FARADAY

Computer Products Division

FARADAY

OEM PC BUS
and AT BUS
Product Catalog

PC BUS
Designers Guide

1ST HALF 1986

FARADAY ELECTRONICS
OEM PC BUS AND AT BUS PRODUCT CATALOG
&
PC BUS DESIGNERS GUIDE

1ST HALF 1986

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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.

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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 acquisation, medical, test & measurement, intelligent terminals, point of sale communications and CAD/CAM. With our continuing committment 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.

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

MEMORY MAP

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

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.

BUS CONNECTOR Pin Assignments

Signal name	Pin	Pin	Signal name
GROUND	B1	A1	-I/O CHECK
+RESET	B2	A2	+D7
+5V	B3	A3	+D6
+IRQ2	B4	A4	+D5
-5V	B5	A5	+D4
+DRQ2	B6	A6	+D3
-12V	B7	A7	+D2
	B8	A8	+D1
+12V	B9	A9	+D0
GROUND	B10	A10	+I/O READY
-MEMW	B11	A11	+AEN
-MEMR	B12	A12	+A19
-IOW	B13	A13	+A18
-IOR	B14	A14	+A17
-DACK3	B15	A15	+A16
+DRQ3	B16	A16	+A15
-DACK1	B17	A17	+A14
+DRQ1	B18	A18	+A13
-DACK0	B19	A19	+A12
+CLOCK	B20	A20	+A11
+IRQ7	B21	A21	+A10
+IRQ6	B22	A22	+A9
+IRQ5	B23	A23	+A8
+IRQ4	B24	A24	+A7
+IRQ3	B25	A25	+A6
-DACK2	B26	A26	+A5
+T/C	B27	A27	+A4
+ALE	B28	A28	+A3
+5V	B29	A29	+A2
+OSC	B30	A30	+A1
GROUND	B31	A31	+A0

I/O Channel Description

Signal	I/O	Description
+RESET	Out	This signal is the system reset.
+IRQ2 to +IRQ7	In	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.
+DRQ1 to +DRQ3	In	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.
-DACK0 to -DACK3	Out	These signals are the DMA acknowledge lines. -DACK0 is reserved for refresh, and a refresh cycle is indicated by -DACK0 and -MEMR.
+T/C	Out	This signal indicates that a DMA channel has reached its terminal count.
-MEMW	Out	This signal indicates a memory write.
-MEMR	Out	This signal indicates a memory read.
-IOW	Out	This signal indicates an I/O write.
-IOR	Out	This signal indicates an I/O read.
+I/O READY	In	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.
+OSC	Out	This is a 14.31818 Mhz clock with a 50% duty cycle.
+CLOCK	Out	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.
+AEN	Out	When this line is high, the DMA chip has control of the bus.
-I/O CHECK	In	This line is used to indicate that there is an error on a device in the expansion bus. The CPU will receive a NMI.
+ALE	Out	This signal is used to indicate when the address bus is valid. Processor addresses are latched on the falling edge of +ALE.
+DO to +D7	In/Out	These signals are the data bus.
+AO to +A19	Out	These signals are the address bus. For I/O operations, only +AO to +A9 are used.

TIMING

CPU MEMORY READ CYCLE
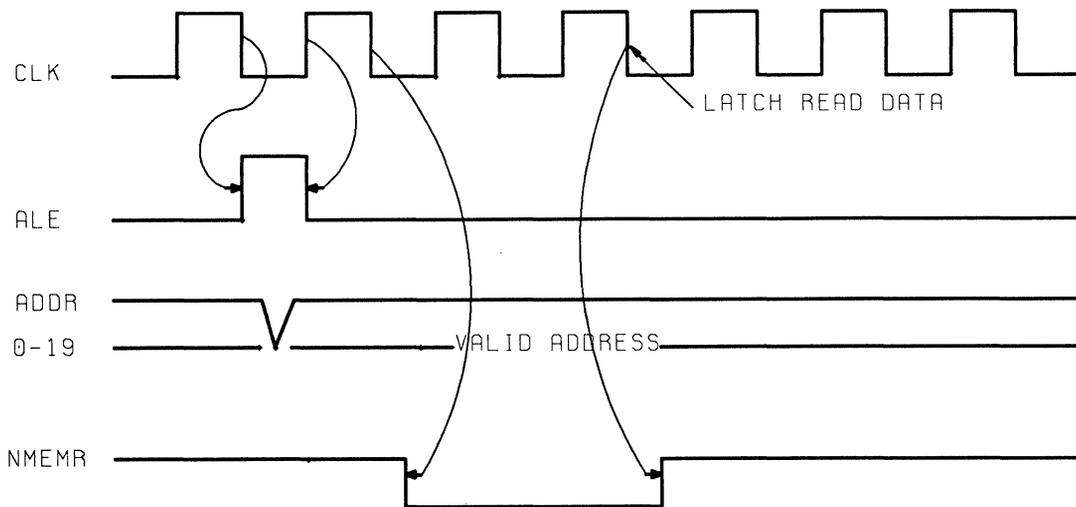
```
CLK   ___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___

                                    LATCH READ DATA

ALE   _____|‾|_____

ADDR
0-19  _____\ /_____VALID ADDRESS_____

NMEMR _____|_____|_____
```
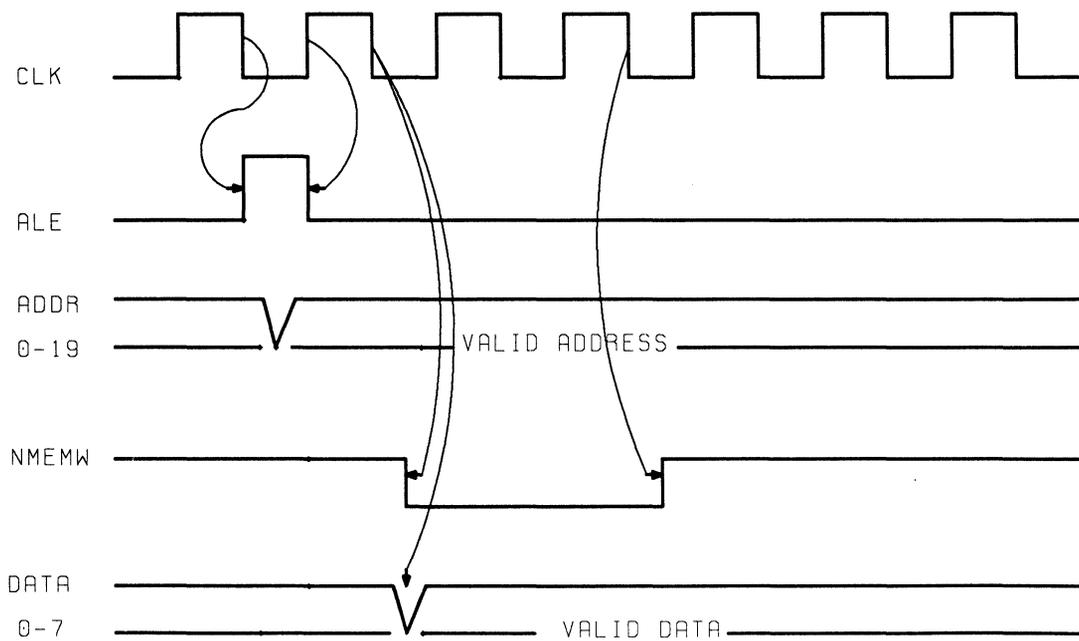
CPU MEMORY WRITE CYCLE

```
CLK   ___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___|‾‾|___

ALE   _____|‾|_____

ADDR
0-19  _____\ /_____VALID ADDRESS_____

NMEMW _____|_____|_____

DATA
0-7   _____\ /_____VALID DATA_____
```

CPU I/O READ CYCLE

CLK

LATCH READ DATA

ALE

ADDR
0-19   VALID ADDRESS

NI/OR

CPU I/O WRITE CYCLE

CLK

ALE

ADDR
0-19   VALID ADDRESS

NI/OW

DATA
0-7   VALID DATA

DMA READ CYCLE

CLK

DRQ

REN

ADDR
0-19   VALID ADDRESS

NDACK

NMEMR

NIOW
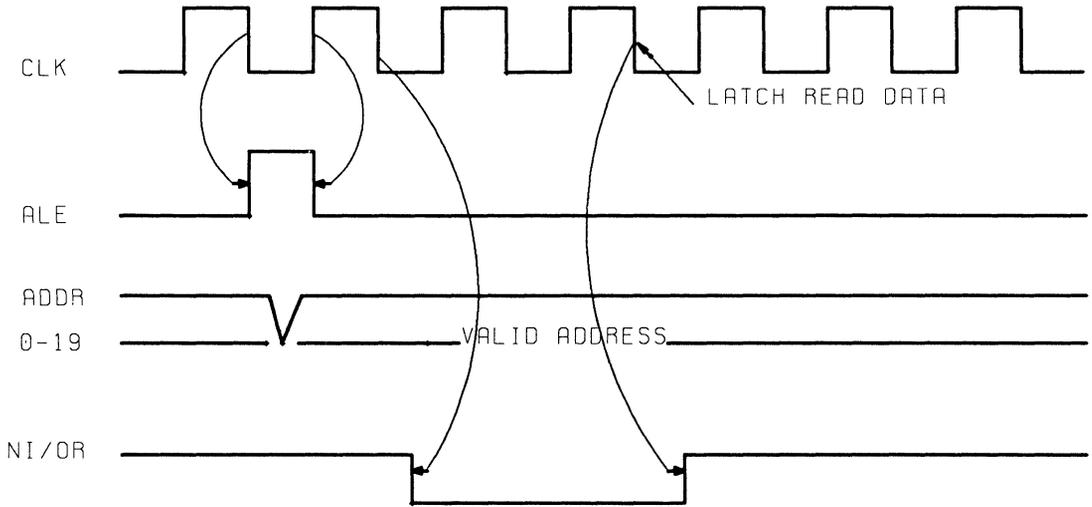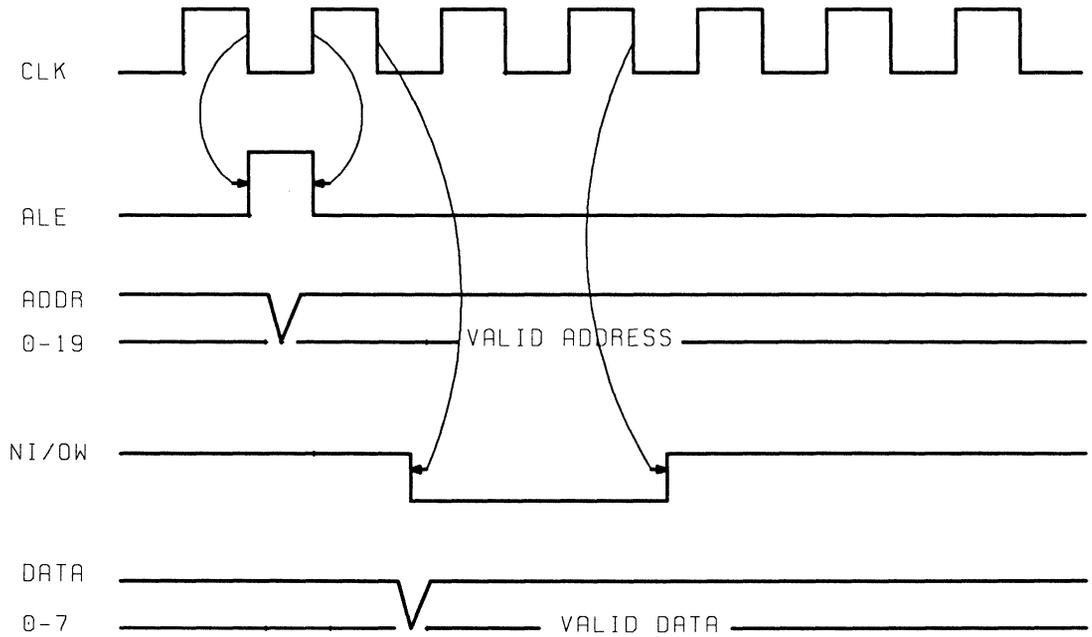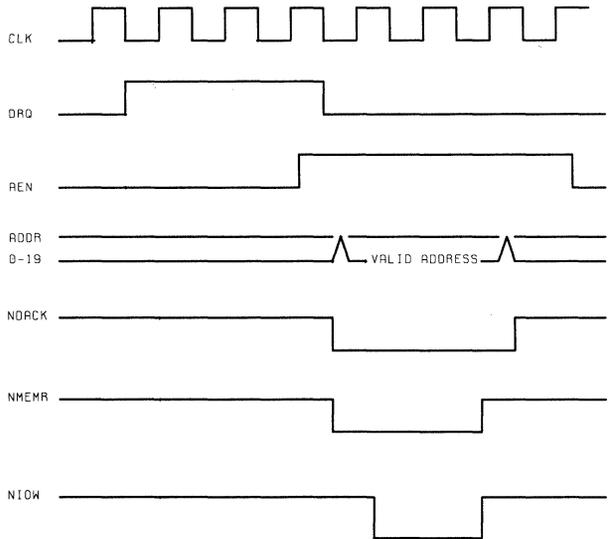
NOTE: The address on the bus is the memory address

DMA WRITE CYCLE

CLK

DRQ

REN

ADDR
0-19   VALID ADDRESS

NDACK

NMEMW

NIOR
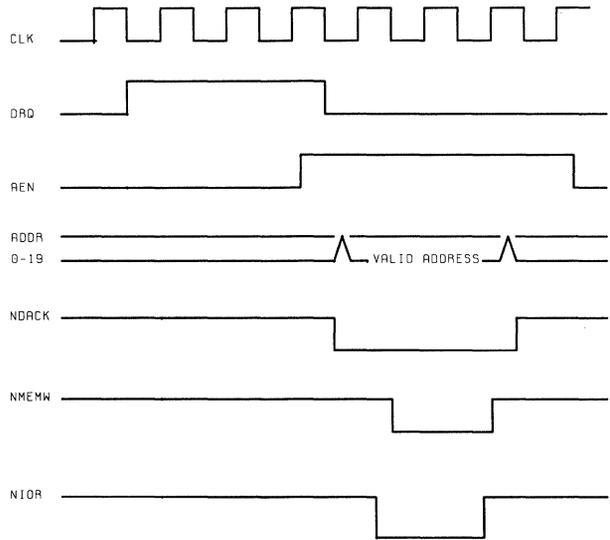
NOTE: The address on the bus is the memory address

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.

