# TABLE OF CONTENTS

Faraday Corporate Overview ........................................................................................................ Section 1
PC BUS Designers Guide ............................................................................................................. Section 2
Single Board Computers ............................................................................................................. Section 3
  FE6400
  FE6410 Series
  FE6420 Series
  BUS PC
  Micro PC
  Cmos Micro PC
  A-Tease Series
  BUS AT Series
Disk Controllers ............................................................................................................................ Section 4
  FE5140 PC BUS Floppy Disk Ctlr
  FE5141 PC BUS Floppy Disk Ctlr
  FE5150 5 1/4" AT BUS Floppy/Hard Disk Ctlr
Video Controllers ....................................................................................................................... Section 5
  FE5200 Monochrome Video Ctlr
Software .......................................................................................................................................... Section 6
  MS9200 (MS-DOS)
  GW9000 (GW-BASIC)
General Purpose Boards .............................................................................................................. Section 7
  FE5400 Cmos Ram/Rom Card
  FE5500 Serial Parallel I/O Card
  FE6SBP PC BUS Six Slot Backplane
  FE8SBP AT BUS Eight Slot Backplane
PC BUS & AT BUS Integrated Circuits ........................................................................................ Section 8
  FE2000 PC BUS CPU Controller I C
  FE2010 PC BUS CPU and Peripheral Controller I C
  FE2100 PC BUS Floppy Disk Controller I C
  FE2200 PC BUS Monochrome Display Controller I C
  FE3000 AT BUS CPU Controller I C
  FE3010 AT BUS CPU and Peripheral Controller I C
System Cabinets .......................................................................................................................... Section 9
  FECC-8S PC BUS & AT BUS CARD CAGE
  FE6400 Evaluation System
  FE6413 Evaluation System
  FE6421 Evaluation System
  BUS PC Evaluation System
  MICRO PC/CMOS MICRO PC Evaluation System
Faraday Sales Representatives and Distributors ........................................................................... Section 10
Faraday Electronics Incorporated makes no warranty of any kind with regard to this material. Faraday Electronics Incorporated assumes no responsibilities for any errors that may appear in this document. Faraday Electronics Incorporated makes no commitment to update or keep current the information contained in this document. Products shown in this catalog are subject to change without notice and do not represent a commitment on the part of Faraday Electronics Incorporated. Contact the factory for information regarding the status of any product.
Section 1

Faraday Corporate Overview

Faraday Profile
Faraday History
Faraday Growth

Faraday Marketing and Distribution
Faraday Corporate Overview

COMPANY PROFILE

Faraday Electronics, Sunnyvale, California, is the leading independent OEM supplier of PC BUS and AT BUS single board computers (SBCs), currently holding a 70% share of the market. Faraday products are used in industrial automation, instrumentation, and workstation applications. The company also offers controllers, CMOS VLSI integrated circuits, and enhanced software development packages.

The privately held company has earned a reputation for being first to market with products that allow OEM manufacturers to reduce design time by utilizing the software development tools, and third-party hardware and software options available through the IBM PC BUS standard.

Top management includes John Lemons, president; Larry Jones, vice president of engineering; Ron Mazza, vice president of marketing; John Finegan, vice president of finance; and Michael Duffy, vice president of operations.

COMPANY HISTORY

Faraday was founded in 1982 by Jack Watts, now chairman, and Larry Jones, now vice president of engineering. Its mission was to design, manufacture and market single board computers compatible with the IBM PC BUS.

In March 1983 Faraday introduced its first product, the FE6400 8-bit SBC, the first PC BUS-compatible board ever to be offered to OEMs. Soon after, the company introduced the FE6410, the industry’s first product to utilize VLSI technology on an IBM PC BUS-based single board computer. Since that time, Faraday has continued to be first to market with products developed on the company’s own CAD and CAE equipment. These products incorporate Faraday’s own BIOS, and reflect VLSI trends to smaller, CMOS functional equivalents. As a result, Faraday can offer its customers boards that require the lowest power, with the most flexible packaging potential of any on the market today.

With the PC becoming pervasive as the worldwide standard for microcomputing, Faraday is focusing today on the industrial automation, instrumentation and workstation markets with its products.

The company moved its offices in 1984 from Palo Alto, California, to larger facilities in Sunnyvale, California. Today, Faraday Electronics occupies 34,000 square feet of floor space in Sunnyvale.

COMPANY GROWTH

Faraday’s sales in its first year, fiscal 1984, were $3 million. In fiscal 1985, sales were $12 million. Sales for fiscal 1986 are projected to exceed $20 million.

The first participation by venture capital investors took place in July 1984 when Oxford Partners, Three Cities Research, Investors in Industry, Hill Samuels, and San Jose Capital invested $2.6 million. Proceeds of this funding were used toward purchase of capital equipment, research and development, and increases in working capital.

In March 1985, Faraday acquired Selanar, a 12-year-old Santa Clara, California, manufacturer of high resolution graphics boards and terminals. The new subsidiary moved its operations to Sunnyvale shortly after the acquisition.

Faraday completed a second round of venture capital funding in August 1985. Oxford Partners, Summit Ventures, Three Cities Research, Investors in Industry, and San Jose Capital invested $3 million. This funding was used for purchase of capital equipment, research and development, and increases in working capital for both Selanar and Faraday.

MARKETING AND DISTRIBUTION

Faraday Electronics’ products are marketed in North America through the company’s own sales
personnel and a network of sales representatives and distributors located throughout the United States.

Internationally, the company's products are marketed through a network of European sales distributors, in addition to sales personnel headquartered in Faraday's Bracknell, U.K., sales office. In addition, Faraday maintains distributors in South America and the Far East, coordinated from its Sunnyvale headquarters.

Faraday markets its products exclusively to OEMs. Applications for Faraday's products include robotics, process control, numerical control, data acquisition, programmable controls, medical equipment, measurement instrumentation, diagnostic equipment, test equipment, data logging, intelligent terminals, point-of-sale equipment, personal computers, communications and CAD/CAM.
Section 2

PC BUS DESIGNER'S GUIDE

PREPARED BY

FARADAY ELECTRONICS

DEC 1985
PREFACE

This guide is intended for the design engineers who are contemplating board or system design based on the PC BUS. It defines the hardware specifications for the PC BUS. It also defines all the BIOS calls that are required to write software for PC BUS based designs.
TABLE OF CONTENTS

PREFACE ......................................................................................................................... 2-2
INTRODUCTION ............................................................................................................... 2-4

Scope ................................................................................................................................. 2-5
Processor ......................................................................................................................... 2-5
Peripherals ....................................................................................................................... 2-5
Memory Map .................................................................................................................... 2-6
BUS Description .............................................................................................................. 2-6
Timing ............................................................................................................................... 2-8
Physical Dimensions ....................................................................................................... 2-11
PC Bios ............................................................................................................................ 2-13
INTRODUCTION

The PC BUS, introduced by IBM, is a simple BUS structure for an 8 bit microprocessor system. It is a 62 pin bus, logically organized and easily configurable for all applications. The bus facilitates ease of maintenance reduced product size and allows designers to configure their system to their individual sizes, and at the same time utilize the host of third party software and hardware already available for the PC BUS. The PC BUS can be adapted to 16 bit microprocessor design by adding a 36 pin connector to the existing 62 pin bus.

As the world's largest supplier of PC BUS products, Faraday Electronics supplies OEM's with products for applications in robotics, process control, numerical control, data acquisition, medical, test & measurement, intelligent terminals, point of sale communications and CAD/CAM. With our continuing commitment to PC BUS, we add value with innovative products to meet customer's demands for embedded solutions with 100% PC BUS compatibility.

We are offering this guide as an aid to help you design your product with more ease. If you need more information, please call your nearest Faraday Sales Office.
PC BUS SPECIFICATIONS

OVERVIEW

The PC BUS defines an 8 bit microprocessor bus that supports one mega byte of memory, six levels of interrupts and four DMA channels. The bus master is an INTEL 8088 based SBC plug-in-card that drives a passive backplane with typically six or eight expansion slots. Any peripheral card can be plugged into these expansion slots provided they meet the specifications of the PC BUS structure defined in the following sections. Among its unique features is the ROM based PC BIOS firmware that makes hardware transparent to programmers and facilitates easier programming.

SCOPE

The scope of the PC BUS specifications as defined in the following sections include:

- PC BUS pin assignments
- PC BUS signal timing
- Memory and I/O address maps
- Electrical requirements
- PC BUS BIOS interrupt vectors

These specifications do not include the following:

- User interfaces
- Functions of various plug in cards
- Interchangeability of various cards

PROCESSOR

The standard processor for the PC bus is the Intel 8088 running at either 4.77 MHz or 7.16 MHz. The 8087 coprocessor is also supported. PC BUS single board computers also include the following features:

- Keyboard port
- Speaker port
- Interrupt controller
- DMA controller
- Timer

PERIPHERALS

There are a wide variety of peripherals available for the PC bus however some have standard addresses. Addresses 000 to 1FF are reserved for peripherals on the CPU board, while addresses 200 to 3FF are available for use by plug in peripheral boards.

<table>
<thead>
<tr>
<th>I/O Address</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>000 - 00F</td>
<td>DMA</td>
</tr>
<tr>
<td>020 - 021</td>
<td>Interrupt controller</td>
</tr>
<tr>
<td>040 - 043</td>
<td>Timer</td>
</tr>
<tr>
<td>060 - 063</td>
<td>PIO</td>
</tr>
<tr>
<td>080 - 083</td>
<td>DMA page register</td>
</tr>
<tr>
<td>0A0</td>
<td>NMI enable register</td>
</tr>
<tr>
<td>0A1 - 1FF</td>
<td>Reserved</td>
</tr>
<tr>
<td>200 - 20F</td>
<td>Joy stick</td>
</tr>
<tr>
<td>210 - 217</td>
<td>Expansion Unit</td>
</tr>
<tr>
<td>278 - 27F</td>
<td>Printer Adapter # 2</td>
</tr>
<tr>
<td>2F8 - 2FF</td>
<td>COM2 (serial port #2)</td>
</tr>
<tr>
<td>320 - 32F</td>
<td>Hard disk adapter</td>
</tr>
<tr>
<td>378 - 37F</td>
<td>Printer adapter # 1</td>
</tr>
<tr>
<td>380 - 38F</td>
<td>SDLC communications adapter</td>
</tr>
<tr>
<td>380 - 389</td>
<td>BISYNC adapter #2</td>
</tr>
<tr>
<td>3A0 - 3A9</td>
<td>BISYNC adapter #1</td>
</tr>
<tr>
<td>3B0 - 3BF</td>
<td>Monochrome display adapter or EGA</td>
</tr>
<tr>
<td>3C0 - 3CF</td>
<td>EGA</td>
</tr>
<tr>
<td>3D0 - 3DF</td>
<td>Color graphics adapter or EGA</td>
</tr>
<tr>
<td>3F0 - 3F7</td>
<td>Floppy disk adapter</td>
</tr>
<tr>
<td>3F8 - 3FF</td>
<td>COM1 (serial port #1)</td>
</tr>
</tbody>
</table>
MEMORY MAP

<table>
<thead>
<tr>
<th>Address</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000 - 9FFFF</td>
<td>0 - 640K RAM</td>
</tr>
<tr>
<td>A0000 - AFFFF</td>
<td>Reserved for EGA</td>
</tr>
<tr>
<td>B0000 - B7FFF</td>
<td>Monochrome adapter or EGA</td>
</tr>
<tr>
<td>B8000 - BFFFF</td>
<td>Color graphics adapter or EGA</td>
</tr>
<tr>
<td>C0000 - C3FFF</td>
<td>Reserved for EGA BIOS</td>
</tr>
<tr>
<td>C8000 - C9FFF</td>
<td>Hard disk controller</td>
</tr>
<tr>
<td>CA000 - FDFFF</td>
<td>User PROM</td>
</tr>
<tr>
<td>FE000 - FFFFF</td>
<td>BIOS</td>
</tr>
</tbody>
</table>

BUS DESCRIPTION

The PC BUS consists of 62 pin edge connectors on .8" centers. The data bus is 8 bits and the address bus is 20 bits. There are 8 interrupts, six of them go to the bus and two are used internal to the CPU. There are 4 DMA channels of which 3 are available on the bus. DMA channel 0 is used to refresh any dynamic memory used in the system.

There are 4 voltage levels present: +5v, +12v, -12v, and -5v. The CPU needs only +5v. Most peripherals do not use the -5v.

The maximum load placed on the bus by any plug in card should not exceed 2 LSTTL loads.

All memory cycles generated by the CPU are 4 clock cycles. All I/O cycles generated by the CPU are 5 clock cycles. All DMA cycles are 5 clock cycles. There is a ready line to extend cycles for slow devices on the bus.
# I/O Channel Description

<table>
<thead>
<tr>
<th>Signal</th>
<th>I/O</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+RESET</td>
<td>Out</td>
<td>This signal is the system reset.</td>
</tr>
<tr>
<td>+IRQ2 to +IRQ7</td>
<td>In</td>
<td>These signals are the interrupt request lines. Interrupt 2 has the highest priority and interrupt 7 the lowest. The signal should be held high until acknowledged by the interrupt service routine.</td>
</tr>
<tr>
<td>+DRQ1 to +DRQ3</td>
<td>In</td>
<td>These signals are the DMA request lines. +DRQ1 has the highest priority and +DRQ3 the lowest. The line should be high until the corresponding DACK is received.</td>
</tr>
<tr>
<td>-DACK0 to -DACK3</td>
<td>Out</td>
<td>These signals are the DMA acknowledge lines. -DACK0 is reserved for refresh, and a refresh cycle is indicated by -DACK0 and -MEMR.</td>
</tr>
<tr>
<td>+T/C</td>
<td>Out</td>
<td>This signal indicates that a DMA channel has reached its terminal count.</td>
</tr>
<tr>
<td>-MEMW</td>
<td>Out</td>
<td>This signal indicates a memory write.</td>
</tr>
<tr>
<td>-MEMR</td>
<td>Out</td>
<td>This signal indicates a memory read.</td>
</tr>
<tr>
<td>-IOW</td>
<td>Out</td>
<td>This signal indicates an I/O write.</td>
</tr>
<tr>
<td>-IOR</td>
<td>Out</td>
<td>This signal indicates an I/O read.</td>
</tr>
<tr>
<td>+I/O READY</td>
<td>In</td>
<td>When this line is low, the current memory or I/O cycle will be extended in multiples of + clock cycles. The cycle should never be extended beyond 2.1 micro-sec.</td>
</tr>
<tr>
<td>+OSC</td>
<td>Out</td>
<td>This is a 14.31818 Mhz clock with a 50% duty cycle.</td>
</tr>
<tr>
<td>+CLOCK</td>
<td>Out</td>
<td>This is the 4.77 or 7.16 Mhz system clock. It has a 30% duty cycle for 4.77Mhz and 50% for 7.16Mhz.</td>
</tr>
<tr>
<td>+AEN</td>
<td>Out</td>
<td>When this line is high, the DMA chip has control of the bus.</td>
</tr>
<tr>
<td>-I/O CHECK</td>
<td>In</td>
<td>This line is used to indicate that there is an error on a device in the expansion bus. The CPU will receive a NMI.</td>
</tr>
<tr>
<td>+ALE</td>
<td>Out</td>
<td>This signal is used to indicate when the address bus is valid. Processor addresses are latched on the falling edge of +ALE.</td>
</tr>
<tr>
<td>+DO to +D7</td>
<td>In/Out</td>
<td>These signals are the data bus.</td>
</tr>
<tr>
<td>+AO to +A19</td>
<td>Out</td>
<td>These signals are the address bus. For I/O operations, only +AO to +A9 are used.</td>
</tr>
</tbody>
</table>
TIMING

CPU MEMORY READ CYCLE

CLK

ALE

ADDR

0-19

NMEMR

LATCH READ DATA

VALID ADDRESS

CPU MEMORY WRITE CYCLE

CLK

ALE

ADDR

0-19

NMEMW

DATA

0-7

VALID DATA
NOTE: The address on the bus is the memory address

NOTE: The address on the bus is the memory address
PHYSICAL DIMENSIONS

The PC BUS circuit cards conform to two standard lengths, a full size card length or a micro size card length. The card dimensions are given in figures 2-8, 2-9, and 2-10.

