Guide to Operations

CONTENTS

1. VLSI 12 Mhz 1/0 MEMORY WAIT STATE 80286 SYSTEM MAIN BOARD

1.1 GENERAL SPECIFICATION

. AMD 80286 10MHz or 12 MHz CPU
. 6/8/12/16 MHz speed hardware selectable
. RAM access time 0-wait and 1-wait selectable
. Up to 4 mega byte memory on board
. 16 mega byte expandable memory in the protect virtual
  address mode
. 2 sockets for AMI, PHOENIX or AWARD BIOS, fully
  compatible with IBM BIOS
. 8 I/O expansion slots
. Socket for 80287 math processor
. CMOS clock and calendar circuit with rechargeable
  battery support
. 24-bit addressing and 16-bit data path capabilities
. 16-level interrupts
. 7-channel DMA (Direct Memory Access)
. 3-programmable timers

WHAT WE POSSESSIVE THAT OTHERS WITHOUT !

. 5 CHIPS SET FULL CMOS PROCESS LOW POWER CONSUMPTION
. ONLY 18 NON-MEMORY COMPONENTS, 38 TOTAL COMPONENTS
. LANDMARK PERFORMS RATE AT 15.4 (12 MHZ 0 WAIT-STATE)
. ZERO WAIT STATE READ OPERATIONS
. ONE WAIT STATE WRITE OPERATIONS
. 20 mA, 150pF DRAM DRIVE CAPABILITY
. FOUR LAYER IMPLEMENTATION FOR LOW NOISE OPERATION

1.2 MAIN BOARD JUMPER SELECTION

CONNECTORS AND JUMPERS

The system board has the following connectors and jumpers

JUMPER NUMBER	FUNCTION
P1	Power supply connector
J1	Keyboard connector
J2	Speaker connector
J3	Keylock / power LED
JP1	Monitor selection
JP2	One / zero-wait selection
JP3	RAM size selection
JP4	RAM size selection
JP5	RAM size selection
JP7	Hardware reset
JP8	External battery connector
JP9	Eprom size selection
TURBO CONTROL	Select CPU clock speed between 6MHz and 12 Mhz

J1

P1

JP1

JP7

JP8

JP2

TURBO

JP3

JP4

JP5

JP9

J3

J2

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100   103   101

RAM BANK 0   ROM (L)   ROM (H)   80286

RAM BANK 1   104
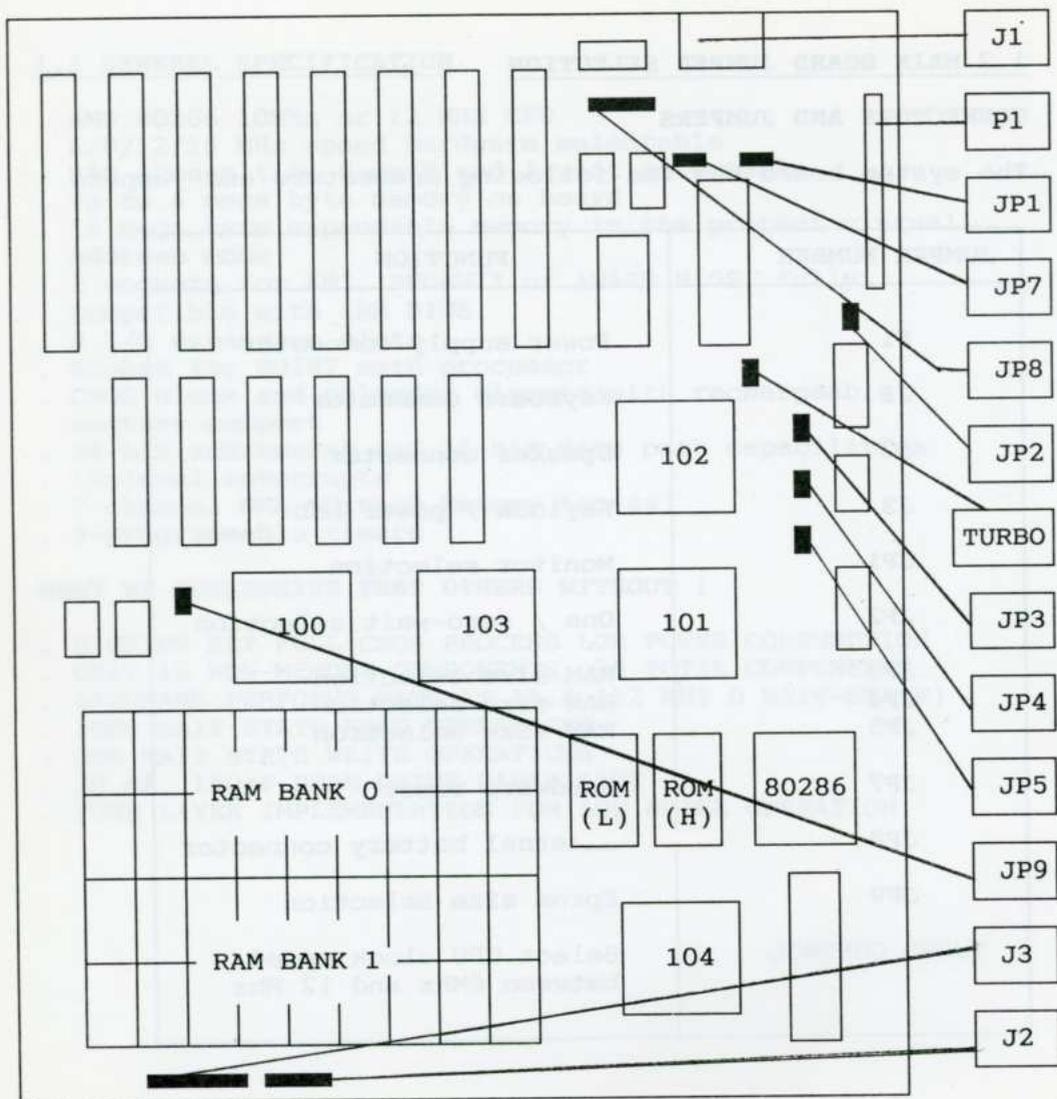
P1 : POWER SUPPLY CONNECTOR

Jumper P1 is used to connect to the power supply cable. The pin assignments are as follows :

PIN	ASSIGNMENT	WIRE COLOR
1	Power good	Orange
2	+ 5V	Red
3	+ 12V	Yellow
4	- 12V	Blue
5	GND	Black
6	GND	Black
7	GND	BLack
8	GND	Black
9	- 5V	White
10	+ 5V	Red
11	+ 5V	Red
12	+ 5V	Red

J1 : KEYBOARD CONNECTOR

The keyboard connector is a 5-pin, 90-degree printed circuit board (PCB) mounting, DIN connector. The assignments are as follows :

PIN	ASSIGNMENT
1	Keyboard clock
2	Keyboard date
3	Not used
4	GND
5	+5Vdc

J2 : SPEAKER CONNECTOR

Its pin assignment as follows :

PIN	ASSIGNMENT
1	Data out
2	Not used
3	GND
4	+5Vdc

J3 : KEYLOCK / POWER LED

The power LED and Keylock connector is a 5 pin berg strip.
Its assignments are as follows :

PIN	ASSIGNMENT
1	Power LED
2	Not used
3	GND
4	Keyboard inhibit
5	GND

JP1 : MONITOR SELECTION

Jumper JP1 is used to select a monochrome or a color graphic
primary display adapter.

Jumper setting : To select the color primary adapter, place
a jumper cap over JP1. To select the monochrome primary
adapter, remove the jumper cap from JP1.

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JP2 : ONE / ZERO-WAIT SELECTION

Jumper JP2 is used to select 0-wait state in read operation, place a jumper cap over JP2. To select 1-wait state, remove the jumper cap from JP2.

JP3, JP4, JP5 : RAM SIZE SELECTION

Jumpers are used together to allow you to select the amount of RAM on board. See the table below for the connecting position. Jumpers settings:

JP3	JP4	JP5	BASE MEMORY	EXPANSION	MEMORY TYPE
ON	ON	OFF	640K	3456K	BANK 0, 18 X 1M BANK 1, 18 X 1M
OFF	OFF	ON	640K	1408K	BANK 0, 18 X 1M
ON	OFF	ON	640K	384K	BANK 0, 18 X 256K BANK 1, 18 X 256K
OFF	ON	ON	640K	0K	BANK 0, 18 X 256K BANK 1, 18 X 256K
ON	ON	ON	512K	0K	BANK 0, 18 X 256K

JP7 : HARDWARE RESET

JP8 : EXTERNAL BATTERY CONNECTOR

The connector is for connecting four size "AA" batteries instead of the blue rechargeable battery. Its pin assignments are as follows :

PIN	ASSIGNMENT
1	6 Vdc
2	Not used
3	GND
4	GND

JP9 : EPROM SIZE SELECTION

Jumper JP9 is used to select ROM size of either 27256 or 27128 chip. To select the 27256 chip, place a jumper cap over JP9. To select the 27128 chip, remove the jumper cap from JP9.

