SAIA-Burgess Electronics

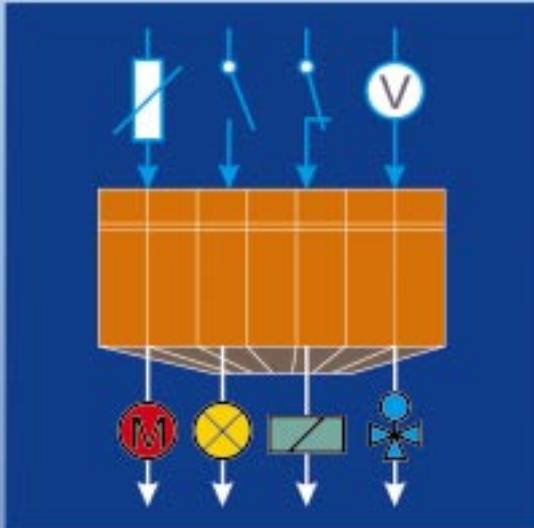SWITCHES • MOTORS • CONTROLLERS

SAIA®PCD
Process Control Devices

Manual
PCD2.M220
with integrated PC

SAIA-Burgess Companies

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SAIA® Process Control Devices

PCD2.M220

with integrated PC

Updates

Manual :   PCD2.M220 with integrated PC - Edition E1

Date	Chapter	Page	Description
16.10.2000	4.5	4-75	Configuration of the harddisk

Table of contents

! **Please note:**

A number of detailed manuals are available to aid installation and operation of the SAIA PCD. These are for use by technically qualified staff, who may also have successfully completed one of our "workshops".

To obtain the best performance from your SAIA PCD, closely follow the guidelines for assembly, wiring, programming and commissioning given in these manuals. In this way, you will also become one of the many enthusiastic SAIA PCD users.

If you have any technical suggestions or recommendations for improvements to the manuals, please let us know. A form is provided on the last page of this manual for your comments.

Summary

PCD1/2 series

Hardware
PCD1
PCD2
Serie xx7

PCD2.M220

PCD2.H...

PCD4 series

Hardware
PCD4

PCD4.H1.. ***)**

PCD4.H2.. ***)**

PCD4.H3.. ***)**

PCD4.H4..

PCD6 series

Hardware
PCD6

*) Adapter module 4'717'4828'0
allows H modules to be used
with the PCD6.

**General
Manuals**

User's
Guide

**Reference
Guide
(PG3)**

PCD8.P1..

PCD7.D1..
PCA2.D1..
PCD7.D2..

- S-Bus
- PROFIBUS
- Remote I/O

Installation
Components
for RS 485-
Networks

- PG4
- Modem

FUPLA/
KOPLA
function
families

Reliability and safety of electronic controllers

SAIA-Burgess Electronics Ltd. is a company which devotes the greatest care to the design, development and manufacture of its products:

- state-of-the-art technology
- compliance with standards
- ISO 9001 certification
- international approvals: e.g. Germanischer Lloyd, UL, Det Norske Veritas, CE mark ...
- choice of high-quality componentry
- quality control checks at various stages of production
- in-circuit tests
- run-in (burn-in at 85°C for 48h)

Despite every care, the excellent quality which results from this does have its limits. It is therefore necessary, for example, to reckon with the natural failure of components. For this reason SAIA-Burgess Electronics Ltd. provides a guarantee according to the "General terms and conditions of supply".

The plant engineer must in turn also contribute his share to the reliable operation of an installation. He is therefore responsible for ensuring that controller use conforms to the technical data and that no excessive stresses are placed on it, e.g. with regard to temperature ranges, overvoltages and noise fields or mechanical stresses.

In addition, the plant engineer is also responsible for ensuring that a faulty product in no case leads to personal injury or even death, nor to the damage or destruction of property. The relevant safety regulations should always be observed. Dangerous faults must be recognized by additional measures and any consequences prevented. For example, outputs which are important for safety should lead back to inputs and be monitored from software. Consistent use should be made of the diagnostic elements of the PCD, such as the watchdog, exception organization blocks (XOB) and test or diagnostic instructions.

If all these points are taken into consideration, the SAIA PCD will provide you with a modern, safe programmable controller to control, regulate and monitor your installation with reliability for many years.

1.   Introduction and requirements

PCD2.M220 with integrated PC

The PLC for machine and process control

The PLC is primarily designed for the control of machines and processes. However, modern requirements increasingly go beyond the PLC's previous fields of use. Such functions as visual display, database access, communications etc. are often needed. These functions can be easily realised using a personal computer (PC). The new PCD2.M220 is a proven PLC with integrated PC hardware. This opens up completely new fields of application:

- High-level language programming
  - use of PC tools such as compilers, debuggers, etc.

- Use of standard (Windows) applications
  - visual display
  - operating data capture
  - databases
  - statistics

- Use of standard operating systems
  - MS-DOS
  - Windows
  - OS/2
  - UNIX

- Communications
  - Ethernet, TCP/IP

PC technology for industry - the PC/104 standard

Standard commercial PC hardware has been designed for use in office PCs and is therefore less suitable for the rugged industrial environment. Some years ago manufacturers of PC boards accepted this problem and established the PC/104 specification, which became the IEEE-P996 standard. PC/104 boards are distinguished by their compact form factor, robust construction and sturdy plug-in bus connection. With the stack-up technique, several PC/104 modules can be connected one above the other.

Integration of PC into PCD2.M220

The proven PCD2.M120 controller is used for integration with the PC, and all its functions are available in the PCD2.M220.

The PCD2.M120 CPU has been expanded with a PC/104 ISA bus, which is coupled to the PLC CPU via a dual-port RAM. Up to six PC modules can be plugged onto the ISA bus, including four PC/104 modules. By using standard off-the-shelf PC/104 modules, a PC can be tailor-made for each application. CPU speed, memory and hard disk sizes can be chosen to suit. PCMCIA drives and Ethernet boards etc. can also be used, so there are no limits on flexibility.
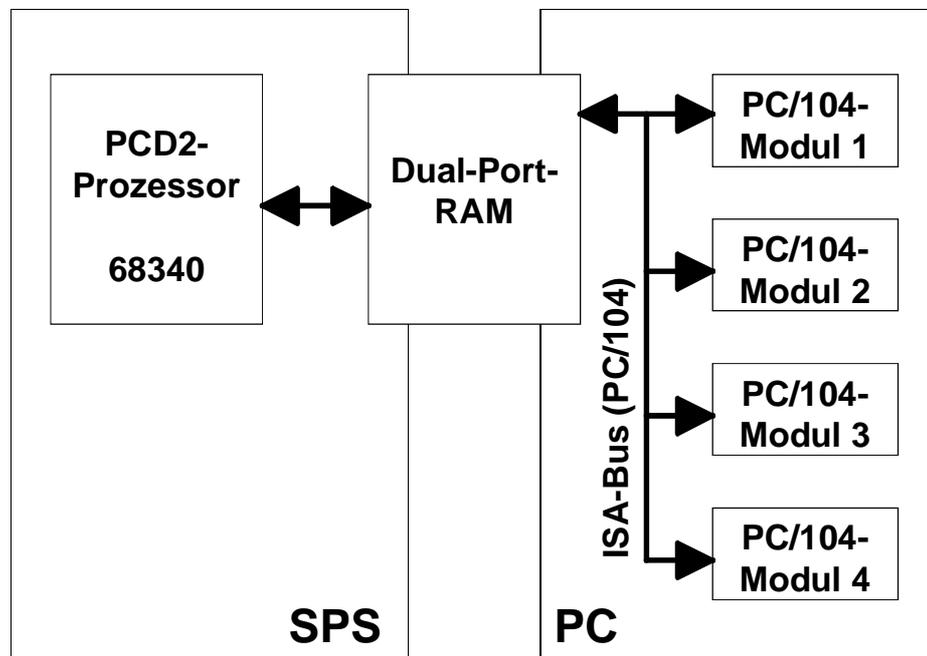
Design for PC integration into PCD2

Conditions required to use this product successfully

This is a high-tech product.

Installation of this system requires sound knowledge of electronics and PCs.

Who should work with this product?:

- Electronics engineers with knowledge of PC technology.

- Without knowledge of electronics, questions will certainly arise. This manual therefore assumes general PC expertise.

- Due to the complexity and variety of PC technology, we cannot guarantee that this product will run correctly in all situations and combinations. Our technical support engineers will offer assistance.

- Strict care should be taken not to expose these devices to electrostatic discharges. Handling must only occur at a CMOS protected work station.

- The supply must be switched off before carrying out any work on a module, and before it is connected or disconnected.

Notes :

2. System structure

2.1 Functional principle

The PCD2.M220 is an independent PLC processor based on the extensively proven PCD2.M120 process controller from SAIA® PCD family. This controller is described in detail in the manual "Hardware PCD1 and PCD2", order reference 26/737E.

The personal computer (PC) is built from PC/104 modules, and runs without dependence on the PLC. If the PC is fitted with a power supply, processor, hard disk, screen, keyboard, operating system, mouse, disk drive, serial/parallel ports etc. it can be used just like a desktop or notebook PC.

Data is exchanged between the PLC and the PC via fast dual-port RAM. Software drivers are available for the PC side (DOS, Windows 16 bit and 32 bit) which handle communications through the dual-port RAM using the SAIA® S-Bus protocol. This gives the PC very fast access to all PLC data.
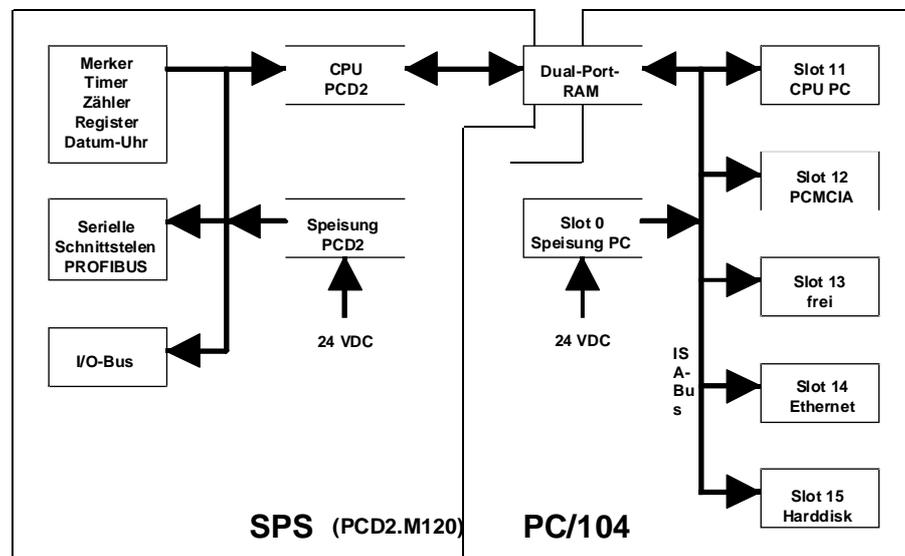
PLC and PC/104 components

2.2   Mechanical design
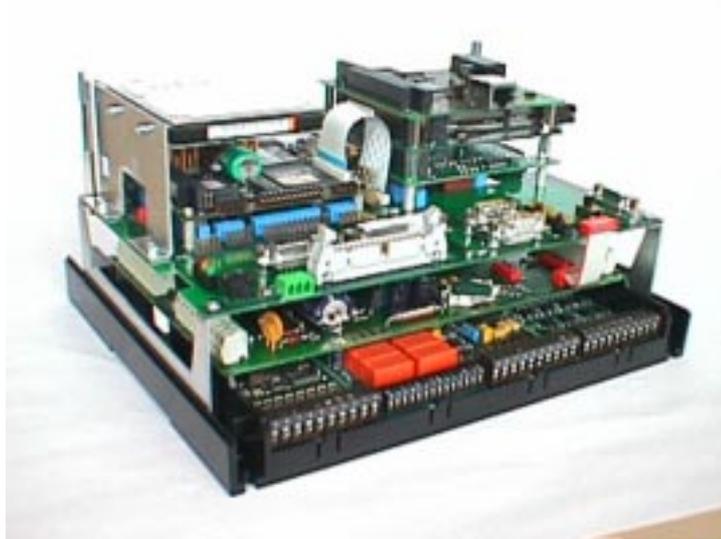
PCD2.M220 open, with PC/104 modules

A PCD2.M120 is the base unit. Using 2 metal angle brackets, the PC's motherboard is fitted approx. 3.5 cm above the PCD's CPU with 4 screws and 2 supports. The front area of the PC board accommodates the connectors for the PC peripherals, the indicator LEDs and the PCD's PGU connector. The PC receives its power via screw terminals on the right-hand side of the unit. All PCD connections are in their usual positions.

The PC/104 modules are mounted with screws and metal supports. With SAIA-Burgess modules (Digital-Logic), the individual PC/104 modules are connected directly, i.e. the modules can be plugged directly onto each other. For other makes of module, connection is via ribbon cable. (See Chapter 3).
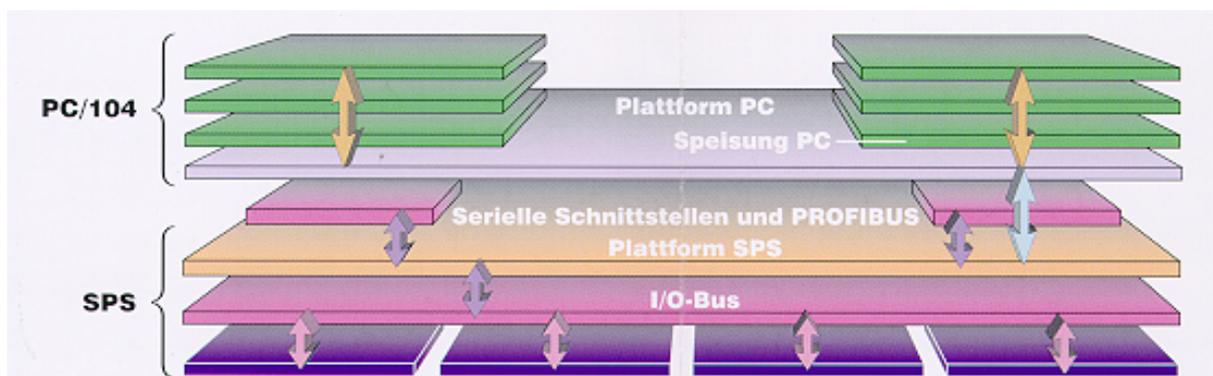
PCD input/output modules

Arrangement of PCD.M120 (below) and PC/104 (above)

Example of PCD2.M220 assembly

15	Harddisk			14	Ethernet
13				12	PCMCIA or 4 636 6607 0
11	CPU				

Platform

PCD2-CPU
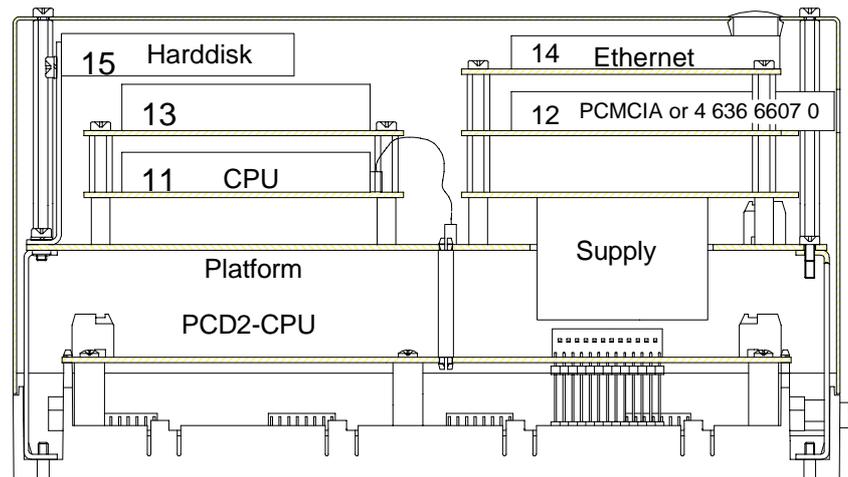
Supply

Arrangement of individual PC/104 components and position of PCD2.

PC/104-CPU from Digital-Logic

PC/104-CPU not from Digital-Logic

PC/104 bus

serial ports

PC/104-CPU

PC/104 platform

PC/104 bus

serial ports

PC/104-CPU

PC/104 platform
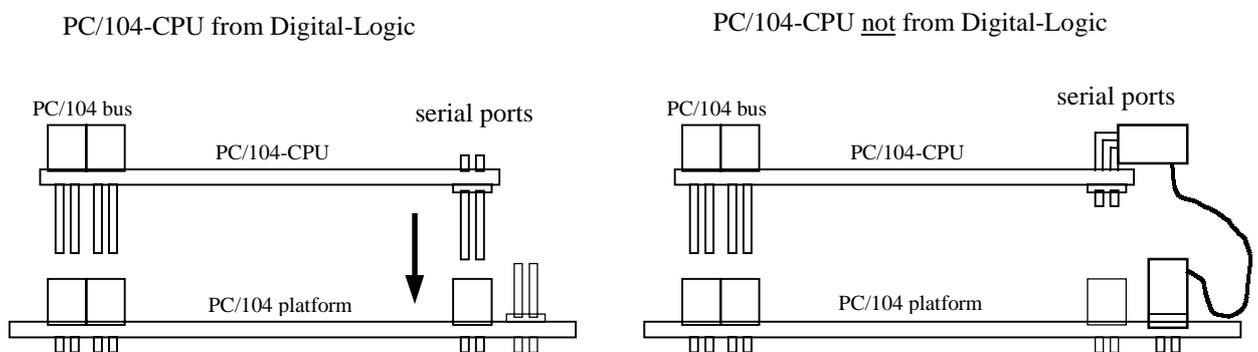
Assembly for SAIA-supplied (Digital-Logic) and non-SAIA modules

2.3 Technical data

PLC section (corresponds to PCD2.M120)

Inputs/outputs	up to 128 I/Os or up to 16 slots with expansion unit, choice of fitting with digital and analogue I/O modules or with counting, measuring and motion control modules
Fast inputs	2, for interrupt or counting tasks up to 1 kHz
User memory	32 KBytes RAM as standard equipment, expandable to 536 KBytes RAM, 24 KBytes RAM + 512 KBytes EPROM or 448 KBytes flash EPROM for programs, text and data blocks, RAM data protection 1 to 3 years [1]
Processor	CPU with 32 bit µC 68340
Processing time	3.6 µs bit processing (e.g. ANH) 20 µs word processing (e.g. ADD, 32 bit)
Communications interfaces	1 x RS 232/RS 485 + 3 x choice of equipment with RS 232, RS 422/RS 485 or 20 mA current loop (TTY)
Network connection	SAIA® S-Bus and PROFIBUS FMS [2] as master or slave
Flags	8192 x 1 bit, volatile or non-volatile, division programmable
Registers	4096 x 32 bit, non-volatile
Index registers	17 x 13 bit (1 each per COB, 1 for all XOBs)
Timers/counters	1600 timers volatile or counters non-volatile, division programmable
Counting range Time range	31 bit excluding sign bit (0 ... 2147483647) 31 bit excluding sign bit (0 ...2147483647 time pulses, selectable from 10 ms to 10 s)

[1]   Depends on ambient temperature.
[2]   PROFIBUS DP in preparation.