<table>
<thead>
<tr>
<th>CARD DIMENSIONS</th>
<th>INCHES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NOMINAL</td>
</tr>
<tr>
<td>Micro Size</td>
<td>Card Length</td>
</tr>
<tr>
<td></td>
<td>Card Height</td>
</tr>
<tr>
<td>Full Size</td>
<td>Card Length</td>
</tr>
<tr>
<td></td>
<td>Card Height</td>
</tr>
</tbody>
</table>

Figure 2-8. Card Dimensions

FABRICATION DIMENSIONS

Figure 2-9. Micro Size Card Outline
Figure 2-10. Full Size BUS Card Outline
The BIOS resides in ROM on the CPU and provides the power up diagnostics and device drivers for the keyboard, video, etc. The BIOS is entered via software interrupts. In general the function to be performed is in the AH register. Other parameters are passed via registers.

<table>
<thead>
<tr>
<th>Vector Address</th>
<th>Interrupt #</th>
<th>Routine</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-03</td>
<td>0</td>
<td>Divide by zero</td>
</tr>
<tr>
<td>04-07</td>
<td>1</td>
<td>Single step</td>
</tr>
<tr>
<td>08-0B</td>
<td>2</td>
<td>NMI</td>
</tr>
<tr>
<td>0C-0F</td>
<td>3</td>
<td>Breakpoint</td>
</tr>
<tr>
<td>10-13</td>
<td>4</td>
<td>Overflow</td>
</tr>
<tr>
<td>14-17</td>
<td>5</td>
<td>Print screen</td>
</tr>
<tr>
<td>18-1B</td>
<td>6</td>
<td>Reserved</td>
</tr>
<tr>
<td>1C-1F</td>
<td>7</td>
<td>Reserved</td>
</tr>
<tr>
<td>20-23</td>
<td>8</td>
<td>Timer — Hardware interrupt 0</td>
</tr>
<tr>
<td>24-27</td>
<td>9</td>
<td>Keyboard — Hardware interrupt 1</td>
</tr>
<tr>
<td>28-2B</td>
<td>A</td>
<td>Hardware interrupt 2</td>
</tr>
<tr>
<td>2C-2F</td>
<td>B</td>
<td>COM 2 — Hardware interrupt 3</td>
</tr>
<tr>
<td>30-33</td>
<td>C</td>
<td>COM 1 — Hardware interrupt 4</td>
</tr>
<tr>
<td>34-37</td>
<td>D</td>
<td>Hard disk — Hardware interrupt 5</td>
</tr>
<tr>
<td>38-3B</td>
<td>E</td>
<td>Floppy disk — Hardware interrupt 6</td>
</tr>
<tr>
<td>3C-3F</td>
<td>F</td>
<td>Printer — Hardware interrupt 7</td>
</tr>
<tr>
<td>40-43</td>
<td>10</td>
<td>Video</td>
</tr>
<tr>
<td>44-47</td>
<td>11</td>
<td>Configuration</td>
</tr>
<tr>
<td>48-4B</td>
<td>12</td>
<td>Memory size</td>
</tr>
</tbody>
</table>

Note: Interrupts 1D, 1E, 1F, 43, and 44 are not interrupt routines, but are pointers to parameter tables.

The following is a description of the BIOS diagnostic program, that runs each time the CPU is reset.

a. The CPU, EPROM, DMA, Timer, RAM memory, and keyboard are tested. (It is not necessary to have a keyboard installed.)

b. BIOS vectors are initialized in low memory.

c. The system is configured for memory size, number of serial ports, parallel ports and type of video controller.

d. A scan is done of the EPROM area from C0000H to FDFFFH. If a PROM is found with the proper format, a call is made to the starting address of the PROM program. It is up to the program to do a return.

<table>
<thead>
<tr>
<th>Address</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00-01</td>
<td>ID byte (55AA)</td>
</tr>
<tr>
<td>02</td>
<td>Size of PROM in 512 byte blocks</td>
</tr>
<tr>
<td>03</td>
<td>Starting address of PROM program</td>
</tr>
<tr>
<td>Last byte</td>
<td>Checksum</td>
</tr>
</tbody>
</table>
e. An interrupt 19H boots the disk operating system.

The following is a description of the BIOS drivers.

Print Screen   Interrupt 05H
This program causes the screen to be sent out character by character to the active printer device.

Video   Interrupt 10H
This program supports three types of displays—a monochrome character adapter, a color graphics adapter, and an enhanced graphics adapter (EGA).

The graphics adapters may be run in graphics or character mode. In character mode an on board character generator is used. In graphics mode character are generated from a character table in the BIOS. The character table is pointed to by vector 1F for the Color graphics adapter and by 1F and 44 for the EGA.

Multiple pages are supported when using the graphics adapters.

Routines q through y are for the EGA only.

a. Set Video mode

Input Registers:

\[ \begin{align*}
\text{AH} &= \ 00 \\
\text{AL} &= \text{Mode}
\end{align*} \]

**Color Graphics Adapter**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Format</th>
<th>Pages</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40 X 25 Character, monochrome</td>
<td>8</td>
<td>TV or Color</td>
</tr>
<tr>
<td>1</td>
<td>40 X 25 Character, color</td>
<td>8</td>
<td>TV or Color</td>
</tr>
<tr>
<td>2</td>
<td>80 X 25 Character, monochrome</td>
<td>4</td>
<td>Color</td>
</tr>
<tr>
<td>3</td>
<td>80 X 25 Character, color</td>
<td>4</td>
<td>Color</td>
</tr>
<tr>
<td>4</td>
<td>320 X 200 X 2 graphics</td>
<td>1</td>
<td>Color</td>
</tr>
<tr>
<td>5</td>
<td>320 X 200 X 1 graphics</td>
<td>1</td>
<td>Color</td>
</tr>
<tr>
<td>6</td>
<td>640 X 200 X 1 graphics</td>
<td>1</td>
<td>Color</td>
</tr>
</tbody>
</table>

**Monochrome Adapter**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Format</th>
<th>Pages</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>80 X 25 Character, monochrome</td>
<td>1</td>
<td>Monochrome</td>
</tr>
</tbody>
</table>

**EGA**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Format</th>
<th>Pages</th>
<th>Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>40 X 25 Character, monochrome</td>
<td>8</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>01</td>
<td>40 X 25 Character, color</td>
<td>8</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>02</td>
<td>80 X 25 Character, monochrome</td>
<td>8</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>03</td>
<td>80 X 25 Character, color</td>
<td>8</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>04</td>
<td>320 X 200 X 2 graphics</td>
<td>1</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>05</td>
<td>320 X 200 X 1 graphics</td>
<td>1</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>06</td>
<td>640 X 200 X 1 graphics</td>
<td>1</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>07</td>
<td>80 X 25 Character, monochrome</td>
<td>8</td>
<td>Monochrome</td>
</tr>
<tr>
<td>0D</td>
<td>320 X 200 X 4 graphics</td>
<td>8</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>0E</td>
<td>640 X 200 X 4 graphics</td>
<td>4</td>
<td>Color or Hi Res</td>
</tr>
<tr>
<td>0F</td>
<td>640 X 350 X 1 graphics</td>
<td>2</td>
<td>Monochrome or Hi Res</td>
</tr>
<tr>
<td>10</td>
<td>640 X 350 X 4 graphics</td>
<td>2</td>
<td>Hi Res</td>
</tr>
</tbody>
</table>
b. Set cursor type

Input registers:

- \( AH = 01 \)
- \( CH = \) Start line for cursor (bits 0-4).
- \( CL = \) End line for cursor (bits 0-4).

c. Set cursor position

Input registers:

- \( AH = 02 \)
- \( DH, DL = \) Row, column
- \( BH = \) Page

d. Read cursor position

Input registers:

- \( AH = 03 \)
- \( BH = \) Page

Output registers:

- \( DH, DL = \) Row, column
- \( CX = \) Cursor mode (See Set Cursor Type)

e. Read light pen position

Input registers:

- \( AH = 04 \)

Output registers:

- \( AH = 0 \) Light pen inactive
- \( 1 \) Light pen active
- \( DH, DL = \) Row, column
- \( CH = \) Raster line
- \( BX = \) Pixel column

f. Select active display page

Input registers:

- \( AH = 05 \)
- \( AL = \) page

g. Scroll active page up

Input registers:

- \( AH = 06 \)
- \( AL = \) # of rows to scroll up (if 0, entire block is blanked)
- \( CH, CL = \) Row, column of upper left hand corner of the block
- \( DH, DL = \) Row, column of lower right hand corner of block
- \( BH = \) Attribute of blank characters for vacated lines

h. Scroll active page down

Input registers:

- \( AH = 07 \)
- \( AL = \) # of rows to scroll down (if 0, entire block is blanked)
- \( CH, CL = \) Row, column of upper left hand corner of the block
- \( DH, DL = \) Row, column of lower right hand corner of block
- \( BH = \) Attribute of blank characters for vacated lines

i. Read character and attribute at current cursor position

Input registers:

- \( AH = 08 \)
- \( BH = \) Page

Output registers:

- \( AL = \) Character
- \( AH = \) Attribute (character modes only)
j. Write character and attribute at current cursor position

Input registers:

\[
\begin{align*}
AH &= 09 \\
AL &= \text{Character} \\
BH &= \text{Page} \\
BL &= \text{Attribute (character modes only)} \\
&\quad \text{or} \\
&\quad \text{Color (graphics modes only)} \\
CX &= \# \text{ of characters to write}
\end{align*}
\]

k. Write character at current cursor position

Input registers:

\[
\begin{align*}
AH &= 0A \\
AL &= \text{Character} \\
BH &= \text{Page} \\
CX &= \# \text{ of characters to write}
\end{align*}
\]

l. Set color palette (320 X 200 X 2 only)

Input registers:

\[
\begin{align*}
AH &= 0B \\
BH &= 0 \text{ Background color set} \\
BL &= \text{Background color (1 of 16)} \\
&\quad \text{or} \\
BH &= 1 \text{ Palette select} \\
BL &= 0 \text{ Green, red, yellow} \\
&\quad 1 \text{ Cyan, magenta, white}
\end{align*}
\]

m. Write dot

Input registers:

\[
\begin{align*}
AH &= 0C \\
AL &= \text{Dot value (Bit 7 = 1 causes value to be exclusive or'd with existing value)} \\
CX &= \text{Column (in pixels)} \\
DX &= \text{Row (in pixels)}
\end{align*}
\]

n. Read dot

Input registers:

\[
\begin{align*}
AH &= 0D \\
CX &= \text{Column (in pixels)} \\
DX &= \text{Row (in pixels)}
\end{align*}
\]

Output registers:

\[
\begin{align*}
AL &= \text{Dot value}
\end{align*}
\]

o. Write teletype

Input registers:

\[
\begin{align*}
AH &= 0E \\
AL &= \text{Character} \\
BL &= \text{Foreground color (graphics)}
\end{align*}
\]

p. Get current video state

Input registers:

\[
\begin{align*}
AH &= 0F
\end{align*}
\]

Output registers:

\[
\begin{align*}
AL &= \text{Mode} \\
AH &= \# \text{ of columns} \\
BH &= \text{Active page}
\end{align*}
\]
q. Set palette (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 10 \\
\text{AL} & = 0 \\
\text{BL} & = \text{Palette register} \\
\text{BH} & = \text{Palette value}
\end{align*}
\]

or

\[
\begin{align*}
\text{AL} & = 1 \\
\text{BH} & = \text{overscan value}
\end{align*}
\]

or

\[
\begin{align*}
\text{AL} & = 2 \\
\text{EX:DX} & = \text{pointer to table} \\
\text{bytes 0 -15 are palette table} \\
\text{byte 16 is overscan value}
\end{align*}
\]

Output registers:

\[
\begin{align*}
\text{ES:BP} & = \text{pointer}
\end{align*}
\]

t. Adapter status (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 12 \\
\text{BL} & = 10
\end{align*}
\]

Output registers:

\[
\begin{align*}
\text{BH} & = 0 \text{ Color mode} \\
\text{BL} & = 0 \text{ 64K adapter memory} \\
\text{CH} & = \text{Feature Bits} \\
\text{CL} & = \text{Switch Setting}
\end{align*}
\]

r. Load character table (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 11 \\
\text{AL} & = \text{type of load} \\
\text{ES:BP} & = \text{pointer to user table} \\
\text{BL} & = \text{block} \\
\text{BH} & = \text{bytes per character} \\
\text{CX} & = \text{count} \\
\text{DX} & = \text{offset into table}
\end{align*}
\]

s. Get character table status (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 11 \\
\text{AL} & = 30 \\
\text{BL} & = \text{0 interrupt 1FH pointer} \\
& \text{1 interrupt 44H pointer} \\
& \text{2 ROM 8 X 14 pointer} \\
& \text{3 ROM double dot pointer} \\
& \text{4 ROM double dot top pointer} \\
& \text{5 ROM 9 X 14 pointer}
\end{align*}
\]

Output registers:

\[
\begin{align*}
\text{ES:BP} & = \text{pointer}
\end{align*}
\]

u. Select alternate print screen routine (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 12 \\
\text{BL} & = 20
\end{align*}
\]

v. Write character string—cursor not moved (char,char,...) (EGA only)

Input registers:

\[
\begin{align*}
\text{AH} & = 13 \\
\text{AL} & = 0 \\
\text{BL} & = \text{Attribute} \\
\text{BH} & = \text{Page} \\
\text{CX} & = \text{Character count} \\
\text{DX} & = \text{Row, column start of write} \\
\text{ES:BP} & = \text{Start of Buffer}
\end{align*}
\]

2-17
w. Write character string—cursor moved (char, char,...) (EGA only)

**Input registers:**

- $AH = 13$
- $AL = 1$
- $BL = \text{Attribute}$
- $BH = \text{Page}$
- $CX = \text{Character count}$
- $DX = \text{Row, column start of write}$
- $ES:BP = \text{Start of buffer}$

x. Write character, attribute string—cursor not moved (char, attr, char, attr,...) (EGA only)

**Input registers:**

- $AH = 13$
- $AL = 2$
- $BH = \text{Page}$
- $CX = \text{Character count}$
- $DX = \text{Row, column start of write}$
- $ES:BP = \text{Start of buffer}$

y. Write character, attribute string—cursor moved (char, attr, char, attr,...) (EGA only)

**Input registers:**

- $AH = 13$
- $AL = 3$
- $BH = \text{Page}$
- $CX = \text{Character count}$
- $DX = \text{Row, column start of write}$
- $ES:BP = \text{Start of buffer}$

### Get Configuration Interrupt 11H

**Output registers:**

- $AX = \text{Configuration}$

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-14</td>
<td># of parallel ports</td>
</tr>
<tr>
<td>13</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>Joystick installed</td>
</tr>
<tr>
<td>11-9</td>
<td># of serial ports</td>
</tr>
<tr>
<td>8</td>
<td>—</td>
</tr>
<tr>
<td>7-6</td>
<td># of floppy disk (if bit 0 = 1)</td>
</tr>
<tr>
<td>5-4</td>
<td>Video mode at boot time</td>
</tr>
<tr>
<td>3-2</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>8087 coprocessor installed</td>
</tr>
<tr>
<td>0</td>
<td>floppy disk installed</td>
</tr>
</tbody>
</table>

### Memory Size Interrupt 12H

**Output registers:**

- $AX = \text{Number of 1K blocks of RAM memory}$
Disk Interrupt 13H

This program handles floppy and hard disk. Functions g through u are for the hard disk only.

The following table is a summary of the values passed to the Disk routine. *Note: The top two bits of the cylinder number are put into the high two bits of the CL register.

<table>
<thead>
<tr>
<th>Register</th>
<th>Parameter</th>
<th>Floppy</th>
<th>Hard Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL</td>
<td>Drive #</td>
<td>0-3</td>
<td>80H-81H (drives 1-8)</td>
</tr>
<tr>
<td>DH</td>
<td>Head</td>
<td>0-1</td>
<td>0-7</td>
</tr>
<tr>
<td>CH</td>
<td>Track or cylinder</td>
<td>0-39 (Track)</td>
<td>0-1023 (cylinder)*</td>
</tr>
<tr>
<td>CL</td>
<td>Sector</td>
<td>1-9</td>
<td>1-63</td>
</tr>
<tr>
<td>AL</td>
<td># of sectors</td>
<td>1-9</td>
<td>1-80 for normal R/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-79 for R/W long</td>
</tr>
</tbody>
</table>

The following two tables summarize the status codes received back from a call to the Disk routine.

