*littl*eMonster

Technical Manual

Rev. 2.6

ES FEHLT DIE SIGNALBESCHREIBUNG X17

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User Information

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General

For the circuits, descriptions and tables indicated no responsibility is assumed as far as patents or other rights of third parties are concerned.
The information in the Technical Descriptions describes the type of the boards and shall not be considered as assured characteristics.

Warranty

Each board is tested carefully and thoroughly before being shipped. If, however, problems should occur during the operation, please check your user specific settings of all boards included in your system. This is often the source of the fault. If a board is defective, it can be sent to your supplier for repair. Please take care of the following steps:

1. The board returned should have the factory default settings since a test is only possible with these settings.

2. In order to repair your board as fast as possible we require some additional information from you. Please fill out the attached Repair Form and include it with the defective board.

3. If possible the board will be upgraded to the latest version without additional cost.

4. Upon receipt of the board please be aware that your user specific settings were changed during the test.

Within the warranty period the repair is free of charge as long as the warranty conditions are observed. Because of the high test expenditure you will be charged with the test cost if no fault is found. Repair after the warranty period will be charged.

This **JUMP*tec*®** product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period **JUMP*tec*®** will at its option either repair or replace defective products.

For warranty service or repair the product must be returned to a service facility designated by **JUMP*tec*®**.

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance or handling by buyer, unauthorized modification or misuse, operation outside of the product´s environmental specifications or improper installation or maintenance.

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Introduction

The ***littleMONSTER*** integrates the complete functionality of an pentium motherboard with CPU, System-BIOS, 8 Mbyte to 128MByte DRAM, keyboard-controller, real time clock, onboard VGA with LCD interface and additional peripheral functions like COM1, COM2, LPT1, floppy-interface, IDE-harddisk-interface, watchdog and Ethernet access. The system runs with CPU clock speeds from 33MHz to 233MHz and supports Intel MMX technology.

The ***littleMONSTER*** is designed in the new PISA format, which provides the functionality of the PCI and ISA bus on one well defined bus. For connecting the backplane with the PISA board, only one EISA like edge card connector is used.
The pinout of the upper row of the PISA bus connector correspond to the pinout of the ISA bus connector, the lower row provides PCI signals. Therefore designing backplanes with up to four PCI slots and additional ISA slots is very easy. To drive large ISA backplanes, a bus buffer is present on the ***littleMONSTER***.

Please refer to the appendix for detailed pin configuration.

Features

- **Processor**

  - ZIF Socket 7 Supports
  - Intel 100 – 166 MHz Pentium® Processor, 133 – 200 MHz Pentium® Processor with MMX™ technology

- **Chipset**

  SiS® 5571 PCIset

- **Power Supply**

  5V only supply
  dual onboard power supply to support Intel MMX™ technology

- **Cache**

  256KB/512KB PB SRAM on board

- **Memory**

  Use 2 x 4/8/16/32/64MB SIMM module DRAM with Fast Page Mode or EDO DRAM

- **Ethernet 10BaseT (Twisted Pair)**

  Crystal CS8900 Ethernet Controller

- **Four serial ports, (COM1, COM2, COM3 and COM4)**

  standard RS232C serial ports, 16550 compatible
  COM2 irda-prepared

- **one parallel port, LPT1**

- **Floppy-interface**

- **EIDE-PCI-hard disk-interface**

  2 x PCI Bus Master IDE ports (up to 4 IDE Devices)
  supports PIO Mode 3,4 IDE & ATAPI CD-ROM

- **ISA bus buffer**

- **Watch dog**

- **128 KByte FLASH-BIOS (AMI)**

- **Real Time Clock**
- **Keyboard Controller**
- **NV-EEPROM for CMOS-SETUP**
- **I²C-Bus (restricted)**
- **Board format PISA, with PISA Bus**
- **Full ISA and PCI electrical characteristics like timing and DC-characteristics**
- **Low power CMOS technology**
- **Bus buffer drivers with 48mA driver capacity (=double of ISA-bus)**
- **Onboard C&T-VGA**
    - C&T 65554 LCD-VGA-Controller
    - VGA-CRT and LCD Controller with 2 MByte Video RAM
    - LCD Controller supports almost any type of LCD
    - Resolution up to 1280x1024 on panel and CRT
    - Color depths up to 16 millions of colors
    - Simultaneous display on CRT and panel
    - True 64-Bit Graphics engine and accelerator
    - PCI-Bus interface incl. Burst Mode support
    - Powerful drivers for Win3.11, Win95, NT3.51, NT4.0, OS/2....
    - plug and play panel interfacing

I/O Map

The I/O-port addresses of the processor module ***littleMONSTER*** are functionally identical with a standard PC/AT.

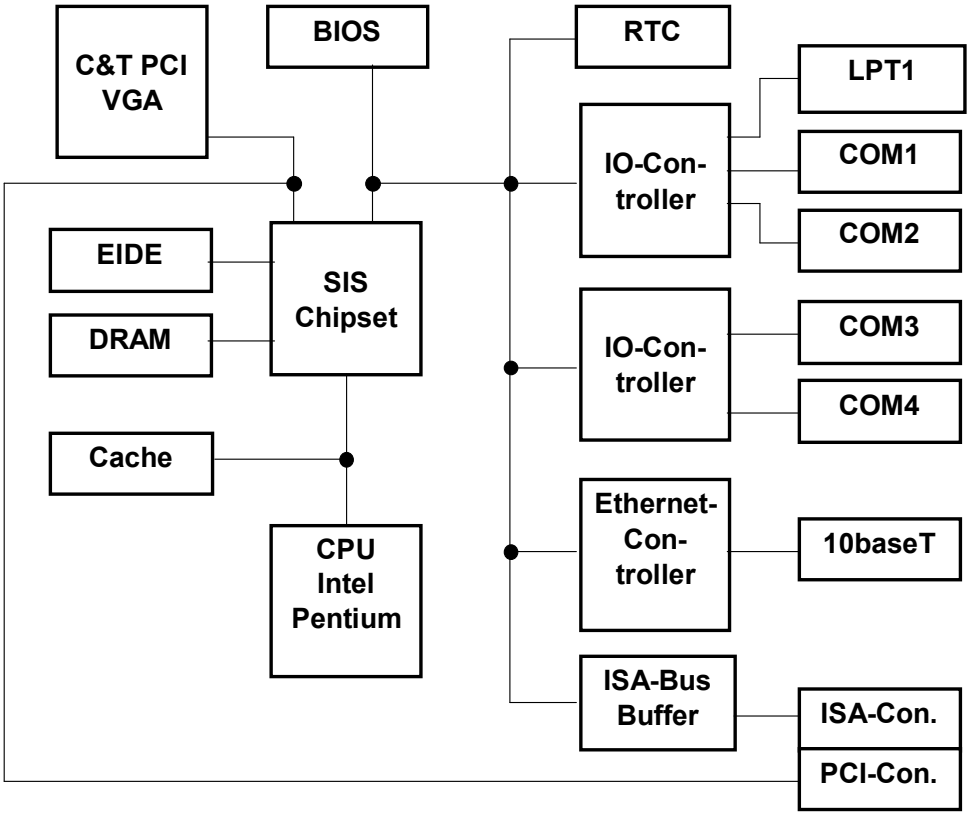
Attention*: Due to the bus buffer, be sure not to cause an I/O conflict with onboard devices.*

Please refer also to paragraph 'ISA-Bus Buffer' for connecting external ISA cards.

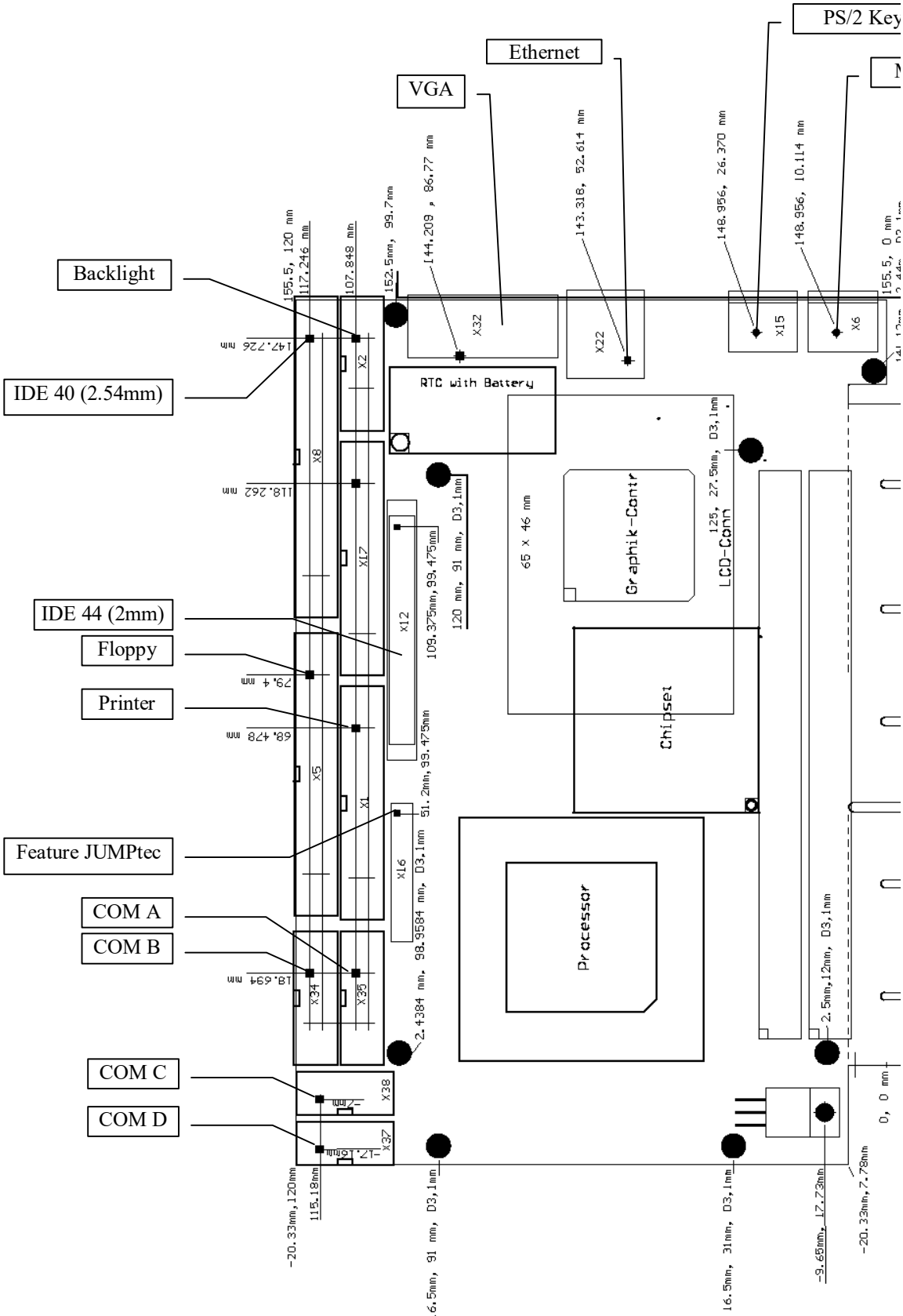
I/O Addresses	***littleMONSTER*** - onboard	Function
0000 - 001F	x	DMA-Controller 1
0020 - 003F	x	Interrupt-Controller 1
0040 - 0043	x	Timer
0050 - 005F	x	Onboard Control Registers
0060 - 0064	x	Keyboard-controller
0061		Port B Register
0070		NMI Enable Register
0070 - 0071	x	Real Time Clock
0080 - 008F	x	DMA Page Register 74LS612
0092	x	Port A Register (Fast A20 Gate)
00A0 - 00BF	x	Interrupt-Controller 2
00C0 - 00DF	x	DMA-Controller 2
00F0 - 00FF	x	Math-Coprocessor
0100		I/O channel
01F0 - 01F8	x	Fixed Disk
0200 - 0207		Game I/O
020C-020D		Reserved
021F		Reserved
0274		Control Register 1 External SSD (Board 0 - 3)
0275		Control Register 1 External SSD (Board 4 - 7)
0278 - 027F		Parallel Port 2
02B0 - 02DF		Alternate Enhanced Graphics Adapter
02E1		GPIB (adapter 0)
02E2 - 02E3		Data acquisition (Adapter 0)
02E8 - 02EF	x	Serial Port 4
02F8 - 02FF	x	Serial Port 2
0300 - 030F	x	Onboard Network (default configuration)
0310 - 031F		Prototype Card
0360 - 0363		PC Network (low Address)
0364 - 0367		Reserved
0368 - 036B		PC Network (high Address)
036C - 036F		Reserved
0370 - 0377	x	Config. Space for second SMC Controller
0378 - 037F	x	Parallel Port 1
0380 - 038F		SDLC, Bisynchronous 2
0390 - 0393		Cluster
03A0 - 03AF		Bisynchronous 1
03B0 - 03BF		Monochrom Disp. and Printer Adap.
03C0 - 03CF		Enhanced Graphic Adapter
03D0 - 03DF		Color/Graphic Monitor Adapter
03E8 - 03EF	x	Serial Port 3

03F0 - 03F7	x	Diskette Controller
03F8 - 03FF	x	Serial Port 1

Block Diagram



Connector Arrangement


PS/2 Key
Ethernet
VGA
Backlight
IDE 40 (2.54mm)
IDE 44 (2mm)
Floppy
Printer
Feature JUMPtec
COM A
COM B
COM C
COM D
RTC with Battery
Graphik-Contr
LCD-Conn
Chipset
Processor
65 x 46 mm
X32
X22
X15
X6
X2
X8
X17
X12
X5
X1
X16
X34
X35
X38
X37

ISA-Bus					PISA		LCD-Connector	IDE-40 Hard Disk	IDE-44 Hard Disk	Floppy	Printer	CRT
Pin	A	B	C	D	E	F	X33	X8	X12	X5	X1	X32
1	/IOCHCHK	GND	/SBHE	/MEMCS16	I2CLK	I2DAT	FLMX	/RESET	/RESET	GND	/STB	RED
2	SD7	RESETDRV	LA23	/IOCS16	GND	GND	LPX	GND	GND	NC	/AFD	GREEN
3	SD6	Vcc	LA22	IRQ10	INTB*	INTA*	GND	IDE D7	IDE D7	GND	PD0	BLUE
4	SD5	IRQ9	LA21	IRQ11	INTD*	INTC*	GND	IDE D8	IDE D8	NC	/ERR	ID2(NC)
5	SD4	-5V	LA20	IRQ12	VCC	VCC	SCLKX	IDE D6	IDE D6	GND	PD1	GND
6	SD3	DRQ2	LA19	IRQ15	VCC	VCC	GND	IDE D9	IDE D9	NC	/INIT	GND
7	SD2	-12V	LA18	IRQ14	RST*	CLKB	GND	IDE D5	IDE D5	GND	PD2	GND
8	SD1	/ENDXFR	LA17	/DACK0	GNT*0	GND	MOD	IDE D10	IDE D10	/FDC IDX	/SLIN	GND
9	SD0	+12V	/MEMR	DRQ0	REQ*0	GNT*1	P23	IDE D4	IDE D4	GND	PD3	KEY(NC)
10	IOCHRDY	GND	/MEMW	/DACK5	GND	GND	P22	IDE D11	IDE D11	/FDC DS0	GND	GND
11	AEN	/SMEMW	SD8	DRQ5	CLKA	REQ*1	P21	IDE D3	IDE D3	GND	PD4	ID0(NC)
12	SA19	/SMEMR	SD9	/DACK6	GND	AD31	P20	IDE D12	IDE D12	/FDC DS1	GND	ID1(NC)
13	SA18	/IOW	SD10	DRQ6	AD30	AD29	P19	IDE D2	IDE D2	GND	PD5	HSYNC
14	SA17	/IOR	SD11	/DACK7	REQ*2	CLKC	P18	IDE D13	IDE D13	/FDC DS2	GND	VSYNC
15	SA16	/DACK3	SD12	DRQ7	GNT*2	CLKD	P17	IDE D1	IDE D1	GND	PD6	RSVD(NC)
16	SA15	DRQ3	SD13	Vcc	AD28	AD27	P16	IDE D14	IDE D14	/FDC MON	GND	
17	SA14	/DACK1	SD14	/MASTER	AD26	AD25	P15	IDE D0	IDE D0	GND	PD7	
18	SA13	DRQ1	SD15	GND	AD24	CBE*3	P14	IDE D15	IDE D15	/FDC DIR	GND	
19	SA12	/REFRESH			AD22	AD23	P13	GND	GND	GND	/ACK	
20	SA11	SYSCLK			AD20	AD21	P12	NC	NC	/FDCSTEP	GND	
21	SA10	IRQ7			AD18	AD19	P11	NC	NC	GND	/BUSY	
22	SA9	IRQ6			PWRGOOD	REQ*3	P10	GND	GND	/FDC WD	GND	
23	SA8	IRQ5			NC	GNT*3	P9	/IOW	/IOW	GND	PE	
24	SA7	IRQ4			AD16	AD17	P8	GND	GND	/FDC WG	GND	
25	SA6	IRQ3			FRAME*	IRDY*	P7	/IOR	/IOR	GND	/SLCT	
26	SA5	/DACK2			CBE*2	DEVSEL*	P6	GND	GND	/FDC TRO0	VCC	
27	SA4	T/C			TRDY*	PCILOCK*	P5	NC	NC	GND		
28	SA3	BALE			STOP*	PERR*	P4	BALE	BALE	/FDC WP		
29	SA2	Vcc			SDONE	SERR*	P3	NC	NC	GND		
30	SA1	OSC			SB*0	AD15	P2	GND	GND	/FDC RD		
31	SA0	GND			CBE*1	AD14	P1	IRQ14	IDEIRQ14	GND		
32					PAR	AD12	P0	/IOCS16	/IOCS16	/FDC SIDE		
33					GND	GND	GND	SA1	IDEA1	GND		
34					GND	GND	MD18	NC	NC	/DCHNG		
35					AD13	AD10	MD19	SA0	IDEA0			
36					AD11	AD8	MD20	SA2	IDEA2			
37					AD9	AD7	MD21	/IDE CS0	IDE CS0*			
38					CBE*0	AD5	MD22	/IDE CS1	IDE CS1*			
39					AD6	AD3	MD23	IDELED	HDLED			
40					AD4	AD1	MD24	GND	GND			
41					AD2	AD0	MD25		Vcc			
42					VCC	VCC	GND		Vcc			
43					VCC	VCC	I2DAT		GND			
44					GND	GND	I2CLK		NC			
45					GND	GND	VEE_ADJ					
46							VEE_CTRL					
47							In3					
48							In2					
49							In1					
50							GND					
51							Vcc					
52							DA_00					
53							OC0					
54							OC1					
55							BIOSEL					
56							VSYNC					
57							HSYNC					
58							BLU					
59							GRN					
60							RED					
61							SW_BACK					
62							VDD_SRC					
63							BACK_SRC					
64							V3					
65							+12V					
66							+12V					
67							Vcc					
68							Vcc					
69							ENPBLT					
70							ENPVDD					
71							ENPVEE					
72							SW_VDD					

	FeatureJUMP	Feature LEU	PS/2-Keyboard	Mouse	COM A,B,C,D	Power	Backlight	Ethernet
Pin	**X16**	**X17**	**X15**	**X6**	**X34, X35, X37, X38**	**X18**	**X2**	**X22**
1	ETHERCLR	KBCLK	KBDAT	MSDAT	RLSD	PWRGOODI	VCC	TXD+
2	RTCCLR	MSCLK	NC	NC	DSR	VCC	SW_BACK	TXD-
3	GND	KBDAT	KEYGND	KEYGND	SIN	VCC	+12V	RXD+
4	GND	MSDAT	KEYVCC	KEYVCC	RTS	GND	GND	NC
5	BF0	VCC	KBCLK	MSCLK	SOUT	GND	GND	NC
6	BF1	-5V	NC	NC	CTS		OC0	RXD-
7	CPUVCC	-12V			DTR		BACK_SRC	NC
8	CPUVCC	GND			RI		DA_00	NC
9	GND	HDLED*			GND		In0	
10	BF2	I2CLK	S-GND	S-GND	VCC		ENPBLT	
11	NC	I2DAT	S-GND	S-GND				
12	CPUVCC	Speaker	S-GND	S-GND				
13	GND	KBLOCK*						
14	DISVGA#	EXTNMI						
15	LKLED	GND						
16	VCC	RESIN*						
17	LNLED	PICIO0						
18	VCC	PICIO1						
19	internal use	PICIO2						
20	internal use	IRTX						
21	internal use	IRRX						
22	internal use	ISPDEV						
23	internal use	PICIO3						
24	internal use	PICIO4						
25	internal use	PICIO5						
26	internal use	PICIO6						

BIOS-Description

The Standard AMI-BIOS is located in the Flash EPROM onboard. This device has 8 bit wide access. 16 bit access is enabled by the shadow RAM feature (Standard).