Computational ranges	integer: -2 147 483 648...+2 147 483 647 ($-2^{31}...+2^{31}-1$), floating point: $\pm 9.22337 \times 10^{18}$ ... $\pm 5.42101 \times 10^{-20}$, modes: decimal, binary, BCD, hexadecimal or floating point.
Real-time clock	time values: s/min/h, week/day of week, month/ day of month, year; accuracy: better than 15 s/month; power reserve: 1 to 3 years [1]
Power supply	integrated on PLC platform, current consumption max. 1.6A from 5V
Supply voltage	24VDC ±20% smoothed or 19 VAC ±15% full-wave rectified
Power draw	15W for 64 I/0s, 20W for 128 I/0s

[1] Depends on ambient temperature.
[2] PROFIBUS DP in preparation.

PC/104 section

Number of slots	5 PC/104 boards + 1 power supply
Power supply	fixed, built into slot 0, current consumption max. 4A from 5V
Supply voltage	24 VDC ±20% smoothed or 19 VAC ±l5% full-wave rectified
Power draw	max. 35W

Available from SAIA	PC/104 boards:
MSM486SV	**CPU 486 SV2/66 MHz** with performance profile as follows: - AMD ELAN SC400 processor - can be equipped with 4 or 16 MBytes DRAM - 0, 2 or 8 MBytes flash disk - E-IDE interface for hard disk - interfaces for VGA (with 1 MByte video RAM) or LCD, 3.5" floppy disk, COM 1 (RS 232), COM2 (RS232), LPT1 and AT keyboard, all running directly to front-panel connector

MSM486DX	**CPU 486 DX4/100 MHz** with performance profile as follows:

- Intel DX4 processor
- can be equipped with 4 or 16 MBytes DRAM
- 0 or 2 MBytes flash disk
- E-IDE interface for hard disk
- interfaces for VGA (with 1 MByte video RAM) or LCD, 3.5" floppy disk, COM 1 (RS 232), COM2 (RS232), LPT1 and AT keyboard, all running directly to front-panel connector

MSME104   **Ethernet Controller** with performance profile as follows:
- LAN Ethernet IEEE 803.2
- plug-in connections for 10BASE-2, AUI and 10BASE-T
- LAN boot BIOS socket
- 64 KBytes RAM buffer
- supports ODIS, Novell, NDIS, UNIX, NT3.5
- 8 and 16 bit ISA interface
- supports user BIOS

MSMJ104   **PCMCIA Drive** with performance profile as follows:
- PC CARD controller VADEM 468, standard 2.1
- PC CARDS supported: SRAM, Flash, Modern, Ethernet, hard drives, GBIP, etc.
- 2 PC CARD slots for Tvpe I, II and III
- ExCA-compatible
- 16 bit data bus
- hot insertion
- supports SCM software

Hard disk   Capacity $\geq$ 1.44 GBytes
External floppy disk   3.5" inc. data and power supply

Additional PC/104 boards on request.

Common data

Dimensions   248 x 208 x 138mm (W x H x D)

Noise emission   CE mark according to EN 50081-2
Noise immunity   CE mark according to EN 50082-2

Ambient   in operation 0...+55ºC, vertical mounting
temperature   necessary, storage temperature -20...+85 °C

Atmospheric humidity   95% relative humidity without condensation
(DIN 40040, class F)

Mech. strength   according to EN 61 131-2

2.4 Plug configuration of PC/104 platform

2.4.1   Arrangement
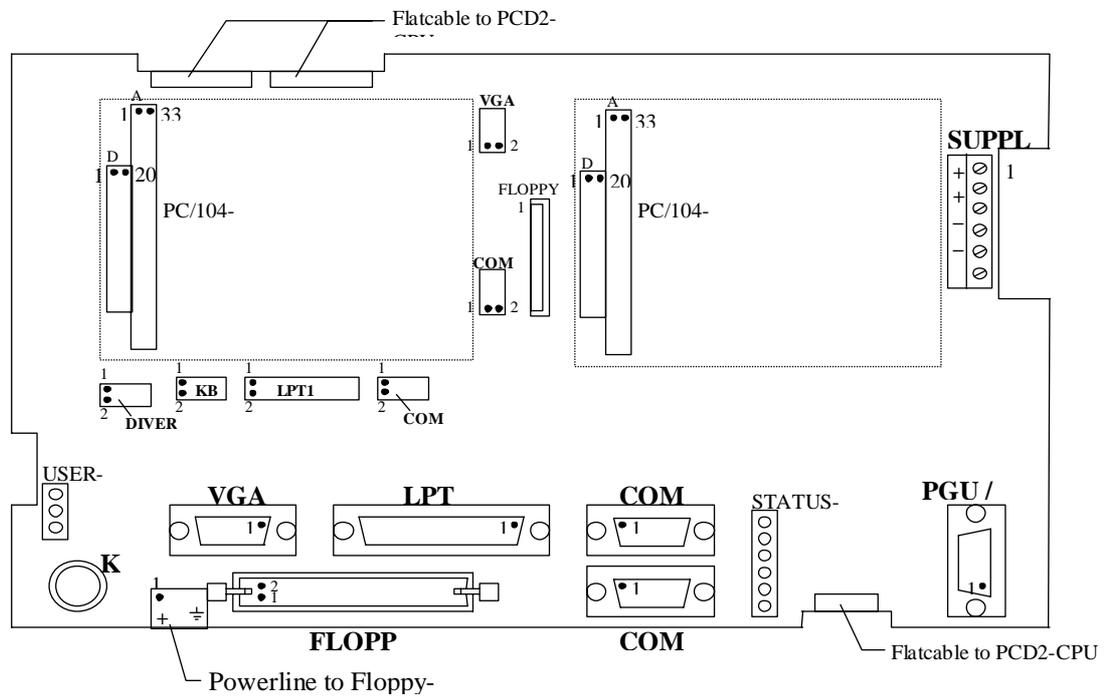
View of connector area without cover

Floppy drive

Floppy drive supply

VGA screen

Keyboard

3 LEDs of PC/104

Start/stop switch
(PCD2.xx7 only)

PGU of PCD

LEDs of PCD

Serial port COM1

Serial port COM2

Parallel port LPT1
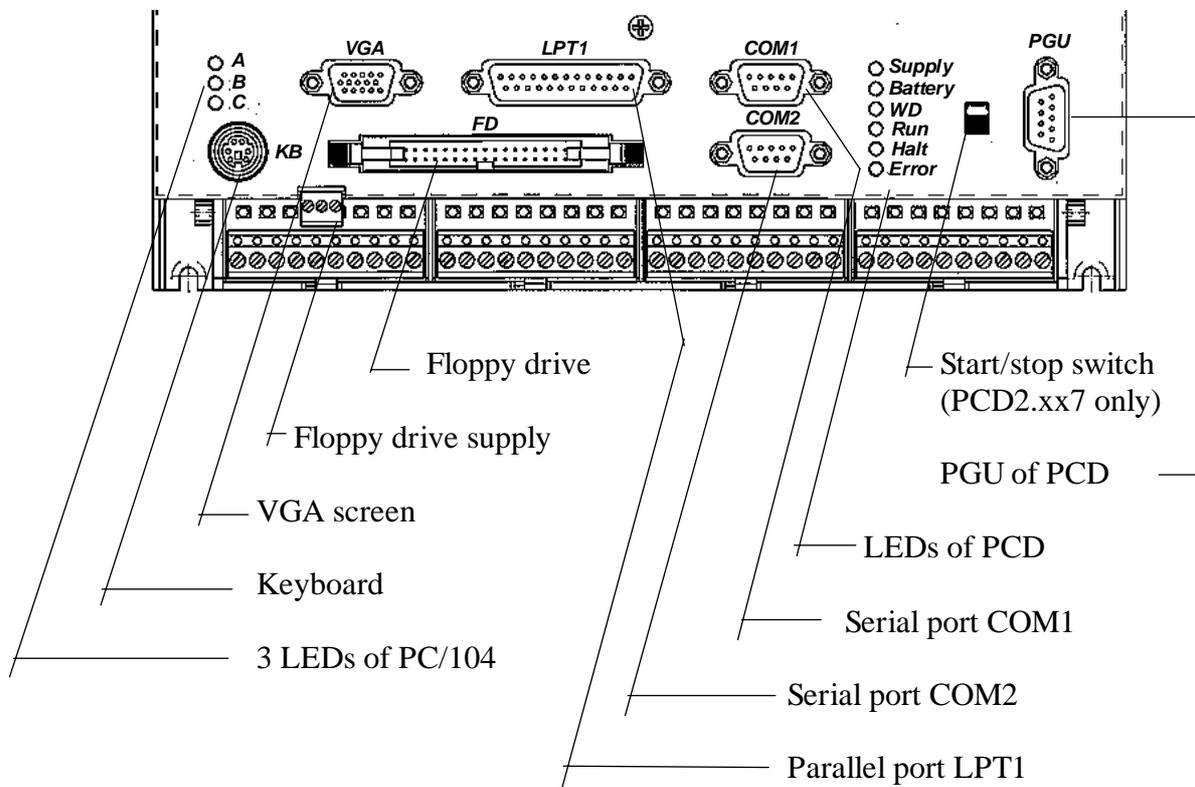
View of connector area with labelled cover

2.4.2   Assignment of connectors on PC/104 platform

Supply (PC/104)

6 pole screw terminal	Signal
Pin 1	24VDC
Pin 2	24VDC
Pin 3	GND
Pin 4	GND
Pin 5	(+12V)
Pin 6	(-12V)

Keyboard (KB)
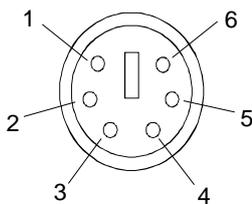
Ribbon connector DIVERS	KB ribbon connector	Min. DIN circular connector, 6-pole, female	Signal
-	Pin 6	Pin 1	KBD_Data
-	-	Pin 2	nc
Pin 3, 5	Pin 8	Pin 3	GND
Pin 7	Pin 3	Pin 4	+5V_ISA
-	Pin 5	Pin 5	KBD_Clock
-	-	Pin 6	nc
Pin 1	Pin 1	-	(Resume)
Pin 2	Pin 2	-	Speaker
Pin 4	Pin 4	-	Ext. Reset
Pin 10	Pin 7	-	Ext. Batt.
Pin 6	Pin 9	-	MOUSE_DAT
Pin 8	Pin 10	-	MOUSE_CLK
Pin 9	-	-	LED_POWER

Monitor (VGA)
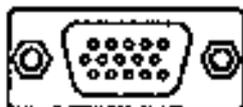
VGA ribbon connector	D-type connector 15-pole, female	Signal
Pin 1	Pin 1	Red
Pin 3	Pin 2	Green
Pin 5	Pin 3	Blue
Pin 2	Pin 5	GND
Pin 2	Pin 7	GND
-	Pin 8 + Pin 11	Bridge
Pin 7	Pin 13	H-Synch
Pin 10	Pin 14	V-Synch
Pin 4, 6, 8	Pin 4, 6, 9, 10, 12, 15	open

Floppy (FD)

DIN connector 34-pole, male	Signal
Pin 8	IDX
Pin 12	DS2
Pin 16	MO2
Pin 18	DIRC
Pin 20	Step
Pin 22	WD
Pin 24	WE
Pin 26	TRK0
Pin 28	WP
Pin 30	RDD
Pin 32	HS
Pin 34	DCHG
Pin 1	Shield
Pin 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 25, 27, 29, 31, 33	GND
Pin 2, 4, 6, 10, 14	not used

Supply for floppy drive

Screw terminal 3-pole	Signal
Pin 1	+5V
Pin 2	GND
Pin 3	PGND

Parallel port LPT1

LPT1 ribbon connector	D-type connector 25-pole, female	Signal
Pin 2	Pin 1	Strobe
Pin 4	Pin 2	Data0
Pin 6	Pin 3	Data1
Pin 8	Pin 4	Data2
Pin 10	Pin 5	Data3
Pin 12	Pin 6	Data4
Pin 14	Pin 7	Data5
Pin 16	Pin 8	Data6
Pin 18	Pin 9	Data7
Pin 20	Pin 10	ACK
Pin 22	Pin 11	Busy
Pin 24	Pin 12	Paper end
Pin 26	Pin 13	Select
Pin 9	Pin 14	Autofeed
Pin 3	Pin 15	Error
Pin 5	Pin 16	Init printer
Pin 7	Pin 17	Shift in
Pin 9, 11,13, 15, 17, 25	Pin 18…Pin 22	open
Pin 19, 21, 23	Pin 23…Pin 25	GND

Serial ports COM1, COM2
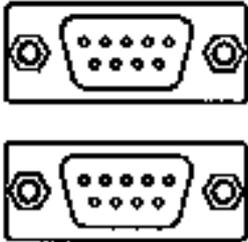
COM1, COM2 ribbon connector	D-type connector 9-pole, male	Signal
Pin 2	Pin 1	DCD
Pin 4	Pin 2	RXD
Pin 6	Pin 3	TXD
Pin 6	Pin 4	DTR
Pin 10	Pin 5	GND
Pin 1	Pin 6	DSR
Pin 3	Pin 7	RTS
Pin 5	Pin 8	CTS
Pin 7	Pin 9	RI
Pin 9		open

The serial port signals are compatible with the RS232C specifications

3. PC/104 - PCD2 interface

3.1 Dual-port RAM (DPRAM)

Communication between the PC/104 and the PCD2 is via a dual-port RAM (DPRAM). In this configuration the PC/104 is master and the PCD2 its slave.

The PG4 programming tools running under Windows are used for PCD2 programming. From version $192 of the PG4 the communications drivers are capable of transmitting data via the dual-port RAM. This method guarantees the exchange of data between both systems.

Full-protocol access via the DPRAM is not allowed if

- the debugger is running at interface 0 in P800 protocol, or
- S-Bus PGU mode has been defined in the PCD2.

Organization of memory in the dual-port RAM

The DPRAM is part of the PC/104's RAM memory. This RAM memory is divided into 3 areas, selectable by means of the J26 jumper. Each of these areas has 8 kBytes, with the last byte serving to trigger the 3 user LEDs (see PC/104 memory map).

Memory Map PC/104
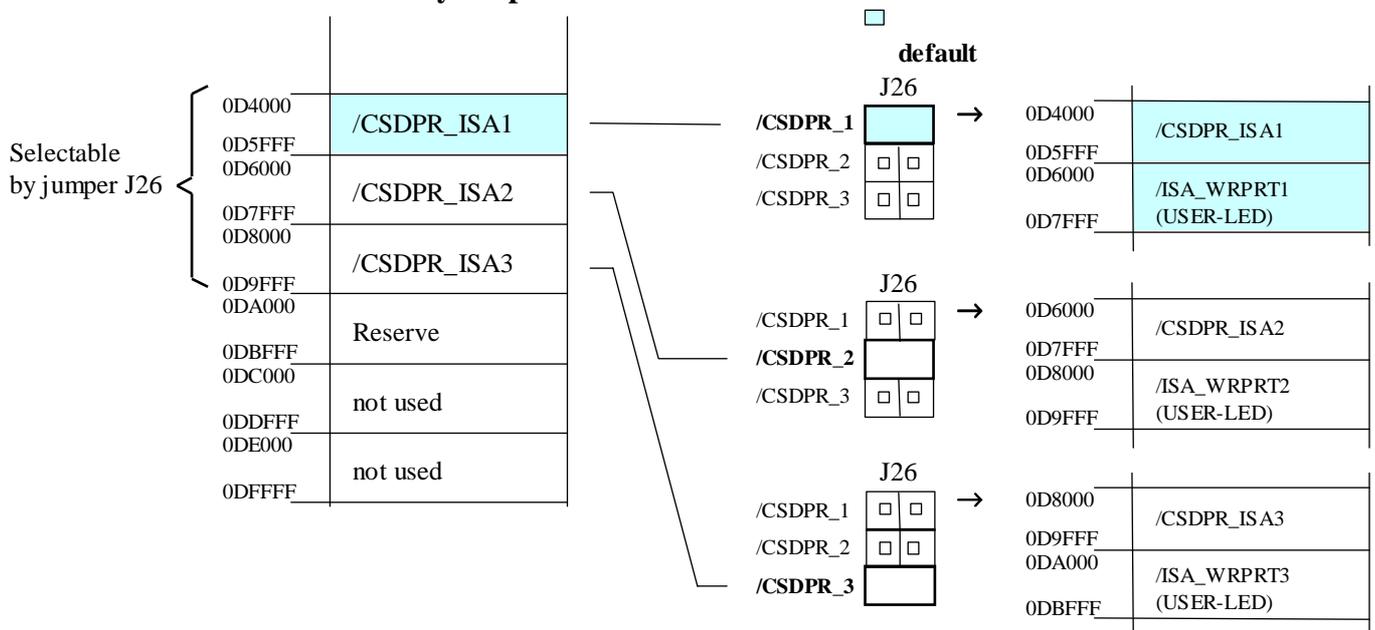
Note:　　If function EMM386 in 'CONFIG.SYS' is active, the DPRAM memory area must be assigned as 'NOEMS'.

