A500
A2000

Diagnostic Kit
User's Manual

C= Commodore

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Table of contents

COMMODORE AMIGA 500 / 2000 DIAGNOSTIC (PAL)

First read this manual completly.

This package includes everything to perform an AMIGA diagnostic test, exept the C64 PSU and A501 needed to test an AMIGA 500. This test checks all RAM, every port, the four sound channels and video of the AMIGA 500 and AMIGA 2000, but it does not check the expansion-slots of the AMIGA 2000.

Note: This test is for service only!

Make sure that you have got all of these parts:

CONTENTS:

1 AMIGA DIAGNOSTIC BOX

1 AMIGA DIAGNOSTIC MODULE

9 AMIGA DIAGNOSTIC CABLES

1 AMIGA DIAGNOSTIC DISK

1 AMIGA DIAGNOSTIC USER GUIDE

1 DISK "PC TERMINAL EMULATION"

Warning: Before connecting or disconnecting anything to / from an AMIGA please make sure that the AMIGA system is s w i t c h e d   o f f.

How to use the AMIGA DIAGNOSTIC KIT

You can run this test either from diskette or from ROM, depending on what you prefere: If you do not want to open the AMIGA 2000, use the AMIGA DIAGNOSTIC DISK (A.D. DISK), but then a part of the CHIP-RAM can not be tested.
The ROM-based test resides completly in the AMIGA DIAGNOSTIC MODULE (A.D. MODULE), so the test will start even if the machine is faulty. Additionally this test checks all CHIP- and FAST-RAM.

To run the ROM-based test:
- A500 only: insert A501
- connect the AMIGA DIAGNOSTIC (A. D.)BOX with the AMIGA
- optional: connect a terminal to the A. D. BOX
- insert the A. D. MODULE
- connect power to both A. D. BOX and AMIGA
- set the switch on the left side of the A. D. BOX to A2000 or A500
- turn power on

To run the disk-based test:
- A500 only: insert A501
- connect the AMIGA DIAGNOSTIC (A. D.)BOX with the AMIGA
- optional: connect a terminal to the A. D. BOX
- connect power to both A. D. BOX and AMIGA
- set the switch on the left side of the A. D. BOX to A2000 or A500
- turn power on
- insert the A. D. DISK at Workbench-prompt

For detailed information see chapters below.

To run the test, you have to connect the AMIGA DIAGNOSTIC BOX (A.D. BOX) to a power supply. You may use a C64 PSU (testing an A500) or you can connect it to the FDD-PSU-Connector of an A2000 power supply (see chapters below).

The A.D. BOX does not supply the AMIGA-PCB with power nor does the AMIGA-PCB supply the A.D. BOX.

Press the RESET BUTTON on the A.D. BOX, if the test does not start correctly.
The test finishes with an alternate display of two test screens on the monitor and running numbers displayed on the LEDs at the A.D. BOX.

When an error occurs, a two digit hex number is displayed on the LED display on the A.D. BOX. This error code indicates which test failed. You find a complete list of all error codes in the AMIGA DIAGNOSTIC ERROR TABLE.

Connecting the AMIGA DIAGNOSTIC BOX

You have to install seven cables between the A.D. BOX and the A500 / A2000. You can distinguish these cables by the connectors of the cables:

1. One cable for the internal Disk Drive:
This cabel has a 35 pin SUB-MINI-D (SMD) male and a 35 pin card edge connector. Plug the 35 pin SMD into the connector labeled "Disk Drive intern" and connect the other end to the internal drive connector .

2/3. Two identical cables for Serial and Parallel Port
These cables have both a 25 pin SMD male and 25 pin SMD female connector.
Plug the first 25 pin SMD male into the A.D. BOX-connector labeled "Serial Port", the other end into the serial port of the AMIGA (short cable).
Plug the second 25 pin SMD female into the A.D. BOX-connector labeled "Parallel Port", the other end into the parallel port of the AMIGA (long cable).