CARD DIMENSIONS		INCHES	
		NOMINAL	TOLERANCE
Micro Size	Card Length	6.20	±0.01
	Card Height	4.20	±0.01
Full Size	Card Length	13.30	±0.01
	Card Height	4.20	±0.01

Figure 2-8. Card Dimensions
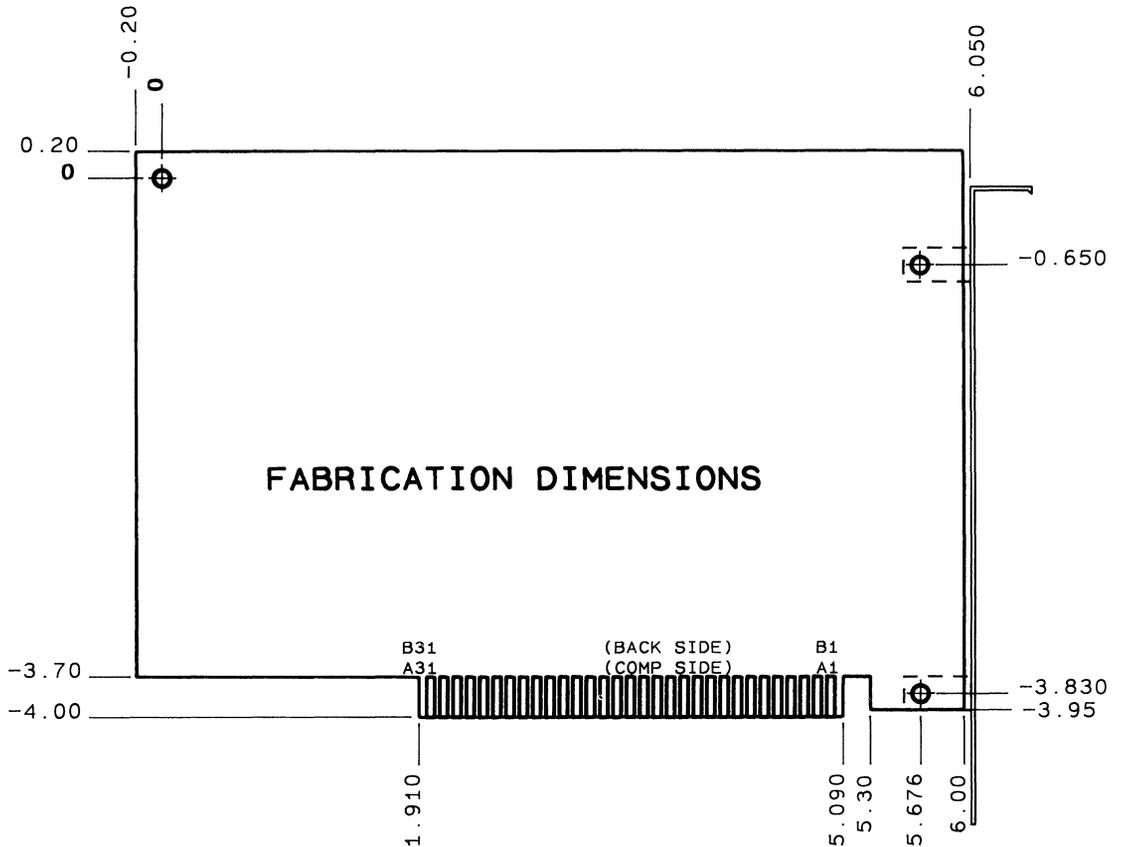
Figure 2-9. Micro Size Card Outline
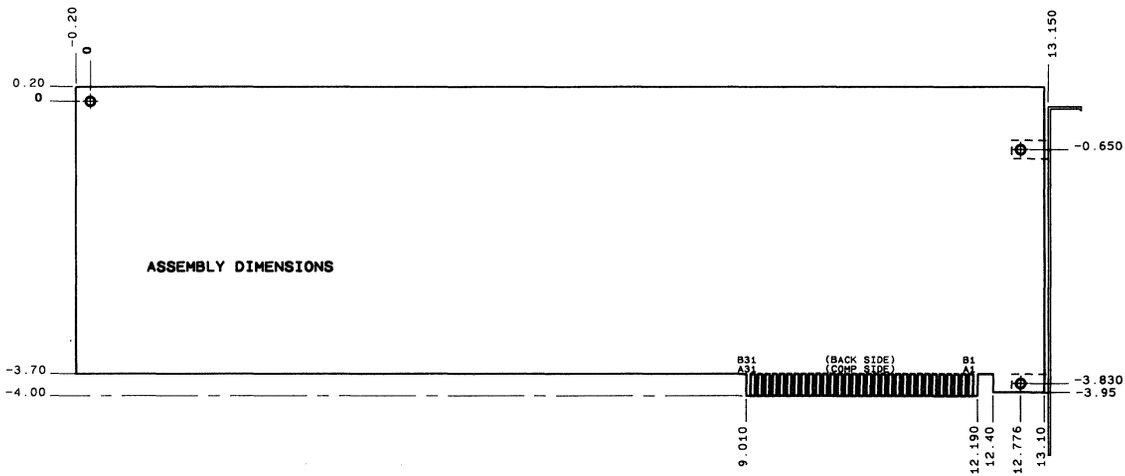
Figure 2-10. Full Size BUS Card Outline

PC BIOS

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.

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

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

Vector Address	Interrupt #	Routine
4C-4F	13	Floppy, hard disk
50-53	14	Serial communications
54-57	15	Reserved
58-5B	16	Keyboard
5C-5F	17	Printer
60-63	18	Reserved
64-67	19	Boot
68-6B	1A	Time of day
6C-6F	1B	Keyboard user program
70-73	1C	Timer user program
74-77	1D	Video parameters
78-7B	1E	Floppy disk parameters
7C-7F	1F	Graphics characters
100-103	40	Diskette-IO
104-107	41	Hard disk parameters
108-10B	42	EGA Bios redirect
10C-10F	43	EGA video parameters
110-113	44	EGA character table

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.

Address	USE
00-01	ID byte (55AA)
02	Size of PROM in 512 byte blocks
03	Starting address of PROM program
Last byte	Checksum

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:

AH =   00
AL =   Mode

Color Graphics Adapter

Mode	Format	Pages	Monitor
0	40 X 25 Character, monochrome	8	TV or Color
1	40 X 25 Character, color	8	TV or Color
2	80 X 25 Character, monochrome	4	Color
3	80 X 25 Character, color	4	Color
4	320 X 200 X 2 graphics	1	Color
5	320 X 200 X 1 graphics	1	Color
6	640 X 200 X 1 graphics	1	Color

Monochrome Adapter

Mode	Format	Pages	Monitor
7	80 X 25 Character, monochrome	1	Monochrome

EGA

Mode	Format	Pages Monitor	
00	40 X 25 Character, monochrome	8	Color or Hi Res
01	40 X 25 Character, color	8	Color or HI Res
02	80 X 25 Character, monochrome	8	Color or Hi Res
03	80 X 25 Character, color	8	Color or Hi Res
04	320 X 200 X 2 graphics	1	Color or Hi Res
05	320 X 200 X 1 graphics	1	Color or Hi Res
06	640 X 200 X 1 graphics	1	Color or Hi Res
07	80 X 25 Character, monochrome	8	Monochrome
0D	320 X 200 X 4 graphics	8	Color or Hi Res
0E	640 X 200 X 4 graphics	4	Color or Hi Res
0F	640 X 350 X 1 graphics	2	Monochrome or Hi Res
10	640 X 350 X 4 graphics	2	Hi Res

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 the 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:

    AH =   09
    AL =   Character
    BH =   Page
    BL =   Attribute (character modes only)
                or
            Color (graphics modes only)
    CX =   # of characters to write

k. Write character at current cursor position

    Input registers:

    AH =   0A
    AL =   Character
    BH =   Page
    CX =   # of characters to write

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

    Input registers:

    AH =   0B
    BH =   0 Background color set
    BL =   Background color (1 of 16)

                or

    BH =   1 Palette select
    BL =   0 Green, red, yellow
            1 Cyan, magenta, white

m. Write dot

    Input registers:

    AH =   0C
    AL =   Dot value (Bit 7 = 1 causes
                value to be exclursive or'd with
                existing value)
    CX =   Column (in pixels)
    DX =   Row (in pixels)

n. Read dot

    Input registers

    AH =   0D
    CX =   Column (in pixels)
    DX =   Row (in pexels)

    Output registers:

    AL =   Dot value

o. Write teletype

    Input registers:

    AH =   0E
    AL =   Character
    BL =   Foreground color (graphics)

p. Get current video state

    Input registers:

    AH =   0F

    Output registers:

    AL =   Mode
    AH =   # of colunms
    BH =   Active page

q. Set palette (EGA only)

Input registers:

AH =	10
AL =	0
BL =	Palette register
BH =	Palette value

or

AL =	1
BH =	overscan value

or

AL =	2
EX:DX =	pointer to table
	bytes 0 -15 are palette table
	byte 16 is overscan value

r. Load character table (EGA only)

Input registers:

AH =	11
AL =	type of load
ES:BP =	pointer to user table
BL =	block
BH =	bytes per character
CX =	count
DX =	offset into table

s. Get character table status (EGA only)

Input registers:

AH =	11
AL =	30
BH =	0 interrupt 1FH pointer
	1 interrupt 44H pointer
	2 ROM 8 X 14 pointer
	3 ROM double dot pointer
	4 ROM double dot top pointer
	5 ROM 9 X 14 pointer

Output registers:

ES:BP =	pointer

t. Adapter status (EGA only)

Input registers:

AH =	12
BL =	10

Output registers:

BH =	0 Color mode
	1 Monochrome mode
BL =	0 64K adapter memory
	1 128K adapter memory
	2 192K adapter memory
	3 256K adapter memory
CH =	Feature Bits
CL =	Switch Setting

u. Select alternate print screen routine (EGA only)

Input registers:

AH =	12
BL =	20

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

Input registers:

AH =	13
AL =	0
BL =	Attribute
BH =	Page
CX =	Character count
DX =	Row, column start of write
ES:BP =	Start of Buffer

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

Input registers:

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

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

Input registers:

AH = 13
AL = 2
BH = Page
CX = Character count
DX = Row, column start of write
ES:BP = Start of buffer

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

Input registers:

AH = 13
AL = 3
BH = Page
CX = Character count
DX = Row, column start of write
ES:BP = Start of buffer

Get Configuration   Interrupt 11H

Output registers:

AX = Configuration

Bit	Function
15-14	# of parallel ports
13	—
12	Joystick installed
11- 9	# of serial ports
8	—
7- 6	# of floppy disk (if bit 0 = 1)
	0 = 1 floppy
	1 = 2 floppies
	2 = 3 floppies
	3 = 4 floppies
5- 4	Video mode at boot time
	0 = no display
	1 = 40 X 25 using color display
	2 = 80 X 25 using color display
	3 = 80 X 25 using monochrome display
3- 2	—
1	8087 coprocessor installed
0	floppy disk installed

Memory Size   Interrupt 12H

Output registers:

AX = 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.

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

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

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

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

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
```

g. Format specific track and set bad sector flags

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 =   0B
       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

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 =   0E
       ES:BX =   Address of memory buffer

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.

Port	Address Location	Timeout value Location
COM1	00400	0047C
COM2	00402	0047D
COM3	00404	0047E
COM4	00406	0047F

a. Initilize 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	2400			
1	1	0	4800			
1	1	1	9600			

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 =   0 COM1
           1 COM2
           2 COM3
           3 COM4

Output registers:

AX =   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:

AH =   01
AL =   Transmit character
DX =   0 COM1
           1 COM2
           2 COM3
           3 COM4

Output registers:

AH =   Status

Bit	Function
7	Timeout
6	XMT shift register empty
5	XMT hold register empty
4	Break
3	Framing error
2	Parity error
1	Over run error
0	Data Ready

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:

AH =   02
DX =   0 COM1
           1 COM2
           2 COM3
           3 COM4

Output registers:

AH =   Status
AL =   character

Bit	Function
7	Timeout
6	—
5	—
4	Break
3	Framing error
2	Parity error
1	Over

d. Get status

Input registers:

AH = 03
DX = 0 COM1
1 COM2
2 COM3
3 COM4

Output registers:

AX = Status

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

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:

AH = 00

Output registers:

AH = Keyboard scan code
AL = Character

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:

AH = 01

Output registers:

AH = Keyboard scan code (If ZF = 0)
AL = Character (If ZF = 0)
ZF = 1 No character available
0 Character available

c. Get the keyboard status

Input registers:

AH = 02

Output registers:

AL = Status

Bit	Function
7	Insert mode
6	Caps lock mode
5	Num Lock mode
4	Scroll mode
3	Alt key depressed
2	Control key depressed
1	Left shift key depressed
0	Right shift key drpressed

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.

Port	Address	Location
LPT1	00408	00478
LPT2	0040A	00479
LPT3	0040C	0047A
LPT4	0040E	0047B

Bit	Function
7	Not busy
6	Acknowledge
5	Out of paper
4	Selected
3	I/O error
2	—
1	—
0	Timeout

a. Print Character

Input registers:

AH =   00
AL =   Character to be printed
DX =   0 LPT1
        1 LPT2
        2 LPT3
        3 LPT4

Output registers:

AH =   Status (See Status, AH = 02)

b. Initilize Printer

Input registers:

AH =   01
DX =   0 LPT1
        1 LPT2
        3 LPT3
        4 LPT4

Output registers:

AH =   Status (See Status, AH = 02)

c. Get printer status

Input registers:

AH =   02
DX =   0 LPT1
        1 LPT2
        2 LPT3
        3 LPT4

Output registers:

AH =   Status

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 inter-
rupt (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

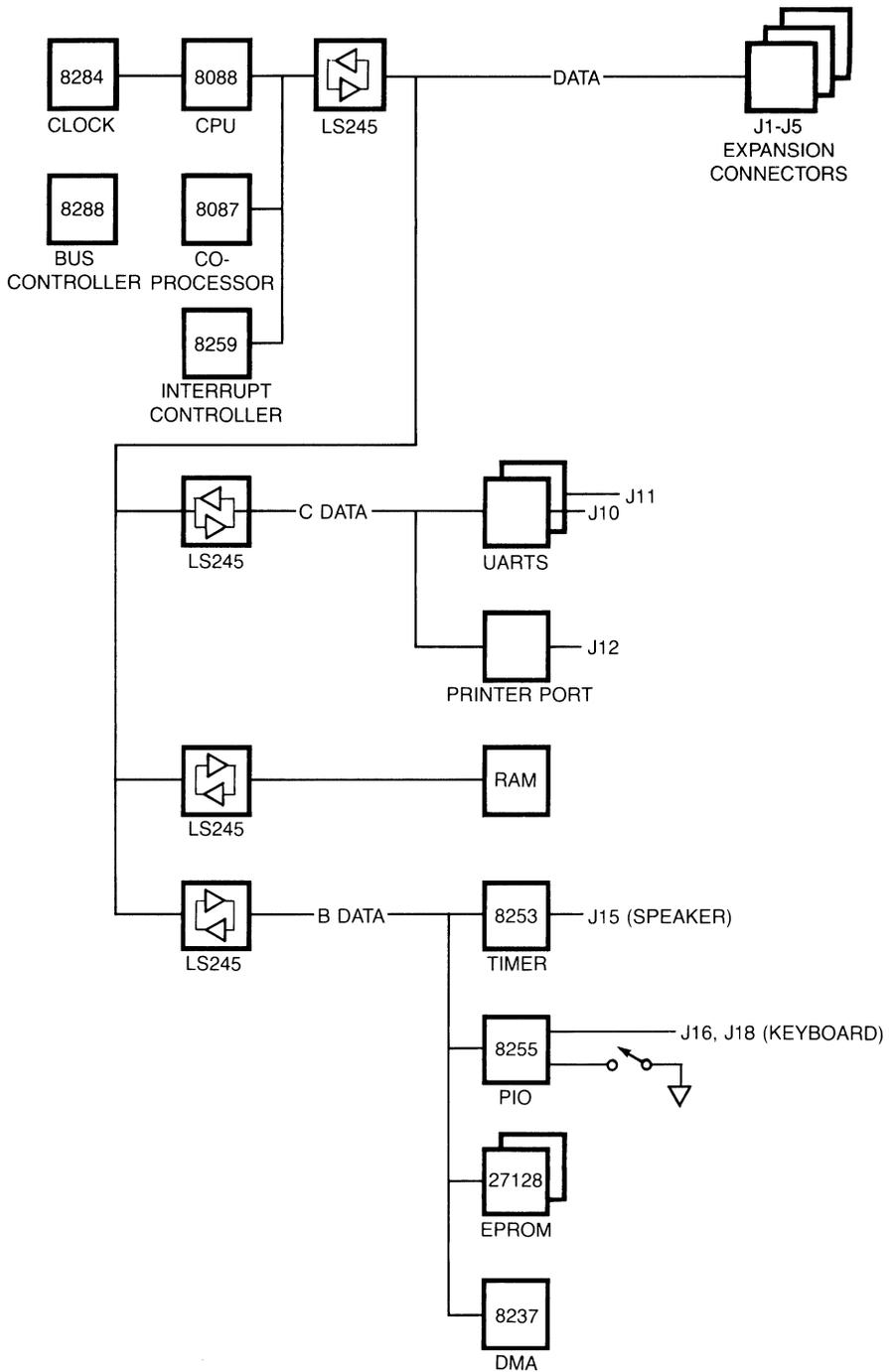## SINGLE BOARD COMPUTERS

Faraday Electronics

FE6400
PC BUS Single Board Computer
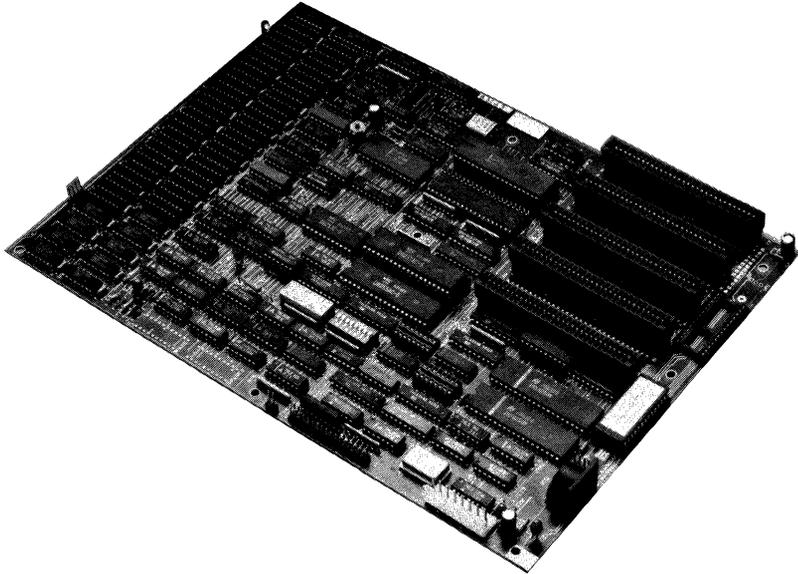
- 100% Hardware and Software
  Compatible with the IBM PC

- 8088 CPU

- 8087 co-processor socket

- 8 Interrupts

- 4 DMA Channels

- 4.77 Mhz Clock Speed

- 3 Timer Channels

- BIOS onboard

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.