### Floppy Status Codes

<table>
<thead>
<tr>
<th>Status Code</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Illegal command passed to routine</td>
</tr>
<tr>
<td>02</td>
<td>Address mark not found</td>
</tr>
<tr>
<td>03</td>
<td>Write attempted to protected disk</td>
</tr>
<tr>
<td>04</td>
<td>Sector not found</td>
</tr>
<tr>
<td>08</td>
<td>DMA overrun</td>
</tr>
<tr>
<td>09</td>
<td>Attempt to cross 64K memory boundary</td>
</tr>
<tr>
<td>10</td>
<td>CRC error on read</td>
</tr>
<tr>
<td>20</td>
<td>FDC failure</td>
</tr>
<tr>
<td>40</td>
<td>Seek error</td>
</tr>
<tr>
<td>80</td>
<td>FDC timeout error</td>
</tr>
</tbody>
</table>

### Hard Disk Status Codes

<table>
<thead>
<tr>
<th>Status Code</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Illegal command passed to routine</td>
</tr>
<tr>
<td>02</td>
<td>Address mark not found</td>
</tr>
<tr>
<td>04</td>
<td>Sector not found</td>
</tr>
<tr>
<td>05</td>
<td>Reset failed</td>
</tr>
<tr>
<td>07</td>
<td>Drive initialize failure</td>
</tr>
<tr>
<td>09</td>
<td>Attempt to cross 64K memory boundary</td>
</tr>
<tr>
<td>0B</td>
<td>Bad track</td>
</tr>
<tr>
<td>10</td>
<td>Uncorrectable ECC read error</td>
</tr>
<tr>
<td>11</td>
<td>Correctable ECC read error</td>
</tr>
<tr>
<td>20</td>
<td>Controller error</td>
</tr>
<tr>
<td>40</td>
<td>Seek error</td>
</tr>
<tr>
<td>80</td>
<td>Timeout</td>
</tr>
<tr>
<td>BB</td>
<td>Undefined error</td>
</tr>
<tr>
<td>FF</td>
<td>Sense failed</td>
</tr>
</tbody>
</table>

a. Reset the disk

Input registers:

AH = 00

Output registers:

AH = Status
CY = 0 No error
     1 Error

b. Read status of last disk operation

Input registers:

AH = 01
DL < 80 Floppy
DL >= 80 Hard disk

Output registers:

AH = Status
CY = 0 No error
     1 Error
c. Read specific sectors to memory

Input registers:

AH = 02
ES:BX = Address of memory buffer
DL = Drive #
DH = Head
CX = Track or cylinder, sector
AL = # of sectors

Output registers:

AH = Status
CY = 0 No error
      1 Error

d. Write specific sectors from memory

Input registers:

AH = 03
ES:BX = Address of memory buffer
DL = Drive #
DH = Head
CX = Track or cylinder, sector
AL = # of sectors

Output registers:

AH = Status
CY = 0 No error
      1 Error

e. Verify specific sectors

Input registers:

AH = 04
DL = Drive #
DH = Head
CX = Track or cylinder, sector
AL = # of sectors

Output registers:

AH = Status
CY = 0 No error
      1 Error

f. Format specific track

Input registers:

AH = 05
DL = Drive #
DH = Head
CX = Track or cylinder, sector
AL = Interleave (1-16) (fixed disk only)
     Sector/Track (floppy only)
ES:BX = Address of format information
       (floppy only)

Output registers:

AH = Status
CY = 0 No error
      1 Error

f. Format specific track

Input registers:

AH = 06
DL = Drive #
DH = Head
CX = Cylinder, sector
AL = Interleave (1-16)

Output registers:

AH = Status
CY = 0 No error
      1 Error

h. Format the drive starting at specific track

Input registers:

AH = 07
DL = Drive #
DH = Head
CX = Cylinder, sector
AL = Interleave (1-16)

Output registers:

AH = Status
CY = 0 No error
      1 Error
i. Get the current drive parameters

Input registers:

```
AH = 08
```

Output registers:

```
AH = Status
CL = Sectors per track (bits 0-5)
    Maximum cylinders (bits 6-7)
CH = Maximum cylinders
DH = Maximum heads
DL = # of drives
CY = 0 No error
    1 Error
```

j. Initialize drive characteristics

Input registers:

```
AH = 09
```

Output registers:

```
AH = Status
CY = 0 No error
    1 Error
```

k. Read long to memory (Read data and 4 ECC bytes)

Input registers:

```
AH = 0A
ES:BX = Address of memory buffer
DL = Drive #
DH = Head
CX = Cylinder, sector
AL = # of sectors
```

Output registers:

```
AH = Status
CY = 0 No error
    1 Error
```

l. Write long to memory (Write data and 4 ECC bytes)

Input registers:

```
AH = 0E
ES:BX = Address of memory buffer
```

m. Seek

Input registers:

```
AH = 0C
DL = Drive #
DH = Head
CX = Cylinder, sector
```

Output registers:

```
AH = Status
CY = 0 No error
    1 Error
```

n. Reset drive

Input registers:

```
AH = 0D
DL = Drive #
```

Output registers:

```
AH = Status
CY = 0 No error
    1 Error
```

o. Read sector buffer to memory

Input registers:

```
AH = 0F
```
Output registers:

AH =  Status
CY =  0 No error
     1 Error

p. Write sector buffer from memory

Input registers:

AH =  0F
ES:BX = Address of memory buffer

Output registers:

AH =  Status
CY =  0 No error
     1 Error

q. Test drive ready

Input registers:

AH =  10
DL =  Drive #

Output registers:

AH =  Status
CY =  0 No error
     1 Error

r. Recalibrate

Input registers:

AH =  11

Output registers:

AH =  Status
CY =  0 No error
     1 Error

s. Run controller RAM diagnostic

Input registers:

AH =  12

Output registers:

AH =  Status
CY =  0 No error
     1 Error

t. Run drive diagnostic

Input registers:

AH =  13

Output registers:

AH =  Status
CY =  0 No error
     1 Error

u. Run controller diagnostic

Input registers:

AH =  14

Output registers:

AH =  Status
CY =  0 No error
     1 Error

Serial Interrupt 14H

This program provides support for asynchronous serial ports labeled COM1, COM2, COM3, COM4. The base address and timeout value of each port is stored in low memory.

<table>
<thead>
<tr>
<th>Port</th>
<th>Address Location</th>
<th>Timeout value Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM1</td>
<td>00400</td>
<td>0047C</td>
</tr>
<tr>
<td>COM2</td>
<td>00402</td>
<td>0047D</td>
</tr>
<tr>
<td>COM3</td>
<td>00404</td>
<td>0047E</td>
</tr>
<tr>
<td>COM4</td>
<td>00406</td>
<td>0047F</td>
</tr>
</tbody>
</table>

a. Initialize the UART

Input registers:

AH =  00
AL =  UART parameters
7 6 5  Baud  4 3  Parity
0 0 0 110  0 0  No parity
0 0 1 150  0 1  Odd parity
0 1 0  300  1 0  No parity
0 1 1  600  1 1  Even parity
1 0 0  1200 1 0
1 0 1  2400 1 1
1 1 0  4800 1 1
1 1 1  9600 1 1

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Timeout</td>
</tr>
<tr>
<td>6</td>
<td>XMT shift register empty</td>
</tr>
<tr>
<td>5</td>
<td>XMT hold register empty</td>
</tr>
<tr>
<td>4</td>
<td>Break</td>
</tr>
<tr>
<td>3</td>
<td>Framing error</td>
</tr>
<tr>
<td>2</td>
<td>Parity error</td>
</tr>
<tr>
<td>1</td>
<td>Over run error</td>
</tr>
<tr>
<td>0</td>
<td>Data Ready</td>
</tr>
</tbody>
</table>

2  Stop bits 1 0  Data
0 1  Stop bit 1 0  7 bits
1 2  Stop bits 1 1  8 bits

Input registers:

\[
DX = \begin{cases} 
0 & \text{COM1} \\
1 & \text{COM2} \\
2 & \text{COM3} \\
3 & \text{COM4} 
\end{cases}
\]

Output registers:

\[
AX = \text{status (see status, AH = 3)}
\]

b. Send transmit character

This routine sets DTR and RTS, and waits for DSR and CTS. If these do not set, a timeout error occurs.

Input registers:

\[
\begin{align*}
AH &= 01 \\
AL &= \text{Transmit character} \\
DX &= \begin{cases} 
0 & \text{COM1} \\
1 & \text{COM2} \\
2 & \text{COM3} \\
3 & \text{COM4} 
\end{cases}
\end{align*}
\]

Output registers:

\[
AH = \text{Status}
\]

c. Get receive character

This routine sets DTR and waits for DSR. If it does not set, a timeout error occurs. If DSR is set, the routine waits for a receive character. If not is received, a timeout error occurs.

Input registers:

\[
\begin{align*}
AH &= 02 \\
DX &= \begin{cases} 
0 & \text{COM1} \\
1 & \text{COM2} \\
2 & \text{COM3} \\
3 & \text{COM4} 
\end{cases}
\end{align*}
\]

Output registers:

\[
\begin{align*}
AH &= \text{Status} \\
AL &= \text{character}
\end{align*}
\]
d. Get status

Input registers:

\[
\begin{align*}
\text{AH} &= 03 \\
\text{DX} &= 0 \text{ COM1} \\
       &= 1 \text{ COM2} \\
       &= 2 \text{ COM3} \\
       &= 3 \text{ COM4}
\end{align*}
\]

Output registers:

\[
\text{AX} = \text{Status}
\]

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Timeout</td>
</tr>
<tr>
<td>14</td>
<td>Transmitter shift reg empty</td>
</tr>
<tr>
<td>13</td>
<td>Transmitter holding reg empty</td>
</tr>
<tr>
<td>12</td>
<td>Break</td>
</tr>
<tr>
<td>11</td>
<td>Framing error</td>
</tr>
<tr>
<td>10</td>
<td>Parity error</td>
</tr>
<tr>
<td>09</td>
<td>Over run error</td>
</tr>
<tr>
<td>08</td>
<td>Data ready</td>
</tr>
<tr>
<td>07</td>
<td>DCD</td>
</tr>
<tr>
<td>06</td>
<td>Ring</td>
</tr>
<tr>
<td>05</td>
<td>DSR</td>
</tr>
<tr>
<td>04</td>
<td>CTS</td>
</tr>
<tr>
<td>03</td>
<td>Change in DCD</td>
</tr>
<tr>
<td>02</td>
<td>Ring stopped</td>
</tr>
<tr>
<td>01</td>
<td>Change in DSR</td>
</tr>
<tr>
<td>00</td>
<td>Change in CTS</td>
</tr>
</tbody>
</table>

Keyboard Interrupt 16H

a. Get character from the keyboard

This routine waits for a character from the keyboard and returns it in the AX register.

Input registers:

\[
\text{AH} = 00
\]

Output registers:

\[
\begin{align*}
\text{AH} &= \text{Keyboard scan code} \\
\text{AL} &= \text{Character}
\end{align*}
\]

b. Get character and status

This routine gets a character if there is one available and returns it in the AX register. The character remains in the keyboard buffer.

Input registers:

\[
\text{AH} = 01
\]

Output registers:

\[
\begin{align*}
\text{AH} &= \text{Keyboard scan code (If ZF = 0)} \\
\text{AL} &= \text{Character (If ZF = 0)} \\
\text{ZF} &= 1 \text{ No character available} \\
        &= 0 \text{ Character available}
\end{align*}
\]

c. Get the keyboard status

Input registers:

\[
\text{AH} = 02
\]

Output registers:

\[
\text{AL} = \text{Status}
\]

**Printer Interrupt 17H**

This program provides support for 4 printers labeled LPT1, LPT2, LPT3, and LPT4. The base address and timeout values for each printer is stored in low memory.
### Print Character

**Input registers:**

- \( AH = 00 \)
- \( AL = \) Character to be printed
- \( DX = \) LPT1
- \( \) LPT2
- \( \) LPT3
- \( \) LPT4

**Output registers:**

- \( AH = \) Status (See Status, \( AH = 02 \))

### Initialize Printer

**Input registers:**

- \( AH = 01 \)
- \( DX = \) LPT1
- \( \) LPT2
- \( \) LPT3
- \( \) LPT4

**Output registers:**

- \( AH = \) Status (See Status, \( AH = 02 \))

### Get printer status

**Input registers:**

- \( AH = 02 \)
- \( DX = \) LPT1
- \( \) LPT2
- \( \) LPT3
- \( \) LPT4

**Output registers:**

- \( AH = \) Status

---

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Not busy</td>
</tr>
<tr>
<td>6</td>
<td>Acknowledge</td>
</tr>
<tr>
<td>5</td>
<td>Out of paper</td>
</tr>
<tr>
<td>4</td>
<td>Selected</td>
</tr>
<tr>
<td>3</td>
<td>I/O error</td>
</tr>
<tr>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>0</td>
<td>Timeout</td>
</tr>
</tbody>
</table>

### Time of Day   Interrupt 1AH

The time of day is maintained by a timer that is updated at the rate of 18.206 times per second. When the timer has reached 24 hours, it is set to 0.

**a. Read current clock setting**

**Input registers:**

- \( AH = 00 \)

**Output registers:**

- \( AL = \) 0 Clock has not passed 24 hours since last read
- \( <> 0 \) Clock has passed 24 hours since last read
- \( CX = \) High portion of count
- \( DX = \) Low portion of count

**b. Set clock**

**Input registers:**

- \( AH = 01 \)
- \( CX = \) High portion of count
- \( DX = \) Low portion of count

---

### Keyboard User Routine   Interrupt 1BH

This interrupt is caused by a break from the keyboard (CTRL BREAK). Normally, this interrupt is set to a return, however the user may put his own routine here.
Timer User Routine   Interrupt 1CH

This interrupt occurs everytime there is a timer interrupt (approximately 18.2 times a second). Normally this interrupt is set to a return, however the user may put his own routine here.
Section 3

SINGLE BOARD COMPUTERS

FE6400 ................................................................................................................... 3-2
FE6410 Series ........................................................................................................... 3-6
FE6420 Series ........................................................................................................... 3-10
BUS PC ..................................................................................................................... 3-14
Micro PC .................................................................................................................. 3-18
Cmos Micro PC ........................................................................................................ 3-22
A-Tease Series ......................................................................................................... 3-26
BUS AT Series .......................................................................................................... 3-30

3-1
Product Overview

The FE6400 offers full hardware and software compatibility with the IBM PC and XT. It includes up to 256K Ram, two serial ports, one parallel port, 64K EPROM, keyboard port, and five IBM-compatible expansion slots. External dimensions of the board, including tooling holes, connectors and expansion ports, are identical to those of the IBM PC motherboard. The FE6400 supports MS-DOS, PC-DOS, CP/M 86, and Concurrent CP/M.
FE6400 Block Diagram
Technical Description

RAM MEMORY
The board contains 256K of RAM memory. Another 384K of Ram memory may be added in an expansion slot. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 250ns. The RAM is parity checked, and a parity error will generate an NMI.

EPROM MEMORY
The board has from 2K to 32K of EPROM memory and supports 2716, 2732, 2764 and 27128 EPROM chips. The top 32K of memory (address F8000 to FFFFF) is reserved for the EPROM memory. If the board has a BIOS EPROM installed, it will be in EPROM 1. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 8088 that runs at 4.77Mhz. An optional math co-processor, the 8087, is also available.

DMA (8237)
The board has four DMA channels. Channel 0 is used for refresh, and channels 1-3 are available for use by the expansion slots. A DMA transfer must take place within a 64K block. Page registers are used to determine which 64K block is used.

Timer (8253)
Three timer channels are available on the board. Channel 0 is tied to interrupt 1, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 1.05 micro-sec.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

PIO (8255)
The PIO chip is used to read the keyboard port, read the configuration switches, enable and read parity checks, and control the speaker port.

Keyboard Port
The board contains a port for an IBM compatible keyboard. The connector is a 5 pin DIN female type or an optional 5 pin header.

Parallel Port
The board contains a Parallel port that may be used as a printer port. The connector is a 34 pin ribbon cable connector.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1" centers. The board is reset when power is applied, so than an external reset may not be necessary. If the external reset is not used, it may be left open.

