

# The Sad Mac

What is the Sad Mac?

Usually when one turns on their Macintosh, it smiles at them (Happy Mac). But once in a long while it kind of snarls at you. First, let's explain what happens the moment you flick the switch, or hit the power key inside your Macintosh.

Once your Macintosh is brought up to full power the Mac runs what's called in the computer world a Power On Self Test (POST). Several memory and system diagnostic tests take place. If any one of these tests fails, the Sad Macintosh icon appears. The Macintosh SE will have two 8-digit hexadecimal numbers displayed under the icon, remarkably similar to the icon pictured above.

How do I make a Sad Mac happy again?

Most hardware failures that display a Sad Macintosh error will do so before the floppy drive or hard drive start spinning. If a Sad Macintosh appears after the disk starts spinning, the first digits of the error code are usually 'OF' and often indicate corrupted software. If you get this error code, try restarting the Macintosh with the Option and Command keys held down to rebuild the desktop file. You also may be able to fix these problems by reinstalling system software.

If all else fails it means there is a problem with the hardware and you should take your Mac to an Apple Qualified technician. Attempting repairs yourself will void Apple's warranty, of course, you don't have to tell them you tried to fix it yourself...

If you've never seen a Sad Mac before and you have this urge, try hitting the interrupt button (plastic things on the side of compact macs, little buttons on the front of newer Macs, or some weird keyboard combination on others) while the Mac is checking the RAM (this is when the screen is grey and void of all else at start up). Of course, I'm not recommending it to anybody because I'm sure there is some way it might affect something adversely.

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## Sad Mac Error Codes On the original ROMs (128k, 512k, 512ke, Plus):

When you press the interrupt button on the side of your Macintosh when booting, you should get a sad Mac icon with 'OF000D' 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 and the second four are the sub code. The class code tells what part of the diagnostic program found the error and 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).

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Class Code

Sub Code

1 = ROM test failed

Meaningless

2 = Memory test - bus subtest

identifies bad chips  
3 = Memory test - byte write

identifies bad chips  
4 = Memory test - Mod3 test

identifies bad chips  
5 = Memory test - address uniqueness

identifies bad chips

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Single Chip Identification

Data Bit	Location	Sub Code Bits
0		

F5

0001  
1

F6

0002  
2

F7

0004  
3

F8

0008  
4

F9

0010  
5

F10

0020  
6

F11



0040  
7

F12

0080  
8

G5

0100  
9

G6

0200  
10

G7

0400

11

G8

0800  
12

G9

1000  
13

G10

2000  
14

G11

4000  
15

G12

8000

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Class Code

Sub Code

F = Exception

0001 Bus error

0002 Address error

0003 Illegal instruction

0004 Zero divide



0005 Check instruction

0006 Traps instruction

0007 Privilege violation

0008 Trace

0009 Line 1010

000A Line 1111

000B Other exception

000C Nothing

000D NMI (normal indication)

0064 Couldn't Read System File into Memory

#### Macintosh SE & Macintosh 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.

The traditional Macintosh error codes are displayed like this:

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

lease note that 00000003 is a hex number.

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

here 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

The ROM checksum test failed. Ignore the Z field.

\$0002

The first small chunk of RAM to be tested failed. The Z

field indicates which RAM Bit(s) failed. This small

chunk of RAM is always in Bank B.

Example:  
\$AABBCCDD

AA=8 bit mask for bits 31-24

BB=8 bit mask for bits 23-16

CC=8 bit mask for bits 15-8

DD=8 bit mask for bits 7-0

\$0003

The RAM test failed while testing bank B, after passing

the chunk tested  
for code \$0002. The Z field indicates

which bits failed as in code \$0002.

\$0004

The RAM test failed while testing bank A. The Z field

indicates which bits  
failed as in code \$0002.

\$0005

The RAM External addressing test failed. The Z field



indicates a failed  
address line.

\$0006

Unable to properly address the VIA1 chip. The Z field

is not applicable.

\$0007

Unable to properly address the VIA2 chip (Macintosh II

only). The Z field is not  
applicable.

\$0008

Unable to properly access the Front Desk Bus. The Z

field is not  
applicable.

\$0009

Unable to properly access the MMU. The Z field is not

applicable.

\$000A

Unable to properly access NuBus. The Z field is not

applicable.

\$000B

Unable to properly access the SCSI Chip. The Z field is

not applicable.

\$000C

Unable to properly access the IWM chip. The Z field is

not applicable.

\$000D

Unable to properly access the SCC Chip. The Z field is

not applicable.

\$000E

Failed Data Bus test. The Z field indicated the bad

bit(s) as a 32-bit mask  
for bits 0-31. This may

indicate either a bad SIMM or data bus failure.

\$000F

Reserved for Macintosh compatibility.

