necessary, when battery power is used. In this node the amount of power required by the system is greatly reduced.

Standby mode can be entered in two ways:
* Press the Standby mode switch.
* Closing the LCD cover without turning off the power.
  In this case a warning beep will sound to indicate that the power has not been sitched off.

The techniques used to conserve power in standby mode are listed below.
* The clock speed is reduced to 4Mhz.
* The HDD is powered down.
* Screen backlighting is switched off.
* The LCD screen is switched off.
* The LCD controller is powered down
* Floppy disk controller is powered down.
* Keyboard LEDs are turned off.

When the system is in standby mode, the CHR/STB LED will flash to alert the system condition.

2.4 Keyboard

The notebook's keyboard has 79 keys (for USA) or 80 keys (for Europe). Some of the keys have dual assignments which are activated by a keystroke, or by holding down the special Fn function key. In this way all the functions of a full size 101/102 keyboard can be duplicated.

In addition special key combinations are assigned to control other functions of the system.

Key Combination summary:

[Fn] + [Esc]	Disable the screen save feature
[Fn] + [1]	Increase contrast
[Fn] + [2]	Decrease contrast
[Fn] + [3]	Increase brightness
[Fn] + [4]	Decrease brightness
[Fn] + [F4]	Width control for Hercules displays
[Fn] + [F5]	Centering control for displays under 480 pixels high
[Fn] + [F6]	Automap Enable/Disable
[Fn] + [F7]	Runs the Notebook at low speed (8 Mhz)
[Fn] + [F8]	Runs the Notebook at high speed (16 Mhz)
[Fn] + [F9]	Normal/reverse video
[Fn] + [F10]	LCD or CRT ouput
[Fn] + [Alt]	European [Alt Gr] key
[Fn] + [Ins]	Single apostrophe [']
[Fn] + [Shift] + [Ins]	A tilde mark [~]

2.5 Video

Refer to 2.2.5

2.6. Hard Disk Drives

2.6.1. Conner CP4044

The Conner CP4044 is a 40MB, 3" hard disk drive. The drive is mounted internally within the chassis of the system unit.
For further product specifications, refer to chapter 9.2.

2.7. Floppy Disk Drives

2.7.1. Sony MPF-220

The Sony MPF-220 is a 3" floppy disk drive. The drive can work with either normal (720KB) or high density (1.44MB) floppy disks. The drive has a sensor to detect normal or high density. In the SETUP program the floppy disk should be configured as: 3" 1.44MB

The drive is mounted internally within the chassis of the system unit.

For further product specifications, refer to chapter 9.1.

3. CONFIGURATIONS

This chapter describes the upgrade options and the possible memory configurations of the system.

3.1 System Upgrades

Options that can be ordered to upgrade the system are the following:

	Description
	80C387SX numeric co-processor
	2MB SIMM (80ns)
	4MB SIMM (80ns)

3.2 Memory configurations

The notebook has standard 1MB (= 1024KB) of RAM on board and this can be expanded up to 5MB.
Generally, DOS can only use the first 640KB of RAM (base memory), and memory above 640KB can be treated in different ways.

* **Extended Memory:**
  This is a simple continuation of Base 1MB memory. less using special programs or utilities, most of the software applications will be unable to address this memory.
* **Expanded Memory:**
  Extended memory can be transformed into Expanded memory (LIM EMS 4.0).
  This is a tecnique of forming a "window" in the Base memory through which some programs can see "pages" of data in Expanded memory. The program can therefore address all RAM.
* **Shadow RAM:**
  Shadow RAM applies only to the first 384K of extended memory (standard notebooks). Instead of using this space as extended or expanded memory, the system and/or VGA BIOS can be copied to this space.
  It will lead to some performance gain, especially in applications which make extensive calls on the BIOS.
  Refer to the documentation of the software (program) to be installed to decide which option to choose.

  Summarizing:
  Enter the total amount of RAM in the system under the item Memory Size. If only 1MB RAM is available, then the spare 384KB can be designated as Shadow RAM, EMS memory, or Extended Memory

  RAM beyond 1MB, may be allocated as Extended or Expanded, or a mixture of both.
  Only use whole numbers of megabytes when dividing RAM.

  The table below shows all the possiblities.

  Note:
  Extended Memory is automatically calculated by SETUP after the other items have been entered.

Memory size	**1M**	**1M**	**1M**	**3M**	**3M**	**3M**
EMS size	384K	256K	Off	2304K	1280K	256K
Shadow Ram	Off	128K	Off	128K	128K	128K
Extended Mem	Off	Off	384K	Off	1M	1M

Fig. 3-1

Memory size	**5M**	**5M**	**5M**	**5M**	**5M**
EMS size	4352K	3328K	2304K	1280K	256K
Shadow Ram	128K	128K	128K	128K	128K
Extended Mem.	Off	1M	2M	3M	4M

Fig. 3-2

3.2.1 Expanded Memory

The on-board chipset is fully hardware/software compatible with the Lotus Intel Microsoft Expanded Memory Specifications (LIMEMS) version 4.0. This implementation allows a 64KB block in the area from 040000h - 09FFFFh (256KB - 640KB) or from 0C0000h to 0EFFFFh to be used as a window, allowing the complete 7552KB (maximum) of on-board RAM to be accessed. Accessing is accomplished by means of paging. The 64KB block is divided into four 16KB pages which can access individual portions of the 7552KB area.

Expanded memory can be assigned by using the SETUP utility. The 'EMS' field in the SETUP program must be set to the correct value when using EMS memory. This field specifies the amount of memory to be used as expanded memory by an expanded memory driver, such as the QUAD_EMS.SYS driver provided on the utility diskette.

If EMS memory is being used on an expansion board, via an expansion box, the 'EMS' field in the SETUP utility must be set to zero. The EMS driver delivered with expansion board should be used instead of the QUAD_EMS driver.

Memory address map

The System Memory Map is shown as follows:

	Memory	Function
000000 - 09FFFF	640K Bytes	Base Memory
0A0000 - 0BFFFF	128K Bytes	Video RAM (Graphic Display Buffer)
0D0000 - 0DFFFF	64K Bytes	EMS default memory base address
0E0000 - 0EFFFF	64K Bytes	ROM for Video BIOS
0F0000 - 0FFFFF	64K Bytes	ROM for System BIOS
100000 - FDFFFF	15M Bytes	Memory - 1M to 15M installed on memory expansion options
FE0000 - FFFFFF	64K Bytes	Duplicated code assignment at address 0E0000
FF0000 - FFFFFF	64K Bytes	Duplicated code assignment at address 0F0000

3.2.2 Address Map

I/O Address Map

Hex Range	Device
000 - 01F	DMA controller #1
020 - 03F	Interrupt Controller #1
040 - 05F	Timer
060 062 - 06F	Keyboard Controller
061	Port B Register, PPI
070 - 07F	Real Time Clock, NMI (Non-interruptable Mask) bit
080 - 08F	DMA Page Reg.
090 - 091	DMA Map Reg.
092	Alternate Gate A20 and Host Reset
093 - 09F	DMA Map Reg.
0A0 - 0BF	Interrupt Controller #2
0C0 - 0DF	DMA Controller #2
0F0 - 0FF	Math Coprocessor
1E8 - 1E9	PMU Control Reg.
1EC - 1EF	EMS and Control Reg.
2F8 - 2FF	Serial Port 2
300 - 31F	Reserved
378 - 37F	Parallel printer port 1
380 - 3AF	Reserved
3B0 - 3DF	Video Graphics Monitor Adapter
3F0 - 3F7	Diskette Controller
3F8 - 3FF	Serial Port 1

At power-on time, the Non-Maskable Interrupt (NMI) into the 80386SX is masked off. The Mask Bit can be set and reset with System Programs as following:

Mask on : Write to I/O address hex 070, with data bit 7 equal to a logic 0.

Mask off : Write to I/O address hex 070, with data bit 7 equal to a logic 1.

4. SYSTEM UTILITY

In this chapter a description is given of the utilities delivered with the system on the utilities diskette.

4.1 Setup

The SETUP consists of a display page for the ROM version. To access the ROM BIOS SETUP, the following keys should be pressed simultaneously:

<CTRL> + <ALT> + <ESC>

This can be done at any time, provided that no running application has taken over the keyboard interrupt handlers. <CTRL>+<ALT> + <ESC> may be pressed during Power On Diagnostics when the machine is first switched on to change the setup information prior to the machine booting. If a configuration error is detected during POD, an appropriate beep code and error message is displayed, then the following message is displayed:

Press <F1> to resume, <F3> to enter Setup

If the <F1> key is pressed, the machine continues with its booting procedure. If <F3> is pressed, the SETUP program is immediately executed.

The SETUP consists of two columns, in which the current values of the CMOS RAM are highlighted. The current settings can be changed by using the <INS> and <DEL> the keys.

< → >, < ← >, < ↑ >, < ↓ > and <ENTER>:
Use to select the field(s) within the page whose values are to be changed.

<INS>, <DEL> : Used to change the field to the required value.

<F10> : Used to write the new configuration information to the CMOS and reboot the system.

<F1> : Changes will not be saved into the CMOS RAM and the system will reboot. In the disk version of SETUP, pressing <F1> will not reboot the system.

4.1.1 Setup page

The system SETUP program is contained in the BIOS-ROM which is built into the set. It can be invoked by pressing simultaniously the CTRL and the ALT key, and while holding them down, hitting the ESC key. The screen shown in Fig. 4-1 will appear on the LCD (or the external monitor if attached and selected).

DATE (MM/DD/YY)	11/27/90
TIME (HH:MM:SS)	10:45:00
INTERNAL DISKETTE	1.44M
EXTERNAL DISKETTE	NONE
HARD DISK	20MB
HDD POWER DOWN	1 MIN
BOOT DISK	C
SPEED SELECT	HIGH
PASSWORD	DISABLE
RS232	ENABLE
MODEM	DISABLE
RS232/MODEM	COM1/COM2
MEMORY SIZE	1M
EMS SIZE	OFF
SHADOW RAM	384K
EXT MEMORY SIZE	OFF
AUTO STANDBY	ENABLE
DISPLAY TYPE	VGA
VIDEO ATTRIBUTE	NORMAL
LCD POWER DOWN	2 MIN
VERTICAL COMPEN..	STRETCHED
WIDTH COMPRESSION	DISP LEFT
AUTO MAP	ENABLE
BOLD FONT	DISABLE

Fig. 4-1

Date and time:
These two items can be corrected by typing in the accurate figures from the keyboard. The same format as shown on the screen has to be used.

Internal External diskette:
Internal diskette is the Notebook's installed floppy. This is a 1.44MB, 3.5" drive, so it is entered as 1.44MB. If a external drive is added through the external drive connector it must be configured here.
Either 1.2MB or 360K for 5.35" drives, or 1.44MB ot 720KB for 3.5" drives. If no external drive is applicable, select none.

Hard disk
The Notebook hard disk has a capacity of 40MB or 80MB. Enter this item as 40MB or 80MB accordingly, select NONE to disable the hard disk.

HDD Power Down:
A power saving feature. This feature comes into operation automatically if no keystroke is entered, or software instruction issued, for a certain length of time.
This is the "trip time".
When no activity is registered, the trip time starts counting down. If the trip time expires with no activity, automatic power down takes place. The SETUP utility allows to choose the time which will elapse (in minutes) before the notebook implements the power saving.

Boot from:
Via this item the system will find an operating system to load on and start up.
Three possiblities are available:
* Boot from hard disk
* Boot from external floppy, assigned as drive B
* Boot from internal floppy, assigned as drive A

Speed select:
This setup item specifies the speed at which the system will run each time you start or reset the notebook, either HIGH (16MHz) or LOW (8MHz).
Note:
The system speed can be changed any time by using special key combination, see chapter 2.4.

Password:
The password feature enables or disables data security. Instruction guiding the user through the proces of altering the password are diplayed on the highlighted line of the screen.

RS232, Modem, RS232/Modem:
* If no serial device is installed through the serial port a little power by diabling the item RS232.
* Similary if no internal modem is installed disable the item modem.
* For the third item RS232/Modem, the location of each of these items can be selected as either COM1 (address 3F8 hex and interrupt IRQ4) or COM2 (address 2F8 hex and interrupt IRQ3).

Memory size, EMS size, Shadow RAM, Ext. Memory size:
These items are are entered in Kilobytes (K) or Megabytes (M). A standard notebook has 1MB of Random Access Memory (RAM) and this can be expanded up to 5MB.
Note:
DOS can only use the first 640KB of RAM (called base memory) and memory above 640KB can be treated in different ways, see chapter 3.2.

Auto standby:
This is the trip time before the system goes into standby mode.

Power management:
Selects the power management of the notebook.

Monitor type:
Selects the type of monitor to be connected to the notebook.

Display type:
This item configures the kind of video display you are using. The notebook has a VGA controller, but is fully backward compatible with previous video standards.
Selected displays are:
VGA, EGA, CGA, and MGA (MGA includes the MDA and Hercules standards).

Video attribute:
Selects wether the notebook will start up using normal or reverse video.

Note:
The video mode can be changed any time by using special key combination, see chapter 2.4.

LCD Power down:
Another power saving feature. The trip time lenght indicates when the system shuts down the screen backlighting.

Vertical compensation, width compression:
Refers to the way the notebook treats displays which are shorter or wider than the LCD screen, see also chapter 2.4 for an explantion of the options.
The option selected in Setup will be used by the system unless the selection is overiden via the key combinations described in chapter 2.4.

Automap:
When enabled, colors are mapped to shades of grey. When disabled, colors are mapped to one of two shades.

Bold font:
When enabled, intensified characters are shown as bold. When disabled, intensified chracters are shown as highlighted.

5 SYSTEM UNIT DISASSEMBLY

5.1 Assembly/disassembly

5.1.1 Top cover removal

- Before removing the top cover of the set, be sure to disconnect the connector of the battery charger at the rearside of the set.
- Also be sure that the battery is removed.
- Refer to Fig. 5-1
- Remove the two screws in the bottom of the set.
- Remove three screws at the rear of the set, after removing the coverplates.
- Open the cover for the video-connector and remove two screws which are located there.
- Open the cover for the keyboard / mouse connector and remove the two screws which are there.
- For the next part refer to Fig. 5-2
- Open up the screen by using the latches on both sides of the set.
- Remove the coverplate which covers two screws which hold the RAM-expansion slots.
- Unlock screws (A) and remove the coverplate.
- The keyboard can now be slided in the direction of arrow B for about 1 - 2 cm. Be carefull not to damage the keyboard connection wire D.
- Remove screw C which hold the uppercase.
- Remove the flat-cable to the LCD-display by lifting the connector and sliding the cable out, see Fig. 5-3.
- Lift the topcover for about 3 cm and disconnect two connectors from the LCD-backlight and the battery, see Fig. 5-4.
- Remove the uppercover from the set and you can access the motherboard and the power board.

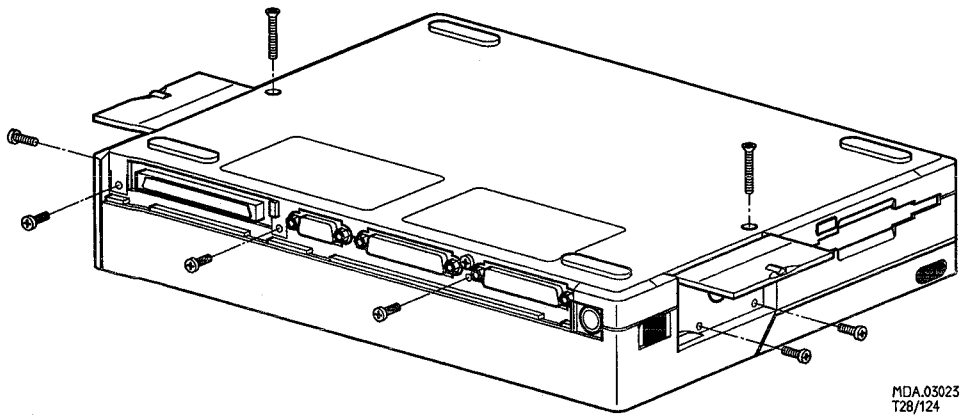


Fig. 5.1

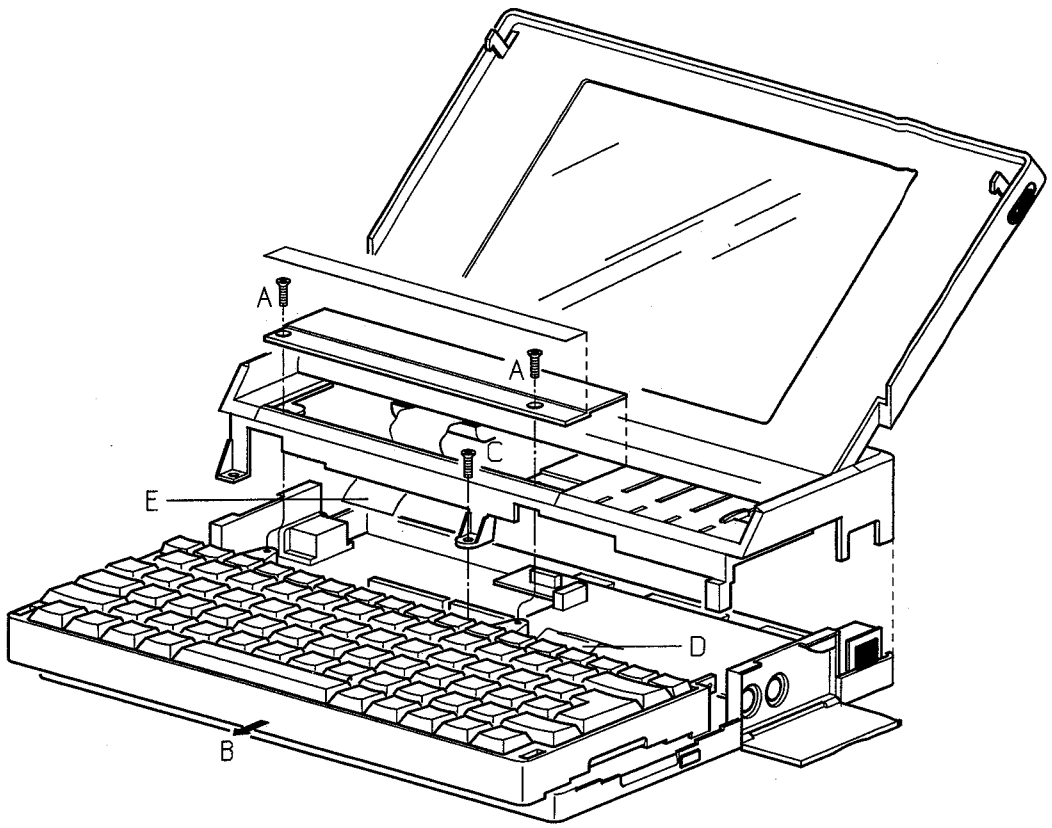
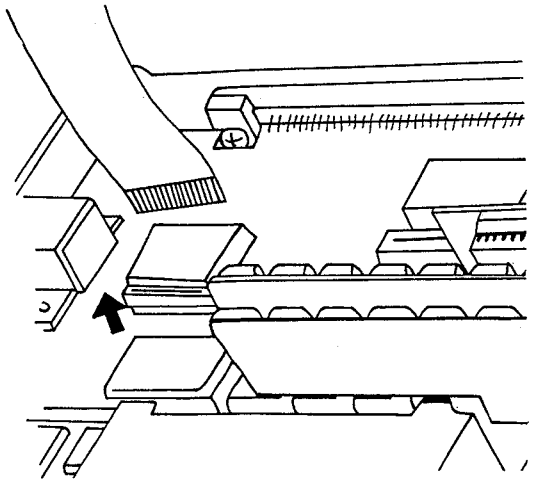


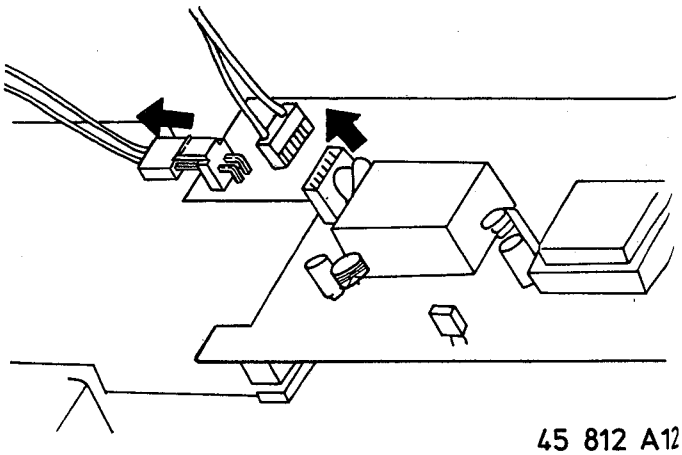
Fig. 5.2

MDA.03024
T28/124



45 708 A14

Fig. 5.3



45 812 A12

Fig. 5.4

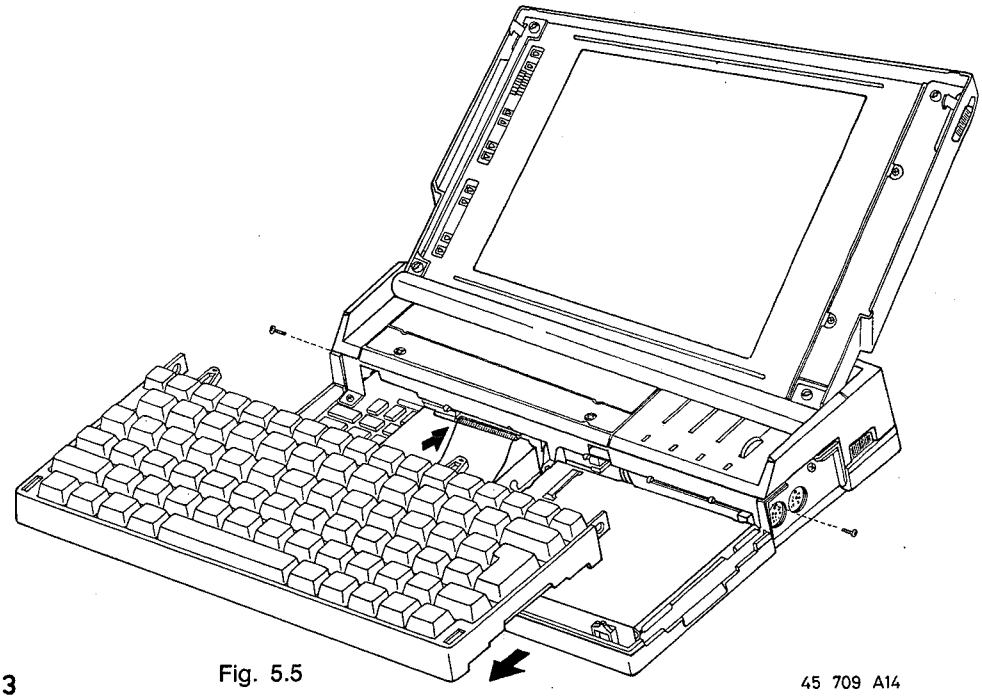


Fig. 5.5

45 709 A14

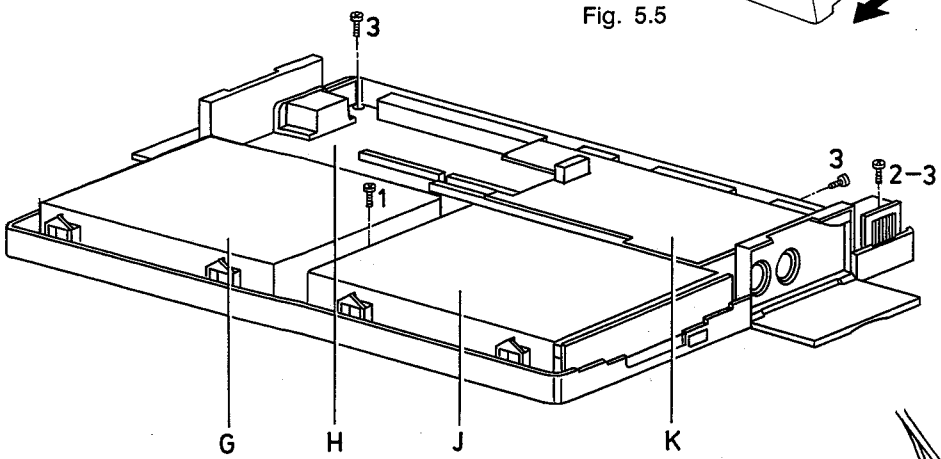
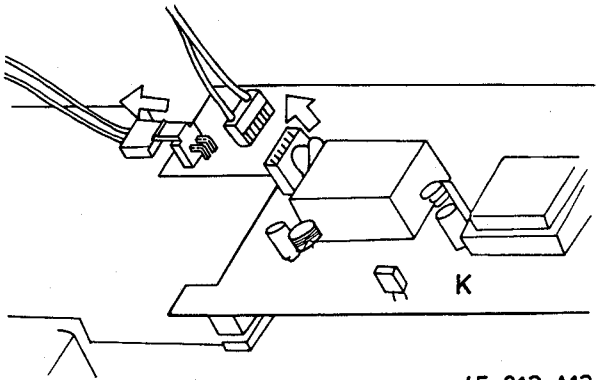


Fig. 5.6

45 811 A12



45 813 A12

Fig. 5.7

5.1.2 Keyboard removal

- Remove the top cover (See 5.1.1)
- Slide up the connector fixing the flat cable to the keyboard and remove the keyboard with cable, see Fig. 5-5.