```
┌──────┐   ┌──────┐   ┌──────┐                                    ┌──────┐
│ 8284 │───│ 8088 │───│ LS245│──────────────DATA──────────────────│ J1-J5│
│CLOCK │   │ CPU  │   │      │                                    │      │
└──────┘   └──────┘   └──────┘                                    └──────┘
                                                                 EXPANSION
┌──────┐   ┌──────┐                                              CONNECTORS
│ 8288 │   │ 8087 │
│ BUS  │   │ CO-  │
└──────┘   └──────┘
CONTROLLER PROCESSOR
           ┌──────┐
           │ 8259 │
           └──────┘
           INTERRUPT
           CONTROLLER

           ┌──────┐                    ┌──────┐
           │ LS245│──────C DATA────────│ UARTS│──── J11
           │      │                    │      │  J10
           └──────┘                    └──────┘
           LS245

                                       ┌──────┐
                                       │      │──── J12
                                       └──────┘
                                    PRINTER PORT

           ┌──────┐                    ┌──────┐
           │ LS245│────────────────────│ RAM  │
           └──────┘                    └──────┘
           LS245

           ┌──────┐                    ┌──────┐
           │ LS245│──────B DATA────────│ 8253 │──── J15 (SPEAKER)
           └──────┘                    └──────┘
           LS245                        TIMER

                                       ┌──────┐
                                       │ 8255 │──── J16, J18 (KEYBOARD)
                                       └──────┘
                                        PIO

                                       ┌──────┐
                                       │27128 │
                                       └──────┘
                                       EPROM

