COMPUKIT© UK101

32K RAM AND 16K EPROM UPGRADE

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This RAM upgrade will increase the available RAM from 4 or 8K up to 32K. It is a non-destructive and entirely reversible upgrade. The upgrade requires the on-board RAM chips (U31-U38 and U45-U52) to be completely removed. The 16K EPROM upgrade will allow for upgraded BASIC ROMs to be included as well as BASIC5 and BASIC6, etc. If the EPROM upgrade is performed then ROMs U9 to U12 inclusive must be removed.

Important:
The video RAM chips (U40 and U39) must be left in place. This upgrade does not affect the video RAM.

THE RAM UPGRADE

The upgrade is built on a small carrier board that sits in the 6502 CPU socket (U8). The displaced 6502 chip is positioned in the 40-pin socket on the carrier board. All power, address, data and logic signals are taken from the 6502 socket. It was necessary to use two extended pin sockets for the CPU, one to be soldered into the carrier board (this necessitated the connection holes widening to 1.5mm diameter), the other to act as a spacer when plugging the carrier board into the 6502 socket.

The CY7C199CN 32K static RAM chip was used because it was to hand. This is a 28-pin DIL package that fits into a 0.4" pitch. The actual chip used is not critical; any 32K CMOS static RAM chip could be used in either 0.4" or 0.7" pitch.

The only other component needed is a quad 2-input NAND gate, SN7400 or similar.

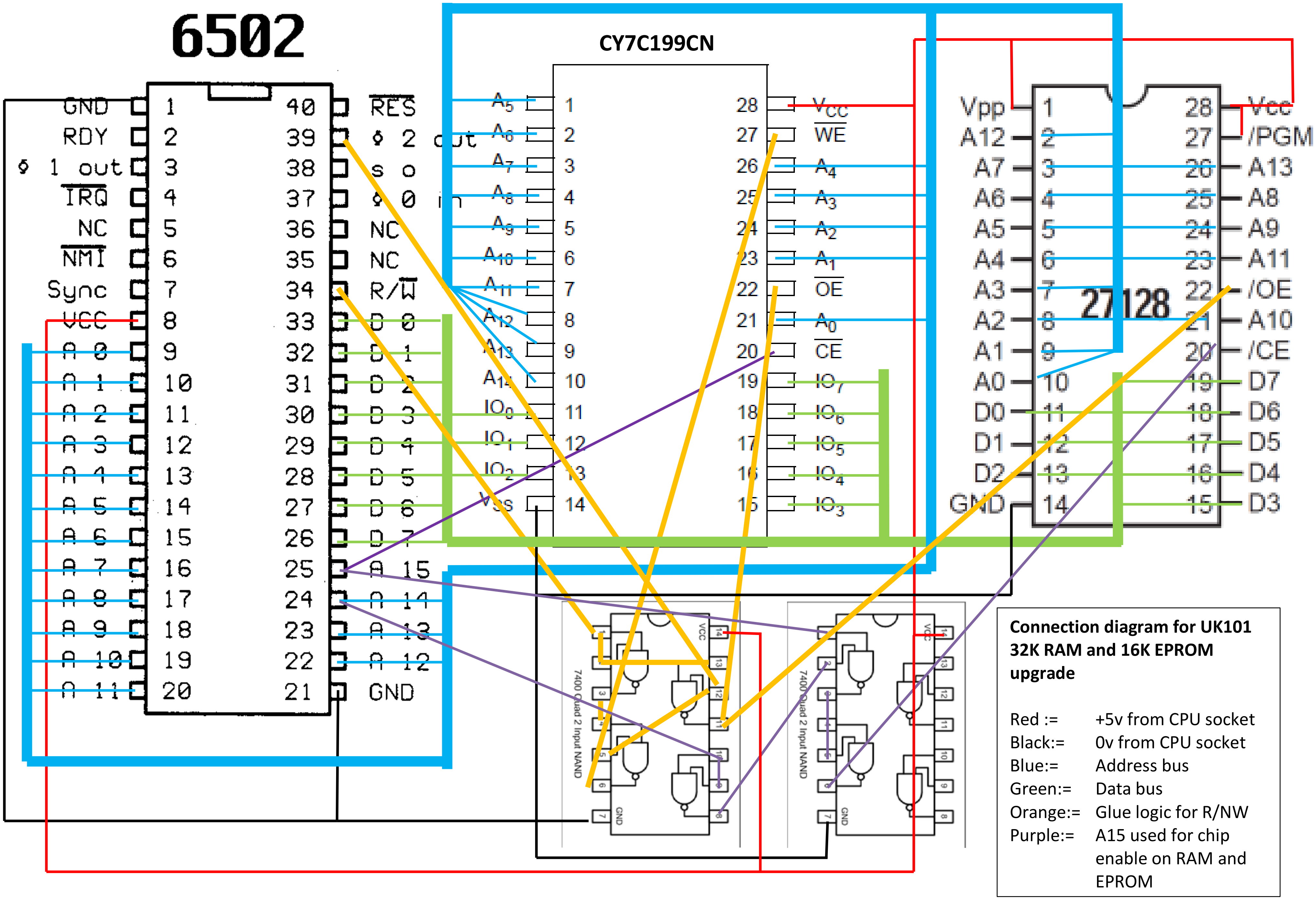
The connection diagram is shown on the following page. It is viewed from above. There is no need to take particular care with the wiring. The prototype was wired using 36AWG, plastic insulated, wire-wrap wire. Address and data lines used different colours to identify them. Wiring was point-to-point, soldering to the respective IC socket pins. Power lines were wired on the top of the carrier board using 24SWG solid wire. It was not necessary to add decoupling capacitors.