5.1.3 Powerboard removal

- Remove the top cover (See 5.1.1)
- Remove one screw (2) near the power switch. See Fig. 5-6.
- Remove the ROM-/ and RAM-module(s) by pulling them out.
- The powerboard (K) can now be removed by pulling it out in upward direction, see Fig. 5-7.

5.1.4 Motherboard removal

- Remove the top cover, see 5.1.1.
- Remove the keyboard, see 5.1.2.
- Remove the powerboard, see 5.1.3.
- Remove two screws (3) and one hex bolt.
- Remove the flexible cable from the floppy disk by pulling it out of the connector.
- Disconnect the harddisk by pulling the connector from the mainboard. Be carefull not to damage this very sensitive connectioncable.
- Remove the motherboard by pulling it up, starting on the right side, see Fig. 5-8.

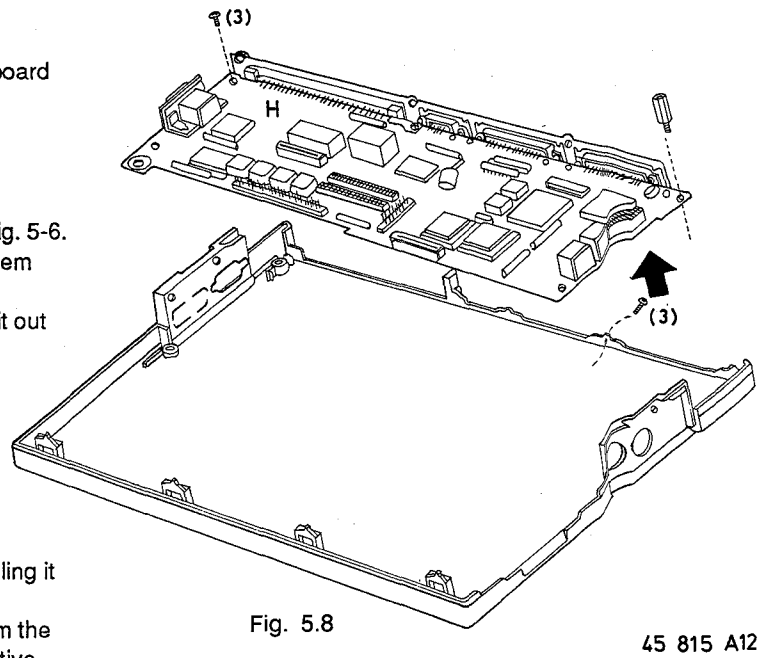


Fig. 5.8

45 815 A12

5.1.5 Floppy disk drive removal

- Remove the top cover, see 5.1.1.
- Remove the keyboard, see 5.1.2.
- Remove the powerboard, see 5.1.3.
- Remove the flexible cable from the motherboard.
- Remove one screw (1) and the bracket which holds both the floppydrive and the harddisk, see Fig. 5-10.
- Shift the floppy diskdrive for about 6 mm to the left and lift it up to remove it, see Fig. 5-9.

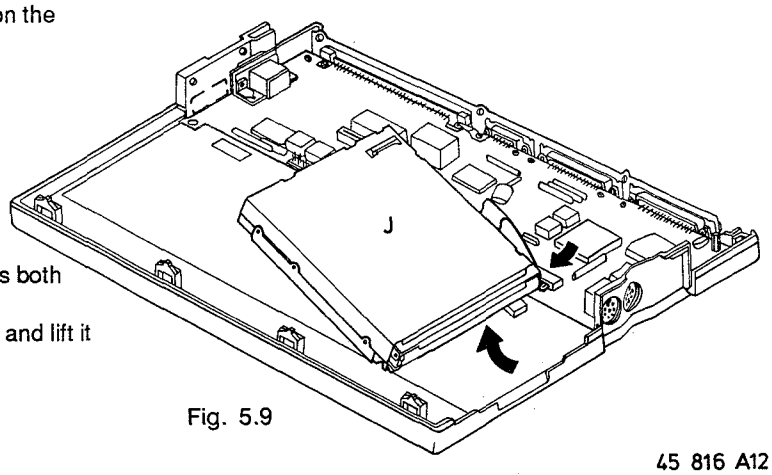


Fig. 5.9

45 816 A12

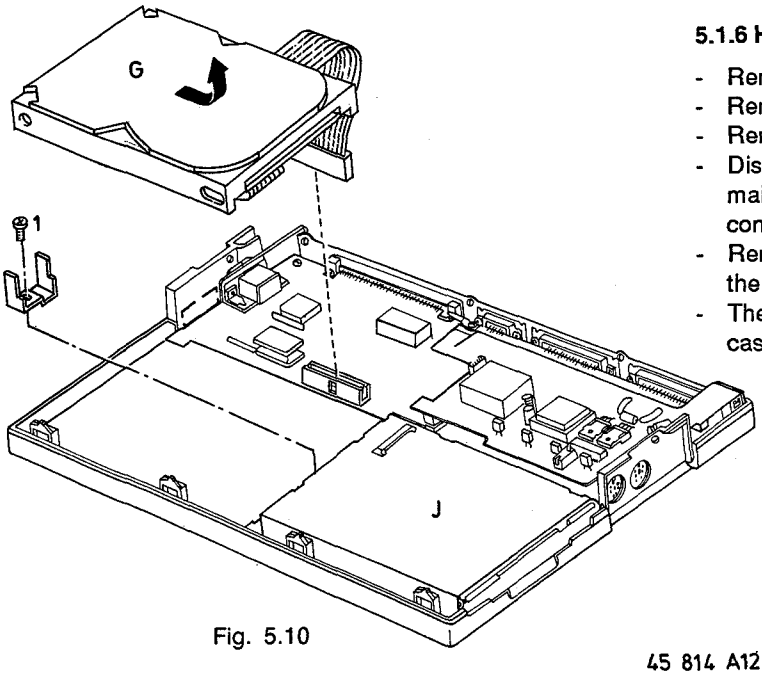


Fig. 5.10

45 814 A12

5.1.6 Harddisk removal

- Remove the top cover, see 5.1.1.
- Remove the keyboard, see 5.1.2.
- Remove the powerboard, see 5.1.3.
- Disconnect the harddisk by pulling the connector from the mainboard. Be carefull not to damage this very sensitive connectioncable.
- Remove one screw (1) and the bracket which holds both the harddisk (G) and the floppydrive (J)
- The harddisk can be removed by lifting it out of the lower case, see Fig. 5-10.

5.2 Mechanical

Use of the postion numbers in the exploded view of the cabinet.Parts list cabinet

All parts in the exploded view have been provided with a position number. In the exploded view four types of position numbers have been used:

A. The numbers 1 to 99 of small size relate to standard fixing material. The parts list belonging to the exploded view mentions the kind, the dimensions and code number (if applicable).

B. The position numbers of the specific parts are of a larger size. The description and the code numbers have been printed in the parts list belonging to the exploded view. These numbers go from 100 up to 199.

C. The numbers 500 to 599 are not mentioned in the parts list. It is supposed that the parts indicated by these numbers are not subject to wear or damage. These parts are not stocked. Supply of these parts is possible, as long as the system is being produced. The purpose of these position numbers is to be able to indicate the relevant parts in correspondence.

D. Parts indicated by a letter/figure combination. This category of numbers is used for those parts which have been drawn in the exploded view to indicate their position in the set. The code number and the description of the part are mentioned in another parts list.

5.2.2 Partslist Cabinet:

Accessories:

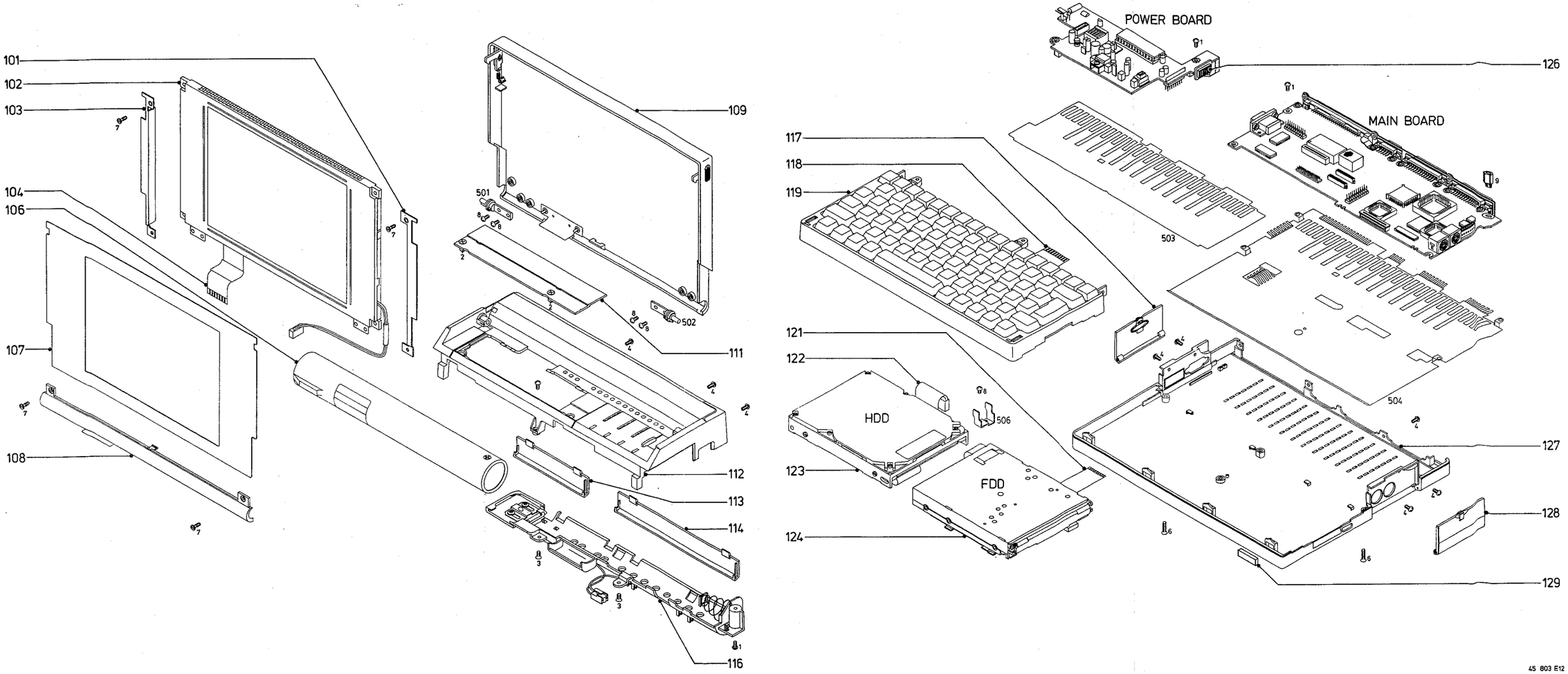
4822 310 50107	Detach key tool
4822 710 20001	Test program (floppy)

Service parts:

101	4822 404 60672	Support (R)
102	4822 130 91015	LCD assy
103	4822 404 60671	Support (L)
104	4822 462 41861	LCD flat cable
106	4822 321 61297	Battery
107	4822 450 61754	Display plate
108	4822 404 60702	Hinge cover assy
109	4822 432 40085	LCD cover assy
111	4822 432 40083	Memory door
112	4822 432 40079	Top cabinet
113	4822 432 40082	Cover
114	4822 432 40081	Cover
116	4822 256 60321	Battery holder
117	4822 432 40086	Door left
118	4822 321 60976	KBD flat cable
119	4822 219 82529	Keyboard (USA)
121	4822 321 60977	Floppy flat cable
122	4822 321 61278	HDD flat cable
123	4822 691 20684	FDD assy 40 MB
124	4822 691 20685	FDD assy 1.44MB
126	4822 411 61741	Knob on/off
127	4822 432 40078	Base assy
128	4822 432 40087	Door right
129	4822 462 41861	Foot

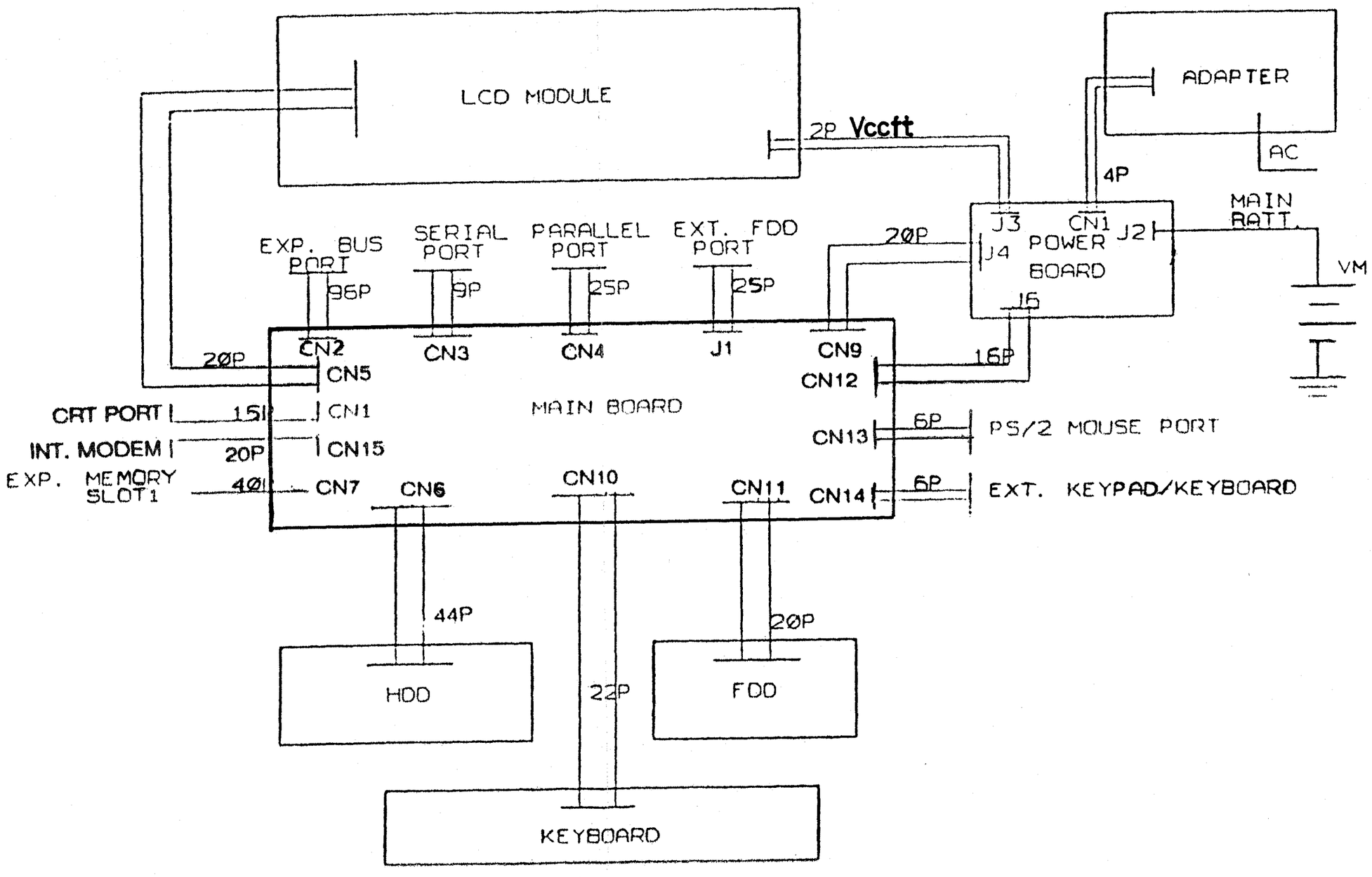
4822 212 60062	Power supply
4822 212 60061	Main board

5.2.2 Exploded view



5.3 Interconnections

5.3.1 Wiring diagram



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6 DIAGNOSTICS

6.1 Functional test program

The power self test will only test a part of the total system. Therefor a functional test program is available to test the remaining system parts for correct functioning.
This test program comes on a 3 1/2" 720 K floppy (4822 710 20001) and can be used for all PCL-line personal computers.
The test program was designed to test the basic system functions in a fast way:

- floppy drive
- hard disk
- mouse
- R232-interface
- Video controller
- monitor
- printer interface

The test results can be printed (see Fig. 6-1).

To start the test first read the instruction for use which can also be found on the test floppy
Type "A:README" to find out the way of executing the test program.

CMOS Data/Serial Number

Drive A = 3.5 inch, 720 kByte
Drive B – Not Intstalled
Harddisk 1 – 40 MByte (Formatted)
Serial number : 1A 0 0 0 0 0 0 0 0 0 0 0 0
Data: Wednesday may 9, 1991

BIOS Data

System hardware is AT with 80386
Mouse dirve is .....
Printer drive reports on-line
RS-232 loopback is .....
VGA with Color Display

Testresults of the PCL304/00 computer

```
<< 1  Testing the floppy disk drive uinit A: ..... Passed
   2  Testing the floppy disk drive uinit B: .....
<< 3  Testing the harddisk drive uinit C: ..... Passed
<< 4  Testing the keyboard for Laptop computers ..... Passed
   5  Reserved for future use .....
   6  Testing the mouse hardware and software ..... Passed
   7  Testing the RS-232 serial connector .....
<< 8  Testing the Color Graphics Adaptor. (On VGA emulated CGA) ..... Passed
<< 9  Testing the Video Graphics Array in mode 18 (640*480*16) .....
<< 10 Parking the harddisk heads in the safety zone ..... Passed
<< 11 Testing the printing the testreport .....
```

Fig. 6-1

6.2 Error messages

This chapter describes diagnostics messages;
power on messages and user diagnostics messages.

6.2.2 Power on diagnostic test messages:

BEEP MESSAGES;

01. ONE BEEP:
    No error is found
02. ONE LONG AND THREE SHORT BEEPS:
    Video error.
03. TWO SHORT BEEPS:
    A non fatal error. The Notebook will allert to the error with a message.

SCREEN MESSAGES;

01. REFRESH TIMING ERROR:
The refresh clock is not operating as expected.

02. KEYBOARD ERROR OR NO KEYBOARD PRESENT.
Either there is a keyboard problem, or the keyboard is not attached.

03. MEMORY SIZE ERROR - RUN SETUP.
The amount of memory found by the POST is different than the amount specified by SETUP.

04. REAL CLOCK ERROR - RUN SETUP.
The real time clock is not operating as expec ted.

05. ERROR ENCOUNTERED INITIALIZING HARD DRIVE.
Try resetting the system. If the problem persists, contact your dealer.

06. ERROR INITIALIZING HARD DISK CONTROLLER.
Try resetting. If the same message appear, contact your dealer.

07. FLOPPY DISK CONTROLLER ERROR OR NO CONTROLLER PRESENT.
POST cannot locate the floppy drive. If the problem persists, contact your dealer.

08. DISKETTE DRIVES OR TYPES MISMATCH, ERROR RUN SETUP.
FDD not installed or cable connection bad. If the message appears again after SETUP, contact your dealer.

09. CMOS RAM ERROR.
Check battery/RUN SETUP CMOS is not valid. The CMOS battery may be malfunctioning. It possible to continue in running the Notebook, but SETUP has to be run every time the system will be boot. Consult your dealer about replacement of the CMOS battery.

10. DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER.
The BIOS can not load the system from the disk. The disk may be either unformatted as a bootable disk or defective.

11. PRESS F1 KEY TO CONTINUE OR ALT-CTRL-ESC TO SETUP.
An error was found during Power on diagnostics test. To attempt to boot the system hit the F1 key or press ALT-CTRL-ESC to run the SETUP program.

6.2.2 User diagnostic messages:

(1) Floppy disk

DISK ERROR STATUS:

Status 00:	Data compare error
status 01:	Invalid function request
status 02:	Address mark not found
status 03:	Write protect error
status 04:	Sector not found
status 05:	Reset failed
status 07:	Drive parameter activity failed
status 08:	DMA overrun on operation
status 09:	Data boundary error
status 0A:	Bad sector flag detected.
status 0B:	Bad cylinder detected
status 0D:	Invalid number of sectors on format
status 0E:	Control data address mark detected
status 0F:	DMA arbitration level out of range
status 10:	ECC or CRC error
status 11:	ECC corrected data error
status 20:	General control failure.
status 40:	Seek operation failed
status 80:	Time-out
status BB:	Undefined error occurred
status CC:	Write fault on selected drive
status E0:	Status error/error register=0
status FF:	sense operation failed

(2) Serial port

LOOPBACK STATUS:
B7: 1-Time out
B6: 1-Transmit shift registeris empt
B5: 1-Transmit holding register is empty
B4: 1-Break
B3: 1-Framing error
B2: 1-Parity error
B1: 1-Overrun error
B0: 1-Data ready

(3) Printer port

LOOPBACK STATUS:
B7: 1-Not busy
B6: 1-Acknowledge
B5: 1-Out of paper
B4: 1-Printer is selected
B3: 1-I/O error
B2: 1-Unused
B1: 1-Unused
B0: 1-Time out6.

6.3 Outline of Diagnostics Test

This Diagnostics Test Program is prepared for the purpose of Testing and Troubleshooting hardware functions of the computer.

This program is loaded from the disk drive and operates under the management of MS-DOS (Disk Operating System).

Diagnostics Menu

This is the menu for the testing procedures.

The menu you obtained may differ slightly depending on the devices installed in your computer system.

If you choose:

(1) MAIN BOARD
Test the Main Board.

(2) FLOPPY DISK DRIVE
Test the floppy disk drive connected to the system.

(3) KEYBOARD
Test the keyboard.

(4) COLOR/GRAPHICS VIDEO
Test the color/graphic controller and display, connected to the system.

(5) 1 SERIAL PORT
Test the RS-232C serial port of the system.

(6) 1 PRINTER PORT
Test the printer port.

(7) MEMORY
Test the base memory. (The number of KB or will change depending on the configuration of your system.) and tests the expanded memory. (The number of KB will change depending on the configuration of your system.)