Serial Channels
The board has two RS232 serial channels. The connectors are 16 pin DIP sockets. The UARTS are 8250's.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1" centers. To use this port, connect an 8 Ohm speaker between pins 1 and 4.

Serial Monitor
The EPROM BIOS supports a serial terminal as a replacement for the video adapter, monitor, and keyboard. Any ASCII terminal with a RS 232 interface
may be used. There are limitations, however. For example, an ASCII keyboard does not have as many keys as the standard PC keyboard. Not all the video functions are supported in the serial mode, and some application programs bypass the BIOS entirely.

Expansion Slots

There are 5 expansion slots on 1" centers. Each expansion slot is a 62 pin connector. All processor memory cycles are 840 ns and all processor I/O cycles are 1.05 micro-sec. Refresh cycles occur approximately every 15 micro-seconds.

Power

Power is provided to the card through an onboard 8 pin connector. The board does not use -5v, but it is bussed to the expansion slots. The mating connector is MOLEX 09507081. The mating pins are MOLEX 08-50-0106. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 5v</td>
<td>3 Amps</td>
</tr>
<tr>
<td>+12v</td>
<td>50 ma</td>
</tr>
<tr>
<td>-12v</td>
<td>50 ma</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

12" L X 8.5" W

Ordering Information

FE6400/256 FE6400 with 256K Ram
FE6410 Series
PC BUS Single Board Computers

- 100% Hardware and Software Compatible with the IBM PC
- 8088 CPU
- On board Floppy & Monochrome Controller
- 8 Interrupts
- 4 DMA Channels
- 4.77 Mhz Clock Speed
- 3 Timer Channels
- BIOS on board

Product Overview

This series of two-layer boards has options for a floppy disk controller and/or monochrome video display controller integrated on the board. It includes up to 512K Ram, one serial port, one parallel port, 32K EPROM, keyboard port, and three IBM-compatible expansion slots. External dimensions of the board, including tooling holes, connectors and expansion ports, are identical to those of the IBM PC motherboard. The FE6410 series supports MS-DOS, PC-DOS, CP/M 86, and Concurrent CP/M.

<table>
<thead>
<tr>
<th>The FE6410 Series</th>
<th>Floppy Ctrl</th>
<th>Monochrome Ctrl</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE6411</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FE6412</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>FE6413</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
FE6410 Block Diagram

3-7
Technical Description

RAM MEMORY
The board contains up to 512K of RAM memory. Another 128K of Ram memory may be added in an expansion slot. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 250ns. The RAM is parity checked, and a parity error will generate an NMI.

EPROM MEMORY
The board has from 8K to 32K of EPROM memory and supports 2764, 27128 and 27256 EPROM chips. The top 32K of memory (address F8000 to FFFFFF) is reserved for the EPROM memory. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 8088 that runs at 4.77Mhz.

DMA (8237)
The board has four DMA channels. Channel 0 is used for refresh, and channels 1-3 are available for use by the expansion slots. A DMA transfer must take place within a 64K block. Page registers are used to determine which 64K block is used.

Timer (8253)
Three timer channels are available on the board. Channel 0 is tied to interrupt 1, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 1.05 micro-sec.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

Keyboard Port
The board contains a port for an IBM compatible keyboard. The connector is a 5 pin DIN female type or an optional 5 pin header.

Parallel Port
The board contains a Parallel port that may be used as a printer port. The connector is a 34 pin ribbon cable connector.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1" centers. The board is reset when power is applied, so that an external reset may not be necessary. If the external reset is not used, it may be left open.

Floppy Port
The board contains a floppy disk port that will support up to four 5 1/4" floppy disk drives.

Monochrome Port
The board contains a monochrome display adapter. The connector is a 6 pin header on .1" centers.

Serial Channels
The board has one RS232 serial channels. The connector is a 10 pin header. The UART is an 8250.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1" centers. To use this port, connect an 8 OHM speaker between pins 1 and 4.
Serial Monitor
The FE6410 series does not support a serial monitor.

Expansion Slots
There are 3 expansion slots on 1" centers. Each expansion slot is a 62 pin connector. All processor memory cycles are 840 ns and all processor I/O cycles are 1.05 micro-sec. Refresh cycles occur approximately every 15 micro-seconds.

Power
Power is provided to the card through an onboard 8 pin connector. The board does not use -5v, but it is bussed to the expansion slots. The mating connector is MOLEX 09507081. The mating pins are MOLEX 08-50-0106. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>2 Amps</td>
</tr>
<tr>
<td>+12v</td>
<td>50 ma</td>
</tr>
<tr>
<td>-12v</td>
<td>50 ma</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
12" L X 8.5" W

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE6411/256</td>
<td>FE6411 with 256K Ram</td>
</tr>
<tr>
<td>FE6411/512</td>
<td>FE6411 with 512K Ram</td>
</tr>
<tr>
<td>FE6412/256</td>
<td>FE6412 with 256K Ram</td>
</tr>
<tr>
<td>FE6412/512</td>
<td>FE6412 with 512K Ram</td>
</tr>
<tr>
<td>FE6413/256</td>
<td>FE6413 with 256K Ram</td>
</tr>
<tr>
<td>FE6413/512</td>
<td>FE6413 with 512K Ram</td>
</tr>
</tbody>
</table>
FE6420 Series
PC BUS Single Board Computers

- 100% Hardware and Software Compatible with the IBM PC
- 8088 CPU
- On board Floppy Controller
- 8 Interrupts
- 4 DMA Channels
- 4.77 Mhz Clock Speed
- 3 Timer Channels
- BIOS on board

Product Overview

This series of single board computers utilizes Faraday's FE2000 VLSI CPU controller chip and FE2100 floppy disk controller chip. It includes up to 640K Ram, two serial ports, one Centronix parallel port, up to 160K EPROM, keyboard port, optional floppy disk controller, and eight IBM-compatible expansion slots. External dimensions of the board, including tooling holes, connectors and expansion ports, are identical to those of the IBM XT motherboard. The FE6420 series supports MS-DOS, PC-DOS, CP/M 86, and Concurrent CP/M.

<table>
<thead>
<tr>
<th>The FE6420 Series</th>
<th>Floppy Ctlr</th>
<th>Rom Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE6420</td>
<td>No</td>
<td>64K</td>
</tr>
<tr>
<td>FE6421</td>
<td>Yes</td>
<td>64K</td>
</tr>
<tr>
<td>FE6422</td>
<td>No</td>
<td>160K</td>
</tr>
<tr>
<td>FE6423</td>
<td>Yes</td>
<td>160K</td>
</tr>
</tbody>
</table>
FE6420 Block Diagram
Technical Description

RAM MEMORY
The board contains up to 640K of RAM memory. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 250ns. The RAM is parity checked, and a parity error will generate an NMI.

EPROM MEMORY
The board has from 8K to 160K of EPROM memory and supports 2764, 27128, 27256 and 27512 EPROM chips. The top 64K of memory (address F0000 to FFFFF) is reserved for the EPROM memory. The memory cycle is 840ns and the access time is 250ns. The addressing of the EPROMs may be changed by replacing the decoding PROM at U70.

Processor
The main processor is an 8088 that runs at 4.77Mhz. An optional math co-processor the 8087, is also available.

DMA (8237)
The board has four DMA channels. Channel 0 is used for refresh, and channels 1-3 are available for use by the expansion slots. A DMA transfer must take place within a 64K block. Page registers are used to determine which 64K block is used.

Timer (8253)
Three timer channels are available on the board. Channel 0 is tied to interrupt 1, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 1.05 micro-sec.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

Keyboard Port
The board contains a port for an IBM compatible keyboard. The connector is a 5 pin DIN female type or an optional 5 pin header.

Parallel Port
The board contains a parallel port that may be used as a printer port. The connector is a 34 pin ribbon cable connector.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1” centers. The board is reset when power is applied, so that an external reset may not be necessary. If the external reset is not used, it may be left open.

Floppy Port
The board contains a floppy disk port that will support up to four 5 1/4” floppy disk drives.

Serial Channels
The board has two RS232 serial channels. The connectors are 10 pin ribbon cable connectors. The UARTs are 8250s.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1” centers. To use this port, connect an 8 OHM speaker between pins 1 and 4.

Serial Monitor
The FE6420 series does not support a serial monitor.
Expansion Slots

There are 8 expansion slots on .8” centers. Each expansion slot is a 62 pin connector. All processor memory cycles are 840 ns and all processor I/O cycles are 1.05 micro-sec. Refresh cycles occur approximately every 15 micro-seconds.

Power

Power is provided to the card through an onboard 8 pin connector. The board does not use -5v, but it is bussed to the expansion slots. The mating connector is MOLEX 09507081. The mating pins are MOLEX 08-50-0106. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 5v</td>
<td>2 Amps</td>
</tr>
<tr>
<td>+12v</td>
<td>50 ma</td>
</tr>
<tr>
<td>-12v</td>
<td>50 ma</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temp.</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temp.</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

12” L X 8.5” W

Ordering Information

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE6420/256</td>
<td>FE6420 with 256K Ram</td>
</tr>
<tr>
<td>FE6420/640</td>
<td>FE6420 with 640K Ram</td>
</tr>
<tr>
<td>FE6421/256</td>
<td>FE6421 with 256K Ram</td>
</tr>
<tr>
<td>FE6421/640</td>
<td>FE6421 with 640K Ram</td>
</tr>
<tr>
<td>FE6422/256</td>
<td>FE6422 with 256K Ram</td>
</tr>
<tr>
<td>FE6422/640</td>
<td>FE6422 with 640K Ram</td>
</tr>
<tr>
<td>FE6423/256</td>
<td>FE6423 with 256K Ram</td>
</tr>
<tr>
<td>FE6423/640</td>
<td>FE6423 with 640K Ram</td>
</tr>
</tbody>
</table>
Faraday Electronics

BUS PC
PC BUS Single Board Computer

- 100% Hardware and Software Compatible with the IBM PC
- 8088 CPU
- Plug In Form Factor
- 8 Interrupts
- 4 DMA Channels
- 4.77 Mhz Clock Speed
- 3 Timer Channels
- BIOS on board

Product Overview

The BUS PC was designed for maximum compatibility with the IBM PC/XT, containing CPU, memory and I/O board functions. The BUS PC is a plug-in 8088 single board computer, form factor-compatible with IBM PC expansion cards. It features 256K of parity-checked RAM, two serial ports (RS232 and RS232/422 jumper selectable) one parallel port, Faraday's BIOS in EPROM, and a socket for the 8087 co-processor.
BUS PC Block Diagram
Technical Description

RAM MEMORY
The board contains 256K of RAM memory. Another 384K of Ram memory may be added in an expansion slot. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 200ns. The RAM is parity checked, and a parity error will generate an NMI.

EPROM MEMORY
The board contains up to 64K of EPROM memory and supports 2764, 27128 and 27256 EPROM chips. The top 64K of memory (address F0000 to FFFFF) is reserved for the EPROM memory. If the board has a BIOS EPROM installed, it will be in EPROM 1. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 8088 that runs at 4.77Mhz. An optional math co-processor, the 8087, is also available.

DMA (8237)
The board has four DMA channels. Channel 0 is used for refresh, and channels 1-3 are available for use by the expansion slots. A DMA transfer must take place within a 64K block. Page registers are used to determine which 64K block is used.

Timer (8253)
Three timer channels are available on the board. Channel 0 is tied to interrupt 1, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 1.05 micro-sec.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

Keyboard Port
The board contains two ports for an IBM compatible keyboard. There is a 9 pin D connector or an optional 6 pin header.

Parallel Port
The board contains a parallel port that may be used as a printer port. The connector is a 34 pin ribbon cable connector.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1" centers. The board is reset when power is applied, so that an external reset may not be necessary. If the external reset is not used, it may be left open.

NMI Port
The board contains a port which can be used to cause a non-maskable interrupt. The connector is a 2 pin header on .1" centers. If the external NMI is not used it may be left open.

Serial Channels
The board has one RS232 serial port (COM2) and one jumper selectable RS232/422 serial port (COM1). The connector for the RS232 serial port is a 26 pin ribbon cable connector. The connector for the RS232/422 serial port is a 25 pin D connector located in the edge card mounting bracket. The serial ports are 8250 UARTS and may be disabled with jumpers.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1" centers. To use this port, connect an 8 OHM speaker between pins 1 and 4.
Serial Monitor
The BUS PC does not support a serial monitor.

Expansion Slot Connector
There is a 62 pin expansion slot connector. (Note Faraday offers a six slot PC BUS backplane and an eight slot AT BUS backplane.)

Power
Power is provided to the card through the expansion slot. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>2 Amps</td>
</tr>
<tr>
<td>+12v</td>
<td>50 ma</td>
</tr>
<tr>
<td>-12v</td>
<td>50 ma</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
13.15” L X 4.2” W

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS PC/256</td>
<td>BUS PC with 256K Ram</td>
</tr>
</tbody>
</table>
Faraday Electronics

Micro PC
PC BUS Single Board Computer

- 100% Hardware and Software Compatible with the IBM PC
- 8088 CPU
- Plug In Form Factor
- 8 Interrupts
- 4 DMA Channels
- 4.77 Mhz Clock Speed
- 3 Timer Channels
- BIOS on board

Product Overview

Faraday's Micro PC, the industry's smallest PC BUS single board computer, incorporates all the functionality of an IBM PC motherboard. Measuring 4.2" by 6.2", one-fifth the size of a standard IBM motherboard, this board includes an 8088 CPU, an 8087 co-processor socket, keyboard port, speaker port, 256K ram memory, and Faraday's PC compatible ROM BIOS. The Micro PC is form factor-compatible with IBM PC expansion cards, and is designed to fit applications requiring compact size or portability. Its form factor results from Faraday's use of its own FE2010 integrated circuit, which replaces 34 low-power Schottky chips and the entire Intel chip set (minus the 8088) of a standard size IBM PC motherboard.
Micro PC Block Diagram
RAM MEMORY
The board contains 256K of RAM memory. Another 384K of Ram memory may be added in an expansion slot. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 200ns. The RAM is parity checked, and a parity error will generate an NMI.

EPROM MEMORY
The board contains up to 64K of EPROM memory and supports 2764, 27128, 27256 and 27512 EPROM chips. The top 64K of memory (address FE000 to FFFFF) is reserved for the EPROM memory. The top 8K of ROM memory is reserved for the Faraday BIOS, support for the user installed program in the remaining 56K is provided for in the BIOS. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 8088 that runs at 4.77 Mhz. An optional math co-processor, the 8087, is also available.

DMA (8237)
The board has four DMA channels. Channel 0 is used for refresh, and channels 1-3 are available for use by the expansion slots. A DMA transfer must take place within a 64K block. Page registers are used to determine which 64K block is used.

Timer (8253)
Three timer channels are available on the board. Channel 0 is tied to interrupt 1, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 1.05 micro-sec.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

Keyboard Port
The board contains two ports for an IBM compatible keyboard. There is a 9 pin D connector or an optional 6 pin header.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1” centers. The board is reset when power is applied, so that an external reset may not be necessary. If the external reset is not used, it may be left open.

NMI Port
The board contains a port which can be used to cause a non-maskable interrupt. The connector is a 2 pin header on .1” centers. If the external NMI is not used it may be left open.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1” centers. To use this port, connect an 8 OHM speaker between pins 1 and 4.

Serial Monitor
The Micro PC does not support a serial monitor.

