**Dr. Eli Flaxer**

**Bios Data Area - PC Memory Map**

<table>
<thead>
<tr>
<th>Address Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00 256dwords</td>
<td>Interrupt vector table</td>
</tr>
<tr>
<td>30:00 256bytes</td>
<td>Stack area used during post and bootstrap</td>
</tr>
<tr>
<td>40:00 word</td>
<td>COM1 port address</td>
</tr>
<tr>
<td>40:02 word</td>
<td>COM2 port address</td>
</tr>
<tr>
<td>40:04 word</td>
<td>COM3 port address</td>
</tr>
<tr>
<td>40:06 word</td>
<td>COM4 port address</td>
</tr>
<tr>
<td>40:08 word</td>
<td>LPT1 port address</td>
</tr>
<tr>
<td>40:0A word</td>
<td>LPT2 port address</td>
</tr>
<tr>
<td>40:0C word</td>
<td>LPT3 port address</td>
</tr>
<tr>
<td>40:0E word</td>
<td>LPT4 port address (except PS/2)</td>
</tr>
<tr>
<td></td>
<td>Extended BIOS Data Area segment (PS/2, see <del>EBDA</del>)</td>
</tr>
<tr>
<td>40:10 2 bytes</td>
<td>Equipment list flags (see <del>INT 11</del>)</td>
</tr>
</tbody>
</table>

```
|7|6|5|4|3|2|1|0| 40:10 (value in INT 11 register AL)
| | | | | | | |_ IPL diskette installed
| | | | | | | |___ math coprocessor
| | | | | | | |___ old PC system board RAM < 256K
| | | | | | | |___ pointing device installed (PS/2)
| | | | | | |___ not used on PS/2
| | | |___ initial video mode
|___# of diskette drives, less 1

|7|6|5|4|3|2|1|0| 40:11 (value in INT 11 register AH)
| | | | | | |___ 0 if DMA installed
| | | | |___ number of serial ports
| | |___ game adapter
|___ not used, internal modem (PS/2)
|___ number of printer ports
```

40:12 byte    | PCjr: infrared keyboard link error count                                   |
40:13 word    | Memory size in Kbytes (see ~INT 12~)                                      |
40:15 byte    | Reserved                                                                   |
40:16 byte    | PS/2 BIOS control flags                                                   |
**40:17 byte**  
Keyboard flag byte 0  
(see ~KB FLAGS~)

|7|6|5|4|3|2|1|0| keyboard flag byte 0  
| | | | | | |___ right shift key depressed  
| | | | | |____ left shift key depressed  
| | | | |____ CTRL key depressed  
| | | |____ ALT key depressed  
| |____ scroll-lock is active  
|____ num-lock is active  
____ caps-lock is active  
________ insert is active

**40:18 byte**  
Keyboard flag byte 1  
(see ~KB FLAGS~)

|7|6|5|4|3|2|1|0| keyboard flag byte  
| | | | | | |___ left CTRL key depressed  
| | | | | |____ left ALT key depressed  
| | | | |____ system key depressed and held  
| | |_____ suspend key has been toggled  
| |____ scroll lock key is depressed  
|____ num-lock key is depressed  
____ caps-lock key is depressed  
_______ insert key is depressed

**40:19 byte**  
Storage for alternate keypad entry

**40:1A word**  
Offset from 40:00 to keyboard buffer head

**40:1C word**  
Offset from 40:00 to keyboard buffer tail

**40:1E 32bytes**  
Keyboard buffer (circular queue buffer)

**40:3E byte**  
Drive recalibration status

|7|6|5|4|3|2|1|0| drive recalibration status  
| | | | | |__ 1=recalibrate drive 0  
| | | | |____ 1=recalibrate drive 1  
| | | |____ 1=recalibrate drive 2  
| |____ 1=recalibrate drive 3  
|____ unused  
__________ 1=working interrupt flag
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### 40:3F byte
Diskette motor status

<table>
<thead>
<tr>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=drive 0 motor on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=drive 1 motor on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=drive 2 motor on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=drive 3 motor on</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>unused</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=write operation</td>
</tr>
</tbody>
</table>

### 40:40 byte
Motor shutoff counter (decremented by -INT 8-)

### 40:41 byte
Status of last diskette operation (see -INT 13,1-)

<table>
<thead>
<tr>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>invalid diskette command</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>diskette address mark not found</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>sector not found</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>diskette DMA error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CRC check / data error</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>diskette controller failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>seek to track failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>diskette time-out</td>
</tr>
</tbody>
</table>

