

# The XT-AT Booklet

For Engineers, Programmers and other serious PC/XT/AT users. A Collection of Hardware and Software Facts and Data on the PC-Compatible Family and the DOS Operating System. Second Edition, Third Review

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Page

## POST codes of IBM AT BIOS

01 80286 processor test real mode, verifies flags, registers & cond. jumps  
02 ROM checksum test1, tests 32K ROMs of POST, BASIC & BIOS  
03 CMOS shutdown Byte, test rolling bit pattern @ shutdown address  
04 8254 timer1 all bits 1 - set timer count, check all bits 1  
05 8234 timer1 all bits 0 - -----"-----, -----"----- 0  
06 8237 DMA0 init., change reg test, disable DMAAct10, R/W cur. adr all ch.  
07 8237 DMA1 init., change reg test, disable DMAAct11, R/W cur. adr all ch.  
08 DMA page reg test, W/R all apge registers  
09 storage refresh test - verify refresh  
0A soft reset  
0B reset 8042  
0C test ok  
0D write byte 0 of 8042 memory  
0E fill memory with data  
0F get I/P buffer switch settings  
10 issue self test-check, 55H is received  
11 initialize display row column  
12 test protected mode registers  
13 initialize 8259 INTctl2  
14 set INT vectors to temp. interrupt  
15 establish BIOS INT call subroutine vectors, verify CMOS checksum ok  
16 set data segment (for?)  
17 set defective battery flag  
18 ensure CMOS dividers set  
19 set return address Byte in CMOS memory  
1A set temporary stack, protected mode test and determine memory size - runs in protected mode to address all RAM, checks (MSW) for protected mode, base memory size saved. Memory size determined with planar and I/O parity disabled. Soft reset checks for parity error.  
1B segment address 01-0000 (second 64K)  
1C set or reset 512 to 640K installed RAM?, protected mode test and memory size determine >640K  
1D segment address 10-0000 (>640K)  
1E set expanded memory size determine in CMOS  
1F test address lines 19-23  
20 cause a shutdown  
21 return 1 from shutdown. Initialize & start CRTctl 6845, test video - W/R reset video enable signal. select alpha mode (40x25BW), W/R patterns check addressability, error: 1 long 2 short beeps - port 80 not used!  
22 enable video signal and set mode; display horizontal bar on screen. CRT lines intrf. test, sense on/off transistion of video enable and HS  
23 check for advanced video card  
24 8259 INTctl1 test, R/W IntMaskreg with 1 & 0, enable INTs, mask device INTs off, check for hot (not expected) INTs  
25 test INT mask registers  
26 check for hot INTs  
05 display 101 error (?)  
27 check the converting logic 106 error  
28 check hot NMI INT (error 107)  
29 test data bus to timer 2 (error 108), 8254 timer check, verify timer 0 counts ok  
2A test (error 102)  
2B too fast  
2C too slow (error 103)  
2D check 8042 for last command accepted (error 105). R/W mem test (prot. mode) W/R data patterns to mem above 64K, mem addressability is checked  
2F proceed next test if warmstart  
30 set shutdown return 2  
31 enable protected mode  
32 address lines 0-15  
33 next block of 64K  
34 back to real mode, test done

Page 2

P.O.S.T. codes	
IBM AT .....	2
AMI BIOS .....	4
AMI 2.12 .....	5
AMI 2/1/91 .....	6
AMI Plus .....	9
Award Modular .....	12
Phoenix .....	13
Quadtel .....	14
IBM Diagnostic Codes (screen) .....	15
Beep Codes	
AMI .....	17
Ami 1/91 .....	17
Award .....	17
DTK/ERSO XT .....	17
MR BIOS .....	18
Mylex .....	18
IBM & Phoenix .....	19
Phoenix 486 Plus 0.1 .....	19
Memory Map Schematic .....	20,21
Interrupt INT# .....	23
Interrupt Vectors .....	24
Memory Map list .....	25
IO port ADDR .....	28
Port Registers	
LPT .....	28
COM .....	28
HD controller .....	29
Character Set .....	30
IRQ# and DMA# .....	31
External cables, ser. par. video .....	32
Internal cables	
MB power, disk, battery, keyboard .....	33
FD cable, HardDisk ST506 .....	34
HardDisk IDE & SCSI .....	35
ISA bus .....	36
PCI bus .....	37
Card Dimensions .....	38
POST Flowchart .....	39
Boot-Strap Flowchart .....	40
Filetypes .....	41

Page 1

35 test for error  
34 restore checkpoint  
35 keyboard test (Mfg burn-In?)  
36 check for 'AA' scan code  
38 stuck key?  
39 error check 8042 working  
3A init. 8042  
3B check for ROM in 2K blocks  
3C check for IPL diskette drive  
3D init floppy for drive type  
3E init hard file  
3F init printer  
40 enable H/W INT if 80287  
41 system code @ E000:0  
42 exit to system code  
43 goto boot loader  
44 attempt boot from hard-disk  
45 unable to boot from disk, goto BASIC, POST & BIOS utility routine, CMOS\_READ, CMOS\_WRITE, Manuf. loop error, mode flag  
81 build descriptor table  
82 switch to virtual mode  
90 - B6 EXEC\_00 to EXEC\_31 and SYS\_32 to SYS\_38 tests  
DD roll error code to MFG\_PORT  
F0 set data segment  
F1 INT test (programmed INT 32)  
F2 exception INT (13d)  
F3 verify 286 LDT/SDT, LTR/STR  
F4 verify 286 bound instruction  
F5 verify push all & pop all instruction  
F6 verify access rights function  
F7 verify ARPL functions \*  
F8 verify IAR instruction  
F9 verify LSL instruction  
FA Low Meg. chip select test

Page 3

Power On Self Test Codes of AMI BIOS:

01 Processor register test start, NMI disabled.  
 02 NMI is Disabled. Power on delay starting.  
 03 Power on delay complete. Any initialization before keyboard BAT is in progress.  
 04 Any initialization before keyboard BAT is complete. Reading keyboard SYS bit, to check soft reset/power-on.  
 05 Soft reset/power-on determined. Going to enable ROM, i.e. disabled shadow RAM/Cache if any.  
 06 ROM is enabled. Calculating ROM BIOS checksum, and waiting for KB controller input buffer to be free.  
 07 ROM BIOS checksum passed, KB controller i/B free.  
 08 Going to issue the BAT command to keyboard controller.  
 09 BAT command to keyboard controller is issued.  
 10 Going to verify the BAT command.  
 11 Keyboard controller BAT result verified. Keyboard command WR next.  
 12 Keyboard command byte code is issued. WR command byte data.  
 13 Keyboard controller command byte is written. Going to issue Pin-23,24 blocking/unblocking command.  
 14 Pin-23,24 of keyboard controller is blocked/unblocked. NOP command of keyboard controller to be issued next.  
 15 NOP command processing is done. CMOS shutdown register test next.  
 16 CMOS shutdown register R/W test passed.  
 17 Going to calculate CMOS checksum, and update DIAG byte.  
 18 CMOS checksum calculation is done, DIAG byte written.  
 19 CMOS init. to begin (if "INIT CMOS IN EVERY BOOT IS SET").  
 20 CMOS initialization done (if any).  
 21 CMOS status register about to init for Date and Time.  
 22 CMOS Status register initialized.  
 23 Going to disable DMA and interrupt controllers.  
 24 DMA controller #1, #2, interrupt controller #1, #2 disabled. About to disable video display and init port-B.  
 25 Video display is disabled and port-B is initialized. Chipset init/auto memory detection about to begin.  
 26 Chipset initialization/auto memory detection over. 8254 timer test about to start.  
 27 CH-2 timer test halfway. 8254 CH-2 timer, test to be complete.  
 28 CH-2 timer test over. 8254 CH-1 timer test to be complete.  
 29 CH-1 timer tests over. 8254 CH-0 timer test to be complete.  
 30 CH-0 timer test over. About to start memory refresh.  
 31 Memory Refresh started. Memory Refresh test to be done next.  
 32 Memory Refresh line is toggling.  
 33 Going to check 15 micro second ON/OFF time.  
 34 Memory Refresh period 30 micro second test complete. Base 64K memory test about to start.  
 35 Base 64K memory test started. Address line test to be done next.  
 36 Address line test passed. Going to do toggle parity.  
 37 Toggle parity over. Going for sequential data R/W test.  
 38 Base 64K sequential data R/W test passed.  
 39 Any setup before interrupt vector init about to start. Setup required before vector initialization complete.  
 40 Interrupt vector initialization about to begin.  
 41 Interrupt vector initialization done.  
 42 Going to read I/O port of 8042 for turbo switch (if any). I/O port of 8042 is read.  
 43 Going to initialize global data for turbo switch. Global data initialization is over.  
 44 Any initialization after interrupt vector to be done next.  
 45 Initialization after interrupt vector is complete. Going for monochrome mode setting.  
 46 Monochrome mode setting is done. Going for Color mode setting.

2A Color mode setting is done.  
 2B About to go for toggle parity before optional ROM test.  
 2C Toggle parity over. giving control for any setup required before optional video ROM check.  
 2D Processing before video ROM control is done.  
 2E About to look for optional video ROM and give control.  
 2F Optional video ROM control is done. About to give control to do any processing after video ROM returns control.  
 30 Return from processing after the video ROM control.  
 31 If EGA/VGA not found then do display memory R/W test.  
 32 EGA/VGA not found.  
 33 Display memory R/W test about to begin.  
 34 Display memory R/W test passed.  
 35 About to look for the retrace checking.  
 36 Display memory R/W test or retrace checking failed.  
 37 About to do alternate Display memory R/W test.  
 38 Alternate Display memory R/W test passed.  
 39 About to look for the alternate display retrace checking.  
 40 Video display checking over. Verify display type with switch setting and actual card to begin.  
 41 Verification of display adapter done.  
 42 Display mode to be set next.  
 43 Display mode set complete.  
 44 BIOS ROM data area about to be checked.  
 45 BIOS ROM data area check over.  
 46 Going to set cursor for power on message.  
 47 Cursor setting for power on message id complete.  
 48 Going to display the power on message.  
 49 Power on message display complete.  
 50 Going to read new cursor position.  
 51 New cursor position read and saved.  
 52 Going to display the reference string.  
 53 Reference string display is over.  
 54 Going to display the Hit <ESC> message.  
 55 Hit <ESC> message displayed.  
 56 Virtual mode memory test about to start.  
 57 Preparation for virtual mode test started.  
 58 Going to verify from video memory.  
 59 Returned after verifying from display memory.  
 60 Going to prepare the descriptor tables.  
 61 Descriptor tables prepared.  
 62 Going to enter in virtual mode for memory test.  
 63 Entered in the virtual mode.  
 64 Going to enable interrupts for diagnostics mode.  
 65 Interrupts enabled (if diagnostics switch is on).  
 66 Going to initialize data to check memory wrap around at 0:0.  
 67 Data initialized. Going to check for memory wrap around at 0:0 and finding the total system memory size.  
 68 Memory wrap around test done. Memory size calculation over.  
 69 About to go for writing patterns to test memory.  
 70 Pattern to be tested written in extended memory.  
 71 Going to write patterns in base 640K memory.  
 72 Patterns written in base memory.  
 73 Going to find out amount of memory below 1M memory.  
 74 Amount of memory below 1M found and verified.  
 75 Going to find out amount of memory above 1M memory.  
 76 Amount of memory above 1M found and verified.  
 77 Going for BIOS ROM data area check.  
 78 BIOS ROM data area check over. Going to check <ESC> and to clear memory below 1M for soft reset.  
 79 Memory below 1M cleared. (SOFT RESET)  
 80 Going to clear memory above 1M.  
 81 Memory above 1M cleared. (SOFT RESET)  
 82 Going to save the memory size.

