

RAM+ for TRS-80 Model 100

128K RAM module

User Manual

**Version 1.0
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Welcome to the RAM+ Memory Expansion Modules User Manual

Introduction

The TRS-80 Model 100 (a.k.a. M100 or MT) was a very popular early ‘laptop’ (slabtop) portable computer in the 1980s. Used extensively by journalist, traveling businessmen and even used as a compact compute control system for a wide variety of equipment.

The original M100 came with 8K of RAM on a module with a unique footprint. Up to three more RAM modules could be added for a total of 32K of RAM. There were several different Ram expansion ideas which became available during this time period including the Cryptronics 96K RAM which when teamed with a full 32K onboard the M100 provided 128K of ‘banked’ RAM, i.e. 4 separate 32K workspaces not a single contiguous 128K RAM area.

Hardware Installation

- Backup any files you want to save from your M100
- Turn off the M100
- Turn off the memory battery backup switch
- Open the expansion cover
- Plug the RAM+ module into the 40P expansion socket taking care to align pin 1 on module with pin 1 on M100 expansion socket.
- Turn memory battery backup switch on

The original Cryptronics 96K RAM required its own memory backup battery. By using modern low power RAM the RAM+ can use only the M100’s built in RAM backup battery.

The StarDust RAM+ also provides all 128K of RAM rather than rely on any RAM in the M100. You can unplug any additional RAM modules in your M100 if you wish as they will no longer be used, i.e. they cannot be accessed. The only downside to leaving them in place is a slightly increased draw on the memory backup battery.

⚡WARNING⚡

The Memory Expansion Module is static sensitive like any other piece of electronic equipment. Make sure to store any removed Memory Expansion Module in a static-proof bag until needed. When handling the memory module do so by the edges and refrain from touching the exposed edge connector or components.

Troubleshooting the Module installations

This section provides some ideas on troubleshooting installation issues.

- Reseat the module to ensure it is properly installed.

‘Driver’ Software

ROM installation

The RAM+ is now installed, but it needs software to allow switching between the four banks. You could use your own EPROM with an appropriate adapter for the M100s unique ROM socket, or a REX+. The easiest way though is to use the Dial-A-ROM for the M100 (MT), set to position 3: <https://www.soigeneris.com/dial-a-rom-for-vintage-computers>. Note that there are two slots on one side of the M100 ROM socket and one slot on the other. Align the DAR to match the slots and plug it in carefully.

ROM activation

With the wide bar cursor on BASIC, press ENTER. At the BASIC 'Ok' prompt, type:

```
CALL 63012
```

And press ENTER. You will see the RAM + menu. If you don't, switch off the Model 100 and go through the installation instructions again. Now you can explore the powerful features of the RAM + software.

RAM+ menu

On the top line of the menu, you see the date and time, just like on the main menu. Next to this is the version number of the RAM + software, and the copyright notice.

The list of files on the RAM + menu is just like on the main menu, except that the built in files are not shown. This leaves room on the sixth line for additional status information, namely the amount of RAM available in the current bank, the current bank number (1 thru 4) and the size of the file that the wide bar cursor is resting on. The seventh line as usual contains the function key labels:

F1 - Bank

Moves you into the next bank, ie from 1 to 2, from 2 to 3, from 3 to 4 and from 4 to 1. After pressing it, you will remain in the new bank until you press it again, or use the GOTO program discussed under F3 - Goto.

F2 - Name

Allows you to rename the file that the wide bat cursor is resting on. There is no need to type the extension (e.g. .DO, .CO or .BA) since you are not permitted to change it. To rename a file, simply press F2-Name. The screen will say:

New name: _

Type in the new name, up to six letters, and press ENTER. The file under the wide bar cursor will now have the name you just typed in.