4. One cable for the external Disk Drive:
This cable has a 23 pin SMD female and a 25 pin SMD male connector.
Plug the 25 pin SMD (male) into the A.D. BOX-connector labeled "Disk Drive extern", the other into the external disk drive connector of the AMIGA.

5. One cable for the Keyboard:
A2000: use the cable with 9pin SMD female and 5pin DIN connector.
A500: use the cable with 9pin SMD female and 5pin flat connector.
Plug the 9 pin SMD (male) into the A.D. BOX-connector labeled "Keyboard", the other side into the A500 / A2000 keyboard connector.

6/7. Two cables for both Mouse/Joystick-Ports
These cables have 9 pin SMD female connectors on both sides.
Plug one of the SMDs into the A.D. BOX-connector labeled "Mouse / Joystick 1", the other end into the port where normally the mouse is connected.
Connect the other mouse/joystick port with the other cable to the A.D. BOX-connector labeled "Mouse / Joystick 2".

A2000: Inserting the A. D. MODULE

If you want to run the ROM based diagnostic, you have to insert the AMIGA DIAGNOSTIC MODULE (A.D. MODULE).

Be sure to turn off all power, and open the Amiga 2000.
Insert the A. D. MODULE into the MMU connector next to the CPU in the same way you insert any other AMIGA expansion cards (labeled side facing the PSU-subchassis, see picture below).
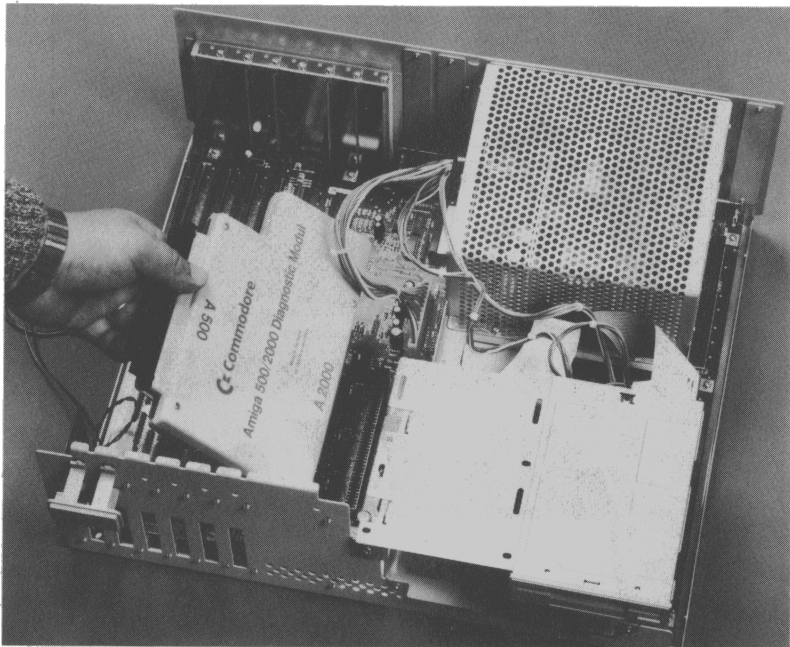
Picture 1: How to insert the AMIGA DIAGNOSTIC MODULE into an A2000