4E Memory test started. (NO SOFT RESET)  
 4F About to display the first 64K memory test. Memory size display started. This will be updated during memory test. Going for sequential and random memory test.  
 50 Memory test below 1M complete.  
 51 Going to adjust memory size for relocation/shadow.  
 52 Memory size adjusted due to relocation/shadow.  
 53 Memory test above 1M to follow.  
 54 Memory test above 1M complete.  
 55 Going to prepare to go back to real mode. CPU registers are saved including memory size.  
 56 Going to enter in real mode.  
 57 Shutdown successful, CPU in real mode. Going to restore registers saved during preparation for shutdown.  
 58 Registers restored.  
 59 Going to disable gate A20 address line.  
 60 A20 address line disable successful.  
 61 BIOS ROM data area about to be checked.  
 62 BIOS ROM data area check halfway.  
 63 BIOS ROM data area check to be complete.  
 64 BIOS ROM data area check over.  
 65 Going to clear Hit <ESC> message.  
 66 Hit <ESC> message cleared. <WAIT> message displayed.  
 67 About to start DMA and interrupt controller test.  
 68 DMA page register test passed.  
 69 About to verify from display memory.  
 70 Display memory verification over.  
 71 About to go for DMA #1 base register test.  
 72 DMA #1 base register test passed.  
 73 About to go for DMA #2 base register test.  
 74 DMA #2 base register test passed.  
 75 About to go for BIOS ROM data area check.  
 76 BIOS ROM data area check halfway.  
 77 BIOS ROM data area check to be complete.  
 78 BIOS ROM data area check over.  
 79 About to program DMA unit 1 and 2.  
 80 DMA unit 1 and 2 programming over.  
 81 About to initialize 8259 interrupt controller.  
 82 8259 initialization over.  
 83 About to start keyboard test.  
 84 Keyboard test started, clearing output buffer, check for stuck key. About to issue keyboard reset command.  
 85 Keyboard reset error/stuck key found. About to issue keyboard controller interface test command.  
 86 Keyboard controller interface test over.  
 87 About to write command byte and init circular buffer.  
 88 Command byte written, global data inti done.  
 89 About to check for lock-key.  
 90 Lock-key checking over.  
 91 About to check for memory size mismatch with cmos.  
 92 Memory size check done. About to display soft error and check for password or bypass setup.  
 93 Password checked.  
 94 About to do programming before setup.  
 95 Programming before setup complete.  
 96 Going to cmos setup programme.  
 97 Returned from cmos setup program and screen is cleared.  
 98 About to do programming after setup.  
 99 Programming after setup complete.  
 100 Going to display power on screen message.  
 101 First screen message displayed. About to display <WAIT...> message.  
 102 <WAIT...> message displayed.  
 103 About to do Main and Video BIOS shadow.  
 104 Main and Video BIOS shadow successful.

Setup options programming after cmos setup about to start.  
 8D Setup options are programmed, mouse check and init to be done next.  
 8E Mouse check and initialization complete.  
 8F Going for hard disk, floppy reset.  
 90 Floppy check returns that floppy is to be initialized. Floppy setup to follow.  
 91 Floppy setup is over.  
 92 Test for hard disk presence to be done.  
 93 Hard disk presence test over.  
 94 Hard disk setup to follow.  
 95 Hard disk setup complete.  
 96 About to go for BIOS ROM data area check.  
 97 BIOS ROM data area check halfway.  
 98 BIOS ROM data area check to be complete.  
 99 BIOS ROM data area check over.  
 100 Going to set base and extended memory size.  
 101 Memory size adjusted due to mouse support, hdisk type-47.  
 102 Going to verify from display memory.  
 103 Returned after verifying from display memory.  
 104 Going to do any init before C800 optional ROM control.  
 105 Any init before C800 optional ROM control is over.  
 106 Optional ROM check and control will be done next.  
 107 Optional ROM control is done. About to give control to do any required processing after optional ROM returns control.  
 108 Any initialization required after optional ROM test over.  
 109 Going to setup timer data area and printer base address.  
 110 Return after setting timer and printer base address.  
 111 Going to set the RS-232 base address.  
 112 Returned after RS-232 base address.  
 113 Going to do any initialization before coprocessor test.  
 114 Required initialization before co-processor test is over.  
 115 Going to initialize the coprocessor next.  
 116 Coprocessor initialized.  
 117 Going to do any initialization after coprocessor test.  
 118 Initialization after coprocessor test is complete.  
 119 Going to check extd keyboard, keyboard ID and num-lock.  
 120 Extd keyboard check is done, ID flag set, num-lock on/off.  
 121 Keyboard ID command to be issued.  
 122 Keyboard ID command issued.  
 123 Keyboard ID flag to be reset.  
 124 Keyboard ID flag reset.  
 125 Cache memory test to follow.  
 126 Cache memory test over.  
 127 Going to display any soft errors.  
 128 Soft error display complete.  
 129 Going to set the keyboard typematic rate.  
 130 Keyboard typematic rate set.  
 131 Going to program memory wait states.  
 132 Memory wait states programming over.  
 133 Screen to be cleared next.  
 134 Screen cleared.  
 135 Going to enable parity and NMI.  
 136 NMI and parity enabled. Going to do any initialization required before giving control to optional ROM at E000.  
 137 Initialization before E000 ROM control over.  
 138 E000 ROM to get control next.  
 139 Returned from E000 ROM control. Going to do any initialization required after E000 optional ROM control.  
 140 Initialization after E000 optional ROM control is over.  
 141 Going to display the system configuration.  
 142 System configuration is displayed.  
 143 Going to give control to INT 19h boot loader.

AMI BIOS 2.2 POST codes

01 flag test  
 03 register test  
 06 system hardware init  
 09 BIOS ROM checksum  
 0C page register test  
 0F 8254 timer test  
 12 memory refresh init  
 15 8237 DMA contrl test  
 18 8237 DMA init  
 1B 8259 INT ctrl init  
 1E 8259 INT ctrl test  
 21 memory refresh test  
 24 base 64K address test  
 27 base 64K memory test  
 2A 8742 keyboard self test  
 2D MC146818 CMOS test  
 30 start first protected mode test  
 33 memory sizing test  
 36 first protected mode test passed  
 39 first protected mode test failed  
 3C CPU speed calculation  
 3F read 8742 hardware switches  
 42 init INT vector area  
 45 verify CMOS configuration  
 48 test & init video system  
 4B unexpected INT test  
 4E start second protected mode test  
 51 verify LDT instruction  
 54 verify TR instruction  
 57 verify LSL instruction  
 5A verify LAR instruction  
 5D verify VERR instruction  
 60 address line 20 test  
 63 unexpected exception test  
 66 start third protected mode test  
 69 address line test  
 6C system memory test  
 6F shadow memory test  
 72 extenden memory test  
 75 verify memory configuration  
 78 display configuration error messages  
 7B copy system BIOS to shadow memory  
 7E 8254 clock test  
 81 MC146818 real time clock test  
 84 keyboard test  
 87 determine keyboard type  
 8A stuck key test  
 8D init hardware INT vectors  
 90 match coprocessor test  
 93 determine COM ports available  
 96 determine LPT ports available  
 99 initialize BIOS data area  
 9C fixed/floppy controller test  
 9F floppy disk test  
 A2 fixed disk test  
 A5 external ROM scan (C000:0)  
 A8 system key lock test  
 AE F1 error message test  
 AE system boot init  
 B1 INT 19 boot loader

AMI Plus POST codes

01 NMI disabled & 286 reg test  
 02 286 reg test ok  
 03 ROM checksum  
 04 8259 init  
 05 CMOS pending INT disabled  
 06 video disabled & timer counting ok  
 07 8253 ch2 ok  
 level  
 08 8253 ch2 delta count ok  
 09 8253 ch1 delta count ok  
 0A 8253 ch0 delta count ok  
 0B parity status cleared  
 0C refresh & system timer ok  
 0D refresh link toggling ok  
 0E refresh periode on/off 50% ok  
 10 refresh is on, begin low 64K RAM test  
 11 address line test ok  
 12 64K base memory test ok  
 13 INT vectors initialized  
 14 8042 keyboard controller test ok  
 15 CMOS read/write test  
 16 CMOS checksum/battery ok  
 17 monochrome mode set ok  
 18 color mode set ok  
 19 begin search for video ROM  
 1A optional video ROM control ok  
 1B DSPY mem R/W test ok  
 1C DSPY mem R/W test alt. display ok  
 1D video retrace check ok  
 1E global equipment Byte set for video ok  
 1F mode set call for Mono/Color ok  
 20 video test ok  
 21 video display ok  
 22 power on message display ok  
 30 virtual mode memory test to begin  
 31 virtual memory mode test started  
 32 processor in virtual memory mode  
 33 memory address line test in progress  
 34 memory address line test in progress  
 35 memory below 1MB calculated  
 36 memory size computation ok  
 37 memory test in progress  
 38 memory init <1MB done  
 39 memory init >1MB done  
 3A display memory size  
 3B about to start memory test <1MB  
 3C memory test <1MB ok  
 3D memory test >1MB ok  
 3E about to go to real mode (shutdown)  
 3F shutdown successful, in real mode again  
 40 about to disable gate A20 address line  
 41 gate A20 address line disabled ok  
 42 about to start DMA controller test  
 4E address line test ok  
 4F processor in real mode after shutdown  
 50 DMA page register test ok  
 51 DMAL base reg test about to start  
 52 DMAL chn1 ok  
 53 DMAL chn2 ok  
 54 about to test FF latch for DMAL  
 55 both DMA FF latch ok  
 56 DMAL & 2 programmed ok  
 57 8259 init over  
 58 8259 mask register check ok  
 59 master 8259 mask reg ok, start slave  
 5A next check timer and keybd INT level  
 5B timer INT ok  
 5C next test keyboard INT  
 5D ERROR! timer/KBD INT not proper  
 5E 8259 INT ctl error  
 5F 8259 INT ctl test ok  
 70 start of keyboard test  
 71 keyboard BAT test ok  
 72 keyboard test ok  
 73 keyboard global data init ok  
 74 floppy setup about to start  
 75 floppy setup ok  
 76 hard disk setup about to start  
 77 hard disk setup ok  
 79 about to init timer data area  
 7A verify CMOS battery power  
 7B CMOS battery verify done  
 7D analyze test result of memory  
 7E CMOS memory size update ok  
 7F nxt scan for option ROMs > C000:0  
 80 keyboard sensed to enable setup  
 81 optional ROM control ok  
 82 parallel port global data init ok  
 83 serial port global data init ok  
 84 80827 check/test ok  
 85 about to display soft error message  
 86 pass control to system ROM E000:0  
 87 system ROM E000:0 check over  
 00 control passed to INT 19 boot loader