Connections were made one at a time and checked off on the wiring circuit. Once completed the wiring was again checked for shorts and continuity using a multimeter.

Installation was a phased process, checking at each stage.

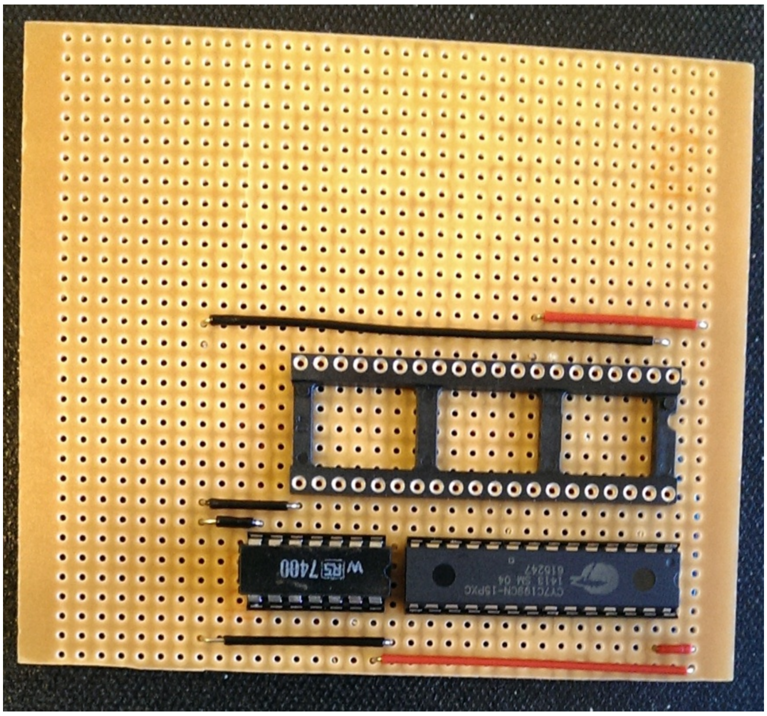
1. Remove the 6502 CPU and carefully insert the carrier board 40-pin extended socket into U8 socket on the main UK101 motherboard. Press home firmly.
2. Insert the 6502 chip into the carrier board, observing correct orientation. Do not at this stage insert the RAM chip or the SN7400. Switch on the UK101. If all the wiring has been completed correctly the familiar D/C/W/M startup prompt should appear. If not it will be necessary to check the wiring and soldering on the carrier board.
3. Once stage 2 has been passed correctly, switch off the UK101 and insert the SN7400 chip observing correct orientation. The UK101 should start normally. If it does not the wiring of the SN7400 must be checked.
4. Now switch off the UK101 and remove the user-RAM chips, U31-U38 and U45-U52. Insert the 32K static RAM chip into its socket on the carrier board, observing correct orientation. Restarting the UK101 should give 31999 bytes free.

