DIAMOND SYSTEMS CORPORATION

MORPHEUS

High Integration PC/104 Celeron CPU
with Ethernet

User Manual v1.0

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1. DESCRIPTION

Morpheus is a Single Board Computer based on the Intel Celeron processor. It conforms to the PC/104 standard, an embedded standard that is based on the ISA and PCI buses and provides a compact, rugged mechanical design for embedded systems. PC/104 modules feature a pin and socket connection system in place of card edge connectors, as well as mounting holes in each corner. The result is an extremely rugged computer system fit for mobile and miniature applications.

For more information on PC/104, visit: www.pc104.org

2. FEATURES

Processor Section

- Intel Ultra Low Voltage Embedded Celeron 400/650MHz processor with FSB 100 MHz uBGA package.
- VIA VT8606 North Bridge, VIA VT82C686B South Bridge

Core System

- VIA VT8606 Integrated Savage4 2D/3D Video Accelerator, 32MB Shared Memory, 4 x AGP
- 2 x 20 pin DF13 connector for LCD display TTL support
- L2 Cache Integrated on CPU die (256 KB)
- One 144-pin SODIMM socket supports up to 512MB of PC133 SDRAM memory
- On-board Real Time Clock with Lithium Battery
- 400Mhz CPU comes with heat sink on Northbridge and 650Mhz CPU comes with fan on Northbridge.

High Speed Multi I/O

- 2 high speed Serial Ports with 16c550 compatible UART and 16 byte FIFO
  - 1 RS-232
  - 1 RS-232/422/485 with jumper selection
- 2 USB 1.1 ports
- 44-pin IDE connector x 1 (IDE supports DMA33)
- PC/104 expansion bus
- 2MB EPROM and combined BIOS support
- IEEE802.3U compatible 10/100 Base-T interface with Realtek 8100BL chip and boot ROM function

SSD Interfaces

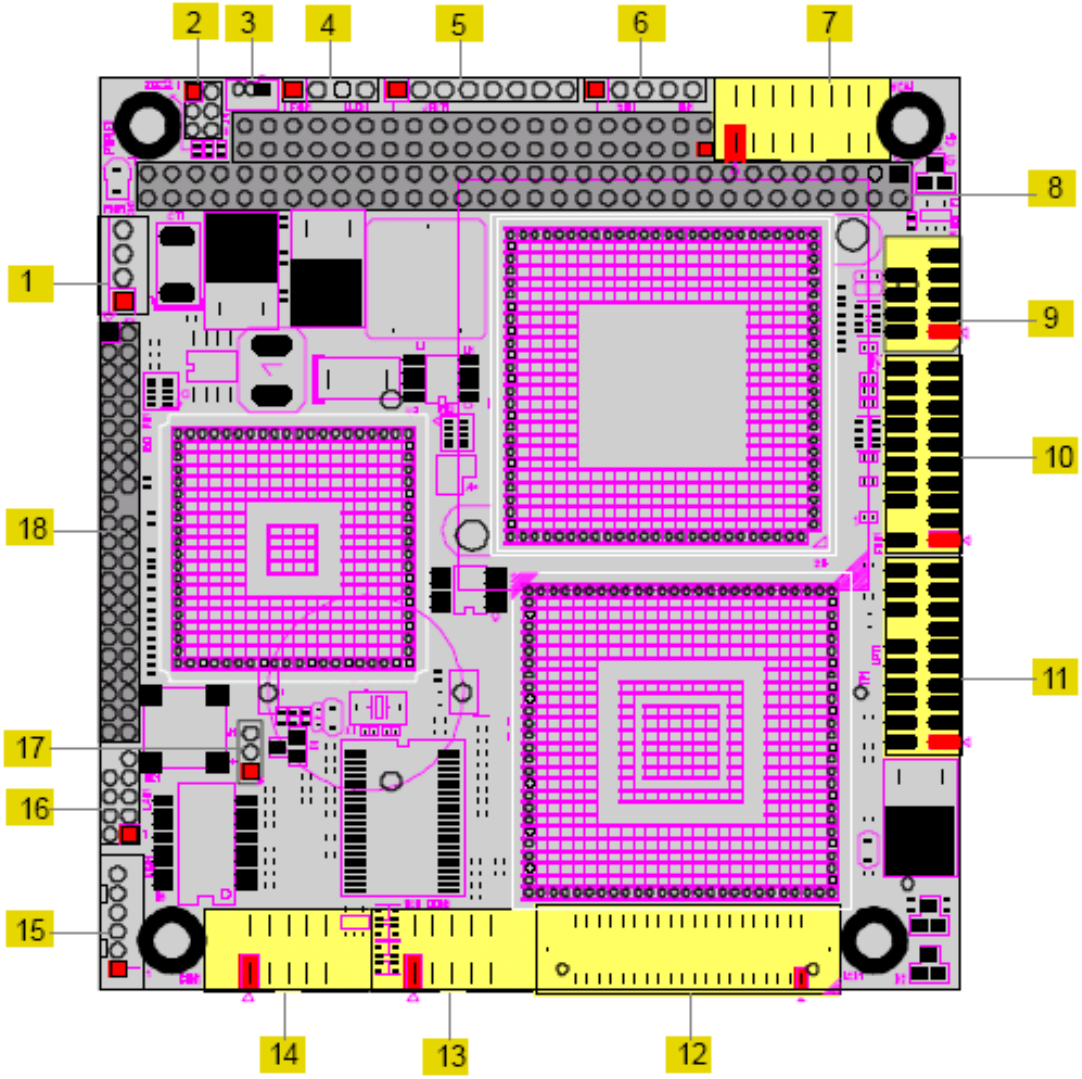
- CompactFlash Socket supports Type I/II CFC up to 1 GB CFC