New AMI Color BIOS after 2/1/91

01 Processor Register Test About to Start, and NMI to be Disabled  
 02 Power On Delay Starting  
 03 Any Initialization Before Keyboard BAT is in Progress  
 04 Reading Keyboard SYS Bit, to Check Soft Reset/Power On  
 05 Going to Enable ROM. i.e. Disable Shadow RAM/Cache if Any  
 06 Calculating ROM BIOS Checksum  
 07 Going to Issue the BAT Command to Keyboard Controller  
 08 Going to Verify the BAT Command  
 09 Keyboard Command Byte to be Written Next  
 0A Going to Write Command Byte Data  
 0B Going to Issue Pin-23,24 Blocking/Unblocking Command  
 0C NOP Command of Keyboard Controller to be Issued Next  
 0D CMOS Shutdown Register Test to be Done Next  
 0E Going to Calculate CMOS Checksum, and Update DIAG Byte  
 0F CMOS Initialization to begin (If "INIT CMOS IN EVERY BOOT IS SET")  
 10 CMOS Status Register About to Init for Date and Time  
 11 Going to Disable DMA and Interrupt Controllers  
 12 About to Disable Video Display and Init Port-B  
 13 Chipset Init/Auto Memory Detection about to begin  
 14 8254 Timer Test about to Start  
 15 8254 CH-2 Timer Test to be Completed  
 16 8254 CH-1 Timer Test to be Completed  
 17 8254 CH-0 Timer Test to be Completed  
 18 About to Start Memory Refresh  
 19 Memory Refresh Test to be Done Next  
 1A Going to Check 15 Micro Second On/Off Time  
 1B Base 64K Memory Test About to Start  
 20 Address Line Test to be Done Next  
 21 Going to do toggle Parity  
 22 Going for Sequential Data R/W TestAny Setup  
 23 Before Interrupt Vector Init  
 24 About to StartInterrupt Vector Initialization  
 25 About to beginGoing to Read I/O Port of 8042 for Turbo Switch (if any)  
 26 Going to Initialize Global Data for Turbo Switch  
 27 Any Initialization After Interrupt Vector to be Done Next  
 28 Going for Monochrome Mode Setting  
 29 Going for Color Mode Setting  
 2A About to go For toggle Parity Before Optional ROM Check  
 2B About to do any Setup Required Before Optional Video ROM Check  
 2C About to Look For Optional Video ROM and Give Control  
 2D About to do any Processing after Video ROM Returns Control  
 2E If EGA/VGA Not Found, Then do Display Memory R/W Test  
 2F Display Memory R/W Test About to begin  
 30 About to Look for the Retrace Checking  
 31 About to do Alternate Display Memory R/W Test  
 32 About to Look for the Alternate Display Retrace Checking  
 33 Verify Display Type with Switch Setting and Actual Card to begin  
 34 Display Mode to be Set Next  
 35 BIOS ROM Data Area About to be Checked  
 36 Going to Set Cursor for Power On Message  
 37 Going to Display the Power On Message  
 38 Going to Read New Cursor Position  
 39 Going to Display the Reference String  
 3A Going to Display the Hit <ESC> Message  
 3B Virtual Mode Memory Test About to Start  
 40 Going to Verify from Video Memory  
 41 Going to Prepare the Descriptor Tables  
 42 Going to Enter in Virtual Mode for Memory Test  
 43 Going to Enable Interrupts for Diagnostics Mode  
 44 Going to Initialize Data to Check Memory Remap at 0:0  
 45 Check for Memory Remap at 0:0 and Find the total System Memory Size

46 About to go For Writing Patterns to Test Memory  
 47 Going to Write Patterns in Base 640K Memory  
 48 Going to Find Out Amount of Memory Below 1M Memory  
 49 Going to Find Out Amount of Memory Above 1M Memory  
 4A Going for BIOS ROM Data Area Check  
 4B Going to Check <ESC> and to Clear Memory Below 1M for Soft Reset  
 4C Going to Clear Memory Above 1M  
 4D Going to Save the Memory Size  
 4E About to Display the First 64K Memory Test  
 4F Going for Sequential and Random Memory Test  
 50 Going to Adjust Memory Size for Relocation/ShadowMemory  
 51 Test Above 1M to Follow  
 52 Going to Prepare to go Back to Real Mode  
 53 Going to Enter in Real Mode  
 54 Going to Restore Registers Saved During Preparation for Shutdown  
 55 Going to Disable Gate A20 Address Line  
 56 BIOS ROM Data Area About to be Checked  
 57 BIOS ROM Data Area Check to be Completed  
 58 Going to Clear Hit <ESC> Message  
 59 About to Start DMA and Interrupt Controller Test  
 60 About to Verify from Display Memory  
 61 About to go For DMA #1 Base Register Test  
 62 About to go For DMA #2 Base Register Test  
 63 About to go For BIOS ROM Data Area Check  
 64 BIOS ROM Data Area Check to be Completed  
 65 About to Program DMA Unit 1 and 2  
 66 8259 Interrupt Controller Initialization  
 67 About to Start Keyboard Test  
 80 About to Issue Keyboard Reset Command  
 81 About to Issue Keyboard Controller Interface Test Command  
 82 About to Write Command Byte and Init Circular Buffer  
 83 About to Check for Lock Key  
 84 About to Check for Memory Size Mismatch with CMOS  
 85 About to Display Soft Error and Check for Password or Bypass Setup  
 86 About to do Programming Before SetupGoing to CMOS Setup Program  
 87 About to do Programming After Setup  
 88 About to Display Power On Screen Message  
 8A About to Display <WAIT...> Message, Mouse Check and Initialization Next  
 8B About to do Main and Video BIOS Shadow  
 8C Setup Options Programming After CMOS Setup About to Start  
 8D Going for Hard Disk, Floppy Reset  
 8E About to go For Floppy Check  
 8F Floppy Setup to Follow  
 8FTest for Hard Disk Presence to be Done  
 91 Hard Disk Setup to Follow  
 92 About to go for BIOS ROM Data Area Check  
 93 BIOS ROM Data Area Check to be Completed  
 94 Going to Set Base and Extended Memory Size  
 95 Going to Verify From Display Memory  
 96 Going to do Any Init Before C800 Optional ROM Control  
 97 Optional ROM Check and Control Will be Done Next  
 98 Give Control to Required Processing After Optional ROM Returns Control  
 99 Going to Setup Timer Data Area and Printer Base Address  
 9A Going to Set the RS-232 Base Address  
 9B Going to do Any Initialization Before Co-Processor Test  
 9C Going to Initialize the Coprocessor Next  
 9D Going to do Any Initialization After Co-Processor Test  
 9E Going to Check Extd Keyboard, Keyboard ID and Num-Lock  
 9F Keyboard ID Command to be Issued  
 A0 Keyboard ID Flag to be Reset  
 A1 Cache Memory Test to Follow  
 A2 Going to Display Any Soft Errors  
 A3 Going to Set the Keyboard Typematic Rate  
 A4 Going to Program Memory Wait States

A5 Screen to be Cleared Next  
 A6 Going to Enable Parity and NMI  
 A7 Do Initialization Required Before Giving Control to Optional ROM at E000  
 A8 E000 ROM to Get Control Next  
 A9 Going to do Any Initialization Required After E000 Optional ROM Control  
 AA Going to Display the System Configuration

Award Modular BIOS

01 Processor Test 1: Processor Status Verification  
 02 Determine POST Type  
 03 Clear 8042 Keyboard Controller  
 04 Reset 8042 Keyboard Controller  
 05 Get Manufacturing Status  
 06 Initialize Chips (DMA, 8259's)  
 07 CPU Test 2: Read/Write/Verify Regs. with FF and 00.  
 08 Initialize CMOS-Timer  
 09 EPROM Checksum  
 0A Initialize Video Controller Register 6845  
 0B Test Timer (8254) Channel 0  
 0C Test Timer (8254) Channel 1  
 0D Test Timer (8254) Channel 2  
 0E Test CMOS Shutdown Byte  
 0F Test Extended CMOS  
 10 Test DMA Channel 0  
 11 Test DMA Channel 1  
 12 Test DMA Page Registers  
 13 Test Keyboard Controller  
 14 Test Memory Refresh  
 15 Test 1st 64K of System Memory  
 16 Setup Interrupt Vector Table  
 17 Setup Video I/O Operations  
 18 Test Video Memory  
 19 Test 8259 Mask Bits - Channel 1  
 1A Test 8259 Mask Bits - Channel 2  
 1B Test CMOS Battery Level  
 1C Test CMOS Checksum  
 1D Set Configuration from  
 1E CMOSize System Memory  
 1F Test Found System Memory  
 20 Test Stuck 8259 Interrupt Bits  
 21 Test Stuck NMI Bits (Parity I/O Check)  
 22 Test 8259 Working  
 23 Test Protected Mode  
 24 Size Extended Memory  
 25 Test Found Extended Memory  
 26 Test Protected Mode Exceptions  
 27 Setup Cache Control or Shadow RAM  
 28 Setup 8242Reserved  
 29 Reserved  
 2A Initialize Keyboard  
 2B Initialize Floppy Drive and Controller  
 2C Detect and Initialize COM Ports  
 2D Detect and Initialize LPT Ports  
 2E Initialize Hard Drive and Controller  
 2F Detect and Initialize Math Coprocessors  
 30 Reserved  
 31 Detect and Initialize Option ROMs  
 3B Initialize Secondary Cache w/ OPTI Chip Set (486 only)  
 CA Micronics Cache Initialization  
 CC NMI Handler Shutdown  
 EE Unexpected Processor Exception  
 FF INT 19 Boot Attempt

Phoenix POST codes

01 CPU register tests in progress  
 02 CMOS write/read bad  
 03 ROM BIOS checksum bad  
 04 8254 timer bad  
 05 DMA init bad  
 06 DMA page register write/read bad  
 08 RAM refresh verification bad  
 09 low 64K RAM test  
 0A low 64KRAM chip or dataline bad, multi-bit?  
 0B low 64KRAM odd/even logic bad  
 0C address line bad low 64KRAM  
 0D parity bad low 64KRAM  
 10 bit 0 low 64K bad  
 11 bit 1 low 64K bad  
 12 bit 2 low 64K bad  
 13 bit 3 low 64K bad  
 14 bit 4 low 64K bad  
 15 bit 5 low 64K bad  
 16 bit 6 low 64K bad  
 17 bit 7 low 64K bad  
 18 bit 8 low 64K bad  
 19 bit 9 low 64K bad  
 1A bit 10 low 64K bad  
 1B bit 11 low 64K bad  
 1C bit 12 low 64K bad  
 1D bit 13 low 64K bad  
 1E bit 14 low 64K bad  
 1F bit 15 low 64K bad  
 20 slave DMA register bad  
 21 master DMA register bad  
 22 master INT mask register bad  
 23 slave INT mask register bad  
 25 INT vector loading in progress  
 27 keyboard ctrl bad  
 28 CMOS power bad, checksum calculation in progress  
 29 CMOS configuration validation in progress  
 2B screen init bad  
 2C screen retrace test bad  
 2D search for video ROM in progress (expansion ROM?)  
 2E screen running with video ROM  
 30 screen operable  
 30 screen running with video ROM  
 31 monoe monitor (40x25) operable  
 32 color monitor (40x25) operable  
 33 color monitor (80x25) operable  
 34 timer tick INT test in progress or bad  
 35 shutdown test in progress or bad  
 36 gate A20 bad  
 37 unexpected INT in protected mode  
 38 RAM test in progress or address bad >FFFFH  
 3A timer channel 2 test or bad  
 3B time-of day clock  
 3C serial prot test  
 3D parallel port  
 3E math-coprocessor test  
 41 system board select bad  
 42 extended CMOS RAM bad