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A2000: Connecting Power

To run the test, you have to connect the A.D.BOX with a power supply: connect the
A. D. BOX to the FDD-PSU-connector of the A2000 PSU.
NOTE: the A2000 PSU needs at least 30% of its nominal load to work correctly, so
connect the mainboard to the same PSU.
Make sure that the power supply is switched off when you connect it to the A.D.BOX.
Both, AMIGA and power supply, have to be connected to your local net as well. The
A.D.BOX. does not supply the AMIGA with power nor does the AMIGA supply
the A.D.BOX.
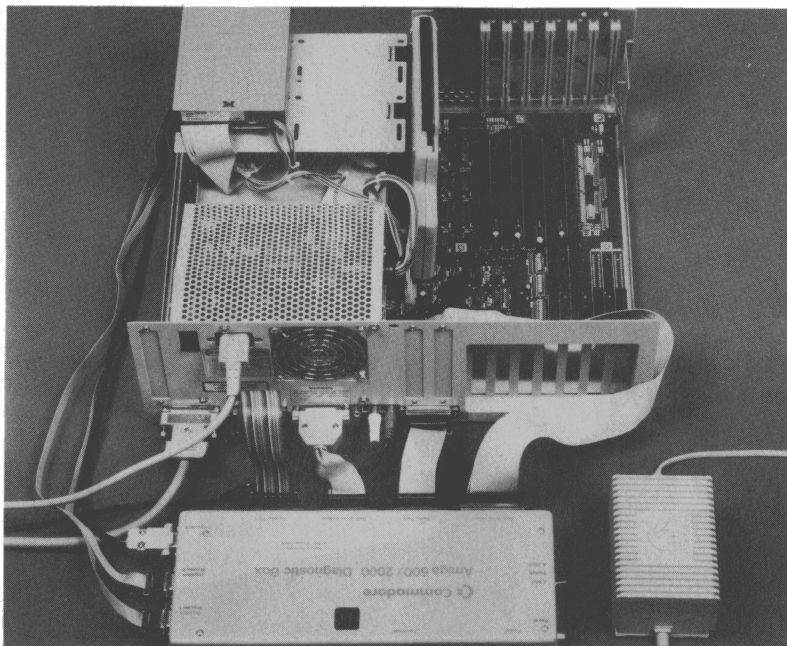
Picture 2: A2000 with AMIGA DIAGNOSTIC KIT connected

A500: Inserting the A.D.Module

Remove the expansion port panel and insert the AMIGA DIAGNOSTIC MODULE
(see picture below).
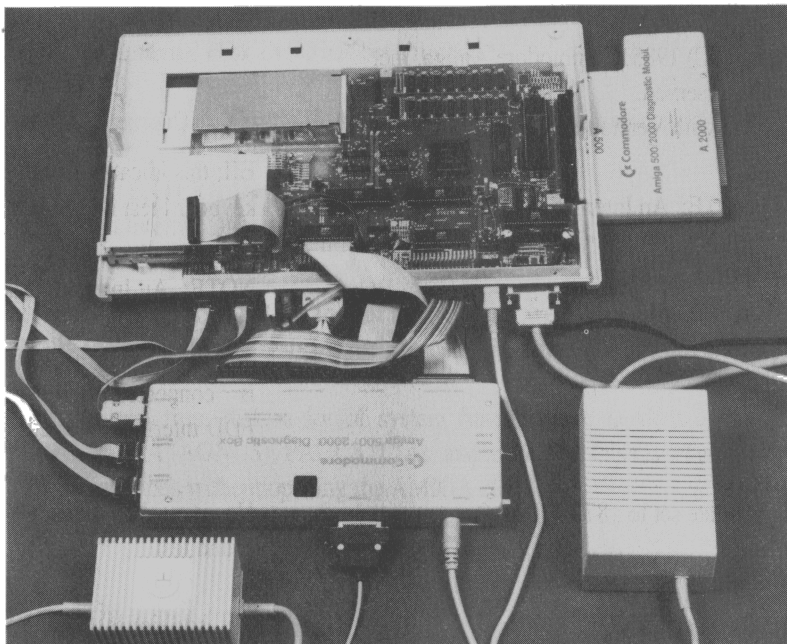
Picture 3: A500 with AMIGA DIAGNOSTIC KIT connected

A500: Connecting power

To run the test, you have to connect the A.D. BOX to a C64-PSU and the A500 to its
own power supply.
Make sure that the power supplys are switched off when you connect them, and that
they have the correct voltage rating!
NOTE: If you switch on the AMIGA seperatly, no damage will occur. If the test
does not work properly, try the reset button at the rear of the A.D. BOX.
To avoid any trouble, switch on the AMIGA and the A.D. BOX together with an
extra power switch.