RTC-CMOS setup menu

During boot sequence the CMOS setup can be entered by pressing the <DEL>-key while the memory test is in progress.

8 lines of text are displayed on the main setup screen.

Main Menu

- Standard CMOS Setup
- Advanced CMOS Setup
- Power Management Setup
- PCI / Plug and Play Setup
- Peripheral Setup
- Auto-Detect Hard Disks
- (Change User Password)
- Change Supervisor Password
- Auto Configuration with Optimal Settings
- Auto Configuration with Fail Safe Settings
- Save Settings and Exit
- Exit Without Saving

Standard CMOS Setup

Date/Time

Select the Date/Time option to change the date or time. The current date and time are displayed.

Floppy Drive A, B

Choose the Floppy Drive A or B to specify the floppy drive type. The settings are *360 KB 5¼"*, *1.2 MB 5¼"*, *720 KB 3½"*, *1.44 MB 3½"*, or *2.88 MB 3½".*

Pri Master, Pri Slave, Sec Master, Sec Slave
Enter the correct settings for the attached mass storage drive. Possible settings are *Not Installed, 1-46* (predefined types), *User, AUTO, CDROM, FLOPTICAL*

Configuring an MFM Drive: If configuring an old MFM hard disk drive, you must know the drive parameters (number of heads, number of cylinders, number of sectors, the starting write precompensation cylinder, and drive capacity). Choose Type and choose the appropriate hard disk drive type (1 - 46). The old MFM hard drive types are listed on page 11. If the drive

parameters of your MFM drive do not match any drive type listed on page 11, select *User* in the Type field and enter the drive parameters on the screen that appears.

User-Defined Drive: If you are configuring a SCSI drive or an MFM, RLL, ARLL, or ESDI drive with drive parameters that do not match drive types 1-46, you can select the *User* in the Type field. You must then enter the drive parameters on the screen that appears. The drive parameters include:

- Size (drive capacity, calculated automatically)
- Cyln (number of cylinders),
- Head (number of heads),
- WPcom (starting write precompensation cylinder)
- Sec (number of sectors)

Parameter	Description
Type	The number for a drive with certain identification parameters.
Cylinders	The number of cylinders in the disk drive.
Heads	The number of heads.
Write Precompensation	The size of a sector gets progressively smaller as the track diameter diminishes. Yet each sector must still hold 512 bytes. Write precompensation circuitry on the hard disk compensates for the physical difference in sector size by boosting the write current for sectors on inner tracks. This parameter is the track number where write precompensation begins.
Landing Zone	This number is the cylinder location where the heads will normally park when the system is shut down.
Sectors	The number of sectors per track. MFM drives have 17 sectors per track. RLL drives have 26 sectors per track. ESDI drives have 34 sectors per track. SCSI and IDE drives have more sectors per track.
Size	The formatted capacity of the drive is (Number of heads) x (Number of cylinders) x (Number of sectors per track) x (512 bytes per sector)

Configuring IDE Drives: If the hard disk drive to be configured is an IDE drive, select the option *AUTO* and press <ENTER> to detect all drive parameters automatically.

AMIBIOS automatically detects the IDE drive parameters (including ATAPI CD-ROM drives) and displays them. You can set the parameters manually if you are absolutely certain that you know the correct IDE drive parameters.

Set *LBA Mode* to *On* to enable support for IDE drives with capacities greater than 528 MB.

Set *Blk Mode* to *On* to support IDE drives that use Block Mode.

Choose *PIO Mode* to select the IDE Programmed I/O mode. PIO programming also works with ATAPI CD-ROM drives. The settings are *Auto, 0, 1, 2, 3, 4,* or *5.* Use *Auto* to allow AMIBIOS to automatically find the PIO mode that the IDE drive being configured uses. If you select *0-5* you must make absolutely certain that you are selecting the PIO mode supported by the IDE drive being configured.

Set *32Bit Mode* to *On* to support IDE drives that permit 32-bit accesses.

Configuring a CD-ROM Drive: Select the appropriate drive (Pri Master, Pri Slave, Sec Master, or Sec Slave). Choose the Type parameter and select CDROM. You can boot the computer from a CD-ROM drive. You can also choose *Auto* and let AMIBIOS automatically set the correct drive parameters.

Hard Disk Drive Types

Type	Cylinders	Heads	Write Precompensation	Landing Zone	Sectors	Capacity
1	306	4	128	305	17	10 MB
2	615	4	300	615	17	20 MB
3	615	6	300	615	17	31 MB
4	940	8	512	940	17	62 MB
5	940	6	512	940	17	47 MB
6	615	4	65535	615	17	20 MB
7	462	8	256	511	17	31 MB
8	733	5	65535	733	17	30 MB
9	900	15	65535	901	17	112 MB
10	820	3	65535	820	17	20 MB
11	855	5	65535	855	17	35 MB
12	855	7	65535	855	17	50 MB
13	306	8	128	319	17	20 MB
14	733	7	65535	733	17	43 MB
16	612	4	0	663	17	20 MB
17	977	5	300	977	17	41 MB
18	977	7	65535	977	17	57 MB
19	1024	7	512	1023	17	60 MB
20	733	5	300	732	17	30 MB
21	733	7	300	732	17	43 MB
22	733	5	300	733	17	30 MB
23	306	4	0	336	17	10 MB
24	925	7	0	925	17	54 MB
25	925	9	65535	925	17	69 MB
26	754	7	754	754	17	44 MB
27	754	11	65535	754	17	69 MB
28	699	7	256	699	17	41 MB
29	823	10	65535	823	17	68 MB
30	918	7	918	918	17	53 MB
31	1024	11	65535	1024	17	94 MB
32	1024	15	65535	1024	17	128 MB
33	1024	5	1024	1024	17	43 MB
34	612	2	128	612	17	10 MB
35	1024	9	65535	1024	17	77 MB
36	1024	8	512	1024	17	68 MB
37	615	8	128	615	17	41 MB
38	987	3	987	987	17	25 MB
39	987	7	987	987	17	57 MB
40	820	6	820	820	17	41 MB
41	977	5	977	977	17	41 MB
42	981	5	981	981	17	41 MB
43	830	7	512	830	17	48 MB
44	830	10	65535	830	17	69 MB
45	917	15	65535	918	17	114 MB
46	1224	15	65535	1223	17	152 MB
User	USER-DEFINED HARD DRIVE - Enter user-supplied parameters.					

Boot Sector Virus Protection

If enabled, any write access to the hard disks boot sector will be trapped and reported on the screen. The user himself decides if the access accomplishes. The Optimal and Fail Safe default settings are *Disabled.*

Advanced CMOS Setup

1st Boot Device, 2nd Boot Device, 3rd Boot Device, 4th Boot Device

Choose the type of the boot device and the order to boot from. Possible settings are *Disabled, IDE-0, IDE-1, IDE-2, IDE-3, FLOPPY, FLOPTICAL, CDROM, SCSI, NETWORK*

Try Other Boot Devices

Set this option to *No* if you don't want to force the BIOS to boot from other devices, if a boot from the ones listed under **1st Boot Device...** fails. The Optimal and Fail Safe default settings are *Yes.*

S.M.A.R.T. for Hard Disks

If set to *Enabled*, this option allows IDE drives to do an error statisc internally. The system BIOS generates a warning message when the number of errors reaches a predefined limit. The Optimal and Fail Safe default settings are *Disabled.*

Quick Boot

Set this option to *Enabled* to instruct AMIBIOS to boot quickly when the computer is powered on. This option replaces the former **Above 1 MB Memory Test** Advanced Setup option. The settings are:

Setting	Description
Disabled	AMIBIOS tests all system memory. AMIBIOS waits up to 40 seconds for a READY signal from the IDE hard disk drive. AMIBIOS waits for 0.5 seconds after sending a RESET signal to the IDE drive to allow the IDE drive time to get ready again. AMIBIOS checks for a <DEL> key press and runs Setup if the key has been pressed.
Enabled	AMIBIOS does not test system memory above 1 MB. AMIBIOS does not wait up to 40 seconds for a READY signal from the IDE hard disk drive. If a READY signal is not received immediately from the IDE drive, AMIBIOS does not configure that drive. AMIBIOS does not wait for 0.5 seconds after sending a RESET signal to the IDE drive to allow the IDE drive time to get ready again. You cannot run Setup at system boot, because there is no delay for the *Hit <Del> to run Setup* message.

The Optimal default setting is *Enabled.* The Fail Safe default setting is *Disabled.*

BootUp Num-Lock

Set this option to *Off* to turn the Num Lock key off when the computer is booted so you can use the arrow keys on both the numeric keypad and the keyboard. The settings are *On* or *Off.* The Optimal and Fail Safe default settings are *On.*

Floppy Drive Swap

Set this option to *Enabled* to permit drives A: and B: to be swapped. The settings are *Enabled* or *Disabled.* The Optimal and Fail Safe default settings are *Disabled.*

Floppy Access Control

This option will be effective only if Floppy is accessed trough BIOS INT 40h functions. Set then to *Read Only* to write protect Floppy drives. The Optimal and Fail Safe default settings are *Normal.*

HDD Access Control

This option will be effective only if HDD is accessed trough BIOS INT 13h functions. Set then to *Read Only* to write protect Hard Disk drives. The Optimal and Fail Safe default settings are *Normal.*

PS/2 Mouse Support

When this option is set to *Enabled,* AMIBIOS supports a PS/2-type mouse. The settings are *Enabled* or *Disabled.* The Optimal default setting is *Disabled.* The Fail Safe default setting is *Enabled.*

System Keyboard

This option specifies that a keyboard is attached to the computer. The settings are *Present* or *Absent.* The Optimal and Fail Safe default settings are *Present.*

Primary Display

This option specifies the type of display monitor and adapter in the computer. The settings are *Mono, CGA40x25, CGA80x25, VGA/EGA,* or *Absent*. The Optimal and Fail Safe default settings are *VGA/EGA*.

Password Check

This option enables password checking every time the computer is powered on or every time Setup is executed. If *Always* is chosen, a user password prompt appears every time the computer is turned on. If *Setup* is chosen, the password prompt appears if Setup is executed. The Optimal and Fail Safe default settings are *Setup.*

Boot To OS/2

Set this option to *Enabled* to permit AMIBIOS to run with IBM OS/2. The settings are *Yes* or *No.* The Optimal and Fail Safe default settings are *No.*

Wait For 'F1' if Error

If this option is *Enabled* the system will wait on power up for the user to press the <F1> key on any occurring error. The Optimal and Fail Safe default settings are *Enabled.*

Internal Cache

This option specifies the caching algorithm used for L1 internal cache memory. The settings are:

Setting	Description
Disabled	The L1 internal cache memory on the CPU is disabled
WriteThru	Use the write-through caching algorithm
WriteBack (Optimal and Fail Save default)	Use the write-back caching algorithm

External Cache

This option specifies the caching algorithm used for L2 secondary (external) cache memory. The settings are:

Setting	Description
Disabled (Fail Save default)	The L1 internal cache memory on the CPU is disabled
WriteThru	Use the write-through caching algorithm
WriteBack (Optimal default)	Use the write-back caching algorithm

System BIOS Cacheable

When this option is set to *Enabled,* the contents of the F0000h system memory segment can be read from or written to L2 secondary cache memory. The contents of the F0000h memory segment are always copied from the BIOS ROM to system RAM for faster execution. The settings are *Enabled* or *Disabled.* The Optimal default setting is *Enabled.* The Fail Safe default setting is *Disabled.*

C000,16K Shadow; C400,16K Shadow; C800,16K Shadow; CC00,16K Shadow

D000,16K Shadow; D400,16K Shadow; D800,16K Shadow; DC00, 16K Shadow

These options control the location of the contents of the 16KB of ROM beginning at the specified memory location. If no adaptor ROM is using the named ROM area, this area is made available to the local bus. The settings are:

Setting	Description
Disabled	The ROM is not copied to RAM. The contents of the ROM cannot be read from or written to cache memory
Enabled	The ROM contents are written to the same address in system memory (RAM) for faster execution
Cache	The contents of the named ROM area are written to the same address in system memory (RAM) for faster execution, if an adaptor ROM will be using the named ROM area. Also, the contents of the RAM area can be read from and written to cache memory

Watchdog Mode

With these settings, the type of watchdog is specified. Possible settings are *Disabled, Reset, NMI.* The Optimal and Fail Safe default settings are *Disabled.*

Watchdog Delay (available only if **Watchdog Mode** is not *Disabled*)

Time delay before the watchdog timer is set. Used for example, to let the system boot without the need to trigger the watchdog. Possible time settings are *1 Sec, 5 Sec, 10 Sec, 30 Sec, 1 Min, 5 Min, 10 Min, 30 Min*.

Watchdog Timeout (available only if **Watchdog Mode** is not *Disabled*)

The watchdog must be triggered (reset) within this span of time. Possible time settings are *0.4 Sec, 1 Sec, 5 Sec, 10 Sec, 30 Sec, 1 Min, 5 Min, 10 Min*.

Power Management Setup

Power Management/APM

If this option is *Disabled,* none of the below listed options are available, the system doesn't provide you with power save features. The Optimal and Fail Safe default settings are *Disabled.*

Green PC Monitor Power State

This option specifies the power management state that the Green PC-compliant video monitor enters after the specified period of display inactivity has expired. The settings are *Stand By,*

Suspend, Off. The Optimal and Fail Safe default settings are *Off.*

Video Power Down Mode

This option specifies the power management state that the video subsystem enters after the specified period of display inactivity has expired. The settings are *Disabled, Standby,* or *Suspend.* The Optimal and Fail Safe default settings are *Suspend.*

Hard Disk Power Down Mode

This option specifies the power management state that the hard disk drive enters after the specified period of HDD inactivity has expired. The settings are *Disabled, Standby,* or *Suspend.* The Optimal and Fail Safe default settings are *Suspend.*

Standby Time Out (Minute)

After this period, the specified devices are entering the standby mode. In Standby mode, some power use is curtailed. Possible settings are *Disabled, 1, 2, 3, 4, 5....14.* The Optimal and Fail Safe default settings are *Disabled.*

Suspend Time Out (Minute)

After this period, the specified devices are entering the suspend mode. In Suspend mode, nearly all power use is curtailed. Possible settings are *Disabled, 1, 2, 3, 4, 5....14.* The Optimal and Fail Safe default settings are *Disabled.*

Slow Clock Ratio

This option specifies the speed at which the system clock runs in power saving modes. The settings are expressed as a ratio between the normal clock speed and the power down clock speed. The settings are *1:1, 1:2* (half as fast as normal), *1:4, 1:8, 1:16, 1:32, 1:64* or *1:128*. The Optimal and Fail Safe default settings are *1:8.*

IRQ3 (COM2/COM4), IRQ4 (COM1/COM3), IRQ5 (LPT2), IRQ7 (LPT1), IRQ9, IRQ10, IRQ11, IRQ12 (PS2 Mouse), IRQ13 (Math Coprocessor), IRQ14, IRQ15

These options enable event monitoring. When the computer is in a power saving mode, activity on the named interrupt request line is monitored by AMIBIOS. When any activity occurs, the computer enters Full On mode. Each of these options can be set to *Monitor* or *Ignore*. The Fail Safe default setting is *Ignore.*

PCI / Plug and Play Setup

PCI Latency Timer (PCI Clocks)

This option sets latency of all PCI devices on the PCI bus. The settings are in units equal to PCI clocks. The settings are *32, 64, 96, 128, 160, 192, 224* or *248.* The Optimal and Fail Safe default settings are *64.*

PCI VGA Palette Snoop

This option must be set to *Enabled* if any ISA adapter card installed in the computer requires VGA palette snooping. The settings are *Disabled* or *Enabled.* The Optimal and Fail Safe default settings are *Disabled.*

PCI IDE BusMaster

Set this option to *Enabled* to specify that the IDE controller on the PCI local bus has bus mastering capability. The settings are *Disabled* or *Enabled*. The Optimal and Fail Safe default settings are *Disabled.*

OffBoard PCI IDE Card

This option specifies if an offboard PCI IDE controller adapter card is used in the computer. You must also specify the PCI expansion slot on the motherboard where the offboard PCI IDE controller card is installed. If an offboard PCI IDE controller is used, the onboard IDE controller on the motherboard is automatically disabled. The settings are *AUTO, Slot1, Slot2, Slot3, Slot4, Slot5, Slot6.* If *AUTO* is selected, AMIBIOS automatically determines the correct setting for this option. The Optimal and Fail Safe default settings are *AUTO.*

OffBoard PCI IDE Primary IRQ (available only if an **OffBoard PCI IDE Card** is used)

This option specifies the PCI interrupt used by the primary IDE channel on the offboard PCI IDE controller. The settings are *Disabled, INTA, INTB, INTC*, or *INTD, Hardwired*. The Optimal and Fail Safe default settings are *Disabled.*

OffBoard PCI IDE Secondary IRQ (available only if an **OffBoard PCI IDE Card** is used)

This option specifies the PCI interrupt used by the secondary IDE channel on the offboard PCI IDE controller. The settings are *Disabled, INTA, INTB, INTC*, or *INTD, Hardwired*. The Optimal and Fail Safe default settings are *Disabled.*

Assign IRQ to PCI VGA Card

This option allows the assignment of a IRQ line for external PCI VGA controller boards. Possible settings are *No* and *Yes.*The Optimal and Fail Safe default settings are *No.*

PCI Slot1 IRQ Priority, PCI Slot2 IRQ Priority, PCI Slot3 IRQ Priority, PCI Slot4 IRQ Priority

This option allows the assignment of a IRQ line to the chosen PCI slot. Depending on the IRQ the IRQ priority is also defined. Possible settings are *AUTO, 3, 4, 5, 7, 9, 10, 11, 12.* The Optimal and Fail Safe default settings are *AUTO.*

DMA Channel 0, DMA Channel 1, DMA Channel 3, DMA Channel 5, DMA Channel 6, DMA Channel 7

These options specify the bus that the named direct memory access lines (DMAs) are used on. It allows you to specify DMAs for use by legacy ISA adapter cards only. The settings are *PnP* or *ISA/EISA*. The Optimal and Fail Safe default settings are *PnP*.

IRQ3, IRQ4, IRQ5, IRQ7, IRQ9, IRQ10, IRQ11, IRQ14, IRQ15

These options specify the bus that the named interrupt request lines (IRQs) are used on. It allows you to specify IRQs for use by legacy ISA adapter cards only. The settings are *PCI/PnP* or

ISA/EISA. The Optimal and Fail Safe default settings are *PCI/PnP*.

Reserved Memory Size

This option specifies the size of the memory area reserved for legacy ISA adapter cards. The settings are *Disabled, 16K, 32K, or 64K*. The Optimal and Fail Safe default settings are *Disabled*.

Reserved Memory Address

This option specifies the beginning address (in hex) of the reserved memory area. The specified ROM memory area is reserved for use by legacy ISA adapter cards. The settings are *C0000, C4000, C8000, CC000, D0000, D4000, D8000* or *DC000*. The Optimal and Fail Safe default settings are *CC000.*

Peripheral Setup

Onboard FDC

This option enables the floppy drive controller on the motherboard. The settings are *Auto, Enabled or Disabled*. The Optimal and Fail Safe default settings are *AUTO*.

Onboard Serial Port1

This option enables serial port 1 on the motherboard and specifies the base I/O port address for serial port 1. The settings are *AUTO, Disabled, 3F8h, 2F8h, 3E8h,2F8h.* The Optimal and Fail Safe default settings are *AUTO*.

Onboard Serial Port2

This option enables serial port 2 on the motherboard and specifies the base I/O port address for serial port 2. The settings are *AUTO, Disabled, 3F8h, 2F8h, 3E8h,2F8h.* The Optimal and Fail Safe default settings are *AUTO*.

Onboard Parallel Port

This option enables the parallel port on the motherboard and specifies the parallel port base I/O port address. The settings are *AUTO, Disabled, 378, 278, 3BC.* The Optimal and Fail Safe default settings are *AUTO*.

Parallel Port Mode

This option specifies the parallel port mode. EPP is a bidirectional data transfer scheme that adhere to the IEEE P1284 specifications. **ECP standard is not supported with this device!** The settings are:

Setting	Description
Normal	The normal parallel port mode is used. This is the default setting.
EPP	The parallel port can be used with devices that adhere to the Enhanced Parallel Port (EPP) specification. EPP uses the existing parallel port signals to provide asymmetric bidirectional data transfer driven by the host device.