Quadtel AT Compatible BIOS

02 Flag TestSystem  
 04 Register Test  
 06 System Hardware Initialization  
 08 Initialize Chip Set Registers  
 0A BIOS ROM Checksum  
 0C DMA Page Register Test  
 0E 8254 Timer Test  
 10 8254 Timer Initialization  
 12 8237 DMA Controller Test  
 14 8237 DMA InitializationInitialize  
 16 8259/Reset Coprocessor  
 18 8259 Interrupt Controller Test  
 1A Memory Refresh Test  
 1C Base 64KB Address Test  
 1E Base 64KB Memory Test  
 20 Base 64KB Test (Upper 16 bits)  
 22 8742 Keyboard Self Test  
 24 MC146818 CMOS Test  
 26 Start First Protected Mode Test  
 28 Memory Sizing Test  
 2A Autosize Memory Chips  
 2C Chip Interleave Enable Test  
 2E First Protected Mode Test Exit  
 30 Unexpected Shutdown  
 32 System Board Memory Size  
 34 Relocate Shadow Ram if Configured  
 36 Configure EMS System  
 38 Configure Wait States  
 3A ReTest 64K Base RAM  
 3C CPU Speed Calculation  
 3E Get Switches From 8042  
 40 Configure CPU Speed  
 42 Initialize Interrupt Vectors  
 44 Verify Video Configuration  
 46 Initialize Video System  
 48 Test Unexpected Interrupts  
 4A Start Second Protected Mode Test  
 4C Verify LDT Instruction  
 4E Verify TR Instruction  
 50 Verify LSL Instruction  
 52 Verify LAR Instruction  
 54 Verify VERR Instruction  
 56 Unexpected Exception  
 58 Address Line 20 Test  
 5A Keyboard Ready Test  
 5C Determine AT or XT Keyboard  
 5E Start Third Protected Mode Test  
 .3 short beepsIndicates any Failure in Early Power On Self Test

IBM PC Diagnostic Error Codes (to screen)

Code	Description (Diagnostic Error Codes)
1x	undetermined problem errors
2x	power supply errors
61	battery error (PS/2)
62	configuration changed but no adaptors changed or CRC error
63	memory size during POST does not match -CMOS- RAM
65	card Id's in CMOS do not match system
1xx	System Board Errors
101	system board failed
102	BIOS ROM checksum error (PC, XT), Timer (AT)
103	BASIC ROM checksum error (PC, XT), Timer interrupt (AT)
104	interrupt controller (PC, XT), Protected mode (AT)
105	timer (PC,XT), Last -8042- command not accepted (AT)
106	converting logic test failure
107	adapter card or math coprocessor (NMI)
108	timer bus test 109 DMA test error
110	system board memory error (PS/2)
111	adapter memory
112	system unit adapter failure
114	system unit and adapter card unit failure (PS/1)
121	unexpected hardware interrupt
131	cassette wrap test failed
151	real-time clock, CMOS RAM or battery
152	real-time clock
161	system options error, battery failure
162	CMOS RAM configuration error
163	CMOS time and date not set
164	system memory configuration is incorrect
165	adapter added/removed
199	user indicated configuration not correct
2xx	RAM Errors
201	memory test error
202	memory address error (Line error 0 - 15)
203	memory address error (Line error 16 - 23)
216	motherboard memory
3xx	Keyboard Errors
301	keyboard no response to SW reset or key stuck (# preceding 301 scancode)
302	user indicated keyboard error or AT system unit is locked
4xx	Monochrome Monitor Errors
432	parallel port test failed (monochrome adapter)
5xx	Color Monitor Errors
556	light pen test
6xx	Diskette Drive/Adapter Errors
601	diskette power on diagnostics test failed
602	diskette test failed (boot record not valid)
603	diskette size error
606	diskette verify function failed
607	write protected diskette
608	bad command diskette status returned
610	diskette initialization failed
611	time-out - diskette status returned
621	bad seek - diskette status returned
622	bad CRC - diskette status returned
628	diskette removed

7xx 8087 Math Coprocessor  
701 coprocessor test failure

9xx Parallel Printer Adapter Errors  
901 parallel prt adapter test fail

10xx Alt. Parallel Printer Adapter  
1001 alt. printer adapter test fail

11xx Async. Comm. Adapter Errors

12xx Alt. Async. Comm. Adapter

13xx Game Control Adapter Errors  
1301 game control adapter test failed  
1302 joystick test failed

14xx Printer test failed.

17xx Fixed Disk Errors  
1701 post error  
1702 adapter error  
1703 drive error (seek)  
1704 adapter or drive error  
1705 no record found  
1706 write fault error  
1707 track 0 error  
1708 head select error  
1709 defective error check

1710 read buffer overrun  
1711 bad address mark  
1712 undetermined error  
1713 data compare error  
1714 drive not ready  
1780 disk 0 failure  
1781 disk 1 failure  
1782 disk controller failure  
1790 fixed disk 0 error  
1791 fixed disk 1 error

18xx I/O Expansion Unit Errors

19xx 3270 PC Attachment Card Errors

20xx Bisync Comm. Adapter Errors

22xx Cluster Adapter Errors

24xx EGA Errors

2501 EGA Display Error

28xx 3278/79 Emulator Adapter (PC, XT)

29xx Color Matrix Printer Errors

30xx Local Area Network Adapter

36xx IEEE 488 Adapter

38xx Data Acquisition Adapter

45xx IEEE-488 adapter card

48xx Internal Modem

71xx Voice Communications Adapter

166xx Primary token-ring network PC adapter

- all error codes for the diagnostic and advanced diagnostic packages for the PC, XT and AT are represented with the device number followed by two digits other than 00. The device number plus 00 represents successful completion of the test.

- IBM Beep codes same as Phoenix's

BEEP CODES

AMI BIOS and AMI COLOR BIOS after 1/91

1 Beep DRAM refresh failure  
2 Beeps Parity error in first 64K RAM  
3 Beeps Basic 64 K RAM failure  
4 Beeps System timer #1 failure  
5 Beeps Processor failure  
6 Beeps Keyboard controller gate A20 error  
7 Beeps Virtual mode exception error  
8 Beeps Display memory read/write test failure non-fatal  
9 Beeps ROM BIOS checksum failure  
10 Beeps CMOS shutdown reg read/write error

Award Modular BIOS

1 long 2 short Video Error  
2 short any non-fatal error  
1 short no error during POST

COMPAQ BIOS no beep-codes

DTK/ERSO XT BIOS

1 short Begin of POST and End of POST  
1 long short long short long short Video initialization failure or invalid media switch setting  
1 long Keyboard failed or locked, Interrupt or other Systemboard error  
Continuous tone First 64K RAM error  
1 short repeated independently Parity error in First 64K RAM  
long short Floppy disk drive or controller failure

QUATEL AT compatible BIOS

3 short indicates any failure in early POST

Beeps	Failure
No display and no sound	Power problem
Click, but no beeps	Power good, can't run PC
Continuous beep	Power problem
Repeating short beeps	Power problem
1 long and 1 short high beep	Clock speed too fast
1 long and 2 short beeps	Display problem
1 short beep	Display problem
1 long and 3 short beeps	EGA problem

MR BIOS

Low High Low Low Low ROM BIOS checksum test  
Low High High Low Low Page register test (ports 81-8F)  
Low High Low High Low 8042 Keyboard controller selftest  
Low High High High Low Memory refresh circuit test  
Low High Low Low High Master 16bit DMA controller test  
Low High High Low High Slave 8bit DMA controller test  
Low High Low Low Low Memory Bank 0 pattern test  
Low High High Low Low Memory Bank 0 parity circuit drive test  
Low High Low High Low Memory Bank 0 parity error  
Low High High High Low Memory bank 0 data bus failure  
Low High Low High Low Memory bank 0 address bus failure  
Low High High Low High Memory bank 0 block access read failure  
Low High Low High High Low Memory bank 0 block access read/write failure  
Low High High High High Low Master 8259 (port 21) failure  
Low High Low Low Low High Slave 8259 (port A1) failure  
Low High High low low High Master 8259 (port20) interrupt address error  
Low High Low High High Slave 8259 (port A0) interrupt address error  
Low High High High Low Low 8259 (port20/A0) stuck interrupt failure  
Low High Low Low High High Master 8259 (port20) stuck interrupt failure  
Low High High Low High High Slave 8259 (portA0) stuck interrupt failure  
Low High Low High High High System timer 8254 CHO/IRQ0 interrupt failure  
Low High High High High High 8254 CHO Test and initialization  
Low High Low Low Low Low High 8254 Ch2 speaker failure  
Low High High Low Low Low High 8254 out2 speaker detect failure  
Low High Low High Low Low High CMOS RAM read/write test failure  
Low High High High Low Low High RTC periodic interrupt / IRQ8 failure  
Low High Low Low High Low High Video initialization and cold boot sign on message  
Low High High Low High Low High Keyboard controller failure  
Low High Low Low Low High High A20 test failure due to 8042 timeout  
Low High High Low Low High High A20 Gate stuck in disabled state  
Low High Low High High Low High Memory parity error  
Low High High High High Low High IO channel error  
Low High Low High Low High High Real Time CLock (RTC) is not updating

Mylex System Corp

1 long always 1 long beep to indicate start of beep coding  
2 long video card bad or no videp card  
1 long 1 short 1 long keyboard controller error  
1 long 2 short 1 long keyboard error  
1 long 3 short 1 long programmable INT controller 8259-1 error  
1 long 4 short 1 long programmable INT controller 8259-1 error  
1 long 5 short 1 long DMA p[age register error  
1 long 6 short 1 long RAM refresh error  
1 long 7 short 1 long RAM data test error  
1 long 8 short 1 long RAM parity error  
1 long 9 short 1 long DMA controller-1 error  
1 long 10 short 1 long CMOS RAM failure  
1 long 11 short 1 long DMA controller-2 error  
1 long 12 short 1 long CMOS-RAM battery failure  
1 long 13 short 1 long CMOS-checksum failure  
1 long 14 short 1 long BIOS ROM checksum failure  
more than 2 long beeps indicates multiple failures

