**DIAGNOSTIC ROM IMAGES**

The files and explanation here are useful if the motherboard is not working correctly with the Anonymous BIOS included with the kit. You will need a way to burn the ROM images and a POST card (monitoring port 80h) to use these diagnostics. Visit:

http://www.minuszerodegrees.net

for a great explanation of burning ROMs and using adapters.

We begin with an explanation received from the creator of these diagnostic ROMS describing what they do, with some special references to building the PC-RETRO Kit Computer…

*Many years ago, I developed my own set of crude diagnostic ROMs for the IBM 5150/5160, ones that output codes to a POST card (at port 80h). Nothing fancy. Extremely crude. I just took the IBM ROM U33 and overwrote certain code with instructions to spit a code to port 80h.  
  
I ended up with a series of eight ROMs. If I encountered what appeared to be a dead motherboard, I ran the first ROM. If that passed, I ran the second. If that passed, I ran the third, and so on…  
  
The first ROM is used to see if the motherboard is basically working. All the Test1 ROM does is send 33 to the POST card. Here are situations that this could be an additional diagnostic aid to your kit builders:  
  
Situation #1:  
1. Kit builder has what appears to be a dead motherboard.  
2. Kit builder runs Supersoft/Landmark ROM (See PC-RETRO DISK) and sees nothing.  
3. Kit builder runs my TEST ROM #1 and sees 33 on POST card [i.e. indicating that some parts of the board are working as expected ]and continues with subsequent Test ROMS.  
  
Situation #2:  
1. Kit builder has what appears to be a dead motherboard.  
2. Kit builder does not have a MONO or CGA card or monitor required by the Supersoft/Landmark ROM.*

*3. Kit builder can burn these Test ROMS to make diagnostic tests.*

Here is an excerpt from a thread at the Vintage Computer Forum which describes using these diagnostic ROM images. As mentioned, these can be used if the Supersoft / Landmark ROM is not working or can’t be run. Begin excerpt:

*If you have no success with the Supersoft/Landmark POST ROMs, here is something much simpler to try.*

*We begin with some background on what the original IBM boot sequence does first….*

*From the POST portion of the source listing of the third revision 5150 BIOS (10/27/82, IBM part number 1501476):  
  
8088 PROCESSOR TEST - on fail, halt CPU  
ROS CHECKSUM TEST I - on fail, halt CPU (testing checksum of U33 ROM)  
8237 DMA INITIALISATION - on fail, halt CPU (also sets up chan. 1 of timer for RAM refresh)  
BASE 16K RAM TEST - on fail, halt CPU  
8259 INITIALISATION -  
8259 TEST - on fail, beep 1 long then 1 short  
8253 TIMER CHECKOUT - on fail, beep 1 long then 1 short  
INIT/START VIDEO CONTROLLER - on fail, beep 1 long then 2 short  
EXPANSION I/O BOX TEST - on fail, display 1801 error - may also display "PARITY CHECK 1" if RAM error encountered  
ADDITIONAL RAM TEST - on fail, display a 201 error followed by failing address followed by bit error pattern  
KEYBOARD TEST - on fail, display a 301 error  
CASSETTE PORT WRAP TEST - on fail, display a 131 error  
EXPANSION ROM SEARCH - look for BIOS Extension ROMs in range C8000 to F4000 - call any that are found  
ROM BASIC CHECK - on fail, display address of failed 8K ROM  
DISKETTE ATTACHMENT TEST - on fail, display a 601 error.  
ENABLE NON MASKABLE INTERRUPTS  
BEEP 1 SHORT TONE  
DO BOOTSTRAP  
  
And the speaker emits a 'pop' sound  
(It is normal for a 'click' to be heard from the speaker straight after power on.)*

*To use these diagnostic ROMs for the 5150 only, burn the binary ROM (Note: For a discussion of EPROMS and adapter options visit http://www.minuszerodegrees.net) The only thing the code does is output "33" to port 80h. Obviously you'll be expecting "33" to appear on a POST card that is monitoring port 80h (Which is the standard AT diagnostic port).*

*TEST#1 = display 33  
TEST#2 = TEST#1 plus ROM checksum - on pass, display 02  
TEST#2A = TEST#2 plus timer test 1 of 2 - on pass, display 2A  
TEST#2B = TEST#2A plus timer test 2 of 2 - on pass, display 2B  
TEST#3 = TEST#2B plus 8237 DMA - on pass, display 03*

*TEST#4 = See detailed description below… on pass, display 99  
  
(Note: Files are available on this PC-RETRO Disk or can be downloaded at…)*

*TEST#1 at http://www.minuszerodegrees.net/rom/BIOS\_5150\_U33\_TEST1\_000\_8K.zip  
TEST#2 at http://www.minuszerodegrees.net/rom/BIOS\_5150\_U33\_TEST2\_00D3\_8K.zip  
TEST#2A at http://www.minuszerodegrees.net /rom/BIOS\_5150\_U33\_TEST2A\_0104\_8K.zip  
TEST#2B at http://www.minuszerodegrees.net /rom/BIOS\_5150\_U33\_TEST2B\_012B\_8K.zip  
TEST#3 at http://www.minuszerodegrees.net/rom/BIOS\_5150\_U33\_TEST3\_014B\_8K.zip*

*TEST#4 at http://www.minuszerodegrees.net /rom/BIOS\_5150\_U33\_TEST4\_014B\_8K.zip  
  
If all up to TEST#3 pass, the failure of TEST#4 to display 99 is a good indicator you have a RAM issue. There would be a chance though that the 01 you see in TEST#4 doesn't indicate bit 0 failure, but is simply the result of a general RAM read problem. The likely cause would be a RAM chip failure (based on experience).*

*Here is an explanation of the diagnostic output from TEST#4:*

*===========================  
TEST #4 - 16K RAM TEST  
===========================  
  
Step 1. Performs CPU test - halt on fail  
Step 2. Verifies that 8 bit checksum of ROM is 00 - halt on fail  
Step 3. Timer 1 - verify that it functions okay  
Step 4. Timer 1 - set it up to refresh memory  
Step 5. 8237 DMA initialisation and test - halt on fail  
Step 6. Test first 16K of RAM  
  
If 16K block of RAM is good, "99" is displayed on POST card, else:  
00 indicates the parity chip  
01 indicates the bit 0 chip  
02 indicates the bit 1 chip  
04 indicates the bit 2 chip  
08 indicates the bit 3 chip  
10 indicates the bit 4 chip  
20 indicates the bit 5 chip  
40 indicates the bit 6 chip  
80 indicates the bit 7 chip  
  
Something else is a multi-bit failure. E.g. 50 indicates bits 4 and 6  
  
5150 motherboard RAM bank layout: P \_ 0 1 2 3 4 5 6 7  
  
Note: On a good 64-256k board, you may see "AA" then "75" temporarily before you see either 00/01/02/04/08/10/20/40/80/99*

REFERENCE NOTE: The complete thread with this discussion can be found here:

http://www.vintage-computer.com/vcforum/archive/index.php/t-22209.html