Environmental and Power

- AWARD® Flash BIOS
- Power saving supported in BIOS: Doze / Standby
- Power Requirement: 400MHz: +5VDC @ 2.1A typical; 650MHz: +5VDC @ 3A typical
- BIOS monitors CPU and System temperature, system voltage.
- Board Dimensions of 90mm x 96mm (3.55" x 3.775")
- Board Weight 110g / 3.9oz
- Operating Temperature: 0 to 60°C (32 to 140°F)
- Storage Temperature: -30 to 80°C (-22 to 176°F)

3. BOARD LAYOUT AND DRAWINGS

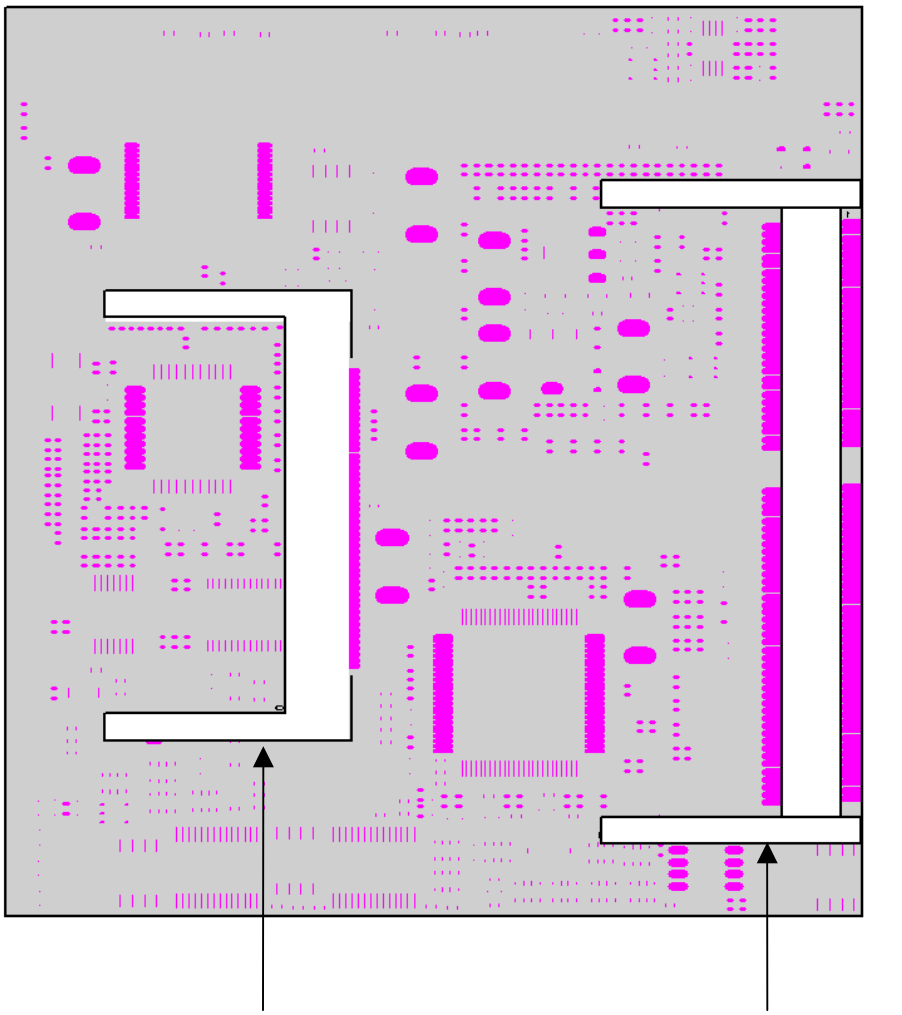
3.1 Board Layout Top View



I/O Connectors and Jumpers

1. Power
2. J5 Serial Port 2 Configuration Jumper
3. Fan Power Input
4. Ethernet LED
5. Utilities
6. IrDA
7. VGA
8. PC 104 Expansion Bus
9. USB 0-1
10. Floppy Disk Drive
11. Parallel Port
12. LCD
13. Serial Port 1
14. Serial Port 2
15. Keyboard and Mouse
16. Ethernet
17. J1 Clear CMOS Jumper
18. IDE

3.2 Board Layout Bottom View



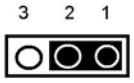
4. JUMPER and I/O HEADERS

J1 CMOS Jumper	This jumper is used to clear CMOS RAM. This will restore the BIOS settings to factory default upon power up.
J5 Serial Port2 Jumper	This jumper is used to set serial protocol for Serial Port 2. Users can select between RS-232, 422, and 485.
VGA	This is a 16-pin I/O header for VGA connection. Users can obtain VGA output by connecting the female end of the VGA connector to this header and connecting the other end to the monitor.
LCD	This is a 40-pin Box header for LCD connection. Users can obtain LCD output by connecting the box header end of the LCD cable to this connector and the other end to the LCD.
IDE	This is a 44-pin I/O header for IDE connection. This is the primary IDE channel and supports up to two IDE devices.
Compact Flash Socket	This socket is used to mount and boot compact flash device as an IDE device. Supports type I/II compact flash and sizes up to 1GB.
USB 0-1	This connector supports 2 USB 1.1 devices.
Keyboard and Mouse	This is a connector for PS/2 keyboard and mouse.