Congratulations your UK101 is now a 32K machine.



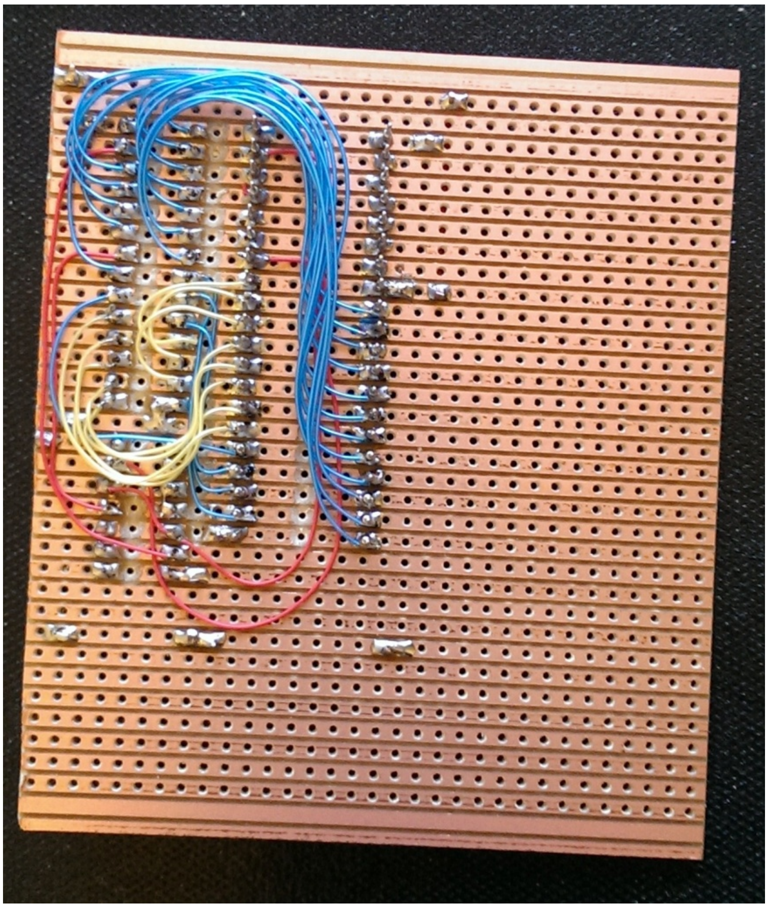
6502
CY7C199CN
27128
7400 Quad 2 Input NAND
GND
VCC
GND RDY ϕ 1 out IRQ NC NMI Sync VCC
A 0 A 1 A 2 A 3 A 4 A 5 A 6 A 7 A 8 A 9 A 10 A 11
RES ϕ 2 out S O ϕ 0 in NC NC R/W
D 0 D 1 D 2 D 3 D 4 D 5 D 6 D 7
A 15 A 14 A 13 A 12 GND
Vcc WE OE CE Vss
Vpp A12 A7 A6 A5 A4 A3 A2 A1 A0 D0 D1 D2 GND
Vcc /PGM A13 A8 A9 A11 /OE A10 /CE D7 D6 D5 D4 D3
Connection diagram for UK101 32K RAM and 16K EPROM upgrade
Red := +5v from CPU socket
Black:= 0v from CPU socket
Blue:= Address bus
Green:= Data bus
Orange:= Glue logic for R/NW
Purple:= A15 used for chip enable on RAM and EPROM

The pictures below show some of the stages in making the prototype.