6.4 Diagnostics Description

6.4.1 Main Board Test

	Procedure
Start	
PIT Counter Reading Writing Diagnostics and Counter Test	Check reading and writing of the timer #0 of the PIT (Programmable Interval Timer). Set the initializing value on the timers #0 and verify that counting down is functioning properly after a fixed period of time has elapsed. The timer #1 is not used as a refresh counter for the DRAM and does not need to be checked.
Page Register Reading/Writing Diagnostics	Check reading and writing of the page register. Bytes I/O R/W test Data: 00H, 55H, AAH, FFH.
DMA Controller Reading/Writing Diagnostics	Check reading and writing of the address register of the DMAC #0 and of the word count register of the DMAC #0 Data: 00H, 55H, AAH, FFH
PIC Reading/ Writing Diagnostics and Interrupt Test	Check reading and writing of the #0 IMR (Interrupt Mask Register) of the PIC (Programmable Interrupt Controller). Verifies whether a PIC #0 interrupt test is carried out properly through a TIMER interrupt test
RTC Diagnostics	Confirm the data in real time clock is within the proper range.
END	

6.4.2 RAM Diagnsotics

	Procedure
Start	
Data Reading/ Writing Diagnostics	Perform the byte reading/writing test using data patterns 00H, 55H, AAH, FFH. This applies to load addresses from 00000H to top of the memory.
End	

6.4.3 Keyboard Diagnostics

	Procedure
Start	
Keyboard Codes Diagnostics	Press any key to recall a scanning code, which is converted to a code. Confirm that the code corresponds to the denotation show on the top of the pressed key.
End	

6.4.4 Video Diagnostics

	Procedure
Start	
Character Sets Diagnostics	Display two ASCII character sets and check them.
Gray Scale Diagnostics	Display 8 gray scale on the display and check them.
Displayed Character Attribute Diagnostics	Check the character attributes on the 80*25 & 40*25 display.
Graphic Mode Diagnostics	to verify that the 640*200 & 320*200 graphic mode display is correct.
	Procedure
One Page Display on Text Mode Diagnostics	Check each page (1-3) shown on the 80*25 display.
End	

6.4.5 Floppy Disk Diagnostics

	Procedure
Start	
FDD Reading/ Writing Diagnostics	Set the parameters according to the FDD and the medium. Repeat the following procedure on each track form No.0 to the largest No.; READ (INT 13H, AH=02H) and confirm that reading has been carried out properly. WRITE (INT 13H, AH=03H) and confirm that writing has been carried out properly. Then compare the result with the data of the reading and writign test to confirm that both values are equal.
End	**(It may scratch diskette)**

6.4. 6 Serial Port Diagnostics

	Procedure
Start	
Loop-Back Connector Diagnostics	Perform the loop-back test in the following procedures; *Set the transferring rate (9600 bps) *Set the transferring system (8 bits, none parity, and 1 stop bit). *Transmit the data. *Receive the data. *Is the received data equal to the transmitted data? *Check that no frame error, overrun error, time-out error parity error have occurred.
End	

6.4.7 Printer Port Diagnostics

	Procedure
Start	
Loop-Back Connector Diagnostics	Perform the loop-back in the following procedure: *Confirm that the initialization has been carried out properly. *Transmit the data. *Receive the data. *Is the received data equal to the transmitted data? *Check that no I/O error, time-out error have occurred.
End	

6.5 Power on Selftest Error Codes

V86P POST ERROR CODE:

POST CODE TEST --------I/O Port 80H

POST 1	PROCESSOR TEST 1: PROCESSOR STATUS VERIFICATION CONTINUE TEST IF OK.
POST 2	PROCESSOR TEST 2: READ/WRITE/VERIFY ALL REGISTERS.
POST 3	INITIALIZE 82C100
POST 4	INITIALIZE 82C425
POST 5	INITIALIZE 82C601
POST 6	INITIALIZE CHIPS (DMA, 8259) DISABLE COLOR AND MONO VIDEO, PARITY CIRCUIT, DMA
POST 9	CHECKSUM THE ROM - 32K BYTES
POST 10	TEST FONT SRAM
POST 14	INITIALIZE REAL TIME CLOCK
POST 15	TEST COMS CHECKSUM
POST 21	TEST FIRST 64K MEMORY BANK
POST 22	SETUP INTERRUPT TABLE IN FIRST 64K
POST 23	SETUP VIDEO I/O OPERATION
POST 24	TEST VIDEO MEMORY
POST 25	TEST 8259 MASK BITS -CHANNEL 1
POST 28	TEST COMS CHECKSUM FLAG
POST 29	CLEAR MEMORY SIZE
POST 30	SIZING SYSTEM MEMORY
POST 31	TEST BASE MEMORY 64K TO TOP OF MEMORY
POST 32	TEST STUCK 8259'S INTERRUPT BITS
POST 34	TEST 8259 INTERRUPT FUNCTIONALITY
POST 35	SIZING EXPANSION MEMORY SYSTEM
POST 36	SETTING EXPANSION MEMORY SYSTEM
POST 37	SETTING COM/PRN PORT
POST 42	KEYBOARD ENABLE AND TEST SETUP HARDWARE INTERRUPT TABLE
POST 43	TEST AND INITIALIZE FLOPPY CONTROLLER
POST 44	TEST PARALLEL PORT TEST SERIAL PORT TEST GAME PORT
POST 47	CHECK 8087 INSTALLATION
POST 49	SCAN EXTERNAL BIOS AND EXECUTE IT
POST FF	INT 19 BOOT ATTEMPT

6.6 Tools and test equipment

The following special items are required.
For Diagnostics Test:
(1) Loopback Adapter (For Serial Port Test)
Interconnect the 9-Pin, female, D-shell connector

Pin No.		Pin No.
Carrier Detect	1 - 5	Signal Ground
Received Data	2 - 3	Transmitted data
Data Set Ready	6 - 4	Data Terminal Ready
Request to Send	7 - 8	Clear to Send

(2) Loopback Adapter (For Parallel Port Test)
Interconnect 25-Pin, male, D-shell connector as shown below.

Pin No.	Pin No.
1 -	13
2 -	15
10 -	16
11 -	17
12 -	14

For Assembly/Disassembly
(1) 5.5mm Nut Driver
(2) "+" Screw Driver

7 VOLTAGE ADAPTER

7.1 Specifications

The adapter is a full range AC input adapter which operates from 90VAC to 270VAC, 50/60Hz, so it is universal for all the countries. The brief specifications are listed as follows:

Input Characteristics

Input voltage	90VAC - 270VAC
Input frequency	47 Hz to 63 Hz
Input current	1.2A (RMS) max for 115VAC 0.6A (RMS) max for 230VAC

Output Characteristics (Voltage Va)

Output Voltage	5.6VDC+3/-6%
Load current range	0A to 3A
Ripple & noise	200 mVp-p

(Voltage Vb)

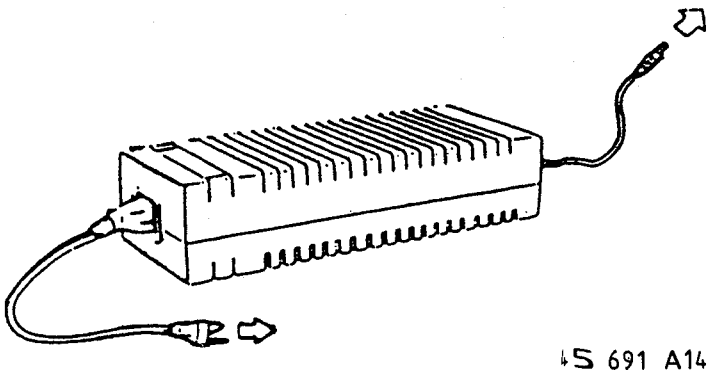
Output voltage	6.1VDC+-5%
Load current range	0A to 1.2A

(Voltage POK)

Output voltage	7.15VDC-7.65VDC
Load current range	0A to 50mA

Adapter DC-cord Pin Assignment

Pin No.	Output
1.	Va
2.	Vb
3.	POK
The outer shell = GND	



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Fig. 7.1

7.2 Parts list

4822 212 60021	Complete assy
4822 432 40032	Lower cabinet
4822 432 40033	Top cabinet
4822 321 61342	DC power cable
5322 321 14018	Mains cable (Euro)
4822 321 10713	Mains cable (UK)
4822 321 10712	Mains cable (Swiss)

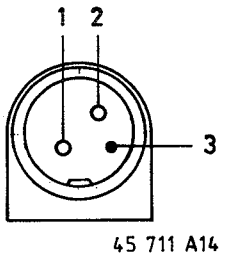


Fig. 7-2

8 CIRCUIT BOARD ASSEMBLIES (CBA)

8.1 Main Board

8.1.1. Main board assembly

The Main Board consists of the following systems:

CPU (Central Processing Unit)

System Logic (HT-21)

ROM (Read only Memory) BIOS

RAM (Random Access Memory)

Real Time Clock Generator (DS-1287)

Keyboard Controller & Encoder (8042 & 80C51)

LCD/CRT Controller Interface (CL-GD 610, 620)

Parallel Port & Serial Port Interface (82C601)

Floppy Disk Interface (8473)

The 80386SX is used for the system CPU (32 bit microprocessor) and the CPU clock frequency can be switched for low speed operation from the standard 16 MHz to 8 MHz. The ROM BIOS consists of one 128K x 8 bit EPROM module.

The standard RAM is factory installed 1 MB.

The Liquid Crystal Display (LCD) controller is compatible with programs that use the IBM Video Graphics Array.

The floppy disk controller provided with two floppy disk drives through an internal FDD interface and the other external FDD interface.

The system has a built-in hard disk with a capacity of 40 Megabytes (MB), and average access time is 29ms.

8.1.2 Connector pin assignment

J1 25-Pin Female Connector for EXT. FDD

Pin No.	Signal	Pin No.	Singal
1.	GND	14.	-RWC
2.	-IDX	15.	-HS
3.	TR00	16.	-DIRC
4.	-WP	17.	-STEP
5.	-RD	18.	GND
6.	-DCH	19.	GND
7.	+5V	20.	GND
8.	+5V	21.	GND
9.	+5V	22.	GND
10.	-DS2	23.	GND
11.	-MO2	24.	GND
12.	-WD	25.	GND
13.	-WGATE		

CN1 15-Pin Female Connector for CRT

Pin No.	Signal	Pin No.	Signal
1.	IOR	9.	NC
2.	IOG	10.	GND
3.	IOB	11.	MS0
4.	MS2	12.	MS1
5.	GND	13.	BHSYNC
6.	GND	14.	BVSYNC
7.	GND	15.	NC
8.	GND		

CN2 96-Pin Connector for EXT. Bus

Pin No.	Signal	Pin No.	Signal
1.	GND	28.	BALE
2.	RESETDRV	29.	+5V
3.	+5V	30.	OSC
4.	IRQ3	31.	GND
5.	NC	32.	-IOCHCK
6.	DRQ2	33.	SD7
7.	+5V	34.	SD6
8.	-OWS	35.	SD5
9.	+5V	36.	SD4
10.	GND	37.	SD3
11.	-SMEMW	38.	SD2
12.	-SMEMR	39.	SD1
13.	-IOW	40.	SD0
14.	-IOR	41.	IOCHRDY
15.	-DACK3	42.	AEN
16.	DRQ3	43.	SA19
17.	-DACK1	44.	SA18
18.	DRQ1	45.	SA17
19.	-REF	46.	SA16
20.	SYSCLK	47.	SA15
21.	IRQ7	48.	SA14
22.	IRQ6	49.	SA13
23.	IRQ5	50.	SA12
24.	IRQ4	51.	SA11
25.	IRQ3	52.	SA10
26.	-DACK2	53.	SA9
27.	TC	54.	SA8
55.	SA7	76.	-DACK7
56.	SA6	77.	DRQ7
57.	SA5	78.	-MASTER
58.	SA4	79.	-SBHE
59.	SA3	80.	LA23
60.	SA2	81.	LA22
61.	SA1	82.	LA21
62.	SA0	83.	LA20
63.	-MEMCS16	84.	LA19
64.	-IOCS16	85.	LA18
65.	IRQ10	86.	LA17
66.	IRQ11	87.	-MEMR
67.	IRQ12	88.	-MEMW
68.	IRQ15	89.	SD8
69.	IRQ14	90.	SD9
70.	-DACK0	91.	SD10
71.	DRQ0	92.	SD11
72.	-DACK5	93.	SD12
73.	DRQ5	94.	SD13
74.	-DACK6	95.	SD15
75.	DRQ6	96.	SD16

CN3 9-Pin Male Connector for CDM Port

Pin No.	Signal	Pin No.	Signal
1.	DCD	6.	DSR
2.	RXD	7.	RTS
3.	TXD	8.	CTS
4.	DTR	9.	RI
5.	GND		

CN4 25-Pin Female Connector for Parallel

Pin No.	Signal	Pin No.	Signal
1.	-STROBE	14.	-AUTOFD
2.	PD0	15.	-PTRERR
3.	PD1	16.	-INIT
4.	PD2	17.	-SLCTIN
5.	PD3	18.	GND
6.	PD4	19.	GND
7.	PD5	20.	GND
8.	PD6	21.	GND
9.	PD7	22.	GND
10.	-ACK	23.	GND
11.	PTRBUSY	24.	GND
12.	PE	25.	GND
13.	SLCT		

CN5 20-Pin Flexible Flat Circuit Connector for LCD Assembly

Pin No.	Signal	Pin No.	Signal
1.	VDD	11.	UD0
2.	GND	12.	UD1
3.	VEE	13.	UD2
4.	LC	14.	UD3
5.	LMDD	15.	LD0
6.	NC	16.	LD1
7.	LC	17.	LD2
8.	FLM	18.	LD3
9.	SH	19.	+5V
10.	NC	20.	NC

CN8 40-Pin Housing RAM Module

Pin No.	Signal	Pin No.	Signal
1.	-CASL3	21.	MA4
2.	+5V	22.	D11
3.	-CASL3	23.	MA5
4.	-CASH3	24.	D10
5.	D0	25.	D3
6.	-CASH3	26.	GND
7.	MA0	27.	MA6
8.	GND	28.	D9
9.	MA1	29.	MA7
10.	D15	30.	D8
11.	D1	31.	D4
12.	D14	32.	-RAS3
13.	MA2	33.	MA8
14.	-RAS3	34.	D7
15.	MA3	35.	MA9
16.	D13	36.	D6
17.	D2	37.	D5
18.	D12	38.	-RMWE
19.	GND	39.	+5V
20.	GND	40.	+5V

CN6 44-Pin header for HDD Assembly

Pin No.	Signal	Pin No.	Signal
1.	-RESET8	23.	-IOW
2.	GND	24.	-IOR
3.	IDED7	25.	-IOR
4.	SD8	26.	GND
5.	SD6	27.	NC
6.	SD9	28.	NC
7.	SD5	29.	NC
8.	SD10	30.	GND
9.	SD4	31.	IRQ14
10.	SD11	32.	-IOCS16
11.	SD3	33.	SA1
12.	SD12	34.	NC
13.	SD2	35.	SA0
14.	SD13	36.	SA2
15.	SD1	37.	-HDCS
16.	SD14	38.	CS1
17.	SD0	39.	-ACTIVE
18.	SD15	40.	GND
19.	GND	41.	+5V
20.	NC	42.	+5V
21.	NC	43.	GND
22.	GND	44.	+5V

CN7 40-Pin Housing RAM Module

Pin No.	Signal	Pin No.	Signal
1.	-CASL2	21.	MA4
2.	+5V	22.	D11
3.	-CASL2	23.	MA5
4.	-CASH2	24.	D10
5.	D0	25.	D3
6.	-CASH2	26.	GND
7.	MA0	27.	MA6
8.	GND	28.	D9
9.	MA1	29.	MA7
10.	D15	30.	D8
11.	D1	31.	D4
12.	D14	32.	-RAS2
13.	MA2	33.	MA8
14.	-RAS2	34.	D7
15.	MA3	35.	MA9
16.	D13	36.	D6
17.	D2	37.	D5
18.	D12	38.	-RMWE
19.	GND	39.	+5V
20.	GND	40.	+5V

CN9 20-Pin Header for Power Board

Pin No.	Signal	Pin No.	Signal
1.	+5V	11.	GND
2.	+5V	12.	-FDDLED
3.	+5V	13.	GND
4.	+5V	14.	-HDDLED
5.	NC	15.	GND
6.	NC	16.	BEEP
7.	VEE	17.	GND
8.	CONTRAST	18.	LCDPWREN
9.	VDD	19.	GND
10.	BRIGHT	20.	LCDE

CN10 22-Pin Flexible Flat Circuit Connector for Keyboard Assembly

Pin No.	Signal	Pin No.	Signal
1.	+5V	12.	MY1
2.	-STRAPEN	13.	MY2
3.	MX7	14.	MY3
4.	MX6	15.	MY4
5.	MX5	16.	MY5
6.	MX4	17.	MY6
7.	MX3	18.	MY7
8.	MX2	19.	MY8
9.	MX1	20.	MY9
10.	MX0	21.	MY10
11.	MY0	22.	MY11

CN11 20-Pin Flexible Flat Circuit Connector for FDD Assembly

Pin No.	Signal	Pin No.	Signal
1.	-STEP	11.	-WD
2.	+5V	12.	GND
3.	-IDX	13.	-FWE
4.	+5V	14.	GND
5.	GND	15.	-RDD
6.	DS1	16.	GND
7.	NC	17.	-TR00
8.	M01	18.	-WP
9.	DIRC	19.	-HS
10.	GND	20.	-DCH

CN12 16-Pin Housing for Power Board

Pin No.	Signal	Pin No.	Signal
1.	PCUD0	9.	PCUD4
2.	-H0STWR	10.	-KIVRAM
3.	PCUD1	11.	PCUD5
4.	-HDSTRD	12.	NC
5.	PCUD2	13.	PCUD6
6.	-PCUINT	14.	-PDS
7.	PCUD3	15.	PCUD7
8.	PWRG00D	16.	NC

CN13 6-Pin Mini-DIN Connector for PS/2 Mouse

Pin No.	Signal	Pin No.	Signal
1.	MDATA	4.	+5V
2.	NC	5.	MCLOCK
3.	GND	6.	NC

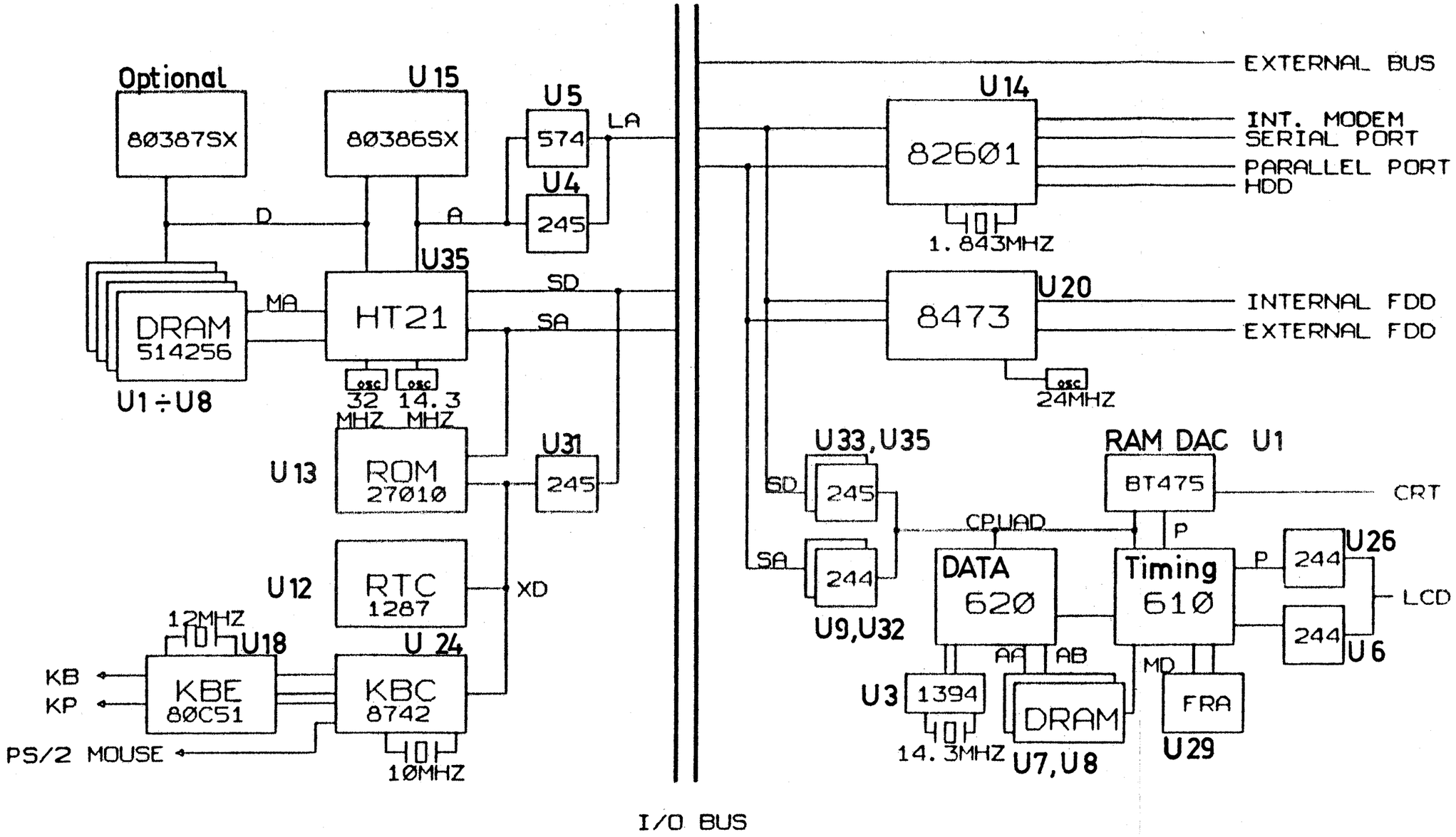
CN14 6-Pin Mini-Din Connector for EXT. Keyboard/Keypad

Pin No.	Signal	Pin No.	Signal
1.	KPDATA	4.	+5V
2.	NC	5.	KPCLK
3.	GND	6.	NC

CN15 20-Pin Header for Int. Modem

Pjin No.	Signal	Pin No.	Signal
1.	-DCD2	11.	-RTS2
2.	GND	12.	NC
3.	RXD2	13.	-CTS2
4.	SPK2	14.	NC
5.	TXD2	15.	-RI2
6.	NC	16.	NC
7.	-DTR2	17.	NC
8.	GND	18.	+5V
9.	-DSR2	19.	NC
10.	GND	20.	GND

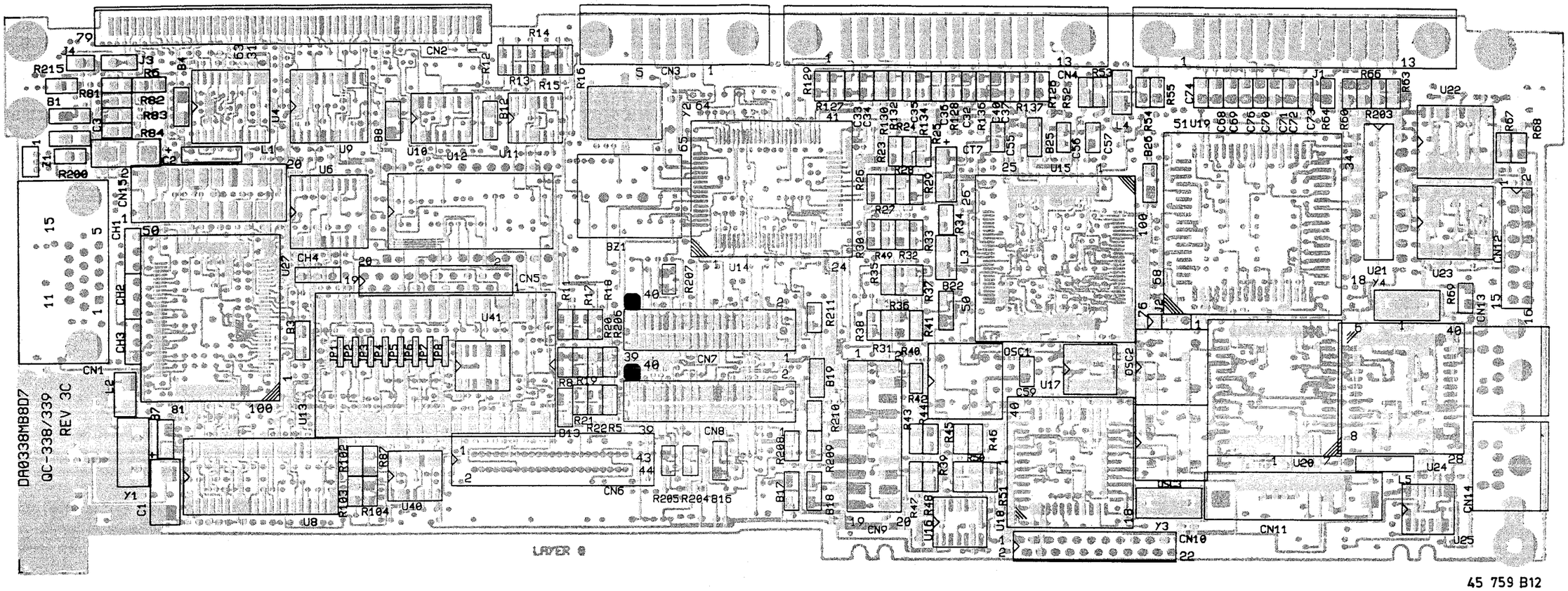
8.1.3 Block diagram



45 771 A12

8.1.4 CBA component layout

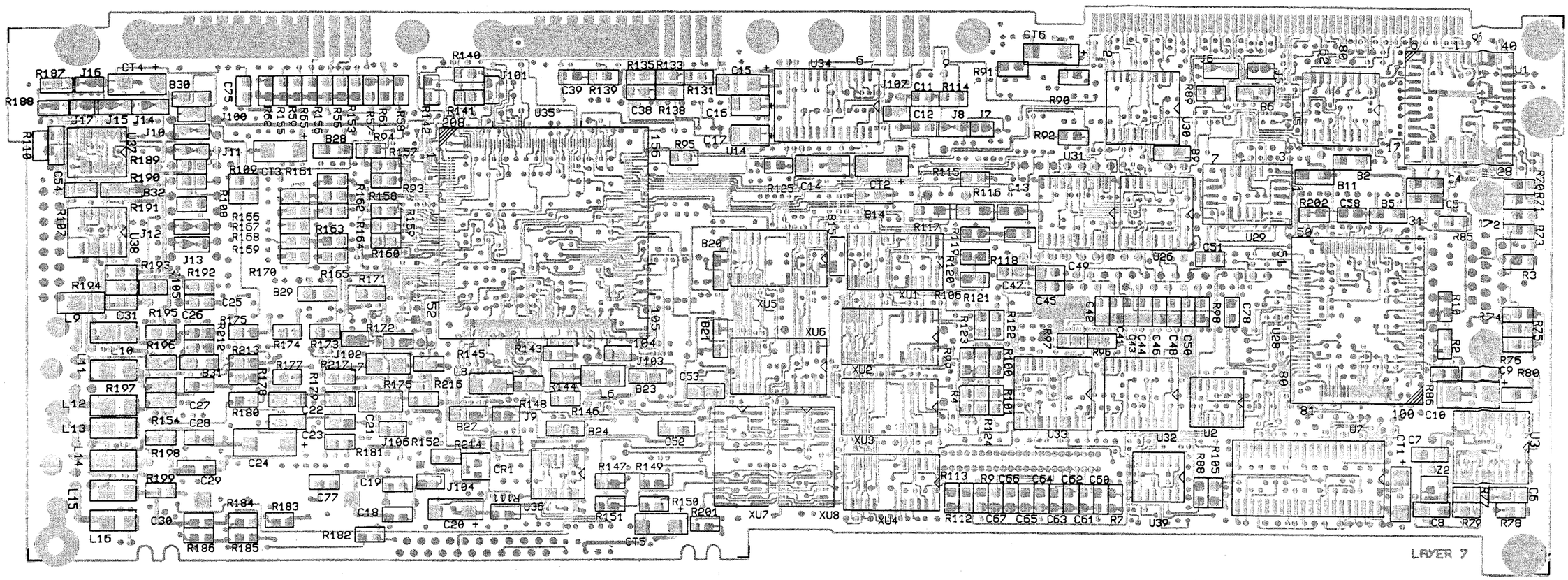
1. Top side



45 759 B12

COMPONENT SIDE

2. Bottom side



45 760 B12

SOLDER SIDE

PROCESSOR SECTION

CPU

U15
80386SX

VCC PIN
8,9,10,21,32,39,42
48,57,69,71,84
91,97

GND PIN
2,5,11,12,13,14
22,35,41,49,50,63
67,68,77,78,85,98

RESETCPU 33 RESET
PROCCLK 15 CLK2
-NA 6 -NA
CPUHRQO 4 HOLD
-BUSY386 34 -BUSY
-READY 7 -READY
INTR 40 INTR
CPUNMI 38 NMI
36 -ERROR
PEREQ 37 PEREQ