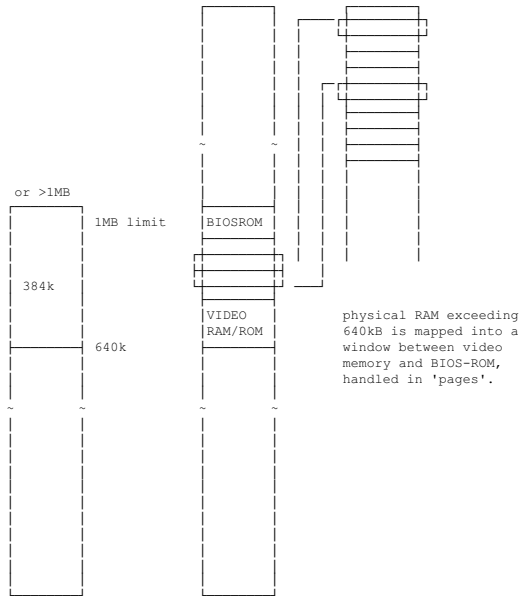
IBM or Phoenix BIOS

Low 1 - 1 - 1 System Board select failure  
Low 1 - 1 - 3 Extended CMOS-RAM failure  
1 - 1 - 3 CMOS Write/read failure  
1 - 1 - 4 RAM BIOS checksum failure  
1 - 2 - 1 programmable timer failure  
1 - 2 - 2 DMA initialization failure  
1 - 2 - 3 DMA page register write/read failure  
1 - 3 - 1 RAM refresh verification failure  
1 - 3 - 3 First 64K RAM chip or dataline failure, multibit  
1 - 3 - 4 First 64K RAM odd/even logic failure  
1 - 4 - 1 Address line failure first 64K RAM  
1 - 4 - 2 Parity failure first 64K RAM  
2 - 1 - 1 Bit 0 first 64K RAM failure  
2 - 1 - 2 Bit 1 first 64K RAM failure  
2 - 1 - 3 Bit 2 first 64K RAM failure  
2 - 1 - 4 Bit 3 first 64K RAM failure  
2 - 2 - 1 Bit 4 first 64K RAM failure  
2 - 2 - 2 Bit 5 first 64K RAM failure  
2 - 2 - 3 Bit 6 first 64K RAM failure  
2 - 2 - 4 Bit 7 first 64K RAM failure  
2 - 3 - 1 Bit 8 first 64K RAM failure  
2 - 3 - 2 Bit 9 first 64K RAM failure  
2 - 3 - 3 Bit 10 first 64K RAM failure  
2 - 3 - 4 Bit 11 first 64K RAM failure  
2 - 4 - 1 Bit 12 first 64K RAM failure  
2 - 4 - 2 Bit 13 first 64K RAM failure  
2 - 4 - 3 Bit 14 first 64K RAM failure  
2 - 4 - 4 Bit 15 first 64K RAM failure  
3 - 1 - 1 Slave DMA register failure  
3 - 1 - 2 Master DMA register failure  
3 - 1 - 3 Interrupt mask register failure  
3 - 1 - 4 Slave Interrupt mask register failure  
3 - 2 - 4 Keyboard controller test failure  
3 - 3 - 4 Screen initialization failure  
3 - 4 - 1 Screen retrace test failure  
3 - 4 - 2 Search for video ROM in progress  
4 - 2 - 1 Timer tick interrupt in progress or failure  
4 - 2 - 2 Shutdown test in progress or failure  
4 - 2 - 3 Gate A20 failure  
4 - 2 - 4 Unexpected Interrupt in protected mode  
4 - 3 - 1 RAM test in progress or address failure FFFF  
4 - 3 - 3 timer channe-2 test or failure  
4 - 3 - 4 time of day clock test or failure  
4 - 4 - 1 serial port test or failure  
4 - 4 - 2 parallel port test or failure  
4 - 4 - 3 Math Coprocessor failure

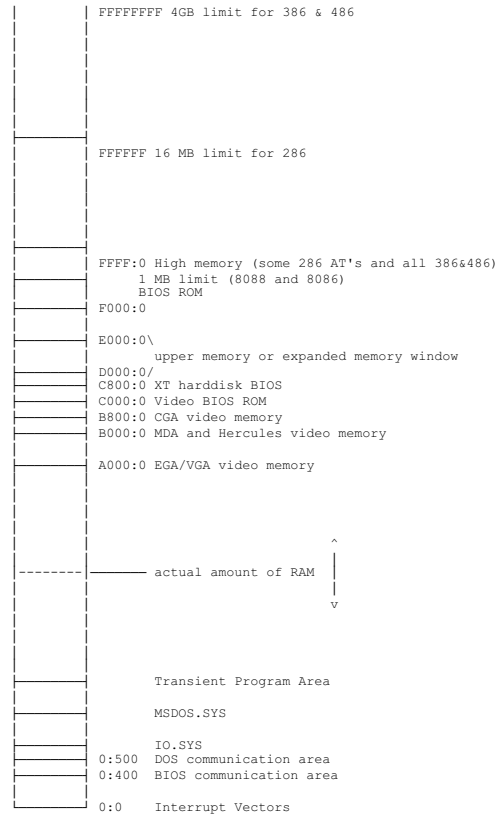
Phoenix 486 ROM BIOS PLUS V 0.10

2-2-3 BIOS ROM checksum failure  
3-1-1 DRAM failure  
3-1-3 8742 KBD-Ctrl failure  
3-4-1 512k Address line failure  
2-1-2-3 ROM copyright faked  
2-2-3-1 Unexpected Interrupts  
1long 2 short Video card problem  
1long n short expansion card problem

PC MEMORY - MAP SCHEMATIC  
Overview first MB (expanded memory LIM)



PC MEMORY - MAP SCHEMATIC  
I C Overview all



INTERUPT USAGE

00H	Divide by zero
01H	Single step
02H	NMI (Parity Err)
03H	Breakpoint
04H	Overflow
05H	ROM BIOS PrintScreen
06H	Reserved (Invalid OPcode)
07H	Reserved (NPU not pres.)
08H	IRQ0 timer tick (Double exception error)
09H	IRQ1 keyboard (NPU segment overrun)
0AH	IRQ2 reserved cascade 2, 8259
0BH	IRQ3 2nd com segment not present
0CH	IRQ4 1st com stack seg overflow
0DH	IRQ5 HD 2nd par. port
0EH	IRQ6 FDD page fault
0FH	IRQ7 1st p. port
10H	ROM-BIOS video NPU fault
11H	ROM-BIOS equipment check
12H	ROM-BIOS conv. memory size
13H	ROM-BIOS disk driver
14H	ROM-BIOS comm. driver
15H	ROM-BIOS IO system extension
16H	ROM-BIOS keyboard driver
17H	ROM-BIOS printer driver
18H	ROM-BIOS ROM BASIC
19H	ROM-BIOS bootstrap
1AH	ROM-BIOS time of day
1BH	ROM-BIOS Ctrl-break
1CH	ROM-BIOS timer-tick
1DH	ROM-BIOS video parameter table
1EH	ROM-BIOS floppy disk parameter
1FH	ROM-BIOS font (char 80-FF)
20H	MS-DOS terminate process
21H	MS-DOS function dispatcher
22H	MS-DOS terminate address
23H	MS-DOS Ctrl-C handler address
24H	MS-DOS critical error handler address
25H	MS-DOS absolute disk read
26H	MS-DOS absolute disk write
27H	MS-DOS terminate and stay resident
28H	MS-DOS idle interrupt
29H	MS-DOS reserved
2AH	MS-DOS network redirector
2BH-2EH	MS-DOS reserved
2FH	MS-DOS multiplex interrupt
30H-3FH	MS-DOS reserved
40H	ROM-BIOS floppy disk driver (only if HD)
41H	ROM-BIOS HD parameter (drive 0)
42H	ROM-BIOS video driver
43H	EGA, MCGA, VGA character table
44H	ROM-BIOS font PCjr
46H	ROM-BIOS HD parameter (disk 1)
4AH	ROM-BIOS alarm handler
5AH	Cluster adapter
5BH	used by cluster program
60H-66H	user interrupts
67H	LIM EMS driver
70H	IRQ8 CMOS realtime clock
71H	IRA9 software diverted to IRQ2
72H	IRQ10 reserved
73H	IRQ11 reserved

74H IRQ12 reserved, PS2 mouse  
75H IRQ13 NCP  
76H IRQ14 HD controller  
77H IRQ15 reserved  
80H-F0H BASIC  
F1H-FFFH not used

P C I N T E R R U P T V E C T O R T A B L E

Memory Location(s)	Int#	Description	
0000:0000 - 0003	0	Divide by zero	
0000:0004 - 0007	1	Single step	
0000:0008 - 000B	2	Non-Maskable Interrupt	
0000:000C - 000F	3	Break point instruction	
0000:0010 - 0013	4	Overflow	
0000:0014 - 0017	5	Print screen	
0000:0018 - 001B	6	Reserved	
0000:001C - 001F	7	Reserved	
0000:0020 - 0023	8	Timer (18.2Hz)	IRQ0
0000:0024 - 0027	9	Keyboard	IRQ1
0000:0028 - 002B	A	Reserved	IRQ2
0000:002C - 002F	B	Reserved for communications	IRQ3
0000:0030 - 0033	C	Reserved for communications	IRQ4
0000:0034 - 0037	D	Fixed Disk	IRQ5
0000:0038 - 003B	E	Diskette	IRQ6
0000:003C - 003F	F	Reserved for printer	IRQ7
0000:0040 - 0043	10	Video I/O	
0000:0044 - 0047	11	Equipment check (configuration)	
0000:0048 - 004B	12	Memory check (configuration)	
0000:004C - 004F	13	Diskette I/O (Fixed Disk XT)	
0000:0050 - 0053	14	RS232 I/O	
0000:0054 - 0057	15	Cassette I/O	
0000:0058 - 005B	16	Keyboard I/O	
0000:005C - 005F	17	Printer I/O	
0000:0060 - 0063	18	ROM BASIC	
0000:0064 - 0067	19	Bootstrap	
0000:0068 - 006B	1A	Time of day	
0000:006C - 006F	1B	Ctrl-Break control	
0000:0070 - 0073	1C	Timer control	
0000:0074 - 0077	1D	Video initialization	
0000:0078 - 007B	1E	Disk parameter table pointer	
0000:007C - 007F	1F	Graphics character table pointer	
0000:0080 - 0083	20	DOS program terminate	
0000:0084 - 0087	21	DOS function call	
0000:0088 - 008B	22	DOS terminate address	
0000:008C - 008F	23	DOS Ctrl-Break exit address	
0000:0090 - 0093	24	DOS fatal error address	
0000:0094 - 0097	25	DOS absolute disk read	
0000:0098 - 009B	26	DOS absolute disk write	
0000:009C - 009F	27	DOS terminate, stay resident	
0000:00A0 - 00FF	28-3F	Reserved for DOS	
0000:0100 - 0103	40	Diskette I/O XT	
0000:0104 - 0107	41	Fixed Disk parameters	
0000:0108 - 017F	42-5F	Reserved	
0000:01B0 - 019F	60-67	User defined interrupts	
0000:01A0 - 01FF	68-7F	Not used	
0000:0200 - 0217	80-85	Reserved for BASIC	
0000:0218 - 03C3	86-F0	BASIC interpreter	
0000:03C4 - 03FF	F1-FF	Not used	

P C M E M O R Y M A P (BIOS DATA AREA)