Expansion Slot Connector
There is a 62 pin expansion slot connector. (Note Faraday offers a six slot PC BUS backplane and an eight slot AT BUS backplane.)
Power

Power is provided to the card through the expansion slot. Power Requirements:

| +5v          | .5 Amps |

Environment

| Operating temperature | 0 to 55 C |
| Storage temperature   | -40 to 80 C |
| Relative Humidity     | 0% to 90% with no condensation |

Physical Dimensions

6.2” L X 4.2” W

Ordering Information

| MICRO PC/256 | Micro PC with 256K Ram |

3-21
Faraday Electronics

CMOS Micro PC
PC BUS Single Board Computer

- 100% Hardware and Software Compatible with the IBM PC
- 80C88 CPU
- Plug In Form Factor
- 256K NMOS Ram
- +5v @ 150 ma
- 4.77 Mhz Clock Speed
- 8087 Socket
- BIOS on board

Product Overview

Faraday's CMOS Micro PC, the industry's smallest PC BUS single board computer, incorporates all the functionality of Faraday Micro PC with CMOS integration. Measuring 4.2" by 6.2", one-fifth the size of a standard IBM motherboard, this board includes an 80C88 CPU, an 8087 co-processor socket, keyboard port, speaker port, 256K NMOS ram memory, and Faraday's PC compatible ROM BIOS. The CMOS Micro PC is form factor-compatible with IBM PC expansion cards, and is designed to fit applications requiring compact size, low power, high noise immunity and less heat dissipation. Its form factor results from Faraday's use of its own FE2010 integrated circuit, which replaces 34 low-power Schottky chips and the entire Intel chip set (minus the 8088) of a standard size IBM PC motherboard.
CMOS Micro PC Block Diagram
Technical Description

RAM MEMORY
The board contains 256K of NMOS RAM memory. Another 384K of NMOS Ram memory may be added in an expansion slot. The memory is refreshed by use of one of the DMA and timer channels. The memory cycle is 840ns, and the access time is 200ns. The RAM is parity checked, and a parity error will generate an NMI.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

EPROM MEMORY
The board contains up to 64K of EPROM memory and supports 2764, 27128, 27256, and 27512 EPROM chips. The top 64K of memory (address FE000 to FFFFF) is reserved for the EPROM memory. The top 8K of ROM memory is reserved for the Faraday BIOS, support for the user installed program in the remaining 56K is provided for in the BIOS. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 80C88 that runs at 4.77 Mhz. An optional math co-processor, the 8087, is also available.

Keyboard Port
The board contains two ports for an IBM compatible keyboard. There is a 9 pin D connector or an optional 6 pin header.

EPROM MEMORY
The board contains up to 64K of EPROM memory and supports 2764, 27128, 27256, and 27512 EPROM chips. The top 64K of memory (address FE000 to FFFFF) is reserved for the EPROM memory. The top 8K of ROM memory is reserved for the Faraday BIOS, support for the user installed program in the remaining 56K is provided for in the BIOS. The memory cycle is 840ns and the access time is 250ns.

Processor
The main processor is an 80C88 that runs at 4.77 Mhz. An optional math co-processor, the 8087, is also available.

Interrupts (8259)
The board supports 8 levels of vectored interrupts.

Keyboard Port
The board contains two ports for an IBM compatible keyboard. There is a 9 pin D connector or an optional 6 pin header.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1" centers. The board is reset when power is applied, so an external reset may not be necessary. If the external reset is not used, it may be left open.

NMI Port
The board contains a port which can be used to cause a non-maskable interrupt. The connector is a 2 pin header on .1" centers. If the external NMI is not used it may be left open.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1" centers. To use this port, connect an 8 OHM speaker between pins 1 and 4.

Serial Monitor
The CMOS Micro PC does not support a serial monitor.

Expansion Slot Connector
There is a 62 pin expansion slot connector. (Note Faraday offers a six slot PC BUS backplane and an eight slot AT BUS backplane.)
Power

Power is provided to the card through the expansion slot. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>150 mA</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 70 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 °C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

6.2” L X 4.2” W

Ordering Information

CMOS MICRO PC/256  Cmos Micro PC with 256K Ram
Product Overview

The A-Tease series of AT BUS single board computers are available in either 6 or 8 Mhz Clock Speed with all other features remaining the same. The A-Tease features an 80286 processor with optional 80287 math co-processor, one megabyte of onboard memory, two selectable RS232/422 serial ports, one parallel port, reset port, 128K of EPROM, eight expansion slots, and Faraday's BIOS in EPROM. The A-Tease also features eight diagnostic LEDs which can pinpoint board failures during diagnostic testing. The A-Tease is available in 6 or 8 Mhz versions with 10 Mhz in the second quarter of 1986.
A-Tease Block Diagram
Technical Description

RAM MEMORY
The board may contain from 640K to 1024K of RAM memory. Ram memory over 1024K may be added in an expansion slot. The RAM is parity checked and a parity error will generate an NMI.

<table>
<thead>
<tr>
<th>Processor Clock</th>
<th>RAM Type</th>
<th>Wait States</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Mhz</td>
<td>150ns</td>
<td>1</td>
</tr>
<tr>
<td>6 Mhz</td>
<td>150ns</td>
<td>0</td>
</tr>
<tr>
<td>8 Mhz</td>
<td>120ns</td>
<td>1</td>
</tr>
<tr>
<td>8 Mhz</td>
<td>120ns</td>
<td>0</td>
</tr>
</tbody>
</table>

EPROM MEMORY
The board contains from 32K to 128K of PROM memory. Included on the board is 32K of BIOS PROM memory. The rest is user space. The PROMs should be 150ns devices.

Processor
The main processor is an Intel 80286 that runs at 6 Mhz or optionally at 8 Mhz. A math co-processor, the 80287 is optional.

DMA (8237)
There are two 8237 DMA controllers on the board. One is used for 8 bit transfers and one is used for 16 bit transfers. DMA transfers are limited to a 64K block. The 64K block is selected by page registers. There is one page register per DMA channel.

Timer (8254)
Three timer channels are available on the board. Channel 0 is tied to Time of day, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 840 nanoseconds.

Interrupts (8259)
The board supports 15 levels of vectored interrupts.

Clock Calendar
The board contains a CMOS clock calendar chip (146818). The CMOS circuit requires an external 6V battery. The circuit also contains CMOS RAM that is used to hold configuration information.

Battery Port
The board contains a battery port for running the clock calendar. The Port is a 4 pin header.

Power Good Port
The A-Tease contains a Power Good Port that comes from the power supply to indicate when power to the A-Tease is good. This signal holds a reset to the board as long as it is low and allows the board to run when it is high. It is also used to protect the CMOS configuration RAM when power is off.

Keyboard Port
The board contains a port for an IBM compatible PC or AT keyboard. There are two connectors available: a 5 pin DIN and a 6 pin header.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1” centers. The board is reset when power is applied, so that an external reset may not be necessary. If the external reset is not used, it may be left open. The board is also reset by the +POWER GOOD signal from the power supply.

Speaker Port
The board has a port to drive an external speaker. The connector is a 4 pin header on .1” centers. To
use this port, connect an 8 OHM speaker between pins 1 and 4.

**Front Panel Port**
The board contains a port that will drive an LED to indicate that power is on. It also contains a line for a keyswitch. This keyswitch is read by the BIOS during boot. If it is not on, the boot will not complete. The connector is a 5 pin header.

**Parallel Port**
The board contains a parallel printer port. The connector is a 26 pin header. It is intended to mate with a 25 pin D connector.

**Serial Ports**
The board contains two serial ports labeled COM1 and COM2. Each port may be used as either a RS232 or a RS422 port. The UARTS are 16450s. The connectors are 26 pin headers that mate to a 25 pin D type connector or optionally 10 pin headers that mate to a 9 pin D type connector.

**LED Indicators**
There are 8 LED indicators on the board that are connected to the parallel port data bits 0-7. These LEDs are used for diagnostic purposes during boot or manufacturing test mode.

**Expansion Slots**
There are 8 expansion slots on .8" centers. Slots 1 to 8 contain connectors for the standard PC BUS while slots 2, 3, 4, 5, 6, and 8 contain an extra connector to allow 16 bit transfers.

**Power**
Power is provided to the card through an on board 8 pin connector and 4 pin connector. The board does not use -5v, but it is bussed to the expansion slots. The mating connector is MOLEX 09507081 and 09507041. The mating pins are MOLEX 08-50-0106. Power Requirements:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>5 Amps</td>
</tr>
<tr>
<td>+12v</td>
<td>50 mA</td>
</tr>
<tr>
<td>-12v</td>
<td>50 mA</td>
</tr>
</tbody>
</table>

**Environment**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

**Physical Dimensions**
13.8” L x 12” W

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Tease-6 Mhz/640</td>
<td>A-Tease at 6 Mhz with 640K Ram</td>
</tr>
<tr>
<td>A-Tease-6 Mhz/1M</td>
<td>A-Tease at 6 Mhz with 1M Ram</td>
</tr>
<tr>
<td>A-Tease-8 Mhz/640</td>
<td>A-Tease at 8 Mhz with 640K Ram</td>
</tr>
<tr>
<td>A-Tease-8 Mhz/1M</td>
<td>A-Tease at 8 Mhz with 1M Ram</td>
</tr>
</tbody>
</table>
Faraday Electronics

BUS AT Series
AT BUS Single Board Computer

- 100% Compatible with the IBM AT
- 6 or 8 Mhz Clock Speed
- Plug in Single Board
- 15 Interrupts
- 0, 1, Wait States
  Jumper Selectable
- 512K Ram
- 3 Timer Channels
- BIOS on board

Product Overview

The BUS AT is a plug in 80286 based single board computer with the functionality and compatibility of an IBM PC AT. It's form factor is that of a standard AT expansion card measuring 4.8” by 13.15”. It is capable of operation at 0 or 1 wait state and includes 512K ram, a reset port, speaker port, NMI port, CMOS clock calendar, keyboard port and Faraday's BIOS. The BUS At is available in either 6 or 8 Mhz with 10 Mhz available in the second quarter of 1986.

<table>
<thead>
<tr>
<th>The BUS AT Series</th>
<th>Clock Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS AT-6 Mhz</td>
<td>6 Mhz</td>
</tr>
<tr>
<td>BUS AT-8 Mhz</td>
<td>8 Mhz</td>
</tr>
</tbody>
</table>
BUS AT Block Diagram
Technical Description

RAM MEMORY
The board contains 512K of RAM memory. Ram memory over 512K may be added in an expansion slot. The RAM is parity checked and a parity error will generate an NMI.

<table>
<thead>
<tr>
<th>Processor Clock</th>
<th>RAM Type</th>
<th>Wait States</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 MHz</td>
<td>150ns</td>
<td>1</td>
</tr>
<tr>
<td>6 MHz</td>
<td>150ns</td>
<td>0</td>
</tr>
<tr>
<td>8 MHz</td>
<td>120ns</td>
<td>1</td>
</tr>
<tr>
<td>8 MHz</td>
<td>120ns</td>
<td>0</td>
</tr>
</tbody>
</table>

EPROM MEMORY
The board contains 64K of PROM memory. Included on the board is 32K of BIOS PROM memory. The rest is user space. Prom memory can be set to run with 0 or 1 wait state. The PROMs should be 150ns devices.

Processor
The main processor is an Intel 80286 that runs at 6 Mhz or optionally at 8 Mhz. A math coprocessor, the 80287 is optional.

Wait State Generator
The board has a wait state generator, however it is possible to add a custom wait state generator in a PAL.

DMA (8237)
There are two 8237 DMA controllers on the board. One is used for 8 bit transfers and one is used for 16 bit transfers. DMA transfers are limited to a 64K block. The 64K block is selected by page registers. There is one page register per DMA channel.

Timer (8254)
Three timer channels are available on the board. Channel 0 is tied to Time of day, channel 1 is used for refresh, and channel 2 is used for the speaker port. The timer has a resolution of 840 nanoseconds.

NMI Port
A NMI may be generated by an on board memory parity error, an -IO CHECK signal from the AT bus or by means of a -NMI signal from the NMI port. The NMI generated by the -IO CHECK signal may be enabled or disabled by means of software or it may be permanently enabled by means of a jumper.

Interrupts (8259)
The board supports 15 levels of vectored interrupts.

Clock Calendar
The board contains a CMOS clock calendar chip (146818). The CMOS circuit requires an external 6V battery. The circuit also contains CMOS RAM that is used to hold configuration information.

Battery Port
The board contains a battery port for running the clock calendar. The Port is a 4 pin header.

Keyboard Port
The board contains a port for an IBM compatible PC or AT keyboard. There are two connectors available: a 9 pin D and a 6 pin header.

Reset Port
The board contains a port that allows the board to be reset externally. The connector is a 2 pin header on .1" centers. The board is reset when power is
applied, so than an external reset may not be necessary.

**Speaker Port**
The board has a port to drive an external speaker. The connector is a 4 pin header on .1” centers. To use this port, connect an 8 Ohm speaker between pins 1 and 4.

**Front Panel Port**
The board contains a port that will drive an LED to indicate that power is on. It also contains a line for a keyswitch. This keyswitch is read by the BIOS during boot. If it is not on, the boot will not complete. The connector is a 5 pin header.

**LED Indicators**
There are 4 LED indicators on the board. These LEDs are used for diagnostic purposes during a boot or manufacturing test mode.

**Expansion Slot Connectors**
The card contains two edge connectors for plugging into a passive AT backplane. There is a 62 pin and 36 pin expansion slot connector. (Note Faraday offers an eight slot AT BUS backplane)

**Power**
Power is provided to the card through the edge connectors. The board uses only +5v. Power Requirements:

<table>
<thead>
<tr>
<th>Power</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>5</td>
</tr>
</tbody>
</table>

---

### Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

**Physical Dimensions**

13.15” L X 4.8” W

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS AT-6 Mhz/512</td>
<td>BUS AT at 6 Mhz with 512K Ram</td>
</tr>
<tr>
<td>BUS AT-8 Mhz/512</td>
<td>BUS AT at 8 Mhz with 512K Ram</td>
</tr>
</tbody>
</table>
Section 4

Disk Controllers

FE5140 PC BUS Floppy Disk Ctlr ........................................................... 4-2
FE5141 PC BUS Floppy Disk Ctlr ........................................................... 4-5
FE5150 PC BUS AT BUS Floppy/Hard Disk Ctlr ................................. 4-8
Faraday Electronics

FE 5140
PC BUS Floppy Disk Controller

- 100% PC BUS Hardware & Software Compatible
- Controls single-sided or double sided 5-1/4” floppies

- 1 Year Warranty
- Controls from 1 - 4 floppies

Product Overview

The FE5140 PC BUS floppy disk drive controller fits into one of the PC BUS expansion slots and is capable of driving from one to four 5 1/4” drives. The controller was designed for double-density, MFM-coded, diskette drives and uses write precompensation with a digital phase-lock loop for clock and data recovery. The board supports PC BUS specifications of 48 TPI and 6 ms Track to Track. The board utilizes a NEC microPD765 or equivalent device. The board requires +5v at .5 Amps.
PC BUS Floppy Disk Controller Block Diagram
Technical Description

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating temperature</strong></td>
<td>0 to 55 C</td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td><strong>Relative Humidity</strong></td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

9.25" L X 4.2" W

Compatible Drives

All floppy disk drives compatible with the IBM PC or XT are compatible with the FE5140. A partial list of drive vendors is below:

1. Tandon Corp.
   20320 Prairie St.
   Chatsworth, CA 91311
   (818) 993-6644

2. Teac Corp. of America
   7733 Telegraph Rd.
   Montebello, CA 90640
   (213) 726-0303

Ordering Information

| FE5140 | PC BUS Floppy Disk Controller |
FE 5141
PC BUS Floppy Disk Controller

- 100% PC BUS Hardware & Software Compatible
- 1 Year Warranty
- Controls single-sided or double sided 5 1/4" floppies
- Controls from 1 - 4 floppies
- Small Size 4.0" by 4.5"
- Incorporates Faraday FE2100 IC

Product Overview

The FE5141 PC BUS floppy disk drive controller fits into one of the PC BUS expansion slots and is capable of driving from one to four 5 1/4" drives. The controller was designed for double-density, MFM-coded, diskette drives and uses write precompensation with a digital phase-lock loop for clock and data recovery. The board supports PC BUS specifications of 48 TPI and 6 ms Track to Track. The board utilizes a NEC microPD765 or equivalent device. The board requires +5v at .5 Amps.
PC BUS Floppy Disk Controller Block Diagram
Technical Description

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

4.5” L X 4.0” W

Compatible Drives

All floppy disk drives compatible with the IBM PC or XT are compatible with the FE5141. A partial list of drive vendors is below:

1. Tandon Corp.
   20320 Prairie St.
   Chatsworth, CA 91311
   (818) 993-6644

2. Teac Corp. of America
   7733 Telegraph Rd.
   Montebello, CA 90640
   (213) 726-0303

Ordering Information

| FE5141 | Integrated PC BUS Floppy Disk Controller |
FE 5150
AT BUS Floppy/Hard Disk Controller

- 100% IBM AT Compatible
- Supports two 5 1/4" Winchester Drives
- Supports two 5 1/4" 1.2 MB Floppy Drives
- One Year Warranty