### 40:42 7 bytes
NEC diskette controller status (see -FDC-)

### 40:49 byte
Current video mode (see -VIDEO MODE-)

### 40:4A word
Number of screen columns

### 40:4C word
Size of current video regen buffer in bytes

### 40:4E word
Offset of current video page in video regen buffer

### 40:50 8 words
Cursor position of pages 1-8, high order byte=row, low order byte=column; changing this data isn't reflected immediately on the display

### 40:60 byte
Cursor ending (bottom) scan line (don't modify)

### 40:61 byte
Cursor starting (top) scan line (don't modify)

### 40:62 byte
Active display page number

### 40:63 word
Base port address for active -6845- CRT controller
3B4h = mono, 3D4h = color

### 40:65 byte
6845 CRT mode control register value (port 3x8h)
EGA/VGA values emulate those of the MDA/CGA

### 40:66 byte
CGA current color palette mask setting (port 3d9h)
EGA and VGA values emulate the CGA
Bios Data Area - PC Memory Map

40:67  dword  CS:IP for 286 return from protected mode
40:68  dword  Temp storage for SS:SP during shutdown
40:69  dword  Day counter on all products after AT
40:6A  dword  PS/2 Pointer to reset code with memory preserved
5 bytes  Cassette tape control (before AT)

40:6C  dword  Daily timer counter, equal to zero at midnight. Incremented by INT 8; read/set by ~INT 1A~

40:70  byte  Clock rollover flag, set when 40:6C exceeds 24hrs
40:71  byte  BIOS break flag, bit 7 is set if ~Ctrl-Break~ was *ever* hit; set by ~INT 9~
40:72  word  Soft reset flag via Ctl-Alt-Del or JMP FFFF:0

1234h  Bypass memory tests & CRT initialization
4321h  Preserve memory
5678h  System suspend
9ABCh  Manufacturer test
ABCDh  Convertible POST loop
????h  many other values are used during POST

40:74  byte  Status of last hard disk operation (see ~INT 13,1~)
40:75  byte  Number of hard disks attached
40:76  byte  XT fixed disk drive control byte
40:77  byte  Port offset to current fixed disk adapter
40:78  4 bytes  Time-Out value for LPT1,LPT2,LPT3,(,LPT4 except PS/2)
40:7C  4 bytes  Time-Out value for COM1,COM2,COM3,COM4
40:80  word  Keyboard buffer start offset (seg=40h, BIOS 10-27-82)
40:82  word  Keyboard buffer end offset (seg=40h, BIOS 10-27-82)
40:84  byte  Rows on the screen (less 1, EGA+)
40:85  word  Point height of character matrix (EGA+)
40:86  byte  PCjr: character to be repeated if the typematic repeat key takes effect
40:87  byte  PCjr: initial delay before repeat key action begins

|7|6|5|4|3|2|1|0|  Video mode options (EGA+)
| | | | | | | | |__ 1=alphanumeric cursor emulation enabled
| | | | | | | |__ 1=video subsystem attached to monochrome
| | | | | | |____ reserved
| | | | |______ reserved
|_______ video RAM  00-64K  10-192K  01-128K  11-256K
____________ video mode number passed to ~INT 10~, function 0

4
40:88 byte PCjr: third keyboard status byte
EGA feature bit switches, emulated on VGA

|7|6|5|4|3|2|1|0| EGA feature bit switches (EGA+)
| | | | | | | |__ EGA SW1 config (1=off)
| | | | | | |___ EGA SW2 config (1=off)
| | | | | |____ EGA SW3 config (1=off)
| | | | ____ EGA SW4 config (1=off)
| | |____ Input FEAT0 (ISR0 bit 5) after output on FCR0
| |____ Input FEAT0 (ISR0 bit 6) after output on FCR0
|____ Input FEAT1 (ISR0 bit 5) after output on FCR1
|____ Input FEAT1 (ISR0 bit 6) after output on FCR1

40:89 byte Video display data area (MCGA and VGA)

|7|6|5|4|3|2|1|0| Video display data area (MCGA and VGA)
| | | | | | |__ 1=VGA is active
| | | | | |___ 1=gray scale is enabled
| | | | |____ 1=using monochrome monitor
| | | |______ 1=default palette loading is disabled
| | |_____ see table below
| |______ reserved
|_______ 1=display switching enabled
|_______ alphanumeric scan lines (see table below)