(0000:0400 - 0000:04FF or 0040:0000 - 0040:00FF) Interrupt Vectors

Communications

0000:0400 - 0401 Address of COM1:  
0000:0402 - 0403 Address of COM2:  
0000:0404 - 0405 Address of COM3:  
0000:0406 - 0407 Address of COM4:

Printer

0000:0408 - 0409 Address of LPT1:  
0000:040A - 040B Address of LPT2:  
0000:040C - 040D Address of 3.printer port  
0000:040E - 040F Address of 4.printer port

0000:0410 - 0411 Equipment flag  
0000:0412 - 0412 Manufacturing test indicator  
0000:0413 - 0414 Memory on planar  
0000:0415 - 0416 Memory in I/O channel for 64K PC  
Manufacturing test area for XT

Keyboard

0000:0417 - 0418 Keyboard flags  
0000:0419 - 0419 Alt key numeric input  
0000:041A - 041B Keyboard buffer head pointer  
0000:041C - 041D Keyboard buffer tail pointer  
0000:041E - 043D Keyboard buffer

Diskette

0000:043E - 043E Disk seek status  
0000:043F - 043F Disk motor status  
0000:0440 - 0440 Disk motor timeout  
0000:0441 - 0441 Disk status  
0000:0442 - 0448 Disk controller status bytes

Monitor

0000:0449 - 0449 CRT mode  
0000:044A - 044B CRT columns  
0000:044C - 044D CRT regen buffer length  
0000:044E - 044F Starting address in regen buffer  
0000:0450 - 0451 Cursor pos. for CRT page 1  
0000:0452 - 0453 Cursor pos. for CRT page 2  
0000:0454 - 0455 Cursor pos. for CRT page 3  
0000:0456 - 0457 Cursor pos. for CRT page 4  
0000:0458 - 0459 Cursor pos. for CRT page 5  
0000:045A - 045B Cursor pos. for CRT page 6  
0000:045C - 045D Cursor pos. for CRT page 7  
0000:045E - 045F Cursor pos. for CRT page 8  
0000:0460 - 0461 Cursor mode  
0000:0462 - 0462 Activ page number  
0000:0463 - 0464 Address of current display adapter  
0000:0465 - 0465 CRT mode  
0000:0466 - 0466 Palette setting

POST data

0000:0467 - 0468 Ptr to ROM initialization routine  
0000:0469 - 046A Ptr to ROM segment

0000:046B - 046B Interrupt flag

Timer

0000:046C - 046D Low word of timer count  
0000:046E - 046F High word of timer count

0000:0470 - 0470 Timer overflow

0000:0471 - 0471 Break indicator  
0000:0472 - 0473 Reboot (Ctl-Alt-Del) indicator  
0000:0474 - 0477 Fixed Disk data area  
0000:0478 - 0478 Printer 1 timeout  
0000:0479 - 0479 Printer 2 timeout  
0000:047A - 047A Printer 3 timeout  
0000:047B - 047B Printer 4 timeout  
0000:047C - 047C RS232 1 timeout  
0000:047D - 047D RS232 2 timeout  
0000:047E - 047E RS232 3 timeout  
0000:047F - 047F RS232 4 timeout  
0000:0480 - 0483 Additional keyboard buffer pointers

0000:0490 - 04CF Used by MODE.COM  
0000:04D0 - 04EF Reserved  
0000:04F0 - 04FF Intraapplication communication area

DOS and BASIC Data

0000:0500 - 500 Print screen status  
0000:0504 - 0504 Single Drive status (A or B)  
0000:0510 - 0511 BASIC's default data segment  
0000:0512 - 0513 IP for BASIC's timer int. vector  
0000:0514 - 0515 CS for BASIC's timer int. vector  
0000:0516 - 0517 IP for BASIC's Ctl-Break int.vector  
0000:0518 - 0519 CS for BASIC's Ctl-Break int.vector  
0000:051A - 051B IP for BASIC's Fatal error int. vect  
0000:051C - 051D CS for BASIC's Fatal error int. vect

BIOS and DOS Code

0000:0600 - start of IBMBIO.COM, IBMDOS.COM or IO.SYS, MSDOS.SYS.

Screen Buffers

A000:0000 - A000:FFFF Reserved for screen buffers  
B000:0000 - B000:0FFF Monochrome screen buffer  
B000:1000 - B000:FFFF Reserved for screen buffers  
B000:8000 - B000:BFFF Color/Graphics screen buffer  
B000:C000 - B000:FFFF Reserved for screen buffers

ROM Memory Expansion and Control

C000:0000 - C000:7FFF ROM memory expansion area  
C000:8000 - C000:FFFF XT HD-BIOS extension  
- C800:0005 entry to physical format  
C000:D000 - E000:FFFF ROM memory exp.-area (scanned)

System ROM

F000:0000 - F000:5FFF ROM memory exp.-area (scanned)  
F000:6000 - F000:DFFF ROM BASIC

ROM BIOS (full IBM compatibles only!)

F000:E000 - F000:E6F1 Power-On Start-Up Test (POST)  
F000:E6F2 - F000:E728 Bootstrap loader (INT 19H)  
F000:E729 - F000:E82D RS23 I/O (INT 14H)  
F000:E82E - F000:E881 Keyboard I/O (INT 16H)  
F000:E882 - F000:E986 Keyboard scan code tables  
F000:E987 - F000:EC58 Keyboard (INT 9H)  
F000:EC59 - F000:EFD1 Disk I/O (INT 13H)  
F000:EFD2 - F000:F044 Printer I/O (INT 17H)  
F000:F045 - F000:F840 Video I/O (INT 10H)  
F000:F841 - F000:F84C Memory check (INT 12H)  
F000:F84D - F000:F858 Equipment check (INT 11H)  
F000:F859 - F000:FA6D Cassette I/O not used in XT  
F000:FA6E - F000:FE6D Graphics character table  
F000:FE6E - F000:FEF2 Time of day (INT 1AH)  
F000:FEF3 - F000:FF52 Interrupt vector table  
F000:FF53 - F000:FF53 Dummy return point for unused int.  
F000:FF54 - F000:FFD9 Print screen (INT 5H)  
F000:FFF0 - F000:FFF4 First code executed after power-on  
F000:FFF5 - F000:FFF5 BIOS release date

P C I O - P O R T A D D R E S S E S

System board I/O map

000-00f 8237 DMA  
020-021 8259 INT  
040-043 8253 Timer  
060-063 8255 PPI XT -064 8742 Ctrl AT  
080-083 DMA page reg  
0AX NMI mask reg masked=80 unmasked=00  
0CX Reserved  
0EX Reserved  
1F0-1F8 Harddisk Controller  
200-20F Game Ctrl  
210-217 Expansion Unit  
220-24F Reserved  
278-27F Reserved  
2F0-2F7 Reserved  
2F8-2FF 2nd asynchronous communication port  
300-31F Prototype Card  
320-32F Fixed Disk  
378-37F Parallel Printer  
380-38F SDLC Communication  
3A0-3AF Reserved  
3B0-3BF Printer port on display card  
3C0-3CF EGA/VGA card  
3D0-3DF CGA Color Graphics Adapter  
3E0-3EF Reserved  
3F0-3F7 Floppy Disk Drive Controller  
3F8-3FF 1st asynchronous communication port

The parallel printer port:

basis address can be 03bc for printer port on video board  
0378 for 1st add in printer port (I/O card)  
0278 for 2nd add in printer port (I/O card)

03bc data register, output to it loads output latch  
0378 on input this address reads back data from output  
0278 latch. bit 0 sets pin2, bit 7 sets pin9 of connector.

03bd input reads realtime status  
0379 bit 7 6 5 4 3 2 1 0  
0279 Busy /Ackn P.End Select /Error - - -

03be output sets, input reads back the control outputs of the port  
037a bit 7 6 5 4 3 2 1 0  
027a - - - IRQen /Sel In Init. /Autfd. /Strobe

The Game-port

The serial port:

basis address can be 03f8 for add in serial port (I/O card)  
02f8 for add in serial port (I/O card)

- 03f8,02f8 Transmit and receive buffer with DLAB=0 (see 03fb)
- 03f9,02f9 Divisor latch LSB with DLAB=1 (Baudrate)
- 03fa,02fa Interrupt enable register with DLAB=0
- 03fb,02fb Divisor latch MSB with DLAB=1 (Baudrate)
- 03fc,02fc Line control register
- 03fd,02fd Modem control register
- 03fe,02fe Line status register
- 03ff,02ff Modem status register

Line control register:

Bit 7 6 5 4 3 2 1 0  
DLAB SetBreak StickPar EvenPar ParityEn Stopbits Wordlength

DLAB= Divisor Latch Access Bit

Wordlength bit1 0 Stopbits: 0 = 1, 1 = 2 stopbits  
5bits 0 0 Parity En: 1 parity bit is generated and checked  
6bits 0 1 0 no parity bit is generated  
7bits 1 0 Even Parity: a 1 selects even, a 0 odd parity  
8bits 1 1 1 Stick parity reverses logic of parity bit

Divisor Latch: Baudrate generator is programmed with this

Divisor Latch MSB is bit15 - bit 8  
Divisor Latch LSB is bit7 - bit 0 LSB and MSB form one word

Baudrate	LSB	MSB	Baudrate	LSB	MSB
50	09	00	1200	00	60
75	06	00	1800	00	40
110	04	17	2000	00	3a
134.5	03	59	2400	00	30
150	03	00	3600	00	20
300	01	80	4800	00	18
600	00	c0	7200	00	10
			9600	00	0c

Line status register:

bit7 6 5 4 3 2 1 0  
0 Tx-reg tx-buffer Break Framing Parity Overrun Data Ready  
empty empty Interr Error Error Error

Interrupt identification register:

bit7 6 5 4 3 2 1 0  
0 0 0 0 0 0 IntID1 IntID0 0 if Interrupt pending

IntID1 IntID0  
1 1 Error (Overrun, Parity, Framing or Break Interrupt)  
1 0 Receiver Data available  
0 1 Transmitter buffer empty  
0 0 Modem status (CTS, DSR, RI or received line signal detect)

Interrupt Enable register:

bit7 6 5 4 3 2 1 0  
0 0 0 0 0 En.Modem En.Recei En.Txbuf En. Data  
status ve line empty available  
Int. Int. Int. Interrupt

Modem control register

bit7 6 5 4 3 2 1 0  
0 0 0 Loop Out2 Out1 RTS DTR

RTS Request to Send  
DTR Data Terminal Ready

Modem status register

bit7 6 5 4 3 2 1 0  
RLSD RI DSR CTS DRLSD TERI DDSR DCTS

RLSD Receive Line Signal Detect  
RI Ring indicator  
DSR Data set ready  
CTS Clear to send  
DRLSD Delta Receive Line Signal Detect  
TERI Trailing Edge Ring Indicator  
DDSR Delta Data Set Ready  
DCTS Delta Clear to Send

Harddisk Controller 1F0-1F7 & 3F6-3F7

data	bit7	6	5	4	3	2	1	0		
error	BBK	UNC	MC	IDNF	MCR	ABRT	TKONF	AMNF	R	1F1
feature/RWC	control code or RWC								W	"
# of sect	# of sectors								RW	1F2
1. sector	1. sector								RW	1F3
track LSB	track# bit 7-0								RW	1F4
track MSB	track# bit 8-15								RW	1F5
DH reg	1	LBA	1	DRV	3	2	1	0	RW	1F6
status reg command	BSY	DRDY	DWF	DSC	DRQ	CORR	IDX	ERR	R	1F7
status 2 control	BSY	DRDY	DWF	DSC	DRQ	CORR	IDX	ERR	R	3F6
address	-	/WTG	3	2	1	0	1	0	R	3F7

BBK had block detected  
MC media change  
MCR media change requested  
TKONF track0 not found  
UNC uncorrectable data error  
IDNF ID not found  
ABRT aborted command  
AMNF address-amrk not found

error codes 01/81H ok, 02/82H sectorformat, 03/83 databuffer  
04/84H ECC logic, 05/85H microcontroller

RWC reduced write current

# of sectors to be read/written 1. sector: starting at sector

DH	drive/head	LBA	LBA mode
DRV	0=master 1=slave		
BSY	busy	DSDY	drive ready
DWF	drive write fault	DSC	drive seek complete
DRQ	data request	CORR	corrected data
IDX	index signal	ERR	error in command exec.