Product Overview

The FE5150 offers full hardware and software compatibility with the IBM AT, Faraday A-Tease, and Faraday BUS AT. It includes support for up to two 5 1/4" Winchester Disk Drives and up to two 5 1/4" Floppy Disk Drives.
AT BUS Floppy/Hard Disk Controller Block Diagram
Technical Description

Winchester Section

- 512 byte sectors
- Multiple sector operating across track and cylinder boundaries
- Programmed I/O data transfers
- ECC correction of up to 5 bits on data fields
- 16 read/write head support
- 16-bit cylinder addressing
- On board diagnostics
- Concurrent data operations between one Winchester and one floppy

Floppy Section

- 160K, 320K, and 1.2MB drives supported
- 48, 80, 96, and 160 tracks supported
- 250K, 300K, and 500K bits per second data rates supported
- Double density, MFM encoded data storage
- Write precompensation supported
- Write protection supported
- All standard functions are programmable
- Data transfers through either DMA or programmed I/O
- Operation complete and status interrupts supported
- Industry standard UPD 765 compatible controller

Power Requirements

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>2.7</td>
</tr>
<tr>
<td>+12</td>
<td>250 ma</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions

13.15" L X 4.8" W

Compatible Drives

All floppy disk drives compatible with the IBM PC or XT are compatible with the FE5150. A partial list of drive vendors is below:

1. Seagate Technology
   920 Disc Drive
   Scotts Valley, CA 95006
   (408) 438-6550

2. Microscience Intl Corp
   575 E. Middlefield Rd
   Mountain View, CA 94043
   (415) 961-2212

3. Tandon Corp.
   20320 Prairie St.
Chatsworth, CA 91311
(818) 993-6644

4. Teac Corp. of America
7733 Telegraph Rd.
Montebello, CA 90640
(213) 726-0303

Ordering Information

| FE5150 | AT BUS Floppy/Hard disk controller |
Section 5

Video Controllers

FE5200 Monochrome Video Controller ........................................... 5-2
FE 5200
PC BUS Monochrome Video Controller

- 100% IBM PC Compatible
- 80 X 25 Character Display
- 350 X 720 Pixels
- Supports Full IBM Character Set
- 9 X 14 Character Box
- 16.257 Mhz
- 7 X 9 Character
- Supports All IBM Attributes

Product Overview

The FE5200 is an integrated monochrome display adapter which uses Faraday’s FE2200 VLSI integrated circuit to support the full IBM character set and attributes with a reduced number of chips. It measures 4.2” X 7.36” and supports an 80 X 25 character display at 350 X 720 pixels.
FE 5200 Block Diagram
Technical Description

CRT Controller Module
The Faraday FE5200 is designed around the Motorola 6845 CRT Controller Module.

RAM
There is 4K of RAM on the board used for a display buffer. No parity is provided on the display buffer.

Character Codes
The board supports 256 different character codes. An 8K-byte character generator contains the fonts for the character codes.

Power Requirements

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>.7 Amps</td>
</tr>
</tbody>
</table>

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
7.36" L X 4.2" W

Ordering Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FE5200</td>
<td>Monochrome video controller</td>
</tr>
</tbody>
</table>
Section 6

Software

MS9200 (MS-DOS) ................................................................. 6-2
GW9000 (GW-BASIC) ............................................................. 6-4
MS9200
PC BUS And AT BUS Enhanced Software

- 100% IBM PC-DOS Compatible
- MS-DOS Version 2.11
- PC-DOS Commands
- Supports Hard Disks

Product Overview

The Faraday MS-DOS package is a disk operation system designed for total compatibility with the IBM PC-DOS; it is accompanied by the User’s Guide. Faraday has licensed MS-DOS from Microsoft Corporation for sale with Faraday Single Board Computers.
Technical Description

MS-DOS Commands
This package comes with all the standard MS-DOS commands.

PC-DOS Commands
The following additional PC-DOS commands are also included:

- ASSIGN
- COMP
- DISKCOPY
- TREE
- GRAPHICS
- DISKCOPY (with autoFORMAT)

Hard Disk Support
Up to 100MB hard disk is supported with this package. The following hard disk commands are included:

- BACKUP
- FDISK
- RESTORE

RAM Required
A minimum of 64K RAM is required for operation of MS9200.

Media
The software comes on a Double Sided Double Density floppy diskette with 48 TPI. It is write protected and includes hubring.

Media Label
The Media comes standard with the following label "MS-DOS Version 2.11". This label is one color and includes copyright information. There is space for a customized label.

User's Guide
The User’s guide is one color on 5 1/2” by 8 1/2” 60lb. white opaque paper. It is shrinkwrapped and 3 hole punched.

Ordering Information

<table>
<thead>
<tr>
<th>MS9200</th>
<th>MS DOS 2.11</th>
</tr>
</thead>
</table>

6-3
GW9000
PC BUS And AT BUS Enhanced Software

- IBM Advanced BASIC Compatibility
- Improved Graphics
- Event Trapping
- GW-BASIC Version 2.01
- Improved Error Reporting
- Enhanced Disk I/O Facility

Product Overview

The Faraday GW-BASIC 2.01 package is the most extensive implementation of Microsoft BASIC that is compatible with IBM’s Advanced BASIC. The package includes a diskette and the BASIC Language Interpreter Manual.
**Technical Description**

**GW9000**

- **MS-9200 required**
- **Media:**
  - SSDD diskette
  - 48 TPI
  - Write protected
  - Includes hubring
- **Media Label:**
  - GW-BASIC Version 2.01
  - 1 Color
  - Leaves space for customized label
  - Copyright information
- **Media in plain tyvek envelope**
  - 1 Color
  - 5 1/2" x 8 1/2"
  - Shrinkwrapped
  - 3-hole punched

- **Standard advanced BASIC commands, excluding MOTOR command**
- **Improvements over GW-BASIC 1.0:**
- **Redirection of Standard Input/Output**
- **Character Device Support** which allows BASIC to communicate with user-installed devices

- **Improved Disk I/O facilities** for handling larger files
- **SHELL** which allows COMMAND or child processes to run without having to leave BASIC
- **Multi-level directories** for better disk organization
- **Directory Management**
- **Improved Graphics**
- **Screen Editor enhancements** including text window support
- **Additional Event Trapping**
- **User definable keyboard trapping**
- **More precise error reporting** with the new system functions
- **Double Precision Transcendentals**
- **More precise control** of BASIC's memory
- **Allocation** for user routines with the /M: switch
- **GW-9000 Functions in addition to IBM’s BASICA:**
  - ENVIRON ($)
  - ERDEV ($)
  - IOCTL ($)
  - SHELL
  - TIMER ON/OFF/STOP

**Ordering Information**

<table>
<thead>
<tr>
<th>GW9000</th>
<th>GW Basic 2.01</th>
</tr>
</thead>
</table>

6-5
### Section 7

**General Purpose Boards**

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE5400 CMOS Ram/Rom Card</td>
<td>7-2</td>
</tr>
<tr>
<td>FE5500 Serial Parallel I/O Card</td>
<td>7-5</td>
</tr>
<tr>
<td>FE6SBP PC BUS Six Slot Backplane</td>
<td>7-8</td>
</tr>
<tr>
<td>FE8SBP AT BUS Eight Slot Backplane</td>
<td>7-11</td>
</tr>
</tbody>
</table>
Faraday Electronics

FE 5400
PC BUS CMOS RAM/ROM EXPANSION CARD

- 100% IBM PC Compatible
- Up to 64K CMOS RAM
- Eight 27256 EPROM Sockets
- Real Time Clock Calendar
- Battery Backup on Board
- Timer Interrupts

Product Overview

The FE5400 offers full hardware and software compatibility with PC BUS and AT BUS single board computers. The FE5400 is a multi-function card that features up to 64K CMOS RAM, 256K of EPROM, three channel timer, and a precision real time clock/calendar with battery backup.

The board contains a BIOS that resides on a dedicated 2764 EPROM. The BIOS contains an on-board diagnostics and support for the clock calendar and timers. There are 4 on board LED's to indicate diagnostic failures.
Technical Description

CMOS RAM
The board contains 8 to 64K of CMOS RAM memory in 8K increments. The memory may be put in any 64K segment, and uses the entire 64K segment it is assigned even if the full 64K in not installed. There is a port to read the RAM starting address. An onboard battery provides backup for the CMOS RAM.

Each time the CPU is reset, an on-board diagnostic will run. This diagnostic will not destroy the contents of the RAM. If an error is found, an error message will be displayed and a LED error code will be displayed on the board. The CPU BIOS will run a destructive diagnostic on the RAM each time the board is reset. To prevent the destruction of the CMOS RAM data, the starting address must be higher than 640K.

EPROM
The board contains eight sockets capable of offering 256K of PROM space. The PROMS supported are 27256s. The EPROMS are capable of starting and stopping on any 64K boundary. There is a port to read the EPROM starting address.

The board contains a BIOS diagnostic that will do a checksum on the EPROMS each time the CPU is reset. The diagnostic may be disabled by means of a jumper.

Timer
The board contains an Intel 8254 timer at I/O address 218-21B. The 8254 contains 3 independent timers. Each of these timers may be programmed to cause an interrupt (see I/O section). The clock for each timer may be selected from a wide range of clocks by means of jumpers. A BIOS routine is provided to make programming the timer easier. There is an on-board diagnostic that will run each time the CPU is reset if it is enabled. The timer may be disabled by means of a jumper.

Clock Calendar
The board contains a National Semiconductor MM58167 real time clock/calendar which is backed by an on board battery. The I/O address of the chip is 260-276. There is an on-board BIOS that supports the chip. An internal interrupt timer may be programmed for intervals of 0.5 seconds, 5 seconds, or 60 seconds and may be coded as a single or repeated interrupt. A jumper is provided to enable or disable this clock interrupt output.

Battery
There is an on-board battery that provides backup for the CMOS RAM and the clock/calendar. The battery will last for four years. There is an I/O port that indicates when the battery has failed.

Power Requirements

| +5v | 500ma |

Environment

| Operating temperature | 0 to 55 C |
| Storage temperature   | -40 to 80 C |
| Relative Humidity     | 0% to 90% with no condensation |

Physical Dimensions

13.15” L X 4.2” W

Ordering Information

| FE5400 | CMOS RAM/ROM with 8K ROM |

Options: Additional RAM available in 8K increments.
Faraday Electronics

FE 5500
PC BUS Serial & Parallel I/O Card

- 100% PC BUS Compatible
- 2 Serial Ports RS232/422/449 Jumper Selectable
- OPTO22 Optomux RS422 compatible
- One Year Warranty
- One Parallel Port Centronix or 8 bit General I/O Port

Product Overview

The FE5500 is a plug-in board that contains two serial ports and one parallel port. The two serial ports support asynchronous communications and can be configured as RS232/422/449 ports. The parallel port can be used as a Centronix compatible printer port or as a 8 bit general input/output port.
FE5500 Block Diagram
Technical Description

Serial Ports
The board contains two serial ports labeled COM1 and COM2. Each port may be used as an RS232/422/449 port. The UARTS are 16450’s which are equivalent to 8250A’s.

There are two 9 pin D type male connectors located at the card edge mounting bracket. They are associated with COM1 and COM2 in addition there are two 26 pin header connectors which can be used to mate with 25 pin D type connectors by using a straight ribbon cable.

Parallel Port
The board contains a parallel printer port, centronix compatible, which can also be used as a general input/output port. The port is available on a 26 pin header. The header connector can be mated with a 25 pin D type connector via a ribbon cable.

Edge Slot Connector
The board has a PC BUS 62 pin edge slot connector.

Power Requirements

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5v</td>
<td>1 Amp</td>
</tr>
<tr>
<td>-5v</td>
<td>50 ma</td>
</tr>
<tr>
<td>+12v</td>
<td>50 ma</td>
</tr>
<tr>
<td>-12v</td>
<td>50 ma</td>
</tr>
</tbody>
</table>

(Required only for RS449 option)

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
13.15” L X 4.2” W

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE5500</td>
<td>Serial Parallel I/O Card</td>
</tr>
</tbody>
</table>
FE6SBP
Six Slot PC BUS Backplane

- Six Expansion Slots
- 1" Slot Spacing
- 62-Pin edge connectors with interconnect wiring for PC BUS single board computer systems.
- 4 layer PCB Design
- 8 Pin Power Connector

Product Overview

This backplane implements the PC BUS backplane interconnection scheme as defined by the PC BUS general specification. (See Section 2: PC BUS Designers Guide.)
PC BUS 6 Slot Backplane Dimensions (Top View)
Technical Description

Slot Spacing
The slots are spaced one inch apart center to center.

Connectors
The board contains six 62-pin PC BUS connectors.

Power Supply Connector
Power is provided to the bus via an 8-pin Molex type power connector (Molex type 09-65-1081). The mating connector is Molex 09507081. The mating pins are Molex 08-50-0106.

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
6.3” L X 5.0” W

Ordering Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FE6SBP</td>
<td>Six slot backplane</td>
</tr>
</tbody>
</table>
Faraday Electronics

FE8SBP
Eight Slot AT BUS Backplane

- Eight Expansion Slots
- .8" Slot Spacing
- 8 62-Pin edge connectors with interconnect wiring for PC BUS
- 4 layer PCB Design
- 8 & 4 Pin Power Connectors
- 6 36-pin edge connectors with interconnect wiring for 16 bit AT BUS

Product Overview

This backplane implements the AT BUS backplane interconnection scheme as defined by the AT BUS general specification.
Eight Slot AT BUS Backplane Dimensions (Top View)
Technical Description

Slot Spacing
The slots are spaced .8” apart center to center.

Connectors
The board contains 8 expansion slots. Slots 1 - 8 contain connectors for the PC BUS while slots 2, 3, 4, 5, 6, and 8 contain an extra connector to support the 16 bit AT BUS.

Power Supply Connector
Power is provided to the bus via an 8-pin Molex type power connector (Molex type 09-65-1081) and an optional 4-pin Molex type power connector (Molex type 09-65-1041). The mating connector is Molex 09507081 and 09507041 respectively. The mating pins are Molex 08-50-0106.

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Physical Dimensions
7.0” L X 8.50 ” W

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE8SBP</td>
<td>8 slot AT BUS backplane</td>
</tr>
</tbody>
</table>
Section 8

PC BUS & AT BUS Integrated Circuits

FE2000 PC BUS CPU Controller IC ................................................................. 8-2
FE2010 PC BUS CPU and Peripheral Controller IC ......................................... 8-4
FE2100 PC BUS Floppy Disk Controller IC .................................................. 8-6
FE2200 PC BUS Monochrome Display Controller IC ..................................... 8-8
FE3000 AT BUS CPU Controller IC .............................................................. 8-10
FE3010 AT BUS CPU and Peripheral Controller IC ...................................... 8-12
FE2000
PC BUS CPU CONTROLLER
INTEGRATED CIRCUIT

- 100% Hardware and Software Compatible to the IBM PC
- Wait State Generator
- 8284 Compatible Clock Generator
- 68 Pin J-Type Leaded Surface Mount Plastic Chip Carrier
- Parallel Interface to Printer (Centronics)
- Parity Generator Checker
- 8255A-5 Compatible Programmable Peripheral Interface
- HCMOS Technology
Product Overview

The Faraday PC CPU Controller Integrated Circuit (FE2000) is a highly integrated chip with various control logic functions allowing designers the flexibility to build a PC BUS single board computer.

The FE2000 has been designed for OEMs who would like to reduce cost, lower power requirements, increase reliability, and reduce board size over that of a functionally equivalent IBM PC motherboard. The FE2000 replaces a total of 25 components.

The FE2000 supports 64K and 256K ram chips. The FE2000 has been designed to be compatible with the Intel 8088 processor.

The FE2000 is a 2 micron CMOS gate-array packaged in an 68 Pin J-Type Leaded Surface Mount Plastic Chip Carrier (mating socket Burndy part number QILE68P-408).