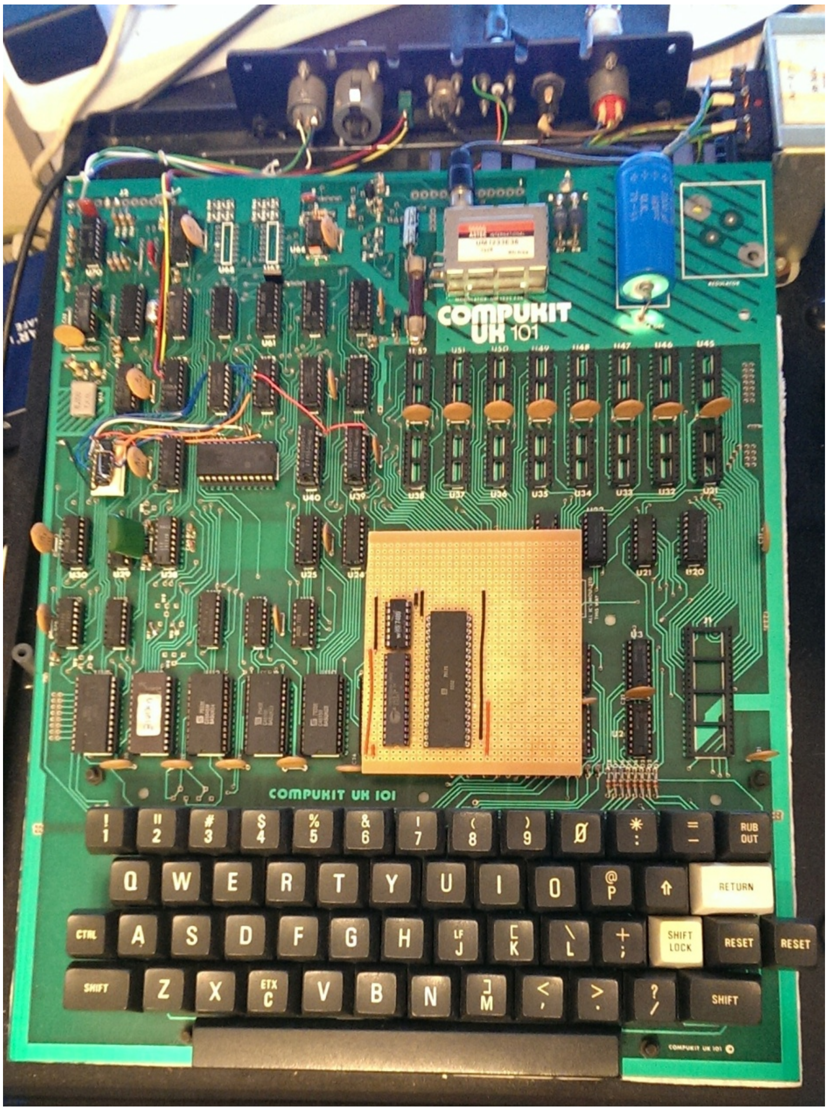


This is the component side view of the prototype veroboard showing the RAM and SN7400 inserted. The wires are the various power connections to the chips.

The extra area above the 40-pin socket is for future inclusion of a 32K eprom and decoding circuitry. The eprom will hold BASIC and the OS and a custom filing system.



This is the wiring side of the carrier board showing the point-to-point wiring. The long blue wires are held in place by a second extended pin socket used as a spacer between the carrier board and the U8 socket.