                                       ┌──────┐
                                       │ 8237 │
                                       └──────┘
                                        DMA
```

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:

+ 5v	3 Amps
+12v	50 ma
-12v	50 ma

Environment

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

Physical Dimensions

12″ L X 8.5″ W

Ordering Information

FE6400/256	FE6400 with 256K Ram

FE6410 Series
PC BUS Single Board Computers
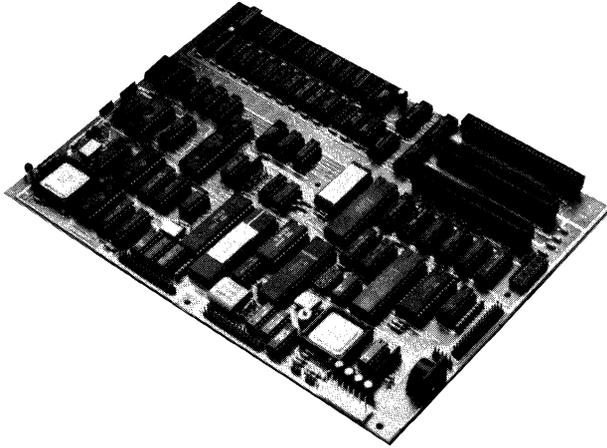
- **100% Hardware and Software Compatible with the IBM PC**

- **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.

The FE6410 Series	Floppy Ctlr	Monochrome Ctlr
FE6411	Yes	No
FE6412	No	Yes
FE6413	Yes	Yes

8088
CPU

LS245

DATA

J1-J3-J5
EXPANSION
CONNECTORS

8288
BUS
CONTROLLER

8259
INTERRUPT
CONTROLLER

Q   D
LS374

LS245   MONOCHROME
DISPLAY CONTROLLER

J21 (MONOCHROME DISPLAY)

LS245   RAM

SERIAL
J16 (SERIAL)

FLOPPY
CONTROLLER
J15 (FLOPPY)

LS245   B DATA

8253
TIMER
J14 (SPEAKER)

J18 (NMI)
J12, J13 (KEYBOARD)
J17 (PRINTER)
J11 (CLEAR)
CPU
CONTROLS

2764
EPROM

8237
DMA
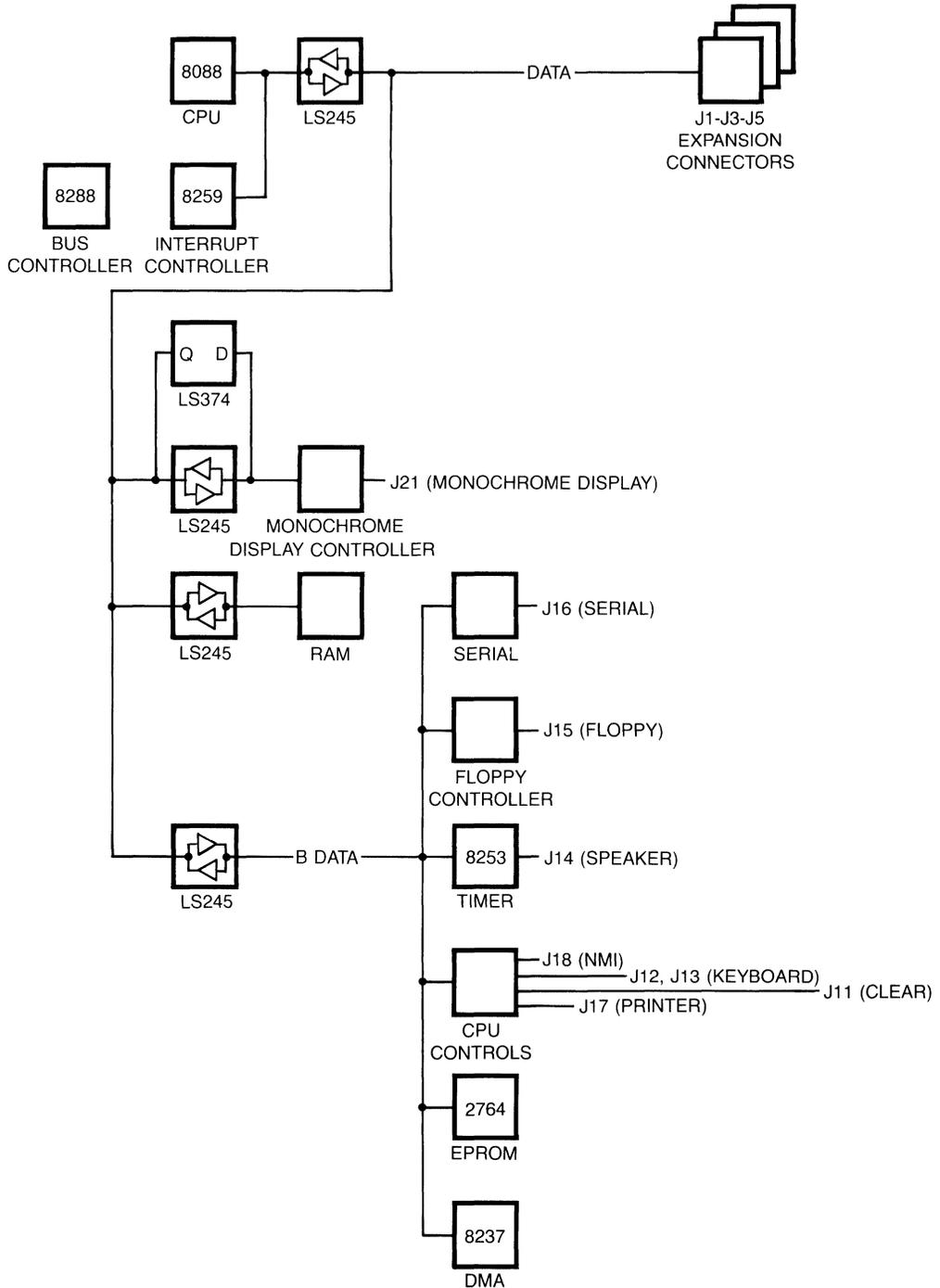
FE6410 Block Diagram

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 FFFFF) 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:

+ 5v	2 Amps
+12v	50 ma
-12v	50 ma

Environment

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

Physical Dimensions

12″ L X 8.5″ W

Ordering Information

FE6411/256	FE6411 with 256K Ram
FE6411/512	FE6411 with 512K Ram
FE6412/256	FE6412 with 256K Ram
FE6412/512	FE6412 with 512K Ram
FE6413/256	FE6413 with 256K Ram
FE6413/512	FE6413 with 512K Ram

Faraday Electronics

FE6420 Series
PC BUS Single Board Computers
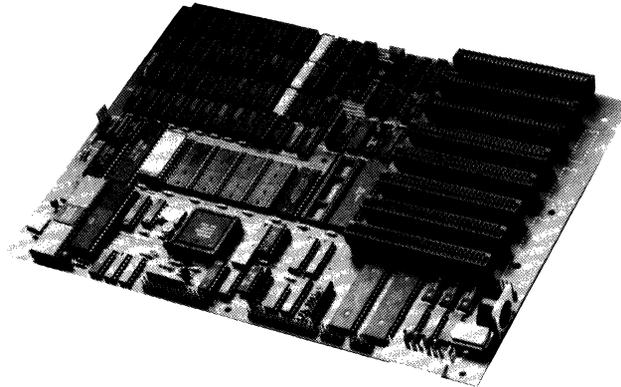
- **100% Hardware and Software Compatible with the IBM PC**

- **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.

The FE6420 Series	Floppy Ctlr	Rom Space
FE6420	No	64K
FE6421	Yes	64K
FE6422	No	160K
FE6423	Yes	160K
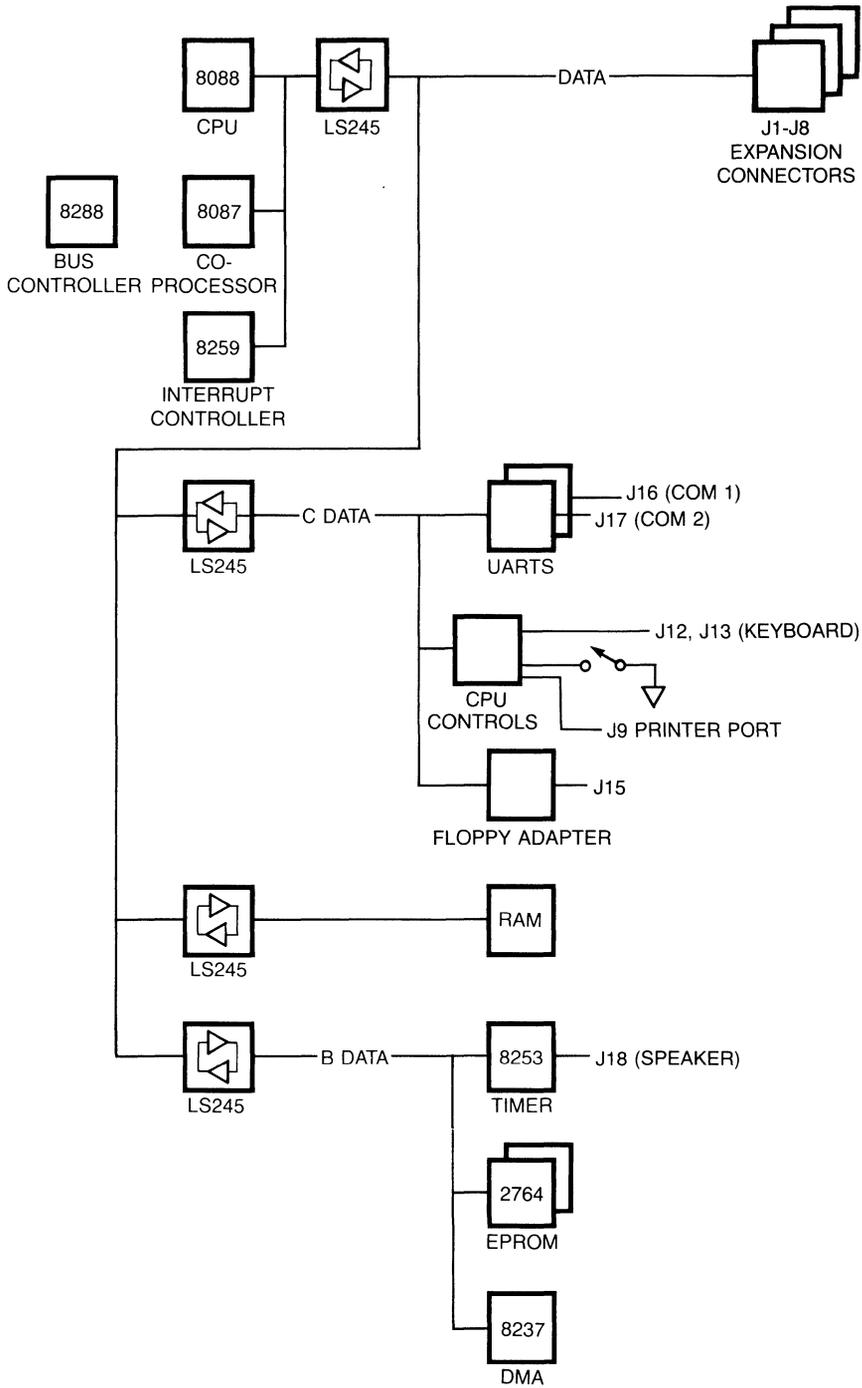
FE6420 Block Diagram

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:

+ 5v	2 Amps
+12v	50 ma
-12v	50 ma

Environment

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

Physical Dimensions

12" L X 8.5" W

Ordering Information

FE6420/256	FE6420 with 256K Ram
FE6420/640	FE6420 with 640K Ram
FE6421/256	FE6421 with 256K Ram
FE6421/640	FE6421 with 640K Ram
FE6422/256	FE6422 with 256K Ram
FE6422/640	FE6422 with 640K Ram
FE6423/256	FE6423 with 256K Ram
FE6423/640	FE6423 with 640K Ram

Faraday Electronics

BUS PC
PC BUS Single Board Computer
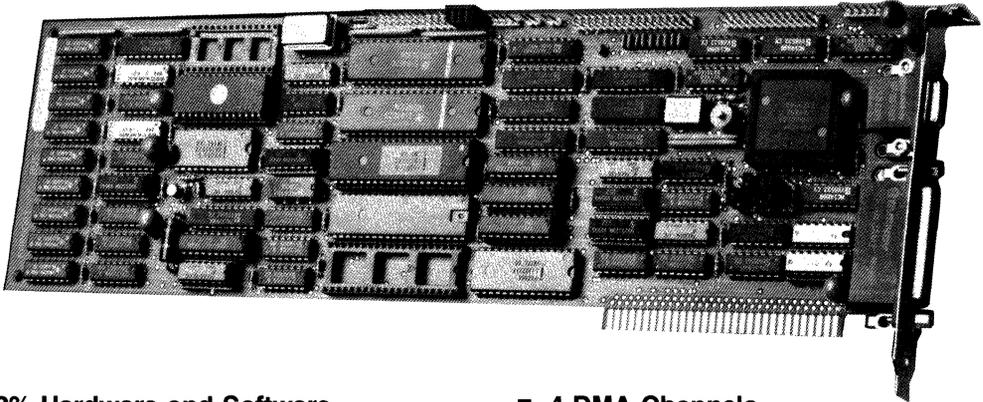
- **100% Hardware and Software Compatible with the IBM PC**

- **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:

+ 5v	2 Amps
+12v	50 ma
-12v	50 ma

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

BUS PC/256	BUS PC with 256K Ram

Micro PC
PC BUS Single Board Computer
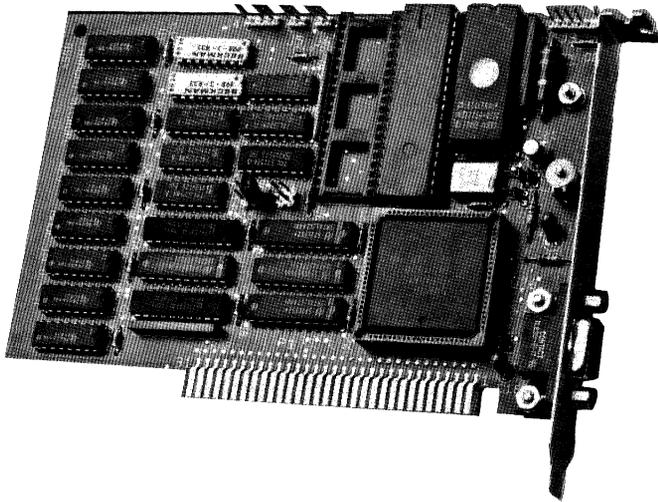
- **100% Hardware and Software Compatible with the IBM PC**

- **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.

8088

74LS245

EXPANSION BUS

8087

RAM   74LS245

FE2010

EPROM

Micro 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, 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

CMOS Micro PC
PC BUS Single Board Computer
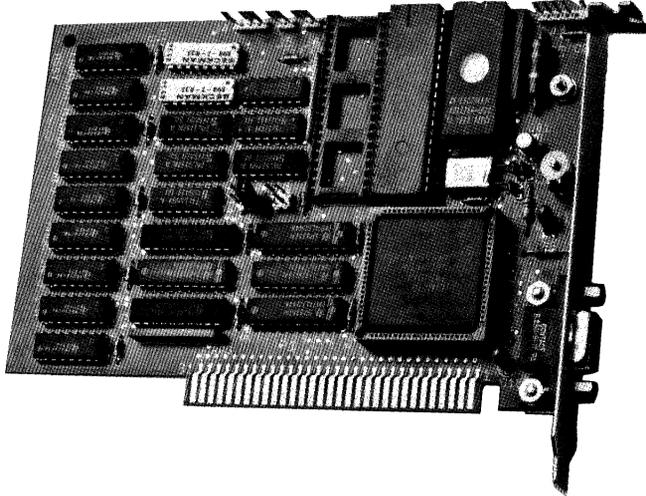
- **100% Hardware and Software Compatible with the IBM PC**

- **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 funtionality 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.

80C88

74LS245

EXPANSION BUS

8087

RAM

74LS245

FE2010

EPROM
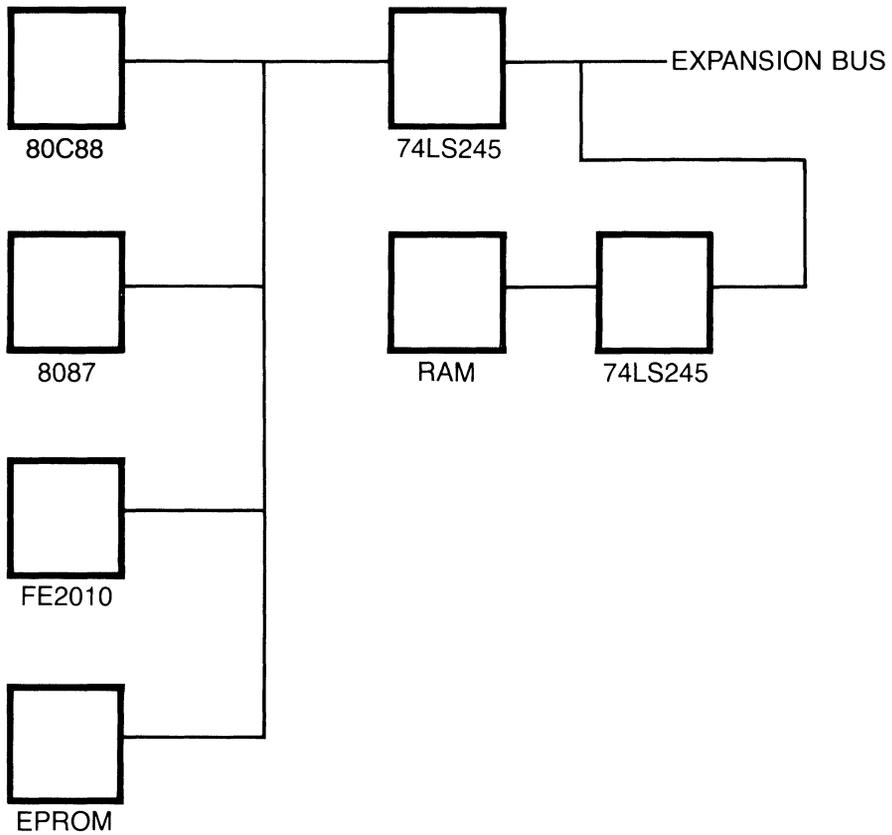
CMOS Micro PC Block Diagram

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.

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.

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 than 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:

+5v	150 ma

Environment

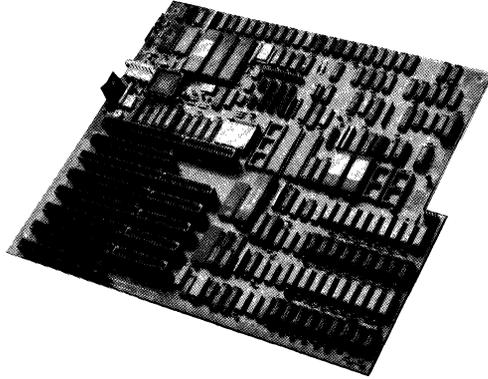| Operating temperature	0 to 70 C
Storage temperature	-40 to 80 C
Relative Humidity	0% to 90% with no condensation

Physical Dimensions

6.2″ L X 4.2″ W

Ordering Information

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

Faraday Electronics

A-Tease Series
AT BUS Single Board Computer