How the Test Works

Once the test is started, several numbers are displayed on the two digit LED-display on the A.D.BOX indicating which part of the test is executed.
This messages will be displayed on the terminal (ROM based version):

HIMAX 1.2 -- 3-Feb-1987 - 16:27:30	This is the identification
Commodore AMIGA Diagnostic WRAPAROUND Test	of this test.
Copyright (C) 1985, Commodore Amiga, Inc.	
All rights reserved.	
** For use with Version 11 Boot ROMs **	
	EJI: this idicates, that the
?EJl** NOTE: An Internal Disk Drive not found! **	keyboard test is passed.
	NOTE: An Internal Disk Drive...
	this means that no FDD is connected and the FDD interface is tested .
Note *** date set to : 87 1 1 10:0:0	Now you should hear the sound test
Found RAM at C00000	the additional RAM at C00000 was found and tested.
++ END of HIMAX (1.2 -- 3-Feb-1987 - 16:27:30)	This the end of the test.

At the end of the test two pictures are alternatively displayed on the monitor: The first one shows a HAM-demo, changing from blue / green to red/yellow, the nine sprites (the little boxes in a row) and a red box with two, only one pixel wide point .
The second picture shows a test picture as you may know it from TV. At this time there are numbers scrolling on the LED-display on the A.D.BOX. All this indicates that the test was successfully finished.

Differences between ROM- and the Disk-Test

Allthough both versions of the test are basically the same, there are some minor differences:

The disk test reports every test on the terminal, the ROM test does not.

There are three additional messages displayed because the FDD is connected:

** NOTE: An Internal Disk Drive has been found! **

** NOTE: Internal Disk Test SKIPPED--diagnostic cable not connected **

Test #60 - Test EXTERNAL Disk Control Lines
** NOTE: An Internal Disk is Connected

Note: These messages do not mean that an error occured!
They only indicate, that all tests of the internal FDD interface are not executed.

To load this test from disk, a lot of system functions are needed: appr. 40k of CHIP-RAM, DMA (AGNUS), PAULA, CIAs and more. But this test checks all ports and system functions without opening the AMIGA 2000.

Connecting a Terminal

You may connect a terminal at the rear of the A.D. BOX with the RS232 cable includet. For example connect a PC running the terminal emulation program, which is on the 5 1/4" disk.

Protocol: 9600 baud, 8 bit, 1 stop bit, no parity

On this terminal all messages will be displayed. Normally the test stops when an error occurs. By pressing SPACE-BAR the test will continue, by pressing RETURN the test-step will be repeated.

Detailed Testdiscription:

This chapter gives a short overview of what the test does.
The Test starts with setting up system: initializing the ports, mounting the exception-vectors etc.
Then the tests are performed.
If an error occurs, an errorcode is displayed on the LED-pannel on the AMIGA-DIAGNOSTIC-BOX and a more detailed message is put to the terminal.
Then the test waits for your input from the terminal:
>   if you press the space bar, the test will be continued,
>   if you press return, this test-step will be repeated.
There is a possibility to get into a help- / debug-menu. This is not ready yet (may be this will never be) and therefor not documented.