R57 1K
R33 1K
R52 1K

R161 10K

-BHE 19
-ADS 16
W/R 25
D/C 24
M/IO 23
-LOCK 26
HLDA 3
-BLE 17
A1 18
A2 51
A3 52
A4 53
A5 54
A6 55
A7 56
A8 58
A9 59
A10 60
A11 61
A12 62
A13 64
A14 65
A15 66
A16 70
A17 72
A18 73
A19 74
A20 75
A21 76
A22 79
A23 80

MIO
-WR
-ADS
-BHE
-DC
HLDA
A0
CPUA20

D0 1 D0
D1 100 D1
D2 99 D2
D3 96 D3
D4 95 D4
D5 94 D5
D6 93 D6
D7 92 D7
D8 90 D8
D9 89 D9
D10 88 D10
D11 87 D11
D12 86 D12
D13 83 D13
D14 82 D14
D15 81 D15

+5
R122 10K D8
R121 10K D9
R60 10K D10
R166 10K D11
R118 10K D12
R119 10K D13
R120 10K D14
R170 10K D15

R55 10K D7
R172 10K D6
R124 10K D5
R164 10K D4
R165 10K D3
R169 10K D2
R167 10K D1

+5
R29 10K -DC
R191 10K -BHE
R61 10K -WR
R58 10K -ADS
R168 10K D0

CO-PROCESSOR (optional)

U19
80387SX

VCC PIN=
4,9,13,22
26,31,33
37,39,43
46,50,58
62,64

GND PIN=
5,14,21,25
27,32,34,38,42
55,60,61,63,66

PROCCLK 54 386CLK2
RESET387 51 RSTIN
-READY 49 -READY
47 -ADS
41 W/R
44 -NPS1
45 NPS2
48 -CMD
A23
A2

D15 11 D15
D14 12 D14
D13 15 D13
D12 16 D12
D11 30 D11
D10 29 D10
D9 28 D9
D8 24 D8
D7 2 D7
D6 3 D6
D5 6 D5
D4 7 D4
D3 8 D3
D2 23 D2
D1 20 D1
D0 19 D0

STEN 40
CKM 59

-READYO 57
PEREQ 56
-BUSY 36
-ERROR 35

387CK2 53
TI/HI 39
TI/HI 50

R62 10K
PROCCLK

+5
R190 10K
R189 10K
PEREQCOP
-BUSY
-ERROR

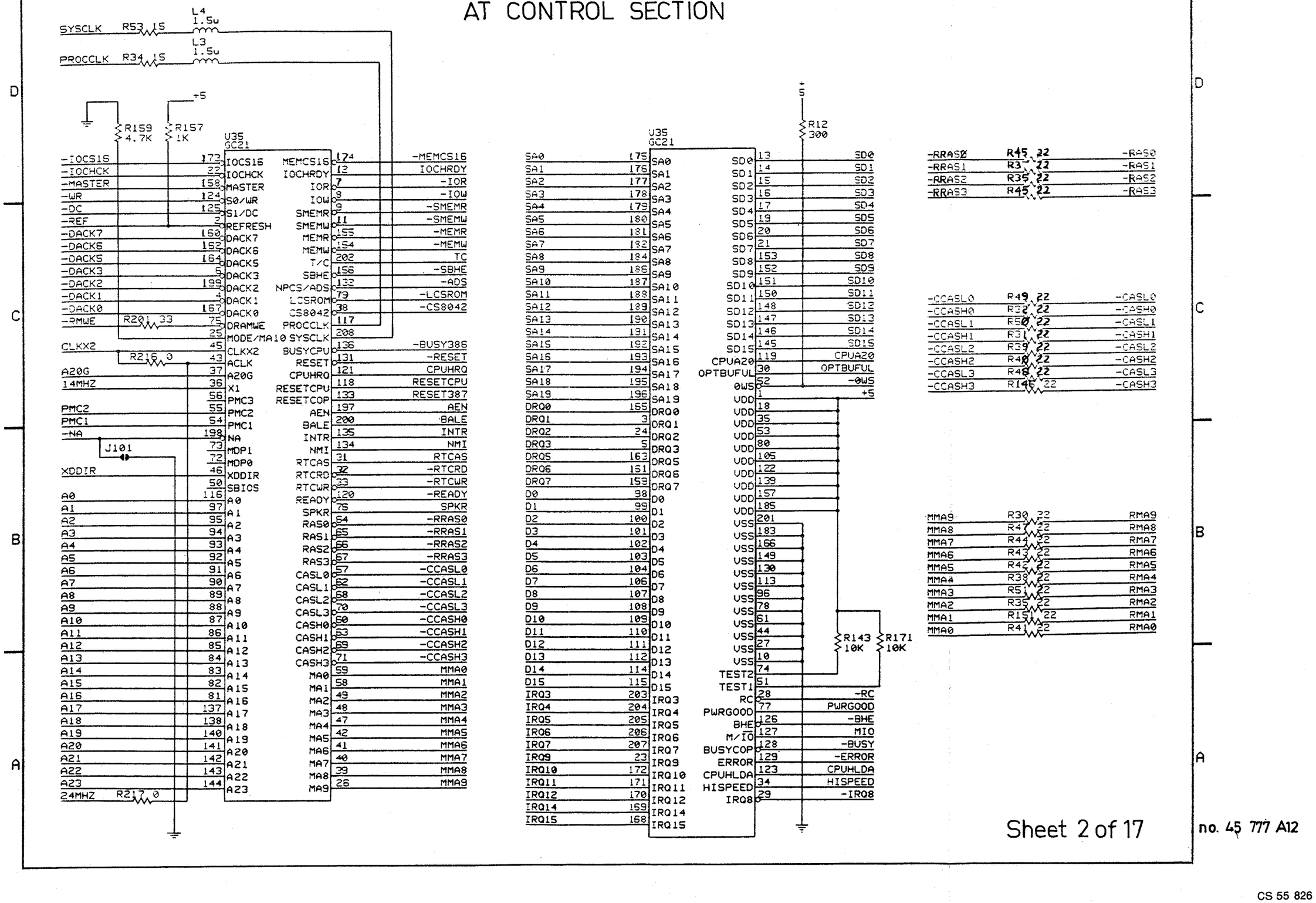
PEREQ J14 PMC2
HLDA J13 CPUHLDA
CPUHRQO J12 CPUHRQ
-BHE J11 -BHEO
PEREQCOP J10 PMC1
J100

A BUS [1-23]
D BUS [0-15]

Sheet 1 of 17

no. 45 776 A12

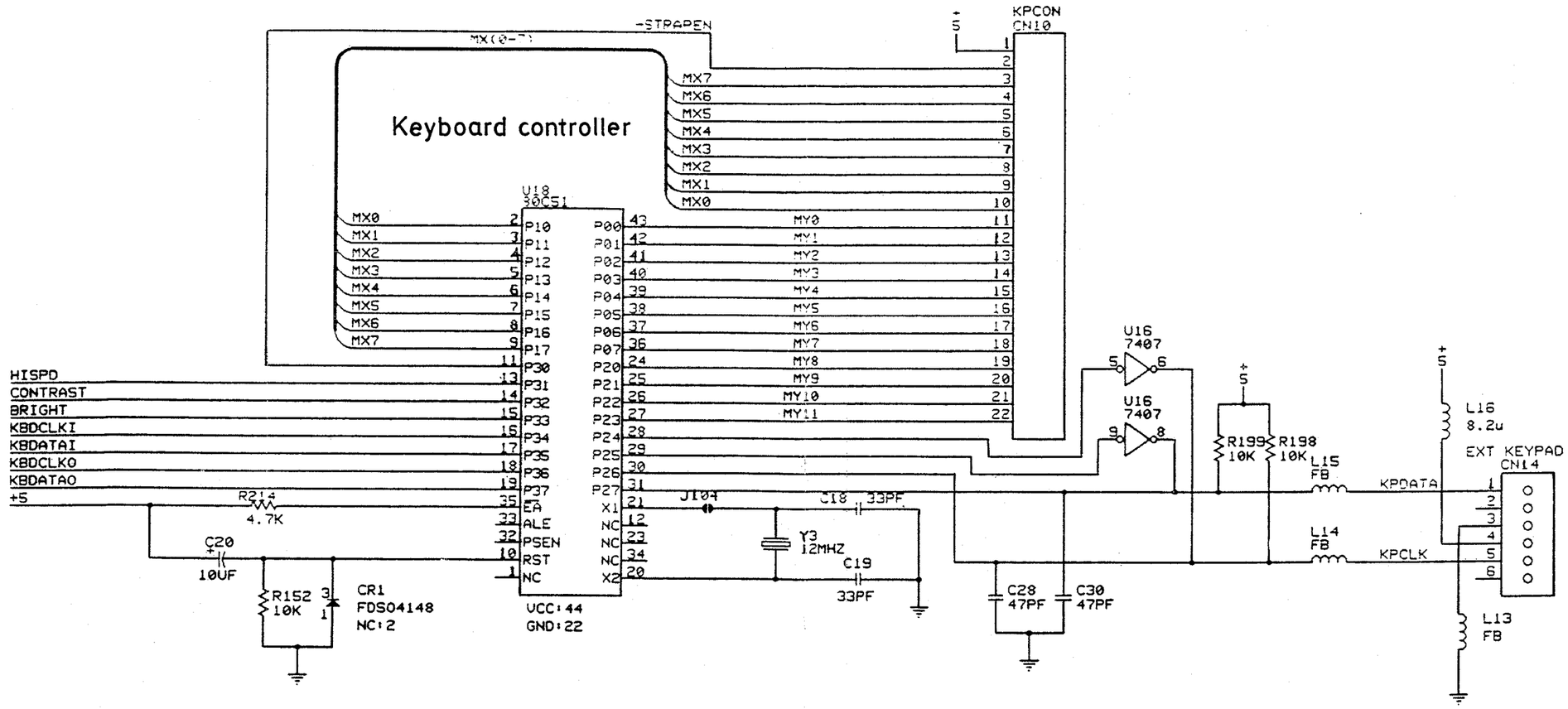
AT CONTROL SECTION



Sheet 2 of 17

no. 45 777 A12

KEYBOARD INTERFACE



I104 closed (default)

Sheet 3 of 17

no. 45 778 A12

KEYBOARD INTERFACE

Keyboard controller

U24 8742

R196 10K
R184 300
U25 7406
-RESET
KBDATAI
RESETDRV
-RC
A20G

C31 15PF
C25 15PF
Y4 10MHZ
R192 2M
R212 4.7K
J105

-IOR
-IOW
-CS8042
SA2
KBDCLKI

XD0
XD1
XD2
XD3
XD4
XD5
XD6
XD7
XD(0-7)

R213 330

GND:22
VCC:44

R194 10K
R69 0K
+5

R197 10K
R195 10K
MDATA
MCLOCK
L11 FB
L10 FB
L9 FB
L12 8.2u
C27 47PF
C26 47PF
CN13
PS/2 Mouse

U17 74AC04
KBDCLKO
KBDATAO

Interrupt

U38 74HC74
Keyboard
OPTBUFUL

PS/2 Mouse
IRQ12

U37 74HC32

I 105 closed (default)

Sheet 4 of 17

no. 45 779 A12

CS 55 828

VGA CONTROL SECTION

Graphics/ Attributes

U27 CL-GD610

U28 CL-GD620

Data controller

-MEMCS16

U2 74F04

-SELCRT

U2 74F04

-SELLCD

+5

-BLANK
SELLCD
SELCRT
LFS
P(0-7)
FRA(4-7)
P7
P6
P5
P4
P3
P2
P1
P0
VDCLK
LLCLK
MOD
-FROE
-FRCAS
-FRRAS
-FRWE
FRA7
FRA6
FRA5
FRA4
FRAD(0-3)
FRAD3
FRAD2
FRAD1
FRAD0
M1D(0-7)
M1D7
M1D6
M1D5
M1D4
M1D3
M1D2
M1D1
M1D0
M0D7
M0D6
M0D5
M0D4
M0D3
M0D2
M0D1
M0D0
-SBHE
MCLK
CPUAD(0-15)
M0D(0-7)
-CPUCYC

CURSOR BLANK GND FC1 FC0 LFS VCC P7/FEAT1 P6/FEAT0 P5 P4 P3 P2 P1 P0 VDCLK LLCLK MOD FROE FRCAS FRRAS FRWE FRA7 FRA6 FRA5 FRA4 FRAD3 FRAD2 FRAD1 FRAD0 GND M1D7 M1D6 M1D5 M1D4 M1D3 M1D2 M1D1 M1D0 GND NC SBHE

DE VSYNC M3D7 M3D6 M3D5 M3D4 M3D3 M3D2 M3D1 M3D0 GND M2D7 M2D6 M2D5 M2D4 M2D3 M2D2 M2D1 M2D0 GND CPUCYC LATCH VCC S/L- ITS MCLK AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15 GND MEMR IOWR IORD BALE RESET AEN

M3D7 M3D6 M3D5 M3D4 M3D3 M3D2 M3D1 M3D0

M2D7 M2D6 M2D5 M2D4 M2D3 M2D2 M2D1 M2D0

CPUAD0 CPUAD1 CPUAD2 CPUAD3 CPUAD4 CPUAD5 CPUAD6 CPUAD7 CPUAD8 CPUAD9 CPUAD10 CPUAD11 CPUAD12 CPUAD13 CPUAD14 CPUAD15

SENSE

MCS16 CPUCYC LATCH S/L- ITS MCLK AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15 GND MEMR MEMW IOWR IORD BALE RESET AEN INTERNAL CPWR CPRD CPURDY GND REFRESH SBHE CGSEL VCC M0D0 M0D1 M0D2 M0D3 M0D4 M0D5 M0D6 M0D7 CLKEXT CLK32 CLK28

+5

INTERNAL

GND A16 A17 A18 CS DSELL DSELH ASEL DIR CRTINT BIOSA13 BIOSA14 BIOSA15 BIOSEN DE HSYNC VSYNC BLANK CURSOR GND VCC AB0 AB1 AB2 AB3 AB4 AB5 AB6 AB7 AB8 AA0 AA1 AA2 VCC AA3 AA4 AA5 AA6 AA7 AA8 GND RAS3 RAS2 RAS1 RAS0 WE CAS GND OSC CLK25

AB0 AB1 AB2 AB3 AB4 AB5 AB6 AB7

AA0 AA1 AA2 AA3 AA4 AA5 AA6 AA7

M3D(0-7)
M2D(0-7)
AB(0-7)
AA(0-7)
SA16
SA17
SA18
SA19
-DSELL
-DSELH
-VASEL
VDIR
IRQ9
HSYNC
VSYNC
-BLANK
-OE16
R87 33 -UWE3
R88 33 -UWE2
R104 33 -UWE1
R105 33 -UWE0
R103 33 -URAS
R102 33 -UCAS
FOUT
FSEL0

Sheet 5 of 17

no 45 780 A12

LCD CRT BUFFER & DRIVER SECTION

Buffer

P(0-7)
SA(0-15)
SD(0-15)

U33 74HCT245

SD15	9	A8	B8	11	CPUAD15
SD14	8	A7	B7	12	CPUAD14
SD13	7	A6	B6	13	CPUAD13
SD12	6	A5	B5	14	CPUAD12
SD11	5	A4	B4	15	CPUAD11
SD10	4	A3	B3	16	CPUAD10
SD9	3	A2	B2	17	CPUAD9
SD8	2	A1	B1	18	CPUAD8
		A→B	EN	1	19

U9 74HCT244

SA10	17	2A4	2Y4	3	CPUAD10
SA12	15	2A3	2Y3	5	CPUAD12
SA14	13	2A2	2Y2	7	CPUAD14
SA15	11	2A1	2Y1	9	CPUAD15
SA13	8	1A4	1Y4	12	CPUAD13
SA11	6	1A3	1Y3	14	CPUAD11
SA9	4	1A2	1Y2	16	CPUAD9
SA8	2	1A1	1Y1	18	CPUAD8
		1G	2G	1	19

U30 74HCT245

SD7	9	A8	B8	11	CPUAD7
SD6	8	A7	B7	12	CPUAD6
SD5	7	A6	B6	13	CPUAD5
SD4	6	A5	B5	14	CPUAD4
SD3	5	A4	B4	15	CPUAD3
SD2	4	A3	B3	16	CPUAD2
SD1	3	A2	B2	17	CPUAD1
SD0	2	A1	B1	18	CPUAD0
		A→B	EN	1	19

U32 74HCT244

SA7	17	2A4	2Y4	3	CPUAD7
SA6	15	2A3	2Y3	5	CPUAD6
SA5	13	2A2	2Y2	7	CPUAD5
SA4	11	2A1	2Y1	9	CPUAD4
SA3	8	1A4	1Y4	12	CPUAD3
SA2	6	1A3	1Y3	14	CPUAD2
SA1	4	1A2	1Y2	16	CPUAD1
SA0	2	1A1	1Y1	18	CPUAD0
		1G	2G	1	19

VDIR
-DSELH
-VASEL
-DSELL
MOD
LFS
VDCLK
LLCLK
VSYNC
HSYNC

LCD driver

U26 74HCT244

P7	17	2A4	2Y4	3	UD3
P6	15	2A3	2Y3	5	UD2
P5	13	2A2	2Y2	7	UD1
P4	11	2A1	2Y1	9	UD0
P3	8	1A4	1Y4	12	LD3
P2	6	1A3	1Y3	14	LD2
P1	4	1A2	1Y2	16	LD1
P0	2	1A1	1Y1	18	LD0
		1G	2G	1	19

UD(0-3)
LD(0-3)

U2 74F04

U36 74HC08

				1	SELLCD
	2	1	3	2	VDD

CRT driver

U6 74HCT244

	17	2A4	2Y4	3	LMOD
	15	2A3	2Y3	5	FLM
	13	2A2	2Y2	7	SH
	11	2A1	2Y1	9	LC
	8	1A4	1Y4	12	BVSYNC
	6	1A3	1Y3	14	BHSYNC
-BLANK	4	1A2	1Y2	16	
	2	1A1	1Y1	18	-BBLANK
		1G	2G	1	19

R81 1K

-SELLCD
-SELCRT

CPUAD(0-15)

no 45 A12

CRT INTERFACE & LCD CONNECTION

Video RAM DAC

U1 AM81EC475

P(0-7) → P7 P6 P5 P4 P3 P2 P1 P0

U2 74F04

MCLK

-BBLANK

CPUAD(0-7) → CPUAD7 CPUAD6 CPUAD5 CPUAD4 CPUAD3 CPUAD2 CPUAD1 CPUAD0

-CPRD

-CPWR

INTERNAL

SA1

SA0

SELLCD

SENSE

MS2

MS0

MS1

BHSYNC

BUSYNC

R215 4.7K

CLOCK SYNC BLANK D7 D6 D5 D4 D3 D2 D1 D0 RD WR RS2 RS1 RS0 SETUP NC/SLEEP

GND GND

OL3 OL2 OL1 OL0

VAA VAA VAA VAA

VREF OPA COMP IREF

RED GREEN BLUE

L1 4.7UH

C3 .1u 1K C5 .1u C4 .1u C2 47u

R70 130 Z1 R82 75 R84 75 R83 75

R3 4.7K R73 4.7K

CH1 0.82u CH2 0.82u CH3 0.82u

CRT connector

CN1

LCD connector

CN5

UDD UEE LC LMOD FLM SH UD0 UD1 UD2 UD3 LD0 LD1 LD2 LD3

CH4 0.47u

+5 R98 10K

C41-C51 1000p x 10

C78 1000P

VGA clock generator

+5 R80 10 C9 .047u C10 47u

C7 .047u C1 47u Z2 4.3V R79 100 +5

Y1 14.318MHZ

VDD VDDA X1 X2 FOUT

FSEL0 FSEL1 FSEL2 FS0 FS1 FS2 FS3 STB EXT0 EXT1

OUT OP+ OP- OP0 VC0 CPS

GND GNDA

L2 2.2u R85 33 FOUT

R78 100K R77 330 C6 .047u C102 047u

ICS1394

U3

Sheet 7 of 17

no 45 782 A12

SPEED SELECT & BIOS SECTION

PCU decoder

U10 74HC138

+5
AEN
-GPCS
+5 R16 10K
-IOW
-IOR
SA0
-PCUWR
+5
R13 10K
R14 10K
R15 10K
-PCURD

HISPD J9 HISPEED
-RESET5
SD0
U11 74HC74
+5

Speed controller

BIOS

U13 27C010

+5 SA16 SA15 SA14 SA13 SA12 SA11 SA10 SA9 SA8 SA7 SA6 SA5 SA4 SA3 SA2 SA1 SA0 -MEMR -LCSROM +5
VPP A16 A15 A14 A13 A12 A11 A10 A9 A8 A7 A6 A5 A4 A3 A2 A1 A0 OE CE -PGM NC
O7 O6 O5 O4 O3 O2 O1 O0
+5 XD7 XD6 XD5 XD4 XD3 XD2 XD1 XD0

R8 10K CPUAD4
R7 10K CPUAD3
R76 10K MS0
R74 10K MS1
R72 10K MS2

R11 10K CPUAD5
R10 10K CPUAD6
R2 10K CPUAD7
R9 10K CPUAD8
R97 10K CPUAD9
R96 10K CPUAD10

MS0 R6 4.7K CPUAD0
MS1 R75 4.7K CPUAD1
MS2 R71 4.7K CPUAD2
+5 R4 10K CPUAD14
R5 10K CPUAD15

AA0..AA7

Video RAM

U8 511664

AA0 AA1 AA2 AA3 AA4 AA5 AA6 AA7
A0 A1 A2 A3 A4 A5 A6 A7
IO1 IO2 IO3 IO4 IO5 IO6 IO7 IO8
M0D0 M0D1 M0D2 M0D3 M0D4 M0D5 M0D6 M0D7

-UUWE1 -UUWE0
-LW -UW
IO9 IO10 IO11 IO12 IO13 IO14 IO15 IO16
M1D0 M1D1 M1D2 M1D3 M1D4 M1D5 M1D6 M1D7

-UURAS1 -UCAS -OOE15
-RAS -CAS -OE

+5
VCC VCC VCC GND 21 30,40

AB0..AB7

Video RAM

U7 511664

AB0 AB1 AB2 AB3 AB4 AB5 AB6 AB7
A0 A1 A2 A3 A4 A5 A6 A7
IO1 IO2 IO3 IO4 IO5 IO6 IO7 IO8
M2D0 M2D1 M2D2 M2D3 M2D4 M2D5 M2D6 M2D7