Parallel Port DMA Channel: not supported with this board!

Parallel Port IRQ

This option specifies the IRQ line for the parallel port. The settings are *5, 7*. The Optimal and Fail Safe default settings are *7.*

Onboard PCI IDE

This option specifies the onboard IDE controller channels that will be used in PCI Burst mode. The settings are *Primary, Secondary, Both* or *Disabled.* The Optimal and Fail Safe default settings are *Both.*

Primary Master Prefetch, Primary Slave Prefetch, Secondary Master Prefetch, Secondary Slave Prefetch

Some Hard Disk Drives need this prefuch buffer enabled. Possible settings are *Enabled* and *Disabled.* The Optimal and Fail Safe default settings are *Enabled*.

Onboard Serial Port3

This option enables serial port 3 on the motherboard and specifies the base I/O port address for serial port 3. The settings are *Disabled, 3E8h.* The Optimal and Fail Safe default settings are *Disabled*.

Onboard Serial Port4

This option enables serial port 4 on the motherboard and specifies the base I/O port address for serial port 4. The settings are *Disabled, 2E8h.* The Optimal and Fail Safe default settings are *Disabled*.

Onboard Ethernet Boot BIOS

This option enables the Remote Boot BIOS of the Crystal Ethernet Controller and sets the ROM memory start address. The settings are *Disabled, C0000, C4000, C8000, CC000, D0000, D4000, D8000* or *DC000*. The Optimal and Fail Safe default settings are *Disabled.*

Auto-Detect Hard Disks

This useful option helps to identify the drive parameters of IDE hard disks. The BIOS shows the Standard CMOS setup and enters the detected HDD parameters automatically.

Change User Password

Use this option to enter the password for system or setup protection. It is available after the **Supervisor Password** is defined. Refer also to option *Password Check* of the *Advanced CMOS Setup* Screen.

Change Supervisor Password

Use this option to enter the password for system or setup protection. After this password is set, the **User Password** can be defined. To change the **Supervisor Password** first erase the **User Password**. Refer also to option *Password Check* of the *Advanced CMOS Setup* Screen.

Auto Configuration with Optimal Settings

Use this option to configure the system with highspeed settings for increasing the system performance.

Auto Configuration with Fail Safe Settings

Use this option to configure the system with fail safe settings for increasing the system stability.

Save Settings and Exit

Use this option to save all setup changes to the NV-EEPROM. This option is also available in the **Main Menu** by pressing <F10>.

Exit Without Saving

Use this option to discard all setup changes. This option is also available in the **Main Menu** by pressing <ESC>.

AMIBIOS Configuration Screen

```
      AMIBIOS System Configuration  (C)  1985-1996,   American Megatrends Inc.,
Main Processor      :  Pentium (P54C)      Base Memory Size    :  640KB
Math Processor      :  Built-In            Ext. Memory Size    :  7168KB
Floppy Drive A:     :  1.44 MB 3½"         Display Type        :  VGA/EGA
Floppy Drive B:     :  None                Serial Port(s)      :  3F8,2F8
AMIBIOS Date        :  07/15/95            Parallel Port(s)    :  378
Pocessor Clock      :  133MHz              External Cache      :  512KB,Enabled
Power Management    :  APM,SMI

Hard Disks(s)          Cyl   Head  Sector  Size     LBA Mode  32Bit Mode  Block Mode  PIO Mode
Secondary Master    :  306   2     32      10MB     LBA       Off         Off         1
PCI Devices:
PCI Onboard IDE                           PCI Onboard VGA
```

Example screen for a *littleMONSTER* board equipped with an Intel Pentium 133MHz, 8MB FP RAM, booting from a 10MB *chipDISK.*

Hardware Description

SiS-Chipset Features

The ***littleMONSTER*** Board operates with the Pentium chipset SiS 5571, which provides following features:

- 32 bit PCI Interface with up to 4 external PCI Masters
- integrated second level cache controller
- integrated DRAM controller
- integrated PMU controller
- integrated PCI to ISA bridge (fully compliant to PCI 2.1)
- enhanced DMA functions
- build-in two 8259A interrupt controllers
- build-in keyboard controller
- fast PCI IDE Master/Slave Controller
- USB Controller

Memory configuration

One memory bank for DRAM extension is located at the bottom of the ***littleMONSTER*** board. Because of the capability to support 32bit (half populated) DRAM access, several memory configurations are available:

total memory	no. of modules	mem. per module	technology	DRAM access
128 MB	2	64 MB	FPM, single sided	64 bit
64 MB	1	64 MB	FPM, single sided	32 bit
64 MB	2	32 MB	FPM, double sided	64 bit
32 MB	1	32 MB	FPM, double sided	32 bit
32 MB	2	16 MB	FPM, single sided	64 bit
16 MB	1	16 MB	FPM, single sided	32 bit
16 MB	2	8 MB	FPM, double sided	64 bit
128 MB	2	64 MB	EDO, single sided	64 bit
64 MB	1	64 MB	EDO, single sided	32 bit
64 MB	2	32 MB	EDO, double sided	64 bit
32 MB	1	32 MB	EDO, double sided	32 bit
32 MB	2	16 MB	EDO, single sided	64 bit
16 MB	1	16 MB	EDO, single sided	32 bit
16 MB	2	8 MB	EDO, double sided	64 bit

For highest memory performance, it is recommended not to use the half populated DRAM modules.

Second level cache

The ***littleMONSTER*** board is equiped with 512 KByte second level piplined burst cache for highest system efficiency. The second level cache can be disabled in the system setup.

Interrupts

IRQ0	System Timer	
IRQ1	Keyboard	
IRQ2	Cascade	
IRQ3	COM 2	note (1)
IRQ4	COM 1	note (1)
IRQ5	Ethernet (default)	note (2)
IRQ6	Floppy	
IRQ7	LPT 1	
IRQ8	Clock/Calendar	
IRQ9	Available	
IRQ10	COM 3	notes (1) (2)
IRQ11	COM 4	notes (1) (2)
IRQ12	PS/2-Mouse	notes (3) (2)
IRQ13	Numeric-processor	
IRQ14	EIDE Channel 1	
IRQ15	EIDE Channel 2	

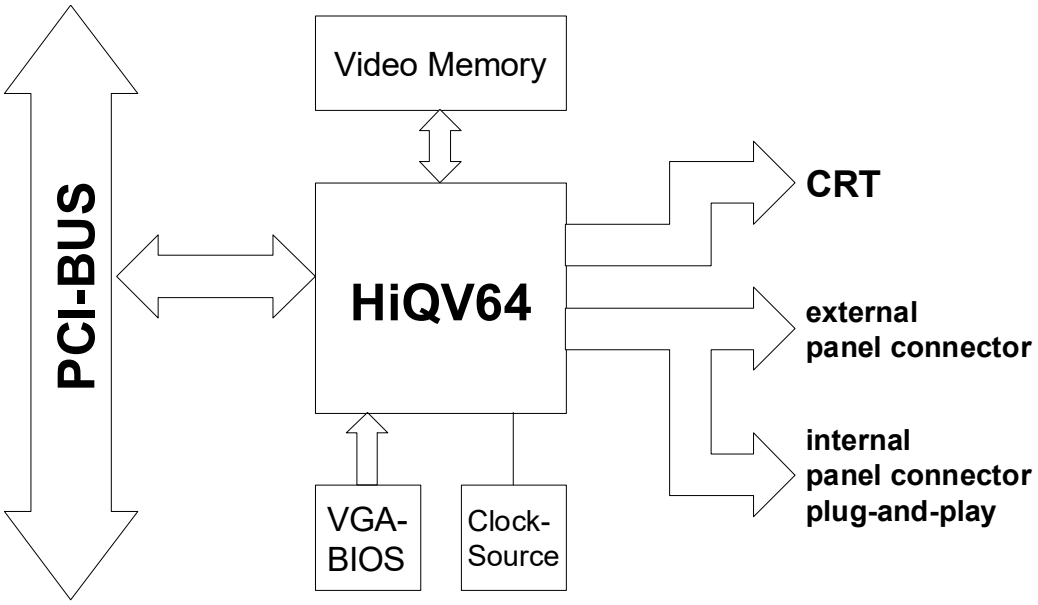
Notes:
(1) if serial ports are disabled via system bios, these interrupts are available for other devices.
(2) possible settings for Ethernet controller, IRQ5 is the factory default.
(3) If the PS/2 mouse support is disabled or no a mouse attached this interrupt is available

DMA

DMA 0	Available
DMA 1	Available
DMA 2	Floppy
DMA 3	Available
DMA 4	Cascade
DMA 5	Available
DMA 6	Available
DMA 7	Available

Onboard C&T VGA

Block Diagram



Supported Display Types

The ***littleMONSTER*** supports a vast variety of panels all configured by a dedicated cable for each panel. There is no jumper setting or software setup required. Since practically all LCDs have different connectors, pinout or LCD voltages, this is the easiest and safest way to configure different panels.
The ***littleMONSTER*** BIOS supports 16 completely different panel types, which are identified via the video BIOS by reading the configuration pins PID0..3 on internal panel connector. **JUMP*tec*®** 's BIOS uses the following entries:

Nr.	PID3..0	Typ
1	0000	Dual Scan Color 1024x768
2	0001	TFT Color 1280x1024
3	0010	Dual Scan Color 640x480
4	0011	Dual Scan Color 800x600
5	0100	TFT Color 640x480 12 Bit
6	0101	TFT Color 640x480 18 Bit
7	0110	TFT Color 1024x768
8	0111	TFT Color 800x600 18 Bit
9	1000	TFT Color 800x600
10	1001	TFT Color 800x600
11	1010	Dual Scan Color 800x600
12	1011	Dual Scan Color 800x600
13	1100	TFT Color 1024x768 2x18 Bit
14	1101	TFT Color 1024x768 Analog

15	1110	Dual Scan Color 1024x600
16	1111	TFT Color 1024x600

Power Supply

The grafic controller on the ***littleMONSTER*** board needs +5V only to supply attached displays. On board 3.3V-circuitry and low-voltage panels are powered by their own voltage regulators, placed on the cables itself. If the used backlight converter needs +12V, supply system with +12V also.

The LC-Display Interface

Connecting a Display

Many different panel adapters for a wide spread variety of displays are available through **JUMP*tec***®. If you use one of those adapters supplied by **JUMP*tec***®, configuration is very easy:

1. Check, whether you have the correct adapter and cable for the panel you plan to use. Inspect the cable for damages.
2. Disconnect power from your System.
3. Connect the panel adapter to the internal LCD connector (X6) on ***littleMONSTER***.
4. Connect the other end of the cable to your display.
5. Connect the backlight converter.
6. Supply power to your system
7. If no picture appears on your display, you should connect a CRT monitor to the CRT-connector (X5).

   If you still don't see any improvement, you may consider to contact the dealer for technical support.

Current panel information from the JUMP*tec*®-Mailbox

To find out whether your panel is supported, you should check the **JUMP*tec***®-Mailbox or **JUMP*tec***® support pages on the Internet for actual panel lists. We regularly update the list of panels that have been tested with the ***littleMONSTER***.
To use the mailbox, set your terminal software to these parameters: 8 data bits, no parity, 1 stop bit. You may use any transfer speed from 1200 up to 14400 bits per second.
Call the mailbox: +49-(0)9482-9405-27
When you are asked for your first and last name, simply enter "JUMP".
Now you are connected to the mailbox. Feel free to download any information you need.
Internet adress: http://www.jumptec.de.

Available Video Modes

Video Mode	Display Mode	Characters/Pixels	Colors/Gray val.	Refresh Rate
00h/01h	Text	40x25	16	70
02h/03h	Text	80x25	16	70
04h/05h	Graphics	320x200	4	70
06h	Graphics	640x200	2	70
07h	Text	80x25	Mono	70
0Dh	Graphics	320x200	16	70
0Eh	Graphics	640x200	16	70
0Fh	Graphics	640x350	Mono	70
10h	Graphics	640x350	16	70
11h	Graphics	640x480	2	60
12h	Graphics	640x480	16	60
13h	Graphics	320x200	256	70

14h	Graphics	320x200	256	70
15h	Graphics	320x200	64k	70
16h	Graphics	320x200	16M	70
17h	Graphics	320x240	256	60
18h	Graphics	320x240	64k	60
19h	Graphics	320x240	16M	60
1Ah	Graphics	400x300	256	60
1Bh	Graphics	400x300	64k	60
1Ch	Graphics	400x300	16M	60
1Dh	Graphics	512x384	256	60
1Eh	Graphics	512x384	64k	60
1Fh	Graphics	512x384	16M	60
20h	Graphics	640x480	16	85
22h	Graphics	800x600	16	85
24h	Graphics	1024x768	16	85
28h	Graphics	1280x1024	16	75
2Ah	Graphics	1600x1200	16	75
30h	Graphics	640x480	256	85
31h	Graphics	640x400	256	70
32h	Graphics	800x600	256	85
34h	Graphics	1024x768	256	85
38h	Graphics	1280x1024	256	75
3Ah	Graphics	1600x1200	256	75
40h	Graphics	640x480	32k	85
41h	Graphics	640x480	64k	85
42h	Graphics	800x600	32k	85
43h	Graphics	800x600	64k	85
44h	Graphics	1024x768	32k	85
45h	Graphics	1024x768	64k	85
48h	Graphics	1280x1024	32k	75
49h	Graphics	1280x1024	64k	75
50h	Graphics	640x480	16M	85
52h	Graphics	800x600	16M	85
54h	Graphics	1024x768	16M	85
58h	Graphics	1280x1024	16M	75
62h	Graphics	640x400	64k	70
63h	Graphics	640x400	16M	70
64h	Graphics	1024x768	16	85
68h	Graphics	1280x1024	16	75
6Ah	Graphics	800x600	16	85
70h	Graphics	640x480	256	85
71	Graphics	640x400	256	70
72	Graphics	800x600	256	85
74	Graphics	1024x768	256	85
78	Graphics	1280x1024	256	75

Backlight Converter

Most LC-displays need an extra AC or DC supply for powering backlight, which is generated by an external converter. This converter usually generates between 60 and 1000 Volts AC and has to be put as close as possible to the backlight to avoid capacitive loss on long cables. ***littleMONSTER*** uses a MOSFET to switch backlight on or off via software control. The configuration on the display adapter decides whether to switch +5V or +12V to the backlight converter.
The switched backlight supply voltage is available at pin 2 (SW_BACK).

Pin-No.:	Pin Name	Pin Description
1	VCC	+5V

2	SW_BACK	switched backlight converter supply voltage from MOS switch
3	+12V	only available if supplied via the PCI bus
4,5	GND	ground
6	N.C.	Do not make connections to this pin
7	BACK_SRC	backlight converter supply voltage input to MOS switch
8	N.C.	Do not make connections to this pin
9	N.C.	Do not make connections to this pin
10	ENPBLT	backlight control output / may be used as the backlight on/off control if the backlight is switched by external hardware instead of using BACK_SRC and SW_BACK

Backlight connector (X2) Pin Description

Onboard I/O, Printer-Port

The Centronics printer interface on the ***littleMONSTER*** can be programmed via the system setup menu. The user can program the base I/O-address 378h, 278h, 3BCh or disable the interface. The parallel port is completely compatible with the parallel port implementation used in the IBM PS-II-Parallel Adapter.

Register-description

address	read	write
xx8h	Centronics-port	Centonics-port
xx9h	status-register	not used
xxAh	control-register	control-register
xxbh	not used	not used

Since the parallel port is bidirectional (set by a special bit in the control-reg.), the centronics-port (xx8h) allows the microprocessor to read the information on the parallel bus. The status register (xx9h) allows the microprocessor to read the status of the printer in the five most significant bits. The status bits are Printer Busy (BUSY), Acknowledge (ACK) which is a handshake function, Paper Empty (PE), Printer Selected (SLCT), and Error (ERROR). The control register (xxAh) is a read/write register. The control bits are found in the six least significant bits of this register. They are Interrupt Enable (IRQ ENB), Select In (SLIN), Initialize the Printer (INIT), Autofeed the Paper (AUTOFD), Strobe (STROBE) und Direction (DIR), which informs the printer of the presence of valid data on the parallel bus.

register	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Centronics-Port	PD7	PD6	PD5	PD4	PD3	PD2	PD1	PD0
status-register	BUSY	ACK	PE	SLCT	ERROR	1	1	1
control-register	1	1	DIR	IRQ ENB	SLIN	INIT	AUTOFD	STROBE

Onboard I/O, Serial port

The four serial input/output interfaces can be set to the base I/O-address 3F8h, 2F8h, 3E8h, 2E8h or disabled. The serial ports are completely compatible with the serial port implementation used on the IBM Serial Adapter. Their interrupts are mapped to IRQ4, IRQ3, IRQ10, IRQ11.

Register description

address	read	write
x0h	TX buffer / divisor latch LSB(*)	RX buffer / divisor latch LSB(*)
x1h	interrupt-enable-register / divisor latch MSB(*)	interrupt-enable-register / divisor latch MSB(*)
x2h	interrupt-ID-register	-
x3h	line control register	line control register
x4h	modem control register	modem control register
x5h	line status register	line status register
x6h	modem status register	modem status register
x7h	Scratch register	Scratch register

(*) If bit7 of the line control registers is 1

If the line control register bit7 is 0, data will be written to the TX- buffer. A read command from this port transfers data from RX-buffer.
If the line control register bit7 is 1 the LSB of the divisor latch is enabled on I/O- address x0 and the MSB at address x1.

Baudrate-Table

baud rate	baud rate-latch MSB	baud rate-latch LSB
50	9	0
75	6	0
150	3	0
300	1	80
600	0	C0
1200	0	60
2400	0	30
4800	0	18
9600	0	0C
19200	0	6
115200	0	1

Scratch register
The scratch register is an 8-bit read/write register that has no effect on any channel in the I/O controller. It is intendend as a scratchpad register used by the programmer to hold data temporarily.

Line control register
The line control register has two functions, if bit 7 = 0 the least significant seven bits used to control the format of the data character. The contents are word length, stop bits, parity and break. If bit 7 = 1 it´s possible to setup the baud rate in register x0 and x1

bit number									
7	6	5	4	3	2	1	0	function	possible value
X								divisor-latch-bit	1 = baud rate-register
	X							Break-Control	1 = Break enable 0 = Break disable
		X						Parity	1 = Parity on
			X					Parity type	0 = odd, 1 = even
				X				Stick Parity	0 = disabled, 1 = enabled
					X			Stop-Bits	0 = 1 Stop Bit 1 = 1,5 (if Bit0,1=0) o. 2
						X	X	word length	00 = 5 Bit 01 = 6 Bit 10 = 7 Bit 11 = 8 Bit

After reset all bits are zero.

Line-status register

The line-status register is used to control the state of the transmit /receive - register and the received data.

bit number									
7	6	5	4	3	2	1	0	function	possible value
X								-	
	X							Transmitter empty	1 = empty, 0 = not empty
		X						TX-Hold-reg. empty	1 = empty, 0 = not empty
			X					Break-Interrupt	1 = Break, 0 = no Break
				X				Framing - Error	1 = Framing - Error
					X			Parity - Error	1 = Parity - Error
						X		Overrun - Error	1 = Overrun - Error
							X	Data ready	1 = Ready

After reset the register value is 60h.

Modem-control register

The modem control register is used to control the interface with the modem or data set.

bit number									
7	6	5	4	3	2	1	0	function	possible value
X	X	X						-	
			X					Loop-testmode	0 = Loop off, 1 = Loop on
				X				Interrupt enable	0 = disabled, 1 = enabled
					X			-	
						X		RTS-output	0 = low, 1 = high
							X	DTR-output	0 = low, 1 = high

After reset all bits are zero.

Modem-status register

The modem-status register is used to control the state and the change of the modem input lines.

bit number									
7	6	5	4	3	2	1	0	function	possible value
X								RLSD complement	0/1
	X							RI complement	0/1
		X						DSR complement	0/1
			X					CTS complement	0/1
				X				Delta RLSD	1 = changed
					X			TERI	1 = RI changed to off
						X		Delta DSR	1 = changed
							X	Delta CTS	1 = changed

After reset the four least significant bits are 0, the most significant bits have the state of their corresponding pin.

Interrupt-ID-register

The interrupt-ID-register is used to identify communication interrupts.

bit number									
7	6	5	4	3	2	1	0	function	possible value

X	X	X	X	X				-	
					X	X		Interrupt-ID	1 = Modem-status 1 = TX Hold register empty 1 = Receive data ready 1 = RX-line status
							X	Interrupt pending	1 = Interrupt pending 0 = no Interrupt pending

After reset the value of the register is 01h.