Test #1 - Read last ROM location

Test #2 - Set CBM as input, ck data and clocks
Test #3 - DRDY and ACK test
Test #4 - Check the CBM Serial Data Line

Test #5 - Check RTS-CTS bit set loop
Test #6 - Check RTS-CTS bit clear loop
Test #7 - Check DTR-DSR bit set loop
Test #8 - Check DTR-DSR bit clear loop

Test #9 - Roll a zero through the parallel port
Test #A - Roll a one through the parallel port

Test #B - W/R a "?" character via the serial connection
Test #C - W/R a "E" character via the serial connection
Test #D - W/R a "J" character via the serial connection
Test #E - W/R a "l" character via the serial connection

Test #F - Keyboard Communications Test

> **Verify HIMAX:**
> **check test equipment and used ports**

> **Test the Serial Port and the Keyboard**

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Test #10 - "SEL" and "CD"
Test #11 - "SEL" is input, "CD" is output

Test Handshake of Par.-Port

Test #20 - Resets LOW test
Test #21 - Disk Port
Test #22 - Modem Port
Test #23 - Resets HIGH Test
Test #24 - Disk Port
Test #25 - Modem Port

Test Reset Signals

Test #26 - SET JoyStick Fire Lines
Test #27 - Check Fire Lines as Outputs
Test #28 - Fire 1
Test #29 - Fire 0
Test #2A - Check Fire Lines as inputs
Test #2A - Fire 0 low, Fire 1 low
Test #2B - Fire 0 high, Fire 1 low
Test #2C - Fire 0 low, Fire 1 high
Test #2D - Fire 0 high, Fire 1 high

Test Joystick Ports

Test #2F - Check for Cable of Internal Disk

Test #30 - +5V Keyboard
Test #31 - +5V Serial Port
Test #32 - +5V JoyStick 1 Port
Test #33 - +5 V JoyStick 0 Port
Test #34 - +5 V Disk Port

Test +5V

Test #35 - Keyboard
Test #36 - Internal Disk Ground
Test #37 - External Disk
Test #38 - Serial Port (pin 7)
Test #39 - Serial Port (pin 1)
Test #3A - Joystick 1
Test #3B - Joystick 0

Test Ground Connections

Test #3C - External Disk +12V

Test +12V Ext. Disk

Test #47 - Joystick Lines

Test Joystick Port

Test #50 - Set all Pot lines to output), Verify all low
Test #51 - Toggle Pot[X] Port[1], Verify line goes Hi
Test #52 - Toggle Pot[Y] Port[1], Verify line goes Hi
Test #53 - Toggle Pot[X] Port[0], Verify line goes Hi
Test #54 - Toggle Pot[Y] Port[0], Verify line goes Hi
Test #55 - Set all Pot lines to output, Verify all High
Test #56 - Toggle Pot[X] Port[1], Verify line goes Lo
Test #57 - Toggle Pot[Y] Port[1], Verify line goes Lo
Test #58 - Toggle Pot[X] Port[0], Verify line goes Lo
Test #59 - Toggle Pot[Y] Port[0], Verify line goes Lo
Test #5A - Set up to Begin testing the Pots as inputs
Test #5B - Pot Input load testing
Test #5C - load 1
Test #5D - load 2
Test #5E - load 3
Test #5F - load 4

| Test POT-Port |

Test #60 - SEL1, SEL3B, DIRB, STEPB
            DKWEB, SIDEB, SEL2B, MTRXD
Test #64 - INDEX

| Test External Disk Control Lines |

Test #6A - Disk GROUND, SIDEB, DKWEB,
            STEPB, DIRB, MTR0D, SEL0B,
            MTR0D, LED, MTRON
Test #6F - INUSE, driveselect, motoroff

| Test Internal Disk Control Lines |

Test #72 - CHNG, WPRO, TK0, RDY
Test #76 - INDEX

Test #6B - Light pen
Test #6B - AGNUS

| First Test of AGNUS
! Lightpentest is not reliable ! |

Test #77 - Force Reset Test with "NARROW" pulse,
           then KBRESET

| Test the RESET-Lines |

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Test #80 - ROM CheckSum Checking
Test #88 - Check "ROM" lock of RAM

