

# CPC Universal 512K Ram Expansion

## RC-6-Fighter Release Notes

Saturday, 5 October 2019 14:17

### Summary

This is 512KByte memory expansion card which is suitable for all Amstrad CPC computers.

The card has an MX4 type connector, so requires an expansion board [1] or suitable ribbon cable connection to hook up to the computer.

On the CPC6128 and later computers the board provides a full 512K RAM expansion following the DK'Tronics/Amstrad specification.

Adding RAM to the older CPC464/664 computers is generally much more problematic than with the later models. Many of the card features are specific to these machines.

Like other RAM cards, it provides full DK'Tronics compatibility when used with the CPC464 and CPC664. This is sufficient to run the vast majority of software requiring additional RAM including CP/M Plus, demos such as Phortem and Batman Forever and many games.

The card also provides a unique 'shadow mode' which enables perfect Amstrad CPC6128 video mode C3 operation on CPC464/664 computers[2]. In shadow mode these older machines can now run FutureOS and other software relying on this video mode and which previously would run only on CPC6128s and later machines. Shadow mode can also enable a 464 to run entirely from the card RAM without using base RAM other than for the video display. This may be useful for reviving or at least diagnosing CPC464s with faulty internal RAM.

RAM Card features are controlled DIP switches which, used in combination, provide the following controls:

- Overdrive ON or OFF
  - select 464/664 mode (ON) or 6128/Plus mode (OFF)
- Shadow Mode ON or OFF [464 mode only]
  - ON provides 'perfect' C3 mode/ OFF provides DK'Tronics C3 mode
  - NB Shadow mode requires 64KB of RAM, reducing the effective capacity of the card to 448KB
- Full or Partial Shadow mode [464 mode only]
  - Partial shadow mode uses shadow memory only for reads from remapped RAM area in mode C3

- Full shadow mode services all CPU base RAM reads from expansion card RAM
  - Base RAM still used for video output via the CRTIC
- Full shadow may be useful for reviving '464s with faulty base RAM or at least diagnosing related problems but partial shadow is the default.

## Compatibility

The following table sets out the basic RAM card configurations required and compatibility achieved with different CPC motherboards.

	Standard Setting		Overdrive Setting		Overdrive/Shadow Setting	
Computer	Expansion	C3 Mode	Expansion	C3 Mode	Expansion	C3 Mode
<b>CPC464</b>	NA	NA	512K	DK'T	448K	Amstrad
<b>CPC664</b>	NA	NA	512K	DK'T	448K	Amstrad
<b>CPC464 [ASIC]</b>	512K	DK'T	NA	NA	NA	NA
<b>CPC464 Plus</b>	512K	DK'T/Amstrad	NA	NA	NA	NA
<b>CPC6128 Plus</b>	512K	Amstrad	NA	NA	NA	NA
<b>KC Compact</b>	NA	NA	512K	DK'T	NA	NA

RAM expansion modes C0-C2 and C4-C7 work identically across all supported machines. Only the special C3 mode (requiring remapping of base memory) behaviour differs from one model to another.

On all machines the card will provide a 512KB expansion with either DK'Tronics or Amstrad C3 mode operation.

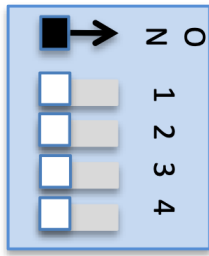
Perfect Amstrad C3 mode operation is available on all machines other than the very late CPC464 costdown revision (ASIC in place of earlier gate arrays) and the KC Compact. These machines will still get a 512KByte expansion but are limited to the DK'Tronics type C3 mode.

By default a CPC464 Plus will also get a DK'Tronics C3 mode unless a resistor is added to the motherboard. The CPC464 Plus and CPC6128Plus motherboards are identical and this resistor is an factory option component which distinguishes between the two. It is included in the CPC6128 Plus but omitted from the CPC464 Plus builds and is needed to configure the ASIC for the additional RAM banks and enable the C3 mode RAM remapping.