Floppy Disk Drive	This is a 20-pin header for floppy disk drives. The connector supports up to two floppy disk drives.
Parallel Port	This is a 20-pin header parallel port connector.
Serial Port 1-2	These two are serial port connectors. Serial port one is designated as RS-232. Serial port 2 is configurable to be RS-232/422/485 by jumpering J5.
Power	This is a 4-pin power connector. It is the external input power connector for powering up the board. Power may be supplied through the PC104 bus or through this connector. Morpheus only requires power to be supplied to the 5V and ground pins to power up.
Ethernet	This is a 10/100 Base-Tx Ethernet connector.
Ethernet LED	This is a 4-pin Ethernet LED header. This connector is used to power up an LED to indicate Ethernet activity.
Utilities	This header provides utilities such as RESET, external speaker, external SMI, and hark disk activity LED.

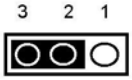
5. JUMPER SETTINGS

5.1 CMOS Jumper Settings J1

Jumpering J1 will reset the CMOS. If users experience problems booting up the Morpheus they should reset the CMOS RAM, which will restore the BIOS settings to factory defaults. To clear the CMOS RAM, power the board down, install the jumper as shown, wait a few seconds, then put the jumper back into the default setting. Then power up the Morpheus again.



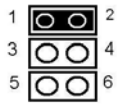
Default Setting (1-2 on)



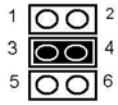
Setting to clear CMOS RAM (2-3 on)

5.2 Serial Port Selection (RS232C/422/485) J5

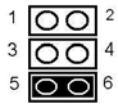
Serial port 2 on Morpheus can be configured to operate in RS-232, RS-422 or RS-485 protocols, while port 1 is fixed RS-232. Jumper J5 determines the serial protocol for port 2. To configure the protocol, power down the CPU, install the jumper in the desired location, then power up the Morpheus again. For serial port pinouts, please refer to section 6.1, page 8.