**Test The
Kickstart-ROM**

Test #89 - Check The Four Audio Channels, and Audio DMA
Test #90 - Custom Chip Register Testing, Clear ADKCON
Test #91 - ADKCON set and clear bits loop
Test #92 - CLXDAT clear
Test #93 - DMACON[R] register check
Test #94 - INTREQ register check
Test #95 - INTENA register check
Test #E0 - Single blitfill
Test #96 - JOYSTICK register check
Test #97 - JOYSTICK register check
Test #98 - JOYSTICK register check
Test #99 - JOYSTICK register check

**Test of
Custom-Chip-Registers**

Test #96 - Real Time Clock test #1
Test #97 - Real Time Clock test #2
Test #98 - Real Time Clock test #3
Test #F9 - Test of Clockchip

**Test of
Clock-Chip**

Test #F0 - Test Chip-RAM
Test #F1 - MirrorTest of CHIP-RAM
Test #78 - RAS-/CAS-Test
Test #F2 - Test of ChipRam
Test #F3 - Test of expansion

**Test of
Chip- & Fast-RAM**

Test #E1 - build up picture
Test #E2 - build up picture
Test #E3 - build up picture

**Build-up
Final Pictures
&
END OF HIMAX**

Amiga Diagnostic Error Code Table

********* 01 - 0F :

1	Word s/b: %lx, was: $0XXXX
2	CBM clock failure
2	CBM clock failure
2	FF - CBM data failure, D0: $0XXXX
2	CBM clock failure
2	00 - CBM data failure, D0: $0XXXX
3	DRDY or ACK failed
4	Clock failure of CBM Serial Data(00) Line
4	Data failure of CBM:
4	Clock Failure of CBM Serial Data(FF) Line
4	FF Data Failure of CBM: $0XXXX
5	CTS was NOT SET!
6	CTS NOT CLEARED!
7	DSR NOT SET!
8	DSR NOT CLEARED!
9	Rolling a zero failed (d0=$0XXXX d2=$0XXXX)
a	Rolling a one failed (d0=$0XXXX, d2=$0XXXX)
b	"?" not found!
c	"E" not found!
d	"J" not found!
e	"l" not found!
f	serial port bit #3 not cleared!
f	s/b $FF, was: $0XXXX
f	s/b $F0, was: $0XXXX
f	s/b $0F, was: $0XXXX
f	s/b $AA, was: $0XXXX
f	s/b $55, was: $0XXXX
f	s/b $00, was: $0XXXX

**** 10 - 1F :

10	"SEL" was hi
10	"CD" was lo
10	"SEL" was lo
10	"CD" was hi
11	"CD" was hi
11	"CD" is lo

**** 20 - 2F :

20   Parallel Port RESET line HIGH
21   Disk Port RESET HIGH
22   Modem Port RESET HIGH
23   Parallel Port RESET low
24   Disk Port RESET was low
25   Modem Port RESET was low
26   JoyStick Fire Lines failed to SET as output!
27   Fire Lines not high
28   Fire 1 is high
29   Fire 0 is high
2a   Fire 1 is high
2a   Fire 0 is high
2b   Fire 1 is Low
2b   Fire 0 is High
2c   Fire 0 is high
2c   Fire 1 is low
2d   Fire 1 is low
2d   Fire 0 is low
2F   Diagnostic Cable not connected

**** 30 - 3F :

30   Keyboard +5
31   Serial Port +5
32   JoyStick[1] +5
33   JoyStick[0] +5
34   Disk Drive +5 volts
35   KeyBoard Ground
36   Internal Disk Ground
37   External Disk Ground
38   Serial Port Ground (pin 7)
39   Serial Port Ground (pin 1)
3a   JoyStick[1] Ground
3b   JoyStick[0] Ground
3c   External Disk Drive +12 Not Present

40   This error (RESET) was caused by a short circuit!
40   JoyStick +5 high
45   JoyStick +5 Low
47   JoyStick[0]
47   JoyStick[1]