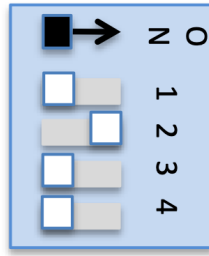
When using the CPC464/664 in shadow mode the effective capacity of the card is reduced by 64K to accommodate shadowing of base memory.

## DIP Switch Settings

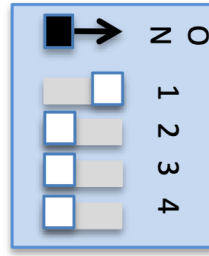
## Revaldinho 512K RAM Card Quick Reference



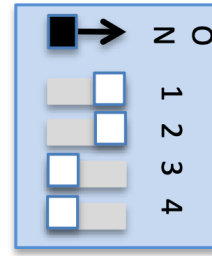
CPC6128/Plus,  
Late CPC464,  
KC Compact



CPC464/664  
DK'Tronics



CPC464/664  
FutureOS



CPC464/664  
Full Shadow

For other settings see the release notes file at  
[https://github.com/revaldinho/cpc\\_ram\\_expansion](https://github.com/revaldinho/cpc_ram_expansion)

### Power ON

- Board requires ~90mA @ 5V
- External PSU recommended with all expansion boards
- Always power ON RAM card before CPC, when using external PSU
- DIP switches are read on CPC Power up

The new DIP settings and effects are listed below:

Config	DIP 1234	464/Z80 overdrive	Port	Shadow/Bank	RAM	C3 Mode
<b>0</b>	<b>0000</b>	<b>OFF</b>	<b>7Fxx</b>	<b>None/x</b>	<b>512KB</b>	<b>AMSTRAD 6128</b>
<b>4</b>	<b>0100</b>	<b>ON</b>	<b>7Fxx</b>	<b>None/x</b>	<b>512KB</b>	<b>DK'Tronics</b>
<b>8</b>	<b>1000</b>	<b>ON</b>	<b>7Fxx</b>	<b>Partial/lo</b>	<b>448KB</b>	<b>AMSTRAD 6128</b>
<b>12</b>	<b>1100</b>	<b>ON</b>	<b>7Fxx</b>	<b>Full/lo</b>	<b>448KB</b>	<b>AMSTRAD 6128</b>

NB DIP switches 3 and 4 are not used with this firmware.

Recommended (and tested) configurations for the RAM card on its own are shown in bold in the table. E.g.

- 0 for CPC6128 providing standard 512KB expansion
- 4 for CPC464 providing 512KB expansion with DK'Tronics C3 mode
- 8 for CPC464 providing 448KB expansion with Amstrad C3 mode

Specification of other configurations is untested and may be changed in any future revisions.

## Release Notes

RC-6-Fighter is the latest firmware for the RAM card.

This release is based on RC-5-Elephant and improves low voltage operation of the card in all modes. Cards have been tested with several CPC running FutureOS and various RAM Tests and demos (including Batman and Phortem) down to around 4.1V. This should make the cards much more tolerant of poor CPC supplies and remove any need for additional external power supplies.

Unlike RC-5, the lower DIP switches are no longer used - this is because the revised logic already fills up the CPLD chip. So, the card is now always mapped to the usual IO port &7Fxx, and doesn't have an option to relocate to &7Exx as did RC-5.

In shadow mode, the shadow bank is fixed at number 3, where previously RC-5 gave a choice of 3 or 7. Number 3 was chosen for compatibility with the DK'Tronics silicon disk software. This does an imperfect check for expansion RAM and fails to spot that the shadow bank is duplicating base RAM. So, it's not possible to use the silicon disk software with the bank set at 7 and hence the number 3 is chosen instead. The Dk'Tronics Bank manager software does correctly test for available memory and is able to find 192K (out of the maximum 256K it looks for) in banks 0,1 and 2.

## Footnotes

[1] Compatible expansion boards include ToTO's Mother X3, Revaldinho CPC Backplane, LambdaMikel LambdaBoard.

[2] When using shadow mode the card size is effectively reduced to 448KBytes

[3] Shadow mode cannot presently be used when deploying pairs of RAM cards or in conjunction with other RAM cards.

[4] The Batman Forever demo does not run on CTRC Type 2 machines