- **100% Hardware and Software Compatible with the IBM AT**

- **6 or 8 Mhz Clock Speed**

- **7 DMA Channels**

- **15 Interrupts**

- **1 Wait State**

- **Up to 1 MB Ram Onboard**

- **3 Timer Channels**

- **BIOS on board**

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.

The A-Tease Series	Clock Speed
A-Tease-6 Mhz	6 Mhz
A-Tease-8 Mhz	8 Mhz
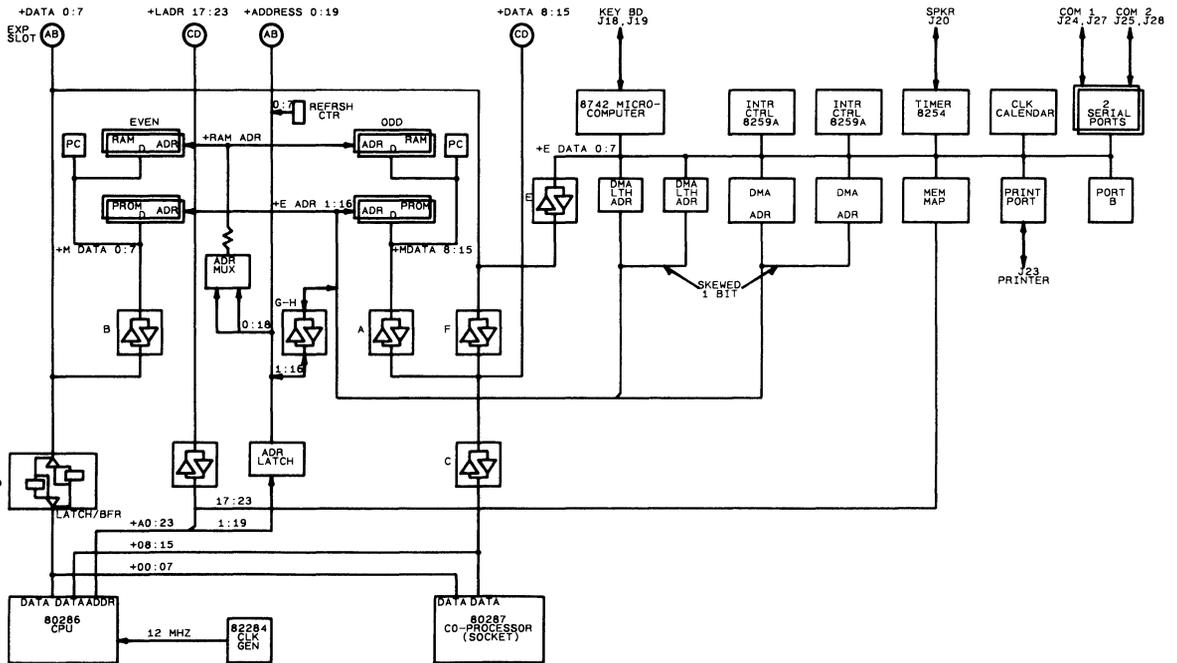
A-Tease Block Diagram

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.

Processor Clock	RAM Type	Wait States
6 Mhz	150ns	1
6 Mhz	150ns	0
8 Mhz	120ns	1
8 Mhz	120ns	0

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 nano-seconds.

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:

+5v	5 Amps
+12v	50 ma
-12v	50 ma

Environment

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

Physical Dimensions

13.8" L X 12" W

Ordering Information

A-Tease-6 Mhz/640	A-Tease at 6 Mhz with 640K Ram
A-Tease-6 Mhz/1M	A-Tease at 6 Mhz with 1M Ram
A-Tease-8 Mhz/640	A-Tease at 8 Mhz with 640K Ram
A-Tease-8 Mhz/1M	A-Tease at 8 Mhz with 1M Ram

Faraday Electronics

BUS AT Series
AT BUS Single Board Computer
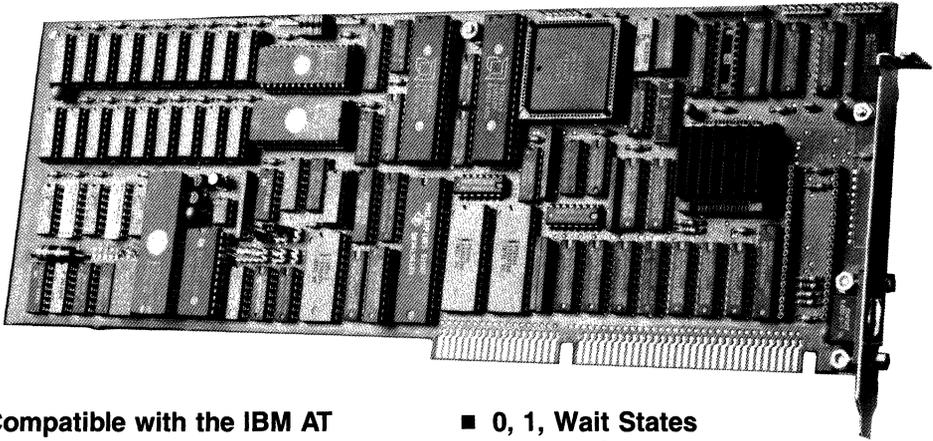
- 100% Compatible with the IBM AT

- 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 calender, 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.

The BUS AT Series	Clock Speed
BUS AT-6 Mhz	6 Mhz
BUS AT-8 Mhz	8 Mhz
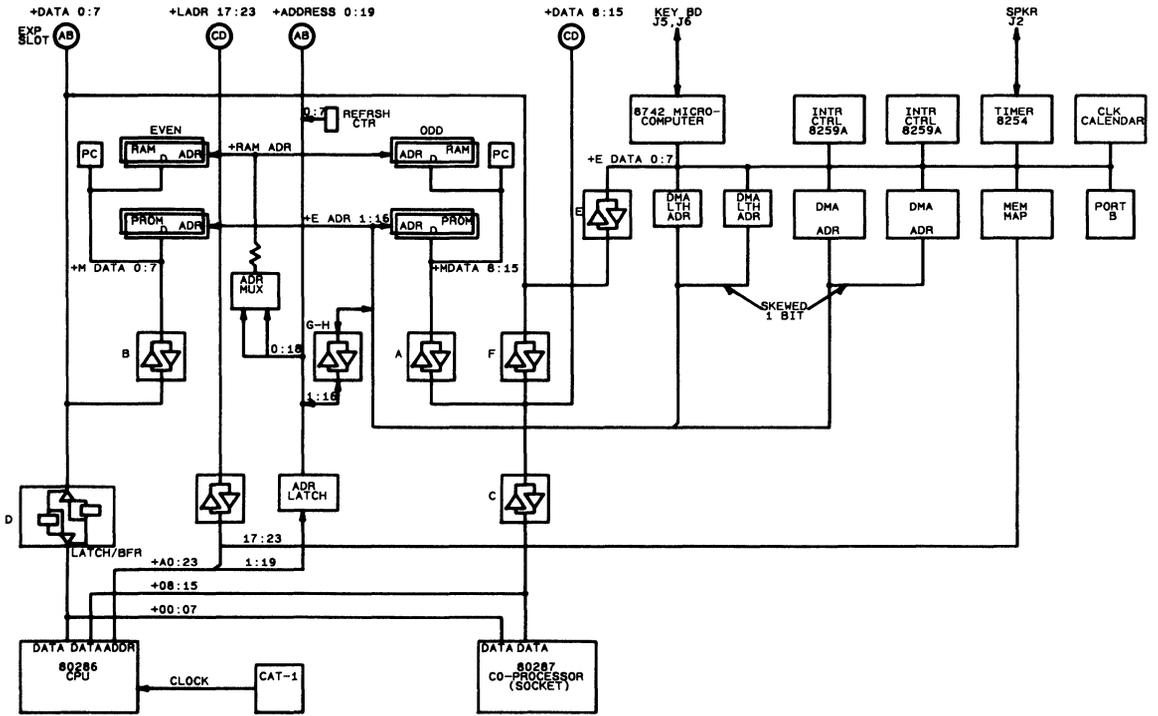
BUS AT Block Diagram

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.

Processor Clock	RAM Type	Wait States
6 Mhz	150ns	1
6 Mhz	150ns	0
8 Mhz	120ns	1
8 Mhz	120ns	0

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 co-processor, 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:

+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

13.15″ L X 4.8″ W

Ordering Information

BUS AT-6 Mhz/512	BUS AT at 6 Mhz with 512K Ram
BUS AT-8 Mhz/512	BUS AT at 8 Mhz with 512K Ram

Section 4

Disk Controllers
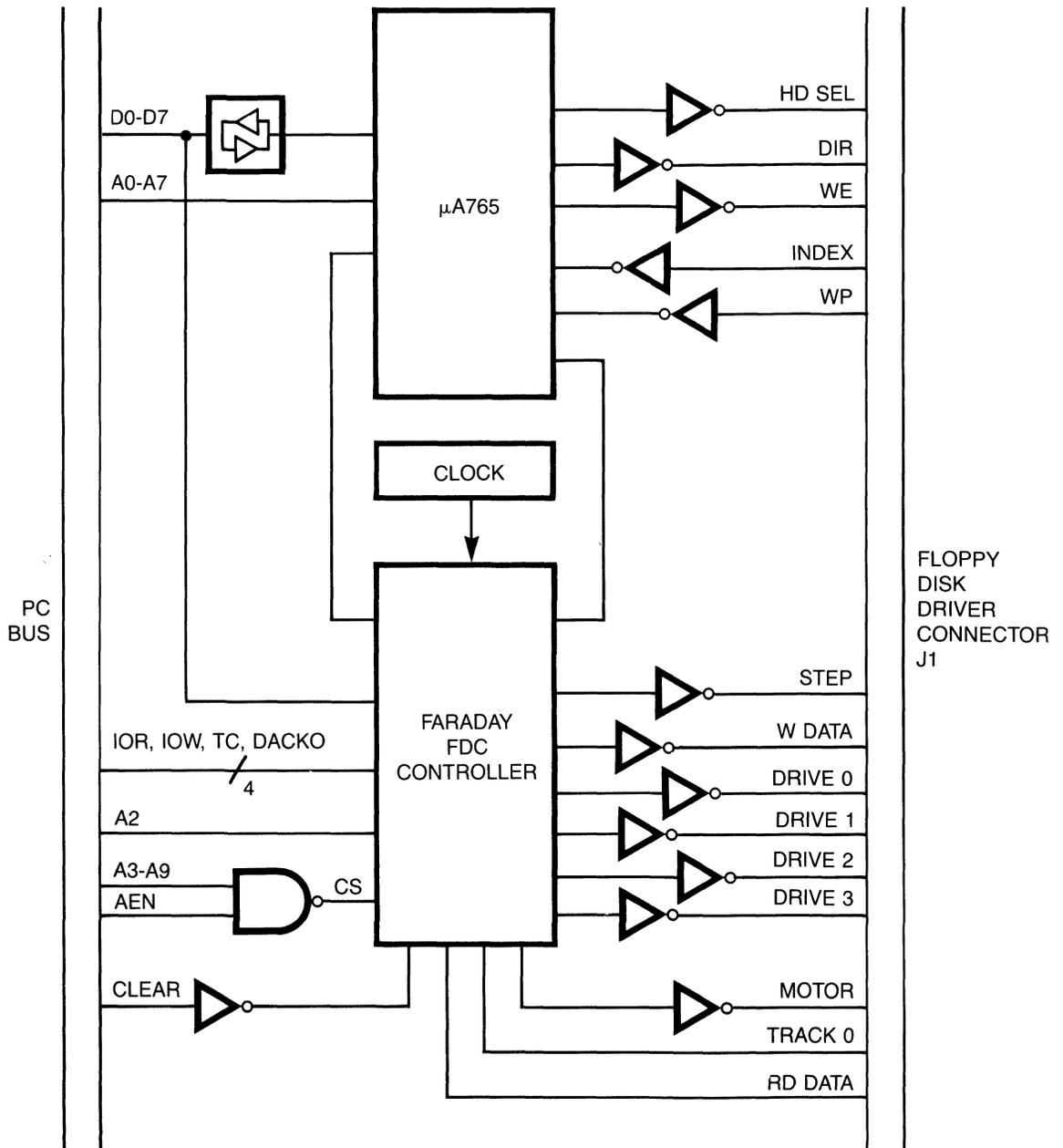
Faraday Electronics

FE 5140
PC BUS Floppy Disk Controller
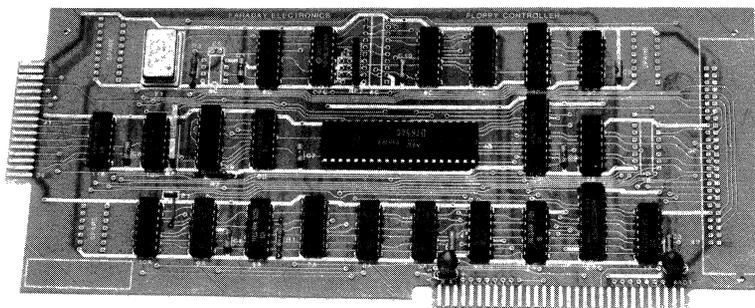
- **100% PC BUS Hardware & Software Compatible**

- **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

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

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
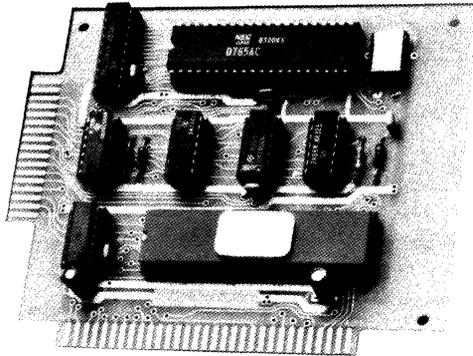
Faraday Electronics

FE 5141
PC BUS Floppy Disk Controller

- **100% PC BUS Hardware & Software Compatible**

- **Controls single-sided or double sided 5 1/4" floppies**

- **Small Size 4.0" by 4.5"**

- **1 Year Warranty**

- **Controls from 1 - 4 floppies**

- **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

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

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

Faraday Electronics

FE 5150
AT BUS Floppy/Hard Disk Controller
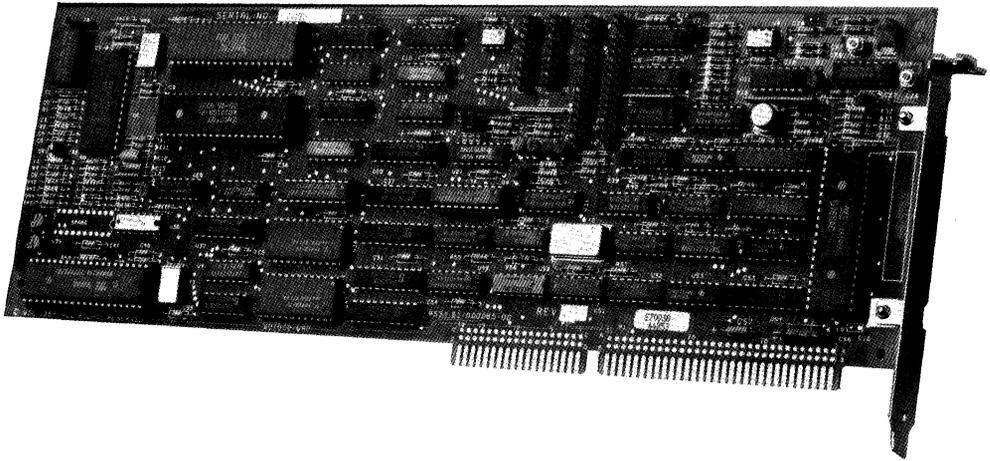
- 100% IBM AT Compatible

- Supports two 5 1/4″ 1.2 MB Floppy Drives

- Supports two 5 1/4″ Winchester 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.
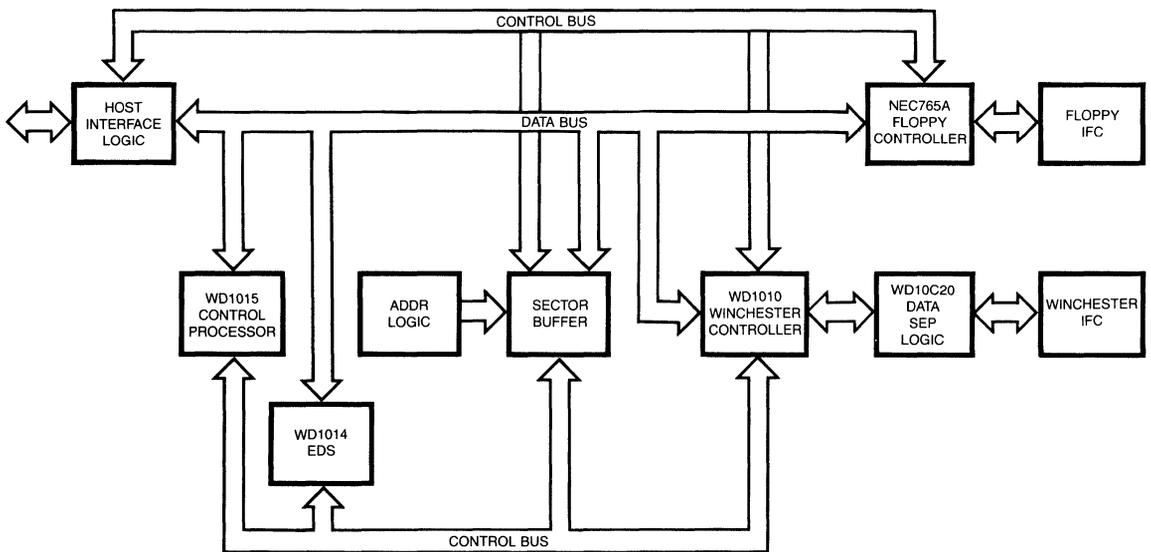
AT BUS Floppy/Hard Disk Controller Block Diagram

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

+5v	2.7 Amps
+12	250 ma

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 4.8" 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.

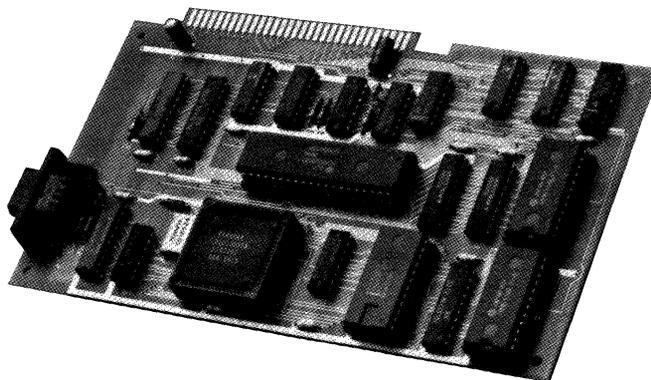   Montebello, CA 90640

    (213) 726-0303

Ordering Information

FE5150	AT BUS Floppy/Hard disk controller

Section 5

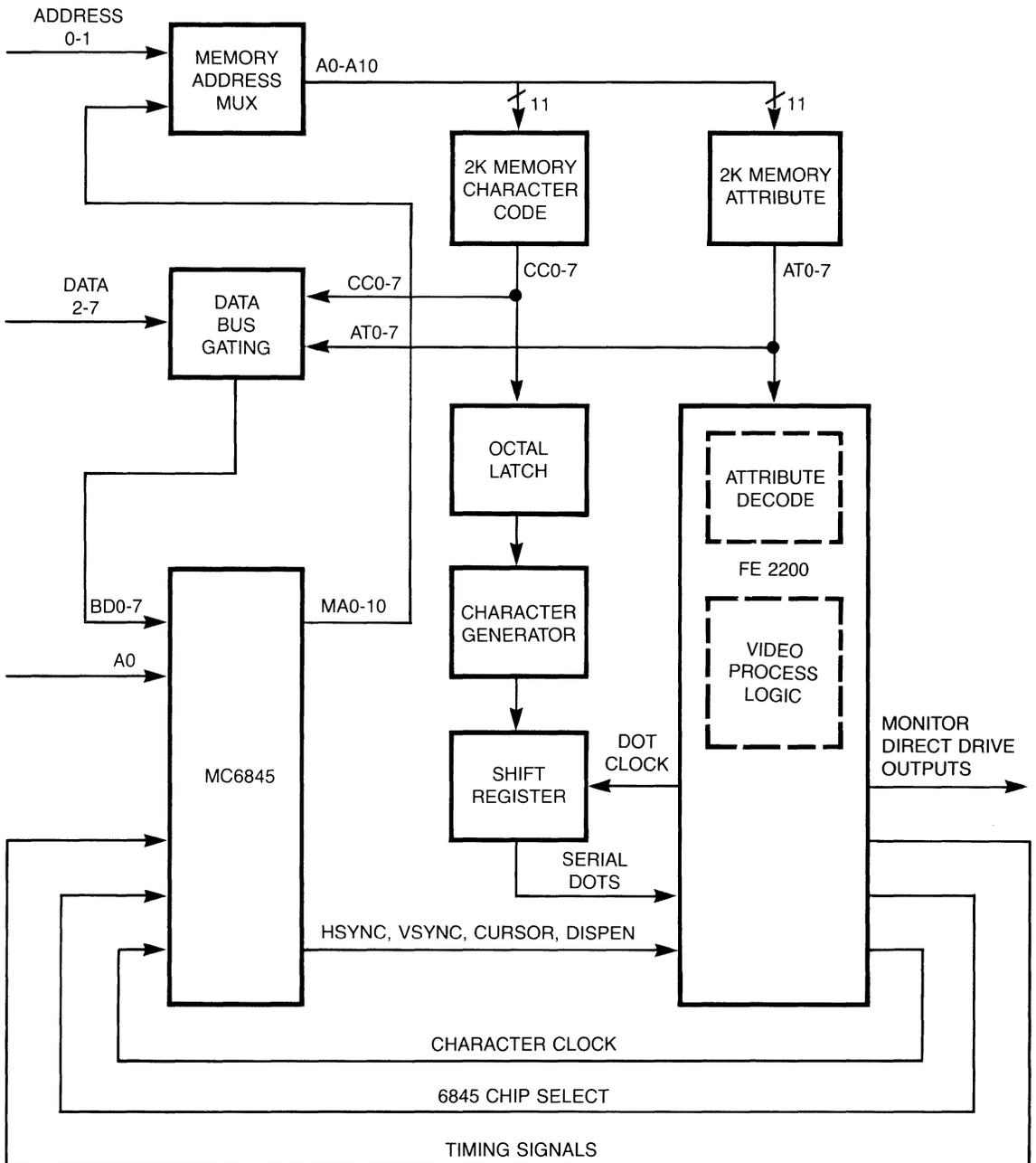## Video Controllers

Faraday Electronics

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.

ADDRESS
0-1

MEMORY
ADDRESS
MUX

A0-A10

11

11

2K MEMORY
CHARACTER
CODE

2K MEMORY
ATTRIBUTE

CC0-7

AT0-7

DATA
2-7

DATA
BUS
GATING

CC0-7

AT0-7

CC0-7

AT0-7

OCTAL
LATCH

ATTRIBUTE
DECODE

FE 2200

BD0-7

MA0-10

CHARACTER
GENERATOR

VIDEO
PROCESS
LOGIC

A0

MC6845

SHIFT
REGISTER

DOT
CLOCK

MONITOR
DIRECT DRIVE
OUTPUTS

SERIAL
DOTS

HSYNC, VSYNC, CURSOR, DISPEN

CHARACTER CLOCK

6845 CHIP SELECT

TIMING SIGNALS

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

+5v	.7 Amps

Environment

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

Physical Dimensions

7.36" L X 4.2" W

Ordering Information

FE5200	Monochrome video controller

