Paul D's CoCo Hardware Page

Disclaimer: The information presented here is as is, without warranty. Use at your own risk!

If you are technically able to construct your own hardware, then plug in your soldering iron, this page is for you.

CoCo IDE   Communication Cables   CoCo I/O Addresses   Memory Fixes and Upgrades

512K Memory Info   J&M Disk Controllers   Rom Part Numbers   Program your own Rom Pak

CoCo to PC Serial Cable (unidirectional)
Build this cable to move files from your CoCo to your PC, using the CoCo's 4 pin serial port and simple printer output routines. Don't bother looking for this cable in any mainstream computer store, you won't find it. Here is the info to build your own.

The CoCo uses a 4 pin DIN style connector, labelled SERIAL I/O on the back of the box. This is what many call the "Bit - banger port". Your PC will hopefully have an available COM port, which will have a 9 or 25 pin D shell connector.

To assemble your cable, you need a 3 conductor cable, a 4 pin male DIN connector, and a 9 or 25 pin D shell connector to match your PC. Another option is to get a hold of an assembled PC serial cable and a CoCo printer cable. Cut both cables and splice the appropriate wires. An ohmmeter is a must to determine proper connection and isolation of each conductor in the cable. The pin assignments are normally labeled on the connector. Go here to test this cable. Connect as follows :

4 pin CoCo DIN	9 pin D shell	25 pin D shell
Pin 2 RD	Pin 4 DTR	Pin 20 DTR
Pin 3 GND	Pin 5 GND	Pin 7 GND
Pin 4 TD	Pin 2 RD	Pin 3 RD

PC to CoCo serial cable (bidirectional) Use for uploading / downloading files.

Build this cable, especially if you want to upload from the PC to the CoCo. This cable requires the use of a terminal program on the CoCo, although ASCII transfers can be done with simple programs on the CoCo.

This cable is visibly the same as the above cable, just wired different. Here are the connections :

4 pin CoCo DIN	9 pin D shell	25 pin D shell
Pin 2 RD	Pin 3 TD	Pin 2 TD
Pin 3 GND	Pin 5 GND	Pin 7 GND
Pin 4 TD	Pin 2 RD	Pin 3 RD

Combination bidirectional and upload only cable NEW!

If you need both styles of cables, here is my latest creation. This is constructed with two factory cables, spliced in a junction box that includes a switch to select either the Bidirectional or Upload only cable. Saves lots of cable swapping. The Pin 3 and 4 connections from the DIN cable are the same, you route the PIN 2 connection to a SPDT switch that selects either the DTR or TD lines on the PC's end. If you are not too good with the soldering iron, I do custom assemble these cables here, follow this link

Some info I have posted on using this cable to transfer files back and forth to the PC is located here

CoCo to CoCo Serial Cable (bidirectional)

This cable is used to communicate between 2 CoCo's using the SERIAL I/O port. All that is required to build this cable is a standard 4 pin DIN cable (printer cable). The standard printer cable has two identical ends, with all corresponding pins connected.

To make this cable, it is necessary to cross the transmit and receive lines. This connects the transmit output from one CoCo to the receive input of

another. On one end, pry up the lock tab, slip back the connector sleeve. Unsolder the wires going to pins 2 and 4. Cross the wires and resolder. Verify your connections with an ohmmeter, pin 2 should be connected to pin 4 on the opposite end of the cable.

Just remember this cable will not work the next time you hook up to your printer. Go here to test this cable.

CoCo Memory Fixes and Upgrades

This is a fairly complex subject. Each computer in itself is not all that complicated, you just have to identify your model and its current memory configuration. In the CoCo 1 series, I am aware of 3 different boards, and they may be configured from between 4K and 64K of memory. There are 2 or more versions of the CoCo2, which have 16K to 64K of memory. Then the CoCo3 came with 128K of memory standard, I know of 512K expansions, and there are others larger than that. I have a fair amount of upgrade information laying around, but I am only showing items that I have had experience with.

The Failed Dynamic Ram

If you have a CoCo that displays "garbage" on the screen after powerup, or appears to power up okay, but crashes at any input, or displays a few odd characters on the video screen, your CoCo probably has one or more failed ram chips. You don't even have to be using your CoCo for these to fail. I have placed CoCo's into storage in good working order, only to find them kaput when brought back into service. Here are some tips and tricks I have used to identify the failed component.

