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Sad Mac Error Codes
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 TITLE
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Macintosh: "Sad Mac" Error Code Meaning

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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?

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 DISCUSSION
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        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.
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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:

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0F0003

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

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0000000F
00000003

Note: 000003 is a hex number.

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

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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

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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
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