Default Setting (RS-232c)



RS-422



RS-485

6. SYSTEM I/O

6.1 Serial Port Connectors

Morpheus supports serial protocols RS-232, RS-422, and RS-485. Serial port 1 supports RS-232 only and serial port 2 supports RS-232/422/485. J5 configures the serial protocol for port 2. Information concerning J5 can be found on page 7. When connecting cables, connect the side with the red stripe to pin 1 on the Morpheus. Using the cable supplied in the cable kit C-MOR-KIT, the DB-9 connector will provide the standard DTE pinout for a PC serial port. The pinouts shown below are for the pin headers on Morpheus, NOT the DB-9 connector.

RS-232 Configuration:

DCD	1	2	RXD
TXD	3	4	DTR
GND	5	6	DSR
RTS	7	8	CTS
RI	9	10	NC

RS-485 Configuration:

DATA+	1	2	DATA-
NC	3	4	NC
GND	5	6	NC
NC	7	8	NC
NC	9	10	NC

RS-422 Configuration:

TXD+	1	2	TXD-
NC	3	4	NC
GND	5	6	NC
NC	7	8	RXD+
RXD-	9	10	NC

SIGNAL NAME	DEFINITION	DIRECTION
RS-232:		
DCD	Data Carrier Detect	Input
RXD	Receive Data	Input
TXD	Transmit Data	Output
DTR	Data Terminal Ready	Output
GND	Ground	---
DSR	Data Set Ready	Input
RTS	Request To Send	Output
CTS	Clear To Send	Input
RI	Ring Indicator	Input
NC	Not Connected	---

SIGNAL NAME	DEFINITION	DIRECTION
RS-422:		
TXD+	Differential Transmit Data (HIGH)	Output
TXD-	Differential Transmit Data (LOW)	Output
RXD+	Differential Receive Data (HIGH)	Input
RXD-	Differential Receive Data (LOW)	Input
RS-485:		
DATA+	Differential Transceiver Data (HIGH)	Bi-directional
DATA-	Differential Transceiver Data (LOW)	Bi-directional

6.2 CPU Fan

This connector provides power to the CPU fan cooling system. The fan is strongly recommended on the North Bridge chip on the 650MHz model. In most cases just a heat sink is sufficient for the North Bridge chip on the 400MHz model.

1	Fan control
2	+5V
3	GND

6.3 Ethernet LED

This connector can be used to indicate whether the Ethernet is working/active or not. Diamond Systems does not provide any cables or LEDs for this connector.

1	Activity LED
2	+3.3V
3	Link LED
4	+3.3V

6.4 VGA

Pin 11 is keyed for easy, error-free connection. When connecting the VGA cable, align the side with the red stripe to pin 1 and attach the .2mm header to the Morpheus. Connect the cable's DB15 female connector to the monitor's DB15 male connector for video output to monitor. Diamond Systems' cable kit C-MOR-KIT includes a cable for this connector.

Red	1	2	Green
Blue	3	4	NC
GND	5	6	GND
GND	7	8	GND
Vcc	9	10	GND
KEY	11	12	VDDAT
HSYNC	13	14	VSYNC
VDCLK	15	16	NC

6.5 LCD

This connector is a 40-pin box header (Hirose DF-40DS-1.2C) for Flat Panel VGA (LCD) connection. To obtain video out on the LCD, attach a cable from the LCD to the Morpheus connector. Diamond Systems does not provide a cable for this connector.

VCC5V	1	2	VCC5V
GND	3	4	GND
VCC3V	5	6	VCC3V
NC	7	8	GND
FPD0	9	10	FPD1
FPD2	11	12	FPD3
FPD4	13	14	FPD5
FPD6	15	16	FPD7
FPD8	17	18	FPD9
FPD10	19	20	FPD11
FPD12	21	22	FPD13
FPD14	23	24	FPD15
FPD16	25	26	FPD17
FPD18	27	28	FPD19
FPD20	29	30	FPD21
FPD22	31	32	FPD23
GND	33	34	GND
SHFCLK	35	36	HSYNC
M(DE)	37	38	VSYNC
ENABLK	39	40	ENAVEE

6.6 IDE

The connector connects IDE devices to the primary IDE channel and supports up to 2 IDE devices. The cable provided has connectors for 2mm 44-pin IDE devices and 0.1-inch 40-pin IDE devices. Connect most standard desktop hard disks, CD-ROM, etc to the 0.1 inch 40-pin IDE header on the cable. Attach laptop hard disks, flash disks, etc. to the 2mm 44-pin header on the cable. To connect the cable to the header, connect the side with the red stripe to pin 1. Diamond Systems' cable kit C-MOR-KIT includes a cable for this connector.