\$FFxx

A 680xx exception occurred during power on testing. The

xx indicates the  
exception:

\$01 — Bus Error

\$02 — Address Error

\$03 — Illegal Instruction Error

\$04 — Zero Divide

\$05 — Check Instruction

\$06 — cpTrapCC, Trap CC, Trap V

\$07 — Privilege violation

\$08 — Trace

\$09 — Line A

\$0A — Line F

\$0B — unassigned

\$0C — CP protocol violation

\$0D — Format exception



\$0E — Spurious interrupt

\$0F — Trap 0–15 exception

\$10 — Interrupt Level 1

\$11 — Interrupt Level 2

\$12 — Interrupt Level 3

\$13 — Interrupt Level 4

\$14 — Interrupt Level 5

\$15 — Interrupt Level 6

\$16 — Interrupt Level 7

\$17 — FPCP bra or set on unordered condition

\$18 — FPCP inexact result

\$19 — FPCP divide by zero

\$1A — FPCP underflow

\$1B — FPCP operand error

\$1C — FPCP overflow

\$1D — FPCP signalling NAN

\$1E — PMMU configuration

\$1F — PMMU illegal operation

\$20 — PMMU 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:

he 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.

he 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 a particular 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:

n 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:

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#### 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

initialization. Minor error code not applicable.  
\$08 -  
Data bus test at location eight bytes off of top of memory

failed. Minor error code indicates the bad bits as a

16-bit mask for bits 15–00. This may indicate either a bad

RAM chip or data bus failure.  
\$0B -  
Unable to properly access the SCSI chip. Minor error code

not applicable.  
\$0C -  
Unable to properly access the IWM (or SWIM) chip. Minor

error code not applicable.

\$0D -

Not applicable to Macintosh Portable. Unable to properly

access the SCC chip. Minor error code not applicable.

\$0E -

Data bus test at location \$0 failed. Minor error code

indicates the bad bits as a 16-bit mask for bits 15-00.

This may indicate either a bad RAM chip or data bus

failure.

\$10 -

Video RAM test failed. Minor error code indicates which RAM

bits failed.

\$11 -

Video RAM addressing test failed. Minor error code contains



the following:

upper word

=

failed address (16-bit)

msb of lower word

=

data written

lsb of lower word

=

data read

Data value written also indicates which address line is

being actively tested.

\$12 -

Deleted

\$13 -

Deleted

\$14 -

Power Manager processor was unable to turn on all the power

to the board. 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 -

Power Manager failed its self-test. Minor error code

contains the following:

msw =  
error status of transmission to power manager.

lsw =  
Power Manager self-test results (0 means it

passed, non-zero means it failed)  
\$16 -  
A failure occurred while trying to size and configure the

RAM. Minor error code not applicable.

## Minor error codes—Power 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

Power Manager was never ready to start handshake.

\$CD37

Timed out waiting for reply to initial handshake.

\$CD36

During a send, Power Manager did not start a handshake.

\$CD35

During a send, Power Manager did not finish a handshake.

\$CD34

During a receive, Power Manager did not start a handshake.

\$CD33

During 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

ROM checksum test.

\$02

RAM test.

\$05

RAM addressing test.

\$06

VIA 1 chip access.

\$08

Data bus test at top of memory.

\$0B

SCSI chip access.

\$0C

IWM (or SWIM) chip access.

\$0D

Not applicable to Macintosh Portable. SCC chip access.

\$0E

Data bus test at location \$0.

\$10

Video RAM test.

\$11

Video RAM addressing test.

\$14

Power Manager board power on.

\$15

Power Manager self-test.

\$16

RAM sizing.

### Power Manager communication error codes

\$CD38

Initial handshake.

\$CD37

No reply to initial handshake.

\$CD36

During send, no start of a handshake.

\$CD35

During a send, no finish of a handshake.

\$CD34

During a receive, no start of a handshake.

\$CD33

During a receive, no finish of a handshake.

## CPU exception codes (as used by the startup tests)

\$0100

Bus error exception code

\$0200

Address error exception code

\$0300

Illegal error exception code

\$0400

Zero divide error exception code

\$0500

Check inst error exception code

\$0600

cpTrapcc, Trapcc, TrapV exception code

\$0700

Privilege violation exception code

\$0800

Trace exception code

\$0900

Line A exception code

\$0A00

Line F exception code

\$0B00

Unassigned exception code

\$0C00

CP protocol violation

\$0D00

Format exception

\$0E00

Spurious interrupt exception code

\$0F00

Trap inst exception code

\$1000

Interrupt level 1

\$1100

Interrupt level 2

\$1200

Interrupt level 3

\$1300

Interrupt level 4

\$1400

Interrupt level 5

\$1500

Interrupt level 6

\$1600

Interrupt level 7