TURBO CONTROL

To select normal mode (6MHz clock speed), place a jumper cap over turbo control jumper pin 2 and pin 3. To select turbo mode (12MHz clock speed), leave all the pins open.

1.3 SYSTEM MEMORY MAP

ADDRESS RANGE	START-END	NAME	FUNCTION
000000-03FFFF	000K-256K	BANK0	SYSTEM MEMORY(256K)
040000-07FFFF	256K-512K	BANK1	SYSTEM MEMORY(256K)
080000-09FFFF	512K-640K	BANK2	SYSTEM MEMORY(128K)
0AFFFF-0BFFFF	640K-768K	VIDEO	DISPLAY CARD BUFFER (128K)
0C0000-0DFFFF	768K-896K	I/O ROM	EXPANSION ROM(128K)
0E0000-0EFFFF	896K-960K	ROM	SYSTEM USAGE(64K)
0F0000-0FFFFF	960K-1024K	ROM	BIOS(64K)
100000-11FFFF	1024K-1152K	BANK2	SYSTEM MEMORY(128K)
120000-15FFFF	1152K-1408K	BANK3	SYSTEM MEMORY(128K)
160000-FDFFFF	1408K-16146K	RAM	EXPANSION RAM (14870K)
FE0000-FEFFFF	16146K-16210K	ROM	SYSTEM USAGE(64K)
FF0000-FFFFFF	16210K-16274K	ROM	BIOS(64K)

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1.4 I/O CHANNELS

The I/O channel supports
. I/O address space hex 100 to 3FF
. 24-bit memory addresses (16MB)
. Refresh of system memory from channel microprocessors
. Selection of data accesses (either 8 bit or 16 bit)
. Interrupt
. DMA channels
. I/O wait-state generation
. Open-bus structure (allowing multiple microprocessors
  to share the system's resources, including memory)

1.5 I/O ADDRESS MAP

HEX RANGE	DEVICES	USAGE
000-01F	DMA CONTROLLER 1	SYSTEM
020-03F	INTERRUPT CONTROLLER 1	SYSTEM
040-05F	TIMER	SYSTEM
060-06F	8042 (KEYBOARD)	SYSTEM
070-07F	REAL TIME CLOCK, NMI MASK	SYSTEM
080-09F	DMA PAGE REGISTER	SYSTEM
0A0-0BF	INTERRUPT CONTROLLER 2	SYSTEM
0C0-0DF	DMA CONTROLLER 2	SYSTEM
0F0	CLEAR MATH COPROCESSOR BUSY	SYSTEM
0F1	RESET MATH COPROCESSOR	SYSTEM
0F8-0FF	MATH COPROCESSOR	SYSTEM
1F0-1F8	FIXED DISK	I/O
200-207	GAME I/O	I/O
278-27F	PARALLEL PRINTER PORT 2	I/O
2F8-2FF	SERIAL PORT 2	I/O
300-31F	PROTOTYPE CARD	I/O
360-36F	RESERVED	I/O
378-37F	PARALLEL PRINTER PORT 1	I/O
380-38F	SDLC, BISYNCHRONUS 2	I/O
3A0-3AF	BISYNCHRONUS 1	I/O
3B0-3BF	MONOCHROME DISPLAY AND PRINTER CARD	I/O
3C0-3CF	RESERVED	I/O
3D0-3DF	COLOR / GRAPHICS MONITOR CARD	I/O
3F0-3F7	FLOPPY DISKETTE CONTROLLER	I/O
3F8-3FF	SERIAL PORT 1	I/O

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1.6 REAL TIME CLOCK AND NONVOLATILE RAM

The real time clock MC146818 and its 64 bytes of RAM
information are backed up by a battery, the internal clock
circuitry uses 14 bytes while the rest is allocated to
system configuration.

ADDRESS	DESCRIPTION
00	Seconds
01	Second alarm
02	Minutes
03	Minute alarm
04	Hours
05	Hour alarm
06	Day of week
07	Date of month
08	Month
09	Year
0A	Status register A
0B	Status register B
0C	Status register C
0D	Status register D
0E	Diagnostic status byte
0F	Shutdown
10	Diskette drive type byte - driver A and B
11	Reserved
12	Fixed disk type byte - driver C and D
13	Reserved
14	Equipment byte
15	Low base memory
16	High base memory
17	Low expansion memory
18	High expansion memory

ADDRESS	DESCRIPTION
19-2D	Reserved
2E-2F	2 byte CMOS checksum
30	Low expansion memory byte
31	High expansion memory byte
32	Data century byte
33	Information flags (set during power on)
34-3F	Reserved

2. MT-201 PC/AT MULTI-FUNCTION ADAPTOR

Address	Description
00	Seconds
01	Seconds alarm
02	Minutes
03	Minutes alarm
04	Hours
05	Hours alarm
06	Day of week
07	Date of month
08	Month
09	Year
0A	Status register A
0B	Status register B
0C	Status register C
0D	Status register D
0E	Diagnostic status byte
0F	Shutdown
10	Diskette drive type byte - drives A and B
11	Reserved
12	Fixed disk type byte - drives C and D
13	Reserved
14	Equipment byte
15	Low base memory
16	High base memory
17	Low expansion memory
18	High expansion memory

2.1 INTRODUCTION

Main Features:

. One parallel printer port to be used for interfacing the PC-AT or compatible to a parallel printer.

. Two RS-232C serial ports(one is optional) are on board to be used with serial printers, modems, remote display terminals or other serial devices, or for asynchronous communications software control.

. One game port to be used with any PC-AT joysticks.

The MT-201 is a powerful and flexible multi- input/output enhancement product for PC-AT family. It is a short size design to be installed into any slot to save space of your PC.

Note: The MT-201 can only be used in the PC-AT or compatibles. There is no Clock-Calendar included on it because this is a standard features of PC-AT. That is to say that the system of PC-AT has a Clock-Calendar itself.

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2.2 SERIAL PORT

The serial port on your MT-201 is a standard EIA RS-232C
interface that is fully programmable and can be expanded to
a second serial port. The primary serial port is on board
for asynchronous communication and is implemented as Data
Terminal Equipment (DTE). And a second RS-232C serial port
is optional. Both serial ports can be used to connect your
PC-AT to a serial printer, modem, remote display terminal or
other device which uses a RS-232C interface.

TO CONNECT YOUR SERIAL PORT

The primary serial port on your MT-201 is ASYN1 and the
secondary serial port is ASYN2 which are 10 pin connectors.
A interface cable is about 30cm long and has a rectangular
connector at one end and a male DB25P connector at the other
end. The rectangular plugs into ASYN1 (second port ASYN2)on
your MT-201. Note that one edge of the 30cm flat ribbon
cable has a red or blue line on it. This line indicates
which end of the rectangular connector is to be installed to
pin 1 of ASYN1 and ASYN2.

Each serial port's address location and interrupt line is
independently jumper selectable. If there are other serial
port installed in the PC, provisions are made on the
Asynchronous Communication adapter for selecting I/O
address. Before installing the asynchronous communications
adapter in the personal computer, certain programmable
options need to be selected by setting jumpers.

2.3 TO SELECT THE SERIAL PORTS

The serial ports on MT-201 use the following system ports:

I/O Ports	Ports Configuration
3F8-3FF HEX	COM1: INT=IRQ4
2F8-2FF HEX	COM2: INT=IRQ3
3E8-3EF HEX	COM3: INT=IRQ4
2E8-2EF HEX	COM4: INT=IRQ3

Configuration Jumpers:

```
GAME   2 4 6 8   10 12 14  16 18 20
PORT   1 3 5 7    9 11 13  15 17 19

         PRN      ASYN1     ASYN2
```

ASYNI

```
10 12 14
 9 11 13
```

ENABLE COM1 _____ 10,9 & 14,13 CLOSE
ENABLE COM3 _____ 10,9 & 11,13 CLOSE
    DISABLE _____ ALL JUMPERS OPEN

ASYN2

```
16 18 20
15 17 19
```

ENABLE COM2 _____ 16,15 & 20,19 CLOSE
ENABLE COM4 _____ 16,15 & 17,19 CLOSE
    DISABLE _____ ALL JUMPERS OPEN

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2.4 SERIAL PORT PINOUTS

Single name	ASYN1/2 Pin no.	RS-232c Name
DCD(data carrier detect)	1	CF
RX (receive data)	2	BB
TX (transmit data)	3	BA
DTR(data terminal ready)	4	CD
GND(signal ground)	5	AB
DSR(data set ready)	6	CC
RTS(request to send)	7	CA
CTS(clear to send)	8	CB
RI (ring indicator)	9	CE
N.C.	10	--

The wiring diagram for ASYN1/2 to DB25P adaptor cable as
follows:

ASYN1/2	DB25P
1	8
2	3
3	2
4	20
5	7
6	6
7	4
8	5
9	22
10	N.C.