#RESET	1	2	GND
D7	3	4	D8
D6	5	6	D9
D5	7	8	D10
D4	9	10	D11
D3	11	12	D12
D2	13	14	D13
D1	15	16	D14
D0	17	18	D15
GND	19	20	NC/(Vcc)
REQ	21	22	GND
IO WRITE	23	24	GND
IO READ	25	26	GND
IO READY	27	28	GND
DACK	29	30	GND
IRQ14	31	32	NC
ADDR1	33	34	ATA66 DETECT
ADDR0	35	36	ADDR2
CS#1	37	38	CS#3
IDEACTP	39	40	GND
VCC (+5V)	41	42	VCC (+5V)
GND	43	44	NC

6.7 Floppy Disk Drive

This header is keyed to provide error-free connection. Morpheus supports up to two floppy drive connections simultaneously. To connect the provided cable to the header, attach the side with the red stripe to pin 1. Diamond Systems provides a floppy drive ribbon cable.

GND	1	2	Drive density select 0
GND	3	4	KEY
GND	5	6	Drive density select 1
#Write data	7	8	#Index
#Write gate	9	10	#Motor enable A
#Track 0	11	12	#Driver select B
#Write protect	13	14	#Driver select A
#Read data	15	16	#Motor enable B
#Head select	17	18	#Direction
#Disk change	19	20	#Step

6.8 USB 0-1

This connector supports up to two USB devices connected simultaneously. Pin 10 is keyed for error-free connection. Diamond Systems' cable kit C-MOR-KIT includes a cable for this connector.

+5V	1	2	+5V
USBD0-	3	4	USBD1-
USBD0+	5	6	USBD1+
GND	7	8	GND
GND	9	10	KEY

6.9 IrDA (Infrared)

Diamond Systems does not provide cables for this header.

1	+5V
2	NC
3	IRRX
4	GND
5	IRTX

6.10 PS/2 Keyboard and Mouse

Diamond Systems provides cables for keyboard and mouse

1	KB_DATA
2	GND
3	MS_DATA
4	KB_CLK
5	+5V
6	MS_CLK

6.11 Parallel Port

The connector is keyed for error-free connection. When connecting the cable attach the side with the red stripe to pin 1. Diamond Systems' cable kit C-MOR-KIT includes a cable for this connector.

#STROBE	1	2	#Auto feed
PTD 0	3	4	#Error
PTD 1	5	6	#Initialize
PTD 2	7	8	#Select Input
PTD 3	9	10	GND
PTD 4	11	12	GND
PTD 5	13	14	KEY
PTD 6	15	16	Busy
PTD 7	17	18	Paper Empty
#Acknowledge	19	20	Select

6.12 Power

This is the external power connector used for powering up the Morpheus. Only 5V and GND are required to power up the Morpheus board. Diamond Systems does not provide a cable for this connector.

Morpheus requires about 2 – 2.5A on the +5V line for proper operation. Be sure to use proper gauge wire to handle this current. Power conductors should be kept as short as possible to reduce the voltage drop on the conductors. A minimum of 22 gauge wire is recommended for the power conductors. (Lower gauge no. = thicker wire.)

1	+5V
2	GND
3	GND
4	+12V

6.13 Ethernet (100 Base-Tx)

This connector is keyed for error-free connection. When connecting the cable to the header, align the side with the red stripe to pin 1. Diamond Systems' cable kit C-MOR-KIT includes a cable for this connector.

TX+	1	2	TX-
RX+	3	4	NC
NC	5	6	RX-
NC	7	8	GND
GND	9	10	KEY

6.14 Utilities

This utility connector provides multiple functions for users. It provides functionalities such as reset, hard disk activity LED, and external speaker. Diamond Systems does not provide a cable for this connector.