3.2   Use of DPRAM in PG4

From the PG4's Project Manager, run the "PCD Online Configurator".
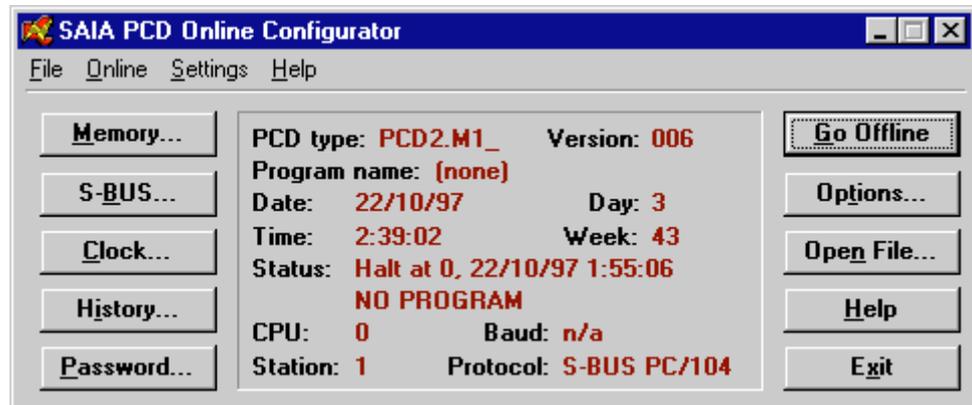
In the Online Configurator window (see above picture) care should be taken to ensure that the "S-BUS PC/104" protocol has actually been selected. Otherwise communication between the PCD2 and the PC should be disabled by clicking on "Go Offline". Then click on "Options...". In the "Channel name:" selection menu, choose "S-BUS PC/104" (see picture below).
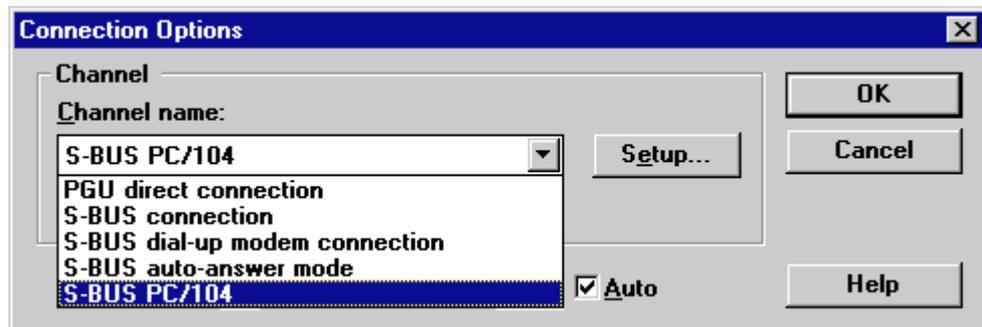
3.3 Programming DPRAM

S-Bus communications libraries have been developed for experienced users. These use the DPRAM to exchange data between the PC/104 and the PCD2.

DOS applications

A "C" library is available for customers who develop their applications under DOS:

$\rightarrow$ PCD8.C16E

This library contains all the necessary communications functions.

WINDOWS applications

Communications libraries are available for WINDOWS 3.x, WINDOWS 95 or WINDOWS NT:

$\rightarrow$ PCD8.C17E   (for WINDOWS 3.x, DLL 16 bit)

$\rightarrow$ PCD8.C18E   (for WINDOWS 95/NT, DLL 32 bit)

These DLLs (Dynamic Link Libraries) should be used only by programmers with sound knowledge of Windows programming.

These libraries allow data to be exchanged with any programs which support DLLs, e.g.:

- Process control systems like: FactoryLink
                                        Wizcon
                                        Intouch
                                        Genesis
                                        …
- Excel
- Word
- Access
- C++
- Pascal
- Delphi
- Visual Basic
- Etc..

Notes :

4.   PC/104 modules

4.1   PC/104-CPU MSM486SV (Elan 400)

4.1.1   Technical data (MSM486SV Specifications)
(for the configuration of the harddisk, see chapter 4.5)

CPU:

CPU 486:	AMD 400™ compatible with 486DX-66MHz
Mode:	Real / Protected
Compatibility:	8086 - 80386
1. Level Cache:	8 kByte write-back
Word Size:	16 Bits
Physical Addressing:	24 lines
Virtual Addressing:	64 MBytes
Clock Rates:	10, 33, 66, (99) MHz selectable
Socket Standard:	directly soldered onboard

Math. Coprocessor:

not available on AMD-ELAN400 CPU

Power Management:

available	clock switching, sleep, possible controlled power-up, inactivity-auto powerdown

DMA:

8237A comp.	2 channels 8 Bits

Interrupts:

8259 comp.	8 + 2 levels PC compatible

Timers:

8254 comp.	3 programmable counter/timers

Memory:

DRAM	4, (8), (12), 16 MByte directly soldered onboard

Video:

Controller:	65540 from C&T
BUS:	VESA Local Bus 32 Bit
Enhanced BIOS:	VGA / LCD BIOS
Memory:	VRAM onboard: 1MByte
CRT-Monitor:	VGA, SVGA up to 768 x 1024 pixels 16/256 colors
Flatpanel:	TFT: 640 x 480 with 8/16/256 colors
	STN: 640 x 480 monochrome
	STN: 640 x 480 with 256 colors
	Plasma: up to 1280 x 1024
	EL: 640 x 350 , 640 x 480, 768 x 1024 pixels
Controller Modes:	CRT only; Flatpanel only or simultaneous CRT and Flatpanel
LCD-BIAS:	not available onboard
Drivers:	Windows

Mass Storage:

FD: Floppy disk interface, for max. 1 floppy with
                    26pin connector
HD: IDE interface, AT - Type, for max. 2 harddisks,
                    44pin connector, for 1.3, 1.8 and 2.5" harddisk
                    with 44pin IDE

Sockets SSD:

1st socket: READ/WRITE ROMDisk, Flashdisk 512kByte - 8MByte
IDE: MSFLASH-Drive 4MB or 10MB onboard mountable

Standard AT Interfaces:

Serial:

Name	FIFO	IRQs	Addr.	Standard	Option
COM1	yes	IRQ4	3F8	RS485	yes
COM2	yes	IRQ3	2F8	RS232C	
COM3	yes	IRQ4	3E8	RS232C	
COM4	yes	IRQ3/11	2E8	RS232C	yes

                    COM1 and COM3 can not share the IRQ4 line
                    simultanly. (Baudrates: 50 - 115 KBaud pro-
                    grammable)
Parallel: LPT1 printer interface, Modes: SPP (output) ,
                    EPP (bidir.)
Keyboard: AT- or PS/2-keyboard
Mouse: PS/2
Speaker: 0.1 W output drive
RTC: integrated into the ELAN400, RTC with CMOS-
                    RAM 128Byte
Backup current: 5 µA at 3V
Battery: Lithium 60mAh onboard (lifetime approx. 1 year)
                    or external

Supervisory:

Watchdog: LTC1232 with power-fail detection, strobe time
                    max. 1 sec.

BUS:

PC/104:   IEEE-996 standard bus, buffered with 24mA
Clock: 8 MHz or programmable

Peripheral Extension:

                    with PC/104 BUS

Power Supply:

Working: 5 Volts ± 5%
Power Rise Time: 100ms + 10% (ov --> 4,75V)
Current: 650 mA nominal with active VGA
                    350 mA in Sleep mode

Physical Characteristics:

Dimensions: Length: 90 mm
                      Depth: 96 mm
                      Height: 20 mm
Weight: 120 gr / 5 ounces
PCB Thickness: 1.6 mm / 0.0625 inches nominal
PCB Layer: 8 with separate ground and VCC plane for low noise

Operating Environment:

Relative Humidity: 5 - 90% non condensing
Vibration: 5 to 2000 Hz
Shock: 10 G
Temperature:
        Operating: Standard version: -25°C to +70°C
                      Extended version: -25°C to +85°C T.B.A
        Storage: -55°C to +85 °C

EMI / EMC (IEC1131-2 refer MIL 461/462):

ESD Electro Static Discharge:
                      IEC 801-2, EN55101-2, VDE 0843/0847 Part 2
                      metallic protection needed
                      separate Ground Layer included
                      15 kV single peak
REF Radiated Electromagnetic Field:
                      IEC 801-3, VDE 0843 Part 3, IEC770 6.2.9.
                      not tested
EFT Electric Fast Transient (Burst):
                      IEC 801-4, EN50082-1, VDE 0843 Part 4
                      250V - 4kV, 50 ohms, Ts=5ns
                      Grade 2: 1KV Supply, 500 I/O, 5Khz
SIR Surge Immunity Requirements:
                      IEC 801-5, IEEE587, VDE 0843 Part 5
                      Supply: 2 kV, 6 pulse/minute
                      I/O: 500 V, 2 pulse/minute
                      FD, CRT: none
High-frequency radiation:
                      EN55022 Kl. A

Compatibility:

MSM486SV: mechanically compatible to our MSMx86 Boards
                      and to all other PC/104 boards

Any information is subject to change without notice.

4.1.2   Interfaces

Parallel port LPT1 (Line Printer Port LPT1)

A standard bi-directional LPT port is integrated in the MICROSPACE PC.

Further information about these signals is available in numerous publications, including the IBM tech-nical reference manuals for the PC and AT computers and from some other reference documents.

The current is: IOH = 12 mA IOL = 24mA

The SMC 37C666 may be programmed with reset strap options in the following modes:

Parallel Port Address (default LPT1)

PCF1 (RTS1) R42	PCF0 (TXD1) J20	port address	IRQ
low	low 2-3	Disabled	7
low	high 1-2	PS2 3BCh	7
high	**low 2-3**	LPT1 378h	7
high	high 1-2	LPT2 278h	7

In order to make any changes the resistor must be wired to the other potential.

Parallel Port Mode (default normal)

ECPEN (MTR2) R35	PADCF (GAME) R46	Printer function
low	low	**Std. Printer Port, output only**
low	high	Enh.Printer Port, bidirectional
high	low	ECP
high	high2	ECP & EPP

In order to make any changes the resistor in V1.21must be wired to the other potential. The next board revision will have jumpers.

Since V1.21 the IOCHRDY is connected to Pin 100, which is needed for the EPP Mode. ECP needs DRQ7 on pin 99 and DACK7 on pin 96 of the SMC37C666. These signals are not connected to these pin numbers in V1.21, since the DACK7/DRQ7 is not available on the ELAN400/410 !

Serial ports COM1 - COM2 - COM3

The serial channels are fully compatible with 16C550 UARTS. COM1 is the primary serial port, and is supported by the board's ROM-BIOS as the PC-DOS 'COM1' device. The secondary serial port is COM2; it is supported as the 'COM2' device. The internal UART (COM1) and the UPC (COM3) use the same IRQ4. This IRQ4 can not be shared, that means only the internal UART or the COM3 gener-ates interrupt requests. The IRQ4 may be switched with the register D6h. or the tool IRQ4.EXE with the parameter I (=internal) or E (=external). The IRQ4.EXE is located on the tooldisk. If the COM3 is selected to the IRQ5, the communication driver must handle the IRQ5 requests. The BIOS deals only with IRQ3 and IRQ4.

Switch the IRQ4	to internal UART (COM1):	IRQ4 I	(reg D6h = 50h)
	to external SMC UART (COM3)	IRQ4 E	(reg D6h = 54h)

Standard:	COM 3/2:	37C666 (SMC):	2 x 16C550 compatible serial interfaces with RS232C
	COM1:	ELAN400:	1 x 16C550 compatible serial interface with RS485

The COM of the ELAN (default COM1)

ELAN	port address	IRQ
register int com disabled	Disabled	
register int com enabled	**COM1 3F8h**	4

On Board V2.x the SMC37C665 is programmable in the BIOS-Setup.

Serial ports RS485 an COM1

The RS485 interface is controlled by the RTS/DTS outputs of the COM1 at the address 3fch. The ap-plication must be able to control the RS485 port correctly.

Function	Output: RS485	Input: RS485	RTS-Output (3FCh Bit 1)	DTS-Output (3FCh Bit0)	Remarks
RS485	Enabled	Disabled	0	0	Transmit Data
RS485	Enabled	Enabled	0	1	TxD & RxD, Loopback
RS485	Disabled	Disabled	1	0	No Bus Access
RS485	Disabled	Enabled	1	1	Receive only Data

Speaker Interface

One of the board's CPU device provides the logic for a PC compatible speaker port. The speaker logic signal is buffered by a transistor amplifier, and provides approximately 0.1 watt of audio power to an external 8 ohm speaker. Connect the speaker between VCC and speaker output to have no quiescient current.

4.1.3   Memory

System Memory Map

The AMD ELAN400^{TM} CPU used as central processing unit on the MICROSPACE PC has a memory address space which is defined by 26 address bits. Therefore, it can address 64 MByte of memory.
The memory address MAP is as follows:

CPU AMD ELAN400

Address:	Size:	Function / Comments:
0000000 - 009FFFFh	640 KBytes	Onboard DRAM for DOS applications
00A0000 - 00BFFFFh	128 KBytes	CGA, EGA, LCD Video RAM 128kB
00C0000 - 00C7FFFh	32 KBytes	VGA BIOS
00C8000 - 00CFFFFh	32 KBytes	BIOS Extension

00D0000 - 00DFFFFh	64 KBytes	No FFS:
		        D000 - DDFFF are free
		        DE00 - DFFFF for Msystems
		With DL-FFS:
		        D000 - D9FFF are free
		        DA00 - DFFFF for DL-FFS
		With PCMCIA:
		        additional 4k are used
		        on D000 - D0FFF

00E0000 - 00E8000h	32 KBytes	Flashbios
00E8000 - 00EBFFFh	16 KBytes	Resource bios
00EC000 - 00EEFFFh	12 KBytes	CARDBIOS
00F0000 - 00FFFFFh	64 KBytes	BIOS
0100000 - 01FFFFFh	1 MBytes	DRAM for extended onboard memory
0200000 - 03FFFFFh	2 MBytes	DRAM for extended onboard memory

Address:	Size:	Function / Comments:
1000000 - 1FFFFFF	16 MBytes	Flashdisk Window
2000000 - 2FFFFFF	16 MBytes	Reserved for PCMCIA Socket 1
3000000 - 3FFFFFF	16 MBytes	Reserved for PCMCIA Socket 2 *)

*) not available on MSM486SN/SV products!

The possible system memory sizes (DRAM)

4 MB	MSM486SV4	4MB Memory
8 MB	MSM486SV8	8MB Memory
12 MB	MSM486SV12	12MB Memory
16 MB	MSM486SV16	16MB Memory

System I/O map

The following table shows the detailed listing of the I/O port assignments used in the MICROSPACE MSM486SV board:

I/O Address:	MSM486SV:
0000 – 001Fh	DMA controller 1
0020 – 003Fh	Interrupt controller 1
0040 – 004Fh	Timer 1
0050 – 005Fh	Timer 2
0060 – 007Fh	Keyboard, System port
0070 – 007Fh	Real Time Clock
0080 – 009Fh	DMA page registers
00A0 – 00BFh	2. Interrupt controller
00C0 – 00DFh	2. DMA Controller
00F0 – 00FFh	
01F0 – 01F8h	IDE HD-Controller
0200 – 021Fh	EMS
0278 – 027Fh	LPT 2 (not used onboard)
02B0 – 02B7h	Watchdog, EEPROM
02E8 – 02EFh	COM3
02F8 – 02FFh	COM2
0300 – 031Fh	Ethernet LAN
0320 – 036Fh	free
0378 – 037Fh	LPT 1
03C0 – 03DFh	VGA controller
03E0 – 03E1h	PCMCIA Registerset of the 365
03E8 – 03EFh	free (reserved for COM4)
03F0 – 03F7h	Floppy disk
03F8 – 03FFh	COM 1

4.1.4   Interrupt Controller

An 8259A compatible interrupt controller, within the CS4041 device, provides seven prioritized interrupt levels. Of these, several are normally associated with the board's onboard device interfaces and controllers, and several are available on the AT expansion bus.

Interrupt:	Sources:	onboard used:
IRQ0	ROM-BIOS clock tick function, from timer 0	yes
IRQ1	Keyboard controller output buffer full	yes
IRQ2	Used for cascade 2. 8259	yes
IRQ3	COM2 serial port	yes
IRQ4	COM1 + COM3 serial port	yes
IRQ5	free for user (reserved for LAN interface)	no
IRQ6	Floppy controller	yes
IRQ7	LPT1 parallel printer	yes
IRQ8	Alarm function of the RTC	yes
IRQ9	not available with ELAN400	
IRQ10	remapable on ELAN400	
IRQ11	remapable on ELAN400	
IRQ12	PS/2 mouse	yes
IRQ13	Math. coprocessor	not available
IRQ14	Harddisk IDE / SCSI	yes
IRQ15	remapable on ELAN400	

Interrupt Redirection

On this design, the IRQ5, IRQ12, IRQ14 are free programmable interrupt lines (we say PIRQ5, PIRQ12 and PIRQ14). That means, internaly of the ELAN400, this lines may be routed to any IRQ number between 1 and 15. The program E400IRQ.EXE /[PIRQn] /[IRQn] select the multiplexer of the ELAN400. The redirector must be loaded befor the first time of using the interrupt!