-UUWE3 -UUWE2
-LW -UW
IO9 IO10 IO11 IO12 IO13 IO14 IO15 IO16
M3D0 M3D1 M3D2 M3D3 M3D4 M3D5 M3D6 M3D7

-UURAS2 -UCAS -OOE16
-RAS -CAS -OE

+5
VCC VCC VCC GND 21 30,40

U29 4464

FRA7 FRA6 FRA5 FRA4 FRAD3 FRAD2 FRAD1 FRAD0
A7 A6 A5 A4 A3 A2 A1 A0
DQ4 DQ3 DQ2 DQ1
FRAD3 FRAD2 FRAD1 FRAD0

-FRRAS -FRCAS -FRWE -FROE
RAS CAS W G
R202 130
VCC 9 GND 18
CS8 47p

Frame buffer

Sheet 8 of 17

no 45 783 A12

CS 55 832

RTC & SYSTEM ADDRESS DRIVER/BUFFER SECTION

RTC

(DS1287/1187)

U12
MC146818

XD(0-7)

XD0 4 AD0
XD1 5 AD1
XD2 6 AD2
XD3 7 AD3
XD4 8 AD4
XD5 9 AD5
XD6 10 AD6
XD7 11 AD7

PWRGOOD 16 STB
RTCAS 14 AS
-RTCRD 17 DS
-RTCWR 15 R/W
1 MOT
13 CS

VDD 24
CKFS 20
PS 22
COUT 21
RESET 18 → -RESET
OSC2 3
OSC1 2
SQW 23
IRQ 19 → -IRQ8
GND 12

+5
R150
10K

Driver system address

U4
74HC245

A23	8 A7	B7 11	LA23
A22	7 A6	B6 12	LA22
A21	6 A5	B5 13	LA21
A20	5 A4	B4 14	LA20
A19	4 A3	B3 15	LA19
A18	3 A2	B2 16	LA18
A17	2 A1	B1 18	LA17

9 A8
A→B EN
1
19

-MASTER
J5 2
J6 2
J3 2
J4 2

XD Buffer

SD(0-7)

U31
74HC245

SD7	9 A8	B8 11	XD7
SD6	8 A7	B7 12	XD6
SD5	7 A6	B6 13	XD5
SD4	6 A5	B5 14	XD4
SD3	5 A4	B4 15	XD3
SD2	4 A3	B3 16	XD2
SD1	3 A2	B2 17	XD1
SD0	2 A1	B1 18	XD0

A→B EN
1
19

XDDIR

System clock

OSC2
OUT 5
32MHZ
J102
L7 0.82u
15 R145
CLKX2

Timer clock

OSC1
OUT 5
14.3MHZ
J103
L6 FB
15 R144
14MHZ

U17
74AC04
13 12
L8 2.2u
15 R148 OSC

default

I 3 open
I 4 closed
I 5 closed
I 6 open
I 102 closed
I 103 closed

Local address buffer

A(17-23)

U5
74ACT574

A23	8 7D	8Q 12	LA23
A22	7 6D	7Q 13	LA22
A21	6 5D	6Q 14	LA21
A20	5 4D	5Q 15	LA20
A19	4 3D	4Q 16	LA19
A18	3 2D	3Q 17	LA18
A17	2 1D	2Q 18	LA17
		1Q 19	

CK OE
1 1
-ADS

LA(17-23)

+5
R185
10K

U25
7406
-MASTER 3 4

Sheet 9 of 17

no 45 784 A12

FDD & HDD CIRCUITY

FDD controller

U20 DP8473

FDD connector

CN11

HDD connector (IDE)

CN5

CN16

U36 74HC08

U17 74AC04

U37 74HC32

U16 7407

default

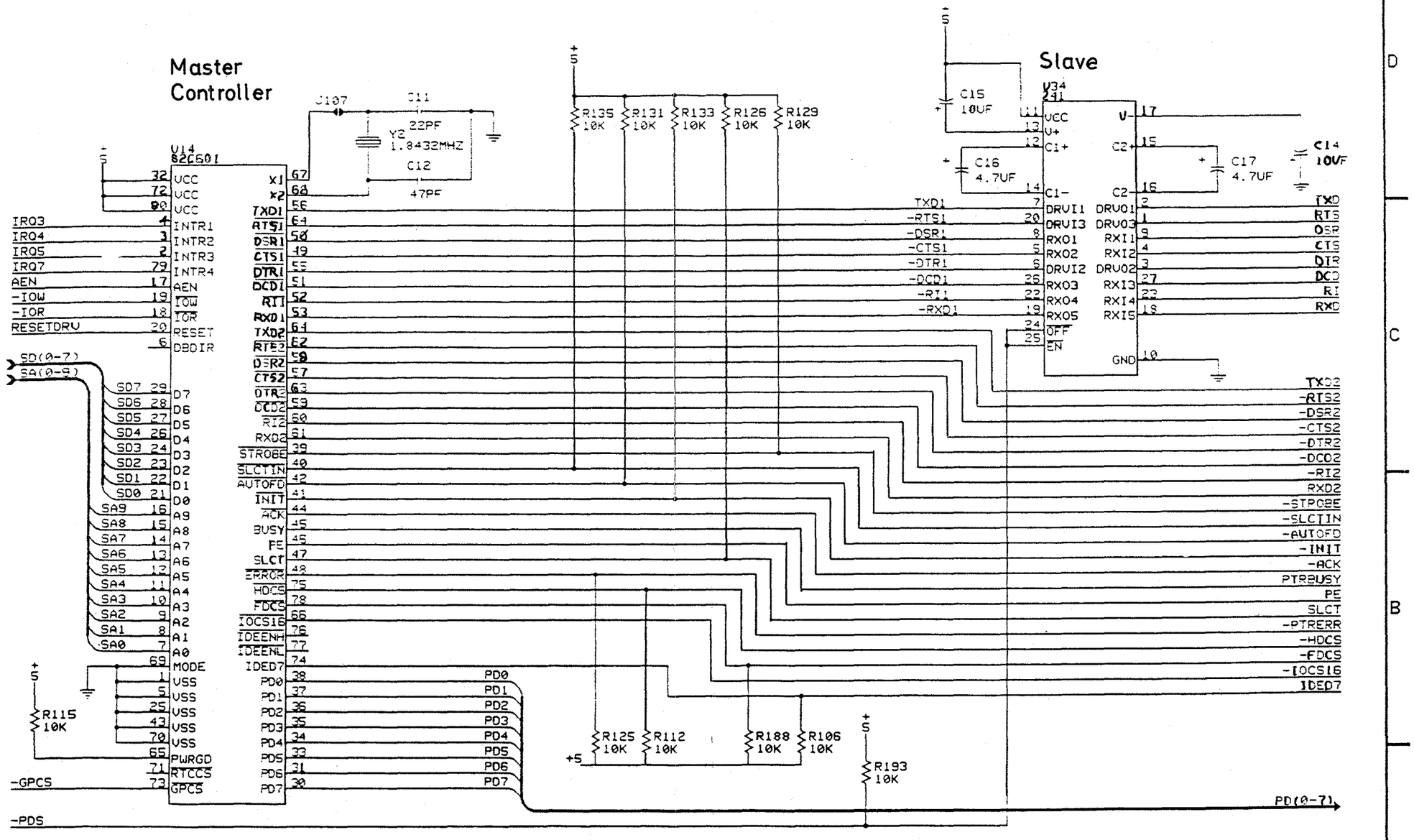
I 15 closed

I 16 open

I 106 closed

Sheet 10 of 17

RS-232 (SERIAL) & PARALLEL PRINTER



I 107 closed (default)

Sheet 11 of 17

no 45 786 A12

POWER BOARD CONNECTOR CIRCUITRY

PB connector

CN9

UEE
UDD

SELLCD select LCD

U36 74HC08
LCDE
LCDPWREN

BEEP - from PCU

-HDDLED
-FDDLED

SPKR
system

U25 7406
U2 74F04
U16 7407
68 R116 1/4W
68 R117 1/4W
R150 51K
SPK1
C13 01UF

SPK2
modem

Buzzer circuitry

NMI

Buffer (write to PCU)

U22 74HC374

SD7 SD6 SD5 SD4 SD3 SD2 SD1 SD0
PCUD7 PCUD6 PCUD5 PCUD4 PCUD3 PCUD2 PCUD1 PCUD0

PB connector

CN12

PCUD0 PCUD1 PCUD2 PCUD3 PCUD4 PCUD5 PCUD6 PCUD7
-HOSTWR
-HOSTRD
-PCUINT
PWRGOOD
-KIVRAM
-PDS
-PCUWR

Buffer (read from PCU)

U23 74HC374

PCUD0 PCUD1 PCUD2 PCUD3 PCUD4 PCUD5 PCUD6 PCUD7
SD0 SD1 SD2 SD3 SD4 SD5 SD6 SD7

U17 74AC04
U36 74HC08
-CPUCYC
U17 74AC04
OPTBUFUL
-PCURD
J7
IRQ10

J8
HOSTNMI
U37 74HC32
CPUNMI
R114 10K

J16
CONTRAST
BRIGHT
R187 10K

interrupt CPU

-HOSTRD
-PCUWR
U11 74HC74
-PCUINT
+5

Sheet 14 of 17

no 45 789 A12

CONNECTOR CIRCUITRY

-STROBE
PD(0-7)
R137 33
PD0 R130 33
PD1 R133 33
PD2 R134 33
PD3 R137 33
PD4 R138 33
PD5 R139 33
PD6 R125 33
PD7 R136 33
-ACK
PTRBUSY
PE
SLCT
C33 2200P
C34 2200P
C35 2200P
C36 2200P
C37 2200P
C38 2200P
C39 2200P
C32 2200P
C40 2200P

Parallel port
(COMPONENT) (SOLDER)
CN4 CN4
-AUTOFD
-PTRERR
-INIT
-SLCTIN

DTR
TXD
RXD
DCD

Serial port
(COMPONENT) (SOLDER)
CN3 CN3
RI
CTS
RTS
DSR

External FDD
J1 J1

-FWE
-WD
-MO2
-DS2
-DCH
-RDD
-WP
-TR00
-IDX
-STEP
-DIRC
-HS
-RWC

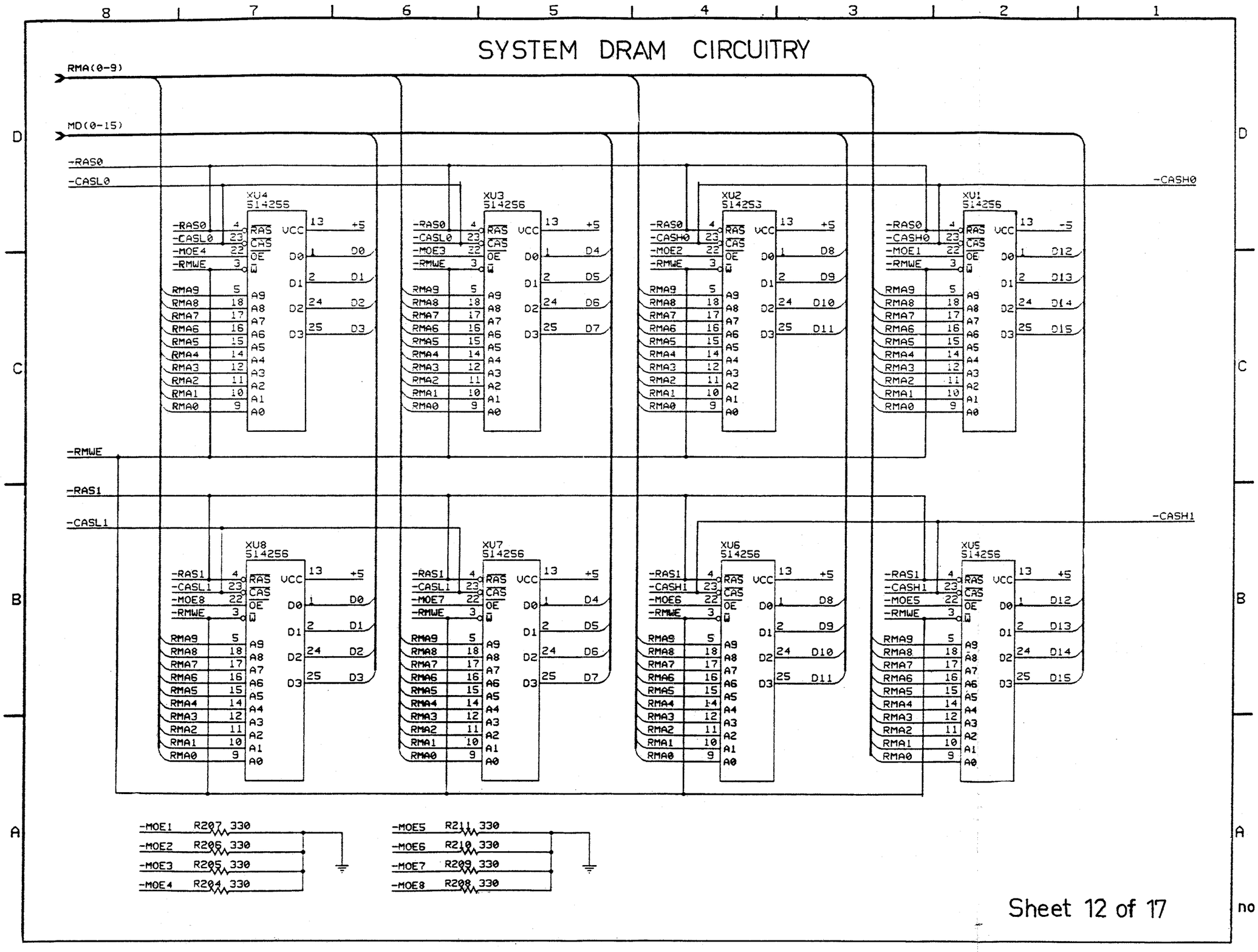
C68-C72 270P
C68 270P
C73 270P
C74
C74-C76 270P
EXTFDD
(COMPONENT) (SOLDER)

CN15 MODEM
-DCD2
RXD2
TXD2
-DTR2
-DSR2
-RTS2
-CTS2
-RI2
NC
NC
R85 1K
R68 10K
SPK2
NC

Sheet 15 of 17

no 45 790 A12

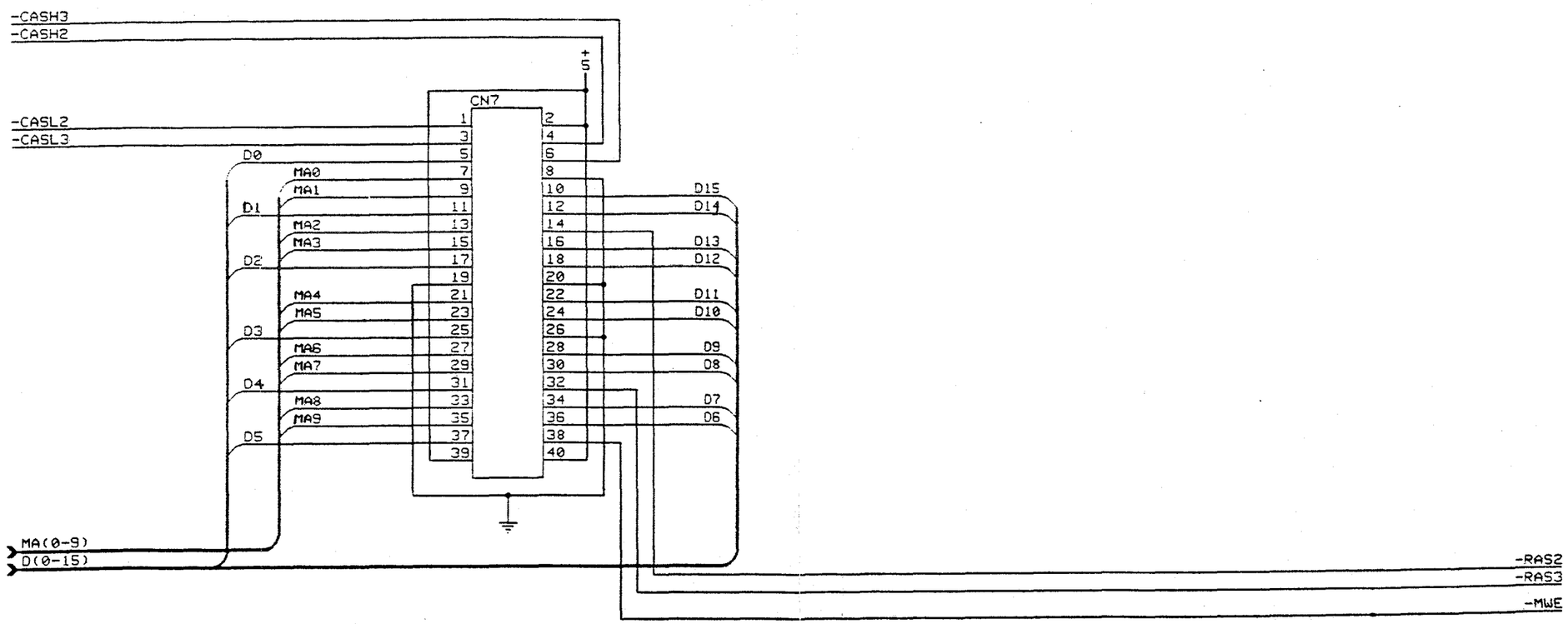
SYSTEM DRAM CIRCUITRY



Sheet 12 of 17

no 45 787 A12

EXPANSION SLOT CIRCUITRY



Sheet 13 of 17

no 45 788 A1Z

EXPANSION CONNECTOR CIRCUITRY

ISA BUS

+5

R23 300 · R22 300 · R136 300 · R91 300 · R90 1K · R95 1K · R25 1K

CN2

	1	32	-IOCHCK
RESETDRV	2	33	SD7
+5	3	34	SD6
IRQ9	4	35	SD5
	5	36	SD4
DRQ2	6	37	SD3
+5	7	38	SD2
-0WS	8	39	SD1
+5	9	40	SD0
	10	41	IOCHRDY
-SMEMW	11	42	AEN
-SMEMR	12	43	SA19
-IOW	13	44	SA18
-IOR	14	45	SA17
-DACK3	15	46	SA16
DRQ3	16	47	SA15
-DACK1	17	48	SA14
DRQ1	18	49	SA13
-REF	19 (R89 33)	50	SA12
SYSCLK	20	51	SA11
IRQ7	21	52	SA10
IRQ6	22	53	SA9
IRQ5	23	54	SA8
IRQ4	24	55	SA7
IRQ3	25	56	SA6
-DACK2	26	57	SA5
TC	27	58	SA4
BALE	28	59	SA3
+5	29	60	SA2
OSC	30	61	SA1
	31	62	SA0
-MEMCS16	63	80	LA23
-IOCS16	64	81	LA22
IRQ10	65	82	LA21
IRQ11	66	83	LA20
IRQ12	67	84	LA19
IRQ15	68	85	LA18
IRQ14	69	86	LA17
-DACK0	70	87	-MEMR
DRQ0	71	88	-MEMW
-DACK5	72	89	SD8
DRQ5	73	90	SD9
-DACK6	74	91	SD10
DRQ6	75	92	SD11
-DACK7	76	93	SD12
DRQ7	77	94	SD13
-MASTER	78	95	SD14
-SBHE	79	96	SD15

+5

IRQ3	R140 10K
IRQ4	R142 10K
IRQ5	R141 10K
IRQ6	R137 10K
IRQ7	R54 10K
IRQ9	R158 10K
IRQ10	R2 10K
IRQ11	R23 10K
IRQ12	R6 10K
IRQ14	R21 10K
IRQ15	R24 10K
BALE	R26 10K

+5

-SMEMW	R94 1K
-SMEMR	R93 1K
-IOW	R109 1K
-IOR	R110 1K

+5

SD7	R153 10K
SD6	R10 10K
SD5	R11 10K
SD4	R138 10K
SD3	R155 10K
SD2	R157 10K
SD1	R154 10K
SD0	R108 10K

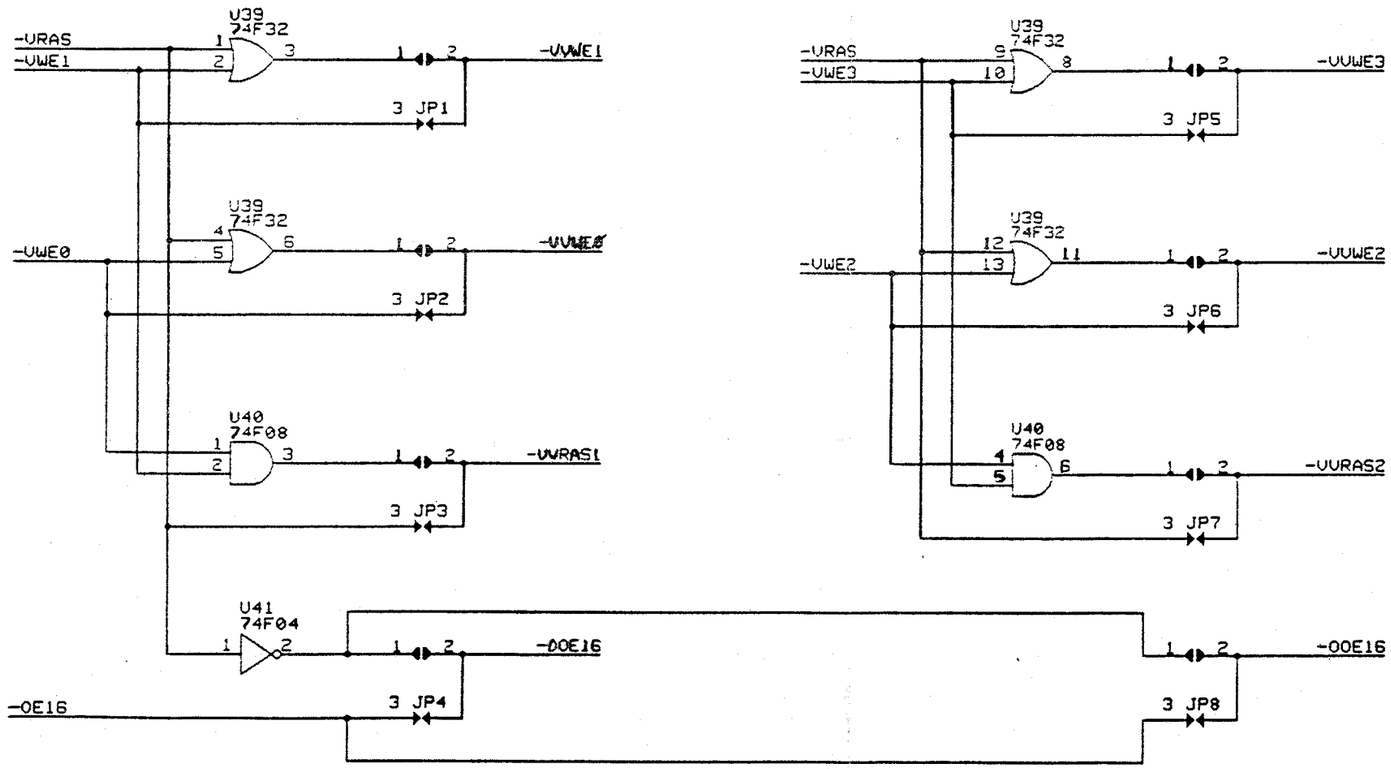
+5

SD15	R18 10K
SD14	R17 10K
SD13	R20 10K
SD12	R19 10K
SD11	R123 10K
SD10	R104 10K
SD9	R106 10K
SD8	R99 10K

Sheet 16 of 17

no 45 791 A12

VGA INTERFACE CIRCUITRY



o pin 1,2 short 2,3 open
* pin 2,3 short 1,2 open

JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	
*	*	*	*	*	*	*	*	610/620 Rev. C
o	o	o	o	o	o	o	o	610/620 Rev. B