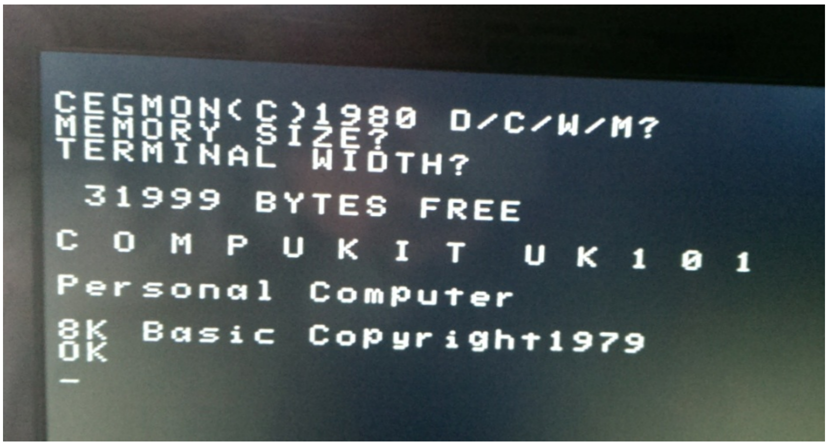
The carrier board sits firmly and neatly over the CPU socket.

The RAM area just below the UHF modulator and blue PSU smoothing capacitor is shown de-populated.

The extra wiring in the upper left of the circuit board is for a 300/600 baud tape speed upgrade and for a 48x32 video upgrade.

The 5v power regulator is on a large heat-sink mounted next to the transformer beneath the main circuit board.

As a result of this upgrade RAM power consumption is reduced by over 80% and the PSU runs cooler. It could still benefit from a cooling fan.



The final result - a 32K UK101

THE EPROM UPGRADE

This upgrade replaces the four on-board BASIC ROMs with a 16K EPROM. Each BASIC ROM is 2K in size so the EPROM has an extra 8K spare for ROMs of your choice. The address space of the EPROM is $8000 to $BFFF and this is shown in the table below;

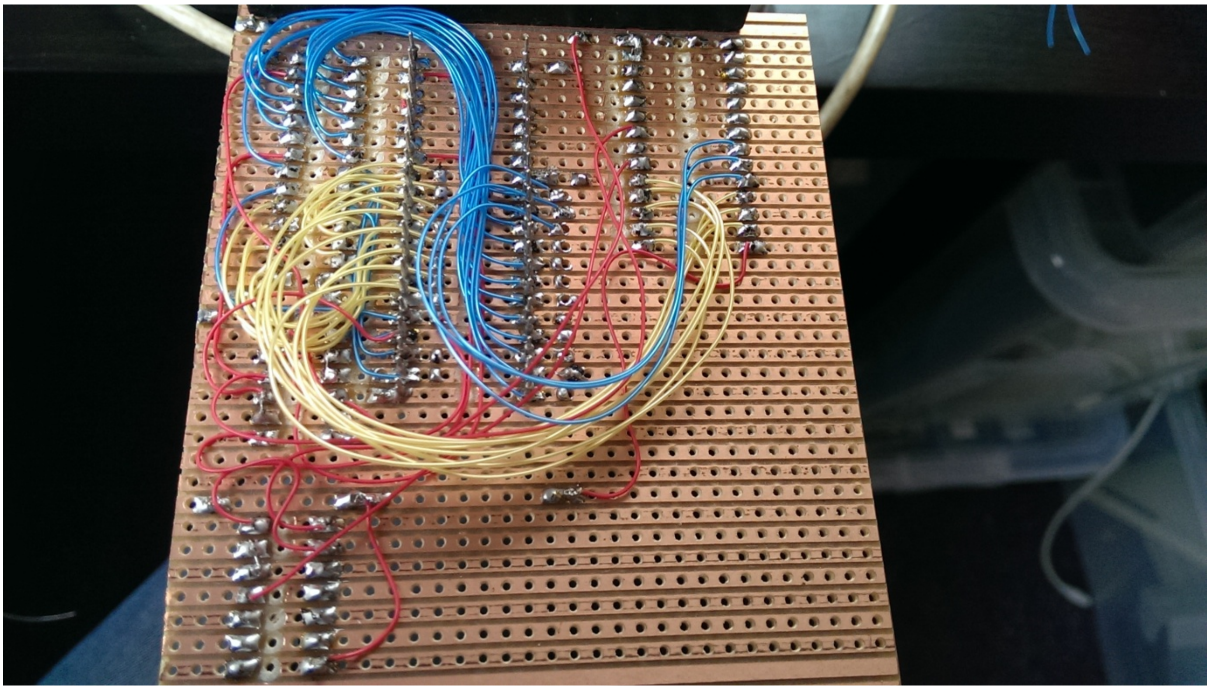
ADDRESS	CONTENTS
$8000 - $87FF	
$8800 - $8FFF	
$9000 - $97FF	BASIC 5
$9800 - $9FFF	BASIC X
$A000 - $A7FF	BASIC 1
$A800 - $AFFF	BASIC 2
$B000 - $B7FF	BASIC 3
$B800 - $BFFF	BASIC 4