Ex. If you do not need the IRQ5, but you need instead the IRQ10, execute the following line:

> E400IRQ /5 /10
> E400IRQ /? shows the help information

Internal of the ELAN400:
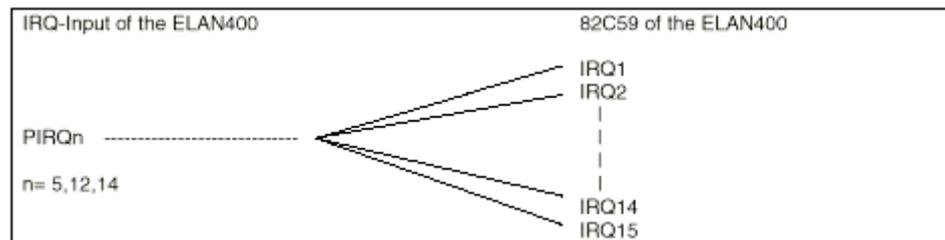
Since board revision 2.0 and higher:
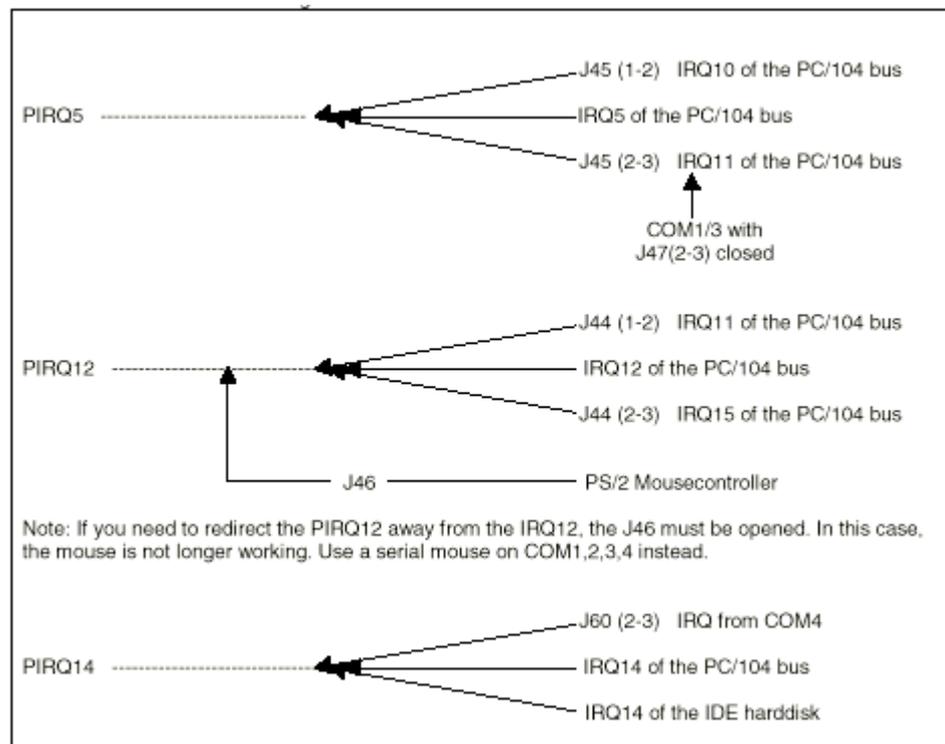
Note: If you select J60 (2-3) and redirect the PIRQ14, the IDE disk is no longer available.

Lets make some examples:

A.) We assume: MSME104 LAN card works with IRQ10 under the WIN95 operating system

Solution: **1. Board modifications:**
Close J45 pin 1-2
Open J44 fully
Close J46, the mouse is working

Set the LAN Card to IRQ10
Note: the IRQ5 pin of the PC/104 bus may not longer be used.

2. Redirection in the ELAN400 multipexer:
Insert in the AUTOEXEC file the following line before starting anything of the LAN driver.

E400IRQ /5 /10

3. Setup of the WIN95 LAN-driver:
Setup to IRQ10, IOBASE xx

B.) We assume   Soundcard MSMM104 is used under the WIN95 operating system
Windows Sound Syst: Base Port: Address 530 - 53fh, IRQ5, Play/Rec DMA 01
MPU401:   Base Port: Address 330-331h, IRQ11
Sound Blaster System: Base Port: Address 220-22fh
Others: OPL3 Port: Address 388h-388h

Solution: **1. Board modifications:**
Close J44 pin 1-2
Open J45 fully
Open J46, the mouse is not longer working, use a serial mouse

2. Redirection in the ELAN400 multipexer:
Insert in the AUTOEXEC file the following line before starting anything of the Soundblaster driver.

E400IRQ /12 /11

3. Setup of theSound-driver:
Setup to IRQ5, IRQ11, IOBASE xx

4.1.5   Timer and Counter

<u>Programmable Timer</u>

An 8253 compatible timer/counter device is also included in the board's ASIC device. This device is utilized in precisely the same manner as in a standard AT implementation. Each channel of the 8253 is driven by a 1.190 MHz clock, derived from a 14.318 MHz oscillator, which can be internally divided in order to provide a variety of frequencies.

Timer 2 can also be used as a general purpose timer if the speaker function is not required.

<u>Timer Assignment</u>

Timer	Function
0	ROM-BIOS clock tick (18.2 Hz)
1	DRAM refresh request timing (15 µS)
2	Speaker tone generation time base

<u>Batterie gepufferte Uhr (RTC)</u>

An AT compatible date/time clock is located within the chipset. The device also contains a CMOS static RAM, compatible with that in standard ATs. System configuration data is normally stored in the clock chip's CMOS RAM in a manner consistent with the convention used in other AT compatible computers.

One unique feature of the board's battery-backed clock device is that it contains the backup battery directly on the board. The battery is rated for a minimum of 100 days of clock and internal CMOS RAM backup under conditions of no power to the board.

The battery is a DIGITAL-LOGIC AG replacement part. The battery-backed clock can be set by using the DIGITAL-LOGIC AG SETUP at boot-time.

Addresses: 70h   =   Index register
                    71h   =   Data transfer register

RTC-Address MAP: 00 - 0F   Real time clock
                      10 - 3F   BIOS setup (Standard)
                      40 - 7F   Extended BIOS

The onboard LithiumBattery has a capacity of 60mAh. The chipset consumes the following currents:
Typical battery current at 25°C :   5 µA

<u>Watchdog</u>

The watchdog timer is not tested in the current product version.

To activate the watchdog, install jumper J28. Use the special function in INT15h to strobe the watch-dog periodically.

> D7 = '1':   Watchdog not strobed
> D7 = '0':   Watchdog is strobed with 32kHz

4.1.6   BIOS

<u>BIOS CMOS Setup</u>

If wrong setups are memorized in the CMOS-RAM, the default values will be loaded after resetting the RTC/CMOS-RAM with the CMOS-RESET jumper. If the battery is down, it is always possible to start the system with the default values from the BIOS.

The following entries may be made:

Date: The current Real Date of the RTC

Time: The current Real Time of the RTC

Drive: A or B none =   no drive present, SSD / ROM-Disk en-
                                abled (if device is loaded)
                   360k =   5,25" low density drive, SSD enabled
                   1,2 MB =   5,25" high density drive
                   720 K =   3,5" low density drive
                   1,44 MB =   3,5" high density drive (Default for A:)
                   The A: Drive is the bootable drive.

Display type: CRT: for Mono CRTs, no LCD operating possible.
                   40 x 25:   for Color CGA or LCD
                   80 x 25:   for Color CGA or LCD (Default)
                   VGA: for VGA

Harddisk type: defines which drive is connected
                   Type = 0 means no drive is present (Default)!
                   Drive type 48 and 49 enable you to define a custom
                   harddisk parameter.

<u>WARNING:</u>

On the next setup pages (switched with PgDn and PgUp) the values for special parameters are modi-fiable. Normally the parameters are set correctly by DIGITAL-LOGIC AG. Be very careful in modifying any parameter since the system could crash. Some parameters are dependent on the CPU type. The cache parameter is always available, for example. So, if you select too few wait states, the system will not start until you reset the CMOS-RAM using the RAM-Reset jumper, but the default values are re-loaded. If you are not familiar with these parameters, do not change anything.

EEPROM mit gespeichertem CMOS-Setup

The EEPROM is used for setup and configuration data, stored as an alternative to the CMOS-RTC. Optionally, the EEPROM setup driver may update the CMOS RTC, if the battery is running down and the checksum error would appear and stop the system. The capacity of the EEPROM is 2048 Bytes.

Organisation of the 2048Byte EEPROMs:

Address MAP:	Function:
0000h	**CMOS-Setup valid (01=valid)**
0001h	**Keymatrix-Setup valid (01=valid)**
0003h	**Flag for DLAG-Message (FF=no message)**
0010h–007Fh	**Copy of CMOS-Setup data**
0080h–00FFh	**reserved for AUX-CMOS-Setup**
0100h–010Fh	**Serial-Number**
0110h–0113h	Production date (year/day/month)
0114h–0117h	1. Service date (year/day/month)
0118h–011Bh	2. Service date (year/day/month)
011Ch–011Fh	3. Service date (year/day/month)
0120h–0122h	Booterrors (Autoincremented if any booterror occurs)
0123h–0125h	Setup Entries (Autoincremented on every Setup entry)
0126h–0128h	Low Battery (Autoincremented everytime the battery is low, EEPROM -> CMOS)
0129h–012Bh	Startup (Autoincremented on every poweron start)
0130h	Number of 512k SRAM
0131h	Number of 512k Flash
0132h/0133h	BIOS Version (V1.4 => [0132h]:= 4, [0133h]:=1)
0134h/0135h	BOARD Version (V1.5 => [0124h]:=5, [0125h]:=1)
0136h	BOARD TYPE ('M'=PC/104, 'E'=Euro, 'W'=MSWS, 'S'=Slot, 'C'=Custom)
0137h	CPU TYPE (01h=ELAN300/310, 02h=ELAN400, 03h=486SLC, 04h=486DX, 05h=P5).
0200h–03FFh	**Keymatrix-Setup data**
0200h–027Fh	Keymatrix Table
0400h–07FFh	**Free for Customer's use**

4.1.7   DiskOnChip

On the SSD 36pin socket a DiskOnChip module from M-Systems may be installed with a capacity of 512k to 12MByte. This device is available from DIGITAL-LOGIC AG.

Operating Systems:

DOS, DL-DOS, RTX-DOS, WIN 3.11, ROM-WIN are working with these drives. All other non DOS compatible systems need a driver. Give attention to the pin 1 orientation in the 36pin SSD socket. Pins 1, 2 and 35, 36 are not used by the DiskOnChip device and must be open.
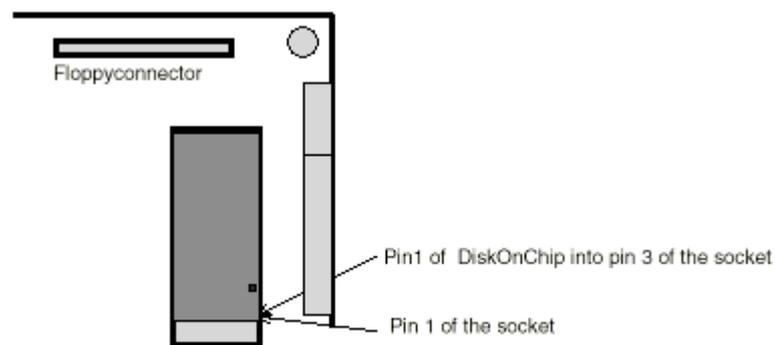
Enabling and Formatting of the DiskOnChip-Modules

Enabling:
Disable the Virus-Alert Option, and disable the DIGITAL-LOGIC flashdisk.

Format: (DiskOnChip is formatted ex works)

1. Boot-up from the standard floppydisk A: or from a harddisk.
2. Enter the tooldisk from M-Systems containing the formattool
   DFORMAT.EXE
   use: dformat /win:DC00 /S:DOC104.EXB /FIRST
3. Start format utility
   The screen should inform about the status of the flashdisk.
4. Enter the DOS-Bootdisk and transfer the bootfiles with SYS A: C:
   From this moment, the flashdisk is now the bootable drive C: and if any harddisk is conencted it changes to letter D: and E:

4.2   PC/104-CPU MSM486DX

4.2.1   Technical data
(for the configuration of the harddisk, see chapter 4.5)

CPU:

CPU 486:	IntelDX4™-100
Mode:	Real / Protected
Compatibility:	8086 - 80386
1. Level Cache:	8 kByte write-back
Word Size:	32 Bits
Physical Addressing:	32 lines
Virtual Addressing:	16 GBytes
Clock Rates:	100 MHz
Socket Standard:	directly soldered onboard

Math. Coprocessor:

integrated in the IntelDX4™-100

Power Management:

available   clock switching, sleep, possible controlled
                     power-up, inactivity-auto powerdown

DMA:

8237A comp.   4 channels 8 Bits
                     3 channels 16 Bits

Interrupts:

8259 comp.   8 + 7 levels
                     PC compatible

Timers:

8254 comp.   3 programmable counter/timers

Memory:

DRAM   4, (8), (12), 16 steps

Video:

Controller:	65540 (opt. 65545) from C&T
BUS:	32 Bit high speed 33 MHz local bus
Enhanced BIOS:	VGA / LCD BIOS
Memory:	VRAM onboard: V3.0 512 KB, V4.0 1024 kByte
CRT-Monitor:	VGA, SVGA up to 768 x 1024 pixels 16/256 colors
Flatpanel:	TFT: 640 x 480 with16/256/16M color
	STN: 640 x 480 monochrome
	STN: 640 x 480 with 256 colors
	Plasma: up to 1280 x 1024
EL:	640 x 350 , 640 x 480, 768 x 1024 pixels
Controller Modes:	CRT only; Flatpanel only or simultaneous CRT
LCD-BIAS:	software adjustable resistor and Flatpanel
Drivers:	Windows, NT3.5, NT4.0

Mass Storage:

FD:	Floppy disk interface, for max. 1 floppy with 26pin connector
HD:	E-IDE interface, AT - Type, for max. 2 harddisks, 44pin connector, for 1.3, 1.8 and 2.5" harddisk with 44pin IDE

Sockets SSD:

1st socket:	2 MByte

Standard AT Interfaces:

Serial:

Name	FIFO	IRQs	Addr.	Standard	Opt.
COM1	yes, V4.0	IRQ4	3F8	RS232C	
COM2	yes, V4.0	IRQ3	2F8	RS232C	

(Baudrates: 50 - 115 KBaud programmable)

Parallel:	LPT1 printer interface mode: SPP (output only), EPP (bidirectional)
Keyboard:	AT- or PS/2-keyboard
Mouse:	PS/2
Speaker:	0.1 W output drive
RTC:	integrated into the 404/45, RTC with CMOS-RAM 128 Byte
Backup current:	5 μA
Battery:	NiCd or NiMH+ Akku 60 mAh onboard, 100 days backup or external 6 volt battery package with larger capacity.

Supervisory:

Watchdog:	LTC1232 with power-fail detection

BUS:

PC/104:	IEEE-996 standard bus, buffered with 24mA
Clock:	8 MHz or programmable

Peripheral Extension:

with PC/104 BUS

Power Supply:

Working:	5 Volts ± 5%
Power Rise Time:	100ms + 10% (0V $\rightarrow$ 4,75V)
Current: Normal	1800 mA nominal, CPU 100 MHz, Optional: switched 3.3V: 1300 mA
Current: Suspend	850 mA

Physical Characteristics:

Dimensions: Length: 90 mm
                     Depth: 96 mm
                     Height: 20 mm   (30 mm incl. cooler)
Weight: 120 gr / 5 ounces
PCB Thickness: 1.6 mm / 0.0625 inches nominal
PCB Layer: 8 with separate ground and VCC plane for low noise

Operating Environment:

Relative Humidity: 5 - 90% non condensing
Vibration: 5 to 2000 Hz
Shock: 10 G
Temperature:
         Operating: Standard version: -25°C to +70°C
                     Extended version: -25°C to +85°C T.B.A
         Storage: -55°C to +85 °C

EMI / EMC (IEC1131-2 refer MIL 461/462):

ESD Electro Static Discharge:
                     IEC 801-2, EN55101-2, VDE 0843/0847 Part 2
                     metallic protection needed
                     separate Ground Layer included
                     15 kV single peak
REF Radiated Electromagnetic Field:
                     IEC 801-3, VDE 0843 Part 3, IEC770 6.2.9.
                     not tested
EFT Electric Fast Transient (Burst):
                     IEC 801-4, EN50082-1, VDE 0843 Part 4
                     250V - 4kV, 50 ohms, Ts=5ns
                     Grade 2: 1KV Supply, 500 I/O, 5Khz
SIR Surge Immunity Requirements:
                     IEC 801-5, IEEE587, VDE 0843 Part 5
                     Supply: 2 kV, 6 pulse/minute
                     I/O: 500 V, 2 pulse/minute
                     FD, CRT: none
High-frequency radiation:
                     EN55022 Kl. A

Compatibility:

MSM486DX: mechanically compatible to our MSMx86 Boards
                     and to all other PC/104 boards

Any information is subject to change without notice.