1	For RESET
2	For RESET
3	N/C
4	N/C
5	HDD LED +
6	HDD LED -
7	SPEAKER+
8	SPEAKER-

Connections	Description	Pin
RESET	Used to reset the board	1-2
N/C	No connection	3-4
HDD LED	LED to indicate Hard disk activity	5-6
SPEAKER	Used for external speakers	7-8

7. SYSTEM RESOURCES

This section details the system resources including assignment of IRQ, I/O, and DMA.

7.1 Interrupt Assignment

IRQ Resource	Description
0	System Timer
1	Standard 101/102-Key or Microsoft Natural Keyboard
2	Programmable Interrupt Controller
3	Communications Port (COM2)
4	Communications Port (COM1)
5	VIA Tech 3038 PCI to USB Universal Host Controller
6	Standard Floppy Disk Controller
7	ECP Printer Port (LPT1)
8	System CMOS/real time clock
10	S3 Graphics Twister
11	Realtek RTL 8139(A/B/C/8130) PCI Fast Ethernet NIC
12	PS/2 Mouse
13	Numeric data processor
14	Primary IDE Controller
14	VIA Bus Master PCI IDE Controller
15	Secondary IDE Controller
15	VIA Bus Master PCI IDE Controller

7.2 Direct Memory Access

DMA	Description
2	Standard Floppy Disk Controller
3	ECP Printer Port (LPT1)
4	Direct memory access controller

7.3 I/O Address Description

I/O Address	Description
0000 – 000F	Direct memory access controller
0020 – 0021	Programmable interrupt controller
0040 – 0043	System timer
0060 – 0060	Standard 101/102
0061 – 0061	System speaker
0064 – 0064	Standard 101/102
0070 – 0071	System CMOS/real time clock
0081 – 0083	Direct memory access controller
0087 – 0087	Direct memory access controller
0089 – 008b	Direct memory access controller
008F – 0091	Direct memory access controller
00A0 – 00A1	Programmable interrupt controller
00C0 – 00DF	Direct memory access controller
00F0 – 00FF	Numeric data processor
0170 – 0177	VIA Bus Master PCI IDE Controller
0170 – 0177	Secondary IDE controller (dual FIFO)
01F0 – 01F7	VIA Bus Master PCI IDE Controller
02F8 – 02FF	Primary IDE controller (dual FIFO)
02F8 – 02FF	Communications Port (COM2)
0376 – 0376	VIA Bus Master PCI IDE Controller
0376 – 0376	Secondary IDE controller (dual FIFO)
0378 – 037F	ECP Printer Port (LPT1)
03B0 – 03BB	S3 Graphics Twister-T chip
03C0 – 03DF	S3 Graphics Twister-T chip
03F0 – 03F5	Standard Floppy Disk Controller
03F6 – 03F6	VIA Bus Master PCI IDE Controller
03F6 – 03F6	Primary IDE controller (dual FIFO)
03F7 – 03F7	Standard Floppy Disk Controller
03F8 – 03FF	Communications Port (COM1)

04D0 – 04D1	PCI bus
0778 – 077F	ECP Printer Port (LPT1)
0CF8 – 0CFF	PCI bus
4000 – 407F	PCI bus
4080 – 40FF	PCI bus
5000 – 501F	PCI bus
6000 – 607F	PCI bus
E000 – E007	Primary IDE controller (dual FIFO)
E000 – E00F	VIA Bus Master PCI IDE Controller
E008 – E00F	Secondary IDE controller (dual FIFO)
E400 – E41F	VIA Tech 3038 PCI to USB Universal Host Controller
E800 – E81F	VIA Tech 3038 PCI to USB Universal Host Controller
EC00 – ECFF	Realtek RTL8139/810x Family Fast Ethernet NIC

8. ACCESSORIES

Part Number	Description
MOR-400	Morpheus PC/104 CPU, Celeron 400MHz
MOR-650	Morpheus PC/104 CPU, Celeron 650MHz
C-MOR-KIT	Morpheus Cable Kit (see page 19)
MEM-128-01	128MB RAM SODIMM for Morpheus
MEM-256-01	256MB RAM SODIMM for Morpheus
MEM-512-01	512MB RAM SODIMM for Morpheus
PS-5V-MOR	AC Adapter, Universal in, 5VDC / 6A out, for Morpheus
ACC-IDEEXT	IDE Extender Board + 2 IDE cables (see below)
FD-32-XT	32MB Flashdisk, Extended Temp.
FD-64-XT	64MB Flashdisk, Extended Temp.
FD-128-XT	128MB Flashdisk, Extended Temp.