FE2000 Chip Replacement Chart

<table>
<thead>
<tr>
<th>Original Chip</th>
<th>Replacement Chip</th>
</tr>
</thead>
<tbody>
<tr>
<td>8255A-5</td>
<td>74LS280</td>
</tr>
<tr>
<td>74LS244 (2)</td>
<td>74125 (2)</td>
</tr>
<tr>
<td>74LS240</td>
<td>74LS74 (2)</td>
</tr>
<tr>
<td>74LS322</td>
<td>74LS32</td>
</tr>
<tr>
<td>8284A</td>
<td>74LS30</td>
</tr>
<tr>
<td>74LS157</td>
<td>74LS20</td>
</tr>
<tr>
<td>74LS155</td>
<td>74LS10</td>
</tr>
<tr>
<td>74LS174</td>
<td>74LS08</td>
</tr>
<tr>
<td>74LS175 (2)</td>
<td>74LS04 (2)</td>
</tr>
<tr>
<td>SWITCH</td>
<td>74LS00</td>
</tr>
</tbody>
</table>

The FE2000 replaces a total of 25 components.
Faraday Electronics

FE2010
PC BUS CPU & PERIPHERAL CONTROLLER
INTEGRATED CIRCUIT

- 100% Hardware & Software compatible with the IBM-PC
- 8284 Clock Generator
- 8288 BUS Controller
- 4 DMA Channels
- 8 Interrupt Channels
- 3 timer Channels
- 84 Pin J-Type Leaded Surface Mount Plastic Chip Carrier

- Keyboard Port
- Complete CPU control logic
- System configuration register eliminating external switches
- 256K & 64K RAM support
- HCMOS Technology
- TTL Compatible
Product Overview

The Faraday CPU & Peripheral controller integrated Circuit (FE2010) is a highly integrated chip that allows designers to easily build a IBM compatible PC or XT single board computer.

The FE2010 has been designed for OEMs who would like to reduce cost, lower power requirements, increase reliability, and reduce board size over that of a functionally equivalent IBM PC or XT motherboard. The FE2010 replaces a total of 49 components, while reducing the size of a typical PC/XT motherboard by 77%.

The FE2010 replaces functionally five Intel peripheral controller I C’s in a motherboard(8284 Clock Generator, 8288 BUS Controller, 8259A Interrupt controller, 8237A DMA controller & 8253 Timer). In addition, it supports both 64K and 256K memory types and has an internal configuration register to replace external switches in the board design.

The FE2010 is a 2 micron CMOS gate-array packaged in an 84 Pin J- type Leaded Surface Mount Plastic Chip Carrier (mating socket Burndy part number QILE84P10).

FE2010 Chip Replacement Chart

<table>
<thead>
<tr>
<th>No.</th>
<th>74LS175(2)</th>
<th>74LS138(3)</th>
<th>74LS244(2)</th>
<th>74LS670</th>
<th>74LS322</th>
<th>74LS245</th>
<th>74LS10</th>
<th>74LS608</th>
<th>74LS325</th>
<th>74LS04(4)</th>
<th>74LS14</th>
<th>74LS245(3)</th>
<th>74LS02(1)</th>
<th>SWITCHES(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8288</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8259A</td>
<td>74LS138(3)</td>
<td>74LS30(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8248A</td>
<td>74LS244(2)</td>
<td>74LS00(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8237A</td>
<td>74LS670</td>
<td>74LS08(3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8253</td>
<td>74LS322</td>
<td>74LS158(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8255A</td>
<td>74LS125(2)</td>
<td>74LS139</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELAY-LINE(1)</td>
<td>74LS10</td>
<td>74LS32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74S280</td>
<td>74LS11</td>
<td>74S08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LS373(2)</td>
<td>74LS04(4)</td>
<td>74LS14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LS245(3)</td>
<td>74LS02(1)</td>
<td>SWITCHES(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No. of chips replaced = 49
FE2100
PC BUS FLOPPY DISK CONTROLLER
INTEGRATED CIRCUIT

- 100% Hardware & Software compatible with the PC BUS
- Variable Write Precompensation
- TTL compatible
- Digital Data Separator
- Integral Crystal Oscillator Circuit Precompensation
- Track Selectable Write
- HCMOS Technology
- 48 Pin Dip

Product Overview

The Faraday Floppy Disk Controller (FE2100) is a CMOS integrated circuit designed to complement the NEC 765 or Intel 8272 type of Floppy Disk Controller Chip to provide a complete PC BUS compatible Floppy Disk Adapter. The FE2100 operates from a +5 volts supply and simply requires that an 8 Mhz crystal or TTL-level clock be connected to X1 pin. All inputs and outputs are TTL compatible.

The FE2100 has been designed for OEMs who would like to reduce cost, lower power requirements, increase reliability, and reduce board size over that of a functionally equivalent IBM PC or XT floppy disk controller. The FE2100 replaces a total of 18 components.

The FE2100 is a 3.5 micron CMOS gate-array packaged in an 48 Pin Dip.
# FE2100 Chip Replacement Chart

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>74LS244</td>
<td>74LS161</td>
</tr>
<tr>
<td>74LS174</td>
<td>74LS175 (4)</td>
</tr>
<tr>
<td>74S288</td>
<td>74LS139</td>
</tr>
<tr>
<td>74LS153</td>
<td>74LS393</td>
</tr>
<tr>
<td>74LS74</td>
<td>74LS32</td>
</tr>
<tr>
<td>74LS08 (2)</td>
<td>74LS04 (2)</td>
</tr>
<tr>
<td>74LS00</td>
<td></td>
</tr>
</tbody>
</table>

No. of chips replaced = 18
Faraday Electronics

FE2200
PC BUS MONOCHROME DISPLAY CONTROLLER
INTEGRATED CIRCUIT

- 100% PC BUS Hardware and Software Compatible
- Provides I/O Channel Synchronization
- Uses a Crystal or a TTL Signal for Frequency Source
- HCMOS
- Incorporates Complete Attribute Decoding
- 68 pin J-type leaded surface mount PLCC

Product Overview

The Faraday Monochrome Display Controller (FE2200) is a single chip with various control logic designed to build a PC BUS compatible monochrome display adapter. The chip is packaged in a 68 pin J-type leaded surface mount and uses HCMOS technology. The chip carrier socket for this plastic chip carrier is available from Burndy (Part #QILE68P-408).

The FE2200 has been designed for OEMs who would like to reduce cost, lower power requirements, increase reliability, and reduce board size over that of a functionally equivalent IBM PC or XT monochrome display adapter. The FE2200 replaces a total of 36 components.

The FE2200 is a 3.5 micron CMOS gate-array.
**FE2200 Chip Replacement Chart**

<table>
<thead>
<tr>
<th>Chip Code</th>
<th>No. of chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>74LS273</td>
<td>5</td>
</tr>
<tr>
<td>74LS138</td>
<td>2</td>
</tr>
<tr>
<td>74LS174</td>
<td></td>
</tr>
<tr>
<td>74S112</td>
<td></td>
</tr>
<tr>
<td>74LS139</td>
<td></td>
</tr>
<tr>
<td>74LS175</td>
<td>3</td>
</tr>
<tr>
<td>74LS157</td>
<td></td>
</tr>
<tr>
<td>74LS125</td>
<td></td>
</tr>
<tr>
<td>74LS32</td>
<td>2</td>
</tr>
<tr>
<td>74S393</td>
<td></td>
</tr>
<tr>
<td>74S11</td>
<td></td>
</tr>
</tbody>
</table>

No. of chips replaced = 36
FE3000
AT BUS CPU CONTROLLER
INTEGRATED CIRCUIT

- 100% Hardware and Software Compatible with the IBM PC-AT
- Wait State Generator Internal or External
- 8284, 82284 Compatible Clock Generator
- 84 Pin J-Type Leaded Surface Mount Plastic Chip Carrier
- Refresh and DMA Controls
- Error Detection Controls
- 82288 Compatible BUS Controller
- HCMOS Technology
Product Overview

The Faraday AT CPU Controller Integrated Circuit (FE3000) is a highly integrated chip with various control logic functions allowing designers the flexibility to build an IBM PC-AT compatible single board computer.

The FE3000 has been designed for OEMs who would like to reduce cost, lower power requirements, increase reliability, and reduce board size over that of a functionally equivalent IBM PC-AT motherboard. The FE3000 replaces a total of 53 components.

The FE3000 supports 6, 8, and 10 Mhz clock speeds as well as 256K and 1MB ram chips. The FE3000 has been designed to be compatible with the Intel 80286 processor as well as upward compatible with the 80386.

The FE3000 is a 2 micron CMOS gate-array packaged in an 84 Pin J-Type Leaded Surface Mount Plastic Chip Carrier (mating socket Burndy part number QILE84P10).

FE3000 Chip Replacement Chart

<table>
<thead>
<tr>
<th>ALS00 (2)</th>
<th>F00</th>
<th>LS125</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS02 (4)</td>
<td>F08</td>
<td>LS112</td>
</tr>
<tr>
<td>ALS04 (4)</td>
<td>F10</td>
<td>LS244 (2)</td>
</tr>
<tr>
<td>ALS08</td>
<td>F11</td>
<td>7407</td>
</tr>
<tr>
<td>ALS10</td>
<td>F74 (3)</td>
<td>PAL16L8 (2)</td>
</tr>
<tr>
<td>ALS27 (2)</td>
<td>F174 (5)</td>
<td>8284A</td>
</tr>
<tr>
<td>ALS32</td>
<td>F175 (2)</td>
<td>82284A</td>
</tr>
<tr>
<td>ALS74 (11)</td>
<td>LS51 (3)</td>
<td>82288A</td>
</tr>
</tbody>
</table>

The FE3000 replaces a total of 53 components.
FE3010
AT BUS CPU and PERIPHERAL CONTROLLER
INTEGRATED CIRCUIT

- 100% Hardware and Software compatible with the IBM PC-AT
- 15 Interrupt Channels
- Real Time Clock/Calendar
- 3 Timer Channels
- 7 DMA Channels
- 84 Pin J-Type Leaded Surface Mount Plastic Chip Carrier
- TTL Compatible
- 6, 8, or 10 Mhz with 0, 1, or 2 Wait State Capability
- 256K or 1MB Ram Chips
- DMA Page Registers
- HCMOS Technology
Product Overview

The Faraday AT CPU & Peripheral Controller Integrated Circuit (FE3010) is a highly integrated chip with various control and peripheral functions. The FE3010 has been designed to replace 21 chips.

The FE3010 has been designed to enhance the IBM PC AT while being extremely flexible. The FE3010 is able to run at 6, 8, or 10 Mhz clock speed with 0, 1, or 2 Wait States. The FE3010 is also capable of utilizing 256K or 1MB ram chips.

The FE3010 used in conjunction with Faraday’s FE3000 (PC AT CPU controller IC) will reduce the size of a typical PC AT motherboard by 80 %, power by 70 % and the component count by 62 %. The FE3010 and FE3000 have been designed to be upward compatible with the Intel 80386 processor.

The FE3010 is a sub 2 micron Standard Cell device packaged in an 84 pin J-Type Leaded Surface Mount Plastic Chip Carrier (mating socket Burndy part number Q1LE84310).

---

Chip Replacement Chart

<table>
<thead>
<tr>
<th>No.</th>
<th>Chip</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8237(2)</td>
<td>i8237</td>
<td>2</td>
</tr>
<tr>
<td>8259(2)</td>
<td>i8259</td>
<td>2</td>
</tr>
<tr>
<td>8254</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M146818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LS612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LS590</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LS500(3)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>74ALS10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74F00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LALS573(2)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>74LS125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74ALS08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74ALS245(3)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>74S288</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No Of Chips Replaced: 21
Section 9

SYSTEM CABINETS

**FECC-8S PC & AT BUS CARD CAGE** ..................................................... 9-2
**FE6400 EVALUATION SYSTEM** ........................................................... 9-5
**FE6413 EVALUATION SYSTEM** ........................................................... 9-7
**FE6421 EVALUATION SYSTEM** ........................................................... 9-9
**BUS PC EVALUATION SYSTEM** ........................................................... 9-11
**MICRO PC/CMOS MICRO PC EVALUATION SYSTEM** ......................... 9-13
Product Overview

The PC BUS & AT BUS Card Cage is an industrial quality chassis for housing Faraday Electronics Single board computers and third party expansion board products. It contains an eight slot backplane with 0.8" centers and power supply connector. Stand up card guides are also provided. Provisions have also been made to mount Hewlett-Packard’s 3-1/2” industrial hard disk drive (HP 97501A) inside the card cage.

Optionally available to support FECC-8S is a perforated top cover, a fan bracket and five additional standup card guides.
Card Cage Physical Dimensions
Technical Description

FECC-8S Card Cage

The FECC-8S card cage is a sheetmetal industrial grade chassis including an eight slot backplane with a power supply connector. The expansion slots are spaced on 0.8” centers. Two movable stand up card guides are provided to allow for various length expansion cards to be fastened securely into the card cage. Additional guides are available as an option.

Physical Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Card Cage alone</th>
<th>With Top cover &amp; Fan Bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>14.375 inches</td>
<td>16.00 inches</td>
</tr>
<tr>
<td>Depth</td>
<td>8.875 inches</td>
<td>8.875 inches</td>
</tr>
<tr>
<td>Height</td>
<td>6.25 inches</td>
<td>6.3125 inches</td>
</tr>
</tbody>
</table>

Board Capacity

There are 8 expansion slots on 0.8” centers. Slots 1 to 8 contain connectors for standard PC BUS while slots 2, 3, 4, 5, 6, & 8 contain an extra connector to support the 16 bit AT BUS.

Electrical Characteristics

Power Connections:

J17: Molex type 09-65-1081

J18: Molex type 09-65-1041

<table>
<thead>
<tr>
<th>pin</th>
<th>J17</th>
<th>J18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5v</td>
<td>+5v</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>+5v</td>
</tr>
<tr>
<td>3</td>
<td>-12v</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>-12v</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>-5v</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+5v</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>

Environment

Operating Temperature: 0 to 55 C
Humidity: 0 to 90% non-condensing

Ordering Information

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FECC-8S</td>
<td>Card Cage and eight slot backplane assembly</td>
</tr>
<tr>
<td>FECC-8FB</td>
<td>Fan bracket for FECC-8S</td>
</tr>
<tr>
<td>FECC-8TC</td>
<td>Perforated top cover for FECC-8S</td>
</tr>
<tr>
<td>FECC-SUCG5</td>
<td>Stand up card guides ,Qty 5</td>
</tr>
</tbody>
</table>
FE6400 Evaluation System
PC BUS Single Board Evaluation Systems

- Fully configured desktop cabinet
- IBM PC compatible keyboard
- FE6400 SBC with 256K RAM
- FE 5140-Floppy Disk controller
- Two 5-1/4” floppy drives
- FE 5200-Monochrome display controller
- 2 Serial Ports
- 1 parallel port
- 130 watt Power supply
- 110 V/220 V option

Product Overview

The FE6400 based desktop evaluation system provides the user with a fully configured PC BUS system based around the FE6400 SBC, 256K RAM, two serial ports and one parallel port. This system also contains the FE5140 FDC, FE5200 Monochrome display adapter, two 5-1/4” floppy disk drives, keyboard and a 110volt/130watt switching power supply. A European version (220v/130watt cabinet) is also available.
Technical Description

FE6400 SBC
This SBC board includes 256K RAM memory, two serial ports, one parallel port, 32K EPROM, keyboard port and five IBM compatible expansion ports. The CPU is a 8088 that runs at 4.77 Mhz.

Serial Ports
Both serial ports are brought out to the back of the cabinet to a 25 pin D type RS232 female connector.

Parallel Ports
A parallel port is brought out at the back of the cabinet through a 25 pin Centronics compatible female connector.

Floppy Disk
The system contains a FE5140 Floppy adapter card that is configured with two 51/4 " floppy disk drives. The disk drives are Teac 55BV or equivalent, double density double sided half height drives.

Monochrome Adapter
The system also contains FE5200-Monochrome display adapter. This card contains 9 pin D-type connector that can be connected to any monochrome display monitor. This card supports text mode and has resolution of 80 columns by 25 lines.