**** **50 - 5F :**

50   One of the pot lines failed to go low!
51   Pot[X] Port[1] pot line failed to go High!
52   Pot[Y] Port[1] pot line failed to go High!
53   Pot[X] Port[0] pot line failed to go High!
54   Pot[Y] Port[0] pot line failed to go High!
55   One of the pot lines failed to go low!
56   Pot[X] Port[1] pot line failed to go Lo!
57   Pot[Y] Port[1] pot line failed to go Lo!
58   Pot[X] Port[0] pot line failed to go Lo!
59   Pot[Y] Port[0] pot line failed to go Lo!
5a   should NEVER get here, installed for symmetry!

**** **60 - 6F :**

6b   (A) _vposr did not latch!, found: 0xXXXX, then: 0xXXXX
6b   (B) Agnus FAULT! Line found s/b: 0xXXXX, was: 0xXXXX
60   /SEL1B is low
60   /SEL1B is high
60   /SEL3B is low
60   /SEL3B is high
60   DIRB is low
60   DIRB is high
60   /STEPB is low
60   /STEPB is high
60   /DKWEB is low
60   /DKWEB is high
60   /SIDEB is low
60   /SIDEB is high

60	/SEL2B is low
60	/SEL2B is high
60	/MTRXD is low
60	/MTRXD is high
64	"INDEX" bit set
6a	Disk Ground is high
6a	/SIDEB is lo
6a	/SIDEB is hig
6a	/DKWEB is lo
6a	/DKWEB is high
6a	/STEPB is low'
6a	/STEPB is hig
6a	DIRB is lo
6a	DIRB is hig
6a	/MTR0D is low
6a	/MTR0D is high
6a	/SEL0B is lo
6a	/SEL0B is hi
6a	/MTR0D is lo
6a	/MTR0D is high
6b	_LED line failed HIGH
6c	_LED line faid LOW
6d	_MTRON failed LOW on KYBRD connector
6e	_MTRON failed HIGH on KBRD connector
6f	Could not clear inuse
6f	Could not select drive 0
6f	Could not select drive 1
6f	Could not select drive 0+1
6f	inuse lines changed state after motoroff

*** 70 - 7F :

72	/CHNG is low
72	/CHNG is high
72	/WPRO is lo
72	/WPRO is hi
72	/TK0 is lo
72	/TK0 is high
72	/RDY is low
72	/RDY is high

76	"INDEX" bit off
76	"INDEX" bit off
77	"NARROW" pulse caused reset!
77	Test $XX - A low _KBRESET did not cause a reset!
78	failed strobe, compare d0/d2, d1/d3
78	failed strobe, compare d0/d2, d1/d3
78	failed strobe, compare d0/d2, d1/d3
78	failed strobe, compare d0/d2, d1/d3
79	Failed addr = %0xXXXX
7a	failed pattern, compare d0/d2,d1/d3, addr=#0XXX
7a	Failed pattern, compare d0/d2,d1/d3, %0XXXX
79	Failed addr = %0FFFF
7a	failed pattern, compare d0/d2,d1/d3, addr=#0XXXX
7a	Failed pattern, compare d0/d2,d1/d3, 0XXXX

*** 80 - 8F :

80	ROM failure! Found: %0XXXX, expected: %0XXXX
83	failed strobe, compare d0/d2, d1/d3
84	addr: %0XXXX, s/b: %0XXXX, was: %0XXXX
85	addr: %0XXXX, compare d0/d2,d1/d3
88	failing addr: %0XXXX, s/b: %0XXXX, was: %0XXXX
89	Should never occur, Added for Symmetry only!
89	ToneTest_end
8B	DSR NOT CLEARED!