PC CHARACTER - SET

PC-8	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
32 20	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	2F 47	
48 30	0	1	2	3	4	5	6	7	8	9	:	<	>	?]		3F 63	
64 40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	4F 79
80 50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	5F 95	
96 60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	6F 111
112 70	p	q	r	s	t	u	v	w	x	y	z	{		}	~	7F 127	
128 80																8F 143	
144 90																9F 159	
160 A0																AF 175	
176 B0																BF 191	
192 C0																CF 207	
208 D0																DF 223	
224 E0																EF 239	
240 F0																FF 255	

LATIN-1

LATIN-1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
32 20	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	2F 47	
48 30	0	1	2	3	4	5	6	7	8	9	:	<	>	?]		3F 63	
64 40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	4F 79
80 50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	5F 95	
96 60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	6F 111
112 70	p	q	r	s	t	u	v	w	x	y	z	{		}	~	7F 127	
128 80																8F 143	
144 90																9F 159	
160 A0																AF 175	
176 B0																BF 191	
192 C0																CF 207	
208 D0																DF 223	
224 E0																EF 239	
240 F0																FF 255	

CONTROL CODES

- NUL null character, filler
- SOH start of header
- STX start of text
- ETX end of text
- EOT end of transmission
- ENQ enquiry
- ACK acknowledge
- BEL bell
- BS backspace
- HT horizontal tab
- LF line feed
- VT vertical tab
- FF form feed
- CR carriage return
- SO shift out
- SI shift in
- DEL delete
- DLE data line exchange
- DC1 device control 1, Xon
- DC2 device control 2
- DC3 device control 3, Xoff
- DC4 device control 4
- NAK negative acknowledge
- SYN synchronisation
- ETB end of transmission block
- CAN cancel
- EM end of message
- SUB substitute
- ESC escape
- FS frame separator
- GS group separator
- RS record separator
- US unit separator

Hardware Interrupt usage of the PC, XT and AT type Computers

IRQ#	function	INT 08	XT, AT	PS2
0	system timer	INT 08	XT, AT	PS2
1	keyboard interface	INT 09	XT, AT	PS2
2	- internal uses - do not use	INT 0A	XT, AT	PS2
3	COM2 2nd serial port	INT 0B	XT, AT	PS2
4	COM1 1st serial port	INT 0C	XT, AT	PS2
5	LPT2 2nd parallel port	INT 0D	XT, AT	PS2
6	diskette-controller	INT 0E	XT, AT	PS2
7	LPT1 1st parallel port	INT 0F	XT, AT	PS2
8	CMOS clock	INT	AT	PS2
9	- internal uses - do not use	INT	AT	PS2
10	free	INT	AT	PS2
11	free	INT	AT	PS2
12	free	INT	AT	PS2
13	numeric coprocessor x87	INT	AT	PS2
14	hard-disk	INT	AT	PS2
15	free	INT	AT	PS2

DMA channel usage in PC, XT and AT

DMA#	bit function
0 8	dyn RAM refresh or other use by motherboard
1 8	free
2 8	diskette-controller
3 8	free
4 16	internal use
5 16	free
6 16	free
7 16	free



PC - C A B L E S

DATA TRANSFER CABLES:

serial:  
 9 25 25 9 pin

```

TxD 3 2 2 3 TxD
RxD 2 3 3 2 RxD
RTS 7 4 4 8 RTS
CTS 8 5 5 7 CTS
DSR 6 6 6 4 DTR
GND 5 7 7 5 GND
DCD 1 8 8 1 DCD
DTR 4 22 22 6 DSR
RI 9 22 22 9 RI
    
```

paralell 4bit Laplink2,-3

LANTASTIC & DOS6

```

/Strobe 1 2 15
bit0 2 15
bit1 3 13
bit2 4 12
bit3 5 10
bit4 6 11
bit5 7
bit6 8
bit7 9
/Ack 10 5
Busy 11 6
PEnd 12 4
Select 13 3
/AutF 14
/Err 15 2
/Init 16
/SelIn 17
GND 18-25 18-25
    
```

parallel 8 bit bidirectional

```

/Strobe 1 1 /Ack
bit0 2 2 bit0
bit1 3 3 bit1
bit2 4 4 bit2
bit3 5 5 bit3
bit4 6 6 bit4
bit5 7 7 bit5
bit6 8 8 bit6
bit7 9 9 bit7
/Ack 10 1 /Strobe
Busy 11 14 /Autofeed
PEnd 12-25 25-12 PEnd
Select 13 17 /SelIn
/AutF 14 11 Busy
/Err 15 16 /Init
/Init 16 15 /Error
/SelIn 17 13 Select
GND 18-25 18-25 GND
    
```

LOOPBACK TEST CABLES:

serial ports  
 LANDMARK, QaPlus

```

25pin 9pin
2 3 Tx
3 2 Rx
4 7 RTS
5 8 CTS
6 1 DSR
7 5 GND
8 1 DCD
20 4 DTR
22 9 RI
    
```

LANDMARK 25pin: 2-3 4-5-(22) 6-8-20  
 9pin: 3-2 7-8-(9), 6-1-4  
 Checkit 25pin: 2-3 4-5 6-8-20-22  
 9pin: 3-2 7-8 1-4-6-9  
 Postprobe 25pin: 2-3 4-5 6-8-11-20-22  
 9pin: 3-2 7-8-1 6-4-9

parallel port loopback test

```

1 /STROBE
13 SELECT
2 DATA
15 /ERROR
10 /ACKNOWLEDGE
16 /INITIALIZE
11 BUSY
17 /SELECT IN
12 PAPER END
14 /AUTOFEED
    
```

parallel loopback  
 LANDMARK

```

4 - 15 7 - 12
5 - 17 8 - 10
6 - 13 9 - 11
    
```

VGA to EGA (9 to 15 pin)

```

red 1 - 1
green 2 - 2
blue 3 - 3
Hor. Sync 4 - 13
Ver. Sync 5 - 14
red GND 6 - 6
green GND 7 - 7
blue GND 8 - 8
GND 9 - 10 & 5
    
```

Power Motherboard:

```

1 power good or 1 GND blk
2 +5 rd 2 GND blk
3 +12 yw 3 -5 wht
4 -12 blue 4 +5 red
5 GND bk 5 +5 red
6 GND bk 6 +5 red
    
```

Power Disk Drive

```

1 +12 yw
2 GND bk
3 GND bk
4 +5 rd
    
```

POWER ATX board

```

11 +3.3V 1 +3.3V
12 -12V 2 +3.3V
13 GND 3 GND
14 PS ON 4 +5V
15 GND 5 GND
16 GND 6 +5V
17 GND 7 GND
18 -5V 8 Power good
19 +5V 9 +5v vsb
20 +5v 10 +12v
    
```

AT CMOS-RAM/clock battery

```

1 GND
2 unused
3 key
4 +5
    
```

AT LED & Keylock conn

```

1 LED +5
2 key
3 GND
4 KBD inhibit
5 GND
    
```

Keyboard cable

```

1 KBD clock
2 KBD data
3 /KBD reset
4 GND
5 +5
    
```

Floppy cable (Bus) 34pin

Pin	Signal	Pin	Signal	X
1	GND	2	N/C	
3	GND	4	N/C	
5	GND	6	N/C	
7	GND	8	Index	
9	GND	10	Motor Enable A	16
11	GND	12	Drive Select B	14
13	GND	14	Drive Select A	12
15	GND	16	Motor Enable B	10
17	GND	18	Stepper Direction	
19	GND	20	Step Pulse	
21	GND	22	Write Data	
23	GND	24	Write Enable	
25	GND	26	Track 0	
27	GND	28	Write Protect	
29	GND	30	Read Data	
31	GND	32	Select Head 1	
33	GND	34	(Spare)	

HARD DISK CABLES - ST-506 Hard Disk Drive Control/Data Cables

Pin	Signal	Pin	Signal
1	Head Select 8	2	GND
3	Head Select 4	4	GND
5	Write Gate	6	GND
7	Seek Complete	8	GND
9	Track 0	10	GND
11	Write Default	12	GND
13	Head Select 1	14	GND
15	Reserved	16	GND
17	Head Select 2	18	GND
19	Index	20	GND
21	Ready	22	GND
23	Step	24	GND
25	Drive Select 1	26	GND
27	Drive Select 2	28	GND
29	Drive Select 3	30	GND
31	Drive Select 4	32	GND
33	Direction In	34	GND

ST-506 Data Cable

Pin	Signal	Pin	Signal
1	Drive Selected	2	GND
3	Reserved	4	GND
5	Reserved	6	GND
7	Reserved	8	GND
9	Reserved	10	GND
11	GND	12	GND
13	MFM Write Data+	14	MFM Write Data-
15	GND	16	GND
17	MFM Read Data+	18	MFM Read Data-
19	GND	20	GND

EIDE or AT-Bus (40pin SQP)

Pin	Signal	Pin	Signal
1	/RESET	2	GND
3	DATA7	4	DATA8
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	GND
21	DRQ	22	GND
23	/IOWR	24	GND
25	/IORD	26	GND
27	/IOCHRDV	28	SPSYNC
29	/DACK	30	GND
31	IRQ14	32	/IOCS16
33	A1	34	/PDIAG
35	A0	36	A2
37	/CS0	38	/CS1
39	/DASP	40	GND

Most signals are identical with the ISA BUS signals. A2-A0 lowest 3 addresslines /CS0 active on IO @ 1F0-1F7 /CS1 active on IO @ 3F0-3F7 SPSYNC spindle sync, older cards have ALE instead /IOCS16 is 16 bit select DRQ is a DRQ#, DACK a DACK# /PDIAG selftest indicator from slave to master HD /DASP disk activity/slave normal = activity after RESET = slave pres.