F3 - Goto

This is for use if you wish to remove the directory entry for RAM + from the main menu. Under these circumstances, you will still need some way to get from bank to bank. Pressing F3 - Goto, in addition to removing the RAM + name from the main menu in all four banks, creates a new .CO file (only 8 bytes long) in each bank that lets you switch from bank to bank from the main menu, without the RAM + ROM software chip installed. The .CO file has a different name in each bank. In bank 1 it is called GOTO2.CO, which stands for Go to Bank 2. In bank 2 it is called GOTO3.CO, in bank 3 it is called GOTO4.CO and in bank 4 it is called GOTO1.CO

After pressing F3 - Goto in any bank, you are returned to the main menu in bank 1. To switch banks from the main menu, simply place the wide bar cursor on the GOTO1.CO file and press ENTER. You will find yourself at the main menu in the next bank.

F4 - Copy

This copies the file under the wide bar cursor from bank to bank, or to a new name in the same bank. Simply place the wide bar cursor on the file to be copied, and press F4-Copy. The screen will say:

To Bank #_

Type in the number of the bank you want to copy to. The file is instantly copied. If you type the number of the bank you are already in, for example if you are in bank 1 and you put To Bank # 1 The screen will say:

New Name: _

Type in the new name just like with F2-Name, and press ENTER. The file will be exactly duplicated under a new name while continuing to exist under the old name also.

F5 - Kill

This kills (erases, removes, deletes) the file under the wide bar cursor. Once it has been erased, the file cannot be resurrected by any means, so this is a somewhat risky action. To make sure you don't erase any valuable data by accident, the screen asks you to confirm that you want to erase the file and requires you to confirm by typing 'y' for yes.

F6 - CRLF

This is for those who find themselves constantly struggling with DIP switches on their printers, trying to stop it all being printed on one line. If you have never found yourself in this situation, you have no use for F6-CRLF.

CRLF stands for Carriage Return/Line Feed, and causes your Model 100 to insert the line feed character that so many printers require after each carriage return. Pressing F6-CRLF causes it to go into reverse video to indicate that from now on the line feed will be added. This remains active in all programs and even when the ROM is taken out.

Pressing it a second time switches off the reverse video and causes the Model 100 to print in the traditional way.

F7 - Date

When you press this key, the screen says:

Date: _

Type in the current date in month/day/year format for example, for January 1, 1900 (a date familiar to most Model 100 owners) simply type:

Date: 01/01/00

And press ENTER. After you press ENTER (even without typing anything), the screen will go on to say

Day: _

Type in the first three letters of the day of the week, e.g.

Day: Sun

And press ENTER. Next the screen will ask you the time:

Time: _

Type in the time using a 24-hour clock. You must separate the hours, minutes and seconds with colons, and you must put two digits for each, so that for example 8.25pm would look like this:

Time: 20:25:00

After typing the current time, press ENTER to return to the RAM+ menu.

F8 - Menu

This takes you out of the RAM + menu back to the standard Model 100 main menu in the same bank. In order to help you keep track of what bank you are in, the menu shows the current bank in the second slot of the second line of the menu, under TEXT and to the right of SCHEDL.

For example, in bank 1 this appears as:

Bank # 1

To get back to the RAM + menu, simply place the cursor on this filename and press enter. If you wish to remove the RAM + chip in order to use another ROM such as Lucid or Write ROM, you can remove the Bank 1 name from the menu by pressing F3-Goto. This removes the bank filename from the main menu, and installs a .CO file that allows you to switch banks without the RAM + ROM installed.

Cold Start.

If you wish to erase all the files in a particular bank, or if you suspect that one of the banks has become scrambled, you can 'cold start' that bank without affecting the other two banks. This is done by moving to the RAM + menu in the bank that you wish to wipe, and holding down the SHIFT and CTRL keys and pressing the PAUSE function key.

If you find yourself unable to get into the next bank (for example from Bank 1 to Bank 2), the chances are that the next bank has been scrambled. This can occasionally happen when installing or removing the RAM. Version 1.3 allows you to cold start a bank without being in it. It works just like F1 - Bank, except that instead of putting you into the next bank it cold starts the next bank before moving to it. Since you don't want to do this by accident, you must press four keys simultaneously to do it.