The constructional diagram is shown above. The chip enable line is provided from;

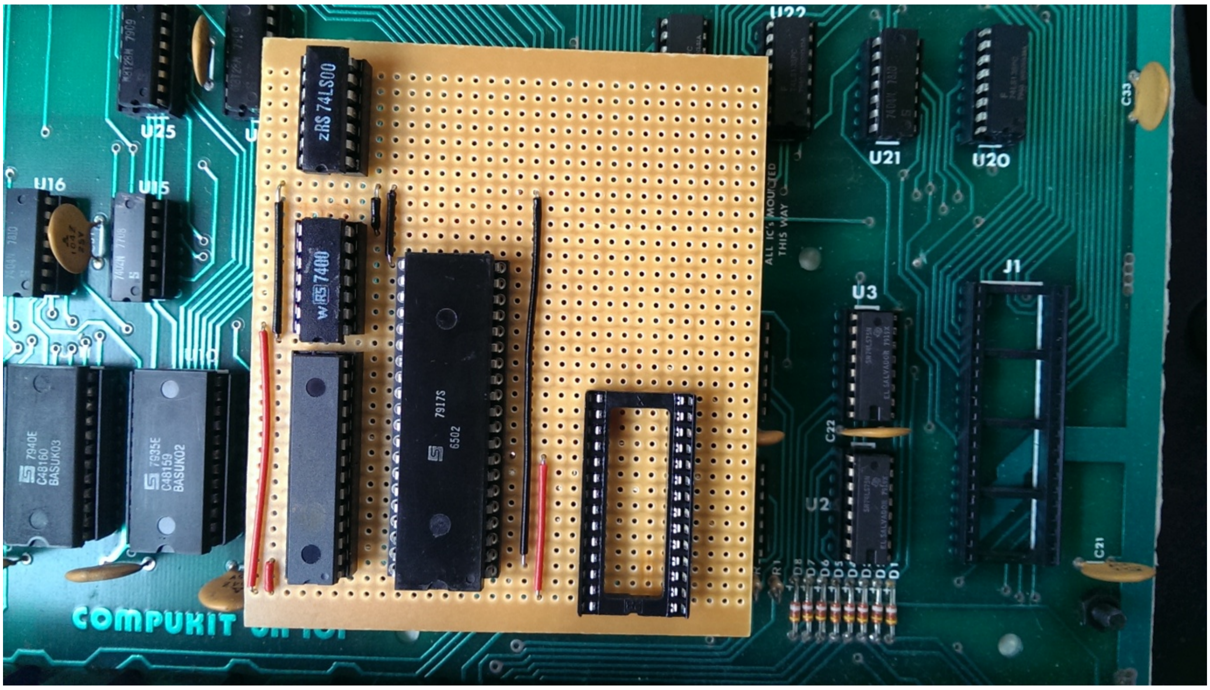
NOT(A14) NAND A15

This requires a second SN7400, quad 2-input NAND gate, fitting to the board. The spare NAND gate from the first SN7400 is used, wired as an inverter, to obtain the NOT(A14) signal. One NAND gate from the second SN7400 is used to provide the NOT(CE) signal to the EPROM, leaving three spare gates for other use.

Stages in construction of the prototype are shown below.



Wiring the 28-pin EPROM socket and the extra SN7400 quad NAND gate



The completed board plugged back into the 6502 socket and awaiting the 16K EPROM