Manual for the RAM-Tester

Target

This device was specially developed to reliably test a wide range of RAM types from the Commodore series (C64, C128, Amiga 500, 1000, 2000 and some later models).

There were already RAM testers on the market, but hardly any of them supported ZIP modules (ZigZag Inline Package). This device closes this gap and can now test nine different types of RAM modules.

As a pure hobby project, the focus is on a simple design with minimal material costs – hence only a single ZIP socket. Additional sockets would have been possible, but would have significantly increased the hardware and software costs.

The project has been open source from the outset. Circuit diagrams, board layout and firmware can be found on GitHub at:

https://github.com/tops4u/ram-tester

Valid for all RAM-Tester with Firmware from 3.0.0
Published: 03.09.2025

Disclaimer
This product is in the prototype stage and is supplied as a laboratory and development tool. It is sold exclusively to technically experienced users who are aware of and accept the risks involved.

- This board does not contain any integrated protective measures such as TVS diodes, ferrite filters or fuses.
- It offers no protection against ESD, overvoltage, overcurrent or EMC interference.
- It may only be operated with a stabilised 5 V USB power source (max. 1 A). Power supplies and cables are not included.
- Only use the device in a controlled laboratory environment, away from flammable materials.
- Appropriate ESD protection measures are mandatory during setup, testing and use.
- This device is not intended for continuous operation or connection to other systems.

Use is at your own risk.

The manufacturer accepts no liability for damage to equipment, property or persons resulting from installation, incorrect operation or use.

Any claims for warranty, repair or return are excluded.

Possiblities

The device can test the following components:

Via 16-pin adapter board:

- 4116 – older component. Requires specialised -5V and +12V power supply. 16,384 cells, each with one bit = 2Kb.

16 pins, DIP (dual inline package) only

- 4164 – older component used in the early C64/C128. Structure 64K cells (65,535) with one bit each. Total 8kB.
- 41256 – component of the early Amiga (500 / 1000 / 2000) series. Structure: 256K cells (262,144) with one bit each. Total: 32kB.

18-pin DIP only

- 4416 – Component used in older computers such as the Commodore 16 or Plus. Structure: 16K cells (16,384) with 4 bits each. A total of 8kB, the same as the 4164, but writes and reads 4 bits simultaneously.
- 4464 – Used, for example, in the newer C64 and reduced the number of RAM components from 8 to 2. Organised into 64K cells (65,535) with 4 bits each. Total 32kB
- 411000 – A slightly newer module which was used, for example, in expansion cards in the Amiga. Organised as 1M cells (1,048,576) with one bit each. This means 128kB per module

20-pin DIP or ZIP

- 514256 / 44256 – Component used in later Amiga series, partly also on expansion cards, e.g. turbo cards. Organised in 256K cells with 4 bits each, totalling 128kB.
- 514258 / 44258 – Same component as the 514256 / 44256 but with the option of static column – when reading, no CAS strobe is required for column changes, which saves a little time.
- 514000 / 441000 – Component with 1M cells, each with 4 bits. This gives a total memory volume of 512kB per component. Used in later Amiga models and for memory expansions.
- 514002 / 441002 – Same organisation as the 514000 / 441000, but also with the option of static column (analogous to 514258 / 44258).

Items of the Tester

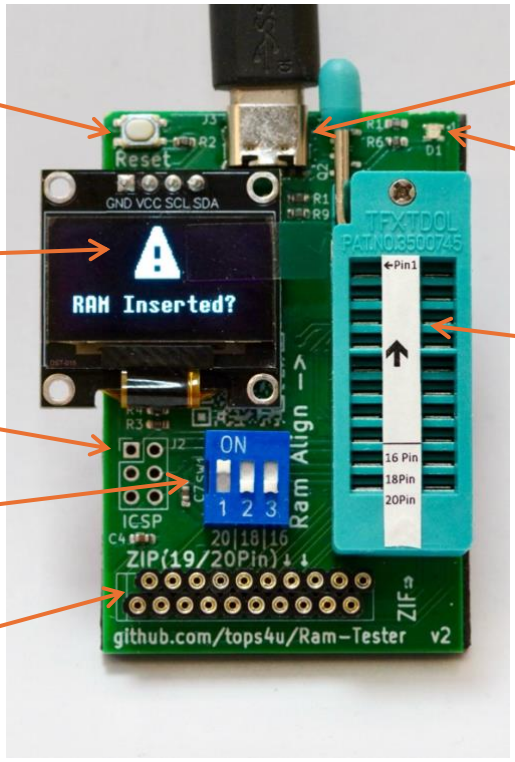
Reset Button.
Starts the test.