*** 90 - 9F :

90	ADKCON register failed to clear!
91	This Bit pattern failed to SET: $0XXXX, bits FOUND: $0XXXX
92	CLXDAT read result should be ZERO, was: $0XXXX
93	DMACONR read result should be ZERO, was: $0XXXX
93	DMACONR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
93	DMACONR read result should be: $0XXXX, was: $0XXXX
93	DMACONR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
94	INTREQR read result should be ZERO, was: $0XXXX
94	INTREQR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
94	INTREQR read result should be: $0XXXX, was: $0XXXX
94	INTREQR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
95	INTENAR read result should be ZERO, was: $0XXXX
95	INTENAR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
95	INTENAR read result should be: $0XXXX, was: $0XXXX

95	INTENAR expctd/fnd: $0XXXX/$0XXXX, (cnt/shft: $0XXXX/$0XXXX)
96	in JOYSTICK0--PATTERN1 expctd: $0XXXX, fnd: $0XXXX
96	in JOYSTICK1--PATTERN1 expctd: $0XXXX, fnd: $0XXXX
96	- RealTimeClock - Stuck Bit Test
97	- RealTimeClock Test - Roll Over Test
98	- Real Time Clock -- Address line test
97	in JOYSTICK0--PATTERN2 expctd: $0XXXX, fnd: $0XXXX
97	in JOYSTICK1--PATTERN2 expctd: $0XXXX, fnd: $0XXXX
98	in JOYSTICK0--PATTERN3 expctd: $0XXXX, fnd: $0XXXX
98	in JOYSTICK1--PATTERN3 expctd: $0XXXX, fnd: $0XXXX
99	in JOYSTICK0--PATTERN4 expctd: $0XXXX, fnd: $0XXXX
99	in JOYSTICK1--PATTERN4 expctd: $0XXXX, fnd: $0XXXX
e0	Test e0, bad AGNUS
e1	Test e1, bad PAULA (or maybe agnus)
e0	Test e0, bad AGNUS
e1	Test e1, bad PAULA (or maybe agnus)

e0	RAM Chip U48 failed!	Chip identifiers are not related to A500
e1	RAM Chip U49 failed!	or A2000.
e2	RAM Chip U50 failed!	
e3	RAM Chip U51 failed!	
e4	RAM Chip U52 failed!	
e5	RAM Chip U53 failed!	
e6	RAM Chip U54 failed!	
e7	RAM Chip U55 failed!	
e8	RAM Chip U56 failed!	
e9	RAM Chip U57 failed!	
ea	RAM Chip U58 failed!	
eb	RAM Chip U59 failed!	
ec	RAM Chip U60 failed!	
ed	RAM Chip U61 failed!	
ee	RAM Chip U62 failed!	
ef	RAM Chip U63 failed!	
f0	RAM Chip "U2C or U1C" failed!	
f1	RAM Chip "U2B or U1B" failed!	
f2	RAM Chip "U2E or U1E" failed!	
f3	RAM Chip "U2D or U1D" failed!	

f4	RAM Chip "U1C" failed!
f5	RAM Chip "U1B" failed!
f6	RAM Chip "U1E" failed!
f7	RAM Chip "U1D" failed!
f8	data bus to ex ram bad
f0	RAM Chip U16 failed!
f1	RAM Chip U17 failed!
f2	RAM Chip U18 failed!
f3	RAM Chip U19 failed!
f4	RAM Chip U20 failed!
f5	RAM Chip U21 failed!
f6	RAM Chip U22 failed!
f7	RAM Chip U23 failed!
f8	RAM Chip U24 failed!
f9	RAM Chip U25 failed!
fa	RAM Chip U26 failed!
fb	RAM Chip U27 failed!
fc	RAM Chip U28 failed!
fd	RAM Chip U29 failed!
fe	RAM Chip U30 failed!
ff	RAM Chip U31 failed!
f9	Clockchip bad
f0	ChipRam not free
f0	ChipRam changed contents
f1	MirrorTest failed
f0	ChipRam is bad
f3	Error in expansion RAM
f3	Error in Expansion Ram
f3	No Ramexpansion installed * diskversion wants to test

Commodore