To cold start bank 2, get into the RAM + menu for bank 1, and press Ctrl, Shift, Code and Pause simultaneously. You will move into bank 2 and the menu will be cleared.

To cold start bank 3, get into the RAM + menu for bank 2, and press Ctrl, Shift, Code and Pause simultaneously. You will move into bank 3 and the menu will be cleared.

To cold start bank 4, get into the RAM + menu for bank 3, and press Ctrl, Shift, Code and Pause simultaneously. You will move into bank 4 and the menu will be cleared. To cold start bank 1, simply use the conventional method of holding down the CTRL and PAUSE keys simultaneously while turning the Model 100 off and on again.

BATTERY LIFE

While the original Cryptronics 96K RAM module required its own backup battery the StarDust RAM+ uses modern low-power RAM and is thus able to use the M100s own internal memory. The battery life will be similar to an M100 with 32K or original RAM modules.

EXTENSIONS TO BASIC

You can now open a data file in another bank from a BASIC program. The program can be in any bank, and the file can be in any bank. The syntax is as follows:

```
OPEN "A:test" FOR OUTPUT AS 1
```

The four banks are given the device names A:, B:, C: and D:. The reason they are not called by their numbers (1,2,3,4) is to avoid conflicts within programs that access the Holmes/PCSG Chipmunk disk drive.

Once the file is opened (for input, output or append), it can be accessed by any of the standard file I/O commands such as:

```
INPUT #1,A$
PRINT #1,B$
A$=INPUT$(1,1)
LINE INPUT #1,Ø$
```

Additionally, programs in other banks can be RUN, MERGED, LOADED and SAVED. They must be saved as '.DO' files, however. You cannot LOAD a .BA file from another bank. To save a program as a .DO file you simply add the .DO extension to the file name, or append' ,A ' to the save command. Examples:

```
SAVE"D:TEST.DO"
SAVE"D:TEST",A
```

The A stands for ASCII. A .DO file is known as an ASCII file, since it consists exclusively of regular text. A .BA file is known as a tokenized file, since it consists of data in BASIC's internal format with all sorts of control and graph characters in it.

SOME COMMON QUESTIONS

How do I recharge the RAM's batteries?

Since the modern StartDust RAM+ uses the M100s internal RAM backup battery no special steps are needed.

What if I want to put in another ROM?

In order for the extended RAM BASIC to work, you must have the RAM + ROM in the option socket. Before you remove the RAM + ROM it is essential to disable the extended BASIC. This is done by pressing F3 (Goto), which also removes the Bank # 1 names from the menus. Having done this, you should switch the Model 100 off and then on again to ensure that you are in bank I. You can then replace the ROM with another, or if you have the PCSG 6 ROM Bank, simply turn the switch to the ROM you wish to access.

IMPORTANT NOTE: Before you pullout any ROM, it is essential that you are back at the main Model 100 Menu, with the Microsoft copyright notice showing in the top right corner. Then switch off the M100, flip it over and pullout the ROM. Put in the replacement ROM, flip the computer right side up, and switch it on. If the old ROM name still shows on the menu it doesn't matter. As soon as you place the cursor on it and press ENTER you will find yourself in the ROM you just plugged in, and when you exit, you will see the new name.

Some ROMs have plastic carriers, with protruding lugs at the ends, which may interfere with the edge of the RAM board, making it difficult to plug the ROM in. The simple remedy for this is to trim the lugs just enough to make them fit. You can use a file, xacto knife or scissors to do this.

Is there another way to move from bank to bank?

You can use the following one-liner to move to another bank from in BASIC:

```
POKE-2,211:POKE-1,1:CALL-2
```

This will move you from any bank into bank 2. The relevant parameter is the number immediately before the CALL statement. To get to bank 1 put a 0 there, to get to bank 2 put a 1, to get to bank 3 put a 2 and to get to bank 4 put a 3.