2.5 TO INSTALL THE SECONDARY SERIAL PORT

To install the secondary port for MT-201 is to insert IC
16450 into U1, SN75188 or MC1488P into U13, SN75189 or
MC1489P into U7 and a extra flat ribbon cable into ASYN2.
Please note the following diagram.

U1	U2	U6	U12
		U7	U13
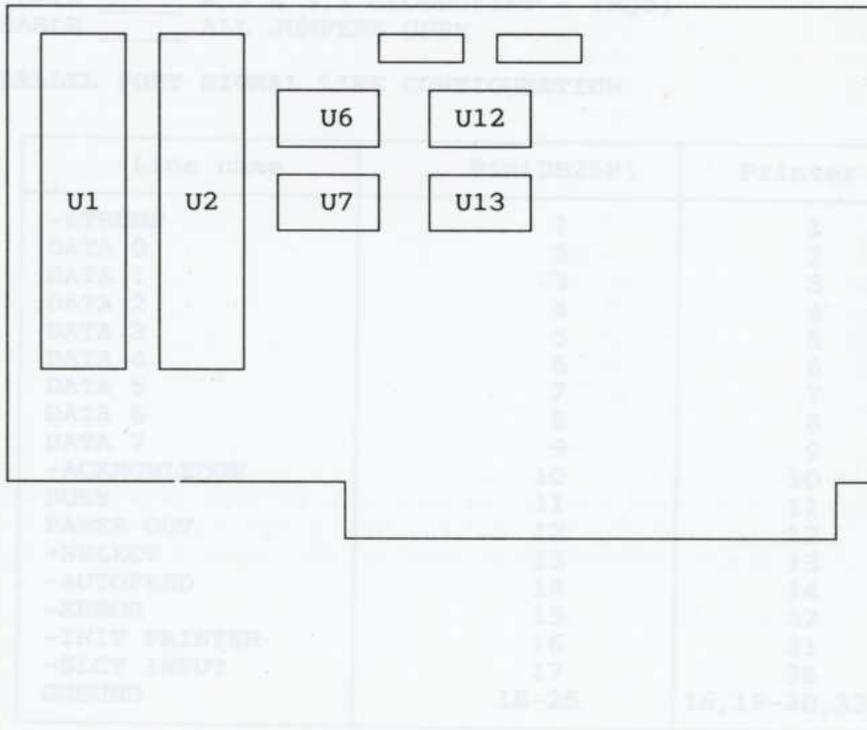
2.6 PARALLEL PRINTER PORT

The MT-201 parallel printer port is designed to attach
printers and can be used as a general I/O port for any
devices of applications that match PC-AT's I/O capabilities
such as the Espon MX-80. The parallel printer supports the
graphics function by driver software.

2.7 TO CONFIG PRINTER PORT

The parallel printer port on the MT-201 can be adjust the jumper setting to select the relevant address as the following I/O ports:

```
4 6 8
3 5 7
```

LPT1 _____ 4,3 & 8,7 CLOSE (INT = IRQ7)
LPT2 _____ 4,3 & 5,7 CLOSE (INT = IRQ4)
DISABLE _____ ALL JUMPERS OPEN

PARALLEL PORT SIGNAL LINE CONFIGURATION

Line name	Pin(DB25P)	Printer
-STROBE	1	1
DATA 0	2	2
DATA 1	3	3
DATA 2	4	4
DATA 3	5	5
DATA 4	6	6
DATA 5	7	7
DATA 6	8	8
DATA 7	9	9
-ACKNOWLEDGE	10	10
BUSY	11	11
PAPER OUT	12	12
+SELECT	13	13
-AUTOFEED	14	14
-ERROR	15	32
-INIT PRINTER	16	31
-SLCT INPUT	17	36
GROUND	18-25	16,19-30,33

2.8 GAME PORT

One game port is included on the MT-201. The input/output port address is defined as 200-20F.
Any IBM compatibles joystick are available. Please contact the place of purchase.

Game port pinouts:

DB15S Connector	Line name
1	+5VDC
2	BUTTON 4
3	POSITION 0
4	GND
5	GND
6	POSITION 1
7	BUTTON 5
8	+5VDC
9	+5VDC
10	BUTTON 6
11	POSITION 2
12	GND
13	POSITION 3
14	BUTTON 7
15	+5VDC

The game port cable and bracket are optional.
The game port allows you to attach one or two joystick to your PC. For attaching two jotsticks, a special cable is required. Please contact your dealer for game port cable.

To enable game port:

```
2
1    CLOSE PIN 1 AND 2.
```

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3. AUTO SWITCHING DUAL GRAPHICS DISPLAY
AND PRINTER ADAPTOR

3.1 INTRODUCTION

The Auto-Switching Dual Graphics Display & Printer Adapter provides the following features:

. fully compatible with the IBM Color Graphics Display Adapter, the IBM Monochrome Display & Printer Adapter, and the Hercules Graphics Card.

. automatic switch to the correct display mode according to the motherboard switches settings during power up.

. automatic switch to the correct display mode upon program access.

. display modes selectable through the DOS supplied MODE.COM program.

. no screen flickering nor screen interferences during scrolling and during video memory access in all display modes.

. supports dual mode monitors or connects up to two display monitors (a color monitor and a monochrome monitor).

. a parallel printer is provided.

3.2 CONFIGURATIONS

The Auto-Switching Dual Display & Printer Adapter has four configurations selectable through jumper P2:

Fixed Color Graphics Configuration (printer at hex 378).
Fixed Color Graphics Configuration (printer disabled).
Fixed Hercules Configuration (printer at hex 3BC), and
Auto-Switching Dual Graphics Configuration (printer at 3BC).

**Fixed Color Graphics Configuration
with Printer Port at HEX 378**

To select the Fixed Color Graphics Configuration with printer port enabled, short pin 1 and pin 2 of the jumper P1. An IBM compatible RGB color display monitor should be used, and the mother board switches should be set to either 40 column or 80 column Color Graphics Display mode in this configuration. The printer port uses I/O address HEX 378. In case of your system has another printer port at the same I/O address, either use the configuration that disables the printer port or change the other printer port to LPT2.

P2

```
┌─────────┐
│  4    3 │   MONO/LPT DISABLE
│ ┌─────┐ │
│ │2   1│ │   COLOR
│ └─────┘ │
└─────────┘
```

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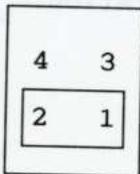
Fixed Color Graphics Configuration
with Printer Port Disable

To select the Fixed Graphics Configuration with printer port
disabled, short both pin 1,pin 2 and pin 3,pin 4 of the
jumper P2. An IBM compatible RGB color display monitor
should be used, and the mother board switches should be set
to either 40-column or 80-column Color Graphics Display mode
in this configuration.

P2
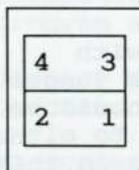
```
+---------+
| 4    3 |    MONO/LPT DISABLE
|         |
| 2    1 |    COLOR
+---------+
```

Fixed Hercules Configuration
with Printer Port at HEX 3BC

To select Fixed Hercules Configuration, short pin 3 and pin
4 of the jumper P2. An IBM compatible monochrome display
monitor should be used, and the mother board switches should
be set to Monochrome Display mode in this configuration.
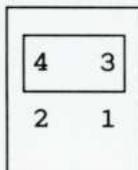
P2

```
+---------+
| 4    3 |    MONO/LPT DISABLE
+---------+
  2    1     COLOR
+---------+
```

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**Auto Switching Dual Graphics Configuration
with Printer Port at HEX 3BC**

To select the Auto Switching Dual Graphics Configuration,
remove all shorting plugs from the jumper P2.

P2

```
      ┌─────────┐
      │ 4     3 │   MONO/LPT DISABLE
      │         │
      │ 2     1 │   COLOR
      └─────────┘
```

The Auto Switching Dual Graphics Configuration is the
combination of the Color Graphics and Hercules Configuration
plus Automatic Switching between the two configurations.

The mother board switches may be set to either Color
Graphics Display or Monochrome Display modes depends on the
type of display monitor used. The card will switch to the
correct mode automatically during power on initialization
provided that a correct type of display monitor or both a
color monitor and a monochrome monitor are attached to the
card.

3.3 SWITCHING DISPLAY BY SOFTWARE

The DOS supplied MODE.COM program may be used to switch
between displays if both a color and a monochrome monitor
are attached to the card. To switch display to the
monochrome monitor, type:

MODE MONO [Enter]

To switch display to the color monitor in 40x25 display,
type:

MODE CO40 [Enter]

TO switch display to the color monitor in 80x25 display,
type:

MODE CO80 [Enter]

N.B.
When using only one display monitor in Auto-Switching Dual
Graphics Configuration, make sure that the programs you run
do not access the display that do not have the monitor
because the card will switch to that display and blank the
existing monitor.