4.2.2   Interfaces

__Parallel port LPT1__ (Line Printer Port LPT1)

A standard bi-directional LPT port is integrated in the MICROSPACE PC.

Further information about these signals is available in numerous publications, including the IBM tech-nical reference manuals for the PC and AT computers and from some other reference documents.

The current is: IOH = 12 mA IOL = 24mA

For bidirectional operation select the EPP mode in the BIOS-Setup.

__Serial ports COM1 - COM2__

The serial channels are fully compatible with 16C450 UARTS. COM1 is the primary serial port, and is supported by the board's ROM-BIOS as the PC-DOS 'COM1' device. The secondary serial port is COM2; it is supported as the 'COM2' device. However, it is possible to disable either one or both serial ports using the BIOS-Setup.

Standard: COM 1/2:   82C735 (C&T):
                               2 x 16C550 compatible serial interfaces

__Speaker Interface__

One of the board's CPU device provides the logic for a PC compatible speaker port. The speaker logic signal is buffered by a transistor amplifier, and provides approximately 0.1 watt of audio power to an external 8 ohm speaker. Connect the speaker between VCC and speaker output to have no quiescient current.

4.2.3   Memory

System Memory Map

The IntelDX4™-100 CPU used as central processing unit on the
MICROSPACE has a memory ad-dress space which is defined by 32
address bits. Therefore, it can address 1 GByte of memory. The memory
address MAP is as follows:

CPU 486DX

Address:	Size:	Function / Comments:
000000 - 09FFFFh	640 KBytes	Onboard DRAM for DOS applications
0A0000 - 0BFFFFh	128 KBytes	CGA, EGA, LCD Video RAM 128kB
0C0000 - 0C7FFFh	32 KBytes	VGA BIOS
0C8000 - 0C8FFFh	4 KBytes	INT15 Support
0C9000 - 0CCFFFh	16 KBytes	FFS
0CD000 - 0CFFFFh	12 KBytes	reserved
0D0000 - 0D4000h	16 KBytes	free for user (reserved for PCMCIA)
0D4000 - 0D8000h	16 KBytes	free for user
0D8000 - 0DFFFFh	32 KBytes	free for user
0E0000 - 0EFFFFh	64 KBytes	SOLID STATE DISK, Flash-File-System for ROM-DOS, transfer window
0F0000 - 0FFFFFh	64 KBytes	Byte wide memory socket for BIOS and shadow DRAM
100000 - 1FFFFFh	1 MByte	DRAM for extended onboard memory
200000 - 3FFFFFh	14 MBytes	DRAM for extended onboard memory

System I/O map

The following table shows the detailed listing of the I/O port assignments used in the MICROSPACE MSM486DX board:

I/O Address:	MSM486DX:
`0000 – 001Fh`	DMA controller 1
`0020 – 0021h`	Interrupt controller 1
`0022h`	Chipset Register Index
`0023h`	Chipset Register Data
`0040 – 004Fh`	Timer 1
`0050 – 005Fh`	Timer 2
`0060 – 007Fh`	Keyboard, System port
`0070h`	RTC, CMOS Register Index
`0071h`	RTC, CMOS Register Data I/O
`0080 – 009Fh`	DMA page registers
`00A0 – 00BFh`	2. Interrupt controller
`00C0 – 00DFh`	2. DMA Controller
`00F0 – 00FFh`	Math. Coprozessor
`01F0 – 01F8h`	IDE HD-Controller
`0200 – 021Fh`	Gameport, EMS
`0278 – 027Fh`	LPT 2 (not used onboard)
`02B0 – 02B7h`	SSD Window Address, Watchdog
`02B8 – 02BFh`	EEPROM input, Dataswitch
`02E8 – 02EFh`	COM3 (not used onboard)
`02F8 – 02FFh`	COM2
`0300 – 031Fh`	Ethernet LAN (not used onboard)
`0320 – 036Fh`	free
`0378 – 037Fh`	LPT 1
`03C0 – 03DFh`	VGA controller
`03E8 – 03EFh`	COM4 (not used onboard)
`03F0 – 03F7h`	Floppy disk
`03F8 – 03FFh`	COM 1

4.2.4   Interrupt Controller

An 8259A compatible interrupt controller, within the CS4041 device, provides seven prioritized interrupt levels. Of these, several are normally associated with the board's onboard device interfaces and controllers, and several are available on the AT expansion bus.

Interrupt:	Sources:	onboard used:
IRQ0	ROM-BIOS clock tick function, from timer 0	yes
IRQ1	Keyboard controller output buffer full	yes
IRQ2	Used for cascade 2. 8259	yes
IRQ3	COM2 serial port	yes
IRQ4	COM1 serial port	yes
IRQ5	LPT2 parallel printer (if present)	no
IRQ6	Floppy controller	yes
IRQ7	LPT1 parallel printer	yes
IRQ8	Battery backed clock	yes
IRQ9	Free for user	no
IRQ10	Free for user	no
IRQ11	Free for user	no
IRQ12	PS/2 mouse	yes
IRQ13	Math. coprocessor	yes
IRQ14	Harddisk IDE / SCSI	yes
IRQ15	Free for user	no

4.2.5   Timer and Counter

Programmable Timer

An 8253 compatible timer/counter device is also included in the board's ASIC device. This device is utilized in precisely the same manner as in a standard AT implementation. Each channel of the 8253 is driven by a 1.190 MHz clock, derived from a 14.318 MHz oscillator, which can be internally divided in order to provide a variety of frequencies.

Timer 2 can also be used as a general purpose timer if the speaker function is not required.

Timer Assignment

Timer	Function
0	ROM-BIOS clock tick (18.2 Hz)
1	DRAM refresh request timing (15 µS)
2	Speaker tone generation time base

Battery buffered Real Time Clock (RTC)

An AT compatible date/time clock is located within the chipset. The device also contains a CMOS static RAM, compatible with that in standard ATs. System configuration data is normally stored in the clock chip's CMOS RAM in a manner consistent with the convention used in other AT compatible computers.

One unique feature of the board's battery-backed clock device is that it contains the backup battery directly on the board. The battery is rated for a minimum of 100 days of clock and internal CMOS RAM backup under conditions of no power to the board.

The battery is a DIGITAL-LOGIC AG replacement part. The battery-backed clock can be set by using the DIGITAL-LOGIC AG SETUP at boot-time.

Addresses:	70h	=	Index register
	71h	=	Data transfer register

RTC-Address MAP:	00 - 0F	Real time clock
	10 - 3F	BIOS setup (Standard)
	40 - 7F	Extended BIOS

The onboard fully charged NiCd or NiMH+ Battery is able to work over 100 days witout recharging. The chip set consumes the following currents:

Typical battery current at 25°C :   5 µA

Watchdog

The watchdog timer detects a system crash and performs a hardware reset. After power up, the watchdog is always disabled as the BIOS does not send strobes to the watchdog. In case that the user wants to take advantage of the watchdog, the application must produce a strobe at least every 800 ms. If no strobe occures within the 800 ms, the watchdog resets the system.

To program the watchdog in user application DIGITAL-LOGIC AG has implemented a special BIOS extension in interrupt 60h/15h (function: EBh).

Calling this function by setting a 1 in the AL- Register, turns on the watchdog and performs a strobe. Calling the same function with a 0 in the AL-Register, turns off the watchdog.

The following part has to be implemented in the users application:

Watchdog on: The application has to call interrupt 60h/15h function EBh and set a 1 into the AL-register at least every 800 ms.

Watchdog off: The application has to call interrupt 60h/15h function EBh and set a 0 into the AL-register within 800 ms after the last strobe has been sent while the watch-dog was still in function (if the watchdog is not turned off in time, it will reset the system again!).

4.2.6   BIOS

BIOS CMOS Setup

If wrong setups are memorized in the CMOS-RAM, the default values
will be loaded after resetting the RTC/CMOS-RAM with the CMOS-
RESET jumper. If the battery is down, it is always possible to start the
system with the default values from the BIOS.

The following entries may be made:

Date: The current Real Date of the RTC

Time: The current Real Time of the RTC

Drive: A or B none =   no drive present, SSD / ROM-Disk en-
                                    abled (if device is loaded)
                   360k =   5,25" low density drive, SSD enabled
                   1,2 MB =   5,25" high density drive
                   720 K =   3,5" low density drive
                   1,44 MB =   3,5" high density drive (Default for A:)
                   The A: Drive is the bootable drive.

Display type: CRT: for Mono CRTs, no LCD operating possible.
                   40 x 25:   for Color CGA or LCD
                   80 x 25:   for Color CGA or LCD (Default)
                   VGA: for VGA

Harddisk type: defines which drive is connected
                   Type = 0 means no drive is present (Default)!
                   Drive type 48 and 49 enable you to define a custom
                   harddisk parameter.
                   Press F1 for autodetect the connected IDE drive.

WARNING:

On the next setup pages (switched with PgDn and PgUp) the values for
special parameters are modi-fiable. Normally the parameters are set cor-
rectly by DIGITAL-LOGIC AG. Be very careful in modifying any para-
meter since the system could crash. Some parameters are dependent on
the CPU type. The cache parameter is always available, for example. So,
if you select too few wait states, the system will not start until you reset
the CMOS-RAM using the RAM-Reset jumper, but the default values are
re-loaded. If you are not familiar with these parameters, do not change
anything.

Power Management Funktionen

Event A Interrups	active	wake
Disk Access:	no	no
LPT & COM Ports:	no	no
Kexboard:	no	no
Video & Coprocessor	no	no
Timer Tick:	no	no
Other IRQs:	no	no
Unmasked Interrupts:	no	no
NMI:	no	no

Event A Data Access	active	wake
Disk Access:	no	no
LPT & COM Ports:	no	no
Keyboard:	no	no
Video Memory:	no	no
Bus Masters:	no	no

Event B Interrupts	active	wake
Timer Tick:	no	
Unmasked Interrups:	no	no
Video Memory:	no	
Keyboard:	no	
Event A / Wake aA:	no	no

COM LPT Disk Selection	active	wake
COM1 & COM2:	no	
COM 3 & COM4:	no	
LPT1, LPT2 & LPT3	no	
Floppy Diskette Drive:	no	
IDE Drive:	no	
A-Timer: 1 off	0 ms	
B-Timer: 0 off	0 ms	

EEPROM with stored CMOS setup

The EEPROM has different functions, as listed below:

- Backup of the CMOS-Setup values.
- Storing system informations like: version, production date, customisation of the board, CPU type.
- Storing user/application values.

The EEPROM will be updated automatically after exiting the BIOS setup menu. The system will operate also without any CMOS battery. While booting up, the CMOS is automatically updated with the EEPROM values.

Press the ESC-key while powering on the system until the video shows the BIOS message and the CMOS will **not** be updated.

This would be helpful, if wrong parameters are stored in the EEPROM and the setup of the BIOS does not start.

If the system hangs or a problem appears, the following steps must be performed:

1. Reset the CMOS-Setup (use the jumper to reset or disconnect the battery for at least 10 minutes).
2. Press Esc until the system starts up.
3. Enter the BIOS Setup: a) load DEFAULT values
                                                b) enter the settings for the environment
                                                c) exit the setup
4. Restart the system.

- The user may access the EEPROM through the INT15 special functions. Refer to the chapter SFI functions.
- The system information are read only information. To read, use the SFI functions.

4.2.7   Flashdisk

What does a Flash-File-System

The Flash-File-System allows you to READ and WRITE information to and from the flashdisk, without limitation.

Usable DOS size of a Flash-File-System

Depending on the MICROSPACE product, different sizes and types are supported:
On the Flashdisk, the real usable capacity must be smaller than the installed devices, due to the spare sector of 64kByte and the memory area used by the FFS.

Onboard usable DOS size
2048k installed flash usable DOS size = 1920 kByte

Used Memory Window

The FFS software uses a 64k memory window at E000-EFFF (ELAN300:D000-DDFFF) to transfer data to and from the flashdisk.

Enable Flashdisk

In the BIOS Setup the Floppydrive B: must be selected to 360k for enabling the flashdisk.

How to format the Flashdisk C: (Flashdisk is formatted ex works)

Use the program DLFMT.EXE to format the flashdisk as follows:

> DLFMT C: [ENTER]

Transfer the system with SYS A: C:

Notes :

4.3 The PC-CARD: PC/104 module (PCMCIA)

4.3.1   Technical data

Controller:	VADEM 468
Compatibility:	fully with INTEL 365

Number of PC-CARD slots:	2
Cascadable units:	2 (total 4 slots possible)
Slot types:	1, 2 and 3
Slot mounting:	Slot A: external
	Slot B: external (internal as option)
PC-CARD version supported:	2.1
ExCA compatibility:	yes

PC-CARD devices supported:	SRAM cards FLASH cards ATA hard disk I/O cards such as modem, LAN, SCSI, etc.

Hot insertion:	supported

Programming voltage:	generated internally

Boot BIOS expansion:	possible internally, with optional boot EPROM

Software support:	SCM included on installation disk Phoenix Card Manager not included AM not included AWARD Cardware not included Software Systems not included

Data Transfer:	16 Bit

Data Transfer Rate:	Flash cards: read: up to 2 MBytes/sec
	                write: up to 60 KBytes/sec
	
	SRAM Card: read: up to 2 MBytes/sec
	                write: up to 500 KBytes/s

Temperature range:	Operation: -25°C .. +80°C Storage: -40°C .. +125°C

Supply:	5 Volt
Current:	max. 0.2 Amp
Number of layers:	4 (GND and VCC isolated)

Details may be changed without notice.

4.3.2   PC-CARDs supported

Summary

Card function:	Make:	Capacity:
SRAM cards:	Mitsubishi	1, 2 MBytes
	Fujitsu	1, 2 MBytes
	Seiko	512k, 1MByte, 2MBytes

FLASH cards:	Intel	1, 4 MBytes Series 1 4, 10, 20 MBytes Series 2
	Seiko / Epson	512 KBytes to 6 MBytes
	Mitsubishi	1, 2 MBytes
	Fujitsu	1, 2 MBytes
	AMD	1, 2, 4 MBytes
	TI	512 KBytes and 1 MByte

FAX/Modem cards:	Angia	FAX/Modem
	Dr. Neuhaus	FuryCard 2400
	ELSA	Microlink 2460MC
	Hotline	HL9672CC
	Intel	Modem 2400, 9600, 14400
	Megahertz	14400 Data/FAX Modem
	Psion	Goldcard

LAN cards:	IBM	Ethernet
	IBM	Token Ring
	XIRCOM	CE-10BC Ethernet-S
	SCM	SMC_ET and SCM_TR

ATA cards:	Calluna	CT80MC
	Integral	Integral 40 MBytes, 80 MBytes, 115 MBytes
	INTEL	ATA 5 MBytes Flash, 10 MBytes Flash
	Maxtor	MXL-105
	Seagate	ST7050
	SunDisk	ST710P5K 10 MBytes ATA Flash
	SunDisk	ST710P, ST720P ATA Flash mit 12V Vpp and 10, 20 MBytes

Important PC-CARD information

MEMORY cards:

Memory cards can be accessed as a normal disk. During initialization the PC card is assigned a drive letter. During the boot sequence, this drive designation is displayed on the screen. This information should always be noted.

SRAM and FLASH cards are not normally formatted. This means that the these cards must be formatted first. A formatting tool is provided for this purpose. FLASH cards need a flash file system for read or write access. Depending on the flash-write technology, this write access is a little slower than the write access to a floppy disk.

ATA cards:

ATA cards are available in 2 versions. One version is the ATA hard disk, consisting of the actual 1.8" hard disk drive with an IDE controller and PC card interface. The hard disk is accessed using 16-bit I/O transfers. The other version is the ATA flash card. These (intelligent) flash cards also contain an integral flash file system and a controller for accessing flash devices. ATA cards are configured automatically during the boot (start) period and access is via the assigned drive designation. Normal flash memory cards are not intelligent and need an external flash file system (driver) to be able to access anything.

> The ATA card must never be removed while it is being accessed. Otherwise data may be lost.

FAX and MODEM cards:

I/O-PC-CARD modules, such as FAX or MODEM cards, are configured automatically. It is only necessary to indicate the relevant COM port numbers. If IRQ3 and IRQ4 are used with COM1 and COM2, the driver reserves IRQ5 for COM3 and IRQ10 for COM4. These new IRQs must therefore be configured in the user program. In WINDOWS these interrupts should be assigned from 'Control Panel' - 'Ports'.

LAN cards:

LAN PC cards are normally supplied with "Card-Enable" software. There are 2 software versions: "PC CARD Enable" and "Card Services Enable". Earlier versions of the LAN-PC CARD also exist with "Socket Service Enable", but these cannot be used with the MSMJ104 card.

"Card Services Enable" Software:
This is now the usual method for exchanging data via a LAN-PC CARD. The "Enable" software communicates with a "Card Services" driver, which is loaded by CONFIG.SYS. This "Card Services Enable" software must be installed after full installation of the "Socket Services" and "Card Services" software.

"PC CARD Enable" Software:
Earlier CARD systems did not have "Socket Services" or "Card Services" and the "PC CARD Enable" software accessed hardware directly, without needing any socket service. Since the MSMJ104 card is fully compatible with INTEL PCIC 365SL, any "PC CARD Enable" software can be used. "PC CARD Enable" software is only used if CONFIG.SYS does not include socket or card services.

Other drivers supplied with LAN cards:

ODI Driver:	lsl	(Link Service Layer)
	ODI DRIVER	Ex. PCMDMCS
	ipxodi	(IPX to ODI)
	net	(NetWare Driver)

NDIS Driver: device = netprot.dos /i
(CONFIG.SYS)DEVICE = NDIS DRIVER.DOS
                     device = netbeui.dos

The /i option defines the path to the PROTOCOL.INI file which contains the configuration data.