If you are fortunate enough that your CoCo will still respond to keyboard input, it can help you determine which ram chip has failed. Try to locate a faulty ram address, by using POKE and PEEK commands. Once you have found one, try swapping ram chip locations. Be sure to unplug your CoCo before you open its case to access the board. If your ram is socketed,

swap a pair, and restart the CoCo. Try the same address location, if it is now okay, and the fault has moved elsewhere, the faulty ram is one of the swapped chips. If it is still the same try swapping another pair and check your results. You can often isolate one faulty ram using this method, but if you have 2 or more faulty rams it will be more difficult to isolate.

If your CoCo wont run, try the reset button. I did one recently that was crashed until I temporarily removed the Extended Basic rom, running only on Color Basic. The computer ran well enough to examine memory and isolate the faulty chip.

Be sure when you are fiddling with the rams that you are using an anti-static strap. The dynamic ram chips are usually fairly tough, but the 6883 SAM is not. You don't want to zap this one out as it will cost you more to replace than the computer is worth.

If you have isolated your faulty ram chip, you need to find a new one to replace. Here is a cross reference of some of the common CoCo ram chips;

Device	Chip Identification	Actual Usage
8040027	4027 4K * 1	CoCo 1 4K (8)
8040016	4116 16K * 1	CoCo 1 16K (8)
8040517	2118 16K * 1	CoCo 2 16K (8)
8040665	4164 64K * 1	CoCo 32K or 64K (8)
	4416 16K * 4	CoCo 2 16K (2)
	4464 64K * 4	CoCo 2 64K (2)
	41464	CoCo 3 128K (4)
	41256	CoCo 3 512K (16)

Replace Those Old Unreliable Hard to Find 4116 DRAM Chips

The 4116 chip found in old 16K CoCo 1 machines is the most prone to fail. It was readily available 10 or more years ago but is getting harder to find all the time. You can use a more common 4164 to replace this chip with a few modifications. I recently installed 3 modified 4164's in with 5 original 4116 DRAM and found it to work okay. For instructions to modify, email me. The other alternative is to upgrade to 32 or 64K by replacing all 8 DRAM. See following instructions to do this.

Color Computer 1 Memory Upgrade to 32K

There are 3 different versions of this computers board. Have a look just below the cartridge port, there should be a part number followed with a -D or -E suffix. This is the version of the board. You may also have a -C (antique) or -B(another antique) or a newer "F" boardd. (actually marked NC) If your board is a B or a C, Radio Shack recommended replacement with an "E" board before the memory upgrade was done. If you have a D board the modifications are fairly drastic, I guess they were built in the days when 4K was standard and 16K was big memory. I have the info for this upgrade, but contact me via e-mail to obtain it.

UPGRADE MUST BE PERFORMED CORRECTLY AND COMPLETELY ON THESE OLD BOARDS, FAILURE TO SET A JUMPER CORRECTLY CAN FAIL YOUR NEW 64K CHIPS OR YOUR MOTHERBOARD. USE THE CORRECT PROCEDURE FOR YOUR BOARD, EACH REVISION OF BOARD HAS A DIFFERENT PROCEDURE TO UPGRADE.

The old 4116 chips used a triple power supply, 5V, -5V and +12V. Moving jumpers changes this voltage to the 5V that the 4164 requires.

If you have an E board, the upgrade is a little easier. You still have to warm up the soldering iron for a couple of connections, but the rest of the procedure is fairly basic. This board has a series of jumpers that allow selection between 4, 16, and 32K. You can further modify to 64K if desired. One item to check before upgrading is to verify that your Basic

Rom is version 1.1 . You would probably only find this rom on a D board, but it is worth checking anyway. If you are running Color Basic only, the version is displayed anytime you start up. If you have Extended Basic, it will most likely display as version 1.0, but this is not the rom you are after. Type in EXEC 41175 to determine your rom version. Here is the procedure to upgrade to 32K on an "E" model board.

Parts required:

1 Color Basic Rom Ver. 1.1 (if required, see above)
8 4164 dynamic ram chips
1 33 ohm 1/4 watt resistor

Procedure for "E" model 32K upgrade:

Be sure your computer is unplugged before opening

Replace all 8 existing ram chips with the new 4164 devices. Replace the Basic Rom if required. Be sure to socket the new chips properly, ie pin 1 location correct.

Set all 6 jumpers to 32K position. You will probably have 5 jumpers on the board, and at the sixth just have a set of pins. This last set of posts with no jumper is at the left of U8, a 6821 PIA. It is marked HIGH /LOW. Connect the unmarked center pin to the pin marked LOW. I usually solder a wire between them. Two pins on right side of the SAM chip (6883) are marked R83. Solder your 33 ohm resistor here.