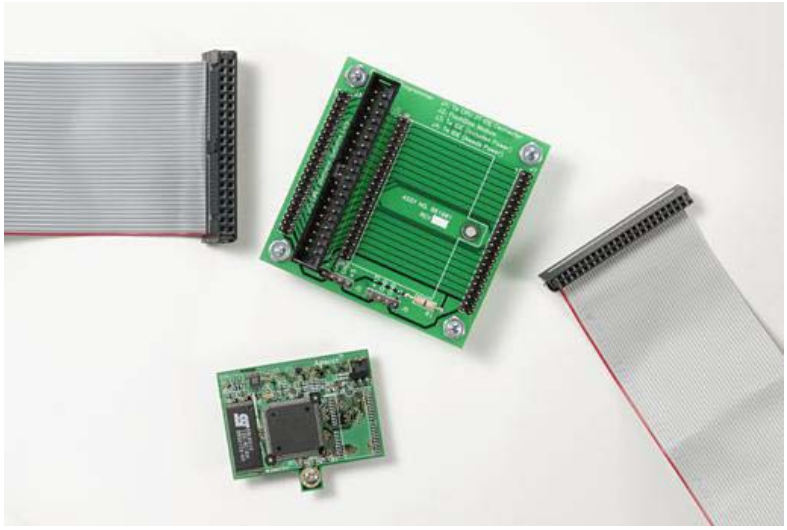


Figure 1. ACC-IDEEXT IDE extender board with FD-32-XT flashdisk module and cables