Bit7  Bit4  Scan Lines
0 0   350 line mode
0 1   400 line mode
1 0   200 line mode
1 1   reserved

40:8A byte Display Combination Code (DCC) table index (EGA+)
40:8B byte Last diskette data rate selected

|7|6|5|4|3|2|1|0| last diskette data rate selected
| | | | |___|___ reserved
| | |_______ last floppy drive step rate selected
|_______ last floppy data rate selected

<table>
<thead>
<tr>
<th>Data Rate</th>
<th>Step Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 500K bps</td>
<td>00 step rate time of 0C</td>
</tr>
<tr>
<td>01 300K bps</td>
<td>01 step rate time of 0D</td>
</tr>
</tbody>
</table>
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10  250K bps  10 step rate time of 0A
11  reserved  11 reserved

40:8C byte   Hard disk status returned by controller
40:8D byte   Hard disk error returned by controller
40:8E byte   Hard disk interrupt control flag(bit 7=working int)
40:8F byte   Combination hard/floppy disk card when bit 0 set
40:90  4 bytes  Drive 0,1,2,3 media state

|7|6|5|4|3|2|1|0| drive media state (4 copies)
| | | | | |___ drive/media state (see below)
| | | | |______ reserved
| | | |_______ 1=media/drive established
| | |_______ double stepping required
|_______ data rate:  00=500K bps  01=300K bps
10=250K bps  11=reserved

Bits
210  Drive Media State
000  360Kb diskette/360Kb drive not established
001  360Kb diskette/1.2Mb drive not established
010  1.2Mb diskette/1.2Mb drive not established
011  360Kb diskette/360Kb drive established
100  360Kb diskette/1.2Mb drive established
101  1.2Mb diskette/1.2Mb drive established
110  Reserved
111  None of the above

40:94 byte   Track currently seeked to on drive 0
40:95 byte   Track currently seeked to on drive 1
40:96 byte   Keyboard mode/type

|7|6|5|4|3|2|1|0| Keyboard mode/type
| | | | | | | |___ last code was the E1 hidden code
| | | | | | |____ last code was the E0 hidden code
| | | | | |____ right CTRL key depressed
| | | |_______ right ALT key depressed
| | |_______ 101/102 enhanced keyboard installed
| |_______ force num-lock if Rd ID & KBX
|_______ last char was first ID char
|_______ read ID in process
### BIOS Data Area - PC Memory Map

| 40:97 byte | Keyboard LED flags |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
---|---|---|---|---|---|---|---|
| | | | | | | | | scroll lock indicator |
| | | | | | | | num-lock indicator |
| | | | | | | | caps-lock indicator |
| | | | | | | | circus system indicator |
| | | | ACK received |
| | | | re-send received flag |
| | | caps-lock indicator |
| | | keyboard transmit error flag |

| 40:98 dword | Pointer to user wait complete flag |
| 40:9C dword | User wait Time-Out value in microseconds |
| 40:A0 byte | RTC wait function flag |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
---|---|---|---|---|---|---|---|
| | | | | | | | INT 15,86 wait pending |
| | | | | | | | not used |
| | | | INT 15,86 wait time elapsed |

| 40:A1 byte | LANA DMA channel flags |
| 40:A2 2 bytes | Status of LANA 0,1 |
| 40:A4 dword | Saved hard disk interrupt vector |
| 40:A8 dword | BIOS Video Save/Override Pointer Table address |
| | (see -VIDEO TABLES-) |
| 40:AC 8 bytes | Reserved |
| 40:B4 byte | Keyboard NMI control flags (convertible) |
| 40:B5 dword | Keyboard break pending flags (convertible) |
| 40:B9 byte | Port 60 single byte queue (convertible) |
| 40:BA byte | Scan code of last key (convertible) |
| 40:BB byte | NMI buffer head pointer (convertible) |
| 40:BC byte | NMI buffer tail pointer (convertible) |
| 40:BD 16bytes | NMI scan code buffer (convertible) |
| 40:CE word | Day counter (convertible and after) |
| 40:F0 16bytes | Intra-Applications Communications Area (IBM Technical Reference incorrectly locates this at 50:F0-50:FF) |