3.4 CONNECTOR INFORMATION

DIRECT DRIVE VIDEO OUTPUT (J1 & J2)

J1 PIN #	J2 PIN #	SIGNAL NAME
1	1	GND
3	2	GND
5	3	+ RED
7	4	+ GREEN
9	5	+ BLUE
2	6	+ INTENSITY
4	7	+ VIDEO
6	8	+ H.SYNC.
8	9	+/- V.SYNC.
10	–	NOT USED

PARALLEL PRINTER INTERFACE (J3)

LINE NAME	J3 PIN #	PRINTER
-STROBE	1	1
DATA 0	2	2
DATA 1	3	3
DATA 2	4	4
DATA 3	5	5
DATA 4	6	6
DATA 5	7	7
DATA 6	8	8
DATA 7	9	9
-ACKNOWLEDGE	10	10
BUSY	11	11
PAPER OUT	12	12
+SELECT	13	13
-AUTOFEED	14	14
-ERROR	15	32
-INIT PRINTER	16	31
-SLCT INPUT	17	36
GROUND	18-25	16,19-30,33

4. AMI 286 BIOS PLUS

4.1 STARTING UP THE SYSTEM

Power up the system and wait for the BIOS to show up the
BIOS activity on the screen.

4.2 MEMORY TEST BYPASS

The BIOS performs diagnostics of the system and displays the
size of the memory being tested.

Note that you can bypass the memory test by pressing the
[ESC] key. This option would be quite useful when the memory
on the system is quite large. You should hit the [ESC] key
when the message Press [ESC] key to bypass memory test
appears on the screen.

Also note the Ref. number at the bottom of the screen. Make
a note of this number before you call Customer Support at
AMI for assistance with the BIOS.

4.3 CMOS SETUP

Immediately after the memory and cache test, you will get the following prompt on the screen:

Press <DEL> If you want to run SETUP or DIAGS

Hit <DEL> key to get into the Setup Mode. Note that <DEL> key will get you into the setup mode only when the message: **Press <DEL> If you want to run SETUP or DIAGS**, is displayed on the screen.

Hitting <DEL> key brings the following message after a few seconds on the screen:

Want to run SETUP or DIAGS (Y/N)?

If you answer <Y> or <y> following by <ENTER> then you would be asked to select Setup or Diagnostics as show below:

SETUP or DIAGS (1/2)?

Hit <1> to use the built-in SETUP option.
Hit <2> to use the Advanced Diagnostics option.

TIME & DATE SETUP

The Setup screen looks like below:

         C M O S   S E T U P
Current date is : XX-XX-XXXX
Enter new date (MM-DD-YYYY)?

To this question you would have to enter the date in the
format shown on the screen.
If you feel that the current date should remain unchanged,
you would just have to hit <ENTER> key. In such case the new
date is set to the same value as the current date.

The next question you have on the screen is:

Current time is : XX-XX-XX
Enter new time (HH:MM:SS)?

To this question you key in time in the format defined.
Press <ENTER> key alone if the current time is right.

As soon as you have done this the BIOS shows you the type of
display on your system.
After that, the setup takes two different paths depending
upon the CMOS being initialized or uninitilialized.

CMOS INITIALIZED

Under these conditions you would see the following message:

Fixed disk drive C type :X (if installed else Not Installed)
Fixed disk drive D type :X (if installed else Not Installed)

Diskette drive A is : 3 1/2"
Diskette drive B is : Double Sided (Other options as above)
Base Memory Size is : XXX KB
Expansion memory size is : XXXX KB

Are these options correct (Y/N)?

Note that the information about Drive A indicates 3 1/2", as
CMOS had bead set earlier to reflect this status. If on the
contrary, CMOS had been set for a 1.2 MB drive, the message
in place of 3 1/2" it would be **High Capacity**.

If you feel that the information displayed above is right,
hit <Y> and the <ENTER> key to proceed to system boot with
the new information.

CMOS UNINTIALIZED

In this case you would have to enter the type of the fixed
Drive C in response to the message:

**** WARNING ****
Entering the wrong disk drive TYPE
causes improper operation of the disk.
If disk not Installed press <RETURN>
For disk TYPE details press <ESC>

Enter disk drive C type (1-47)?

Note that the disk type details are only a key stroke away.
Hit <ESC> key to find for yourself. You could always come
back by hitting <ESC> again.(REFER TO 4.4 FOR DRIVE DETAILS)

Once you have convinced yourself about the drive enter the
appropriate number and hit <ENTER>.
Note that pressing <ENTER> key alone indicates the absence
of the Drive C.

You would then be asked to enter the type of the disk Drive
D. The procedure for doing this is the same as that for
Drive C. Remember if you do not have Drive D on your system,
you just have to hit <ENTER> key.

SUMMARY OF SET-UP

The Set-up screen thus requires you to set
a) Date
b) Time
c) Hard Disk Type for Drive C (if present)
d) Hard Disk Type for Drive D (if present)

The Set-up procedure also automatically detects the
following:

a) Type of display card.
b) Size of real memory.
c) Size of memory beyond 1 MB.
d) Presence of 360kb floppy drives.
e) Presence of 80287.

Also if a second Hard Disk drive is physically connected but
the CMOS is not set for this Drive D, the BIOS informs you
about the same and gives you a chance to configure the drive
through SETUP.

Having setup the CMOS, the BIOS runs through the diagnostics
again, tests the memory, sets up the devices configured and
proceeds to boot.

Note that the Set-up option is available even after a soft
reset.

The BIOS prompts you to run Set-up under the following
conditions:
a) CMOS options not set.
b) Display Configuration Mismatch.
c) Memory size mismatch.
d) Hard Disk set-up error.
e) CMOS battery is low.
f) An additional hard disk presence is detected.

4.4 HARD DISK DRIVE TYPE TABLE

TYPE	CYLN	HEADS	W-PCOMP	L-ZON	CAPACITY
1	306	4	120	305	10 MB
2	615	4	300	615	20 MB
3	615	6	300	615	30 MB
4	940	8	512	940	64 MB
5	940	6	512	940	48 MB
6	615	4	FFFF	615	20 MB
7	462	8	256	511	31 MB
8	733	5	FFFF	733	31 MB
9	900	15	FFFF	901	115 MB
10	820	3	FFFF	820	21 MB
11	855	5	FFFF	855	36 MB
12	855	7	FFFF	855	51 MB
13	306	8	128	319	21 MB
14	733	7	FFFF	733	44 MB
15	---	-	-----	---	-----
16	612	4	0000	663	21 MB
17	977	5	300	977	42 MB
18	977	7	FFFF	977	58 MB
19	1024	7	512	1023	61 MB
20	733	5	300	732	31 MB
21	733	7	300	732	42 MB
22	733	5	300	733	31 MB
23	306	4	0000	336	10 MB
24	925	7	0000	925	56 MB
25	925	9	FFFF	925	72 MB
26	754	7	754	754	46 MB
27	754	11	FFFF	754	72 MB
28	699	7	256	699	42 MB
29	823	10	FFFF	823	71 MB
30	918	7	918	918	55 MB

TYPE	CYLN	HEADS	W-PCOMP	L-ZONE	CAPACITY
31	1024	11	FFFF	1024	98 MB
32	1024	15	FFFF	1024	133 MB
33	1024	5	1024	1024	44 MB
34	612	2	128	612	10 MB
35	1024	9	FFFF	1024	80 MB
36	1024	8	512	1024	71 MB
37	615	8	128	615	42 MB
38	987	3	987	987	25 MB
39	987	7	987	987	60 MB
40	820	6	820	820	42 MB
41	977	5	977	977	42 MB
42	981	5	981	981	42 MB
43	830	7	512	830	50 MB
44	830	10	FFFF	830	72 MB
45	917	15	FFFF	918	115 MB

4.5 ERRORS REPORTED BY AMI-BIOS

AMI-BIOS performs various diagnostic tests at the time the system is powered up. Whenever an error is encountered during these tests, either you hear a few short beeps or see an error display on your monitor. If the error occurs before the display device is initialized the system reports the error by giving a number of short beeps.

If the error is FATAL, then system halts after reporting the FATAL error. If the error is NON-FATAL, then process continues after reporting the NON-FATAL error.

FATAL ERRORS:

Beep Count	Meaning
1	DRAM refresh failure.
2	Parity circuit failure.
3	Base 64KB RAM failure.
4	System timer failure.
5	Processor failure.
6	Keyboard controller - Gate A20 error.
7	Virtual mode exception error.
8	Display Memory R/W test failure. (*)
9	ROM-BIOS checksum failure.

(*) Non-Fatal Error.

ERROR MESSAGES

FATAL ERRORS
1. Channel - 2 of Timer Not functional.
2. Stray Interrupt sensed in controller.
3. Interrupt controller #2 not functional.