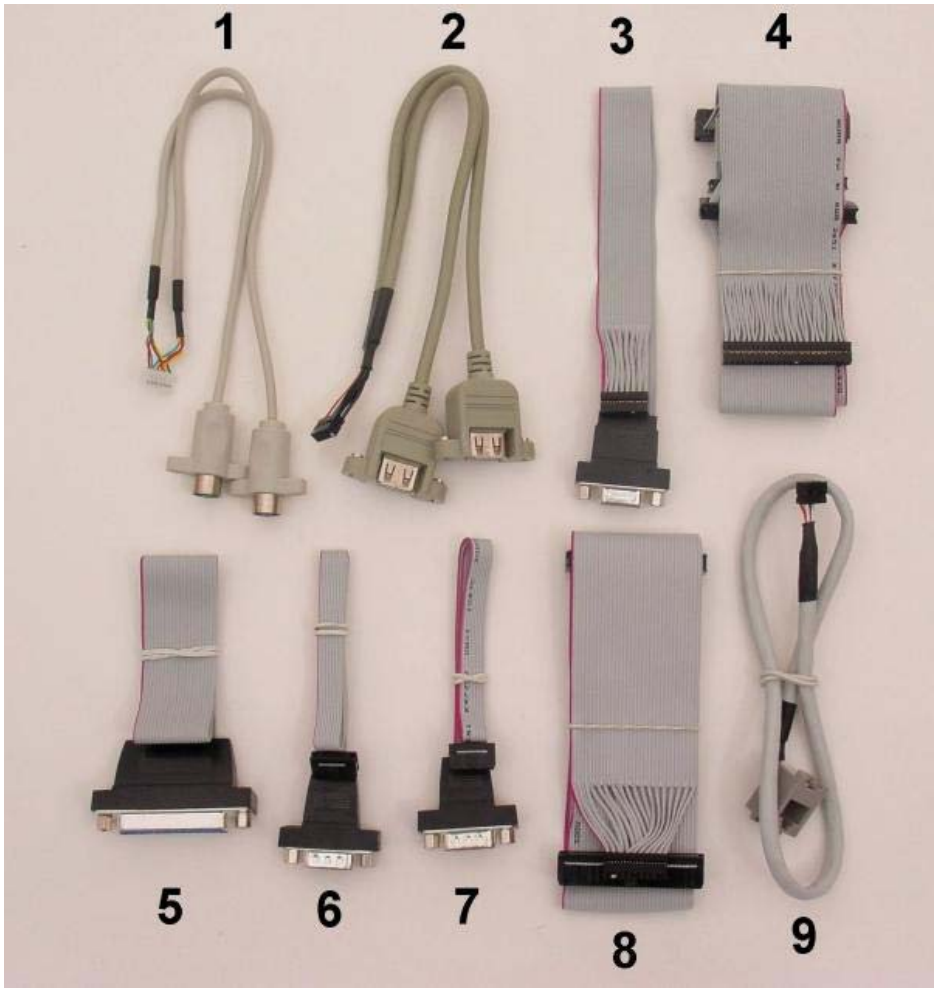


Figure 2. Morpheus Cable Kit

Item	Description
1	Keyboard and mouse cable
2	USB cable
3	VGA cable
4	IDE cable
5	Parallel port cable
6, 7	Serial port cables (2 included in kit)
8	Floppy drive cable
9	Ethernet cable

9. QUICK START GUIDE

This section will describe the steps necessary to get the Morpheus up and running quickly.

9.1 General Setup

This section describes the initial setup that will be identical no matter which operating system or IDE configuration you choose to use.

1) Remove the Morpheus board from its packaging.
2) Install the mounting kit standoffs into the PC/104 mounting holes located at each corner of the board. This ensures that the board will not touch the surface beneath it.
3) Connect a power supply to the external power input header.
4) *Optional:* Attach the keyboard and mouse connector if a keyboard and mouse are needed.
5) *Optional:* Attach the VGA cable. Connect your monitor's VGA cable to the DB15 socket.
6) *Optional:* Connect Ethernet cable.
7) *Optional:* You will need to connect the USB cables if you are going to use a USB floppy, keyboard or mouse. Connect the USB cable.

9.2 IDE Configuration

Morpheus has a single IDE channel that can support up to two devices simultaneously (Master and Slave). IDE devices connect through a 44-pin, laptop IDE pin out. Here are a few example setups:

1) One laptop IDE hard drive connected directly to Morpheus through a 44-pin ribbon cable. This cable is supplied with the Morpheus.
2) One IDE flash disk connected directly to an IDE extender board, which is connected to Morpheus through a 44-pin ribbon cable.
3) Use 44-pin ribbon cable to connect an IDE extender board to Morpheus. You can then connect other 40-pin or 44-pin IDE compatible devices to the extender board. Use a power-supply to supply power to 40-pin IDE devices.

9.3 Booting into MS-DOS, FreeDOS or ROM-DOS

This section describes how to boot into a DOS-based operating system via a bootable floppy disk.

1) Connect a floppy drive to Morpheus or connect a USB floppy drive to a USB socket connected to the Morpheus.
2) Insert your DOS-based boot disk into the floppy drive.
3) Power up the Morpheus.
4) Morpheus starts BIOS power-on self test (POST.) At this screen hit <DEL> to enter BIOS configuration.
5) Go into "Advanced BIOS Features" and ensure that floppy is the first boot device. If using USB floppy drive enter "Advanced BIOS Features" and ensure that USB-FDD is the first boot device. Also, enabled Legacy USB in "Integrated Peripherals".
6) Reboot Morpheus and it will boot the DOS OS on the floppy disk.

9.4 Booting into Linux or Microsoft Windows

This section describes how to setup Morpheus in preparation for a Linux or Windows install from an installation CD-ROM onto a laptop IDE hard drive.

1) Connect the IDE extender board to IDE channel.
2) Connect a CD-ROM drive jumpered for the slave position to the IDE extender board through the 40-pin cable.
3) Connect power to the CD-ROM drive.
4) Connect a laptop hard drive jumpered for master position to the second slot of the 44-pin cable.
5) Power up and boot Morpheus.
6) Morpheus starts BIOS power-on self test (POST.) At this screen hit <DEL> to enter BIOS configuration.
7) Go into “Advanced BIOS Features” and ensure that the CD-ROM drive is first boot device.
8) Insert the boot CD for your operating system into the CD-ROM drive.
9) Save BIOS settings and reboot.
10) Morpheus should now boot off the CD and start the OS installation process.

10. TECHNICAL SUPPORT

For technical support, please email: support@diamondsystems.com or contact Diamond Systems technical support at 1-510-456-7800.