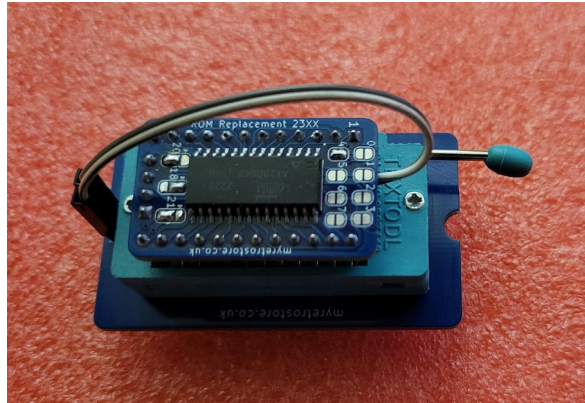# Programming ROM Replacement 23XX

Introduction

The 23XX is a replacement ROM for the 2316 / 2332 / 2364 ROMs which is used on many old retro computers like the Commodore and Atari.

The original 23XX rom is a 24 pin chip which is no longer manufactured. In order to replace this you needed to use a 28 pin to 24 adapter so that you could use a 27CXXX ROM. As the 27CXXX chips are also no longer manufactured this leads to stock problems. The 28 to 24 adapter is also larger than the original 23XX which can lead to physical space issues, and the 27CXXX also requires a UV light to erase.

This is where this design comes in. It uses a modern and available SMD flash EPROM while keeping the 24 pin package, so it's no larger than it needs to be, and can be easily re-programmed with the required hardware.

This design also makes correct use of the CS2/CS3 active high/low lines which in many adapters are hardwired to VCC/GND.

Commodore for some reason decided to have multiple versions of the 2332 and 2364 with different active high/low CS pins. This design caters for all these options by setting various solder jumpers.
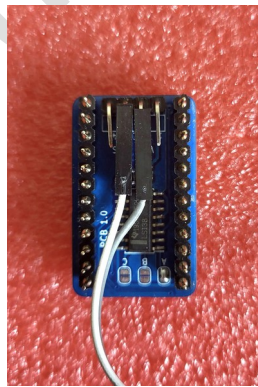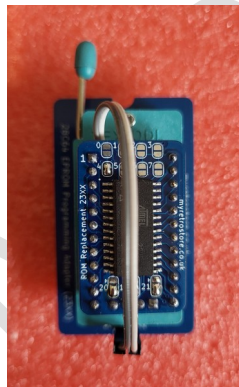
Programming

To re-program the 23XX you need to purchase the 23XX programming adapter, which allows the AT28C64 chip to be re-programmed with a suitable programmer like the TL866.

Before programming you need to change a few solder jumpers on the PCB:
- Bridge jumper 20, 18, 21 to position 1-2 (Top)
- Remove any jumpers on 0 to 7
- Remove the 2 jumpers from underneath the PCB (WE / CS)
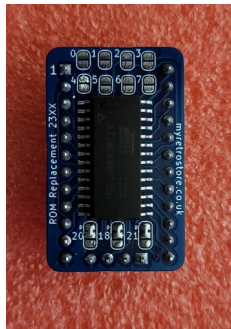
- Using the 2 pin cable connect WE / CE pins from the 23XX to the programmer.
- Insert the 23XX into the programmer. **Note the orientation – Pin 1**

- Using a programmer like the TL866, set the chip to AT28C64B, load the firmware and program the ROM

    To make sure the addressing is always correct if you are writing a 2Kb ROM, copy the ROM 4x to make 8Kb which will fill the entire contents of the 28C64.
    Similarly if you are writing a 4Kb image, then duplicate this to make 8Kb.

    Under DOS, for example to do a 4Kb image:
    copy /b 4k_rom.bin + 4k_rom.bin 8k_rom.bin

Then write the 8k ROM.

- Once programming is completed you will need to set the jumpers for the ROM you are trying to replace.

- Re-add the 2 jumpers to WE / CS pins on the bottom on the PCB
- Set the jumpers as per the below table:

2316 /CS1 /CS2 CS3		18 Short 2-3	20 Short 2-3	21: Short 2-3	4: Shorted
2332 /CE1 CE2	A: Shorted	18 Short 1-2	20 Short 2-3	21: Short 2-3	4: Shorted
2332 /CE1 /CE2	A: Shorted	18 Short 1-2	20 Short 2-3	21: Short 2-3	0: Shorted
2364 /CE1	A,C: Shorted	18 Short 1-2	20 Short 2-3	21: Short 1-2	0: Shorted
2364 CE1	A,C: Shorted	18 Short 1-2	20 Short 2-3	21: Short 1-2	2: Shorted

Make sure the jumper are correctly shorted and not shorting all 3 pins

Insert the ROM into the computer, again making sure the orientation is correct before applying power.