Sheet 17 of 17

no 45 792 A12

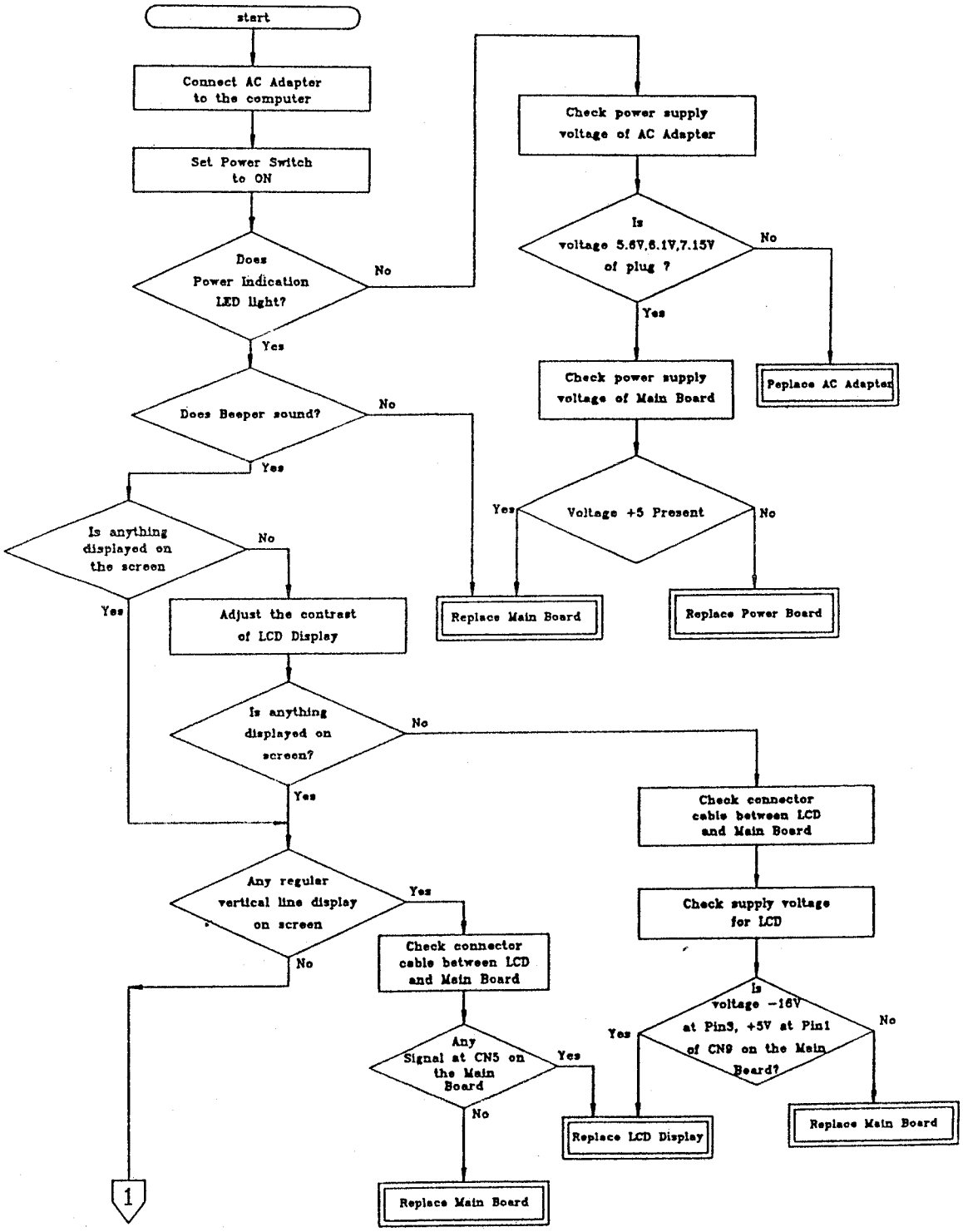
CS 55 841

8.1.6 Partslist Main board:

U3	4822 209 63325	CI-CD610-32QC-G
U-1	4822 209 63333	Kb/mouse ctrl 8042
U14	4822 209 63328	82C601
U15	4822 209 63324	HT 21
U20	4822 209 63329	80C286-12
U22	4822 209 63327	DP8473v
SPK1	4822 280 10243	Buzzer
U-RA	4822 212 60022	328 ram module
U-SY	4822 900 10203	Sys/rom module (338)
U-13	4822 209 63326	DS1287 (rtc)
U-19	4822 209 63332	Kb encoder 80C51
U-24	4822 209 63314	CI-CD620-32QC-C
CN9.10	4822 265 41088	Mini din 6p

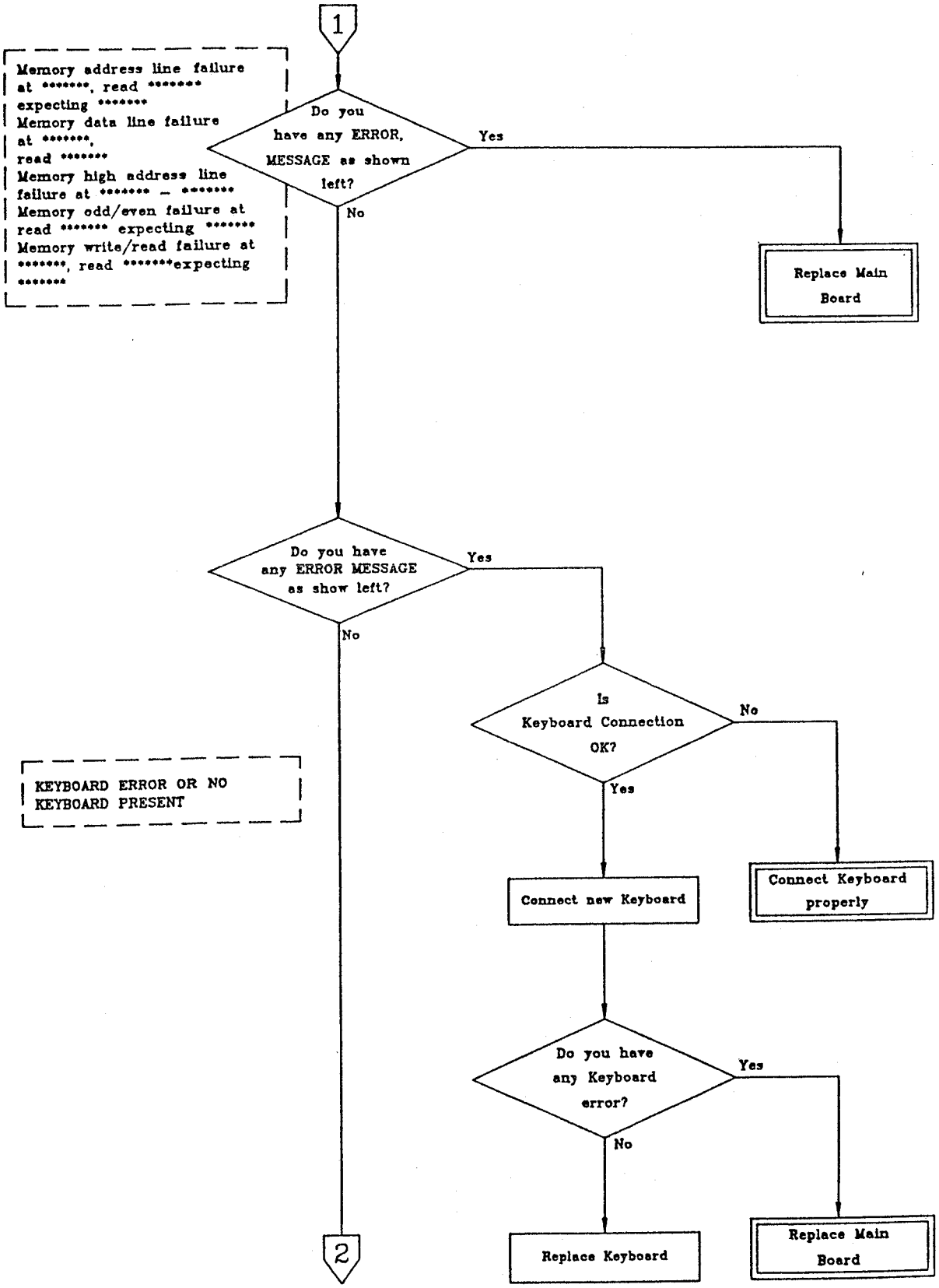
8.1.7. Troubleshoot flow chart

Troubleshooting Main Board



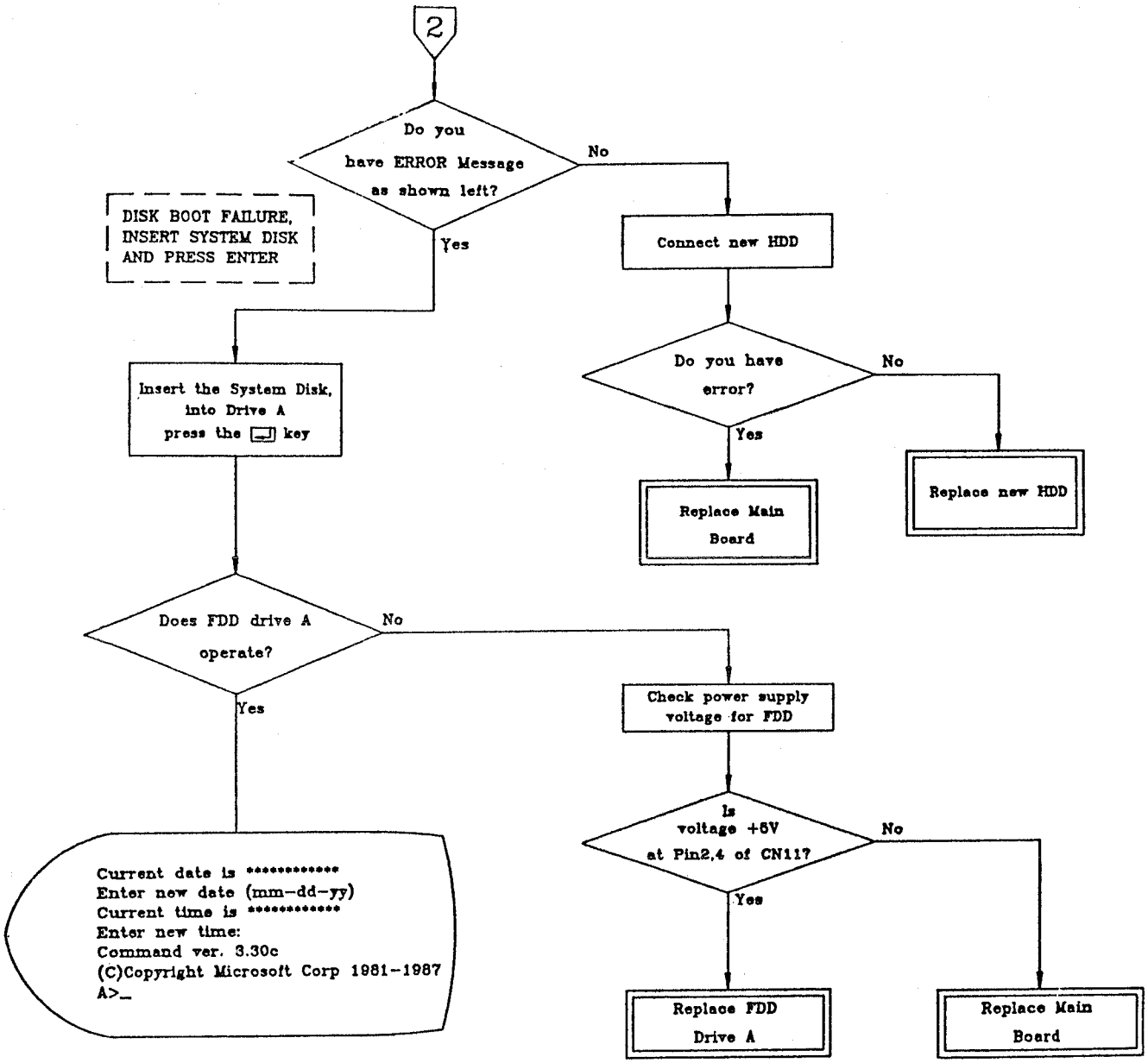
1

45 765 A12


1
Memory address line failure at *******, read ******* expecting *******
Memory data line failure at *******, read *******
Memory high address line failure at ******* – *******
Memory odd/even failure at read ******* expecting *******
Memory write/read failure at *******, read *******expecting *******
Do you have any ERROR, MESSAGE as shown left?
Yes
No
Replace Main Board
Do you have any ERROR MESSAGE as show left?
Yes
No
KEYBOARD ERROR OR NO KEYBOARD PRESENT
Is Keyboard Connection OK?
No
Yes
Connect Keyboard properly
Connect new Keyboard
Do you have any Keyboard error?
Yes
No
Replace Keyboard
Replace Main Board
2

2

45 766 A12


2
Do you have ERROR Message as shown left?
No
Yes
DISK BOOT FAILURE, INSERT SYSTEM DISK AND PRESS ENTER
Connect new HDD
Insert the System Disk, into Drive A press the ↵ key
Do you have error?
No
Yes
Replace Main Board
Replace new HDD
Does FDD drive A operate?
No
Yes
Check power supply voltage for FDD
Is voltage +5V at Pin2,4 of CN11?
No
Yes
Current date is **********
Enter new date (mm-dd-yy)
Current time is **********
Enter new time:
Command ver. 3.30c
(C)Copyright Microsoft Corp 1981-1987
A>_
Replace FDD Drive A
Replace Main Board

8.2 Power Board

8.2.1 Power Supply Assembly

The power supply consists of charge control circuit on the power board and some other control circuits on the main board. It receives power from adapter (5.6V, 6.1V, 7.15V)) or battery (4.8V nominal) and supplies power to:

(1) The main board (+5V, PG, BTW, BUP, LCDE)

(2) The LCD (VDD, VEE)

(3) The backlight (CCFT)

(4) Battery power indicator (PGR, PRD, CHRG, CHRG)

Please refer to the block diagram on the following page for the operation concept.

The power board consists of four blocks as follows:

1. **Charge control circuit**
   The power controller 87C51 can detect the battery whether charging is completed (charge LED off) by sensing the battery voltage. It is because, after battery is fully charged, further charging will cause the reduction of its voltage.

2. **Voltage detector**
   The 87C51 reads the voltage of main battery, +5V from ADC0833 and manages the power of the whole system.

a. When switch on the unit, firstly, it detects the input voltage is enough or not, the turn on the control circuit to generate 5V, send PG (POWER GOOD) signal for main board, and light up green power LED.
When the output voltage is lower than 4.6V, it will change to battery low mode. Under thismode, the buzzer will beep twice every 15 seconds. Upon using battery and the output voltage being lower than 4.5V, it will change to battery warning mode, the buzzer will beep four times every 10 seconds.

3. **Power supply circuit**
   The transformer can transform the input voltage 5.0V to 15V, which supports the MOSFET as bias voltage. The output MOSFET is regulated to 5V.

4. **Power supply of LCD circuit**
   It generates VDD and VEE for LCD when the signal LCDE is high. The circuit uses 5V to generate VDD. The VEE depends on the signal from keyboard controller 87C51 on the main board. When the duty of the signal increases, the VEE de-creases.

5. **Power Supply for Backlight (CCFT)**
   It generates VBL for CCFT when the signal BLE is low. The circuit uses VSW to generate VBL. The VBL depends on the signal from keyboard controller 87C51 on the main board. When the duty of the siganl increases, the VBL increase.

8.2.2 Connector pin assignment

CN1 4-pin Voltage Adapter connector

Pin.no	Signal
1	VA
2	VB
3	POK
4	GND

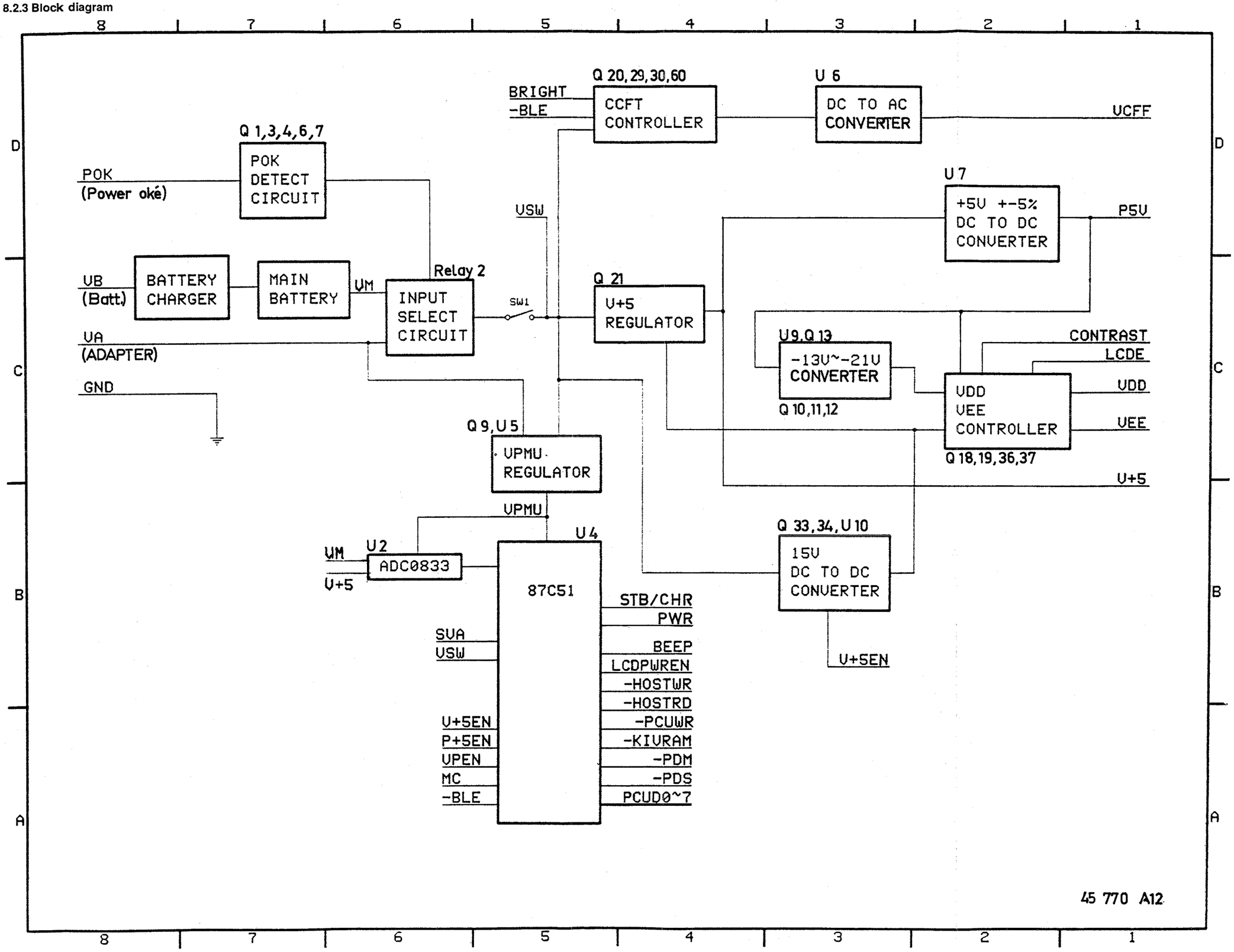
J2 2-pin battery connector

Pin.no	Signal
1	+VM
2	GND

J3 5-pin backlight connector

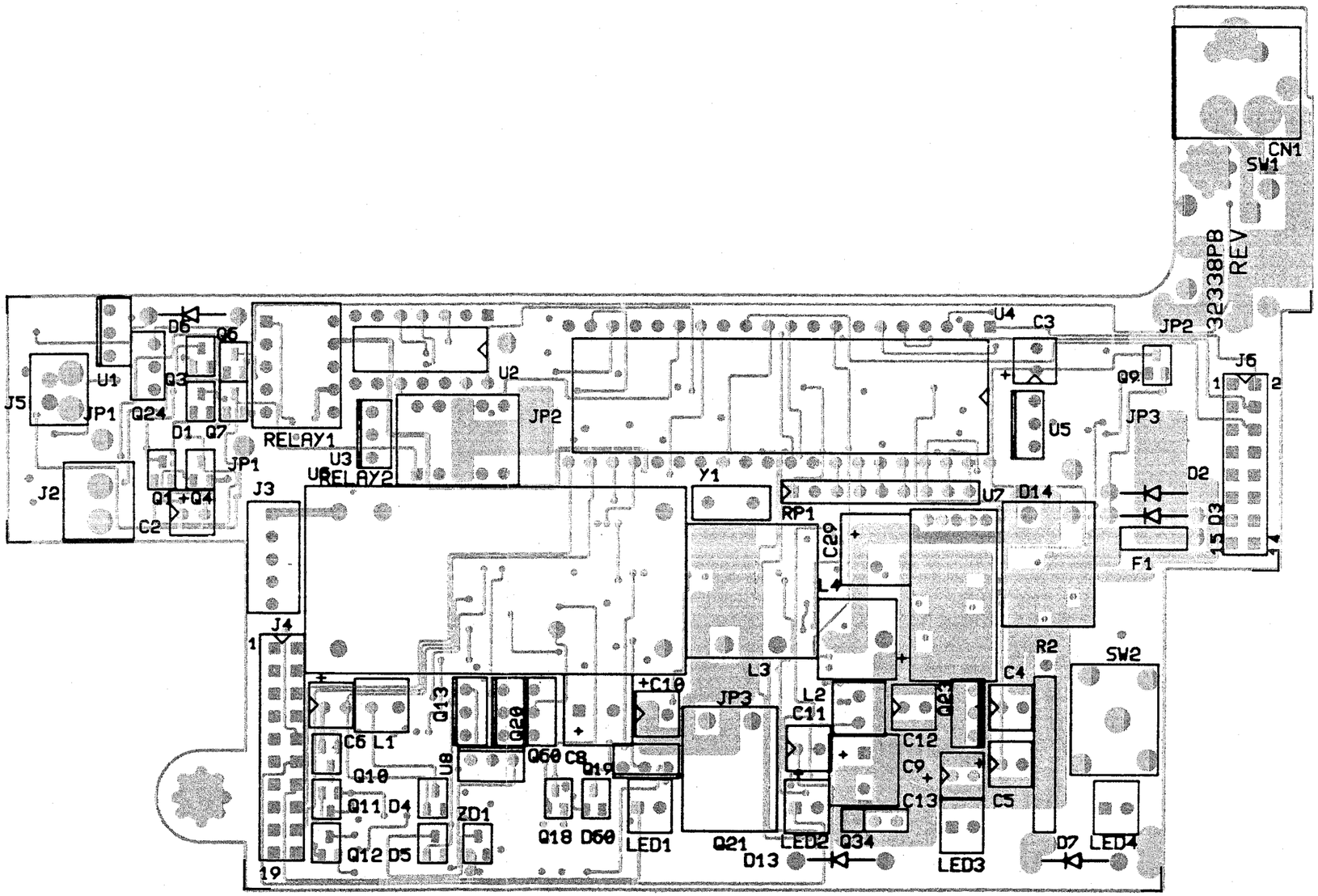
Pin.no	Signal
1	VCFF (AC)
2	NC
3	NC
4	NC
5	VCFF (AC)

