◊◊

Sad Mac Error Codes

◊

TITLE

Macintosh: "Sad Mac" Error Code Meaning

◊

Article ID: 7748
Created: 7/2/91
Modified: 9/9/97

TOPIC

When I turn on my Macintosh, I get a black screen with a "sad Macintosh" face and the numbers
020016. There is no listing for this error code in any of my manuals. What does it mean?

DISCUSSION

The particular error code that appears with the "sad Macintosh" is not as important as WHEN it occurs. If the Macintosh can start up from a different system diskette, then the problem is probably with the system software on the other disk. System problems are usually identified when you get a "happy Macintosh" face and the "Welcome to Macintosh" screen before the "sad Macintosh."

If the "sad Macintosh" face appears immediately at power up, that usually suggests an issue with the logic board or memory. Try starting up from a floppy disk before assuming it's a hardware problem.

Sad Mac Error Codes Description

On the Original ROMs (Macintosh 128k, 512k, 512ke, Plus):

When you press the interrupt button on the side of your Macintosh when starting up, you should get a sad Mac icon with '0F000D' and some bits cycling under the icon indicating it is performing a memory test.

This numeric code is in two parts:

- The first two characters are the class code. The class code tells what part of the diagnostic program found the error.
- The second four are the sub code. The sub class code tells what the error was. In the case of a bad RAM chip, the sub class identifies the bad chip (this was very helpful to homegrown upgraders).

Class Code	ub Code
1 = ROM test failed	eaningless
2 = Memory test - bus subtest	dentifies bad chips
3 = Memory test - byte write	dentifies bad chips
4 = Memory test - Mod3 test	dentifies bad chips
5 = Memory test - address uniqueness	dentifies bad chips

Single Chip Identification

Data Bit	ocation	ub Code Bits
	5	001
	6	002
	7	004
	8	008
	9	010
	10	020
	11	040
	12	080
	5	100
	6	200
10	7	400

11	8	800
12	9	000
13	10	000
14	11	000
15	12	000

Class Code	ub Code
F = Exception	001 Bus error
	002 Address error
	003 Illegal instruction
	004 Zero divide
	005 Check instruction
	006 Traps instruction
	007 Privilege violation
	008 Trace
	009 Line 1010
	00A Line 1111
	00B Other exception
	00C Nothing
	00D NMI (normal indication)
	064 Couldnt Read System File into Memory

Macintosh SE & acintosh II ROMs:

The Sad Mac error codes have been changed to incorporate additional power for testing and to support the 32-bit world. Generally, the same codes are used for 68000 exceptions as the Macintosh, however they are displayed differently.

Traditional

The traditional Macintosh error codes are displayed like this:

0F0003

Where F indicates an exception occurred, and 3 indicates an illegal instruction occurred. On the Macintosh SE and II, the display would appear:

0000000F
00000003

Note: 000003 is a hex number.

Power On
The new power-on error codes have the following format:

XXXXYYYY
ZZZZZZZZ

Where XXXX is internal test manager state information (ignore this), YYYY contains codes that indicate either an exception code, or the test number for a power on test failure. The ZZZZZZZZ code contains additional failure information to help track down the problem.

YYYY Error Codes:

$0001 he ROM checksum test failed. Ignore the Z field.

$0002 he first small chunk of RAM to be tested failed. The Z field ndicates which RAM Bit(s) failed. This small chunk of RAM is lways in Bank B.

xample: AABBCCDD

A=8 bit mask for bits 31-24

B=8 bit mask for bits 23-16

C=8 bit mask for bits 15-8

D=8 bit mask for bits 7-0

$0003 he RAM test failed while testing bank B, after passing the chunk

ested for code $0002. The Z field indicates which bits failed as

n code $0002.

$0004 he RAM test failed while testing bank A. The Z field indicates

hich its failed as in code $0002.

$0005 he RAM External addressing test failed. The Z field indicates a

ailed address line.

$0006 nable to properly address the VIA1 chip. The Z field is not

pplicable.

$0007 nable to properly address the VIA2 chip (Macintosh II only).

The Z field is not applicable.

$0008 nable to properly access the Front Desk Bus. The Z field is not

pplicable.

$0009 nable to properly access the MMU. The Z field is not applicable.

$000A nable to properly access NuBus. The Z field is not applicable.

$000B nable to properly access the SCSI Chip. The Z field is not

pplicable.

$000C nable to properly access the IWM chip. The Z field is not

pplicable.

$000D nable to properly access the SCC Chip. The Z field is not

pplicable.

$000E ailed Data Bus test. The Z field indicated the bad bit(s) as a

2-bit mask for bits 0-31. This may indicate either a bad SIMM or

ata bus failure.

$000F eserved for Macintosh compatibility.

$FFxx 680xx exception occurred during power on testing.

he xx indicates the exception:

01 us Error

02 ddress Error

03 llegal Instruction Error

04 ero Divide

05 heck Instruction

06 pTrapCC, Trap CC, Trap V

07 rivilege violation

08 race

09 ine A

0A ine F

0B nassigned

0C P protocol violation

0D ormat exception

0E purious interrupt

0F rap 015 exception

10 nterrupt Level 1

11 nterrupt Level 2

12 nterrupt Level 3

13 nterrupt Level 4

14 nterrupt Level 5

15 nterrupt Level 6

16 nterrupt Level 7

17 PCP bra or set on unordered condition

18 PCP inexact result

19 PCP divide by zero

1A PCP underflow

1B PCP operand error

1C PCP overflow

1D PCP signalling NAN

1E MMU configuration

1F MMU illegal operation

20 MMU access level violation

Macintosh Portable ROMs:
The bootup code in the Macintosh Portable contains a series of startup tests that are run to ensure that the fundamental operations of the machine are working properly. If any of those tests fail, a Sad Mac icon appears on the screen with a code below that describes what failure occurred. Here is a typical example of a Sad Mac display with an error code below it:

SAD MAC CODE

05460203 D7.L)

000OB6DB D6.L)

The two codes are actually the contents of the two CPU data registers D6 and D7. The upper word (upper 4 hex digits, in this case 0546) of D7 contains miscellaneous flags that are used by the start-up test routines and are unimportant to just about everybody except a few test engineers within Apple. The lower word of D7 is the major error code. The major error code identifies the general area the test routines

were
in when a failure occurred. D6 is the minor error and usually contains additional information about the failure, something like a failed bit mask.

SAD MAC CODE BROKEN DOWN

Test Flags	ajor Error
546	203

Minor Error	inor Error
0000	6DB

The major error is further broken into the upper byte that contains the number of any 68000 exception that occurred ($00 meaning that no exception occurred), and the lower byte that usually contains the test that was being run at the time of failure. If an unexpected exception occurred during aparticular test, then the exception number is logically ORed into the major error code. This way both the exception
that occurred as well as the test that was running can be decoded from the major error code:

SAD MAC CODE FURTHER BROKEN DOWN

68000 Exception	est Code
02	3

In this example, the code says that an address error exception ($0200) occurred during the RAM test for Bank A ($03); $0200 ORed with $03 = $0203.

Major Error Codes
Below is a brief description of the various test codes that might appear in the major error code:

Warning: Some of these codes may mean slightly different things in Macintosh models other than the Macintosh Portable. These descriptions describe specifically how they are used in the Macintosh Portable.

$01 ROM test failed. Minor error code is $FFFF, means nothing.

$02 RAM test failed. Minor error code indicates which RAM bits

failed.

$05 RAM external addressing test failed. Minor error code indicates a failed address line.

$06 Unable to properly access the VIA 1 chip during VIA nitialization. Minor error code not applicable.

$08 Data bus test at location eight bytes off of top of memory failed. inor error code indicates the bad bits as a 16bit mask for bits 1500. his may indicate either a bad RAM chip or data bus failure.

$0B nable to properly access the SCSI chip. Minor error code not pplicable.

$0C nable to properly access the IWM (or SWIM) chip. Minor error code ot applicable.

$0D ot applicable to Macintosh Portable. Unable to properly access the SCC chip.

inor error code not applicable.

$0E ata bus test at location $0 failed. Minor error code indicates he bad bits as a 16bit mask for bits 1500. This may indicate ither a bad RAM chip or data bus failure.

$10 ideo RAM test failed. Minor error code indicates which RAM bits ailed.

$11 ideo RAM addressing test failed. Minor error code contains the ollowing: pper word ailed address (16-bit)

sb of lower word ata written

sb of lower word ata read

ata value written also indicates which address line is being

ctively tested.

$12 eleted

$13 eleted

$14 ower Manager processor was unable to turn on all the power to the oard. This may have been due to a communication problem with the Power Manager. If so, the minor error code contains a Power Manager error code, explained in the next section.

$15 ower Manager failed its self-test. Minor error code contains the ollowing:

msw error status of transmission to power manager.

sw Power Manager self-test results (0 means it assed, non-zero means it failed)

$16 failure occurred while trying to size and configure the RAM. inor error code not applicable.

Minor error codesPower Manager Processor Failures

If a communication problem occurs during communication with the Power Manager, the following error codes will appear somewhere in the minor error code (usually in the lower half of the code, but not always):

$CD38 ower Manager was never ready to start handshake.

$CD37 imed out waiting for reply to initial handshake.

$CD36 uring a send, Power Manager did not start a handshake.

$CD35 uring a send, Power Manager did not finish a handshake.

$CD34 uring a receive, Power Manager did not start a handshake.

$CD33 uring a receive, Power Manager did not finish a handshake.

Diagnostic Code Summary

Below is a summarized version of the Sad Mac error codes:

Test Codes

01	OM checksum test.
02	AM test.
05	AM addressing test.
06	IA 1 chip access.
08	ata bus test at top of memory.
0B	CSI chip access.
0C	WM (or SWIM) chip access.
0D	ot applicable to Macintosh Portable. SCC chip access.
0E	ata bus test at location $0.
10	ideo RAM test.
11	ideo RAM addressing test.
14	ower Manager board power on.
15	ower Manager self-test.
16	AM sizing.

Power Manager Communication Error Codes

CD38	nitial handshake.
CD37	o reply to initial handshake.
CD36	uring send, no start of a handshake.
CD35	uring a send, no finish of a handshake.
CD34	uring a receive, no start of a handshake.
CD33	uring a receive, no finish of a handshake.

CPU Exception Codes (as used by the startup tests)

0100	us error exception code

0200 ddress error exception code

0300 llegal error exception code

0400 ero divide error exception code

0500 heck inst error exception code

0600 pTrapcc,Trapcc,TrapV exception code

0700 rivilege violation exception code

0800 race exception code

0900 ine A exception code

0A00 ine F exception code

0B00 nassigned exception code

0C00 P protocol violation

0D00 ormat exception

0E00 purious interrupt exception code

0F00 rap inst exception code

1000 nterrupt level 1

1100 nterrupt level 2

1200 nterrupt level 3

1300 nterrupt level 4

1400 nterrupt level 5

1500 nterrupt level 6

1600 nterrupt level 7