NON-FATAL ERRORS
1. Keyboard Error.
2. Keyboard/Interface Error.
3. CMOS battery state low.
4. CMOS system options not set.
5. CMOS checksum failure.
6. CMOS memory size mismatch.
7. CMOS system time and date not set.
8. CMOS display configuration mismatch.
9. Display setting not proper.
10.Keyboard is locked......Unlock it.
11.Floppy disk controller failure.
12.Hard disk unit 0 error.
13.Hard disk unit 1 error.
14.Hard disk unit 0 failure.
15.Hard disk unit 1 failure.
16.Hard disk unit 1 not defined in CMOS.
17.Cache Memory Bad - Do Not Enable Cache.

4.6 DIAGNOSTICS MENU

Note the following is the Diagnostics Opening Menu:

a) The <u>Guide Line</u> in Reverse Video specifying the usage of the Cursor Keys, <ENTER> & <ESC> key.

b) The Configuration of the system in the <u>"Devices Present"</u> box.

c) The <u>Real Time Clock</u> ticking away at the right hand top corner of the screen.

d) <u>Diagnostics Option Line</u> - Hard Disk, Floppy, Keyboard, Video & Miscellaneous Diagnostics.

e) Hard Disk <u>Diagnostics Options Window</u> - detailing the various hard disk diagnostics that are available.

f) Note that the Block Cursor is on the <u>Hard Disk</u> & the first option under hard disk diagnostics - <u>Hard Disk Format</u>

KEY CONVENTIONS

Use the Left & Right arrow keys to move in the Diagnostics Options Line.
Use the Up & Down arrow keys to move within a Diagnostics Options Window.
Use the <ENTER> key to select the option in the Diagnostics Options Window.
Use <ESC> key to abort & return to previous menu.

4.7 HARD DISK DIAGNOSTICS

The Hard Disk options discussed below fall in two
categories:
a) Destructive Operation   - The data on the Hard Disk is
                                lost.
b) Non-destructive operation - The data on the Hard Disk is
                                undisturbed.

The list below gives the various Hard Disk Options & the
category they fall in:

a) Hard Disk Format   - Destructive Operation.
b) Auto Interleave   - Destructive Operation.
c) Media Analysis   - Destructive operation.
d) Performance Test   - Non-destructive Operation.
e) Seek Test   - Non-destructive Operation.
f) Read/Verify Test   - Non-destructive Operation.
g) Check Test Cylinder - Data on the Test Cylinder alone is
                          lost.

All the options under Hard Disk Diagnostics require more or
less the following inputs:

a) Disk Drive
b) Drive Type
c) Interleave Factor
d) Bad Track List
e) Start Cylinder
f) End Cylinder
g) Start Head
h) End Head

All the above input fields have a default value. Thus a user
need not necessarily key-in all the inputs.

We shall discuss the inputs required & their meaning for
Hard Disk Format Option. This discussion can however be
extended for the rest of the Hard Disk options.

HARD DISK FORMAT OPTION

Note that in case of a single drive system the disk drive
for the operation is assumed to be drive C.

a. Drive Type Definition

The default value for the drive type is the SETUP value set
during the CMOS setup.
However if the drive was not set during CMOS setup, the user
now has an option of setting the drive to be one among the
46 standard disk drive types.
Note that all the information about the drive unfolds when
the disk drive is being chosen.
If the disk drive type does not fall within the 46 standard
disk types, use the USER option to define your own
parameters for the drive.
Note that this USER definition is valid only as long as the
Diagnostics is in effect. This feature is provided for you
to test a disk drive, the definition for which is not
available in the ROM.

b. Interleave Factor

Choose an optimum interleave factor. The default value for
the interleave factor is 3.

c. Mark Bad Tracks

If the manufacturer has defined certain bad patches on the
disk, enter <Y> to this question.

The user then goes into a menu which allows for complete
editing of the bad track list.
Exit Bad Track entry by hitting <ESC> or selecting the <u>Save</u>
<u>and Exit</u> option. Note the usage of <ESC> key here.
The default answer for this question is <N>.

c. Cylinder Number

Enter the Start & End Cylinder Number if you want to
override the defaults.
The same is true for Start & End Head number.
The default value for the Start Cylinder & Head is 0 and
that of the End Cylinder & Head is the value of the maximum
cylinder & head respectively.

e. Proceed

If all the entries are correct, you could hit <Y>. Else you
could say <N> & go over all the entries again.
The default answer is <N>.

f. Warning

If you had hit <Y> to the previous question, you get a
WARNING message. You could proceed to format if you are
absolutely sure about the information you have entered upto
this point.

g. Activity Screen

PLUS then proceeds to format the Hard Disk with the
specified parameters. While it is Formatting PLUS displays
the Operation in progress, the Cylinder & Head No. that is
formatted.
You could always hit <ESC> key to abort the format
operation.

AUTO INTERLEAVE OPTION

This is the most powerful feature which enables you to get the peak performance out of your hard disk.
With this feature you need not speculate about the value of the Interleave Factor. PLUS is entrusted with the job of finding the optimum Interleave value by a trial & error method & formatting the Hard Disk with this value.
Discover the big advantage with this feature.

MEDIA ANALYSIS OPTION

Media analysis performs the following operations on the Hard DIsk:
- Preformats the Hard Disk with specified parameters like Format Option.
- Analysis the surface of the Hard Disk for any errors & makes a note of them.
- Marks the Bad Patches.
This takes quite some time & for best results this test should run uninterrupted.
The parameters required for this are to be inputted in the same way like the Format Option.

PERFORMANCE TEST

This test enables the user to check out his disk performance. The critical factor in deciding the disk performance is the Interleave Factor. Changing the Interleave Factor can bring about drastic changes in Disk Performance.
The test determines the Data Transfer Rate & the Track to Track Seek time. Data Transfer Rate is measured in the units Kilobytes/Second & the Track to Track Seek time in milliseconds.
Higher value for Data Transfer Rate implies a better disk performance & lower value of Track to Track Seek time indicates a better disk.

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SEEK TEST

This test checks the seek capability of the Hard Disk on the specified Cylinder & Head range. First a sequential seek is performed & then random seek is performed.
Any errors during this test are reported.

READ/VERIFY TEST

This test performs sequential & random read & verify operation on the specified Cylinder,Head range.

FORCED BAD TRACKS

This operation enables an user to define a set of tracks as bad. Certain specific applications require this option.

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4.8 FLOPPY DIAGNOSTICS

All the options under floppy diagnostics require more or
less the require the following inputs:

a) Drive No.
b) Start Tracks No.
c) End TRacks No.

As in the case of hard disk the list below gives the effect
of each of the diskette tests:

a) Diskette Format   - Destructive.
b) Speed Test   - Non-destructive.
c) Random R/W Test   - Destructive.
d) Sequential R/W Test   - Destructive.
e) Disk Change Line Test - Non-destructive.

DISK FORMAT

This test allows an user to check out the **D756** controller's
abilities to format a diskette.
The user need not be bothered about the drive or the
diskette in the drive. PLUS automatically determines the
best way a diskette can be formatted for reliability.
e.g. In case of a 1.2MB drive the user need not specify
whether the diskette to be formatted is 1.2MB or 360KB
capacity. PLUS finds the most reliable format automatically.
Note that this test does not write a DOS format on the
diskette.

DRIVE SPEED TEST

This test determines the speed of rotation of the drive.
Please note that the following are the allowable speeds for
the various drives:

a) 1.2MB drive - 360 rpm for a 1.2MB diskette in it.
                 300 rpm for a 360KB diskette in it.
b) 360KB drive - 300 rpm.
c) 720KB drive - 300 rpm.
d) 1.4MB drive - 300 rpm.
Allow for a tolerance of 1% on all the speeds.
Ensure that the diskette is formatted before performing this
test.

RANDOM READ/WRITE TEST

This test performs a random read/write operation on the
diskette & thus check out the random seek capability of the
drive.
Again ensure that the diskette is formatted before
performing this test.

SEQUENTIAL READ/WRITE TEST

This test performs a sequential read/write operation &
checks out the sequential seek, read & write capability of
the drive.
The test requires a formatted diskette.

DISK CHANGE LINE TEST

This test is valid only for drives with the disk change line
feature namely:

- 1.2MB drive.
- 1.4MB or 720KB drive.

This test checks whether the status of the disk change line
changes when the diskette is removed/inserted in the drive.
This test requires a formatted diskette.

4.9 KEYBOARD DIAGNOSTICS

There are two types of diagnostics performed on the
keyboard/keyboard controller
They are:
a) Controller Test.
b) Scan/ASCII Code Test.

CONTROLLER TEST

This test excises the keyboard controller & the keyboard
status flags and takes about 2 minutes. Any error resulting
from this test is reported.
Observe the **CAPS, NUM** & **SCROLL** LED's going on and off during
the course of this test.