8.2.3 Block diagram



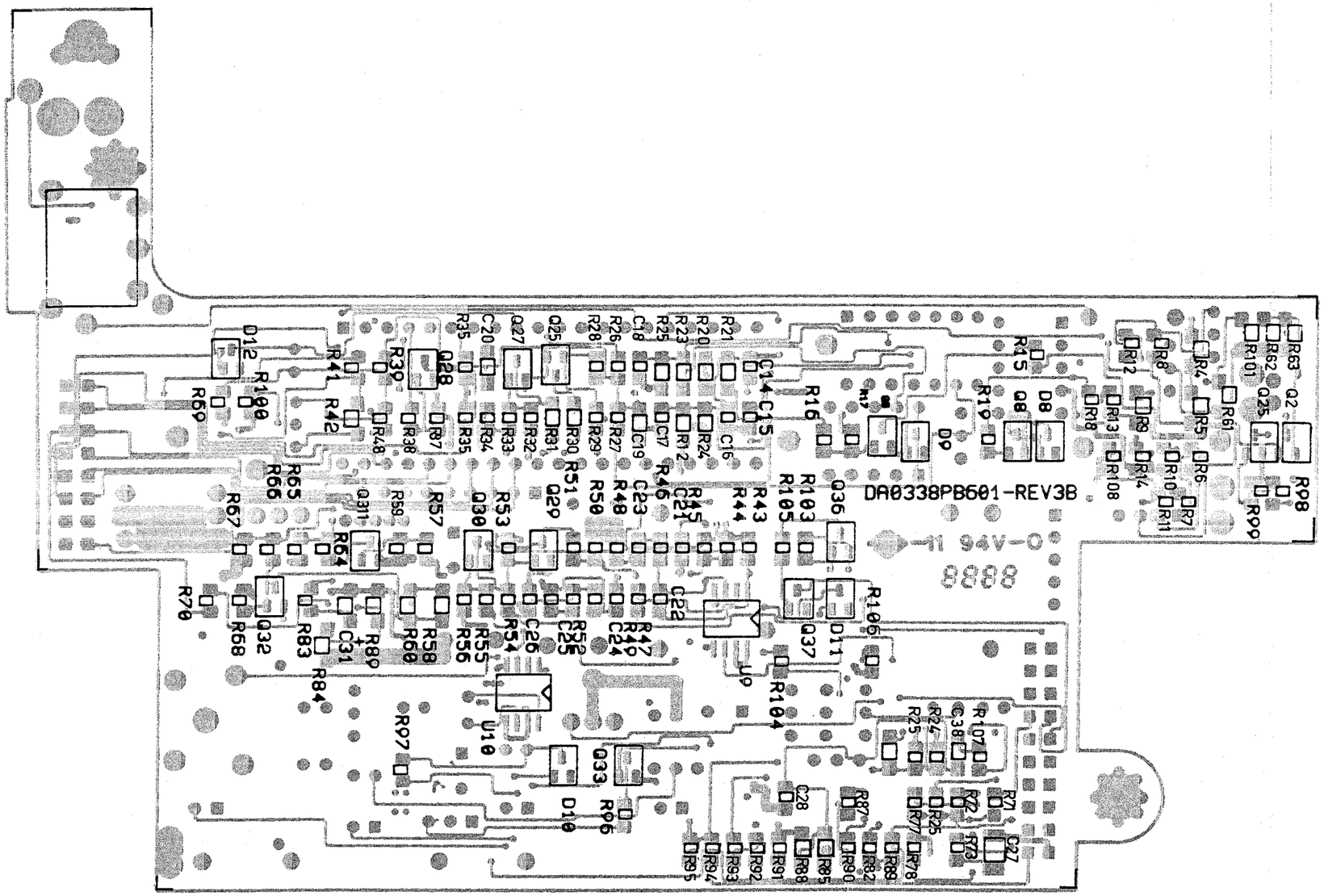
8.2.4 CBA component layout

1. Top side



45 761 B12

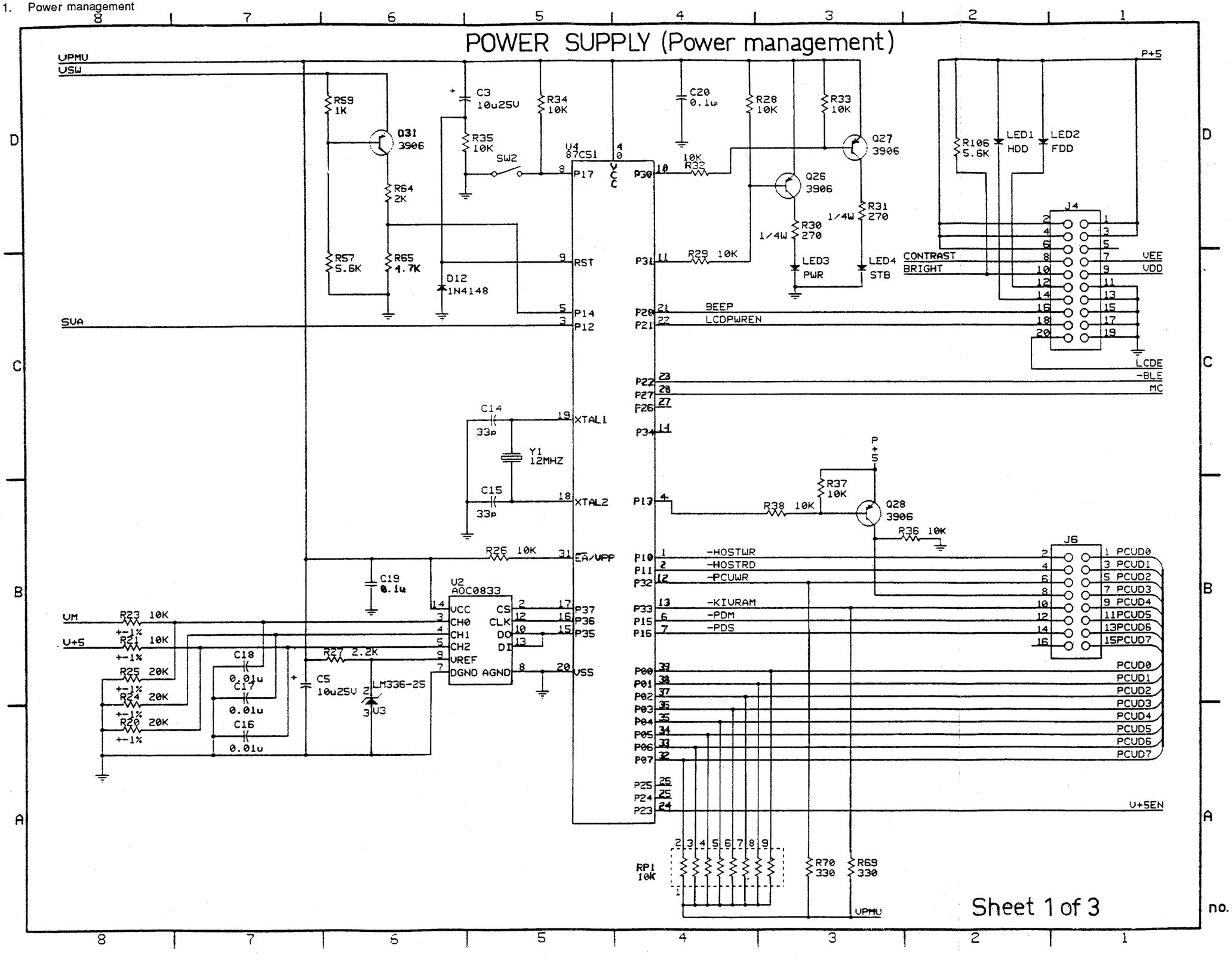
2 . Bottom side



45 762 B12

8.2.5 Circuit diagrams

1. Power management

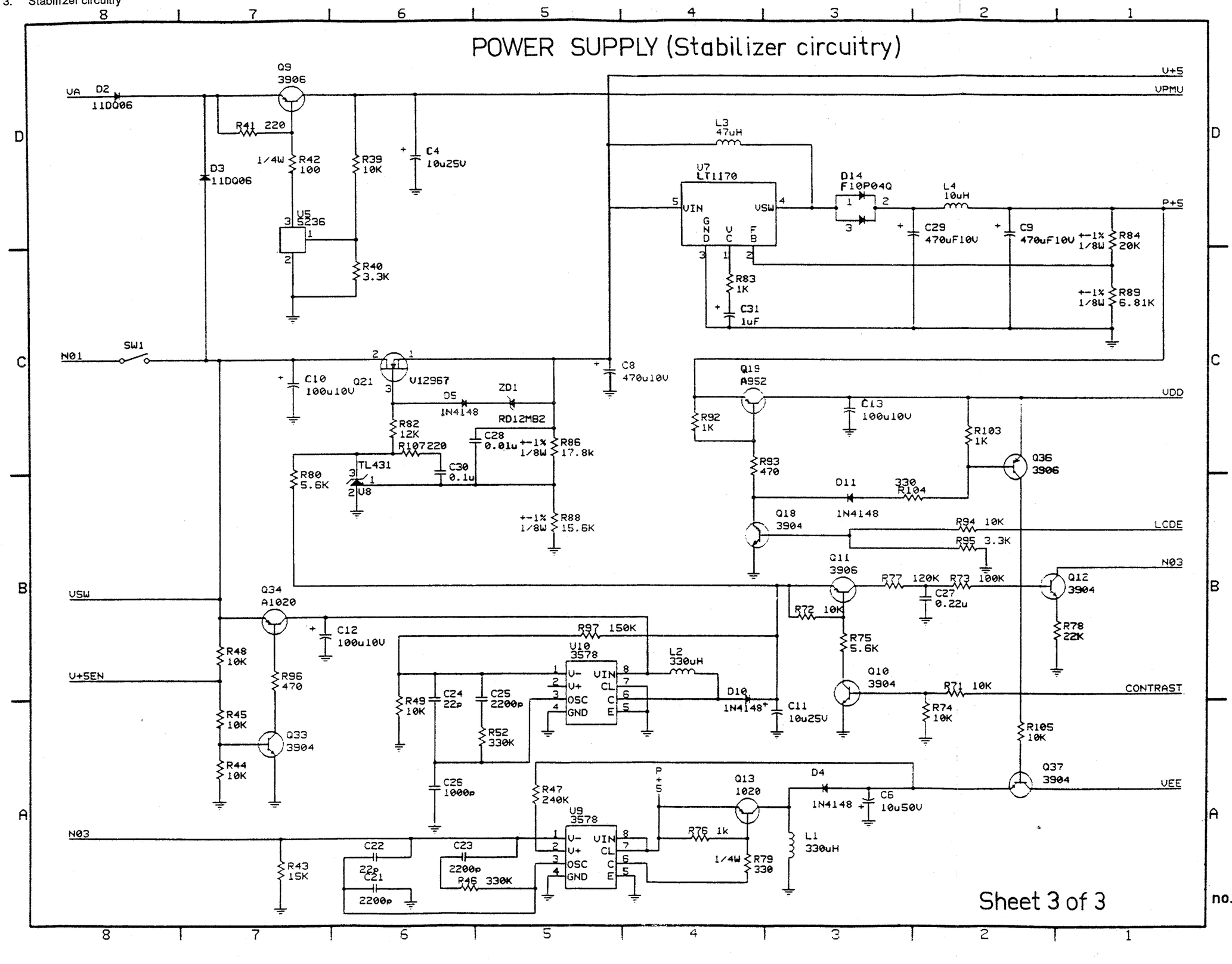


no. 45 773 A12

CS 55 850

3. Stabilizer circuitry

POWER SUPPLY (Stabilizer circuitry)



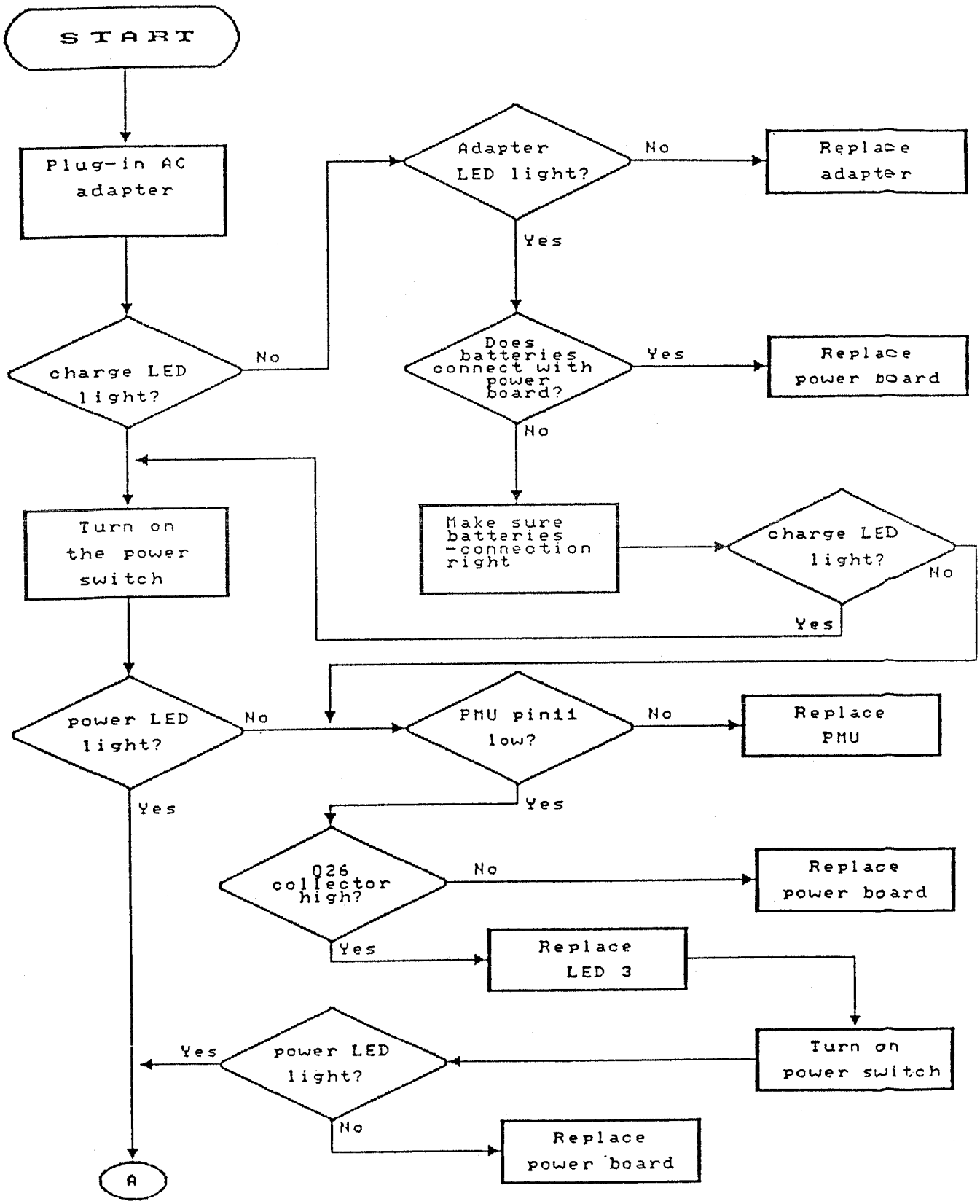
no. 45 775 A12

8.2.6 Partslist Power board:

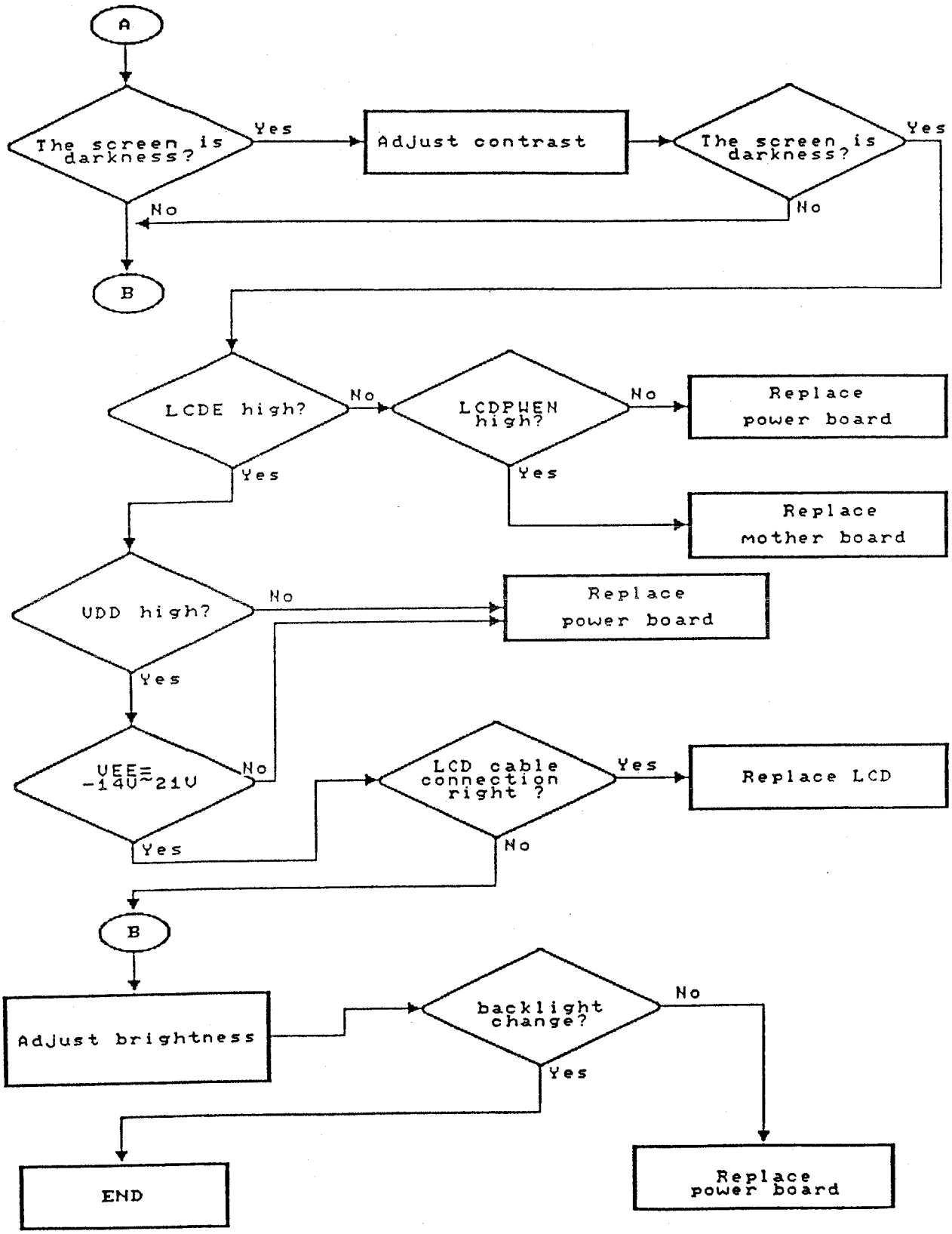
	4822 212 60062	Complete assy
SW1	4822 271 30728	Micro switch
U1	4822 209 63318	ADC0833
	5322 209 81559	LM336BZ
	4822 209 70287	M5237L
	4822 209 30135	LT1170
	4822 209 30136	Microprocessor
	4822 212 60063	Module DC-AC
U5	4822 209 63315	80C51
SW2	4822 277 21463	Slide on/off
U4-U7	4822 209 63319	LM3578A
U19,U33	4822 209 63316	TL431
LED1-4	4822 130 82343	Green
CN1	4822 265 41085	Mini din 3p
	4822 280 20486	Relay mini

8.2.7 Troubleshoot flow chart

Troubleshooting Power Board



45 768 A12


A
The screen is darkness?
Yes
Adjust contrast
The screen is darkness?
Yes
No
No
B
LCDE high?
No
LCDPWEN high?
No
Replace power board
Yes
Yes
Replace mother board
UDD high?
No
Replace power board
Yes
VEE= -14V~21V
No
LCD cable connection right ?
Yes
Replace LCD
Yes
No
B
Adjust brightness
backlight change?
No
Yes
END
Replace power board

45 769 A12

8.3 Keyboard

8.3.1 Keyboard Assembly

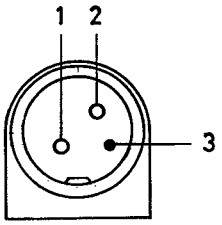
Keyboard assembly consists of a printed circuit board, key switches and key caps.
The Keyboard Assembly is connected to the Main Board through a 22 pin flat flexible cable.

8.3.2 Scan Code

Key No.	Make Code	Break Code	Key No.	Make Code	Break Code
1.	29	A9	29.*	2B	AB
2.	02	82	30.	3A	BA
3.	03	83	31.	1E	9E
4.	04	84	32.	1F	9F
5.	05	85	33.	20	A0
6.	06	86	34.	21	A1
7.	07	87	35.	22	A2
8.	08	88	36.	23	A3
9.	09	89	37.	24	A4
10.	0A	8A	38.	25	A5
11.	0B	8B	39.	26	A6
12.	0C	8C	40.	27	A7
13.	0D	8D	41.	28	A8
15.	0E	8E	42**.	2B	AB
16.	0F	8F	43.	1C	9C
17.	10	90	44.	2A	AA
18.	11	91	45**.	56	D6
19.	12	92	46.	2C	AC
20.	13	93	47.	2D	AD
21.	14	94	48.	2E	AE
22.	15	95	49.	2F	AF
23.	16	96	50.	30	B0
24.	17	97	51.	31	B1
25.	18	98	52.	32	B2
26.	19	99	53.	33	B3
27.	1A	9A	54.	34	B4
28.	1B	9B	55.	35	B5
Key No.	Make Code	Break Code	Key No.	Make Code	Break Code
57.	35	B6	116.	3F	BF
58.	36	9D	117.	40	C0
60.	38	B8	118.	41	C1
61.	39	B9	119.	42	C2
90.	45	C5	120.	43	C3
110.	01	81	121.	44	C4
112.	3B	BB	122.	57	D7
113.	3C	BC	123.	58	D8
114.	3D	BD	125.	46	C6
115.	3E	BE			

* 101-Key keyboard only.
** 102-key keyboard only.

8.3.3 Connector pin assignment



45 711 A14

Key No.	Base Case, or Shift + Num Lock Make/ Break	Shift Case Make/Break	Num Lock on Make/Break
75	D0 52/ E0 D2	E0 AA E0 52/ E0 D2 E0 2A	E0 2A E0 52/ E0 D2 E0 AA
76	E0 53/ E0 D3	E0 AA E0 53/ E0 D3 E0 2A	E0 2A E0 53/ E0 D3 E0 AA
79	E0 4B/ E0 CB	E0 AA E0 4B/ E0 CB E0 2A	E0 2A E0 4B/ E0 CB E0 AA
80	E0 47/ E0 C7	E0 AA E0 47/ E0 C7 E0 2A	E0 2A E0 47/ E0 C7 E0 AA
81	E0 4F/ E0 CF	E0 AA E0 4F/ E0 CF E0 2A	E0 2A E0 4F/ E0 CF E0 AA
83	E0 48/ E0 C8	E0 AA E0 48/ E0 C8 E0 2A	E0 2A E0 48/ E0 C8 E0 AA
84	E0 50/ E0 D0	E0 AA E0 50/ E0 D0 E0 2A	E0 2A E0 50/ E0 D0 E0 AA
85	E0 49/ E0 C9	E0 AA E0 49/ E0 C9 E0 2A	E0 2A E0 49/ E0 C9 E0 AA
86	E0 51/ E0 D1	E0 AA E0 51/ E0 D1 E0 2A	E0 2A E0 51/ E0 D1 E0 AA
89	E0 4D/ E0 CD	E0 AA E0 4D/ E0 CD E0 2A	E0 2A E0 4D/ E0 CD E0 AA

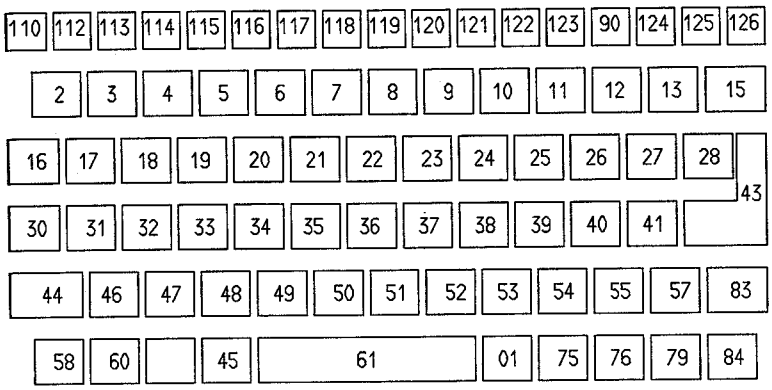
* If the left shift key is held down, the AA/2A shift make and break is sent with the other scan codes. If the right Shift key is held down. B6/36 is sent. If both Shift key are down, both sets of codes are sent with the other scan code.

Key No.	Scan Code Make/Break	Ctrl Case, Shift Case Make/Break	Alt Case Make/ Break
124	E0 2A E0 37/ E0 B7 E0 AA	E0 37 /E0 B7	54/D4

Key No.	Make Code	Ctrl Key Pressed
126	E1 1D 45 9D C5	E0 46 E0 C6

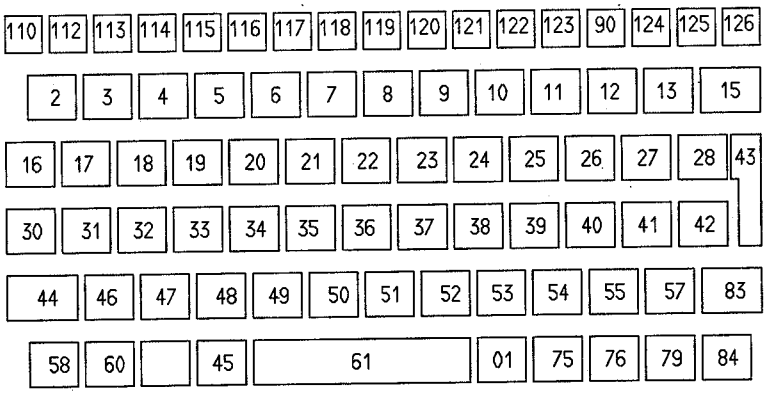
* This key not typematic. All associated scan codes occur on the make of the key.