Interrupt-enable-register

The interrupt-enable-registers are used to enable the four different serial interrupt sources independently. To enable the interrupt request signal bit3 of the modem-control-register must be set.
If bit7 of the line-control-register is set instead of the interrupt-enable-register the MSB of the baud rate-register is selected.

bit number									
7	6	5	4	3	2	1	0	function	possible value
X	X	X	X					-	
				X				Modem status	1 = Interrupt enabled
					X			Receiver-line status	1 = Interrupt enabled
						X		TX-hold-reg. empty	1 = Interrupt enabled
							X	Data ready	1 = Interrupt enabled

After reset all bits are zero.

Onboard I/O, IRDA interface

Alternatively an IRDA-transceiver can be connected to the TTL signals of COM2 at connector X17 to allow for bidirectional wireless data transfer at speeds up to 115 kbaud. (No BIOS- or software support is provided for this feature.)

NOTE: IRDA (named after the standardizing group ”InfraRed Data Association”) defines a standard for high speed infrared data transfer (over distances of about 1 meter). It is supported by many suppliers at chip, module or device level.

ISA Bus Buffer

In order to drive large backplanes, all ISA output signals on the ***littleMONSTER*** board are buffered via bus drivers. If external ISA-Cards are used, it’s **strictly recommended** to avoid address conflicts with onboard devices, otherwise the ***littleMONSTER*** board or the ISA card could be damaged.

PCI Bus

The ***littleMONSTER*** Board provides a 32bit PCI Bus extension for connecting up to four external Master PCI cards. Please refer to the current PISA specification to get further information for designing PISA backplanes with PCI slots.

Watchdog

Detailed description of the watchdog function:

Programming:
The function *Init watchdog* must be called only once. The three parameters *delay time*, *timeout time* an *trigger event* must be set. After initialisation the watchdog will be active only after the delay time has expired. The watchdog must be reset during the *timeout time* with the *trigger watchdog function*. Otherwise a RESET or NMI will occur depending on *trigger event*.

The trigger- and the delay time can be set in steps of 0.2 sec.
The maximum values are:

- timeout time 65535*0.2sec. = 13107s ≅ 3h 38min
- delay time 32767*0.2sec. = 6553s ≅ 1h 49min

The system BIOS makes it very easy to use the watchdog via software interrupt 15h. Two ways are possible to access the watchdog: The simplest way is to use AH=0E0h to init or trigger the watchdog. The second way is to use the functions ”Write I^2C” and ”Read I^2C” with AH=0E1h and handling the I^2C bus protocol.

A) Simple with AH = E0h
Init Watchdog (Int 15h, AH=E0h)

Called with
AX E000h
BX **timeout time**
BX = 0 ⇨ watchdog off. BX_{max} = 0FFFFh
CX **delay time**
CX = 0 ⇨ no delay. CX_{max} = 07FFFh
DX **trigger event**
DX = 0 ⇨ RESET, DX = 1 ⇨ IOCHCHK

Returns no
Example

```
mov   ax,0E000h    ; Watchdog set
mov   bx,5         ; 5*0,2s = 1s Timeout
mov   cx,5         ; 5*0,2s = 1s Delay
mov   dx,0         ; after Timeout and Delay generate RESET
int   15h
```

Trigger Watchdog (Int 15h, AH=E0h)

Called with AX E001h

Returns no
Example

```
mov   ax,0E001h    ; trigger watchdog
int   15h
```

The JIDA Standard

JIDA is the abbreviation for JUMP*tec*® Intelligent Device Architecture.

Every board with onboard BIOS extension shall support the following function calls, which supply information about the board. JIDA functions are called via Interrupt 15h with AH=EAh, AL=function number, DX=4648h (security word), CL=board number (starting with 1).

The interrupt will return with CL#0, if a board with the number specified in CL does not exist. CL will be equal to 0 if the board number exists. In this case, the content of DX is used to determine, if operation was successful. DX=6B6Fh indicates successful operation, any other value indicates an error.

To get information about the installed boards following the JIDA standard, the following procedrue is recommended:

Call ”Get Device ID” with CL=1. The name of the first device installed will be returned. If result was ”Board exists” (CL=0), increment CL and call ”Get Device ID” again. Repeat until result is ” Board not present” (CL#0). You now know the names of all boards within your systen that follow the JIDA standard. More information about a specific board may then be obtained by calling the appropriate inquiry function with the board’s number in CL.

WARNING: Association between board and board number may change due to configuration changes. Do **not rely on any association between board and board number**. Instead, always use the procedure described in the preceding paragraph first, to determine the association between board and board number.

The source of a Turbo-Pascal™ unit called JIDA_ACC.PAS showing JIDA access is included on the support disk.

Get Manufacturer ID	Int 15h
Input:	AX = EA00h DX = 4648h CL = Board number (1=first board a.s.o.) ES:BX = Pointer to destination data area
Output:	CL=0: Board present DX=6B6Fh: Function successful CL≠0: Board not present DX≠6B6Fh: Error
Description:	If CL=0 and DX=6B6Fh, then 4 Byte manufacturer ID were copied to the area pointed to by ES:BX By default, the result will be ”JUMP”. Note: There is no ending zero byte. Function must be implemented on every device supporting the JIDA.

Get Device ID	Int 15h
Input:	AX = EA01h DX = 4648h CL = Board number ES:BX = Pointer to destination data area
Output:	CL=0: Board present DX=6B6Fh: Function successful CL≠0: Board not present DX≠6B6Fh: Error

Description:	If CL=0 and DX=6B6Fh, then 7 Byte device ID were copied to area pointed to by ES:BX By default, the result will be " " Note: There is no ending zero byte. Function must be implemented on every device supporting the JIDA.

Get Manufacturing Date	Int 15h	
Input:	AX = EA02h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BX = Manufacturing date	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description	If CL=0 and DX=6B6Fh, then BX=Manufacturing date. Date format is the same as used for DOS files: Bit0..4: Day Bit5..8: Month Bit9..15: Years since 1980	

Get Serial Number	Int 15h	
Input:	AX = EA03h CL = Board number ES:BX = Pointer to destination data area	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	If CL=0 and DX=6B6Fh, then 10 Byte serial number were copied to area pointed to by ES:BX The result is different for each single ***littleMONSTER***. Note: There is no ending zero byte.	

Get Hardware Revision	Int 15h	
Input:	AX = EA04h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BH=Major revision number BL=Minor revision number	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

Get Firmware Revision	Int 15h	
Input:	AX = EA05h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BH=Major revision number BL=Minor revision number	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

Get Last Repair Date	Int 15h	
Input:	AX = EA06h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BX = Last repair date.	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	If CL=0 and DX=6B6Fh, then BX=Last repair date. For date format see function ”Get Manufacturing Date”. If board was never repaired, result will be equal to manufacturing date.	

Read Running Time Meter	Int 15h	(not implemented with MULTI-4)
Input:	AX = EA07h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BX=Running time (hours) CH=Overflow counter	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

ReadBoot Counter	Int 15h	(not implemented with MULTI-4)
Input:	AX = EA08h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BX = Boot counter	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

Get Contrast setting	Int 15h	
Input:	AX = EA20h CL = Board number	DX = 4648h

Output:	CL=0: Board present	DX=6B6Fh: Function successful
	CL≠0: Board not present	DX≠6B6Fh: Fn.not implemented
	CH = Actual contrast value (range 0..63)	

not supported on ***littleMONSTER***

Set Contrast	Int 15h	
Input:	AX = EA21h CL = Board number CH = New contrast value	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	Valid range for contrast is 0..63. Other values will be ignored.	

not supported on ***littleMONSTER***

Disable DC/DC Converter	Int 15h	
Input:	AX = EA22h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

not supported on ***littleMONSTER***

Enable DC/DC Converter	Int 15h	
Input:	AX = EA23h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

not supported on ***littleMONSTER***

Get Matrix Translation Table	Int 15h	
Input:	AX = EA30h CL = Board number ES:BX = Pointer to destination data area	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	72 Byte matrix keyboard translation table will be copied to area pointed to by ES:BX	

not supported on ***littleMONSTER***

Set Matrix Translation Table	Int 15h	
Input:	AX = EA31h CL = Board number ES:BX = Pointer to new translation table	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	New matrix keyboard translation table will be copied from area pointed to by ES:BX	

not supported on ***littleMONSTER***

Get Matrix Translation Entry	Int 15h	
Input:	AX = EA32h CL = Board number BH = Matrix line (0..7 allowed) BL = Matrix row (0..8 allowed)	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present CH = Table entry (undefined if BH or BL are invalid)	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

not supported on ***littleMONSTER***

Set Matrix Translation Entry	Int 15h	
Input:	AX = EA33h CL = Board number BH = Matrix line (0..7 allowed) BL = Matrix row (0..8 allowed) CH = New Entry	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

not supported on ***littleMONSTER***

Read User Byte from EEPROM	Int 15h	
Input:	AX = EA40h CL = Board number BH = Number of byte to read (0..15 allowed)	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present BL = Value read	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

Write User Byte to EEPROM	Int 15h	
Input:	AX = EA41h CL = Board number BH = Number of byte to write (0..15 allowed) BL = Value to write	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented

Read OC Output State	Int 15h	
Input:	AX = EA50h CL = Board number	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present CH = Actual output state	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	Data format: CH = xxxxxxba, where b = OC1, a = OC0	

Switch OC Outputs	Int 15h	
Input:	AX = EA51h CL = Board number CH = New output state	DX = 4648h
Output:	CL=0: Board present CL≠0: Board not present	DX=6B6Fh: Function successful DX≠6B6Fh: Fn.not implemented
Description:	Data format: CH = xxxxxxba, where b = OC1, a = OC0	

Network Operation

Overview

The Crystal LAN™ CS8900 ISA Ethernet Adapter from Crystal Semiconductor follows IEEE 802.3 standards and supports half- or full-duplex operation in ISA bus computers on 10 Mbps Ethernet networks.

The following software is required:

- CS8900 Setup and Device Driver Software diskette.
- Installation diskettes or CD-ROM for your client and/or network operating system.

DESKTOP MANAGEMENT INTERFACE (DMI) INTERFACE

DMTF Desktop Management Interface (DMI) support for the CS8900 adapter is provided through the ODI client (DOS and OS/2) and NDIS 2.0.1 (DOS and OS/2) device drivers. The three files required to implement this interface are provided in the \DMI directory of the "CS8900 Setup and Device Driver Software" disk:

- CS89DMI.MIF -- Management Information Format (MIF) file describing the charctersitics of the CS8900 based adapters.
- CS89DMI.DLL -- Component Interface for the OS/2 operating system (supports both the OS/2 ODI and NDIS 2.0.1 device drivers).
- CS89DMI.OVL -- Component Interface for the DOS operating system (supports both the DOS ODI and NDIS 2.0.1 device drivers).

Installation procedures are specific to a particular management application. Refer to your management application's documentation for the installation of the required DMI support files.

Installation

INSTALLATION OVERVIEW

Perform the following steps to install and configure you CS8900 ISA Ethernet Adapter:

1. Connect your network cable.
2. Configure the adapter.
3. Install the device driver and support files.
4. Perform diagnostic tests if needed.

CS8900 Configuration

Connect your network cable. The cable must be connected before loading the driver.
CS8900-based adapters shipped from Crystal Semiconductor are configured with the following "default" settings:

Operation Mode:	Memory Mode

IRQ:	12
Base I/O Address:	300
Memory Base Address:	D0000
Optimization:	DOS Client
Transmission Mode:	Half-duplex
BootProm:	None
Media Type:	Autodetect (3-media cards) or 10BASE-T (10BASE-T only adapter)

To change the adapter's configuration run the CS8900 Setup Utility after the adapter is installed. Since COM4 also uses IRQ10, it is **strictly recommended** to change the CS8900-Interrupt via the CS8900 SetupUtility (e.g. to Interrupt 12).

Attention: Do not change the base I/O address of the ethernet controller under any circumstances, otherwise the onboard ISA buffer will cause an I/O conflict.

WINDOWS FOR WORKGROUPS - NDIS 3.0 DRIVER INSTALLATION

Use the NDIS 3.0 driver (ENDS3ISA.386) in a Windows for Workgroups Network environment or to connect a Windows for Workgroups client to a Windows NT server.

1) Start Windows. From the Program Manager double click on the "Network" group Icon.
2) Double click on the "Network Setup" icon to start the Network Setup utility.
3) Click on the "Networks" button.
4) Select the "Install Microsoft Windows Network" option and click on the "OK" button.
5) Select the "Drivers..." button at the bottom of the dialog box.
6) From the "Network Drivers" panel select "Add Adapter".
7) Select the "Unlisted or Updated Network Adapter" from the Network Adapters list and click "OK".
8) When prompted, insert the "CS8900 Setup and Device Driver Software" diskette in drive A: and click "OK" to accept the default path (A:\).
9) The next dialog box lists adapter drivers. Select "Crystal (CS8900)" and click "OK".
10) You will be returned to the "Network Drivers" window. Click the "Close" button.
11) On the "Network Setup" panel, click "OK"'.
12) Respond "Yes" to any update messages. Insert the Windows for Workgroups system disk(s) as prompted.
13) When the installation process is complete, exit and restart Windows for Workgroups for the changes to take effect.

WINDOWS FOR WORKGROUPS - DOS ODI CLIENT DRIVER INSTALLATION

Use the DOS ODI driver (EODIISA.COM) to connect a Windows for Workgroups client to a Novell NetWare 3.12 or 4.X server. Perform the installation using Novell's ”NetWare Client for DOS/WINDOWS” Installation package.

1) From a DOS prompt start the Novell installation program from the NetWare WSDOS_1 diskette (NetWare Client for DOS/WIN, Disk 1).
2) At the NetWare Client Installation panel set the destination directory to where you want to store your NetWare files. The directory will be created if it does not exist.
3) Make sure you have answered "Yes" to the question about modifying your AUTOEXEC.BAT and CONFIG.SYS files. If you wish to use Windows as a NetWare client answer "Yes" to install support for Windows and specify the path to your Windows directory.
4) Highlight the option to select the driver and press <ENTER>.
5) From the "Network Board" dialog page to the end of the list and select the "Other Drivers" option.

6) Insert the drivers diskette. Press <ENTER> to accept the default path.
7) Choose "Crystal ISA Ethernet Adapter EODIISA" as the driver.
8) When the "Settings" panel is displayed enter selections for the desired Frame Type(s). Valid frame types are:

    Ethernet_802.2 (default)
    Ethernet_802.3
    Ethernet_II
    Ethernet_SNAP

    Up to a maximum of four frame types are supported.

    NOTE: The first frame type you specify must be one used by the IPX protocol on the NetWare server to which you wish to connect. Ethernet_802.2 is the default frame type for NetWare 3.12 and 4.X servers. (Contact your Network Administrator to determine the frame types supported by your server.)

    An optional Node Address can be assigned if desired. Only assign a local Node Address in accordance with IEEE 802.2 specifications. A universally administered address is assigned at the factory and is used by default.
9) Return to the NetWare Client Install panel, select the "Highlight here and press <Enter> to install" option and press <ENTER>.
10) Exchange disks as prompted.
11) When the installation process is complete, reboot the system.
12) The installation process will automatically configure Windows for Workgroups as a NetWare client. Be sure to login to the file server from the DOS prompt each time before you start Windows.

WINDOWS 95 - INSTALLATION FOR CS8900-BASED ADAPTERS

1) Install the adapter and boot Windows 95.
2) If required to log on do so as Administrator or as a user with Administrator's privileges.
3) After Windows 95 has finished booting select the "Start" button on the Task Bar.
4) Select "Settings" and then "Control Panel" from the "Start" menu.
5) Double-click on the "Network" icon in the Control Panel window.
6) Click on the "Add" button.
7) From the "Select Network Component Type" window select "Adapter" and click on the "Add" button.
8) From the "Select Network Adapters" window click the "Have Disk" button.
9) When prompted insert the "CS8900 Setup and Device Driver Software" diskette in drive A:
10) Click on "OK" to accept the default path (A:\) in the "Copy manufacturer's files from:"list box.
11) Select "Crystal LAN(tm) CS8900 Ethernet Adapter" and click on "OK".
12) From the "Network" Control Panel window, select the "Crystal LAN(tm) CS8900 Ethernet Adapter" and click on the "Properties" button.
13) Click on the "Resources" tab. Set the configuration type to "Basic Configuration 0" and set the resources to those you assigned to the adapter during during configuration with the CS8900 Setup Utility. If using the adapter's default configuration, enter:

    I/O address range = 300-30F
    Interrupt (IRQ) = ???
    Memory address = disabled (ignore this setting)

    NOTE: Resources already in use are marked with an asterisk "*". If the adapter's default configuration is in conflict with resources used by other devices in the system, you must exit Windows 95 and run the CS8900 Setup Utility to reconfigure the CS8900 adapter.

14) Click the "OK" button to return to the "Network" Control Panel.
15) Add protocol support as appropriate for your network environment by using the "Add" button and selecting "protocol" as the network component to install.
16) Click the "Network" control panel's "OK" button.
17) Shut down and restart Windows 95 for all changes to take effect.

WINDOWS 95 - ADVANCED CONFIGURATION

This procedure assumes the Crystal LAN CS8900 adpapter and device drivers have been installed as described in ”Installation for CS8900-based Adapter”. If not, do so now.

1) Start Windows 95 and log on as Administrator or as a user with Administrator's privileges.
2) Go to the "Network" control panel window. Select the "Crystal LAN(tm) CS8900 Ethernet Adapter" and click on the "Properties" button.
3) Click on the "Advanced" tab. You will be presented with settings for:

   a) Cable Type
   Select the type of cable you have connected to the adapter. Use the default "Auto Detect" if you want the driver to automatically determine the type of cable connected to the adapter each time the driver loads.

   b) Duplex Mode
   Select the transmission mode you want the adapter to use. It is strongly recommened you use the default "half-duplex" for CS8900-based adapters unless you are sure of the transmission mode capabilities of the network equipment to which you will be connecting.

   WARNING: Setting a transmission mode that is incompatible with the other equipment on your network will prevent the adapter from working properly and can adversely affect your entire network's performance.

   c) LoadWithoutCable
   Specify the driver's behavior when loading without a cable connected to the adapter. The default "No" will cause the driver to report an error and unload if a cable is not connected to the Crystal LAN(tm) adapter. Selecting "Yes" will allow the driver to load without a cable connected.

   NOTE: This setting is ignored if the driver is configured to "Auto Detect" the cable type. You must specify the cable type before the driver will load without a cable.

   d) NetworkAddress
   If you want to override the adapter's assigned Ethernet Address, enter the 12 hex-digit locally administered address in the "NetworkAddress" field. Otherwise, leave this field blank.

   NOTE: Only assign a local Ethernet Address in accordance with IEEE 802.2 specifications. A universally administered Ethernet Address is assigned at the factory and is used by default.

   e) SerialNumber
   If you are installing more than one Crystal ISA Ethernet Adapter in the same PC, you must specify the serial number for each adapter. If you are installing a single adapter in this PC, this field is optional (leave blank).

4) Set each property to the desired value and click "OK".
5) Click the "OK" button on the "Network" control panel window to update the required files.
6) Shut down and restart Windows 95 for all changes to take effect.

WINDOWS NT

1) Boot Windows NT.
2) If required to log on, do so as Administrator or as a user with Administrator's privileges.
3) After Windows NT has finished booting, open the "Main" window from the Program Manager.
4) Open the "Control Panel" window and double-click on the "Network" icon in the Control Panel window.
5) If the message: ”Windows NT Networking is not installed. Install it now?” is displayed, reply ” Yes”, otherwise continue with step 6.

   When prompted, choose ”Do Not Detect” network adapter and then ”Continue”. Continue the installation with step 7.
6) Continue with the "Network Settings" dialog by clicking the "Add Adapter" button.

7) From the "Add Network Adapter" dialog, click the down arrow on the "Network Adapter Card" list box. Select "<Other> Requires disk from manufacturer" at the end of the adapter list. Click the "Continue" button.
8) When prompted, insert the "CS8900 Setup and Device Driver Software" diskette in drive A: and click on "OK" to accept the default path of A:\.
9) Select "Crystal LAN(tm) Family Ethernet Adapter" and click on "OK".
10) If you are installing more than one Crystal ISA Ethernet Adapter in the same PC, enter the serial number for the adapter you are installing when prompted. If you are only installing a single adapter in this PC you may leave this field blank. Click on the "Continue" button when finished.
11) If you want to override the adapter's assigned Ethernet Address, enter the 12 hex-digit locally administered address in the "NetworkAddr" field. Otherwise, leave this field blank. Click on "Continue" when finished.