Section 6

Software

Faraday Electronics

MS9200
PC BUS And AT BUS Enhanced Software
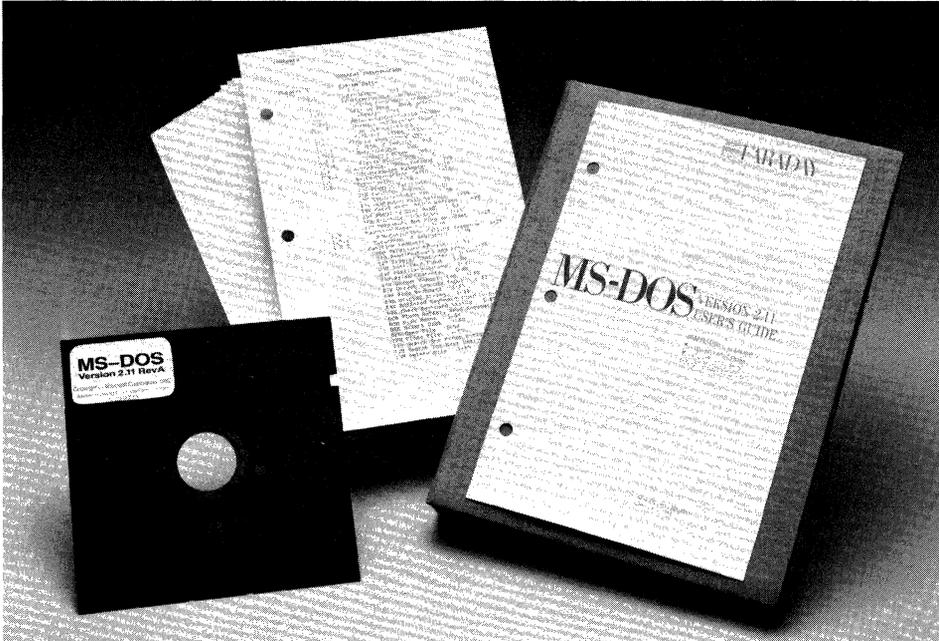
- **100% IBM PC-DOS Compatible**
- **PC-DOS Commands**

- **MS-DOS Version 2.11**
- **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

MS9200	MS DOS 2.11

Faraday Electronics

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 facililties 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

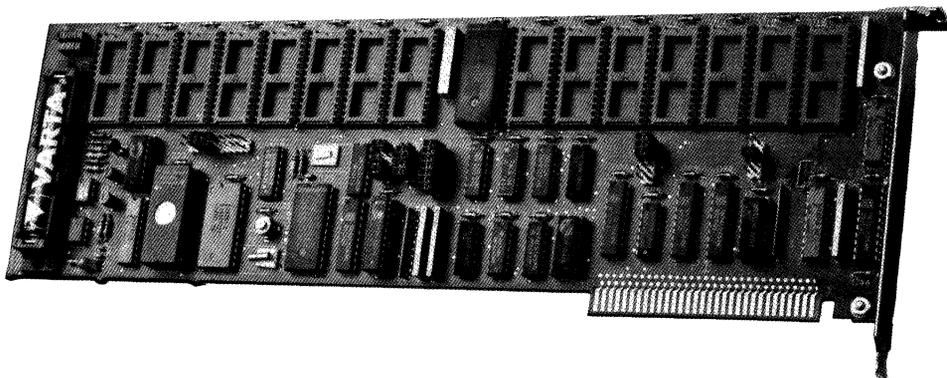 TIMER ON/OFF/STOP

Ordering Information

GW9000	GW Basic 2.01

Section 7

General Purpose Boards

Faraday Electronics

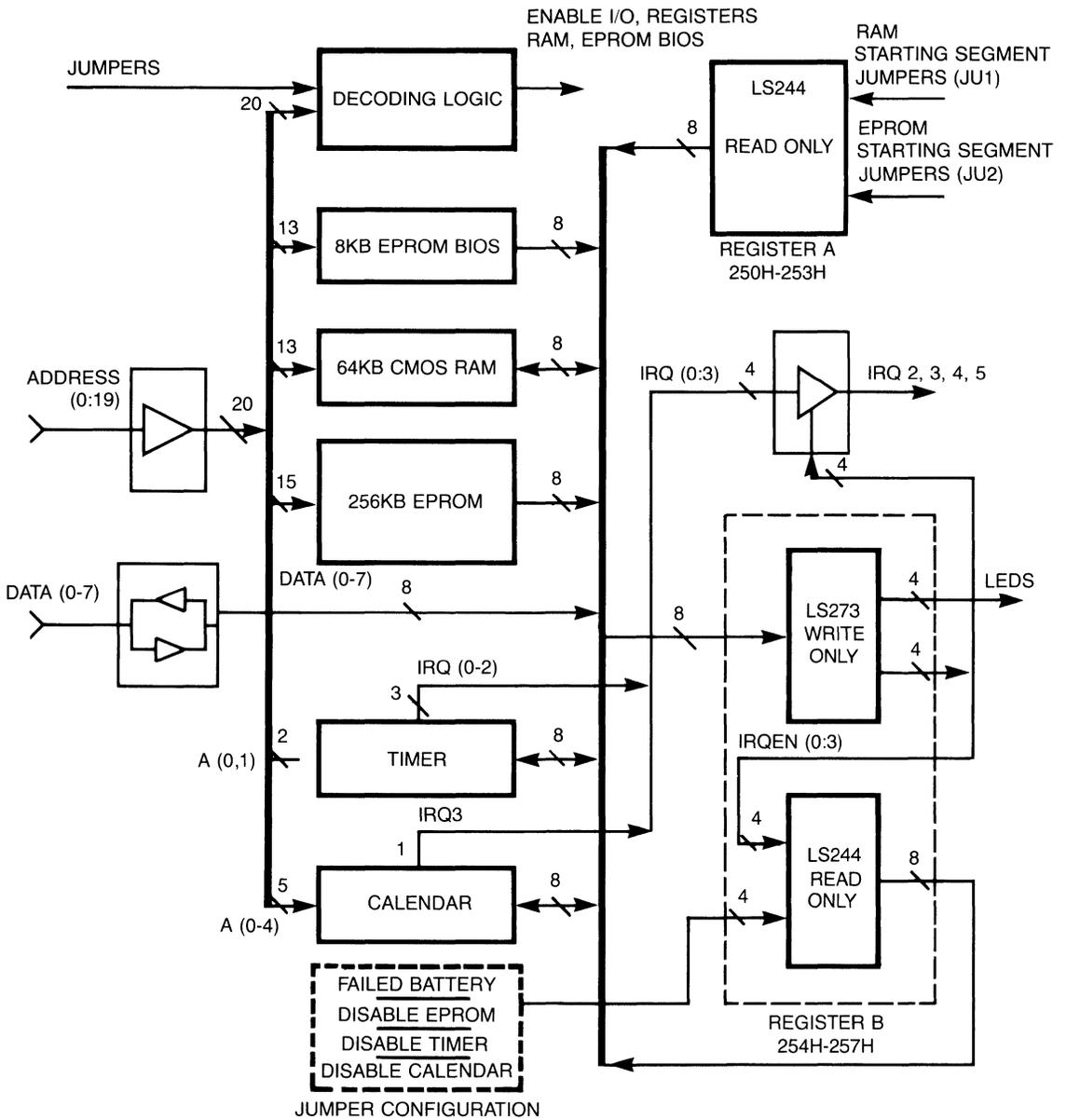# FE 5400
PC BUS CMOS RAM/ROM EXPANSION CARD

- **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.

JUMPERS

ENABLE I/O, REGISTERS
RAM, EPROM BIOS

DECODING LOGIC

20

13   8KB EPROM BIOS   8

ADDRESS
(0:19)   20

13   64KB CMOS RAM   8

15   256KB EPROM   8

DATA (0-7)

DATA (0-7)   8

IRQ (0-2)

3

A (0,1)   2   TIMER   8

IRQ3

1

5   CALENDAR   8

A (0-4)

FAILED BATTERY
DISABLE EPROM
DISABLE TIMER
DISABLE CALENDAR

JUMPER CONFIGURATION

LS244

READ ONLY

8

REGISTER A
250H-253H

RAM
STARTING SEGMENT
JUMPERS (JU1)

EPROM
STARTING SEGMENT
JUMPERS (JU2)

IRQ (0:3)   4   IRQ 2, 3, 4, 5

4

8   LS273
WRITE
ONLY   4   LEDS

4

IRQEN (0:3)

4   LS244
READ
ONLY   8

4

REGISTER B
254H-257H

FE5400 Block Diagram

7-3

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 availabe in 8K increments.

Faraday Electronics

FE 5500
PC BUS Serial & Parallel I/O Card
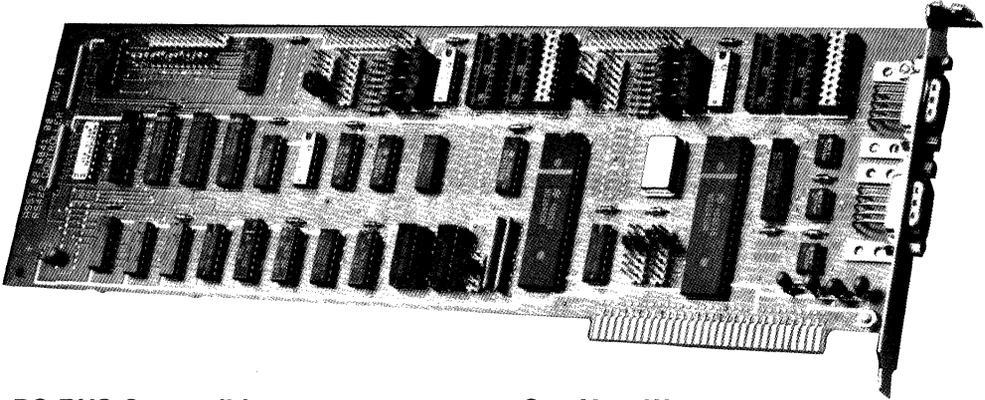
- **100% PC BUS Compatible**

- **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.
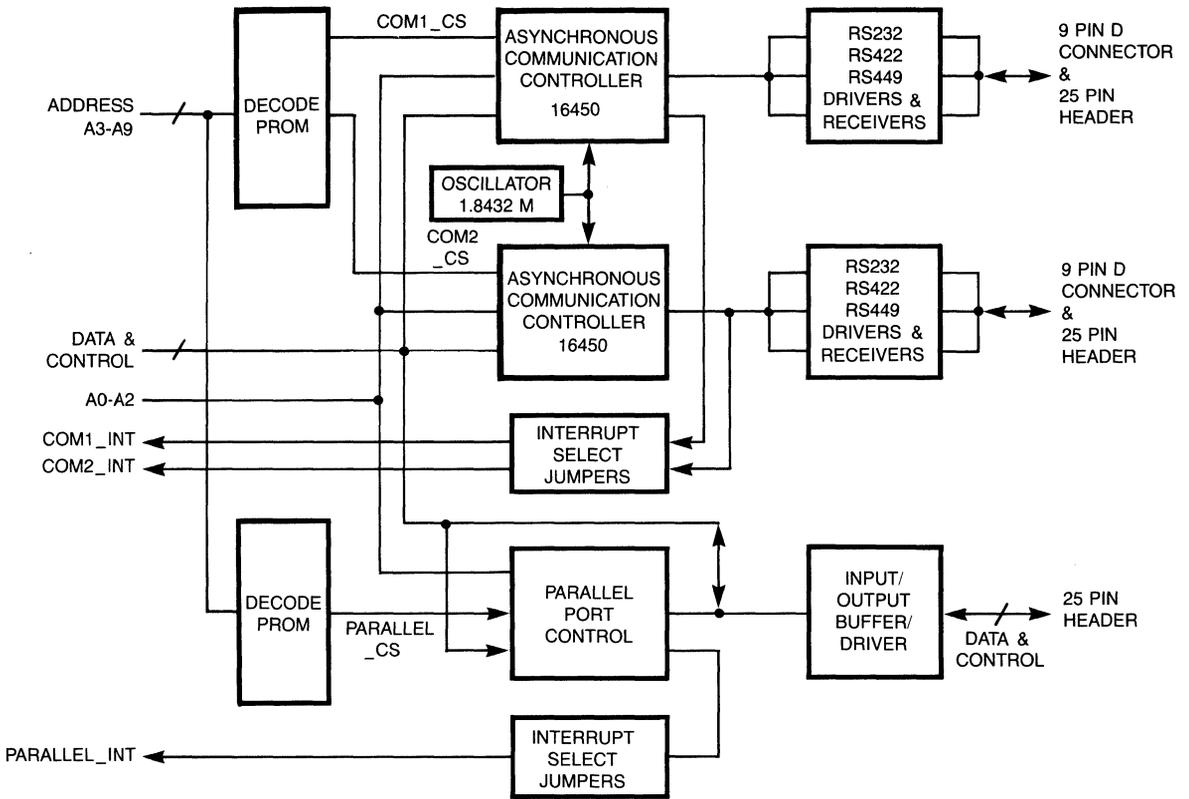
FE5500 Block Diagram

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

+5v	1 Amp
-5v	50 ma (Required only for RS449 option)
+12v	50 ma
-12v	50 ma

Environment

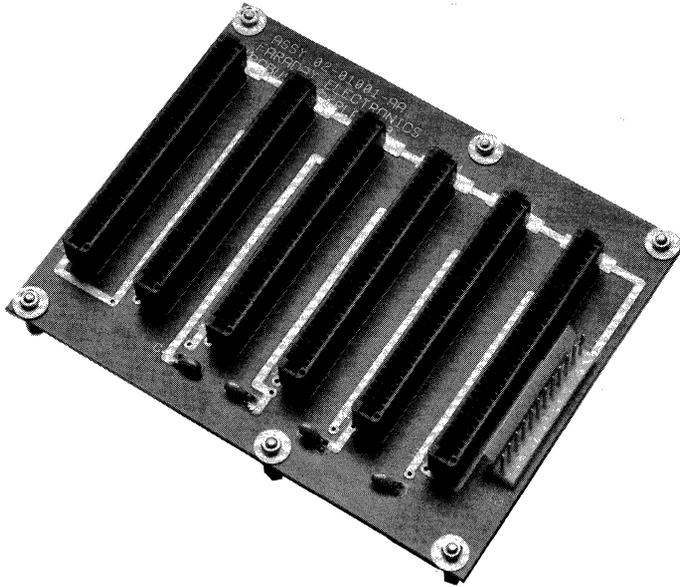| Operating temperature	0 to 55 C
Storage temperature	-40 to 80 C
Relative Humidity	0% to 90% with no condensation

Physical Dimensions

13.15" L X 4.2" W

Ordering Information

| FE5500	Serial Parallel I/O Card

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.)
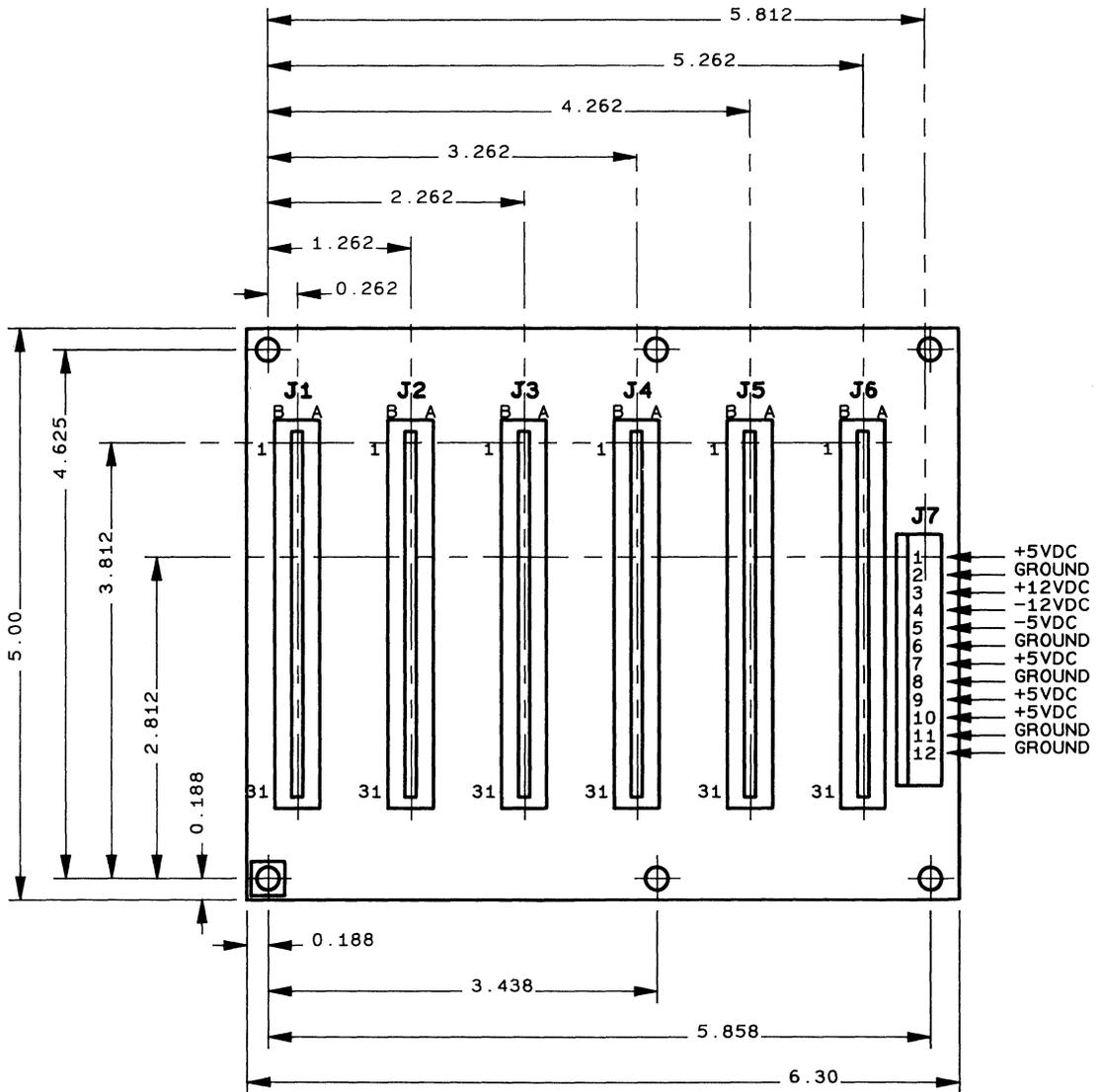
PC BUS 6 Slot Backplane Dimensions (Top View)

Technical Description

Slot Spacing

The slots are spaced one inch apart center to cen-
ter.

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 mat-
ing connector is Molex 09507081. The mating pins
are Molex 08-50-0106.

Environment

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

Physical Dimensions

6.3″ L X 5.0″ W

Ordering Information

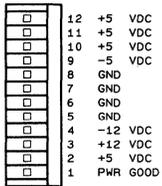| FE6SBP	Six slot backplane

Faraday Electronics
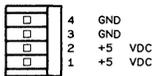
FE8SBP
Eight Slot AT BUS Backplane
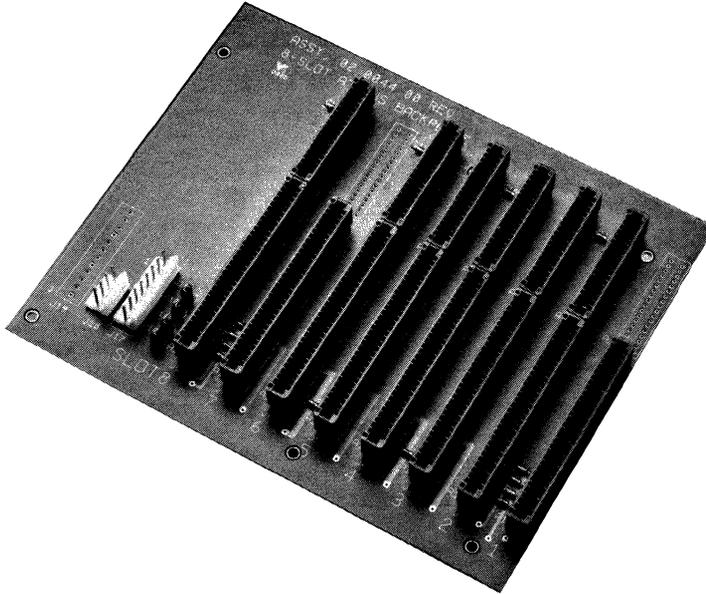
- Eight Expansion Slots
- .8″ Slot Spacing
- 8 62-Pin edge connectors with interconnect wiring for PC BUS

- 4 layer PCB Design
- 8 & 4 Pin Power Connectors
- 6 36-pin edge connectors with interconnect wiring for 16 bit AT BUS
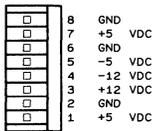
Product Overview

This backplane implements the AT BUS backplane interconnection scheme as defined by the AT BUS general specification.
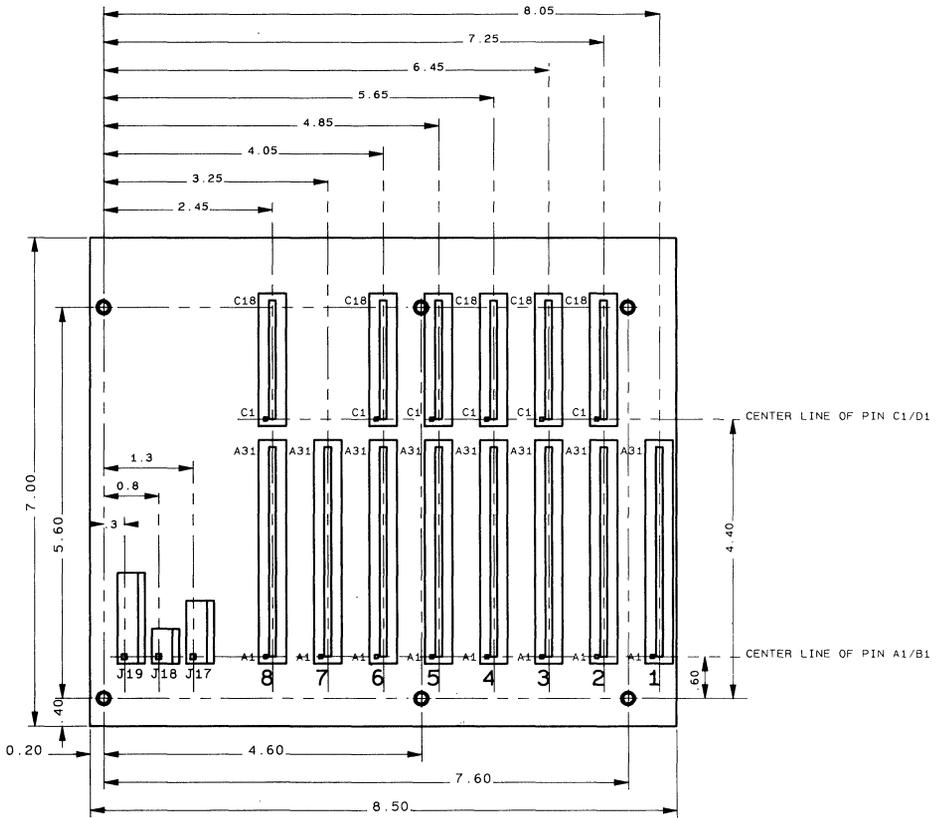
J19 DETAIL

12	+5	VDC
11	+5	VDC
10	+5	VDC
9	−5	VDC
8	GND	
7	GND	
6	GND	
5	GND	
4	−12	VDC
3	+12	VDC
2	+5	VDC
1	PWR GOOD	

J18 DETAIL

4	GND	
3	GND	
2	+5	VDC
1	+5	VDC

J17 DETAIL

8	GND	
7	+5	VDC
6	GND	
5	−5	VDC
4	−12	VDC
3	+12	VDC
2	GND	
1	+5	VDC

8.05
7.25
6.45
5.65
4.85
4.05
3.25
2.45

C18   C18   C18   C18   C18

C1   C1   C1   C1   C1   C1

A31   A31   A31   A31   A31   A31   A31   A31

CENTER LINE OF PIN C1/D1

1.3
0.8
3

7.00
5.60
4.40

A1   A1   A1   A1   A1   A1   A1   A1

J19 J18 J17   8   7   6   5   4   3   2   1

CENTER LINE OF PIN A1/B1

.60

.40

0.20

4.60

7.60

8.50

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

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

Physical Dimensions

7.0" L X 8.50 " W

Ordering Information

FE8SBP	8 slot AT BUS backplane

Section 8

PC BUS & AT BUS Integrated Circuits

Faraday Electronics

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

8255A-5	74LS280
74LS244 (2)	74125 (2)
74LS240	74LS74 (2)
74LS322	74LS32
8284A	74LS30