Lastly, you have to disconnect capacitors C31, C35, C45, C48, C61, C64, C67, C70. I usually just snip the leads off to disconnect. Capacitors are right next to ram chips. You need very thin cutters to do this, be sure to wear safety glasses as the capacitors may have glass cases and are prone to shatter.

You should have 32K. For the 64K mod of this board, e-mail me to request it.

CoCo IDE Interface

I have not tried this one personally, but there is a schematic [here](#)

512K Memory Upgrades for CoCo3

These are daughter cards that slip into the CoCo3 motherboard above the existing ram chips. I have seen these boards produced by Tandy, Disto and Performance Peripherals, and I am sure there are a few more. I believe Mark Marlette still produces one that uses 256K SIMMS. These earlier boards all use 16 41256 DRAM chips. These boards produce alot of heat, and create higher loads for the minimal CoCo supply, so good ventilation is essential. One thing I have noticed is often the power supply capacitors leak near the heatsink on these units. Have a look at this picture in the lower left corner, C29 and C31 often loose their electrolyte, as noticed by the brown stain at thier base. These capacitors are fairly easy to replace. Shown on this board below is a Performance Peripherals 512K board.
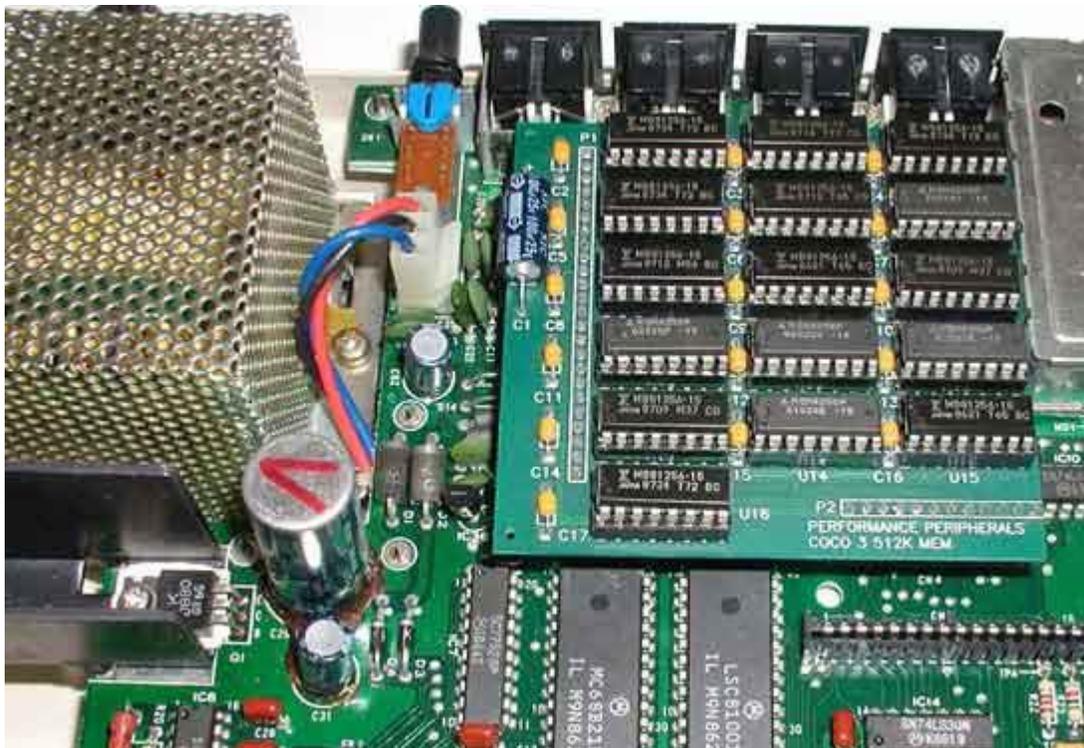
Below are a couple of pictures of a Tandy 512K upgrade, all you will see is the ground plane from the top, also pictured is the board removed from the mainboard.
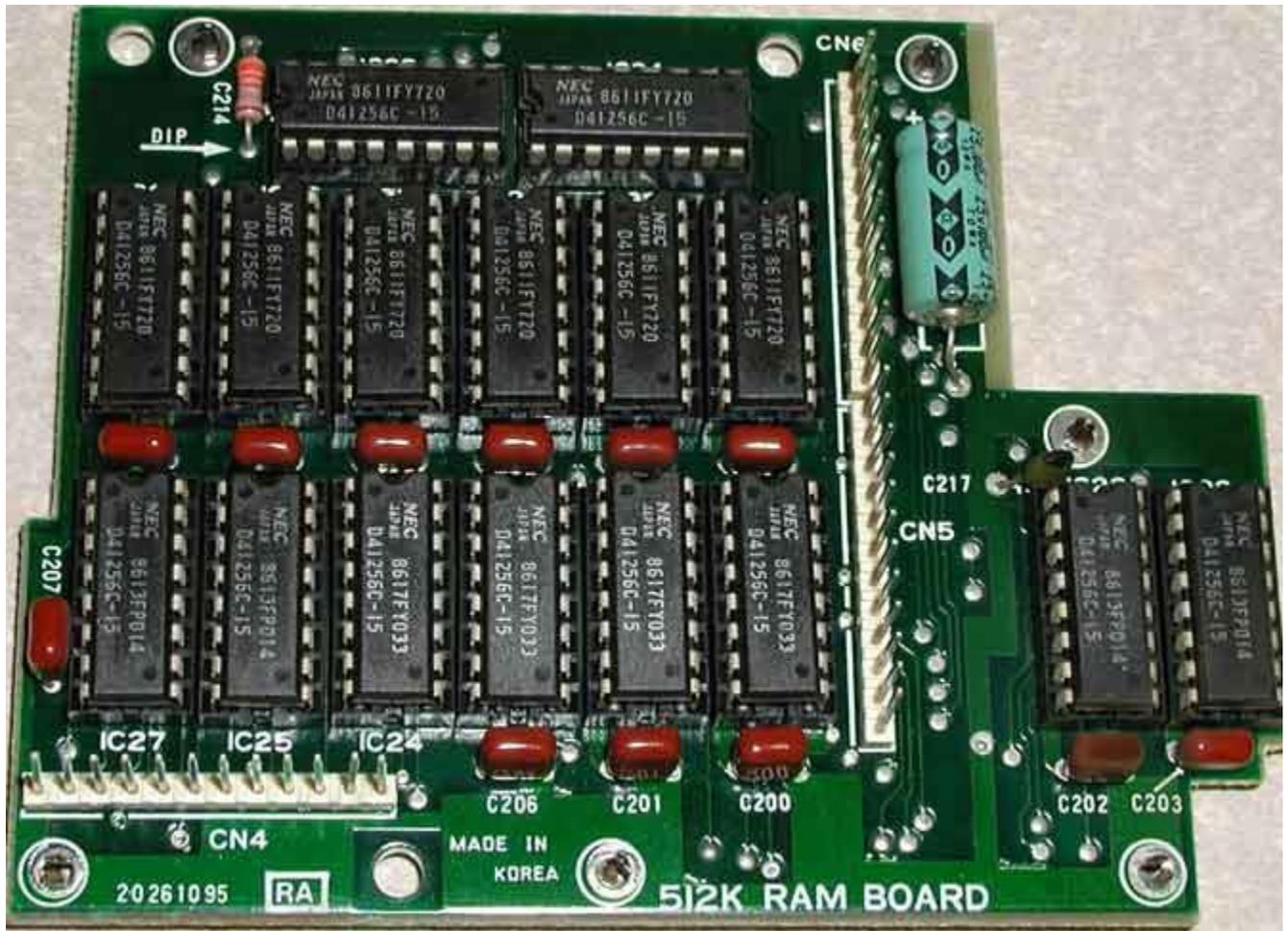
To install any of the 512K upgrades, remove the 4 socketed 41464 DRAM chips , they are all in a row in IC16 - IC19, before installing the expansion board. Don't be tempted to leave this original 128K of memory in place, it will not add to the 512K. Upon installation, the upgrade makers also recommend cutting several capacitors on the mainboard. Tandy recommends desoldering C65, 85pf capacitor with their upgrade.

Color Computer Rom Part Numbers and Checksums

All early CoCo's used socketed rom chips. Later versions had the rom's soldered to the board. Here are part numbers of the roms and their corresponding revision.

8040364	**Color Basic 1.0**	
8040364A	**Color Basic 1.1**	
8040364B	**Color Basic 1.2**	**5917**
8042364	**Extended Color Basic 1.0**	
8042364A	**Extended Color Basic 1.1**	**3338**
	Disk Basic 1.1	
EDC9		

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