    NOTE: Only assign a local Ethernet Address in accordance with IEEE 802.2 specifications. A universally administered Ethernet Address is assigned at the factory and is used by default.
12) Select the type of cable you have connected to the adapter. Use the default "Auto Detect" if you want the driver to automatically determine the cable type connected to the adapter each time the driver loads.
13) Select the transmission mode you want the adapter to use. It is strongly recommened you use the default "half-duplex" for CS8900-based adapters unless you are sure of the transmission mode capabilities of the network equipment to which you will be connecting.

    WARNING: Setting a transmission mode that is incompatible with the other equipement on your network will prevent the adapter from working properly and can adversely affect your entire network's performance.
14) Specify the driver's behavior when loading without a cable connected to the adapter. The default "No" will cause the driver to report an error and unload if a cable is not connected to the Crystal LAN(tm) adapter. Selecting "Yes" will allow the driver to load without a cable connected.

    NOTE: This setting is ignored if the driver is configured to "Auto Detect" the cable type. You must specify the cable type before the driver will load without a cable.
15) Accept the default "Bus Type" and "Bus Number" from the "Bus Location" dialog and click the "OK" button. Windows NT will copy the required driver files to your hard drive and return you to the "Network Settings" Control Panel.
16) The next step is to select the appropriate protocols to bind to the adapter for your network environment. When prompted, install the protocol options and and utilities required for your network. (If not prompted, use the "Add Software" and then the "Bindings" option from the "Network Settings" dialog.)
17) Restart Windows NT when prompted for all changes to take effect.

MS LAN MANAGER DOS AND OS/2

This procedure assumes that MS LAN Manager 2.X is already installed on the target system. If not, do so now. Refer to the "Microsoft LAN Manager Installation and Configuration Guide" for instructions.

1) Start the LAN Manager Setup program and select "Configuration".
2) Select "Network Drivers".
3) Select the installed configuration you want to update. If the configuration list is empty, select "Add New Config".
4) From the "Network Adapter Drivers" window, select "Other Driver".
5) When prompted, insert the "CS8900 Setup and Device Driver Software" diskette in the diskette drive and press <Enter>. You do not need to enter path information. The diskette is configured to enable the Setup utility to find the required files.
6) Select "Crystal LAN(tm) CS8900 Ethernet Adapter" and then "OK".
7) From the "Network Protocols" window, select the appropriate protocol(s) for you network environment. Typically, this will be the NetBEUI driver (required for NetBIOS support).
8) Follow the instructions in the window to complete the configuration. Your AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files will be updated.

1) Restart the computer to load the NDIS 2.0.1 and protocol drivers.

DOS ODI CLIENT - USING NOVELL'S INSTALLATION UTILITY

Use this procedure to install the NetWare DOS Client software if you have the Novell NetWare DOS Client Installation utility and you are configuring the PC as a NetWare client for the first time. If the PC has been previously configured as a DOS client using a network adapter from another vendor, go to the section on Manual Driver Installation.

NOTE: If the Novell NetWare DOS Client Installation utility is distributed as part of the NetWare Server Installation on CD-ROM, you must make diskette images for the DOS Client Installation utility from the NetWare Server Installation program. You cannot run the DOS Client Installation utility from CD-ROM.

1) Start the Novell installation program from the NetWare WSDOS_1 diskette (NetWare Client for DOS/WIN, Disk 1).
2) At the NetWare Client Installation panel, set the destination directory to where you want to store your NetWare files. The directory will be created if it does not exist.
3) Make sure you have answered "Yes" to the question about modifying your AUTOEXEC.BAT and CONFIG.SYS files. If you wish to use Windows as a NetWare client, answer "Yes" to install support for Windows and specify the path to your Windows directory.
4) Highlight the option to select the driver and press <ENTER>.
5) From the 'Network Board' dialog, page to the end of the list and select the "Other Drivers" option.
6) Insert the drivers diskette. Press <ENTER> to accept the default path.
7) Choose "Crystal ISA Ethernet Adapter EODIISA" as the driver.
8) When the "Settings" panel is displayed, enter selections for the desired Frame Type(s). Valid frame types are:

    Ethernet_802.2 (default)
    Ethernet_802.3
    Ethernet_II
    Ethernet_SNAP

    Up to a maximum of four frame types are supported.

NOTE: The first frame type you specify must be one used by the IPX protocol on the NetWare server to which you wish to connect. Ethernet_802.2 is the default frame type for NetWare 3.12 and 4.X servers. (Contact your Network Administrator to determine the frame types supported by your server.)

DO NOT enter selections for memory address, port address, DMA, or IRQ.

An optional Node Address can be assigned if desired. Only assign a local Node Address in accordance with IEEE 802.2 specifications. A universally administered address is assigned at the factory and is used by default.

9) Return to the NetWare Client Install panel, select the "Highlight here and press <Enter> to install" option and press <ENTER>.
10) Exchange disks as prompted.
11) When the installation process is complete, reboot the system.

DOS ODI CLIENT - MANUAL DRIVER INSTALLATION

Use this procedure to install the NetWare DOS Client software if the PC has been previously configured as a DOS client using the NetWare DOS Requester (VLM.EXE) or NetWare DOS ODI Shell (NETX.EXE). You can also use this procedure if you have the NetWare DOS ODI Client support files but do not have access to the Novell DOS Client Installation package.

1) Move to the target directory on the hard disk where the existing NetWare DOS Client files are installed (e.g. C:\NWCLIENT). Create a new directory if this is a new installation.
2) Copy EODIISA.COM from the A:\DOS directory of the driver diskette to the target directory.

   Also copy LSL.COM, IPXODI.COM and the VLMs (VLM.EXE and related files) to the target directory if this is new installation. Note:The DOS ODI Client support files are not provided with the driver diskette.
3) Add the target directory to the end of the path statement in your AUTOEXEC.BAT file. For example, PATH=C:\;C:\DOS;C:\NWCLIENT
4) If you are using the NetWare DOS Requester (VLM.EXE), make sure the CONFIG.SYS file contains the statement:

   LASTDRIVE=Z

5) Use an ASCII text editor to edit (or create) the NET.CFG file in the target directory. If you are editing an existing NET.CFG file, change only the LINK DRIVER statement to LINK DRIVER EODIISA and remove any configuration statements such as PORT, IRQ, MEMORY, etc. The only keywords supported under the LINK DRIVER statement for the EODIISA driver are FRAME and NODE ADDRESS.

   Following is a sample NET.CFG suitable for most NetWare 3.12 and 4.X networks. Lines preceded by a semicolon are comments and are ignored by the driver. Note: Statements in the NET.CFG file are position sensitive. Indent as shown below.

```
; SAMPLE NET.CFG File for EODIISA.COM Driver

Link Driver EODIISA
        Frame ETHERNET_802.2
;       Node Address 200000000200 (Optional Node Address)

NetWare DOS Requester
        FIRST NETWORK DRIVE = F

;--- End of file ----
```

Up to a maximum of four frame types are supported. The four valid frame types are:

Ethernet_802.2 (default)
Ethernet_802.3
Ethernet_II
Ethernet_SNAP

NOTE: If multiple frame types are specified, the first frame type must be one used by the IPX protocol on the NetWare server to which you wish to connect. Ethernet_802.2 is the default frame type used by NetWare 3.12 and 4.X servers. (Contact your Network Administrator to determine the frame types supported by your server.)
An optional Node Address can be assigned if desired. Only assign a local Node Address in accordance with IEEE 802.2 specifications. A universally administered address is assigned at the factory and is used by default.

6) Reboot the system.
7) At a DOS prompt, change to the target directory and load the driver and support file manually in the order shown.

Example: (assumes target directory is \NWCLIENT)

CD C:\NWCLIENT <ENTER>
LSL <Enter>
EODIISA <Enter>
IPXODI <Enter>
VLM <Enter>

8) If no errors are reported, you may create a batch file (or place the commands in you AUTOEXEC.BAT file) to execute the above commands and load the driver automatically.

NOTE: If the PC was previously configured as a NetWare DOS Client using another adapter, check the AUTOEXEC.BAT file and make sure you remove any existing commands that load drivers for other network adapters.

DOS ODI CLIENT - CONSIDERATIONS WHEN USING EMM386

If you are using EMM386 (or other similar DOS memory managers) make sure that you exclude the area (RAM and ROM) used by the adapter. As an example (assumes using EMM386), to exclude a 4K range of shared memory used by the adapter starting at memory address D000:0000, change the EMM386 line in CONFIG.SYS to:

Device=C:\DOS\EMM386.EXE NOEMS X=D000-D0FF

Remember to reboot your machine after changing CONFIG.SYS.

DOS ODI CLIENT - DRIVER SIGN-ON MESSAGES

The sign-on messages reported by the driver and the ODI client support files when loaded can be helpful in diagnosing problems. Load the driver and support files manually, one at a time, noting the messages displayed as they load. (If the files are loaded automatically from a batch file, the may scroll by too fast to read.) Following are some things to look for as you load the driver and support files.

- LSL.COM - When loading, it displays the message:

The configuration file used is "C:\NWCLIENT\NET.CFG

giving the full path to the NET.CFG file it used (C:\NWCLIENT\NET.CFG is used as an example. This may be different on your system.) Take note to ensure it is using the NET.CFG file you intended. (Multiple NET.CFG files may exist on the system.)

- EODIISA.COM - When loading, it displays the cable type in use, operation mode (IO/Memory Mode) Transmission Mode (half/full duplex), the IRQ used, I/O-port used, Memory Address (if Memory mode used), the Node Address, and Frame Type used by the adapter.
  Make sure the resources reported are what you expect. In particular note the operation mode (IO/Memory) and frame type. If you have configured the adapter to run in memory mode but the driver reports it is using I/O mode, this is an indication of a memory address conflict. (The driver defaults to I/O mode operation if it detects a memory address conflict.) If the frame type listed for "Board 1" is not as expected, check the NET.CFG file and make sure the desired frame type is listed and that it is the first frame type listed in the LINK DRIVER section.

- VLM.EXE - When the DOS Requester is loaded (VLM.EXE) it should report the following message:

  The VLM.EXE file is pre-initializing the VLMs
  You are attached to server XXXXX

  where XXXXX is the name of your file server. If you do not see this message or the system hangs, it is a good indication the client is not connecting to the server. Check to ensure a cable fault does not exist and that you are using the correct frame type. (Check with you Network Administrator to determine the frame type(s) supported by the target NetWare server.)

NOVELL NETWARE NETWORKS - WORKSTATION FOR OS/2 REQUESTER

1) Install the adapter and reboot OS/2

2) You must have the 6 NetWare Client Installation diskettes available to install the NetWare Client software. If you create the installation diskettes from the NetWare Server CD-ROM, be sure each diskette is labeled with the correct volume label as shown below. If not, use the DOS "label" command to label them correctly.

Diskette Name	Volume Label
WS0S2_1 (Disk 1)	WSOS2_1
WSOS2_2 (Disk 2)	WSOS2_2
WSOS2_3 (Disk 3)	WSOS2_3
OSUTIL1 (Disk 4)	OSUTIL1
OS2DOC1 (Disk 5)	OS2DOC1
WSDRV_1 (Disk 6)	WSDRV_1

3) Copy the EODIISA.SYS driver (located in the \0S2 directory) from the "CS8900 Setup and Device Driver Software" diskette to the \OS2 directory of the WSDRV_1 installation diskette.
4) Open an OS/2 command window or full screen session.
5) Insert the WSOS2_1 diskette into drive A: and type INSTALL.
6) Select the "Requester on Workstation" from the "Installation" menu.
7) Set the target directory for file installation (typically C:\NETWARE).
8) In the "Requester Installation" dialog select "Edit CONFIG.SYS and Copy All Files...". Click "OK".
9) The "Choose the ODI LAN Driver" dialog appears. Enter "EODIISA.SYS" and click "Continue".

10) Next, specify whether or not you need NetWare Support for DOS and Windows. Click on "Help" for more information on setting up support for DOS and Windows applications.
11) From the "Suggested Default Settings to AUTOEXEC.BAT" dialog, select the support options appropriate for your configuration and click on the "Save" button. Make sure the path specified point to your existing AUTOEXEC.BAT file.
12) The installation message appears asking if you want to save settings to another batch file. Select "No" and continue.
13) If an installation message appears stating that you need to set "DOS_LASTDRIVE=" in your DOS settings, click "OK" to continue. Enter this setting in the OS/2 "DOS settings" for the DOS command prompt once installation is complete.
14) From the "Choose Optional Protocols" dialog, select the protocol support appropriate for your network environment, then click "Save".
15) Save changes to your CONFIG.SYS when prompted by clicking "Ok".
16) The "Copy Requester Files" dialog opens. Click "Copy" to copy the driver files to your hard disk.
17) Follow the screen prompts to copy the required files from the remaining diskettes and complete the NetWare Client for OS/2 installation.
18) Shut down the system and reboot OS/2 for all changes to take effect.

NETWARE 3.12 and 4.X SERVER - NOVELL'S INSTALLATION UTILITY (4.X Only)

Use this procedure if you want to install the driver using Novell's INSTALL.NLM utility and you are installing ONLY ONE CS8900 ISA Ethernet adapter. If you are using NetWare 3.12 or are installing multiple CS8900 Ethernet adapters in the same server, perform a manual installation. (See section on Manual Driver Installation.) This procedure assumes that NetWare 4.X is already installed on your system. If not, install it now.

1) Load the Novell Installation utility (type LOAD INSTALL at the console s command prompt) and select "Driver options".
2) From the "Driver Options" menu, select "Configure network drivers".
3) From the "Additional Driver Actions" menu, choose "Select a driver".
4) If the EODIISA.LAN driver is listed, select it. Otherwise press the INSERT key to "Install an unlisted driver".
5) When prompted, insert the "CS8900 Setup and Device Driver Software" diskette and press ENTER. The installation utility will scan the diskette for the NetWare EODIISA.LAN driver.
6) When the EODIISA.LAN driver appears in the list, highlight it and press ENTER.
7) When prompted, respond "Yes" to copy the EODIISA.LAN driver from the driver diskette to the server's SYS:SYSTEM directory.
8) If prompted to save old copies of EODIISA.LAN, MSM.NLM, or ETHERTSM.NLM, respond "No". If an error message appears stating MSM.NLM or ETHERTSM.NLM are not found on the driver diskette, ignore the message and press ENTER to "Continue copying the next file".
9) Once copying is completed, use the arrow key to move the cursor to the "Protocols" input box on the screen.
   Press the F3 key to "Manually set IPX frame types".
   The driver supports loading of up to 4 frame types. You can load instances of the driver for any or all of the frame types. However, Novell recommends using only ETHERNET_802.2 for best performance. The valid frame types are:

   ETHERNET_802.2 (default for NetWare 3.12 and 4.X)
   ETHERNET_802.3 (required for NetWare 3.11 and earlier)
   ETHERNET_II (used for TCP/IP support)
   ETHERNET_SNAP

   Highlight the frame type(s) you want to use and press ENTER to select it. When finished selecting the frame type(s) you want, press the ESC key to return to the main dialog.
10) Highlight the "Save parameters and load driver" option and press ENTER. The driver will load and you will be prompted for a network identification number. Enter an eight-digit hexadecimal number or press ENTER to accept the number presented. Do this for each frame type you selected in the step above.
11) Load additional drivers for adapters from other manufacturers, or use the ESC key to move to the main menu of the Installation utility.
12) To ensure that the drivers are loaded correctly, exit Install and do the following:

    Type MODULES at the console's command prompt. You should see the following modules listed:

    MSM.NLM_,
    ETHERTSM.NLM_, and
    EODIISA.LAN_

    Others may be listed also. EODIISA.LAN will only be listed once even if you loaded it again for additional frame types.

Load the MONITOR NLM (type _LOAD MONITOR_ at the console's command prompt). Select "LAN/WAN Information" and press return. You should see EODIISA listed for each frame type you loaded.

The LEDs on the adapter indicate normal operation. (See the section on using the adapter's LEDs in Testing and Troubleshooting)

You can log on from a workstation and communicate with the server.

NETWARE 3.12 and 4.X SERVER - MANUAL DRIVER INSTALLATION

Use this procedure if you are using NetWare 3.12, installing multiple CS8900 Ethernet adapters in the same server, or if you prefer not to use the NetWare 4.X INSTALL.NLM. This procedure assumes that NetWare 3.12 or 4.X is already installed on your system. If not, install it now. If you will be installing multiple CS8900 Ethernet adapters, be sure you have recorded the serial number for each card. The serial number is printed on the front of the adapter. (See the section "Installing Multiple CS8900 Adapters".)

1) Boot DOS (or down the server and exit to DOS) and move to the target directory on the server. This directory should be the directory used by NetWare for the SERVER.EXE file, for this example: C:\NETWARE.
2) Copy the EODIISA.LAN driver from the A:\NETWARE directory of the "CS8900 Setup and Device Driver Software" diskette to the target directory.
3) Start NetWare. When the server completes the boot process, mount the SYS: volume if it is not already mounted. (Type MOUNT ALL at the console command prompt.)
4) Load the LAN driver and bind IPX to the CS8900 ISA Ethernet Adapter. The following illustrates how to load the driver for a single adapter and bind it to IPX using the default Ethernet_802.2 frame type. Enter the following at the console's command prompt:

   LOAD C:\NETWARE\EODIISA
   BIND IPX to EODIISA NET=[unique hex network number]

   A unique hexadecimal number (8 digits max.) must be assigned to each LAN. (Do not type the brackets.)
5) To create an additional logical network, load another instance of the driver and bind it to another frame type. The following example shows how you would load the driver for two frame types; the first uses the default ETHERNET_802.2 frame type with the second using ETHERNET_II.

   LOAD C:\NETWARE\EODIISA
   BIND IPX to EODIISA NET=[unique hex network number]
   LOAD C:\NETWARE\EODIISA FRAME=ETHERNET_802.3
   BIND IPX to EODIISA NET=[2nd unique hex network number]

   The driver supports loading of up to 4 frame types. You can load instances of the driver for any or all of the frame types. However, Novell recommends using only ETHERNET_802.2 for best performance. The valid frame types are:

   ETHERNET_802.2 (default for NetWare 3.12 and 4.X)
   ETHERNET_802.3 (required for NetWare 3.11 and earlier)
   ETHERNET_II (used for TCP/IP support)
   ETHERNET_SNAP

   If installing multiple adapters, use the adapter's serial number (S/N) to specify the adapter for which you are loading the driver. The following example loads the driver for two CS8900 Ethernet adapters. The first uses the default ETHERNET_802.2 frame type with the second

using ETHERNET_II.

LOAD C:\NETWARE\EODIISA SERIAL=[1st S/N]
BIND IPX to EODIISA NET=[unique hex network number]
LOAD C:\NETWARE\EODIISA FRAME=ETHERNET_II SERIAL=[2nd S/N]
BIND IPX to EODIISA NET=[2nd unique hex network number]

6) To ensure that the drivers are loaded correctly, exit Install and do the following:

Type MODULES at the console's command prompt. You should see the following modules listed:

MSM.NLM,
ETHERTSM.NLM, and
EODIISA.LAN

Others may be listed also. EODIISA.LAN will only be listed once even if you loaded it again for additional frame types.

Load the MONITOR NLM (type LOAD MONITOR at the console's command prompt). Select "LAN/WAN Information" and press return. You should see EODIISA listed for each frame type you loaded.

The LEDs on the adapter indicate normal operation. (See the section on using the adapter's LEDs in Testing and Troubleshooting).

You can log on from a workstation and communicate with the server.

NOVELL NETWARE NETWORKS - IF UNABLE TO CONNECT TO THE FILE SERVER

When the DOS Requester is loaded (VLM.EXE) it should report the following message:

"The VLM.EXE file is pre-initializing the VLMs...."
"You are attached to server XXXXX"

where XXXXX is the name of your file server. If you do not see this message or the system hangs, it is a good indication the client is not connecting to the server. Check the proper ethernet address first (an address like FF:FF:FF:FF:FF will cause an error). Check to ensure a cable fault does not exist and that you are using the correct frame type. (Check with your Network Administrator to determine the frame type(s) supported by the target NetWare server.) Edit the NET.CFG file to change the frame type used by the adapter if needed.

IBM OS/2 NETWORKS - OS/2 CLIENT, PEER-PEER, and LAN SERVER

The following procedure assumes either OS/2 LAN Server, OS/2 Warp, or Warp Connect have been installed on the system. If not, do so now. Also it is assumed that you have installed LAPS (IBM's LAN Adapter and Protocol Support program) or MPTS (OS/2 Warp).