74LS157	74LS20
74LS155	74LS10
74LS174	74LS08
74LS175 (2)	74LS04 (2)
SWITCH	74LS00

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

8288	74LS175(2)	74LS74(4)
8259A	74LS138(3)	74LS30(2)
8284A	74LS244(2)	74LS00(1)
8237A	74LS670	74LS08(3)
8253	74LS322	74LS158(2)
8255A	74LS125(2)	74LS139
DELAY-LINE(1)	74LS10	74LS32
74S280	74LS11	74S08
74LS373(2)	74LS04(4)	74LS14
74LS245(3)	74LS02(1)	SWITCHES(2)

No. of chips replaced = 49

Faraday Electronics

FE2100
PC BUS FLOPPY DISK CONTROLLER
INTEGRATED CIRCUIT

- **100% Hardware & Software compatible with the PC BUS**

- **TTL compatible**

- **Integral Crystal Oscillator Circuit Precompensation**

- **48 Pin Dip**

- **Variable Write Precompensation**

- **Digital Data Separator**

- **Track Selectable Write**

- **HCMOS Technology**

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

74LS244	74LS161
74LS174	74LS175 (4)
74S288	74LS139
74LS153	74LS393
74LS74	74LS32
74LS08 (2)	74LS04 (2)
74LS00	

No. of chips replaced = 18

Faraday Electronics

FE2200
PC BUS MONOCHROME DISPLAY CONTROLLER
INTEGRATED CIRCUIT

- **100% PC BUS Hardware and Software Compatible**

- **Uses a Crystal or a TTL Signal for Frequency Source**

- **Incorporates Complete Attribute Decoding**

- **Provides I/O Channel Synchronization**

- **HCMOS**

- **68 pin J-type leaded surface mount PLCC**

Product Overview

The Faraday Monchrome 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

74LS273 (5)	74LS08 (4)
74LS138 (2)	74LS04 (3)
74LS174	74LS74 (2)
74S112	74LS02
74LS139	74LS00
74LS175 (3)	74S86
74LS157	74LS10
74LS125	74S74
74LS32 (2)	74LS11
74S393	74LS20
74S11	74S32

No. of chips replaced = 36

Faraday Electronics

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

ALSOO (2)	F00	LS125
ALS02 (4)	F08	LS112
ALS04 (4)	F10	LS244 (2)
ALS08	F11	7407
ALS10	F74 (3)	PAL16L8 (2)
ALS27 (2)	F174 (5)	8284A
ALS32	F175 (2)	82284A
ALS74 (11)	LS51 (3)	82288A

The FE3000 replaces a total of 53 components.

Faraday Electronics

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/Calender

- 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

i8237(2)
i8259(2)
8254
M146818
74LS612
74LS590
74LS00(3)
74ALS10
74F00
74LALS573(2)
74LS125
74ALS08
74ALS245(3)
74S288

No Of Chips Replaced: 21

Section 9

## SYSTEM CABINETS

FECC-8S
PC & AT BUS Card Cage
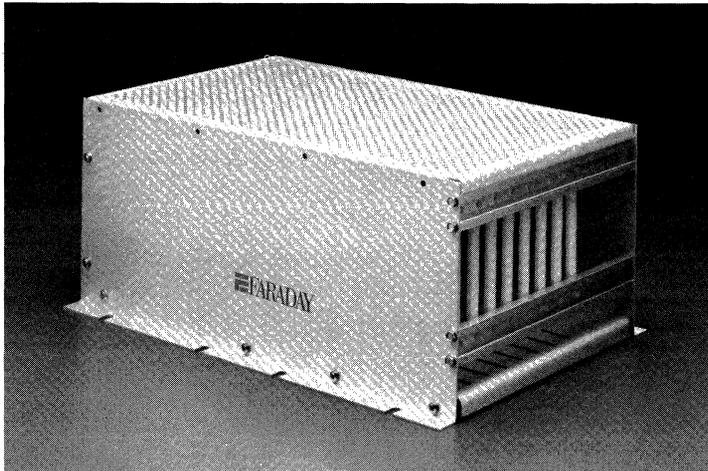
- 100% PC & AT BUS hardware compatible

- Industrial Grade

- Stand up card guides

- Perforated Top Cover (optional)

- 8 slot AT BUS Backplane

- Card spacing on 0.8" centers

- Easy to install

- Fan Bracket (optional)

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.

4.000   3.000   4.000   1.70

8 SLOTS
● .800 SPACING

9.625   10.25

14.40

16.06

6.31
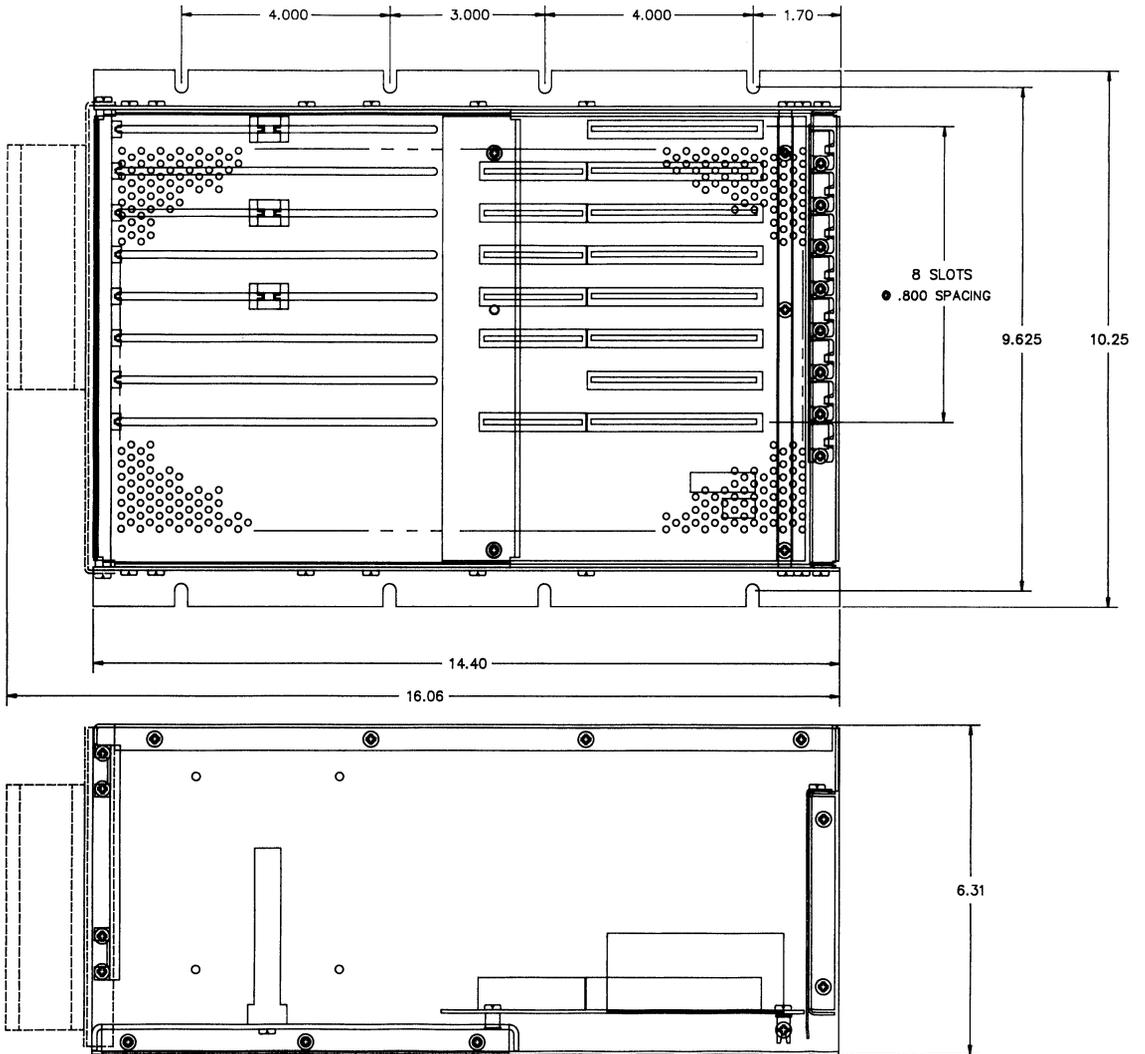
Card Cage Physical Dimensions

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

	Card Cage alone	With Top cover & Fan Bracket
Width	14.375 inches	16.00 inches
Depth	8.875 inches	8.875 inches
Height	6.25 inches	6.3125 inches

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

pin	J17	pin	J18
1	+5v	1	+5v
2	GND	2	+5v
3	+12v	3	GND
4	-12v	4	GND
5	-5 v		
6	GND		
7	+5v		
8	GND		

Environment

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

Ordering Information

FECC-8S	Card Cage and eight slot backplane assembly
FECC-8FB	Fan bracket for FECC-8S
FECC-8TC	Perforated top cover for FECC-8S
FECC-SUCG5	Stand up card guides ,Qty 5

Faraday Electronics

FE6400 Evaluation System
PC BUS Single Board Evaluation Systems
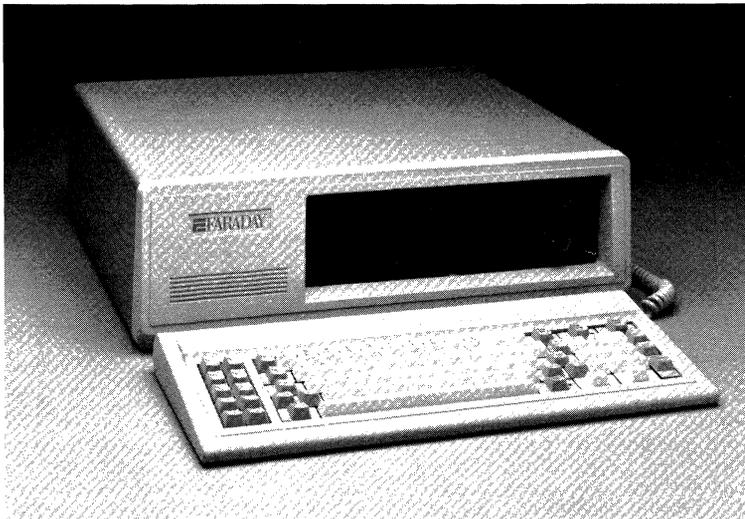
- Fully configured desktop cabinet
- FE6400 SBC with 256K RAM
- Two 5-1/4" floppy dirves
- 2 Serial Ports
- 130 watt Power supply

- 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 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-

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

Electrical Characteristics:

+5V:	15 A maximum
+12V:	4.2 A maximum
-12V:	0.25A maximum
-5 V:	0.30A maximum
Total Maximum Power Output: 130W	

Environment

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

Ordering Information

DT1000	US version cabinet with 110volt/130 watt supply
EU1000	European version cabinet with 220volt/130 watt supply

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
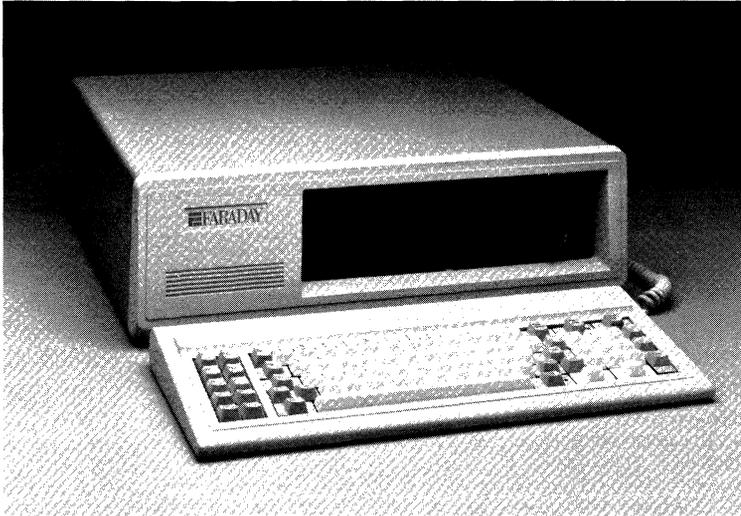