SCSI (50pin SQP)

pin	Signal	Signal diff	pin	Signal	Signal diff
1	Ground	Shield Ground	26	TERMPWR	TERMPWR
2	-DB(0)	Ground	27	Ground	Ground
3	Ground	+DB(0)	28	Ground	Ground
4	-DB(1)	-DB(0)	29	Ground	+ATN
5	Ground	+DB(1)	30	Ground	-ATN
6	-DB(2)	-DB(1)	31	Ground	Ground
7	Ground	+DB(2)	32	-ATN	Ground
8	-DB(3)	-DB(2)	33	Ground	+BSY
9	Ground	+DB(3)	34	Ground	-BSY
10	-DB(4)	-DB(3)	35	Ground	+ACK
11	Ground	+DB(4)	36	-BSY	-ACK
12	-DB(5)	-DB(4)	37	Ground	+RST
13	Ground	+DB(5)	38	-ACK	-RST
14	-DB(6)	-DB(5)	39	Ground	+MSG
15	Ground	+DB(6)	40	-RST	-MSG
16	-DB(7)	-DB(6)	41	Ground	+SEL
17	Ground	+DB(7)	42	-MSG	-SEL
18	-DB(P)	-DB(7)	43	Ground	+C/D
19	Ground	+DB(P)	44	-SEL	-C/D
20	Ground	-DB(P)	45	Ground	+REQ
21	Ground	DIFFSENS	46	-C/D	-REQ
22	Ground	Ground	47	Ground	+I/O
23	Ground	Ground	48	-REQ	-I/O
24	Ground	Ground	49	Ground	Ground
25	N.C.	TERMPWR	50	-I/O	Ground

P C - B U S ( I S A - B U S )

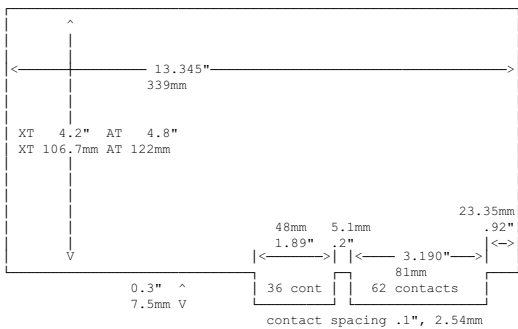
SOLDER SIDE	COMPONENT SIDE
B1 GND	IO CHCHK (NMI) - A1
B2 +Reset DRV	D7+ A2
B3 +5V	D6+ A3
B4 +IRQ2	D5+ A4
B5 -5V	D4+ A5
B6 +DRQ2	D3+ A6
B7 -12V	D2+ A7
B8 -CARD SLCTD	D1+ A8
B9 +12V	D0+ A9
B10 GND	IO CHRDRY+ A10
B11 -MEMW	AEN+ A11
B12 -MEMR	Ad19+ A12
B13 -IOW	Ad18+ A13
B14 -IOR	Ad17+ A14
B15 -DACK3	Ad16+ A15
B16 +DRQ3	Ad15+ A16
B17 -DACK1	Ad14+ A17
B18 +DRQ1	Ad13+ A18
B19 -DACK0 (MREF)	Ad12+ A19
B20 CLK	Ad11+ A20
B21 +IRQ7	Ad10+ A21
B22 +IRQ6	Ad9+ A22
B23 +IRQ5	Ad8+ A23
B24 +IRQ4	Ad7+ A24
B25 +IRQ3	Ad6+ A25
B26 -DACK2	Ad5+ A26
B27 +TC	Ad4+ A27
B28 +ALE	Ad3+ A28
B29 +5V	Ad2+ A29
B30 +OSC 70ns,14.31818MHz	Ad1+ A30
B31 GND	Ad0+ A31
D1 -MEM CS16	16bit H enabled SBHE C1
D2 -I/O CS16	Ad23 C2
D3 IRQ10	Ad22 C3
D4 IRQ11	Ad21 C4
D5 IRQ12	Ad20 C2
D6 IRQ15	Ad19 C6
D7 IRQ14	Ad18 C7
D8 -DACK0	Ad17 C8
D9 DRQ0	MEMR- C9
D10 -DACK5	MEMW- C10
D11 DRQ5	D8 C11
D12 -DACK6	D9 C12
D13 DRQ6	D10 C13
D14 -DACK7	D11 C24
D15 DRQ7	D12 C15
D16 +5V	D13 C16
D17 -Master	D14 C17
D18 GND	D15 C18

PCI BUS pinout

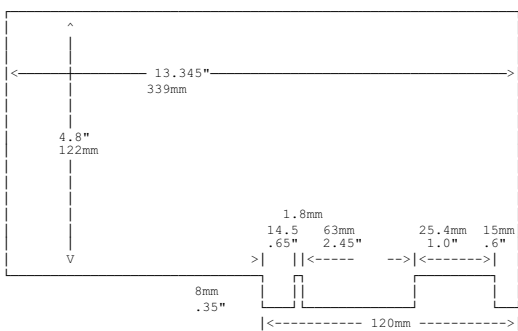
A01 TRST#	B01 -12V	A49 AD[09]	B49 GND
A02 +12V	B02 TCK	A50 GND 5V Key	B50 GND 5V Key
A03 TMS	B03 GND	A51 GND 5V Key	B51 GND 5V Key
A04 TDI	B04 TDO	A52 C/BE[0]#	B52 AD[08]
A05 +5V	B05 +5V	A53 +3,3V	B53 AD[07]
A06 INTA#	B06 +5V	A54 AD[06]	B54 +3,3V
A07 INTC#	B07 INTB#	A55 AD[04]	B55 AD[05]
A08 +5V	B08 INTD#	A56 GND	B56 AD[03]
A09 Reserved	B09 PRSNT1#	A57 AD[02]	B57 AD[01]
A10 +5V (I/O)	B10 Reserved	A58 AD[00]	B58 AD[01]
A11 Reserved	B11 PRSNT2#	A59 +5V (I/O)	B59 +5V (I/O)
A12 GND/3,3V Key	B12 GND/3,3V Key	A60 REQ364#	B60 ACK64#
A13 GND/3,3V Key	B13 GND/3,3V Key	A61 +5V (I/O)	B61 +5V (I/O)
A14 Reserved	B14 Reserved	A62 +5V (I/O)	B62 +5V (I/O)
A15 RST#	B15 GND	64 Bit Space	64 Bit Space
A16 +5V	B16 CLK	64 Bit Space	64 Bit Space
A17 GNT#	B17 GND	A63 GND	B63 Reservedf
A18 GND	B18 REQ#	A64 C/BE[7]#	B64 GND
A19 Reserved	B19 +5V	A65 C/BE[5]#	B65 C/BE[6]#
A20 AD[30]	B20 AD[31]	A66 +5V (I/O)	B66 C/BE[4]#
A21 +3,3V	B21 AD[29]	A67 PAR64	B67 GND
A22 AD[28]	B22 GND	A68 AD[62]	B68 AD[63]
A23 AD[26]	B23 AD[27]	A69 GND	B69 AD[61]
A24 GND	B24 AD[25]	A70 AD[60]	B70 +5V (I/O)
A25 AD[24]	B25 +3,3V	A71 AD[58]	B71 AD[59]
A26 IDSEL	B26 C/BE[3]#	A72 GND	B72 AD[57]
A27 +3,3V	B27 AD[23]	A73 AD[56]	B73 GND
A28 AD[22]	B28 GND	A74 AD[54]	B74 AD[55]
A29 AD[20]	B29 AD[21]	A75 +5V (I/O)	B75 AD[53]
A30 GND	B30 AD[19]	A76 AD[52]	B76 GND
A31 AD[18]	B31 +3,3V	A77 AD[50]	B77 AD[51]
A32 AD[16]	B32 AD[17]	A78 GND	B78 AD[49]
A33 +3,3V	B33 C/BE[2]#	A79 AD[48]	B79 GND
A34 FRAME#	B34 GND	A80 AD[48]	B80 AD[47]
A35 GND	B35 IRDY#	A81 GND	B81 AD[45]
A36 TRDY#	B36 +3,3V	A82 AD[44]	B82 GND
A37 GND	B37 DEVSEL#	A83 AD[42]	B83 AD[43]
A38 STOP#	B38 GND	A84 +5V (I/O)	B84 AD[41]
A39 +3,3V	B39 LOCK#	A85 AD[40]	B85 GND
A40 SDONE	B40 PERR#	A86 AD[38]	B86 AD[39]
A41 SBO#	B41 +3,3V	A87 GND	B87 AD[37]
A42 GND	B42 SERR#	A88 AD[36]	B88 +5V (I/O)
A43 PAR	B43 +3,3V	A89 AD[34]	B89 AD[35]
A44 AD[15]	B44 C/BE[1]#	A90 GND	B90 AD[33]
A45 +3,3V	B45 AD[14]	A91 AD[32]	B91 GND
A46 AD[13]	B46 GND	A92 Reserved	B92 Reserved
A47 AD[11]	B47 AD[12]	A93 GND	B93 Reserved
A48 GND	B48 AD[10]	A94 Reserved	B94 GND

CARD DIMENSIONS

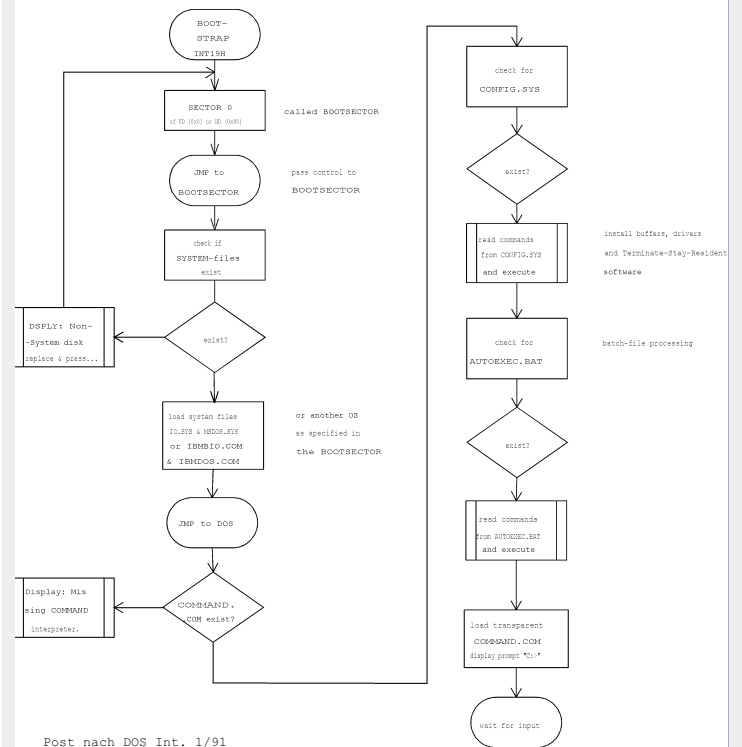
XT / AT (ISA) card dimensions



PCI card dimensions



P C P O W E R O N S E L F T E S T ( P O S T )



Post nach DOS Int. 1/91

- |                        |                          |
|------------------------|--------------------------|
| 1 NMI off              | 7 Init Video-card        |
| 2 POST checksum        | 8 Init 8259              |
| 3 CMOS-RAM test        | 9 display BIOS message   |
| 4 Init Chip(s) Chipset | 10 NMI on                |
| 5 Init POST-variables  | 11 scan & init expansion |
| 6 Init POST Interrupts | 12 boot                  |