1) Install the adapter and reboot OS/2.
2) Select the LAPS or MPTS program icon from the OS/2 desktop. If you cannot find the icon, you can start the program from an OS/2 command prompt as \IBMCOM\LAPS.EXE or \IBMCOM\MPTS.EXE.
3) Select "Install" from the LAPS or MPTS window. Enter a User ID and Password if prompted.
4) Insert the CS8900 Setup and Device Driver Software diskette in drive A: and enter the path \OS2. Select "OK".

5) When the dialog appears stating the CS8900 ISA Ethernet Adapter driver has been installed, select "OK".
6) Select "Configure" in the next window. Make sure the "LAN adapter and protocols" button is selected. Click on "Configure".
7) The "LAPS CONFIGURATION" panel appears next (for both LAPS and MPTS installations). Select the "Crystal LAN(tm) CS8900 Ethernet Adapter" and click on "Add".
8) In the "Protocols" list box, select the protocols you need for your network and click on "Add" after each one you select. (Usually you will select "NetBIOS" for OS/2 networks and "IEEE 802.2" for NetWare networks.)
9) Click on "OK" and then "Close" in the LAPS Configuration panel when you have finished configuring your adapter.
10) Exit the LAPS or MPTS program. Select "OK" for update windows for the CONFIG.SYS, STARTUP.CMD, and PROTOCOL.INI files.
11) Shut down and restart OS/2 for all changes to take effect.

IBM OS/2 NETWORKS - D0S CLIENTS FOR LAN SERVER NETWORKS

The NDIS 2.0.1 DOS driver (ENDS2ISA.DOS) is required to run a DOS workstation in an IBM LAN Server environment. IBM LAN Support Program (LSP) version 1.33 or higher is also required.

1) Start the LSP installation program by inserting the LSP installation diskette in the A: drive. Type DXMAID and press <Enter>.
2) Follow the instructions displayed by the DXMAID installation program. Respond to questions concerning your particular setup as appropriate.
3) When prompted, insert the "CS8900 Setup and Device Driver Software" diskette in drive A:, enter the search path as _A:\DOS_ and press <Enter>. You can press <F1> if you need additional help on any DXMAID installation dialog.
4) From the "Primary Adapter and Alternate Adapter" dialog, verify the Crystal LAN(tm) CS8900 Ethernet Adapter driver is listed as the "Adapter Driver".
5) Verify the list of "Protocol Drivers" to ensure the appropriate protocols are supported for your network environment. All protocol drivers listed will be installed. If you want to change the Protocol Drivers list, select a protocol driver in the list and press <F6> to display the list of options.
6) Press <F4> to copy the NDIS DOS driver and protocol driver(s) to the appropriate directory. The installation program will also make the necessary modifications to your AUTOEXEC.BAT, CONFIG.SYS, and PROTOCOL.INI files.
7) After installation is complete, restart the computer to load the NDIS 2.0.1 driver (ENDS2ISA.DOS) and LSP protocol drivers.

PACKET DRIVER

The packet driver provides an interface between the CS8900 ISA Ethernet Adapters and a TCP/IP protocol stack (or packet driver utility) written in accordance with the PC/TCP Version 1.09 Packet Driver Specification. It is used in a DOS or MS Windows 3.1X environment.

The "CS8900 Setup and Device Driver Software" diskette contains the following files located in the \PCKTDRVR directory:

EPKTISA.COM	Packet driver for DOS workstations
SOURCE.ZIP	Source files for packet driver

INSTALLATION

1) Install the adapter and boot DOS. DOS 3.3 or greater is required. If you are running Windows, version 3.1 or greater is required. The packet driver must be loaded before starting Windows.
2) Copy the packet driver (EPKTISA.COM) to the target directory on your hard drive or boot floppy.
3) Change directories to the target directory and load the packet driver. The syntax of the packet driver load command is:

    epktisa [options] 0xINT [OxIO_ADDR] [0xIRQ] [E_ADDR]

    INT is the packet software interrupt number (in hexadecimal) and is the only required parameter. (The most frequently used packet software interrupt number is 0x60.) The other parameters are optional and will be taken from the adapter's EEPROM by default. See the table below for an explanation of all available options and parameters.
4) Install and/or load the TCP/IP protocol or packet driver utilities you want to use. Be sure to use the same packet software interrupt number (OxINT) that you used when you loaded the packet driver.

    (TCP/IP protocols and packet driver utilities must be obtained from third party sources -- they are not provided on the "CS8900 Setup and Device Driver Software" diskette).

PACKET DRIVER PARAMETERS

INT	Packet software interrupt number (in hex). Prefix the INT number by "Ox".
IO_ADDR	I/O base address of the adapter (in hex). Prefix the IO_ADDR number by "Ox".
IRQ	Hardware IRQ used by the adapter (in hex). Prefix the IRQ number by "Ox".
E_ADDR	12-digit hexadecimal locally administered address in canonical format. Do not use the "0x" prefix. Example: 020011223344

OPTIONS:

-i	Force driver to report itself as IEEE 802.3 instead of Ethernet II
-d	Delayed initialization. Used for diskless booting
-n	NetWare conversion. Converts 802.3 packets into 8137 packets
-w	Windows hack, obsoleted by winpkt
-p	Promiscuous mode disable
-u	Uninstall
-s	Scan I/O space for adapter even if a plug and play card found

EXAMPLES

1. To load the driver using a software interrupt number of 96 (60 hex), an I/O base address of 300 (hex), an IRQ of 10, a locally administered address of 060011223344, and disable promiscuous mode, you would type

    epktisa -p 0x60 0x300 0xB 060011223344

2. To unload the driver, type

    epktisa -u

3. Typing epktisa without any arguments (including the packet software interrupt number) will cause a usage message listing all options to be displayed.

SCO UNIX DRIVER INFORMATION

A CS8900 ISA Ethernet driver is available for SCO Unix 3.2 version 4.X. It is not included on the CS8900 Setup and Device Driver Software diskette. It is available on a separate diskette, or, it may be downloaded from Crystal's BBS free of charge. See the sections on Crystal's BBS service and technical support for more information on how to contact Crystal Semiconductor to obtain the SCO Unix CS8900 ISA Ethernet devicedriver.

LINUX DRIVER INFORMATION

A CS8900 ISA Ethernet driver is available for the Linux operating system. It is not included on the "CS8900 Setup and Device Driver Software" diskette. However, source code for the driver may be downloaded from Crystal's BBS free of charge. The source code may then be compiled into your Linux kernel or compiled into a dynamically loadable module suited for version of the Linux kernel you are using. See the sections on Crystal's BBS service and technical support for more information on how to contact Crystal Semiconductor to obtain the source code for the CS8900 ISA Ethernet device driver for Linux.

DIAGNOSTICS OVERVIEW

Once the adapter has been installed and configured, the diagnostic option of the CS8900 Setup Utility can be used to test the functionality of the adapter and its network connection. Use the diagnostic's Self Test option to test the functionality of the adapter with the hardware configuration you have assigned. You can use the diagnostic's Network Test to test the ability of the adapter to communicate across the Ethernet with another PC equipped with a CS8900 adapter card (it must also be running the CS8900 Setup Utility).

NOTE: The Setup Utility's diagnostics are designed to run in a DOS-only operating system environment. DO NOT run the diagnostics from a DOS or command prompt session under Windows 95, Windows NT, OS/2, or other operating system.

To run the diagnostics tests on the CS8900 adapter:

1) Boot the PC. If the PC is already running and network device drivers are loaded, restart the PC without loading the network device drivers.
2) From the CS8900 Setup and Device Driver Software diskette, run the CS8900 Setup Utility.
3) The adapter's current configuration is displayed. Hit the ENTER key to get to the main menu.
4) Select Diagnostics (ALT-G) from the main menu.

   - Select Self-Test to test the adapter's basic functionality.

   - Select Network Test to test the network connection and cabling.

DIAGNOSTIC SELF-TEST

The diagnostic Self-Test checks the adapter's basic functionality, as well as its ability to communicate across the ISA bus, based on the system resources assigned during hardware configuration. The following tests are performed:

- I/O Register Read/Write Test
  The IO Register Read/Write test ensures that the CS8900 can be accessed in I/O mode and that the I/O base address is correct.

- Shared Memory Test
  The Shared Memory test ensures the CS8900 can be accessed in memory mode and that the range of memory addresses assigned does not conflict with other devices in the system.

- Interrupt Test
  The Interrupt test ensures there are no conflicts with the assigned IRQ signal.

- EEPROM Test
  The EEPROM test ensures the EEPROM can be read.

- Chip RAM Test
  The Chip RAM test ensures the 4K of memory internal to the CS8900 is working properly.

- Internal Loop-back Test
  The Internal Loop Back test ensures the adapter's transmitter and receiver are operating properly. If this test fails, make sure the adapter's cable is connected to the network (check for Link LED activity for example).

- Boot PROM Test
  The Boot PROM test ensures the Boot PROM is present, and can be read. Failure indicates the Boot PROM was not successfully read due to a hardware problem or due to a conflicts on the Boot PROM address assignment. (Test only applies if the adapter is configured to use the Boot PROM option.)

Failure of a test item indicates a possible system resource conflict with another device on the ISA bus. In this case, you should use the _Manual Setup_ option to reconfigure the adapter by selecting a different value for the system resource that failed. (See the section _Resolving I/O Conflicts_.)

DIAGNOSTIC NETWORK TEST

The diagnostic Network Test verifies a working network connection by transferring data between two CS8900 adapters installed in different PCs on the same network. (Note: the diagnostic network test should not be run between two nodes across a router.)

This test requires that each of the two PCs have a CS8900-based adapter installed and have the CS8900 Setup Utility running. The first PC is configured as a "Responder" and the other PC is configured as an "Initiator". Once the Initiator is started, it sends data frames to the Responder

which returns the frames to the Initiator.

The total number of frames received and transmitted are displayed on the Initiator's display, along with a count of the number of frames received and transmitted OK or in error. The test can be terminated anytime by the user at either PC.

To setup the diagnostic Network Test:

1) Select a PC with a CS8900-based adapter and a known working network connection to act as the Responder. Run the CS8900 Setup Utility and from the main menu, select

    Diagnostics
    -> Network Test
    -> Responder

    Hit ENTER to start the Responder.
2) Return to the PC with the CS8900-based adapter you want to test and start the CS8900 Setup Utility.
3) From the main menu, select

    Diagnostics
    -> Network Test
    -> Initiator

    Hit ENTER to start the test.

    You may stop the test on the Initiator at any time while allowing the Responder to continue running. In this manner, you can move to additional PCs and test them by starting the Initiator on another PC without having to stop/start the Responder.

DRIVER SIGN-ON MESSAGES

The sign-on messages reported by the driver and protocol support files when loaded can be helpful in diagnosing problems. If possible, load the driver and support files manually, one at a time, noting the messages displayed as they load. (If the files are loaded automatically from a batch or configuration file, they may scroll by too fast to read.)

RESOLVING I/O-CONFLICTS

An I/O-conflict occurs when two or more adapters use the same ISA resource (I/O address, memory address, or IRQ). You can usually detect an I/O conflict in one of four ways after installing and or configuring the CS8900-based adapter:

1) The system does not boot properly (or at all).
2) The driver cannot communicate with the adapter, reporting an "Adapter not found" error message.
3) You cannot connect to the network or the driver will not load.
4) If you have configured the adapter to run in memory mode but the driver reports it is using I/O- mode when loading, this is an indication of a memory address conflict.

Another common source of install problems is conflicts between EMM386 and the RAM and ROM areas assigned to the adapter. Please ensure that you exclude the area (RAM and ROM) used by the adapter from use by EMM386.

Be sure, not to use other I/O addresses than 300h for the crystal controller. If an I/O-conflict

occurs, run the CS8900 Setup Utility and perform a diagnostic self-test. Normally, the ISA resource in conflict will fail the self-test.

Technical Support

For technical support please contact **JUMP*tec*®**.
Technical help, troubleshooting and driver support is provided through **JUMP*tec*®**.
You may also contact Crystal's Technical Application Support.

Crystal's CS8900 Technical Application Support can be reached at:

Telephone: (800) 888-5016 (from inside U.S. and Canada)
(512) 442-7555 (from outside the U.S. and Canada)
Fax: (512) 912-3871
Email: ethernet@crystal.cirrus.com

BEFORE CONTACTING TECHNICAL SUPPORT

Before contacting **JUMP*tec*®** or Crystal for technical support, be prepared to provide as much of the following information as possible.

1) Adapter type
2) Adapter configuration
3) - I/O Base, Memory Base, I/O or memory mode enabled, IRQ, and DMA channel
   - Configured for media auto-detect or specific media type (which type).
   (Record this information from the driver's sign-on message if possible.)
4) Computer System's Configuration
   - BIOS (make and version)
   - System make and model
   - CPU (type and speed)
   - System RAM
5) Software
   - CS8900 driver and version
   - Your network operating system and version
   - Your system's OS make/version (MS-DOS, Novell's DOS, Win95, WFWG, etc.)
   - Version of all protocol support files
   - Frame types supported by you server
6) Contents of your configuration files

   - CONFIG.SYS
   - AUTOEXEC.BAT file
   - PROTOCOL.INI file
   - NET.CFG FILE
   - WINDOW'S SYSTEM.INI (if using Windows client)
   - AUTOEXEC.NCF file
7) Any Error Message displayed.

CRYSTAL'S BBS SERVICE

You can obtain the latest CS89XX drivers and support software from Crystal's BBS. Access to the BBS is available 24 hours a day, seven days a week. Baud rates from 300K to 14.4K are supported as well as
most common file transfer protocols.

To access the BBS, set your terminal software to use 8 data bits, 1 stop bit, and no parity. Dial

(512) 441-3265 and press <ENTER> after connection is made. Login using your account name and password. (If you do not have an account, you may login as "GUEST". No password is required for the Guest account.)

From the main system menu, select the "Enter Public File Area" menuoption. From the Public File Area menu, select the "LAN (Local Area Network)" file area. A list of the latest drivers and support utilities available for the CS89XX ISA Ethernet adapter will be presented along with the option to download the file(s).

Setup Utility

Installation procedure

- Place the DOS setup and installation utility into drive A: (or B:)
- From a DOS prompt type: A:\SETUP (or B:\SETUP).
- The current configuration of the adapter will be displayed. Click on OK or press the Enter key to proceed.
- Use the adapter/auto configuration screen to accept, as a group, all of the recommended configuration settings. If any of these setting as not appropriate, then go to the next step.
- Use the adapter/manual configuration options to manually override any of the recommended configurations setting shown by the Auto-configuration screen.
- Use diagnostics/self test to test the functionality of the card.
- Use the diagnostics/network Test screen to test the abiltity of the card to communicate across the Ethernet with another CS8900-based card which is also running the DOS setup and Installation utility.

Adapter / auto configuration screen

This screen shows the current configuration settings for the card. For a brief description of the configuration parameters see the next section.
The user must determine if the displayed settings are appropriate for the system, and whether these settings will cause conflicts with any other components on the PC. If all of these settings are appropriate, then the user selects the ”CONFIG” option which willl save these settings into the EEPROM. The user can then exit the screen. If any of these settings are not appropriate, then the user should exit this screen without selecting CONFIG and then open the manual configuration screen.

Adapter / manual configuration screen

This function allows the user to manually assign system resources and other CS8900 features. The user is required to know what system resources can be used without conflicts to other devices.
The current values for the parameters appear on the screen the first time this screen is selected. The settings can then be modified.

- I/O-port address describes the base address and range used on the ISA bus to access the CS8900-chip (due to the onboard ISA buffer, no other values than 300h are allowed).
- Interrupt request (IRQ) identifies the interrupt used by the CS8900 to communicate with the system software over the bus.
- Shared memory describes the memory base address used if memory mode is selected. In memory mode, memory reads/writes are being utilized to transfer data between the system and the CS8900. A 4K block of memory needs to be assigned (due to the onboard ISA buffer, no other values than 300h are allowed).

NOTE: If memory mode is selected, then the user must manually exclude use of that block by the system. This is accomplished by editing the CONFIG.SYS file. For example, if the contoller uses memory in the address range D000h to D0FFh, you would exclude this range from Windows by adding the following line to the CONFIG.SYS file:

device=c:\windows\emm386.exe x=d000-d0ff

- Boot PROM describes the memory base address of the boot PROM, if present in setup.

-
- Connector type describes the type of Ethernet media
- OS optimization describes the performance option selected:
    - DOS - maximize ethernet throughput, with no attempt to minimize CPU utilization or number of interrupts.
    - Windows / server - Selects a configuration which minimizes the number of interrupts generated by the CS8900, with no attempt to maximize ethernet throughput.

Diagnostics / Self test screen

This function tests the adapter based on the settings that the user has assigned, either from auto configuration or manual configuration screen. System resources availability can be ckecked by running this test. Adjustment to the setup should be manually made it the diagnostics fail.
Failure upon test items such as I/O, IRQ, DMA and MEM indicate the conflict with other devices on the bus. In this case, the user is prompted to use manual configuration screen to eliminate those conflicts.
The tests are run once when the function is entered. The user can then chose to repeat the test by selecting REPEAT.
The I/O register read/write test insures that the CS8900 can be accessed in I/O mode, and that the I/O base address is correct. If this test fails, the I/O base address should be changed.
The EEPROM test insures that the EEPROM can be read. If the EEPROM can not be read, then the controller should be checked exactly on the system.
The chip RAM test insures that the 4K byte memory internal to the CS8900 is working properly. If both this test, and the shared memory test fail, then the memory base address should be modified and this test run again. If this test fails but the shared memory test passes, then the board must be repaired or replaced.
The shared memory test insures the memory base address doesn´t conflict with other memory assignments in the system. If this test fails, the memory base address must be changed.
The internal loop back test insures that the controller is operating properly. If this test fails, make sure the PC is properly attached to the network (check for LED activity for example). If network attachment is confirmed, the card must be repaired or replaced.
The Interrupt test insures that there are no conflicts on the IRQ assignment. If this test fails the IRQ assignment must be changed.
The DMA channel test insures that there are no conflicts on the DMA assignment. If this test fails the DMA assignment must be changed.
The boot PROM test insures that the Boot PROM is present, and can be read. If this test fails, the boot PROM was not successfully read due to a hardware problem, or due to a conflict on the boot PROM base address assignment.

Diagnostics/Network Test Screen

This function lets the user further verify the network connection by transferring data between two PC´s. This test requires that each of two stations have a CS8900 controller installed and have diagnostics/network Test program running. The user first sets one station to run responder, and then sets the orther station to run initiator.
The responder stays in a loop to wait for a frame to arrive, and then sends back the same frame if the frame was received OK. The initiator also stay in a loop that keeps feeding frames to the network and at the same time receiving frames back from the responder. The total number of frames received and transmitted are displayed on the screen, along with a count of the number received/transmitted OK and the number received/transmitted in error. The test can be terminated anytime by the user at either side.

Specifications

Mechanical Specifications

PISA Bus connector:	Edge Card Connector, EISA standard, AMP 650226-1
Dimensions:	length * width 176 * 125 mm (6,9" x 4,9")
Height:	ca. 36 mm (depending on processor heatsink)

Electrical Specifications

Supply voltage:	5V DC +/- 5%
Supply voltage ripple:	100 mV peak to peak 0 - 20 MHz
Supply current (maximal): (Σ max. current all Parts)	2,8 A + current DRAM + current Prozessor

Prozessor maximal current (intel-data-sheet):	Pentium® 133 MHz	2,5 A
	Pentium® 166 MHz	3,1 A
	Pentium® Processor with MMX™ 166 MHz	3,2 A
	Pentium® Processor with MMX™ 200 MHz	3,9 A
DRAM maximal current (MICRON data sheet):	4 Meg x 32	0,80 A
	4 Meg x 32	0,82 A

Supply current (typical, DOS-Prompt):

with 16 MB DRAM + Pentium® 133 MHz	4,20 A
with 16 MB DRAM + Pentium® 166 MHz	4,50 A
with 16 MB DRAM + Pentium® Processor with MMX™ 166 MHz	4,00 A
with 16 MB DRAM + Pentium® Processor with MMX™ 200 MHz	4,35 A

Environmental Specifications

Temperature:	operating 0 to +60 C ((*)with appropriate airflow)) non operating: -10 to +85 °C
Humidity:	operating: 10% to 90% (non-condensing) non operating: 5% to 95% (non-condensing)

(*) The maximum operating temperature is the maximum measurable temperature on any spot on the modules´s surface. It is the user´s responsibility to maintain this temperature within the above specification.