- Fully configured desktop cabinet
- FE6413 SBC with 256K RAM
- Two 5-1/4" floppy drives
- 1 Serial Port
- 130 watt Power supply

- 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:

+5V:	15 A maximum
+12V:	4.2 A maximum
-12V:	0.25A maximum
-5 V:	0.30A maximum
Total Maximum Power Output: 130W	

Environment

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

Ordering Information

DT1013	US version cabinet with 110volt/130 watt supply
EU1013	European version cabinet with 220volt/130 watt supply

NOTE

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

Faraday Electronics

FE6421 Evaluation System
PC BUS Single Board Evaluation Systems
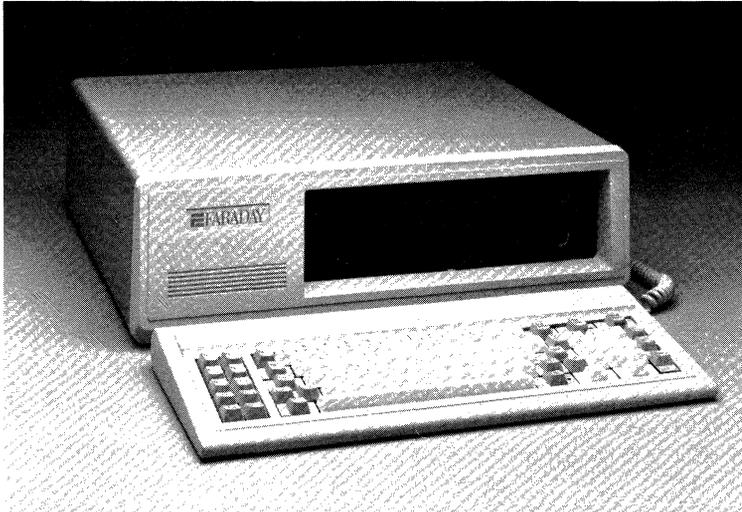
- Fully configured desktop cabinet
- FE6421 SBC with 256K RAM
- Two 5-1/4″ floppy drives
- 2 Serial Ports
- 130 watt Power supply

- IBM PC compatible keyboard
- Floppy Disk controller
- FE5200 Monochrome display controller
- 1 parallel port
- 110 V/220 V option

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 110volt/130watt switching power supply. A European version (220v/130watt 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-

Width:	19.25″
Height:	5.00″
Depth:	15.00″
Weight:	40 Lbs

Electrical Characteristics:

+5V:	15 A maximum
+12V:	4.2 A maximum
-12V:	0.25A maximum
-5 V:	0.30A maximum
Total Maximum Power Output: 130W	

Environment

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

Ordering Information

DT1021	US version cabinet with 110volt/130 watt supply
EU1021	European version cabinet with 220volt/130 watt supply

NOTE

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

Faraday Electronics

BUS PC Evaluation System
PC BUS Single Board Evaluation Systems
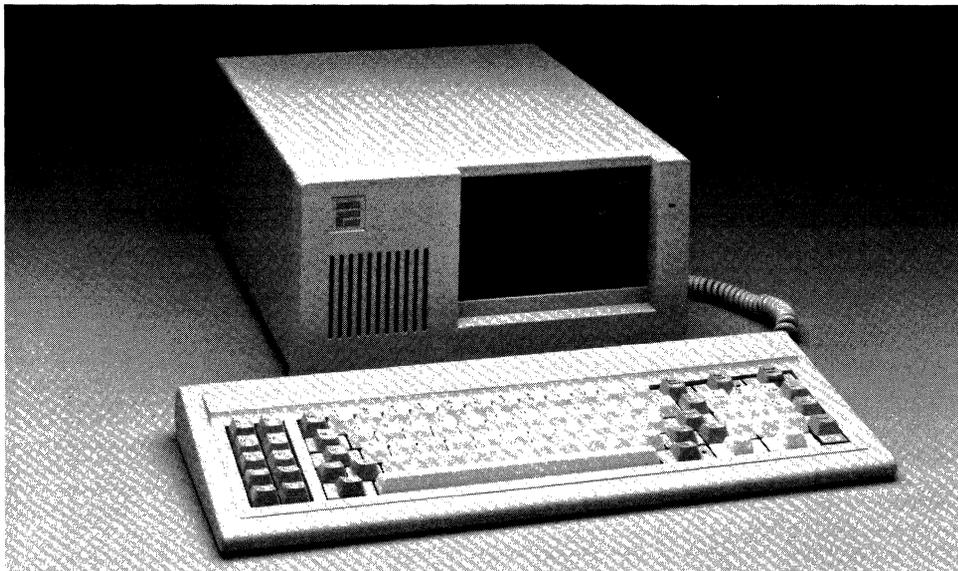
- ■ **Fully configured desktop cabinet**

- ■ **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-

Width:	15.50″
Height:	6.25″
Depth:	12.00″
Weight:	25 Lbs

Electrical Characteristics:

+5V:	7.0 A maximum
+12V:	5.0 A maximum
-12V:	0.50A maximum
-5 V:	0.30A maximum
Total Maximum Power Output: 100W	

Environment

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

Ordering Information

BS6500	US version cabinet with 110volt/100 watt supply
EU6500	European version cabinet with 220volt/100 watt supply

NOTE

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

Faraday Electronics

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, 64 K 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 mono-chrome 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:

+5V:	7.0 A maximum
+12V:	5.0 A maximum
-12V:	0.50A maximum
-5 V:	0.30A maximum
Total Maximum Power Output: 100W	

Environment

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

Ordering Information

MC6600	US version cabinet with 110volt/100 watt supply &
	NMOS(bipolar) MICRO PC
MC6601	US version cabinet with 110v/100watt supply &
	CMOS MICRO PC
EU6600	European version cabinet with 220volt/100 watt supply &
	NMOS(bipolar) MICRO PC
EU6601	European version cabinet with 220v/100watt supply &
	CMOS MICRO PC

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   (714) 897-0319
Garden Grove, CA 92645   (213) 598-9645

EQS SYSTEMS
(OH, WV, MI, KY, PA)
Main Office
8588 Mayfield
Chesterland, OH 44026   (216) 729-2222

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HANNAH-HILL
(WY, CO, UT, NM, AZ, Las Vegas, El Paso, TX)
Main Office
888 Interlocken Pkwy.
Suite 100
Broomfield, CO 80020   (303) 424-0108
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Main Office
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Main Office
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Santa Clara, CA 95054   (408) 496-6611
Fairfield   (707) 422-1287
Sacramento   (916) 985-0370

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(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
    (800) 447-1191

PDQ ASSOCIATES (Upstate NY)
Main Office
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
Silovej 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

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1140 Brussels
Belgium
Phone: 02-216-6330
Telex: 61415 RODL B

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TEKELEC
Cite Des Bruyeres
Rue Carle 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