SCAN/ASCII CODE TEST

Upon invoking this test a keyboard layout is shown on the
screen. This keyboard layout might not necessarily
correspond with your keyboard.
The objective of this test is to determine whether the keys
depressed match with their scan code.
Thus every time a key is depressed the scan code and the
ASCII code of the key is shown.

Use <CTRL> <BREAK> key to abort this test.

Note: Function keys 11 & 12 in an Enhanced keyboard cannot
be checked out by this test.

4.10 VIDEO DIAGNOSTICS

Video diagnostics includes the following:

a) Sync Test   - Checks the Sync capability.
b) Adaptor Test   - Performs test on the Display Memory.
c) Attribute Test   - Checks the attributes of the DIsplay Memory.
d) 80x25 Display Test - Checks the 80x25 character set of the display adaptor.

The video diagnostics requires very little input and the result can be visually observed.

4.11 MISCELLANEOUS DIAGNOSTICS

This includes the following tests:

a) Serial Communication Port Test.
b) Printer Port Test.

SERIAL COMMUNICATION PORT TEST

This test requires special RS-232C connector to be plugged on to the port. The details of this connector are as below:

- RD & TD shorted
- DSR & DTR shorted
- CTS & RTS shorted

This test exercise the port for different:
- Baud Rates
- 7 Bit / 8 Bit
- Odd / Even Parity

The result of the test are shown on the screen.
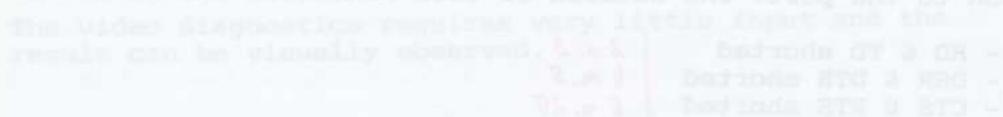
PRINTER PORT TEST

This test writes a pattern on the printer and the results are observed on the printer.

5. KEYBOARD

5.1 THE KEYBOARD

The keyboard contains a microprocessor which is connected to the main circuit board by a 5-pin cable.

This section, which describes the keyboard functions, is intended for the user who is not familiar with the operating characteristics of a PC.

The keyboard is divided into three sections: the typewriter key area, the function keys, and the numeric keyboard.

You can raise the angle of the keyboard by pushing in and then turning the small round lever on either side of the keyboard.

The keys repeat as long as they are held down.

5.2 THE FUNCTION KEYS

The function keys, which are located at the left of the
keyboard, let you enter a command using a single key. When
the system is in BASIC mode, each key will have the
following value:

```
F1:   LIST B
F2:   RUN
F3:   LOAD"
F4:   SAVE"
F5:   CONT
F6:   "LPT1
F7:   TRON-
F8:   TROFF
F9:   KEY B
F10: SCREEN 0,0,0
```

with B = to a blankspace
and - = to the return key

if, for example, you wanted LOAD FILE 1" to appear on the
screen, then you would only need to push the F3 key type in
FILE 1". LOAD" FILE 1" would appear on the screen.

5.3 THE NUMERIC KEYPAD

The numeric keys are located on the right side of the key
board. When used with the program editor, these keys enable
you to move the cursor up, down, right and left. YOu can
also use the NUM LOCK key to set the numeric keypad so that
it works more like a calculator key pad. Pressing the NUM
LOCK key shifts the numeric keypad into its own upper-shift
mode, so that you get the numbers 0 through 9 and the
decimal point, as indicated on the keycaps. Pressing NUM
LOCK again will return the key pad to its normal cursor
control mode. Like CAPSLOCK, you can temporarily reverse NUM
LOCK by pressing one of the Shift Keys. The NUM LOCK's LED
indicator will light up when the keyboard is in the numeric
key board state.

CURSOR UP

Moves the cursor one line up.

CURSOR DOWN

Moves the cursor one line down.

CURSOR LEFT

Moves the cursor one position left. If the cursor moves
beyond the left edge of the screen, it will appear to the
right side of the screen on the line below.

CURSOR RIGHT

Moves the cursor one position right. If the cursor moves
beyond the right edge of the screen, it will appear on the
left side of the screen, one line down. (In other words, it
wraps)

HOME

Moves the cursor to the end of the line. When the **CTRL** and **END** keys are pressed simultaneously, the data from the current cursor position to the end of the line is erased.

PGUP

When the **CTRL** and **PGUP** keys are pressed simultaneously, the cursor will move to the top of the document.

PGDN

Moves the cursor down 25 lines. When the **CTRL** and **PGDN** keys are pressed simultaneously, all data from the cursor position to the end of the screen will be deleted.

INS

Turns on the insert mode. The insert key toggles on and off.

In the insert mode, data typed in will be inserted into the existing test. As characters are moved off the right side of the screen, they will wrap around and form a new line below.

When the insert mode is off, any characters typed in will overwrite existing text.

You can also turn off the insert mode by pressing any of the cursor movements keys or the "<-" key.

DEL

Deletes the character at the current cursor position. All characters to the right of the deleted character move one position left to fill in the empty space. Once again, text will wrap to the line below.

5.4 THE MAIN KEYS

The keyboard responds like a standard typewriter keyboard.
Capital letters and special characters shown above the
numbers on the number keys are displayed by holding down
either of the shift keys and pressing the desired key. The
functions of some special keys are described below.

CAPS LOCK

The CAPS LOCK key is similar to the shift lock key on a
typewriter. The only difference is that it generates capital
letters and not the special uppershift characters on the
numeric keys. The key toggles, so after it is pushed you
will continue to get capital letters until it is pushed
again. To get lower case letters while CAPS LOCK is on, push
the shift key while pushing a selected letter. The LED
indicator will light when the CAPS LOCK is on.

ALT

The ALT key enables easy entry of BASIC statement keywords.
This key enables you to type an entries BASIC keyword with a
single stroke.

Simultaneously hold down the ALT key and one of the
alphabetic keys (A-Z), to type a BASIC keyword. Keywords
associated with each letter are summarized below. Letters
not having reserved words are noted by NO WORD.

A.	AUTO	M.	MOTOR
B.	SAVE	N.	NEXT
C.	COLOR	O.	OPEN
D.	DELETE	P.	PRINT
E.	ELSE	Q.	NO WORD
F.	FOR	R.	RUN
G.	GOTO	S.	SCREEN
H.	HEXS	T.	THEN
I.	INPUT	U.	USING
J.	NO WORD	V.	VAL
K.	KEY	W.	WIDTH
L.	LOCATE	X.	XOR

SHIFT

Make capital letters and the special characters shown above
the numbers by hold down either of the shift keys and
pressing any key.

CTRL

The CTRL key is used together with a standard key to perform
a special command or function. Below are examples of these
functions.

CTRL - G
Tone. When these two keys are pushed, the speaker beeps.

CTRL - SCROLL LOCK
Break. This stops your program while it is running.

CTRL - NUM LOCK
Pause. This temporarily stops your program; press any key to
continue.

CTRL - ->
Next word. This moves the cursor right to the next word on
the line.

CTRL - <-
Previous word. Moves the cursor left to the previous word on
the line.

CTRL - HOME
Clear screen. This command clears the screen and moves the
cursor to the upper-left corner.

CTRL - ALT - DEL
System reset. Holding both the CTRL and the ALT keys
simultaneously and then pressing the DEL key reloads the
system or program diskette.

ATL - ESC
You will hear a buzzer whenever a key is pressed. If you do
not wish this buzzer to sound, press down these keys. To
reactivate the buzzer, push these same two keys down again.

TAB

Moves the cursor to the next tab stop. Tabs stops are
already set every eight character positions.

When the insert mode is off, pressing the TAB key moves the
cursor over characters until it reaches the next tab stop.

When the insert mode is on, pressing the TAB key inserts
blank spaces from the current cursor position to the next
tab stop.

ESC

Pressing this key deletes the line the cursor is on.
Therefore the line is not passed to BASIC for processing. If
it is a program line, the line is not erased from the
program in memory.

BACKSPACE

This key not only backspaces, but also erases the letter
that it is passing over. All characters to the right of the
deleted character will move left one position to fill the
deleted space. Subsequent characters and lines within the
current logical line will move up as with the DEL key.

If you wish to move to the left and not erase the letters
which you are passing, use the CURSOR LEFT key in the
numeric pad section of the keyboard.

ENTER <-

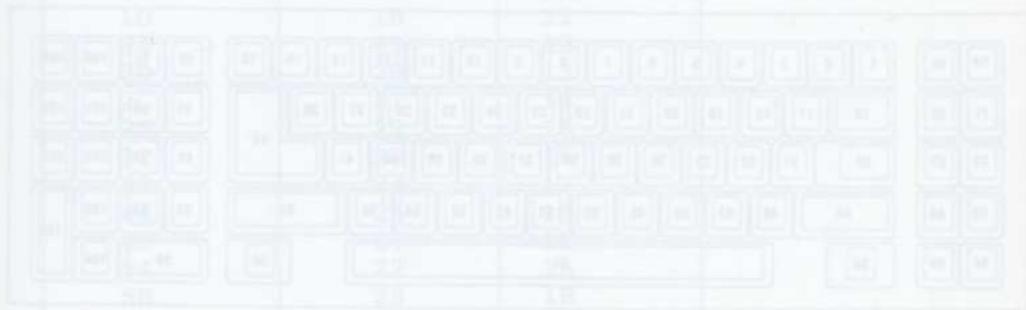This is the CARRIAGE RETURN or ENTER KEY.