Examples: IBM Ethernet LAN card:

ODI: The NET.CFG file must be modified as follows:
                       Link Driver PCMDMCS
                       FRAME ETHERNET_802.3
                       PC CARD

4.3.3   PC card formats supported

MSMJ104 supports memory cards with the "PC CARD/JEIDA 4.1" standard. Notebook and palmtop computers with integral PC-CARD slots support various memory card formats. Common formats include:

PC-CARD FORMAT: Most portable PCs with a PC-CARD slot support the defined PC-CARD standard format, also known as interchangeable file format (IFF). This format is mainly suitable for SRAM cards. It has only limited use with flash cards.

FLASH-FILE FORMAT: This was developed and defined as a standard flash-card format for frequent read/write operations with fast access.

Two makes are available:

SCM_FFS: supported by MSMJ104   requires SCM_FSS driver, included in MSMJ104.

MS_FFS: supported by MSMJ104   requires Microsoft driver, not included in SMJ104.

4.3.4   Hardware configuration

CPU module:	PC/104
Processor:	286, 386, 486
BUS:	16 bit AT compatible
BUS timing:	max. 8 MHz

Hard disk capacity:	2 MByte for all tools and drivers
Basic memory:	640 kBytes
Extended memory:	used to upload the FFS driver

Tested chip sets:	SCATsx, 4021, 4031 and 4041 from C&T

Memory window:	D000 - D2FFh or D800 - DAFFh or DD00 - DFFFh for PC-CARD
	E000 - EFFFh should not be used, as this range is used by the onboard SSD with E-FFS from DIGITAL-LOGIC AG.

4.3.5   Software support

In general, different drivers are required to operate a PC-CARD, depending on its type. Since the MSMJ104 is fully compatible with INTEL-365, several makes of driver can be used.

The module I/O addresses are also INTEL-compatible.

Register index:	3E0hex
Data transfer:	3E1hex
Slot 1:	Register number 00 - 3Fhex
Slot 2:	Register number 40 - 7Fhex

Software drivers depend on the module used:

Software driver:	FLASH:	SRAM:	ATA drive:	I/O card:	LAN cards:
From DIGITAL-LOGIC AG SCM FFS	**yes**	**yes**	**yes**	**yes**	**yes**
Not included:					
- Socket Service	yes	yes	yes	yes	yes
- Card Services	yes	yes	yes	yes	yes
- Resource Manager	no	no	yes	yes	yes
- Flash-File System	yes	(yes)	no	no	no
From module supplier:					
Enable Software	no	no	no	no	yes

- **PC CARD driver from SCM**

  With SCM's new PC-CARD boot driver, a system can be started from an ATA card and the DOS InterLink program can be used to connect a PC-CARD driver with another PC.

  If you intend to boot from an ATA card or to use InterLink, the new driver must be installed. Otherwise these features will not work.

  Before installing the new driver on the hard disk, the old driver and the entire SCM directory must be erased. Entries for the old SCM driver in CONFIG.SYS must also be deleted. The new driver's install program is the same as the old one's.

  New tools can be obtained for formatting and activating the PC-CARD:

  MCFORM.EXE   For formatting all PC memory cards
                     (ATA, FLASH, EEPROM, SRAM)

  MCFORMAT.BAT   Expanded formatting program (boot
                     function) for all memory cards.

  After installation all files are located in the subdirectory SWAPFTL.

- **Drivers for PC Memory Cards from SCM**

  SwapBox driver: **MMCD.EXE** Version: **2.16** Date: **2-29-96**

   Boot driver: **MMCD.BIN**   Version: **1.24** Date: **2-29-96**

  Formatting program.   **MCFORM.EXE**   Version: **4.57** Date: **2-27-96**

4.3.6   Installation

1.   Switch off system
2.   Install MSMJ104 on the CPU module
3.   Check module jumpers
4.   Power up system. When the system starts up, install software drivers.

J14

J13

J18

J23

PC Card - Carrier

PC/104-BUS
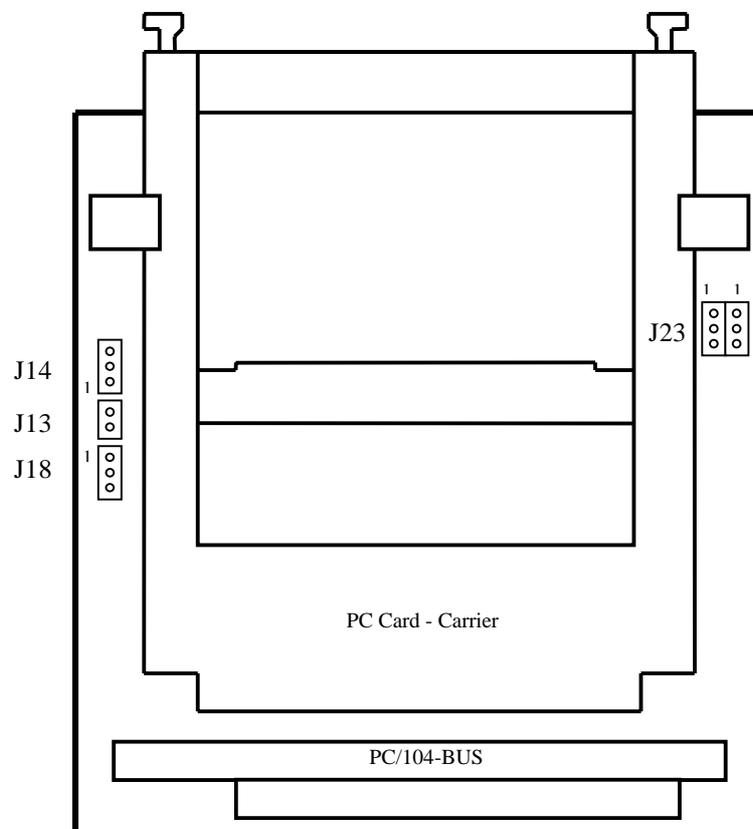
Installing drivers for PC memory cards

Step	Screen	Comment
Insert PC CARD driver diskette into drive. Key in <A:INSTALL> <ENTER> Select language (German or English) → <ENTER>		
<ENTER> skips the 1st page.	1	Read information from screen 1. <ENTER> takes you to next screen.
<ENTER> confirms storage location of files.	2	Key in the following data: - Source driver/path with Install disk - Destination driver/path - Path for CONFIG.SYS <ENTER> takes you to next screen.
<ENTER> confirms memory addresses and slot numbers.	3	- Memory window for MSMJ104 → D000h and <TAB> - Start address of I/O window → 170 and <TAB> - Select "Dual Slot Drive" with arrow key <ENTER> takes you to next screen.
<ENTER> confirms the use of memory cards	4	Normally, leave as it is. <ENTER> confirms and takes you to next screen.
<ENTER> confirms the key entry → installation starts up.		Check all entries. <ENTER> confirms them. Installation starts up.
<ESC> restarts.		Restarts MICROSPACE PC.

The install program sets the correct parameters for most systems automatically. The following free memory space is required:

- min. 1 MByte free on hard disk
- min. 2 MBytes RAM
- HIMEM.SYS or other memory manager for extended memory must be available

If no extended memory manager can be found, the user is advised during start-up and files are downloaded into the main memory. This may mean that large applications cannot run because there is too little room in memory.

The interface to the memory card is controlled by the DOS driver MCD.SYS.
With the MSMJ104, the MMCD.SYS device driver assigns two DOS driver designators. These driver designators allow memory and ATA cards to be accessed in the PC-CARD slots of the MSMJ104. The assigned driver designator is entered on a list which is displayed during start-up. For example, if a system has two hard disks 'C' and 'D', the next letter, 'E', will be assigned to the first PC-CARD slot and 'F' to the second.

Note:
If the memory card cannot be addressed by the assigned driver designator, this may be due to incorrect or incomplete formatting of the memory card. Formatting can be carried out with file MCFORMAT.EXE, which is included on the MMCD software disk.

Formatting memory cards

Two possibilities are available for formatting: MCFORMAT or MCFORM.

1. SRAM memory cards:	Only require formatting once. These cards can be erased like any exchangeable storage medium. MCFORMAT.EXE should be used.
2. Flash memory cards:	Only require formatting once. With the SCM flash-file system these memory card can be erased like any exchangeable storage medium. MCFORMAT.EXE should be used
3. ATA-Cards:	Like hard disks, only require formatting once. MCFORMAT.EXE should be used

Note:
The MCFORMAT.EXE program requires the MMCD.SYS device driver. Before a memory card can be formatted, this driver must always be installed. MCFORMAT also requires MCFORM.EXE. This file is on the install diskette. MCFORM.EXE must be located in the same directory as MCFORMAT.EXE.

Warning:
During formatting with MCFORMAT.EXE all data on the memory card is deleted.

Formatting a PC memory card with MCFORM.EXE

Step	Comment
On the hard disk, change to the PC-CARD directory (SWAPFTL)	
Key in <MCFORM> [LW]: <ENTER>.	Start MCFORM.EXE with driver designator: D:, E: or F:
Select language (German or English) → <ENTER>	
Define memory card type (Menu item 1, <ENTER>).	First select menu item 1 to define the type of card (ATA, SRAM, FLASH or EEPROM).
Select type and size of card. <ENTER> confirms selection.	Select card type and size (ATA, SRAM, FLASH or EEPROM) with cursor up/down and <ENTER> to confirm selection.
Exit submenu with <ESC>.	
Select menu item 2 to format memory card	**(All data will be lost !!!)**
<ESC> exits the program	

The following flow chart shows formatting steps with MCFORMAT:

```
        ┌─────────────────────┐
        │        Start        │
        │    MCFORMAT.EXE     │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │       Step 1        │        <ENTER> takes you to the next screen.
        │   Def. make of card │
        ├─────────────────────┤
        │    Select memory    │
        │      card type      │        Select with cursor and confirm
        │                     │        with <ENTER>.
        ├─────────────────────┤
        │    Select memory    │
        │      card size      │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │       Step 2        │        <ENTER> takes you to the next screen
        │  Def. type of format│
        ├─────────────────────┤
        │  Select type of     │
        │  format to be used  │        Selects SCM_FFS- or PC CARD format
        │    for the card     │
        └─────────────────────┘
                   │
        ┌─────────────────────┐
        │       Step 3        │        <ENTER> starts formatting
        │   Card formatting   │
        └─────────────────────┘
                   │
        ┌─────────────────────┐  yes
        │      Is the         │─────────────────┐
        │  flash card to be   │                 │
        │   used with the     │      ┌──────────────────────┐
        │  PC CARD format?    │      │  Copy files required  │
        └─────────────────────┘      │   to the flash card.  │
                   │                 │   <EXIT> returns you  │
        ┌─────────────────────┐      │    to MCFORMAT.       │
        │     Exit from       │──────└──────────────────────┘
        │   MCFORMAT.EXE      │
        └─────────────────────┘
        <ESC> exits from MCFORMAT
```

Installing the AUTO-BOOT option

The following steps install the AUTO-BOOT option:

1. Prepare a DOS system PC memory card
2. Copy the driver and start-up files to the PC-CARD.
3. Activate the AUTO-BOOT-BIOS extension on the MSMJ104 card.

Step 1: Prepare a DOS system PC memory card

1. Key in drive letter in MCFORMAT and press <ENTER>.
2. Select menu option 1 and with option 5 select card CIS (type and size). <ENTER>.
3. Confirm selection with <ENTER>
4. Exit menu with <ESCAPE>.
5. Select menu option 4 to format card with DOS system files. <ENTER>.
6. Key in letter of drive (A, C) containing the DOS system. <ENTER>. The card is now formatted with the DOS system.
7. Exit the MCFORMAT program with <ESCAPE>.

Step 2: Copy the driver and start-up files to the PC-CARD.
DIGITAL-LOGIC's PC-CARD tooldisk contains 4 subdirectories with the files needed to make a memory card ready for operation. If the drive designator of the PC-CARD memory card is 'D', all files in subdirectory 'SYS-D' must be copied to the system-formatted memory card.

MSMJ104 address table:

Start-up from PC CARD	J23	J24	Address of BIOS-EXTENSION	Address of MEMORY WINDOW for access to PC CARD
off	1-2	1-2	–	D0000–D3000
on	1-2	2-3	D8000–D9FFF	DA000–DAFFF
on	2-3	1-2	D0000–D1FFF	D2000–D2FFF
on	2-3	2-3	DD000–DEFFF	DF000–DFFFF

The CONFIG.SYS file in the PC memory card is now configured to start up "Memory-Window DA000". If the user wishes to alter this value, the /F:DA00 value of MMCD.EXE should be changed to another one.

If a memory manager such as EMM386 is used, the ranges of the memory window and BIOS extension should be excluded.

Example:

EMM386 NOEMS X=D800-DAFF

Step 3: Activate AUTO-BOOT-BIOS extension on MSMJ104 card.

1. Switch off PC.
2. Install jumpers J23 and J24 (see table, step 2).
3. Switch on PC with PC-CARD-Bootable-Memory in its slot.

Manual installation of AUTO-BOOT option

The following steps install this option:

1. Prepare a DOS system memory card.
2. Modify the CONFIG.SYS and AUTOEXEC.BAT files.
3. Copy AUTOBOOT files to memory card.
4. Activate AUTO-BOOT-BIOS extension on MSMJ104 card as follows:

MSMJ104 address table:

Start-up from PC CARD	J23	J24	Address of BIOS EXTENSION	Address of MEMORY WINDOW for access to PC CARD
off	1-2	1-2	–	D0000–D3000
on	1-2	2-3	D8000–D9FFF	DA000–DAFFF
on	2-3	1-2	D0000–D1FFF	D2000–D2FFF
on	2-3	2-3	DD000–DEFFF	DF000–DFFFF

This procedure can only be performed for SRAM and FLASH cards with the SCM flash-file format (SCM_FFS).

Step 1: Prepare a DOS system memory card:

Before system files can be transferred to a memory card, it must be reformatted. The following steps are necessary to format a memory card:

- Key drive letter in MCFORMAT and press <ENTER>.
- Select menu option 1, then select type and size of memory card to be formatted.
- Select menu option 3 to format the memory card for system files.
- Key in letter of drive containing the DOS system (C:), <ENTER>. The system files and COMMAND-COM are now copied to the memory card.
- Exit the formatting program with <ESCAPE>.

Note: If dual-slot systems are used on the MSMJ104 card, the driver designator (drive letter) of the slot to be formatted must be entered.

Step 2: Modify the CONFIG.SYS and AUTOEXEC.BAT files

Before the system files can be copied to the memory card, some lines in
CONFIG.SYS and AUTOEXEC.BAT should be changed or added. If
flash cards are used with SCM-FFS, modification 'A' applies for the
CONFIG.SYS file. If SRAM cards are used, modification 'B' applies for
the CONFIG.SYS file.

Modification of the CONFIG.SYS file:

```
DEVICE = MMCD.SYS /B:3e0 /F:zzzz /R:3 /P:170 /U:1
SHELL = y:\COMMAND.COM y:\ /P
```

y   stands for the drive letter of the memory slot from which
              AUTO-BOOT occurs (D:, E:, F:)
zzzz   is the memory window for access to the PC-CARD card (see
              table 4.3 D200, DA00, DF00)

Modification of the AUTOEXEC.BAT file:

```
y (must appear on the first line)
.........
.........
vector.bat (must appear on the last line)
```

y is the logical drive letter of the MMCD, as described above.

Step 3: Copy AUTOBOOT files to the memory card.

● Copy the REVECTOR.COM and VECTOR.BAT files from the install
  disk to the memory card.
● Copy the MMCD.SYS file to the memory card.
● Copy the modified CONFIG.SYS and AUTOEXEC.BAT files to the
  memory card.

Step 4: Activate AUTO-BOOT-BIOS extension on MSMJ104 card

● Installation of the Enable jumper on the MSMJ104 card to activate the
  BIOS extension ($\rightarrow$ see MSMJ104 address table).

Automatic start-up of user program:

If the user program is to run correctly after start-up, the VECTOR.BAT
file must be modified. On the install disk, this file only contains the file
REVECTOR. Modification provides for the following:

File VECTOR.BAT:

```
REVECTOR
............
Program 1
Program 2
```

4.3.7   Memory

Memory used with the PC-CARD

If a memory manager is used such as EMM386, the memory address ranges of the memory window and BIOS extension must be protected. (See MSM104J address table).

Example:

If a memory manager (e.g. EMM386) is used, the memory address range for the MMCD memory window must be protected. For example, if the memory window is set at starting address D000, with a 16 kByte window size, and if EMM386 is used, the following entry will appear in the CONFIG.SYS file in MS-DOS:

```
DEVICE = path \ EMM386.EXE NOEMS X=D000-D300
```

Memory used with FFS and PC-CARD cards

<table>
<tr>
<td>⚠ (!)</td>
<td>Since all flash disks are disabled, the above memory ranges cannot be used and cannot be claimed by other hardware or expanded modules.

For example, the following cannot be used:
In 'CONFIG.SYS' DOS = HIGH, DOS = UMB and 'HIMEM.SYS' without:
Device=C:\dos\emm386.exe noems i=B000-B7FF
        x=CC00-CFFF x=E000-EFFF x=D000-D300</td>
</tr>
</table>

Example:

XMS is to be used and there are many drivers to be loaded into the 'High Memory Areas'. To gain maximum free memory in the high memory areas the following steps should be taken:

The CONFIG.SYS file should be edited so that the following lines appear in it:

```
Device=C:\dos\himem.sys
Device=C:\dos\emm386.exe noems i=B000-B7FF x=CC00-CFFF
                                                 x=D000-EFFF
```

This excludes not only the memory window section, but also the entire MSMJ104 address table (D000 - EFFF) to prevent any problems when changing the J23/J24 jumpers to other addresses.