U.S. KEYBOARD



MDA.02991
T19/117

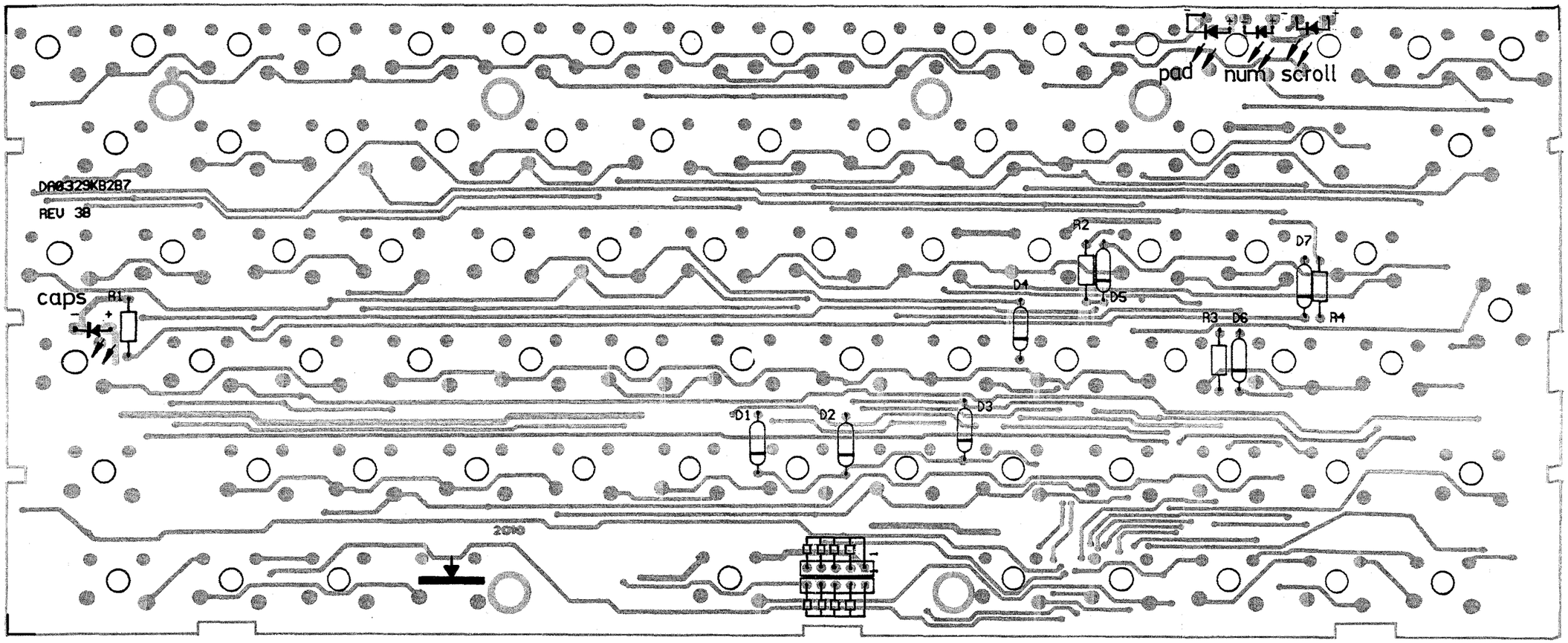
EUROPEAN KEYBOARD



MDA.02990
T19/117

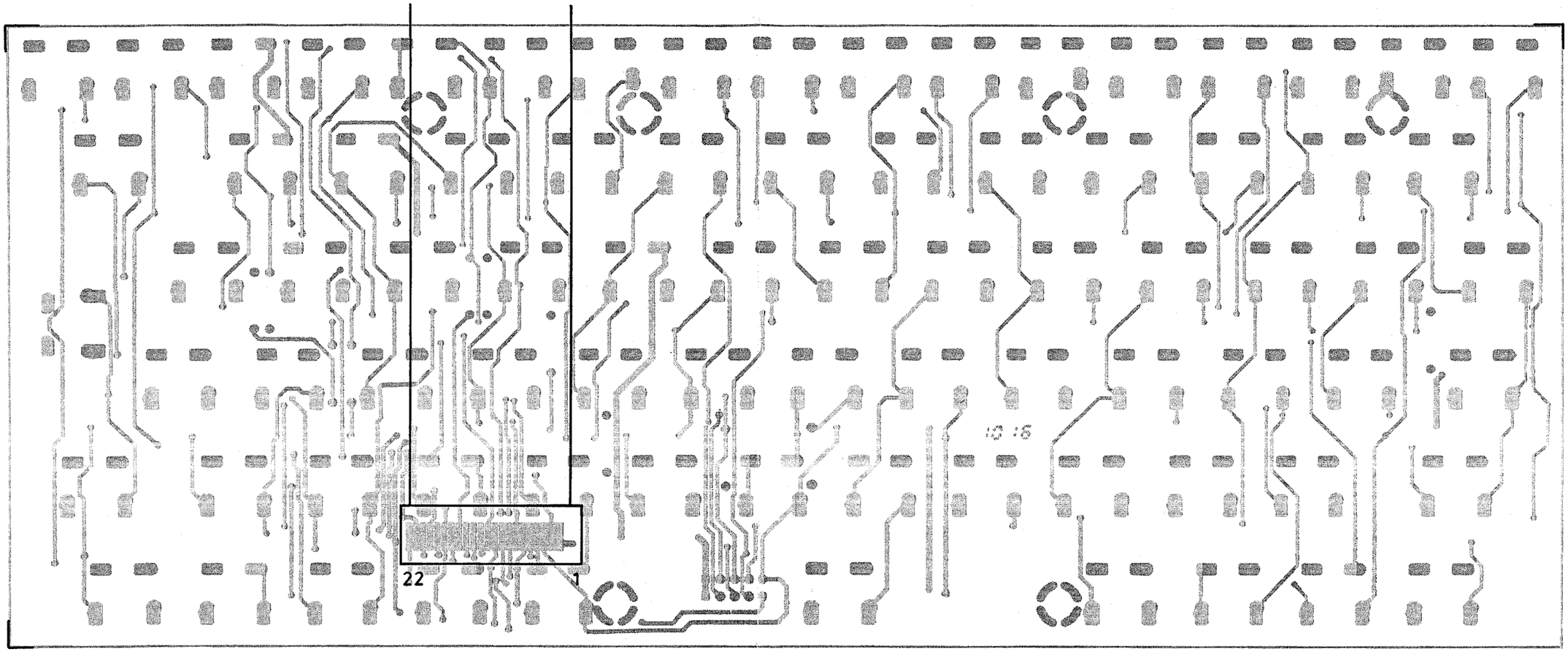
8.3.4 CBA component layout

1. Top side



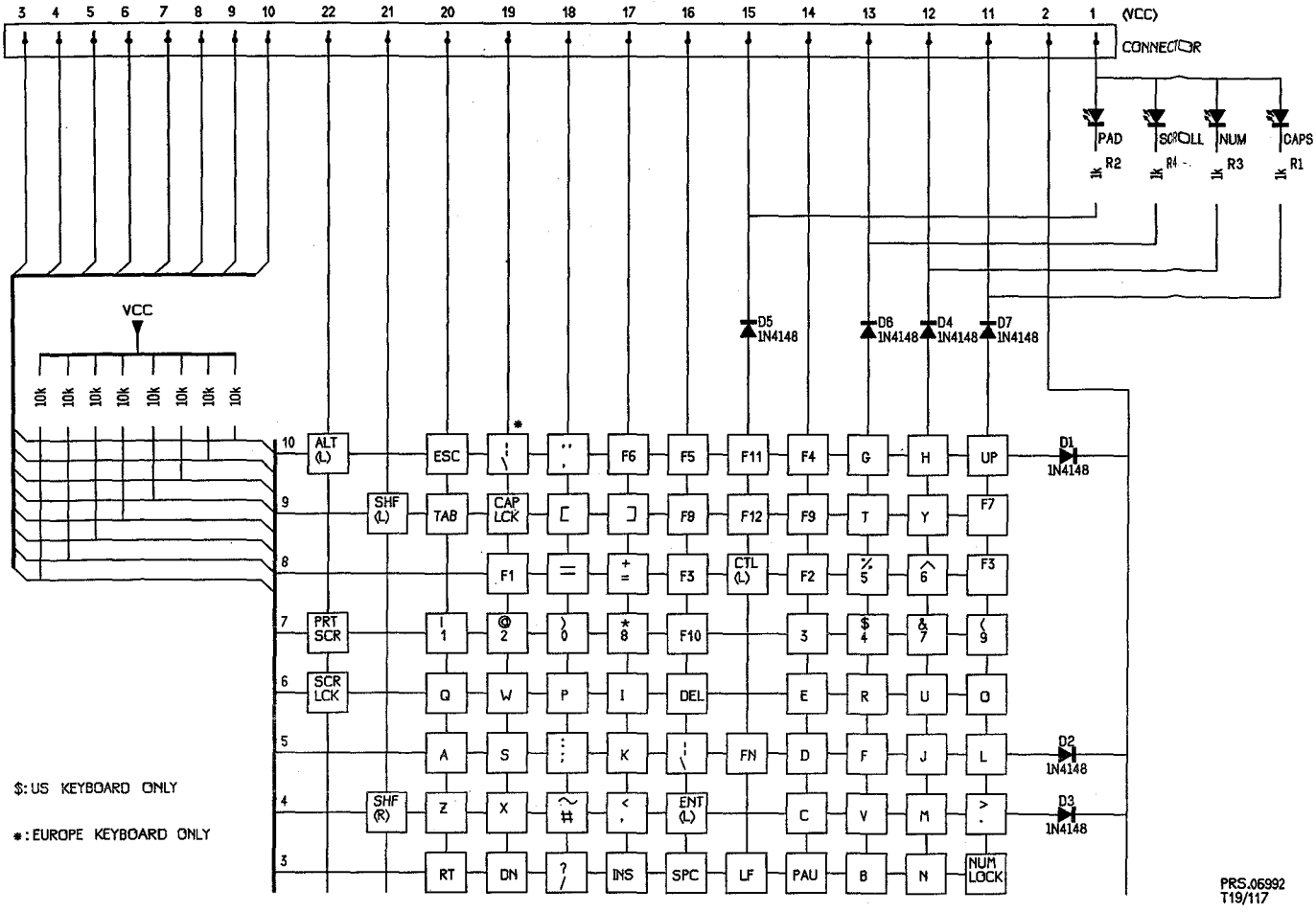
45 764 A12

2. Bottom side



45 763 A12

8.3.5 Circuit diagram



8.3.6 Partslist Keyboard:

4822 219 82529	Complete assy (USA version)
4822 130 30621	1N4148
4822 130 82362	LED (green)
4822 111 91977	Resistor network
4822 321 60976	flat cable
4822 271 30729	Keyswitch
4822 271 30728	Keyswitch fn

9 DEVICES

9.1 Hard disk drive

9.1.1 PCL304 HDD assembly specification

The PCL304 uses a 3.5" 42.9MB 19.05mm (0.75") hard disk drive type Conner CP4034:

Servo	Embedded
Nr. platters	1
Data heads	2
Formatted capacity	42.9 MB
Bytes per block	512
Blocks per drive	83.904
Sectors/track	39
Bytes/track	19456
track density	2100 TPI
recording density	34 K BPI
data tranfer rate	
to/from buffer	3.75 MB/sec
to/from media	1.25 MB/sec
Recording method	2 of 7 RLL
Average Seek time	29 ms
Startup time (max.)	20 sec.
Average latency	10.3 ms
Rotation speed (1%)	2913 RPM
Interleave	1:1
Buffer size	32K
Supply voltage	5V
Power consumption:	
Read/write/seek	2.8 W
Standby	0.4 W
Dimensions	0.75" x 4.00" x 5.15"

9.1.2 Pin Assignment

Pin No.	Signal	Pin No.	Signal
1.	-RESET	23.	-IOW
2.	GND	24.	GND
3.	+DATA 7	25.	-IOR
4.	+DATA 8	26.	GND
5.	+DATA 6	27.	RESERVED
6.	+DATA 9	28.	ALE
7.	+DATA 5	.	RESERVED
8.	+DATA 10	30.	GND
9.	+DATA 4	31.	IRQ14
10.	+DATA 11	32.	-IO16
11.	+DATA 3	33.	+ADDR 1
12.	+DATA 12	34.	-PDIAG
13.	+DATA 2	35.	+ADDR 0
14.	+DATA 13	36.	+ADDR 2
15.	+DATA 1	37.	-CS0
16.	+DATA 14	38.	-CS1
17.	+DATA 0	39.	-ACTIVE
18.	+DATA 15	40.	GND
19.	GND	41.	+5V(Logic)
20.	KEY	42.	+5V(Motor)
21.	RESERVED	43.	GND
22.	GND	44.	-XT/AT

9.1.3 Installing instructions

Hard disk units are non repairable system components, this means that in case of failures the complete hard disk unit has to be replaced.
The removal and mounting of the drive is described in chapter 5.
Installing a new hard disk does not require special actions.
After changing the hard disk configuration run SET UP see chapter 4.

9.2 Floppy disk drive

9.2.1 FDD assembly specification

The PCL304/00 uses a 3.5" 1.44 MB 0.75" height floppy disk drive, type Sony MPF-220 with:

Capacity (unformatted)	1MB/2MB
Capacity (formatted)	720 KB/1440 KB
Recording mode	MFM
Recording density	8717 BPI/17434 BPI
Data transfer rate	250K BPS/500K BPS
Singal track seek time	3 ms
Average access time	100 ms
Rotation speed	300 r.p.m.
Number of tracks	160
Number of cylinders	80
Number of heads	2
Track density	135 TPI
Dimension (inch)	4(W)x0.75(H)x5.1(D)
Power supply	5V

9.2.2 Pin Assignment

Pin No.	Signal	Pin No.	Signal
1.	STEP	11.	WDATA
2.	+5V	12.	GND
3.	IDX	13.	WGATE
4.	+5V	14.	GND
5.	GND	15.	RDATA
6.	DS1	16.	GND
7.	DS2	17.	TR00
8.	MOTOR ON	18.	WP
9.	DIRC	19.	HS
10.	GND	20.	DCH

9.2.3 Installing instructions

Like thwe hard disk unit, floppy drives are also considered as a non repairable system component.
In case of failures the complete floppy drive has to be replaced.

The removal and mounting of the floppy drive is described in chapter 5.
Installing a new floppy drive does not require special actions.
After changing the floppy disk configuration run SET UP see chapter 4.

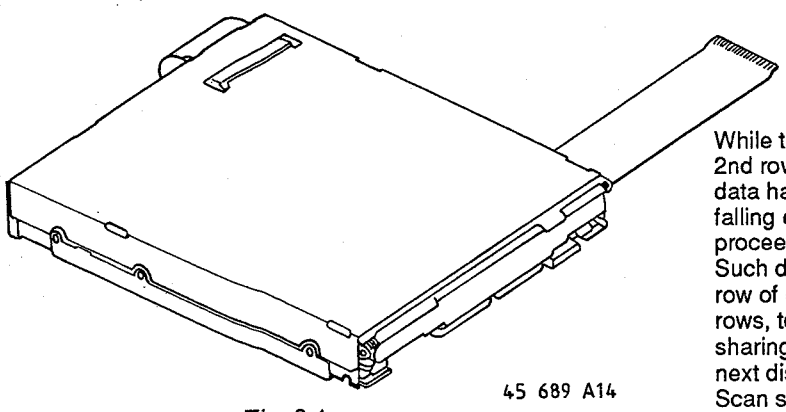


Fig. 9-1

9.3 LCD Assembly

9.3.1 Specifications

LCD Assembly consists of a 640x480 dots LCD module (LM64P701), a LCD cover, a LCD panel, a decoration plate and 2 connecting cables.
Following please find the specification of the LCD:

Resolution	640x480 dots
Duty	1/240
Type	FTN reflective type LCD
Dot Size	0.24 (W) x 0.24 (H)
Dot Spacing	0.03
Outline Dimension	257(W)x158.5(H)x 9.5(D)
Effective View Area	180 (W) x 133 (H)
Power supply VDD	5V
Power supply VEE	-22V~- 28V

9.3.2 Theory of the LCD operation

The following figure is the block diagram of the LCD module:
The LCD driver is 80 bits LSI, consisting of shift registers, latch circuits and LCD driver circuits.
Display data which are externally divided into data for each row (640 dots) will be sequentially transferred in the form of 4-bit parallel data through shift registers by Clock Signal CP2 from the left top of the display face.
When data of one row (640 dots) have been input, they will be latched in the form of parallel data for 640 lines of signal electrodes by Latch Signal CP1. Then the corresponding drive signal will be transmitted to the 640 lines of column electrodes of the LCD panel by the LCD drive circuits.
At this time, scan start-up signal S has been transferred from the scan signal driver to the 1st row of scan electrodes, and the contents of the data signals are displayed on the 1st rows of upper and lower half of the display face according to the combinations of voltages applied to the scan and signal electrodes of the LCD.

While the 1st rows of data are being displayed, the 2nd rows of data are entered. When 640 dots of data have been transferred, then latched on the falling edge of CP1 clock, the display face proceeds to the 2nd rows of display.
Such data input will be repeated up to the 240th row of each display segment, from upper to lower rows, to complete one frame of display by time sharing method. Then data input proceeds to the next display face.
Scan start-up Signal S generates scan signal to drive horizontal electrodes.
Since DC voltage, if applied to LCD panel, causes chemical reaction which will deteriorate LCD panel, drive waveform shall be inverted at every display frame to prevent the generation of such DC voltage. Control Signal M plays such a role.
Because of the characteristics of the CMOS driver LSI, the power consumption of the unit goes up as the operating frequency CP2 increases. Thus the driver LSI applies the system of transferring 4-bit parallel data through the 4 lines of shift registers to reduce the data transfer speed CP2. Thanks to the LSI, the power consumption of the unit will be minimized.
In this circuit configuation, 4-bit display data shall be therefore input to data input pins of DU0-3 (upper display segment) and DL0-3 (lower display segment.)
Furthermore the LCD unit adopts bus line system for data input to minimize the power consumption. In this system data input terminal of each driver LSI is activated only when relevant data input is fed.
Data input for column electrodes of both the upper and the lower display segment and chip select of driver LSI are made as follows:
The driver LSI at the left end of the display face is first selected, and the adjacent driver LSI of the right side is selected when 80 dots data (20 CP2) is fed. This process is sequentially continued until data is fed to the driver L at the right end of the display face.
This process is simultaneously followed at the column driver LSI of both the upper and the lower display segments. Thus data input for both the upper and the lower display segments must be fed through 4 -bit bus line sequentially from the left end of display face.
Since this graphic display unit contains no refresh RAM, it requires data and timing pulse inputs even for static display.
Frame cycle of 11.7 ms min. or frame frequency of 85 Hz max. will demonstrate optimum display quality in terms of flicker an 'shadowing'. LCD unit functions at the minimum frame cycle of 8 ms (maximum frame frenquency of 125 Hz).

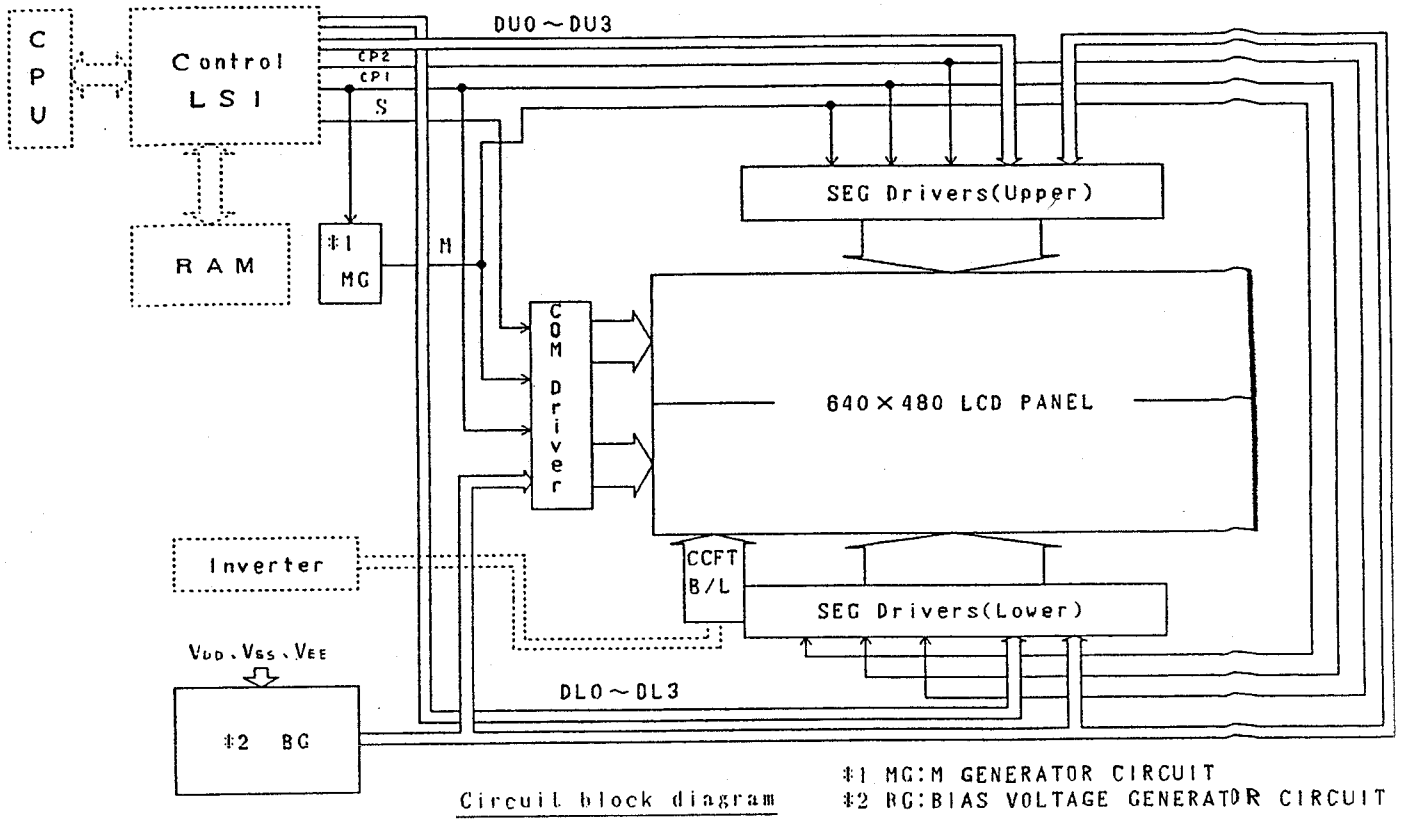


Fig. 9-2

9.3.3 LCD Pin Assignment

Pin No.	Signal	Pin No.	Signal
1.	VDD	8.	SCAN
2.	VSS	9.	CP2
3.	VEE	10.	N.C.
4.	CP1	11.	DU0
5.	N.C.	12.	DU1
6.	N.C.	13.	DU2
7.	YSCL	14.	DU3

Pin No.	Signal	Pin No.	Signal
15.	DL0	18.	DL3
16.	DL1	19.	EI
17.	DL2	20.	EO

CCFT Pin Assignment

Pin No.	Signal
1.	HV
2.	N.C.
3.	N.C.
4.	N.C.
5.	GND

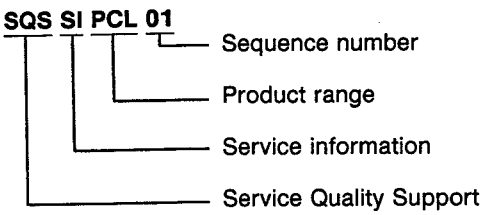
9.4 Battery pack

Battery Pack (4KR-5000DE) consists of 4 pcs of rapid charge type Nickel-Cadmium battery sealed together, a 80 degrees celcius breaker for protection and two contact plates.
Each of the battery is 1.2V 5000 mAH, so the total voltage is 4.8V. During charging, the voltage of battery is going up to 6.2V, which means the battery is fully charged. Then the voltage is going down, same sense, circuit of the power board catches the change of the voltage drop and makes the control circuit stop charging the battery pack.

10 MODIFICATION

- Description of the system used for publishing modification data and supplements to the Service Manual.

  All modification data and supplements to the service manual are published by means of Service Information bullitins.
  Each Service Information has a number, for example:



A Service Information bullitin consists of a yellow front sheet, as the case may be followed by supplementary and/or replacement sheets.
Replacements sheets serve to replace existing sheets in the Service Manual. These sheets are identified by an additional letter after the page number, for example 5-1a. Page 5-1a then takes the place of page 5-1.

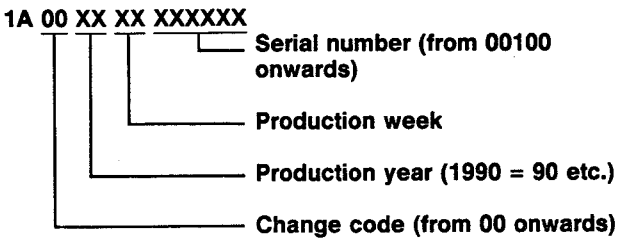
Supplementary sheets are inserted between the existing sheets in the Service Manual. These sheets can be identified by an additional figure following the page number, for example 5-1-1.
Sheet 5-1-1 should be inserted after page 5-1.

Each Service Information is accompanied by an updated list of contents per page.
For each page added or each page replaced the list of contents indicates with wich Service Information the relevant page has been published.

- **Description of the system by means of which modifications are indicated in the notebook computer.**

All important parts of the notebook computer, such as power supply, p.c. boards and modules, are provided with a sticker. These stickers specify a number of product data.
The meaning of this data will now be explained for the most important sections.

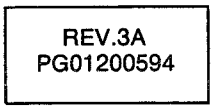
- The complete system unit
  Type plate
  The type plate is located underneeth the system unit.
  Below a sample of such a type plate is given:



Note:
In case of a important modification to the system unit the production code on the type plate is increased by one.
E.G. 00 becomes 01.

- Printed panels
  The stickers are generally located on the component side of the circuit board assembly (CBA).

Example:



- The production status number will not always be mentioned.
- In case of an important modification, the revision number or letter will be increased in alphabetical or numerical order.