PRTSC* (PRINT SCREEN)

When the key board is in lowershift, pressing this key cause
the asterisks to be typed. In uppershift, this key cause a
copy of what is on the screen to be printed on the printer
(LPT1). So, if you ever need a hard(or printed) copy of what
is currently being displayed, press the PRTSC key and a
shift key simultaneously.

NOTE: Characters which cannot be recognized by the printer
      are printed as blank spaces.

SCROLL LOCK

When the SCROLL LOCK and CTRL keys are pushed simultaneously, instruction level BASIC is interrupted and program execution returns to command level BASIC. These keys are also used to exit the AUTO line numbering mode.

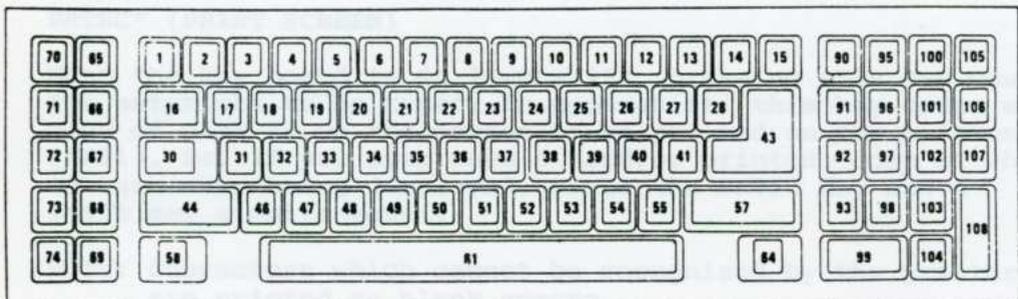## 5.5 KEYBOARD SCAN CODES

Each key is assigned a unique 8-bit, make, scan code, which is sent when the key is pressed. Each key also sends a break code when the key is released.

Scan codes, which are received from the keyboard, are converted by the keyboard controller before they are put into controller's output buffers. The following figure the keyboard layout with key numbers.

KEYBOARD SCAN CODES

SCAN CODE TRANSLATION TABLE

Keyboard Scan Code	Key	System Scan Code
00		FF
76	90	01
16	2	02
1E	3	03
26	4	04
25	5	05
2E	6	06
36	7	07
3D	8	08
3E	9	09
46	10	0A
45	11	0B
4E	12	0C
55	13	0D
66	15	0E
0D	16	0F
15	17	10
1D	18	11
24	19	12
2D	20	13
2C	21	14
35	22	15
3C	23	16
43	24	17
44	25	18
4D	26	19
54	27	1A
5B	28	1B
5A	43	1C
14	30	1D
1C	31	1E

Keyboard Scan Code	Key	System Scan Code
1B	32	1F
23	33	20
2B	34	21
34	35	22
33	36	23
3B	37	24
42	38	25
4B	39	26
4C	40	27
52	41	28
0E	1	29
12	44	2A
5D	14	2B
1A	46	2C
22	47	2D
21	48	2E
2A	49	2F
32	50	30
31	51	31
3A	52	32
41	53	33
49	54	34
4A	55	35
59	57	36
7C	106	37
11	58	38
29	61	39
58	64	3A
05	70	3B
06	65	3C
04	71	3D
0C	66	3E
03	72	3F

Keyboard Scan Code	Key	System Scan Code
0B	67	40
02 OR 83	73	41
0A	68	42
01	74	43
09	69	44
77	95	45
7E	100	46
6C	91	47
75	96	48
7D	101	49
7B	107	4A
6B	92	4B
73	97	4C
74	102	4D
79	108	4E
69	93	4F
72	98	50
7A	103	51
70	99	52
71	104	53
7F OR 84	105	54
60	R	55
61	R	56
78	R	57
07	R	58
0F	R	59
17	R	5A
1F	R	5B
27	R	5C
2F	R	5D
37	R	5E
3F	R	5F
47	R	60

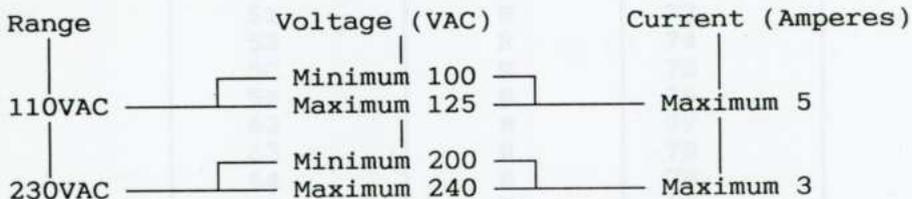| Keyboard Scan Code	Key	System Scan Code
4F	R	61
56	R	62
5E	R	63
08	R	64
10	R	65
18	R	66
20	R	67
28	R	68
30	R	69
38	R	6A
40	R	6B
48	R	6C
50	R	6D
57	R	6E
6F	R	6F
13	R	70
19	R	71
39	R	72
51	R	73
53	R	74
5C	R	75
5F	R	76
62	R	77
63	R	78
64	R	79
65	R	7A
67	R	7B
68	R	7C
6A	R	7D
6D	R	7E
6E	R	7F

6. POWER SUPPLY

The system's power is contained inside of the system unit
and provides power for the system board, the adaptors, the
diskette drives, the fixed disk drives, the keyboard, and
the IBM Monochrome Display.

The system power supply is designed for IBM PC/AT
compatibles computer use. Total output is 145 Watts with
115/230VAC selectable switch at the rear of power supply
box.

The power supply can operate at a frequency of either 60 +/-
3 Hz or 50 +/- 2Hz, and it can operate at 100VAC to 130
VAC, 5.0A or 220/260VAC, 2.5A. The voltage is selected with
the switch above the power cord plug at the rear of the
power supply. The following figure shows the input
requirements.

AC Input Voltage: 100V to 130V/200V to 260V selectable
AC Input Frequency: 47 to 63 Hz

INPUT REQUIREMENTS

```
Range                 Voltage (VAC)          Current (Amperes)
  |                        |                        |
  |                   ┌─ Minimum 100 ┐              |
110VAC ────────────┴─ Maximum 125 ─┴──── Maximum 5
  |                        |                        |
  |                   ┌─ Minimum 200 ┐              |
230VAC ────────────┴─ Maximum 240 ─┴──── Maximum 3
```

POWER SUPPLY OUTPUT

NORMAL PUT	OUTPUT CURRENT
+5V	15A
+12V	5A
-5V	0.3A
-12V	0.3A

Note: The power supply also supplies 115VAC or 230VAC for the IBM Monochrome Display.

OUTPUT PROTECTION

If any output becomes overloaded, the power will switch off within 20 milliseconds. An overcurrent condition will not damage the power supply.

OUTPUT VOLTAGE SEQUENCING

Under normal conditions, the output voltage levels track within 300 milliseconds of each other when power is applied to, or removed from the power supply, provided at least minimum loading is present.

NO-LOAD OPERATION

No damage or hazardous conditions occur when primary power is applied with no load on any output level. In such cases, the power supply may switch off, and a power-on cycle will be required. The power supply requires a minimum load for proper operation.