<table>
<tr>
<td>⚠ (!)</td>
<td>Memory managers which erase the whole RAM range during initialization, such as 386MAX, cannot be used in AUTO-BOOT mode.</td>
</tr>
</table>

4.3.8   Summary of files

INSTALLS.EXE   Software self-installation program

MMCD.SYS   Driver for DOS applications IFF, SCM_FFS and
                      ATA cards in the CONFIG.SYS file, such as:

/F:zzzz   This parameter defines the memory window
                      address. If no parameter is specified, a standard
                      value of D000 is used. The memory window can
                      be moved about. The window always reserves 4
                      KB of memory.

    Note: Due to possible conflicts with other system
                      components, the memory window should be sited
                      in address range C800 to EF00.

                      Example: MMCDFTL.SYS or MMCD.SYS
                               drivers, when memory window E000-
                               E0FF is to be used:
                               DEVICE = ...\MMCD.SYS /F:E000

/B:xxx   This parameter specifies the I/O addresses of the
                      PC-CARD controller. All Intel 82365SL-
                      compatible PC-CARD controllers use the
                      standard address 3E0. This parameter can only be
                      modified if the PCB controller allows different
                      I/O addresses.

                      Example: MMCDFTL.SYS or MMCD.SYS
                               drivers, when I/O address 300 is to be
                               used:
                               DEVICE = ...\MMCD.SYS /B:300

/P:zzz   This parameter specifies the I/O addresses used
                      with ATA cards. This address must be modified
                      if another hard disk in the system uses standard
                      address 170.

                      Example: MMCDFTL.SYS or MMCD.SYS
                               drivers, when ATA I/O address 200 is
                               to be used:
                               DEVICE = ...\MMCD.SYS /P:200

/R:z	This parameter allows the selective choice of drive designation for a chosen slot.	
	Example:	/R:1 First slot
		/R:2 Second slot only
		/R:3 First and second slot
		/R:4 Third slot only
		/R:5 First and third slot ...etc.

/N   XMS not used for this driver

/W   The driver operates without wait sequences
                          (Standard = 3 wait sequences)

/U:2   Initializes 2 partitions for PC-CARDs (can only be
                          used with SRAM and ATA cards).

MCFOMAT.EXE   Formats memory cards, ATA drivers and flash
                          cards which use MCFORMAT.
                          To switch to extended mode:
                          MCFORMAT [drive] [-E]

ATAFRMT.EXE   Formats ATA hard disks or Sundisk flash cards

SETMODEM.EXE   Modem card setup
                          SETMODEM [/P] [/W] [/I]
                          /P = 1, 2, 3, 4   assigns COM port number
                          /W = C800, .. , EF00 Sets memory window
                          /I = 0, 1, 2, 3...15   Defines interrupt for
                                                  modems
                          Recommended: SETMODEM /P4 /WD000 /I5

Using PC-Card PC/104 module(PCMCIA) with

PC/104-CPU MSM486DX:

Operating system	Installation of driver	
DOS	After installing the SCM software SWAPFTL, CONFIG.SYS must show the following entry: device=c:\swapftl\mmcd.exe /B:3e0h /F:d000h /R:3 /P:170h /U:1	

WIN95	Settings – Control Panel	– Add New Hardware
		 – PCMCIA Socket
		 – Vadem PCIC compatible
		   PCMCIA controller with
		   input/output range
		   03E0–03E1
		   and interrupt 11

Using PC-Card PC/104 module (PCMCIA) with

PC/104-CPU MSM486SV (ELAN400):

Operating system	Installation of driver	
DOS	After installing the SCM software SWAPFTL, CONFIG.SYS must show the following entry: device=c:\swapftl\mmcd.exe /B:3e2h /F:d000h /R:3 /P:170h /U:1	

WIN95	Settings – Control Panel	– Add New Hardware
		 – PCMCIA Socket
		 – Vadem PCIC compatible
		   PCMCIA controller with
		   input/output range
		   03E2–03E3
		   (no interrupt)

	in config.sys add the line: device=c:\windows\system\csmapper.sys device=c:\windows\system\carddrv.exe /slot=2	

4.4 Ethernet PC/104 module

- Optimized for use with the PC/104 bus

- Suitable for integrated (compact) applications

- Low-power CMOS

- Fast transfer time: 10 MBit/second

- Integral memory of 4608 Bytes

- Connections with ribbon cable and twisted 2-core cable

4.4.1   Technical data

LAN interface

Availability:	Standard
Controller:	SMC91C92, SMC91C94
Enhanced BIOS:	Optional, Boot-BIOS
Memory OnChip:	4608Byte RAM
Interface:	Ethernet IEEE802.3 Cheapernet, 10BASE-2 (thin wire, thin coax), 10BASE-T (twisted pair) or 10Base-5 (AUI, coax)
Data rate:	10 MB/s
Driver:	Packet-Driver, ODI, Novell approved
Compatibility:	ODI-Novell
Remote boot socket:	Yes
Cable type:	RG/58A/U 50 Ohms

Bus

Standard:	PC/104
Size:	8 or 16 Bit

Power supply

Power:	5Volt +/- 5%, 1W

Dimensions

Length:	96 mm
Width:	90 mm
Height:	20 mm

Environmental conditions

Relative humidity:		5 - 90% without condensation	
Vibration:		5 - 2000 Hz	
Shock:		10g	
Temperature:	Operation:	Standard version:	0°C to +70°C
		Industry version:	-25°C to +85°C
		(Ask DIGITAL-LOGIC AG for details)	
	Storage:	-55°C to +85°C	

Subject to technical modification, even without prior notice.

4.4.2   Installation

Software and hardware configuration

Software and hardware configuration is stored in EEPROM.

We recommend software storage of the configuration only for those cases when values are to be modified without having to resolder jumpers. The loaded configuration only works with Novell V3.11, Novell-Lite and all other NOS-ODI drivers.

For OS/2, NT and UNIX applications, hardware configuration should be used, as the drivers are only designed for this configuration.

Jumper positions for base address, IRQ, bus, interface

> Strict care should be taken to ensure that, within the system, no other application uses the same interrupts and the same base address as the Ethernet module. Otherwise errors may result or the system may even crash.

Jumper J6:

	Pos.: Conf.	1-2 IOS0	3-4 IOS1	5-6 IOS2	7-8 ENEEP	Base addr.	IRQ	Bus	Interface
*) MSM486SV	0	closed	closed	closed	open	340	5	8	AUI/COAX/WS ♥
*) MSM486DX	1	open	closed	closed	open	340	10	16	AUI/COAX/WS ♥
	2	closed	open	closed	open	320	11	16	AUI/COAX/-- ♥
	3	open	open	closed	open	300	5	8	AUI/COAX ♥
MSM486SV	4	closed	closed	open	open	340	5	8	10BASE-T/WS ♣
MSM486DX	5	open	closed	open	open	340	10	16	10BASE-T/WS ♣
	6	closed	open	open	open	320	11	16	10BASE-T/-- ♣
	7	open	open	open	open	loadable software configuration			

  *) Factory setting   ♥ = BNC

                                                      ♣ = twisted pair

4.4.3   Configuration

Configuration for NW3.x (from hardware)

The Ethernet processor can be programmed with values from the
EEPROM. This is the **normal method** for starting all operating systems.

A.)   Choice of configuration

Selection is by means of the jumper 'IOS0' - 'IOS2'
See table on preceding page

To initialize the PC system with a new configuration, execute
a restart.

B.)   Generation of the appropriate 'NET.CFG' file

The 'NET.CFG' file can be written or modified with an ASCII editor.
Equally, this can be done with a tool from DIGITAL-LOGIC. This step
must take place at the beginning, or after a new configuration has been
selected.

With the BCONF configuration program, the correct 'NRT.CFG' files are
generated. (These files should be saved to the same directory as the other
drivers).

See example for 'NET.CFG':

LINK DRIVER SMC9000	
INT 5	or 9, 10, 11
PORT 300	or 320 (340, hardware default)
NODE ADDRESS 909080804040	continuous
FRAME ETHERNET_802.3	
MEDIA_TYPE AUI	

C.)   **Start network driver in MSME104 for NW 3.11**

The drivers listed below can be taken from the tool disk. Files should be started up in the order indicated. (These files are located in the 'AUTOEXEC.BAT' file).

        LSL   Low-level driver
        SMC9000 SMC driver for Novell V3.11 and Novell-Lite
        IPXODI   IPX-ODI driver
        NETX   Novell-Network-Shell

The password can now be entered,

or:

D.)   **Start network driver in MSME104** (Novell-Lite)

The drivers listed below can be taken from the tool disk. Files should be started up in the order indicated. (These files are located in the 'AUTOEXEC.BAT' file).

        LSL   Low-level driver
        SMC9000 SMC driver for Novell V3.11 and Novell-Lite
        IPXODI   IPX-ODI driver
        CLIENT   Lite V1.1 Workstation-Shell

The password can now be entered.

Configuration for NW4.x (from hardware)

A.)   Choice of configuration:

Selection is via the 'IOS0' - 'IOS2' jumper.
See table on preceding page.

> To initialize the PC system with a new configuration, execute
> restart.

B.)   Generation of the appropriate 'NET.CFG' file

The 'NET.CFG' file can be written or modified with an ASCII editor.
Equally, this can be done with a tool from DIGITAL-LOGIC. This step
must take place at the beginning, or after a new configuration has been
selected.

```
NET.CFG      Link Driver SMC9000
        PORT 340
        INT 10
        FRAME Ethernet_802.2

NetWare DOS Requester
        FIRST NETWORK DRIVE = H
        NETWARE PROTOCOL = NDS BIND
        NAME CONTEXT = "TEST.PRODUKTION.DLAG"
```

Context name can be obtained by asking the network administrator.

**C.)   Start network driver in MSME104 for NW4.x**

The drivers listed below can be taken from the tool disk. Files should be
started up in the order indicated. (These files are located in the
'AUTOEXEC.BAT' file).

SET NWLANGUAGE = ENGLISH

LSL	low level driver	(will be loaded into 'himem')
SMC9000	SMC Driver for Novell V3.11	(will be loaded into 'himem')
IPXODI	IPX-ODI-Driver	(will be loaded into 'himem')
VLM /MX	Novell Network Shell	

The password can now be entered.

Board Layout
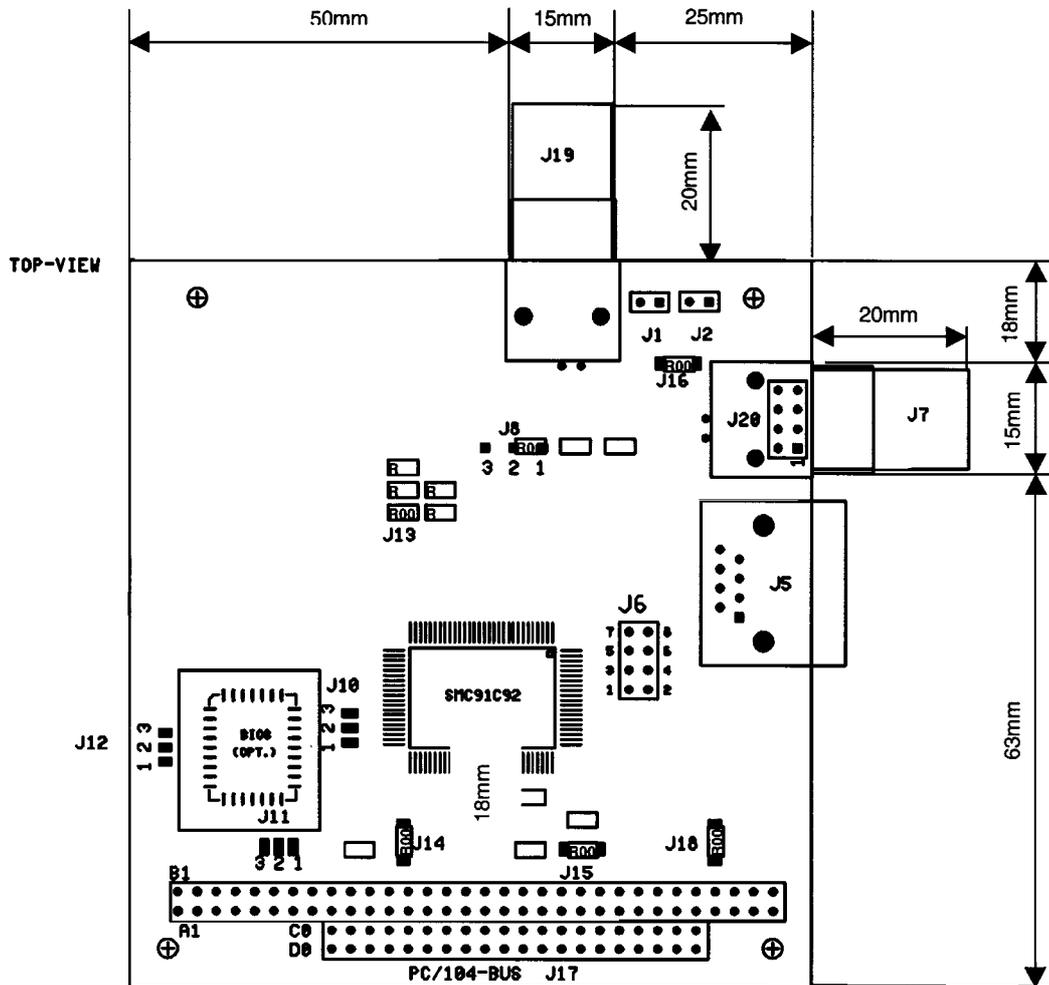
	Connector-List		**Jumper-List**
			Pin 1-2 / 2-3
J1:	Reserve net-output	J6:	see table on next page
J2:	Reserve net-output	J8:	HBE EGND* /Vee
J5:	RJ45 10-BASE-T	J10:	EPROM A16 Vcc/GND open *)
J7:	BNC connector	J11:	EPROM A17 Vcc/GND open *)
J17:	PC/104-bus	J12:	EPROM A18 Vcc/GND open *)
J19:	BNC connector opt.	J13:	16-bit close*) /8-bit open
J20:	AUI output	J14:	IOCHRY close *)
		J15:	ALE close *)
		J16:	always close *)
		J18:	-9V enable close

*)   default setting

Jumpers on the Board

Jumper J6:

Pos.: Conf.	1-2 IOS0	3-4 IOS1	5-6 IOS2	7-8 ENEEP	Base-addr.	RIQ	Bus	Interface
0	Closed	Closed	Closed	Open	340	5	8	AUI/COAX/WS
1	Open	Closed	Closed	Open	340	10	16	AUI/COAX/WS
2	Closed	Open	Closed	Open	320	11	16	AUI/COAX/--
3	Open	Open	Closed	Open	300	5	8	AUI/COAX
4	Closed	Closed	Closed	Open	340	5	8	10BASE-T/WS
5	Open	Closed	Closed	Open	340	10	16	10BASE-T/WS
6	Closed	Open	Closed	Open	320	11	16	10BASE-T/WS
7	Open	Open	Closed	Open	Downloadable **software configuration**			

Interface:

MSME104:	Signal:	Jumper 1 – 2	Jumper 2 - 3
J8	HBE	EGND *)	VEE
J9	INTERRUPT	IRQ3	IRQ5 *)
J10	EPROM A16	VCC *)	GND
J11	EPROM A17	VCC *)	GND
J12	EPROM A18	VCC *)	GND
J13	16 Bit (8 bit = open)	Closed *)	
J14	IOCHRDY	Closed *)	
J15	ALE-Signal	Closed *)	
J16	Ethernet level	Closed *)	
J18	-9V LAN Supply	Closed *)	

*)   Default

Ethernet Configuration:

MSME104:	Signal:
J6	IOS Hardware Configuration Select

Interrupt Definitions

Card:

INT3	=	IRQ11	
INT2	=	IRQ10	
INT1	=	IRQ5	
INT0	=	IRQ9	(or IRQ2 on XT CPUs)

Connectors on the board

The selection of the active interface connector is made by software in the driver.

Coaxial Interface 10BASE-2:

J1, J2, J7, J19

10BASE-Interface:

J5

PIN	Signal:
1	TX100R+
2	TX100R-
3	RX100R+
4	nc
5	nc
6	RX100R-
7	nc
8	nc

AUI

J20

PIN	Signal:
1	12V (external)
2	GND
3	CD+
4	CD-
5	RX+
6	RX-
7	TX+
8	TX-

Required external voltages for the MSME104

10BASE-2 / 10BASE-T

Only 5V needed from the PC/104-Bus.

AUI

5V needed from PC/104-Bus
12V needed for AUI Output via

- PC/104-Bus PIN B9 or
- AUI Connector J20 PIN 1

Software

Driver Location

1. On the LAN driver diskette that you get with your product, always read
    the read me file located on the disk for the latest updated and realeased
    drivers.

2. The latest drivers can be received from the manufacturer of your product
    using SMC LAN Ethernet Silicon. Contact the manufacturer directly.

    **Note: This should be your first line of support for additional drivers.
    Different manufacturers support a subset/superset of SMC LAN
    drivers.**

3. SMC's BBS
    Access: 516-273-4936
    Library: "91C92"

    Once you have logged in, select the "t" command which brings you to the
    "download directory area". Press "2" or "3" to select "91C92" or "Fast
    Ethernet" directory for downloading.