PISA-Bus Specification

Specification ISA Bus (top layer, upper row, right part)

Pin	Signal Name	Function	CPU Modul					I/O Modules				
			Typ	Pullup	Iol	Ioh	C	Typ	Pullup	Iol	Ioh	C
A1	/IOCHCK	I/O Channel Check	I	1K				OC		12mA		120pF
A2	SD7	Data Bit 7	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A3	SD6	Data Bit 6	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A4	SD5	Data Bit 5	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A5	SD4	Data Bit 4	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A6	SD3	Data Bit 3	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A7	SD2	Data Bit 2	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A8	SD1	Data Bit 4	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A9	SD0	Data Bit 3	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
A10	IOCHRDY	I/O Channel Ready	I	1K				OC		12mA		120pF
A11	AEN	Address Enable	O		12mA	6mA	120pF	I				
A12	SA19	Address Bit 19	O		12mA	6mA	120pF	I				
A13	SA18	Address Bit 18	O		12mA	6mA	120pF	I				
A14	SA17	Address Bit 17	O		12mA	6mA	120pF	I				
A15	SA16	Address Bit 16	O		12mA	6mA	120pF	I				
A16	SA15	Address Bit 15	O		12mA	6mA	120pF	I				
A17	SA14	Address Bit 14	O		12mA	6mA	120pF	I				
A18	SA13	Address Bit 13	O		12mA	6mA	120pF	I				
A19	SA12	Address Bit 12	O		12mA	6mA	120pF	I				
A20	SA11	Address Bit 11	O		12mA	6mA	120pF	I				
A21	SA10	Address Bit 10	O		12mA	6mA	120pF	I				
A22	SA9	Address Bit 9	O		12mA	6mA	120pF	I				
A23	SA8	Address Bit 8	O		12mA	6mA	120pF	I				
A24	SA7	Address Bit 7	O		12mA	6mA	120pF	I				
A25	SA6	Address Bit 6	O		12mA	6mA	120pF	I				
A26	SA5	Address Bit 5	O		12mA	6mA	120pF	I				
A27	SA4	Address Bit 4	O		12mA	6mA	120pF	I				
A28	SA3	Address Bit 8	O		12mA	6mA	120pF	I				
A29	SA2	Address Bit 7	O		12mA	6mA	120pF	I				
A30	SA1	Address Bit 6	O		12mA	6mA	120pF	I				
A31	SA0	Address Bit 5	O		12mA	6mA	120pF	I				

I = Input O = output I/O = Bidirectional signal OC = Open Collector output

Note: bus buffer drivers have 48mA driver capacity!

Specification ISA Bus (bottom layer, upper row, right part)

Pin	Signal Name	Function		CPU Modul						I/O Modules				
				Typ	Pullup	Iol	Ioh	C		Typ	Pullup	Iol	Ioh	C
B1	GND	Ground												
B2	RESETDRV	Reset System Signal		O		12mA	6mA	120pF		I				
B3	+5V	+5V												
B4	IRQ9	Interrupt Request 9		I	10K					O		4mA	1mA	50pF
B5	-5V	-5V (to X1 pin 5)												
B6	DRQ2	DMA Request 2		I	10K					O		12mA	6mA	120pF
B7	-12V	-12V (to X1 pin 6)												
B8	/0WS	Zero Wait State		I	1K					OC		12mA		120pF
B9	+12V	+12V (to X1 pin 4)												
B10	GND	Ground												
B11	/SMEMW	Mem. Write (1MB)		O	10K	12mA	6mA	120pF		I				
B12	/SMEMR	Mem. Read (1MB)		O	10K	12mA	6mA	120pF		I				
B13	/IOW	I/O Write		O	10K	12mA	6mA	120pF		I				
B14	/IOR	I/O Read		O	10K	12mA	6mA	120pF		I				
B15	/DACK3	DMA Acknowledge 3		O		4mA	1mA	50pF		I	10K			
B16	DRQ3	DMA Request 3		I	10K					O		12mA	6mA	120pF
B17	/DACK1	DMA Acknowledge 1		O		4mA	1mA	50pF		I	10K			
B18	DRQ1	DMA Request 1		I	10K					O		12mA	6mA	120pF
B19	/REFRESH	Memory Refresh		O	1K	12mA	6mA	120pF		I				
B20	SYSCLK	8 MHz		O		12mA	6mA	120pF		I				
B21	IRQ7	Interrupt Request 7		I	10K					O		4mA	1mA	50pF
B22	IRQ6	Interrupt Request 6		I	10K					O		4mA	1mA	50pF
B23	IRQ5	Interrupt Request 5		I	10K					O		4mA	1mA	50pF
B24	IRQ4	Interrupt Request 4		I	10K					O		4mA	1mA	50pF
B25	IRQ3	Interrupt Request 3		I	10K					O		4mA	1mA	50pF
B26	/DACK2	DMA Acknowledge 2		O		4mA	1mA	50pF		I	10K			
B27	TC	DMA Terminal Count		O		4mA	1mA	50pF		I	10K			
B28	BALE	Address Latch Enable		O		12mA	6mA	120pF		I				
B29	+5V	+5V												
B30	OSC	OSC (14.3MHz Clock)		O		12mA	6mA	120pF		I				
B31	GND	Ground												

I = Input O = output I/O = Bidirectional signal OC = Open Collector output

Note: bus buffer drivers have 48mA driver capacity!

Specification ISA Bus (top layer, upper row, left part)

Pin	Signal Name	Function	CPU Modul					I/O Modules				
			Typ	Pullup	Iol	Ioh	C	Typ	Pullup	Iol	Ioh	C
C0		*no Pad*										
C1	/SBHE	Bus High Enable	O		12mA	6mA	120pF	I				
C2	LA23	Latch Address 23	O		12mA	6mA	120pF	I				
C3	LA22	Latch Address 22	O		12mA	6mA	120pF	I				
C4	LA21	Latch Address 21	O		12mA	6mA	120pF	I				
C5	LA20	Latch Address 20	O		12mA	6mA	120pF	I				
C6	LA19	Latch Address 19	O		12mA	6mA	120pF	I				
C7	LA18	Latch Address 18	O		12mA	6mA	120pF	I				
C8	LA17	Latch Address 17	O		12mA	6mA	120pF	I				
C9	/MEMR	Mem.Read High 1M	O	10K	12mA	6mA	120pF	I				
C10	/MEMW	Mem.Write High 1M	O	10K	12mA	6mA	120pF	I				
C11	SD8	Data Bit 8	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C12	SD9	Data Bit 9	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C13	SD10	Data Bit 10	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C14	SD11	Data Bit 11	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C15	SD12	Data Bit 12	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C16	SD13	Data Bit 13	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C17	SD14	Data Bit 14	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF
C18	SD15	Data Bit 15	I/O	10K	12mA	6mA	120pF	I/O		12mA	6mA	120pF

I = Input O = output I/O = Bidirectional signal OC = Open Collector output

Specification ISA Bus (bottom layer, upper row, left part)

Pin	Signal Name	Function	CPU Modul					I/O Modules				
			Typ	Pullup	Iol	Ioh	C	Typ	Pullup	Iol	Ioh	C
D0		*no Pad*										
D1	/MEMCS16	16 Bit Mem.access	I	1K				OC		12mA		120pF
D2	/IOCS16	16 Bit I/O access	I	1K				OC		12mA		120pF
D3	IRQ10	Interrupt Request 10	I	10K				O		4mA	1mA	50pF
D4	IRQ11	Interrupt Request 11	I	10K				O		4mA	1mA	50pF
D5	IRQ12	Interrupt Request 12	I	10K				O		4mA	1mA	50pF
D6	IRQ15	Interrupt Request 13	I	10K				O		4mA	1mA	50pF
D7	IRQ14	Interrupt Request 14	I	10K				O		4mA	1mA	50pF
D8	/DACK0	DMAAcknowledge 0	O		4mA	1mA	50pF	I	10K			
D9	DRQ0	DMA Request 0	I	10K				O		12mA	6mA	120pF
D10	/DACK5	DMAAcknowledge 5	O		4mA	1mA	50pF	I	10K			
D11	DRQ5	DMA Request 5	I	10K				O		12mA	6mA	120pF
D12	/DACK6	DMAAcknowledge 6	O		4mA	1mA	50pF	I	10K			
D13	DRQ6	DMA Request 6	I	10K				O		12mA	6mA	120pF
D14	/DACK7	DMAAcknowledge 7	O		4mA	1mA	50pF	I	10K			
D15	DRQ7	DMA Request 7	I	10K				O		12mA	6mA	120pF
D16	+5V	+5V										
D17	/MASTER	Bus Master Assert	I	1K				OC		12mA		120pF
D18	GND	Ground										

I = Input O = output I/O = Bidirectional signal OC = Open Collector output

Note: bus buffer drivers have 48mA driver capacity!

Specification PCI Bus

For pinout and technical data please refer to the current PISA bus specification.

Signal Description

General

This Chapter includes a detailed description of each signal of the ***littleMONSTER***. Following table gives an overview of any signals including the peripheral interfaces.

Pull Up resistors at the various connectors

Pin	PC/104 (A)	PullUp-Res.	PC/104 (B)	PullUp-Res.	PC/104 (C)	PullUp-Res.	PC104 (D)	PullUp-Res.	Key	PullUp-Res.
0					GND	N/A	GND	N/A		
1	/IOCHCK	1k	GND	N/A	/SBHE	N/A	/MEMCS16	300	SPKR	N/A
2	SD7	4k7	RESETDRV	N/A	LA23	N/A	/IOCS16	300	GND	N/A
3	SD6	4k7	VCC	N/A	LA22	N/A	IRQ10	4k7	PowerGood	10k
4	SD5	4k7	IRQ9	4k7	LA21	N/A	IRQ11	4k7	KLOCK	10k
5	SD4	4k7	-5V	N/A	LA20	N/A	IRQ12	4k7	KDATA	1k
6	SD3	4k7	DRQ2	N/A	LA19	N/A	IRQ15	4k7	KCLK	1k
7	SD2	4k7	-12V	N/A	LA18	N/A	IRQ14	4k7	GND	N/A
8	SD1	4k7	/0WS	300	LA17	N/A	/DACK0	N/A	Vcc	N/A
9	SD0	4k7	+12V	N/A	/MEMR	1k	DRQ0	N/A	VBAT	N/A
10	IOCHRDY	1k	GND	N/A	/MEMW	1k	/DACK5	N/A	PowerGood	10k
11	AEN	N/A	/SMEMW	1k	SD8	4k7	DRQ5	N/A		
12	SA19	N/A	/SMEMR	1k	SD9	4k7	/DACK6	N/A		
13	SA18	N/A	/IOW	300	SD10	4k7	DRQ6	N/A		
14	SA17	N/A	/IOR	300	SD11	4k7	/DACK7	N/A		
15	SA16	N/A	/DACK3	N/A	SD12	4k7	DRQ7	N/A		
16	SA15	N/A	DRQ3	N/A	SD13	4k7	VCC	N/A		
17	SA14	N/A	/DACK1	N/A	SD14	4k7	/MASTER	300		
18	SA13	N/A	DRQ1	N/A	SD15	4k7	GND	N/A		
19	SA12	N/A	/REFRESH	300	GND	N/A	GND	N/A		
20	SA11	N/A	SYSCLK	N/A						
21	SA10	N/A	IRQ7	4k7						
22	SA9	N/A	IRQ6	4k7						
23	SA8	N/A	IRQ5	4k7						
24	SA7	N/A	IRQ4	4k7						
25	SA6	N/A	IRQ3	4k7						
26	SA5	N/A	/DACK2	N/A						
27	SA4	N/A	T/C	N/A						
28	SA3	N/A	BALE	N/A						
29	SA2	N/A	VCC	N/A						
30	SA1	N/A	OSC	N/A						
31	SA0	N/A	GND	N/A						
32	GND	N/A	GND	N/A						

Peripheral Interface

Keyboard (X15)

Pin	Signal name	Function
1	KBDAT	Keyboard data
2	NC	
3	GND	Ground
4	+5V	+5V
5	KBCLK	Keyboard clock
5	NC	

KBDAT (Keyboard DATA)
bidirectional I/O pin on CPU modules
Keyboard data signal.

KBCLK (Keyboard Clock)
bidirectional I/O pin on CPU modules
Keyboard clock signal.

PS/2 Mouse (X6)

Pin	Signal name	Function
1	MSDAT	Mouse data
2	NC	
3	GND	Ground
4	+5V	+5V
5	MSCLK	Mouse clock
5	NC	

MSDAT (Mouse DATA)
bidirectional I/O pin on CPU modules
Mouse data signal.

MSCLK (Mouse Clock)
bidirectional I/O pin on CPU modules
Mouse clock signal.

Serial Port COM A, B, C, D (X34, X35, X37, X38)

Pin	Signalname	Function	In / Out	DSUB-25	DSUB-9
1	DCD	Data Carrier Detect	In	8	1
2	DSR	Data Set Ready	In	6	6
3	RxD	Receive Data	In	3	2
4	RTS	Request to send	Out	4	7

5	TxD	Transmit Data	Out	2	3
6	CTS	Clear to Send	In	5	8
7	DTR	Data Terminal Ready	Out	20	4
8	RI	Ring Indicator	In	22	9
9	GND	Signal Ground	--	7	5
10	+5V	+5V	--	--	--

Parallel Port LPT 1 (X1)

Pin	Signalname	Function	In / Out	DSUB-25
1	/Strobe		out	1
3	Data 0		I/O	2
5	Data 1		I/O	3
7	Data 2		I/O	4
9	Data 3		I/O	5
11	Data 4		I/O	6
13	Data 5		I/O	7
15	Data 6		I/O	8
17	Data 7		I/O	9
19	/ACK		in	10
21	BUSY		in	11
23	PAPER out		in	12
25	SEL out		in	13
2	/AUTOFD		out	14
4	/ERROR		in	15
6	/INIT		out	16
8	SEL in		out	17
26	Vcc	+ 5 V	--	NC
10,12	GND	Signal Ground	--	18 - 25
14,16	GND	Signal Ground	--	18 - 25
18,20	GND	Signal Ground	--	18 - 25
22,24	GND	Signal Ground	--	18 - 25

Floppy Connector (X5)

Pin	Name	Description
2	/REDWC	Density Select
4	n/c	Reserved
6	n/c	Reserved
8	/INDEX	Index
10	/MOTEA	Motor Enable A
12	/DRVSB	Drive Sel B
14	/DRVSA	Drive Sel A
16	/MOTEB	Motor Enable B
18	/DIR	Direction
20	/STEP	Step
22	/WDATE	Write Data
24	/WGATE	Floppy Write Enable
26	/TRK00	Track 0
28	/WPT	Write Protect
30	/RDATA	Read Data
32	/SIDE1	Head Select
34	/DSKCHG	Disk Change

Note: All odd pins are GND, Ground.

IDE Connector for 2,5 " Hard Disk (X12)

Pin	Signals	Pin	Signals
1	/RESET	2	GND
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	GND	20	Key
21	Reserved	22	GND
23	/IOW	24	GND
25	/IOR	26	GND
27	IOCHRDY	28	Reserved
29	Reserved	30	GND
31	IRQ	32	/IO16
33	ADDR1	34	/PDIAG
35	ADDR 0	36	ADDR2
37	/CS0	38	/CS1
39	/Active	40	GND
41	+5V (Logic)	42	+5V (Motor)
43	GND	44	Reserved

IDE Connector for 3,5 " Hard Disk (X8)

Pin	Signals	Pin	Signals
1	/RESET	2	GND
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	GND	20	Key
21	Reserved	22	GND
23	/IOW	24	GND
25	/IOR	26	GND
27	IOCHRDY	28	Reserved
29	Reserved	30	GND
31	IRQ	32	/IO16
33	ADDR1	34	/PDIAG
35	ADDR 0	36	ADDR2
37	/CS0	38	/CS1
39	/Active	40	GND

Ethernet Connector (X22)

Pin	Signalname	Function	In/Out
1	TXD+	10BASE-T Transmit	differential Output
2	TXD-	10BASE-T Transmit	differential Output
3	RXD+	10BASE-T Receive	differential Input
4	NC	unused Pin	
5	NC	unused Pin	
6	RXD-	10BASE-T Receive	differential Input
7	NC	unused Pin	
8	NC	unused Pin	

TXD+, TXD-

Differential output pair drives 10 Mb/s Manchester encoded data to the 10BASE-T transmit lines.

RXD+, RXD-

Differential input pair receives 10 Mb/s Manchester encoded data from the 10BASE-T receive lines.

Feature Connector JUMPtec (X16)

Pin	Signals	Pin	Signals
1	ETHERCLR	2	RTCCLR

3	GND	4	GND
5	BF0	6	BF1
7	CPUVCC	8	CPUVCC
9	GND	10	BF2
11	NC	12	CPUVCC
13	GND	14	DISVGA#
15	LKLED	16	VCC
17	LNLED	18	VCC
19	I2DAT	20	ISPDEV0
21	I2CLK	22	NC
23	NC	24	ROMCS#
25	GND	26	TRISBIOS

ETHERCLR
Connect with Ground for default Setting Ethernet on POR.

RTCCLR
Connect with Ground for reset CMOS-RAM.

DISVGA#
Connect with Ground for disable onboard-VGA.

LKLED, LNLED
Connect with Cathode of Ethernet-LED.

I2CLK, I2DAT
Onboard I2C-Bus: only for JIDA-functions. Please refer page 11 for further information.

ROMCS#, TRIBIOS
Only for internal use by JUMPtec.

BF0, BF1, BF2
Set multiplier for external/internal CPU-Clock.

X16

J1 J2

J3 J4

Pentium Core Frequency	J1	J2	J3	J4
100 MHz	On	Off	On	Off
133 MHz	Off	On	On	Off
166 MHz	Off	On	Off	On
200 MHz	On	Off	Off	On

ISA Bus signals

Address / Data Signal Group

SD<0..15> (System Data Bus)

bidirectional I/O pins

These signals provide data bus bits 0 to 15 for the peripheral devices. All 8-bit devices use SD0 <0..7> for data transfers. The 16-bit devices will use SD<0..15>. To support 8-bit devices, the data on SD<8..15> will be gated to SD<0..7> during 8-bit transfers to these devices. 16-bit CPU cycles will be converted to two 8-bit cycles for 8-bit peripheral automatically.

SA<19..0> (System Address)

output from CPU modules
input to all other modules
Address bits 0 through 15 are used to address I/O devices and address bits 0 through 19 are used to address memory within the system. These 20 address lines, in addition to LA<17..23> allow access of up to 16MB of memory. SA<0..19> are gated on the PC/104-bus when BALE is high and latched on falling edge of BALE.

LA<17..23> (Latchable Address Bus)

output on CPU modules
input on any other module
These signals (unlatched) are used to address memory up to 16 MB.

/SBHE (System Bus High Enable)

output on CPU modules
input on all other module
Bus High Enable indicates a transfer of data on the upper byte of the data bus (SD<8..15>). 16 bit I/O devices use SBHE to condition data bus buffers tied to SD<8..15>.

BALE (Bus Address Latch Enable)

output from CPU modules
input on any other module
Bale is an active high pulse which is generated at the beginning of any bus cycle initiated by a CPU modul. It indicates when the SA<0..19>, LA<17..23>, AEN, and /SBHE signals are valid.

AEN (Address ENable)

output from CPU modules
input on any other module
AEN is an active high output that indicates a DMA transfer cycle, only resources with a active /DACK signal should respond to the command lines when AEN is high.

Control Signal Group

/MEMR (MEMory Read)

output from CPU modules
input on any other module
/MEMR instructs memory devices to drive data onto the data bus. /MEMR is active on all memory read cycles.

/SMEMR (System MEMory Read)

output from CPU modules
input on any other module
/SMEMR instructs memory devices to drive data onto the data bus. /SMEMR is active on memory read cycles to addresses below 1MB.

/MEMW (MEMory Write)

output from CPU modules
input on any other module
/MEMW instructs memory devices to store the data present on the data bus. /MEMW is active on all memory write cycles.

/SMEMW (System MEMory Write)

output from CPU modules
input on any other module
/SMEMW instructs memory devices to store the data present on the data bus. /SMEMW is active on all memory write cycles to address below 1MB.

/IOR (I/O Read)

output from CPU modules
input on any other module
I/O read instructs an I/O device to drive its data onto the data bus. It may be driven by the CPU or DMA controller. /IOR is inactive (high) during refresh cycles.

/IOW (I/O Write)

output from CPU modules
input on any other module
I/O write instructs an I/O device to store the data present on the data bus. It may be driven by the CPU or DMA controller. /IOW is inactive (high) during refresh cycles.