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POWER-GOOD SIGNAL

The power supply provides a "power-good" signal to indicate
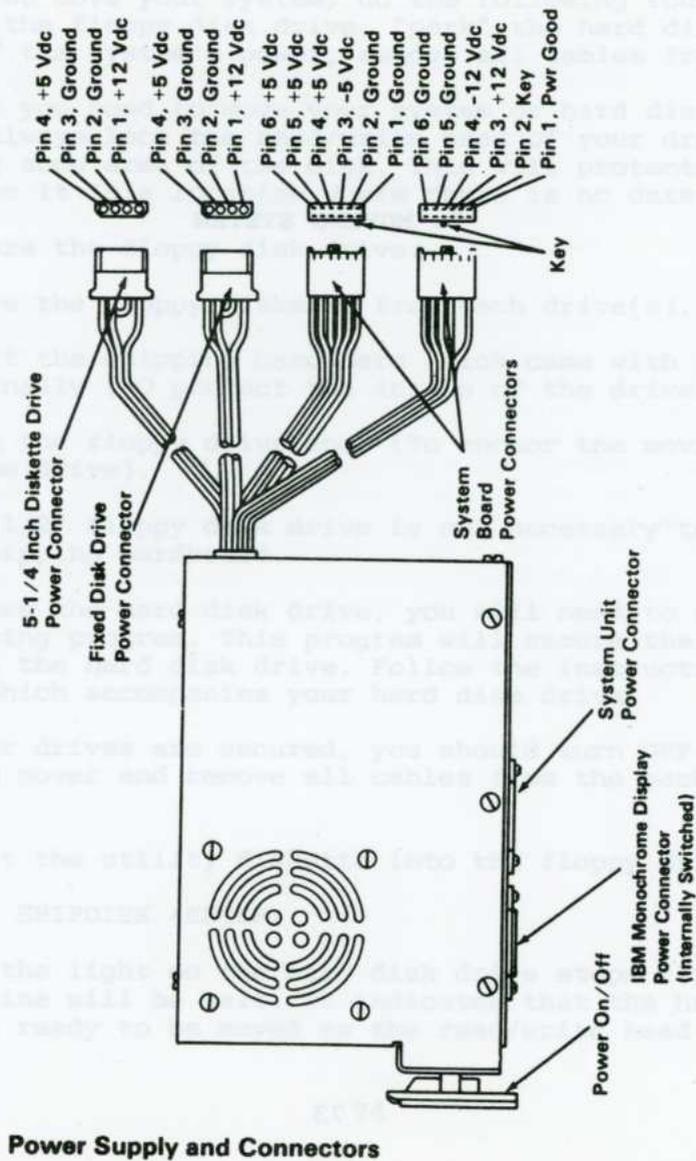proper operation of the power supply.
When the supply is switched to OFF for a minimum of 1 second
and then switches to ON, the "power-good" signal is
generated, assuming that there are no problems. This signal
is a logical AND of the do output-voltage sense signal and
the AC input-voltage sense signal.
The "power-good" signal is also a TTL compatible high level
for normal operations, or a low level for fault conditions.
The AC fail signal cause power-good to go to a low level at
least 1 millisecond before any output voltage fails below
the regulation limits. The operating point used as a
reference for measuring the 1 millisecond is normal
operation at minimum line voltage and maximum load.
The DC output-voltage sense signal holds the power-good
signal at a low level when power is switched on until all
output voltage have reached their minimum sense levels. THe
power good signal has turn-around delay of at least 100
milliseconds but not longer than 500 milliseconds. The
following figure sense levels for the output voltage.

LEVEL (VDC)	MINIMUM (VDC)
+5	+4.5
-5	-3.75
+12	+10.8
-12	-10.4

The power-good signal can drive six standard TTL loads.

Pin 4, +5 Vdc
Pin 3, Ground
Pin 2, Ground
Pin 1, +12 Vdc

Pin 4, +5 Vdc
Pin 3, Ground
Pin 2, Ground
Pin 1, +12 Vdc

Pin 6, +5 Vdc
Pin 5, +5 Vdc
Pin 4, +5 Vdc
Pin 3, -5 Vdc
Pin 2, Ground
Pin 1, Ground

Pin 6, Ground
Pin 5, Ground
Pin 4, -12 Vdc
Pin 3, +12 Vdc
Pin 2, Key
Pin 1, Pwr Good

Key

5-1/4 inch Diskette Drive
Power Connector

Fixed Disk Drive
Power Connector

System Board
Power Connectors

System Unit
Power Connector

IBM Monochrome Display
Power Connector
(Internally Switched)

Power On/Off

Power Supply and Connectors

7. MOVING SYSTEM

Before you move your system, do the following four things: prepare the floppy disk drive, "park" the hard disk drive, turn OFF the system's power, remove all cables from the unit.
Whenever you need to move your system or hard disk, you should always lock the read/write head of your drive to the shipping zone area of the disk. This will protect the head and place it in a location where there is no data.

To prepare the floppy disk drive:

1. Remove the floppy diskette from each drive(s).

2. Insert the shipping cardboard which came with the unit originally (TO protect the inside of the drive).

3. Close the floppy drive door (To anchor the moving parts of the drive).

Note: 3 1/2" floppy disk drive is not necessary to put shipping cardboard.

To prepare the hard disk drive, you will need to run a head positioning program. This program will secure the moving parts in the hard disk drive. Follow the instructions in the manual which accompanies your hard disk drive.

Once your drives are secured, you should turn OFF the system's power and remove all cables from the back of the unit.

1. Insert the utility diskette into the floppy drive.

2. Type: SHIPDISK <ENTER>

3. When the light on the hard disk drive stops flickering, the machine will be halt. It indicates that the hard disk drive is ready to be moved as the read/write head is now parked.

APPENDIX A
FEATURES OF THE <u>VLSI</u> CHIP SET

VL82C100

. Fully compatible with IBM PC/AT-type designs.
. Replaces 19 logic devices.
. Supports 12 MHz processor clock.
. Seven DMA channels.
. 14 external interrupt request.
. Three timer/counter channels.
. Designed in CMOS for low power consumption.

Description:
The VL82C100 PC/AT-Compatible Peripheral Controller replaces
two 82C37A Direct Memory Access Controllers, two 82C59A
interrupt Controllers, an 82C54 Programmable Counter, a
74LS612 AT Memory Mapper, two 74LS573 Octal Three-State
Lacthes, a 74LS138 3 to 8 Decoder, and five other less-
complex integrated circuits. Using this internal
functionally, the VL82C100 provides all 24 address bits for
16M bits of DMA address space. It also interfaces directly
to the CPU to handle all interrupts. Timing for refresh
cycles, and arbitration, between refresh and DMA hold
requests, are also controlled by the VL82C100.

VL82C101

. Fully compatible with IBM PC/AT-type designs.
. Replaces 36 integrated circuits on the PC/AT-type
  board.
. Supports 12 MHz processor clock.
. Sink 20 mA on slot driver outputs.
. Designed in CMOS for low power consumption.

Description:

The VL82C101 PC/AT-Compatible System Controller replaces an
82C284 Clock Controller and 82C288 Bus Controller(both are
used in 286-based systems), an 82C84A Clock Generator and
Driver, two PAL16L8 devices(used for memory decode), and
approximately ten other less complex integrated circuits
used as wait state logic. When used in 12Mhz systems
utilizing 100ns DRAMs, the device provides the required one
wait state for a "write" operation, and zero wait states for
a "read" operation. A 12Mhz system using 120ns DRAMs will be
provided with one wait state for "write" and one wait state
for "read". The device accepts both the 24Mhz crystal to
control the system clock as well as the 14.318Mhz crystal to
control the video clock. It also supplies reset and clock
signals to the I/O slots.

VL82C102

- Fully compatible with IBM PC/AT-type designs.
- Completely performs memory control function in IBM PC/AT-compatible systems.
- Replaces 20 integrated circuits on PC/AT-type motherboard.
- Support 12 MHz processor clock.
- Designed in CMOS for low power consumption.

Description:

The VL82C102 PC/AT-Compatible MEmory Controller generates the row address strobe (RAS) and column address strobe (CAS) necessary to support the dynamic RAMs used in PC/AT-type systems. IN addition, the device allows five motherboard memory options for the user, up to a full 4M-byte system. Four of the five options allow a full 640K-bytes user area to support the disk operating system(DOS). In addition, the VL82C102 provides the upper addresses to the I/O slots, the chip select for the ROM ans RAM memory, and drives the system's speaker.

VL82C103

- Fully compatible with IBM PC/AT-type designs.
- Completely performs address buffer function in IBM PC/AT-compatible systems.
- Replaces several buffers, lathes and other logic devices.
- Supports 12 MHz processor clock.
- Designed in CMOS for low power consumption.

Description:

The VL82C103 PC/AT-Compatible Address Buffers provides the system with a 16-bit address bus input from the CPU to 41 buffered drivers. The buffered drives consist of 17 bidirectional system bus drives, each capable of sinking 20mA (50'LS loads) of current and driving 200pf of capacitance on the backplane; 16 bidirectional peripheral bus drivers, each capable of sinking 8mA (20'LS loads) of current; and eight memory bus drivers, also capable of sinking 8mA of current. On-chip refresh circuitry supports both 256K-bit and 1M-bit DRAMs. The VL82C103 provides addressing for the I/O slots as well as the system.

VL82C104

. Fully compatible with IBM PC/AT-type designs.
. Completely performs data buffer function in
  IBM PC/AT-compatible systems.
. Replaces several buffers, latches and other logic
  devices.
. Supports 12 MHz processor clock.
. Designed in CMOS for low power consumption.

Description:
The VL82C104 PC/AT-Compatible Data Buffer provides a 16-bit
CPU data bus I/O as well as 40 buffered drivers. The
buffered drivers consist of 16 bidirectional system data bus
drivers, each capable of sinking 20mA (50'LS loads) of
current; eight bidirection peripheral bus drivers, each
capable of sinking 8mA (20'LS loads) of current; and 16
memory data bus drivers, each capable of sinking 8mA (20'LS
loads) of current. The VL82C104 also generates the parity
error signal for the system.