4. FTP Server site on the Internet:
    Access: info.smc.com

    File Names of the supported LAN-Drivers

SMC9000S.ZIP	452,811 12-20-94 4:23p - SMC9000 Drivers and Utilities
NT35OBJ.ZIP	34,577 06-24-94 3:09p - Win NT 3.5 Drivers (also in SMC9000s.zip)
WFW311.ZIP	156,501 12-20-94 4:28p - Win for Work Groups required files (also in SMC9000s.zip except NetWare related connectivity drivers)
OS2NWCLT.ZIP	10,767 12-19-94 5:51p - OS/2 NetWare Client Software (also in SMC9000s.zip)
ENABLERS.ZIP	9,630 09-14-94 2:57p - PCMCIA Standalone enablers
UNIX driver	The UNIX driver is only located on the FTP server as a TAR-file. It is located in the :/pub/chips/smc9000 directory, and its file name is: S9192.TAR.

Important: When you **PKUNZIP** the files, remember to use the
                   "-d" option to extract the sub-directories.

Example: pkunzip -d smc9000s.zip

This will put the contents of the superdisk in the current working
directory and create sub-directories as well.

Required Tools to support TCP/IP

A: A **physical LAN**, Ethernet for example, but it is not required. Token Ring ARCNET, WAN connectivity by PPP or SLIP is also acceptable.

B: A **"Data Link Driver"**. In today's LAN environment, there are three major Data Link Interfaces.

  1.   Novel ODI (Open Data Link Interface) - This driver specification is supported by Novell and is used in all of Novell's Client and Server products.

  2.   Microsoft's NDIS (Network Driver Interface Specification) - This driver   specification is used as the interface to the other network components of Microsoft's operating systems. There are two flavors. They are NDIS Version 2.x (NDIS2) and NDIS Version 3.x (NDIS3).

         NDIS2 is considered to be the older driver specification that has been around the longest and supported the OS/2 LAN Manager product. Since this specification has been around so long, many other OS manufacturers such as Artisoft's "Lantastic", Banyan's "Vines", FTP, Wollongong etc., have been supporting it as well.

         NDIS3 drivers support the newer operating systems within Microsoft, specifically, Windows for Work Groups, Windows NT, and the Windows 95. These new OS also support NDIS2 drivers as well. Also, Novell's ODI drivers are supported in the new "Windows" products.

  3:     There are other proprietary drivers for other operating systems, including "Packet Drivers" which is a Share-ware type of product. They are supported by the particular operating system vendor, not SMC.

C.   A **transport stack**. There are currently 3 major transport stacks.

    1.   IPX/SPX - This transport stack is primarily used in the Novell Network environment.

    2.   TCP/IP - This stack is supported by many vendors and has been around in the UNIX world for many years.

    3.   NETBIOS/NETBEUI - This transport interface was originally designed for OS/2 LAN Manager and the IBM-Network, and is still supported by Microsoft and IBM.

This software is not supported by SMC. It is supplied by the major operating system vendors, such as Microsoft, Novell, IBM, Artisoft and Banyan. Also, there are other third party software companies that support TCP/IP stacks for the major operating systems.

D.   **Applications and Operating systems** - Many operating systems have many of the above pieces built in and some are add-on's. Similarly for applications, some are network aware and some are not.

The interface to the operating system and network vaires from application and operating systems.See additional information from the operating system vendor.

As can be seen in the above mentioned, to support TCP/IP on a client, it depends on many network pieces from a number of network vendors. There are many combinations to get TCP/IP support. From SMC's perspective, as long as you have an ODI or NDIS driver, both of which are supported by SMC, you can get TCP/IP connectivity. Refer to the operating system and application vendor for additional information.

Ethernet Drivers

To find Ethernet Drivers

Operating System :	Version:	Driver File Name:	Version:	Datecode:	Direc-tory:
Novell Workstation	V3.1x/4.x	LSL.COM	2.05	10.09.93	
		SMC9000.COM	3.03	24.09.94	
		IPXODI.COM	2.12	7.10.93	
	NETX.EXE	NETX.COM	3.32	24.05.94	
NOVELL Server	3.1x	SMC9000.LAN	2.01	10.11.93	
NOVELL Server	4.x	SMC9000.LAN	4.1	27.9.94	
WFW		SMC9000.DOS/OS2	2.01		
Windows 95		SMC9000.DLL		27.8.95	
Windows NT3.1	3.1	SMC9000.DLL	3.0		
Windows NT3.51	3.51	SMC9000.DLL	0.1A		
		SMCNCDET.DLL			
		SMC9000.SYS			
Windows NT4.x	4.x	SMC9000.DLL		27.8.95	
OS/2 LAN-Manager	2.01		2.01		

Possible choice for your Novell Workstation

Operating System :	Version:	Driver File Name:	Version:	Datecode:	Directory:
Novell Workstation	V3.1x/4.x	LSL.COM	1.21	10.3.92	
		SMC9000.COM	3.00	5.1.94	
		IPXODI.COM	2.10	22.1.93	
	NETX.EXE	NETX.COM	3.32	4.4.95	
Novell Workstation	V3.1x/4.x	LSL.COM	2.01	5.11.92	
		SMC9000.COM	3.00	5.1.94	
		IPXODI.COM	2.10	22.1.93	
	NETX.EXE	NETX.COM	3.32	4.4.95	
Novell Workstation	V3.1x/4.x	LSL.COM	2.05	10.9.93	
		SMC9000.COM	3.03	24.9.94	
		IPXODI.COM	2.12	7.10.93	
	NETX.EXE	NETX.COM	3.32	24.5.94	
Novell Workstation	V3.1x/4.x	LSL.COM	2.14	11.10.94	
		SMC9000.COM	4.00	7.3.96	
		IPXODI.COM	3.01	31.1094	
	NETX.EXE	NETX.COM	3.02	4.4.95	

How to install a Driver

Readme.txt from the directory ETH96_1

Use this files with the SMC9000 dual function (ethernet/modem) and single function PCMCIA boards.

These boards and set of drivers can operate both if Card and Socket Services compliant to the PCMCIA specification 2.1 (or upper) is present or not.

Procedure to use the board under DOS / Windows 3.1x / Windows 95 / Windows NT

You need to choose whether you want to use ODI, NDIS2 or NDIS3 drivers. Use the following table as a guide:

Software	Driver
1. Netware from DOS	ODI
2. Netware from DOS and /or Windows 3.1x	ODI
3. MS Windows Network from Windows 3.1x	NDIS2 (ODI also possible)
4. Netware AND MS Win Network Win 3.1x	ODI
5. Lan Manager	NDIS2
6. Windows NT and Windows 95 Miniport	NDIS3

ODI

Two methods are available:

1)   With Card and Socket Services (preferred option):

WARNING: You MUST have a Card and Socket Services compliant to the
                            2.1 PCMCIA spec. (or better) installed in your config.sys!

          - Power-up.
          - Plug the card into the PCCard Slot.
            (When you enable the Card Services and configure the Card as a
            modem you will hear some confirmation beeps. This will not
            happen with single function cards).
          - Run the following from the A:\ODI directory
                  lsl
                  smc9000p (you will hear some confirmation beeps)
                  ipxodi
                  netx (or VLMs not supplied in this disk for burst mode)
                  f:
                  login
          - You are ready to run under DOS

2) To run drivers with the enabler:

WARNINGS: Card and Socket Services must not be loaded in your config.sys!
                   The current enabler supports INTEL PCIC PCMCIA controller
                   only (other controllers will be added in the future).
                   There should be access from D0000 to D1000 in upper memory
                   (exclude this region of memory used by memory manager. i.e
                   option X=D000-D0FF in EMM386.EXE in the config.sys).

            - Plug the card into the PC-Card Slot.

A1)   Ethernet operations only. Dual function board.

- Run A:\ENABLER\ETHERNET

This maps the board into your ISA bus (default at I/O 300h and IRQ 5) and from there to the PC Card. It works just as a regular ISA adapter. PC Card special features such as hot-swapping are not supported by the enabler.

- Change directory to A:\ODI.
- Then follow the same steps as above (lsl, smc9000p, etc.).

A2)   Ethernet operations. Single function board.

- Run A:\ENABLER\ENABLER

This maps the board into your ISA bus (default at I/O 300h and IRQ 5) and from there to the PC Card. It works just as a regular ISA adapter. PC Card special features such as hot-swapping are not supported by the enabler.

- Change directory to A:\ODI.
- Then follow the same steps as above (lsl, smc9000p, etc.).

B)   Modem operations only. Dual function board.

- Run A:\ENABLER\MODEM.

This maps the modem to COM 2 IRQ 3 (default). Now you can use it as a regular ISA modem.

c)   Simultaneous dual operations. Modem and Ethernet.

- Run A:\ENABLER\DUAL400.

This maps the board into your ISA bus (default at I/O 300h and IRQ 5 for ethernet and I/O 2F8 for modem) and from there to the PC Card. It works just as a regular ISA adapter. PC Card special features such as hot-swapping are not supported by the enabler.

- Change directory to A:\ODI.
- Specify the following in the SMC9000P section of the NET.CFG:
     + BOARD 1
     + Int #2 <your COM port int>
     + Mem #1 <your PCMCIA mem window> (i.e. Mem #1 D0000)
- Then follow the same steps as above mentioned (lsl, smc9000p, etc.).

WINDOWS support for networks through ODI drivers
(after finishing the proceeding)

- To run "Windows For Workgroups" with complete Netware (Novell)
  Network support configure it through Network Setup to use Novell
  Netware type of Networks. You should always login in DOS before
  starting Windows.
  <i.e.: check the "Install Windows support for the following Network
  only:"
  and select Novell Netware (4.0 for VLMs and 3.X for NETX)>

- To run "Windows For Workgroups" with complete Netware (Novell)
  Network support AND Microsoft Windows Network support
  simultaneously configure it through Network Setup in the following way:

  - Check "Install Microsoft Windows Network"
  - Check "Install support for an additional network" and select "Novell
    Netware..." Use shell 3.X for NETX and 4.0 for VLMs
  - Select Drivers and Add Adapter. Select "Unlisted or updated..." and
    click OK. Type A:\NDIS in the box. Select "SMC9000 Ethernet
    PCMCIA..." click OK. The comment [ODI/NDIS3] will appear to
    indicate that it will give NDIS support through the ODI driver. Close
    and save everything. It will prompt to reboot, OK. Now you should
    have support for both networks.

  NDIS2

  Two methods are available:

1) WFW with Card and Socket Services (preferred option):

WARNING: You MUST have a Card and Socket Services compliant to the 2.1
          PCMCIA spec.installed in your config.sys !

  - Start Windows.
  - Go into the Network Setup.
  - Check Install Microsoft Windows Network and select OK.
  - Select Drivers, Select Add Adapter, Select Unlisted or Updated
    Network Adapter.
  - Type A:\NDIS into the box and select OK.
  - Select SMC9000 Ethernet PCMCIA Adapter and click OK.
  - Select Setup, Select Advanced. Use the PCMCIA value under Enable
    Card Services Use.
  - Close and save everything. Windows will prompt to reboot, select yes.
  - After rebooting the card will be enabled (confirmation beeps) and both
    modem and ethernet will be enabled (or ethernet only for single
    function card)

2)   WFW with Enabler

WARNING: Card and Socket Services must not be loaded in your config.sys!
The current enabler supports INTEL PCIC PCMCIA controller only
(other controllers will be added in the future).
There should be access from D0000 to D1000 in upper memory (exclude
this region of memory used by the memory manager. i.e option X=D000-
D0FF in EMM386.EXE in config.sys).

Plug the card into the PCCard Slot.
Configuration using enablers is similar to that detailed in sections A1 to
C in the ODI case. Please check on a future release of this Read me-file.
The options that need to be selected through the network setup. Prior to
starting the NDIS drivers one of the enabling programs will need to be
run.

Notes on I/O and Interrups settings

The configuration files default to Port 300, IRQ 5 for the LAN part. Also,
this new release of the drivers has the ability to automatically configure
I/O and INT when operating under Card Services (CS). When the driver
is loaded without any parameter selected in the NET.CFG (or
PROTOCOL.INI) for the Port and Interrupt, it will request to CS to
determine the I/O and Int location therefore minimizing the possibility of
hardware conflicts (as long as CS is properly installed and knowledgeable
about any hardware installed in the system). If you experience problems
using the default settings (300,5) you may want to "comment out" the
Port and Int settings from the configuration files and by doing this, CS
will assign it for you.

<u>NDIS3</u>

WIN95
Make sure to have your Win95 Install CDRom (or install diskettes)
available. Win95 will sense the new hardware upon a card insertion and
ask you for the software drivers diskette. When this happens and you are
prompted with a dialogue box, type A:\WIN95NT. Win95 will copy the
necessary drivers from the diskette and depending on the previous
software and hardware installed in your PC it may attempt to copy other
files from the Win95 install source (CD-Rom or diskettes).

NOTE: If you are re-installing the card in a system where there is a
previous version of the drivers for this card you must
completely remove it (Network and modem from the Control
Panel, and registry entries) before starting the installation.

WIN NT
After adding the new adapter in the network settings the system will ask
you for the drivers diskette. Type in A:\WIN95NT.

Questions regarding the Drivers

1. Required drivers to get Windows NT LAN support

A NDIS3 driver is required. The driver can be found on the BBS and FTP
server.
The file name is: SMC9000s.zip.

2. Required drivers to get Windows for Work Groups LAN support

The NDIS2 and/or ODI driver is required. The driver can be found on the
BBS and FTP server.
The file name is: SMC9000s.zip. Depending on your connectivity
requirement, you can use both or one of the drivers listed above.

3. Supported drivers from SMC

The MAC layer driver that supports DECnet, DEC Pathworks, Hays
LANstep, Wollongong Pathway, Access for DOS and Banyan Vines is
the SMC9000 NDIS 2.01Driver (SMC9000s.zip). Contact the operating
system vendor for additional information.

4. How to get an OS/2 Workstation to talk with a Novell Server

By using NetWare OS/2 V2.0, 2.1 Requester Drivers together with the
SMC9000 ODI MAC driver you will achieve that an OS/2 Workstation
talks with a Novell Server.

5. How to get an OS/ Workstation to talk to a Unix host

Use FTP PC/TCP V1.2 for OS/2 or Novell LAN Workplace V3.x for
OS/2 together with the SMC9000 ODI client MAC driver.

6. How to get a DOS Workstation to talk to a Unix host

Use FTP PC/TCP V2.2 for DOS or Novell LAN Workplace V4.x for
OS/2 together with the SMC9000 ODI client MAC driver.

7. How to get a DOS Workstation to talk to a server running on OS/2

Use IBM LAN Server V2.0 DOS Requester or Microsoft LAN Manager
V2.x DOS Workstation with the SMC9000 NDIS 2.01 MAC driver.

8. How to get packet drivers

Currently Packet Drivers can be obtained for a fee from an outside
consulting company (Company: Crynware; Contact: Russ Nelson;
Ph. # (001 315) 268-1925; Internet address: Nelson@crynwr.com).

SMC will be providing these drivers directly in the near future.

Notes :

4.5 Configuration of the harddisk

The configuration of the harddisk of the PCD2.M22x is not the same for the ELAN or the DX processor. To support the configuration an installation diskette is delivered with each processor. On this diskette a file 'readme.txt' can be opened. The content is the following:

PCD2.M22x Start diskette

Welcome to the PCD2.M22x Start diskette. This diskette enables you to start up your PCD2.M22x harddisk. This means that the 'fdisk.exe' command will be executed, then the harddisk will be formatted and to finish, the 'config.sys' and 'autoexec.bat' will be copied to it. The DOS or the WINDOWS will not be installed with this Start diskette.

The PC is to boot with this Start diskette.

To configure your hard disk, you have at first to start the Fdisk procedure. Therefore, at the prompt, type: <Fdisk> and then press the <Enter> key.

The first display will show the 'FDISK Options' menu. Please select the first item called :

>   Create DOS partition or Logical DOS Drive

and then press <Enter>.

The next display shows 'Create DOS partition or Logical DOS Drive' menu. Select the first item named:

>   Create Primary DOS Partition

then press <Enter>.

The third display shows 'Create Primary DOS Partition'. At the question:

>   Do you wish to use the maximum available size for Primary
>   DOS Partition and make the partition active (Y/N)..............?[Y]

you have to answer [Y] for yes. On an European keyboard please press the <Z> key to have an 'Y'.

The next message will appear on your screen:

'You must restart your system for that your changes take effect. Shut down WINDOWS before restarting.'

At this step, switch off and then on again your PCD2.M22x. Now you can start the approbriate installation program by typing:

        <setup DX> (for a DX card)
        <setup EL> (for an Elan card)

The first action will be to format your harddisk. Setup will automatically start this procedure. Just before the formatting will start, you must answer to the question:

        WARNING, ALL DATA ON NON-REMOVABLE DISK DRIVE C: WILL BE LOST!

        Proceed with Format (Y/N)?

Answer with <Y> for Yes. On European keyboard please press on the <Z> key to have an 'Y'.

Then the formatting will start. Wait at least 2 - 3 minutes.

When the formatting is finished, the next question appears on the screen:

Volume label (11 characters, <ENTER> for none)?

You can type a label name with a maximum of 11 characters or just press <Enter> for no label.

Congratulations, you have formatted your harddisk with success.

In the next step, Setup will copy 'autoexec.bat' and 'config.sys' on the harddisk.

At the end, you can read on the screen:

        * your hard drive is now ready.
        * Please remove the disk A from the drive A
        * and then restart your PCD2.M22x.

Press any key to continue . . .

Press a key, and then the prompt will appear : C:\>

Now remove the diskette and then you can restart your PCD2.M22x.

From :

Company :
Department :
Name :
Address :

Tel. :

Date :

Send back to :

SAIA-Burgess Electronics Ltd.
Bahnhofstrasse 18
CH-3280 Murten (Switzerland)
http://www.saia-burgess.com

BA : Electronic Controllers

PCD2.M220 with integrated PC

If you have any suggestions concerning the SAIA$^{®}$ PCD, or have found any errors
in this manual, brief details would be appreciated.

Your suggestions :