Display for operation an status report (optional).

ICSP for Updates.

DIP Block to configure the amount of PINs.

ZIP Socket for ZIP RAM types.



Power connector USB-C

Status LED

ZIF Socket to test DIP RAM. The RAM must align PIN-1 in the top left position!

Test procedure

1. Connect the power supply
   - Connect the device to a 5 V power source.
   - This is a USB C device that automatically negotiates 5 V with the charger.
   - Alternatively, you can use a USB C to USB A adapter.
2. Automatic fuse
   - The device has a self-resetting fuse.
   - In the event of a short circuit or other problems, it switches off for protection.
   - Once the fault has been rectified, the fuse resets itself after a short time.
3. Warning: socket assignment
   - During the test, only one RAM module may be inserted in one of the two sockets (ZIP or ZIF) at any one time – never in both at the same time!
4. Warning: Module type
   - The 411000 module may only be used in the ZIF socket (DIP form).
   - Using this module in the ZIP socket may destroy it!
5. Setting the DIP switch
   - Use the DIP switch to set the number of pins your module has.
   - Only one switch may be in the ON position at any given time.
   - If none or more than one switch is set to ON, a spanner symbol and ‘DIP Settings!’ will appear on the display after restarting.
   - The installed firmware version is shown below this message.

Insert the component to be tested into the appropriate socket. The test is initiated by pressing the ‘RESET’ button.

1. The display starts up and shows ‘RAM TESTER’.
2. The position of the DIP switches is checked. If the combination is invalid, a spanner symbol and the text ‘DIP Settings!’ appear.
3. Depending on the DIP setting, each connection of the RAM module is checked for short circuits to ground. If the system finds a short circuit, a lightning bolt symbol appears and the first faulty pin (in ascending order) is displayed.
4. The RAM module is initialised. The device then checks the size of the module by writing data and reading it back out again. If this is not successful, a warning triangle and the message ‘RAM inserted?’ appear.
5. Once the size has been detected, the module designation is shown on the display.
6. This is followed by tests of the address lines, the address decoder and the row and column logic. An error results in a corresponding error message indicating which address is affected.
7. In the first part of the memory test, all cells are set to ‘1’ and then to ‘0’. Cells that cannot be switched are detected in this way.
8. In the second part, the device describes each row with alternating bit patterns (‘01010101...’ and ‘10101010...’) and reads them out. If problems occur in steps 7 or 8, the message ‘RAM Faulty’ is displayed.
   9. In the final test, the device writes random data, immediately performs a RAS-only refresh and waits until the minimum guaranteed storage time has been reached. The entire line is then read in and compared. If an error occurs here, an error message appears.

If all steps are completed without error, the RAM module is considered OK.

→ At the end, it is essential to check whether the detection has recognised the correct module. Some errors can manifest themselves in such a way that a different module type (e.g. smaller) is recognised.

Information: In step 9, a pseudo random pattern is used. Not all cells are tested for their retention time at the same time. This test is performed twice in succession with inverted data, thus ensuring that all individual bits are filled with 0 and 1 once each. This eliminates the need for two RESET cycles, as is the case with the 2.x.y versions of the tester.

Error messages:

The error messages on the display contain clear text describing the error; alternatively, the LED for the messages can be read.

Error	Display	LED red	LED green	LED orange
No Ram	«Ram inserted?»	Slowly blinking	-	-
Addressline, -decoder or -buffer Error	«Row / Col address =xy" or "Decoder Error"	1 x	-	1-10 für Row (0-9) resp. 11-20 für Col (0-9).
DIP Switches in invalid position	«DIP Settings» + acutal Firmware Version	Fast blinking	-	-
Running Test	«RAM Tester» «Checking…» «Detected:» + RAM Typ	-	-	On / could be flickering a little
Short to Ground	«GND Short» + affected Pin Nr accoding to ZIF Socket!	3 x		N = Pin Nr accorindg to ZIF Socket
Test Error	«Ram Faulty» + Test Nr	2 x		N = failed Test
Test OK	OK sign + Ram Typ	-	1x 16 Pin 2x 18 Pin 3x 20 Pin 4x 4116 Adapter	N = affected Subtype, see below

LED blink codes for RAM types:

1 GN / 1 OR	4164	2 GN / 1 OR	4416	3 GN / 1 OR	514256
1 GN / 2 OR	41256	2 GN / 2 OR	4464	3 GN / 2 OR	514258
1 GN / 3 OR	41257	2 GN / 3 OR	411000	3 GN / 3 OR	514400
1 GN / 4 OR	4816			3 GN / 4 OR	514402
		4 GN / 1 OR	4116		