/IOCHCK (I/O CHannel CheckK)

input to CPU modules
open collector output on any other module
/IOCHCK is an active low input signal which indicates that an error has taken place on the modul bus. If I/O checking is enabled on the CPU modul, an /IOCHCK assertion by a peripheral device generates an NMI to the processor.

IOCHRDY (I/O CHannel ReaDY)

input to CPU modules
open collector output on any other module
The I/O channel ready is pulled low in order to extend the read or write cycles of any bus access when required. The cycle can be initiated by the CPU, DMA controllers or refresh

controller. The default number of wait states for cycles initiated by the CPU are 4 wait states for 8 bit peripherals and 1 wait state for 16 bit peripherals. One wait state is inserted as a default for all DMA cycles. Any peripheral that cannot present read data or stobe in write data in this amount of time use IOCHRDY to extend these cycles.
This signal should not be held low for more than 2,5 us for normal operation. Any extension to more than 2,5 us does not guarantee proper DRAM memory contents because memory refresh is stopped while IOCHRDY is low.
The IOCRDY signal is monitored on CPU modules, and if low (invalid) for more than 1,5 seconds, the CPU module is resetted and booted like in a power up situation. This gives the user the possibility to use this signal also as an external reset pin.

/MEMCS16 (16 Bit MEMory Chip Select)

input to CPU modules
open collector output on any other module
The /MEMCS16 signal determines when a 16 bit to 8 bit conversion is needed for memory bus cycles. A conversion is done any time the CPU module is requesting a 16 bit memory cycle and the /MEMCS16 line is high. If /MEMCS16 is high, 16 bit CPU cycles are converted into two 8 bit cycles on the bus automatically. If /MEMCS16 is low, an access to peripherals is done 16 bit wide.

/IOCS16 (16 Bit I/O Chip Select)

input to CPU modules
open collector output on any other module
The /IOCS16 signal determines when a 16 bit to 8 bit conversion is needed for I/O bus cycles. A conversion is done any time the CPU module is requesting a 16 bit I/O cycle and the /IOCS16 line is high. If /I/OCS16 is high, 16 bit CPU cycles are converted into two 8 bit cycles on the bus automatically. If /I/OCS16 is low, an access to peripherals is done 16 bit wide.

/REFRESH (Memory REFRESH)

output to CPU modules
input on any other module
/REFRESH is pulled low whenever a refresh cycle is initiated. A refresh cyle is activated every 15,6 us to prevent loss of DRAM data.

/0WS (0 Wait States)

input to CPU modules
output on any other module
The Zero wait state signal tells the CPU to complete the current bus cycle without inserting the default wait staes. By default the CPU inserts 4 wait states for 8 bit transfers and 1 wait state for 16 bit transfers.

Special Function Signal Group

/MASTER (MASTER bus request)

input to CPU modules
open collector output on any other module
This signal is used with a DRQ line to gain control of the system bus. A processor or DMA controller on the I/O channel may issue a DRQ to a DMA channel in cascade mode and receive a /DACK. Upon receiving the /DACK, abus master may pull /MASTER low, which will allow it to control the system address, data and control lines. After /MASTER is low, the bus master must wait one system clock period before driving the address and data lines, and two clock periods before issuing a read or write command. If this signal is held

low for more than 15 us, system memory may be lost because of lack of refresh.

SYSCLK (SYStem CLocK)

output from a CPU modul
input on any other modul
SYSCLK is supplied by the CPU modul and has a nominal frquency of about 8 MHz with 40-60 % duty cycle. Slower and higher frquencies may be supplied by different CPU modules. This signal is supplied at all times except when the CPU module is in sleep mode.

OSC (OSCillator frequency)

output from CPU modules
input to any other module
OSC is supplied by CPU modules. It has a nominal frequency of 14,31818 MHz and a duty cycle of 40-60 %. This signal is supplied at all times except when the CPU module is in sleep mode.

RESETDRV (Bus RESET)

output from CPU modules
input to any other module
This active high output is system reset generated from CPU modules to reset external devices.

DRQ<0..3, 5..7> (DMA ReQuest)

inputs to CPU modules
outputs from any other module
The asynchronous DMA request inputs are used by external devices to indicate when they need service from the CPU modules DAM controllers. DRQ<0..3> are used for transfers between 8 bit I/O adapters and system memory. DRQ<5..7> are used for transfers between 16 bit I/O adapters and system memory. DRQ4 is not available externally. All DRQ pins have pullup-resistors on CPU modules.

/DACK<0..3, 5..7> (DMA ACKnowledge)

outputs from CPU modules
inputs to any other module
DMA acknowledge 0..3 and 5..7 are used to acknowledge DMA requests. They are low active.

T/C (Terminal Count)

output from CPU modules
input to all other modules
The active high output TC indicates that one of the DMA channels has transferred all data.

IRQ<3..7, 9..12, 14,15> (Interrupt ReQuests)

input to CPU modules
output on any other module
These are the asynchronous interrupt request lines. IRQ0, 1, 2, 8 and 13 are not available as external interrupts because they are used internally on CPU modules. All IRQ signals are active high. The interrupt requests are prioritized, with IRQ9 through IRQ12 and IRQ14 through IRQ15 having the highest priority (IRQ9 is the highest) and IRQ3 through IRQ7 having the lowest priority (IRQ7 is the lowest). An interrupt request is generated when an IRQ line is raised from low to high. The line must be held high until the CPU

acknowledges the interrupt request (interrupt service routine).

Data Conversion and Swapping

Data Conversion

16 - bit transfers by the main CPU via the PC/104 - bus are converted into two 8 - bit transfers (low and high Byte) when the control signals MEMCS16* or IOCS16* are not asserted. The higher Byte - Data (SD<15..8>) is directed to SD <7..0> with SA0 =H during write cycles and from SD <7..0> to SD <15..0 > with SA0 =H during read cycles. This operation is transparent to the software .

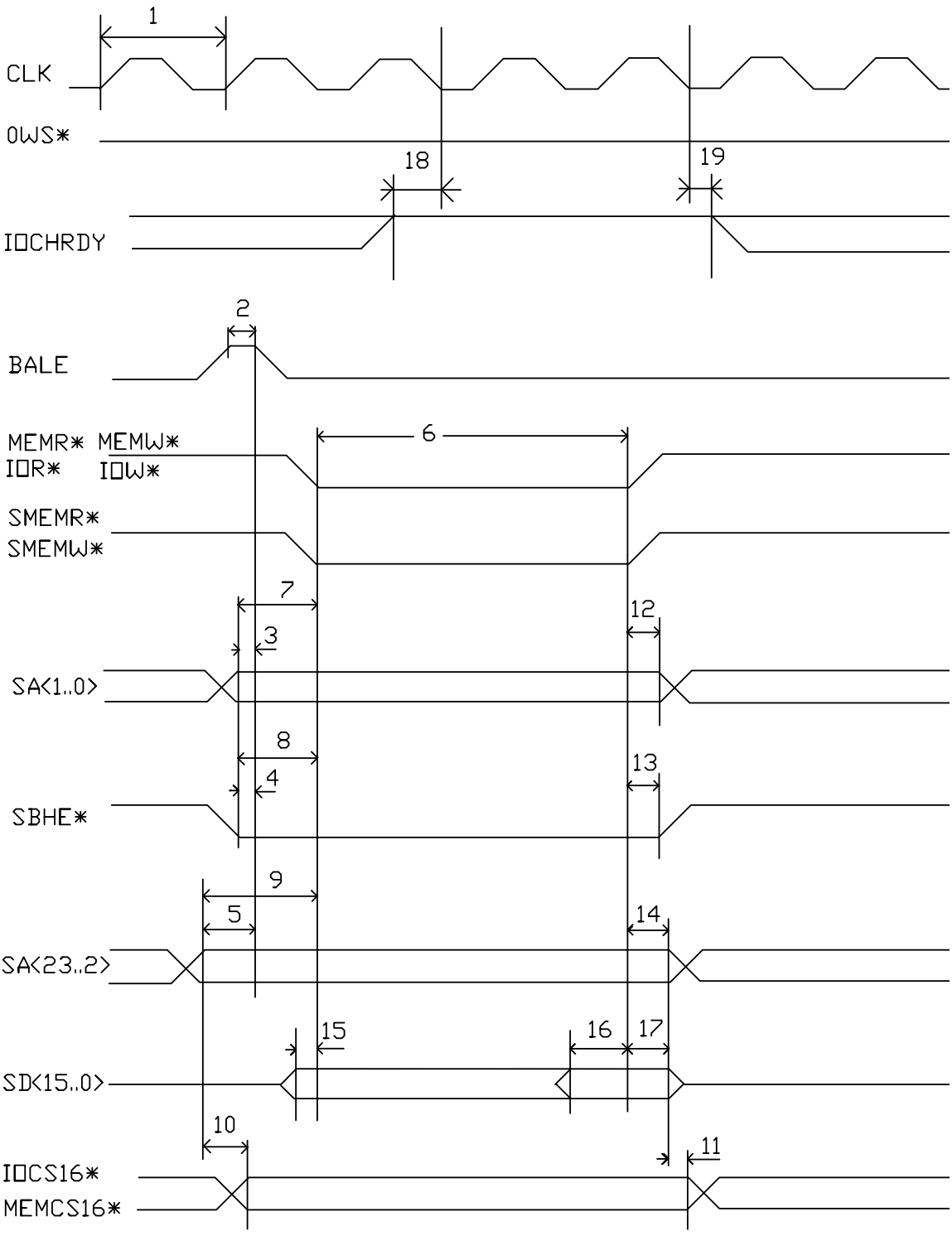
Data Swapping

Data are swapped between SD <15..8 > and SD <7..0 > on the main CPU for odd Byte transfers (SA0 =H) with 8 - bit devices on the PC/104 - bus. Swapping occurs also during DMA cycles (SA0 =H) if the devices on the PC/104 - bus is a 16 - bit memory device and an
8 - bit DMA channel is used for the transfer.

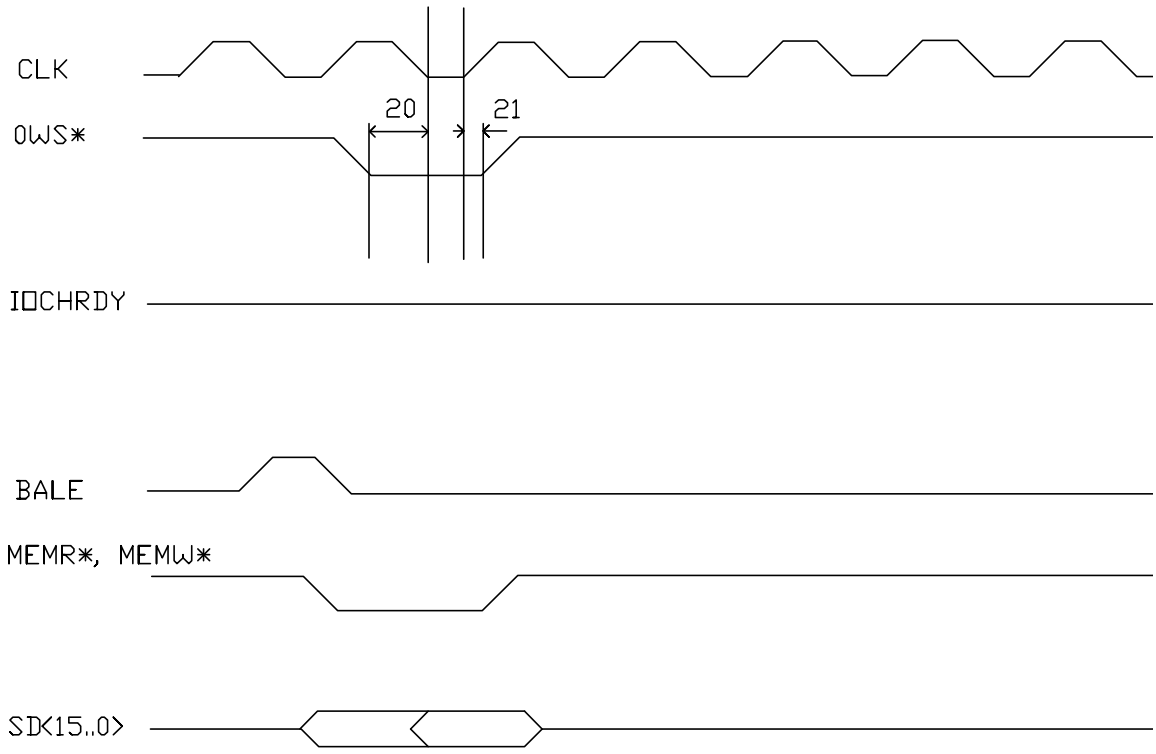
No.	Description	Min	Typ	Max	Note
1	Clock period (Tclk)	125			
2	BALE high width		54		
3	SA<1..0> setup to BALE low			8	
4	SBHE* setup to BALE low		20		
5	SA<23..2> setup to BALE low		130		
6a	Command width 16 bit cycles (zero wait states)		125		2)
6b	Command with 8 bit cycles (with 2 wait states)		325		3)
7	SA<1..0> setup to command zero cmd delay	8			1)
8	SBHE* setup to command zero cmd delay		20		1)
9	SA<23..2> setup to command zero cmd delay	130			1)
10	MEMCS16* , IOCS16* delay from SA<23..2>			80	
11	MEMCS16* , IOCS16* hold after SA<23..2	0			
12a	SA<1..0> hold after command	23			
12b	SA<1..0> hold after SMEMR* or SMEMW*		18		
13a	SBHE* hold after command	23			
13b	SBHE* hold after SMEMR* or SMEMW*	18			
14a	SA<23..2> hold after command	30			
14b	SA<23..2> hold after SMEMR* or SMEMW*	25			
15	Write Data setup to command active		6		
16	Read Data setup to command inactive	65			1)
17a	Write Data hold after command	45			
17b	Read Data hold after command	0			
18	IOCHRDY setup to CLK	34			
19	IOCHRDY hold after CLK	2			
20	0WS* setup to CLK	20			
21	0WS* hold after CLK	0			

Notes:
1) Command delay programmable between 0 and 3 CLK/2 cycles seperately for 16 bit memory , 8 - bit memory and I/O cycles
2) Command width depends on the number of wait states (programmable from 0 to 3 CLK cycles) and command delay (note 1)
3) Command width depends on the number of wait states (programmable from 2 to 5 CLK cycles) and command delay (note 1)

CPU Bus Cycle Timing



Zero Wait State Operation



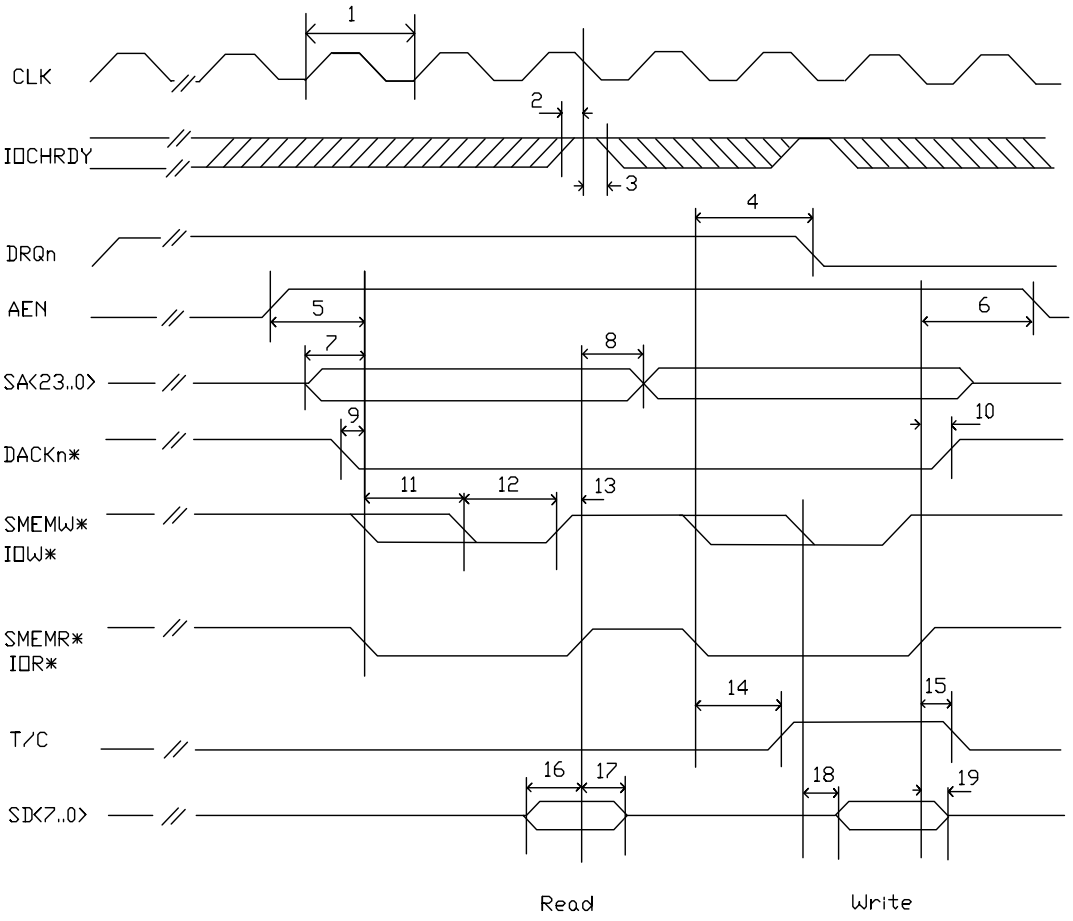
DMA Timing Specification

This section specifies the timing for Direct Memory Access cycles (all times in ns):

No.	Description	MIN	TYP	MAX	Note
1	Clock period (Tclk)	125			
2	IOCHRDY setup to CLK	35			
3	IOCHRDY hold from CLK	20			
4	DRQ inactive delay from command			55	
5	AEN setup to command	80			
6	AEN hold from command	10			
7	SA<23..0> setup to command	50			
8	SA<23..0> hold from command	50			
9	DACK setup to command	0			
10	DACK hold from command		0		
11	Extended Write delay	122		128	
12	Write command width (Extended Write , 0 Waitstates)	80			1)
13	Read inactive delay from Write	20			
14	T/C delay from command			165	
15	T/C hold from command	0			
16	Read data setup	110			
17	Read data hold	0			
18	Write data delay after command			80	2)
19	Write data hold	15			

Notes: 1) with programmable wait states from 1 to 4 CLK cycles
2) this time cannot be extended by insertion of wait states

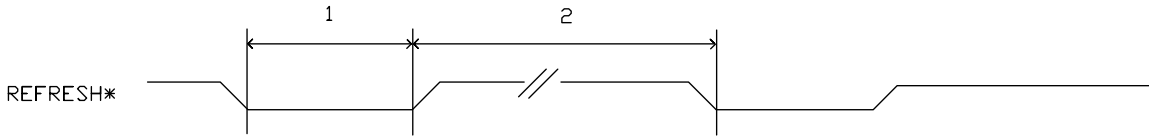
DMA - Timing


1
CLK
2
IOCHRDY
3
4
DRQn
AEN
5
6
7
8
SA<23..0>
9
10
DACKn*
11
12
13
SMEMW*
IOW*
SMEMR*
IOR*
14
15
T/C
16
17
18
19
SD<7..0>
Read
Write

REFRESH* Signal Timing
This section specifies the timing of the REFRESH* signal

No.	Description	MIN	TYP	MAX	Note
1	REFRESH* pulse width	750ns			
2	REFRESH* inactive time	15,6μS			

REFRESH* Signal Timing



Document Revision History

Filename	Date	Edited by	Alteration to preceding revision
LEU1D010.DOC	-	M. Schanz	Created
LEU1D020.DOC	18.09.97	K. Wenke	Corrected, created, update
LEU1D120.DOC	28.10.97	R. Barth	Revised BIOS settings, deleted wrong and unneccessary entries; 1st. official release
LEU1D121.DOC	04.11.97	R. Barth	Deleted occurences of ECP mode; deleted PISA bus description; added reference to PISA spec; deleted reference to Extension BIOS in chapter Watchdog
LEU1D122.DOC	12.01.98	SG	Exchanged Jump to Jumptec
LEU1D123.DOC	09.02.98	J. Hagn	Layout revised, Filename corrected
LEU1D124.DOC	13.02.98	KW	Add current-values Add JUMPtec-Feature-connector description Remove CPUs not work possible in this design
LEU1D125.DOC	25.02.98	Hu	Added text in “connector arrangement” STILL IN PROGRESS !!
LEU1M126.DOC	22.04.98	J. Hagn	Special characters removed, Part Number entered