Enclosure
The cabinet is a desktop light gray enclosure with the following dimensions-

<table>
<thead>
<tr>
<th>Width</th>
<th>19.25&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>5.00&quot;</td>
</tr>
<tr>
<td>Depth</td>
<td>15.00&quot;</td>
</tr>
<tr>
<td>Weight</td>
<td>40 Lbs</td>
</tr>
</tbody>
</table>

Electrical Characteristics:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>15 A</td>
</tr>
<tr>
<td>+12V</td>
<td>4.2 A</td>
</tr>
<tr>
<td>-12V</td>
<td>0.25 A</td>
</tr>
<tr>
<td>-5 V</td>
<td>0.30 A</td>
</tr>
<tr>
<td>Total Maximum Power Output:</td>
<td>130W</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT1000</td>
<td>US version cabinet with 110volt/130 watt supply</td>
</tr>
<tr>
<td>EU1000</td>
<td>European version cabinet with 220volt/130 watt supply</td>
</tr>
</tbody>
</table>

NOTE
This system is not UL or FCC approved and is not intended for resale.
Faraday Electronics

FE6413 Evaluation System
PC BUS Single Board Evaluation Systems

- Fully configured desktop cabinet
- FE6413 SBC with 256K RAM
- Two 5-1/4" floppy drives
- 1 Serial Port
- 130 watt Power supply
- IBM PC compatible keyboard
- Floppy Disk controller
- Monochrome display controller
- 1 parallel port
- 110 V/220 V option

Product Overview

The FE6413 based desktop evaluation system provides the user with a fully configured PC BUS system based around the FE6413 SBC, 256K RAM, one serial port and one parallel port. The FE6413 has an integrated floppy controller and a monochrome display adapter. The system comes with two 5-1/4" floppy disk drives, keyboard and a 110volt/130watt switching power supply. A European version (220v/130watt cabinet) is also available.
Technical Description

FE6413 SBC
This SBC board includes 256K RAM memory, one serial port, one parallel port, 32K EPROM, keyboard port and three IBM compatible expansion ports. The CPU is a 8088 that runs at 4.77 Mhz. This SBC has a integrated floppy disk controller and monochrome display adapter.

Serial Ports
A serial port is brought out to the back of the cabinet to a 25 pin D type RS232 female connector.

Parallel Ports
A parallel port is brought out at the back of the cabinet through a 25 pin Centronics compatible female connector.

Floppy Disk
The system contains two 5 1/4" floppy disk drives. The disk drives are Teac 55BV or equivalent double sided, double density half height drives.

Monochrome Adapter
The system contains a monochrome display adapter which is integrated within the FE6413, through the use of FE2200 IC. This adapter has a resolution of 80 columns by 25 lines, text mode.

Enclosure
The cabinet is a desktop light gray enclosure with the following dimensions-

| Width: 19.25" |
| Height: 5.00" |
| Depth: 15.00" |
| Weight: 40 Lbs |

Electrical Characteristics:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>15 A maximum</td>
</tr>
<tr>
<td>+12V</td>
<td>4.2 A maximum</td>
</tr>
<tr>
<td>-12V</td>
<td>0.25A maximum</td>
</tr>
<tr>
<td>-5 V</td>
<td>0.30A maximum</td>
</tr>
</tbody>
</table>

Total Maximum Power Output: 130W

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT1013</td>
<td>US version cabinet with 110volt/130 watt supply</td>
</tr>
<tr>
<td>EU1013</td>
<td>European version cabinet with 220volt/130 watt supply</td>
</tr>
</tbody>
</table>

NOTE
This system is not UL or FCC approved and is not intended for resale.
Product Overview

The FE6421 based desktop evaluation system provides the user with a fully configured PC BUS system based around the FE6421 SBC, 256K RAM, two serial ports and one parallel port. The FE6421 has an integrated floppy controller. The system comes with FE5200 Monochrome display adapter, two 5-1/4" floppy disk drives, keyboard and a 110 volt/130 watt switching power supply. A European version (220v/130 watt cabinet) is also available.
Technical Description

FE6421 SBC
This SBC board includes 256K RAM memory, two serial ports, one parallel port, 64K EPROM, keyboard port and eight IBM compatible expansion ports. The CPU is a 8088 that runs at 4.77 Mhz. This SBC has a integrated floppy disk controller.

Serial Ports
The serial ports are brought out to the back of the cabinet to a 25 pin D type RS232 female connector.

Parallel Ports
A parallel port is brought out at the back of the cabinet through a 25 pin Centronics compatible female connector.

Floppy Disk
The system contains two 5 1/4" floppy disk drives. The disk drives are Teac 55BV or equivalent double sided, double density half height drives.

Monochrome Adapter
The system contains a monochrome display adapter, the FE5200. This adapter has a resolution of 80 columns by 25 lines, text mode.

Enclosure
The cabinet is a desktop light gray enclosure with the following dimensions-

<table>
<thead>
<tr>
<th>Width:</th>
<th>19.25&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height:</td>
<td>5.00&quot;</td>
</tr>
<tr>
<td>Depth:</td>
<td>15.00&quot;</td>
</tr>
<tr>
<td>Weight:</td>
<td>40 Lbs</td>
</tr>
</tbody>
</table>

Electrical Characteristics:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V:</td>
<td>15 A maximum</td>
</tr>
<tr>
<td>+12V:</td>
<td>4.2 A maximum</td>
</tr>
<tr>
<td>-12V:</td>
<td>0.25A maximum</td>
</tr>
<tr>
<td>-5 V:</td>
<td>0.30A maximum</td>
</tr>
<tr>
<td>Total Maximum Power Output:</td>
<td>130W</td>
</tr>
</tbody>
</table>

Environment

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature:</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DT1021</td>
<td>US version cabinet with 110volt/130 watt supply</td>
</tr>
<tr>
<td>EU1021</td>
<td>European version cabinet with 220volt/130 watt supply</td>
</tr>
</tbody>
</table>

NOTE
This system is not UL or FCC approved and is not intended for resale.
Parents of

BUS PC Evaluation System
PC BUS Single Board Evaluation Systems

- Fully configured desktop cabinet
- BUS PC SBC with 256K RAM
- Two 5-1/4" floppy drives
- 2 Serial Ports
- 100 watt Power supply
- IBM PC compatible keyboard
- FE 5140-Floppy Disk controller
- FE 5200-Monochrome display controller
- 1 parallel port
- 110 V/220 V option

Product Overview

The BUS PC based desktop evaluation system provides the user with a fully configured PC BUS system based around the BUS-PC SBC, PC BUS backplane 256K RAM, two serial ports and one parallel port. This system also contains the FE5140 FDC, FE5200 Monochrome display adapter, two 5-1/4" floppy disk drives, keyboard and a 110volt/100watt switching power supply. A European version (220v/100watt cabinet) is also available.
Technical Description

**BUS PC SBC**
This SBC board includes 256K RAM memory, two serial ports, one parallel port, 32K EPROM, keyboard port and a speaker port. The CPU is a 8088 that runs at 4.77 Mhz. This SBC is a plug-in-card 13.15” X 4.2” and plugs into a PC BUS backplane provided with the system.

**Serial Ports**
Both serial ports are brought out to the back of the cabinet to a 25 pin D type RS232 female connector.

**Parallel Ports**
A parallel port is brought out at the back of the cabinet through a 25 pin Centronics compatible female connector.

**Floppy Disk**
The system contains an FE5140 Floppy adapter card that is configured to two 51/4 " floppy disk drives. The disk drives are Teac 55BV or equivalent, double density double sided half height drives.

**Monochrome Adapter**
The system also contains FE5200-Monochrome display adapter. This card contains 9 pin D-type connector that can be connected to any monochrome display monitor. This card supports text mode and has resolution of 80 columns by 25 lines.

**Enclosure**
The cabinet is a compact light gray enclosure with the following dimensions-

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Width:</td>
<td>15.50”</td>
</tr>
<tr>
<td>Height:</td>
<td>6.25”</td>
</tr>
<tr>
<td>Depth:</td>
<td>12.00”</td>
</tr>
<tr>
<td>Weight:</td>
<td>25 Lbs</td>
</tr>
</tbody>
</table>

**Electrical Characteristics:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V:</td>
<td>7.0 A maximum</td>
</tr>
<tr>
<td>+12V:</td>
<td>5.0 A maximum</td>
</tr>
<tr>
<td>-12V:</td>
<td>0.50A maximum</td>
</tr>
<tr>
<td>-5 V:</td>
<td>0.30A maximum</td>
</tr>
<tr>
<td>Total Maximum Power Output:</td>
<td>100W</td>
</tr>
</tbody>
</table>

**Environment**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature:</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

**Ordering Information**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BS6500</td>
<td>US version cabinet with 110volt/100 watt supply</td>
</tr>
<tr>
<td>EU6500</td>
<td>European version cabinet with 220volt/100 watt supply</td>
</tr>
</tbody>
</table>

**NOTE**
This system is not UL or FCC approved and is not intended for resale.
MICRO PC/CMOS MICRO PC Evaluation System
PC BUS Single Board Evaluation Systems

- Fully configured desktop cabinet
- MICRO PC or CMOS MICRO PC with 256K RAM
- Two 5-1/4" floppy drives
- 100 watt Power supply
- IBM PC compatible keyboard
- FE 5140-Floppy Disk controller
- FE 5200-Monochrome display controller
- 110 V/220 V option

Product Overview

The MICRO PC based desktop evaluation system provides the user with a fully configured PC BUS system based around the MICRO-PC or CMOS MICRO PC SBC, 256K RAM. This system also contains the FE5140 FDC, FE5200 Monochrome display adapter, two 5-1/4" floppy disk drives, keyboard and a 100volt/100watt switching power supply. A European version (220v/100watt cabinet) is also available.
Technical Description

MICRO PC SBC
This SBC board includes 256K RAM memory, 64K EPROM, keyboard ports and a NMI port. The CPU is a 8088 that runs at 4.77 Mhz. This SBC is a plug-in-card 5.5” X 4.2” and plugs into a PC BUS based passive backplane provided with the system. A CMOS version of this SBC is also available as an alternative option with this system.

Floppy Disk
The system contains a FE5140 Floppy adapter card that is configured with two 5-1/4” floppy disk drives. The disk drives are Teac 55BV or equivalent double sided, double density half height drives.

Monochrome Adapter
The system also contains a FE5200 Monochrome display adapter. This card contains 9 pin D-type connector that can be connected to any monochrome display monitor. This card supports text mode and has resolution of 80 columns by 25 lines.

Enclosure
The cabinet is a compact light gray enclosure with the following dimensions:

| Width:    | 15.50” |
| Height:   | 6.25”  |
| Depth:    | 12.00” |
| Weight:   | 25 Lbs |

Electrical Characteristics:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>7.0 A maximum</td>
</tr>
<tr>
<td>+12V</td>
<td>5.0 A maximum</td>
</tr>
<tr>
<td>-12V</td>
<td>0.50A maximum</td>
</tr>
<tr>
<td>-5V</td>
<td>0.30A maximum</td>
</tr>
<tr>
<td>Total Maximum Power Output:</td>
<td>100W</td>
</tr>
</tbody>
</table>

Environment

<table>
<thead>
<tr>
<th>Condition</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature:</td>
<td>0 to 55 C</td>
</tr>
<tr>
<td>Storage temperature:</td>
<td>-40 to 80 C</td>
</tr>
<tr>
<td>Relative Humidity:</td>
<td>0% to 90% with no condensation</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC6600</td>
<td>US version cabinet with 110volt/100 watt supply &amp; NMOS(bipolar) MICRO PC</td>
</tr>
<tr>
<td>MC6601</td>
<td>US version cabinet with 110v/100watt supply &amp; CMOS MICRO PC</td>
</tr>
<tr>
<td>EU6600</td>
<td>European version cabinet with 220volt/100 watt supply &amp; NMOS(bipolar) MICRO PC</td>
</tr>
<tr>
<td>EU6601</td>
<td>European version cabinet with 220v/100watt supply &amp; CMOS MICRO PC</td>
</tr>
</tbody>
</table>

NOTE
This system is not UL or FCC approved and is not intended for resale.
Section 10

Faraday Sales Representatives and Distributors

**FARADAY SALES REPRESENTATIVES**

**ADVANCED DIGITAL GROUP**  
(Southern California)

- **Main Office**  
  12062 Valley View St.  
  Suite 111  
  Garden Grove, CA 92645  
  (714) 897-0319  
  (213) 598-9645

**EOS SYSTEMS**  
(OH, WV, MI, KY, PA)

- **Main Office**  
  8588 Mayfield  
  Chesterland, OH 44026  
  (216) 729-2222

- **Southwest OH/KY**  
  Columbus, OH  
  (614) 228-3453

- **Pittsburgh, PA**  
  (412) 261-2604

- **Pontiac, MI**  
  (313) 388-2280

**FM ASSOCIATES**  
(FL, GA, NC, SC, TN, MS, AL, E.LA)

- **Main Office**  
  5927 Anno Ave.  
  Orlando, FL 32809  
  (305) 851-5710

- **Dunedin, FL**  
  (813) 733-7200

- **Jupiter, FL**  
  (305) 746-2996

- **Norcross, GA**  
  (404) 446-0033

- **Huntsville, AL (AL, MS, TN)**  
  (205) 882-0889

- **Ramsey, NC (NC, SC, S.VA)**  
  (919) 824-2196

**HANNAH-HILL**  
(WY, CO, UT, NM, AZ, Las Vegas, El Paso, TX)

- **Main Office**  
  858 Interlocken Pkwy.  
  Suite 100  
  Broomfield, CO 80020  
  (303) 424-0108

- **Sun City, AZ**  
  (602) 933-4623

- **Los Lunas, NM**  
  (505) 865-5767

- **Idaho**  
  (208) 529-0671

- **Utah**  
  (801) 364-0606

**J.R. SALES ENGINEERING**  
(NB, IA)

- **Main Office**  
  1930 St. Andrews N.E.  
  Cedar Rapids, IA 52402  
  (319) 393-2232

**MANCO**  
(Northern California)

- **Main Office**  
  3350 Scott Blvd., Bldg. 55  
  Santa Clara, CA 95054  
  (408) 496-6611

- **Fairfield**  
  (707) 422-1287

- **Sacramento**  
  (916) 985-0370

**MARTINDALE ASSOCIATES**  
(CT, NH, MA, ME, VT, RI, NJ, NY-Long Island)

- **Main Office**  
  212 Main St.  
  North Reading, MA 01864  
  (617) 664-0355

- **Danbury, CT**  
  (203) 748-2253

- **Pineau Associates (Upstate NY)**  
  1 Ellinwood Court  
  New Hartford, NY 13413  
  (315) 768-8167

**QUAD DATA INC.**  
(IL, IN, WI)

- **Main Office**  
  1100 Howard St.  
  Elk Grove Village, IL 60007  
  (312) 228-1722

**SCI REP**  
(PA, NJ, DE, DC, VA, MD)

- **Main Office**  
  9512-A Lee Highway  
  Fairfax, VA 22031  
  (703) 385-0600

- **Main Office**  
  304 Cooper Center  
  Pennsauken, NJ 08109  
  (609) 662-5222

**DISTRIBUTORS INTERNATIONAL**

- **Switzerland, Liechtenstein**  
  AMERA ELECTRONICS AG  
  Lerchenhalde 73  
  CH-8046 Zurich  
  Switzerland  
  Phone: 0-157-1112  
  Telex: 823466

- **Denmark**  
  INTERELKO  
  Silivej 18  
  DK-2690 Karlslunde  
  Denmark  
  Phone: 45-314-0700  
  Telex: 43507

- **The Netherlands**  
  RODELCO ELECTRONICS  
  Takkebijster 2  
  P.O. Box 6824  
  4802 HV Breda  
  Netherlands  
  Phone: 07-678-4911  
  Telex: 54195 RODL NL
DISTRIBUTORS INTERNATIONAL

Netherlands, Belgium, Luxemburg
Genevestraat 4, B8
1140 Brussels
Belgium
Phone: 02-216-6330
Telex: 61415 RODL B

France
TEKELEC
Cite Des Bruyeres
Rue Carie Vernet
B.P. No. 2 92310 Sevres
France
Phone: 1-534-7535
Telex: TKLEC 240552

West Germany
TEKELEC AIRTRONIC GMBH
Kapuzinerstrasse 9
D-8000 Munchen 2
West Germany
Phone: 0-895-1640
Telex: 522241
Fax: 89516410

England, Scotland, Ireland, Wales
THAME SYSTEMS LTD.
Thame Park Road
Thame, Oxon OX9 3XD
England
Phone: 084-421-7272
Telex: 837508

Sweden, Norway, Finland
TRACO AB
Box 103
S-123 22 Farsta
Sweden
Phone: 46-893-0000
Telex: 8135085

South America
INTECTRA, INC.
2629 Terminal Blvd.
Mt. View, CA 94043
Phone: 415-967-8818
Telex: 345545 INTECTRA MNTV
Fax: 415-967-8836