User Guide

V1.0

Contents

1 Introduction

neatROM is a replacement circuit for 24 & 28 pin 8bit ROMs used in retro computers. The idea was to have a neat design like my other projects neatPLA, neat8701 & neatSRAM. All components are on the bottom side.

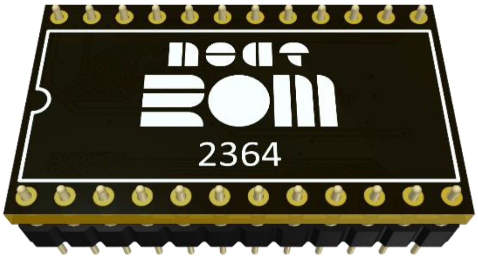


Figure 1. neatROM 2364

The 24pin version is called **neatROM 2364**. It supports:

- Use like a generic 2332 or 2364 replacement ROM.
- 16 jumper selectable 4/8kB banks.
- CS signal to pin 20. Also supports CS2 signal to pin 21 in VIC-20 character ROM mode.
- Reprogrammable with an adapter.
- Switchless Kernal Selector for VIC-20 & C64. Switch between two different Kernals with the Restore-key. Third Kernal selectable with a jumper.
- multiROM feature. Use only one neatROM 2364 in a C64 or VIC20 and replace missing ROMs with a connection to the missing ROM CS signal. In a long motherboard C64 one neatROM 2364 can replace all 3 ROMs (Basic, Kernal, Character). In VIC-20 one neatROM 2364 can replace both Kernal & Basic ROMS.

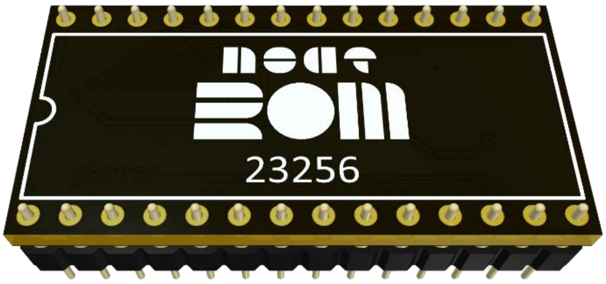


Figure 2. neatROM 23256

The 28pin version is called **neatROM 23256**. It supports:

- Use like a generic 2764, 23128, 27128, 23256 or 27256 replacement ROM.
- 8 jumper selectable 16kB banks or 4 jumper selectable 32kB banks.
- CS signal to pin 22.
- Reprogrammable with an adapter.
- Switchless Kernal Selector for C64 & C128. Switch between two different Kernals with the Restore-key.
- multiROM feature. Use only one neatROM 23256 in a short motherboard C64 and replace missing character ROM with a connection to the character ROM CS signal. Usage in C128 is under study.

2 Generic ROM replacement

2.1 neatROM 2364: generic 2332 or 2364 ROM replacement

The neatROM 2364 got 16pcs of 8kB banks selectable with jumpers. If you use 4kB ROM images, then it's easiest to copy the ROM image twice to fill an 8kB bank. There is a pulldown resistor on the A12 signal on the PCB, but the target motherboard may have the pin pulled high.

The banks 1 to 16 are selected with jumpers as shown in Table 1. Position 1 (grey cells) can be left empty if there is a jumper in positions 2 and/or 3. Jumper positions 2 & 3 set the A13 & A14 signals to 0 if jumper is present. In positions 5 & 6 the A15 & A16 signals are set to 1 if jumper is present. The neatROM 2364 is disabled if there is no jumper in positions 1-3.

	Jumper position					
Address	**1**	**2**	**3**	**4**	**5**	**8Kb banks**
0000-1FFF	:			:	:	BANK 1
2000-3FFF	:	:		:	:	BANK 2
4000-5FFF	:		:	:	:	BANK 3
6000-7FFF		:	:	:	:	BANK 4
8000-9FFF	:				:	BANK 5
A000-BFFF	:	:			:	BANK 6
C000-DFFF	:		:		:	BANK 7
E000-FFFF		:	:		:	BANK 8
10000-11FFF	:			:		BANK 9
12000-13FFF	:	:		:		BANK 10
14000-15FFF	:		:	:		BANK 11
16000-17FFF		:	:	:		BANK 12
18000-19FFF	:					BANK 13
1A000-1BFFF	:	:				BANK 14
1C000-1DFFF	:		:			BANK 15
1E000-1FFFF		:	:			BANK 16

Table 1. neatROM 2364 banks selection.

Rows represent the pin header on the neatROM 2364. The black and grey boxes represent jumpers and the colons represent empty pin header pins. Pin header viewed as in Figure 3 where the jumpers are set for bank 7.

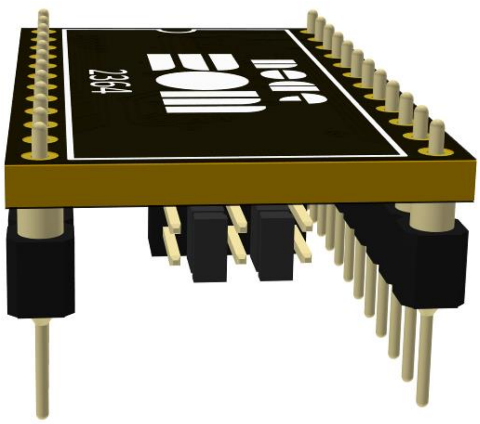


Figure 3. neatROM 2364 pin header and jumpers

2.1.1 VIC-20 character ROM mode

The VIC-20 character ROM got an extra chip select signal CS2. To enable the CS2 signal, the soldered short on the bottom side of the PCB must be in the C (Character) position. For default use the short must be in the D (Default) position. Change the short if needed. Notice the flash IC is not programmable if the short is in the C position.

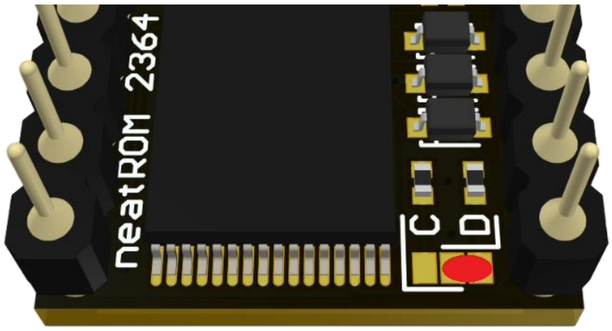


Figure 4. Default ROM mode.

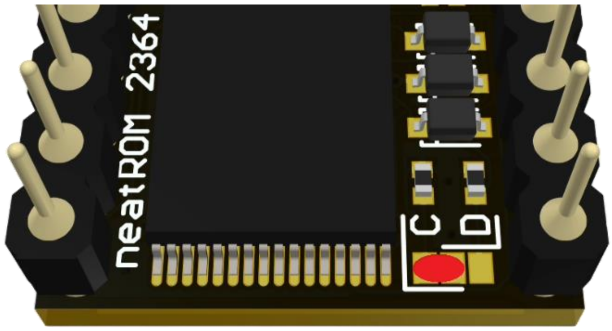


Figure 5. VIC-20 character ROM mode.

2.2 neatROM 23256: generic 2764, 23128 or 23256 ROM replacement

The neatROM 23256 got 8pcs of 16kB banks or 4pcs of 32kB banks selectable with jumpers. If you use 8kB ROM images, then it's easiest to copy it twice to fill a 16kB bank. There is a pulldown resistor on the A13 signal on the PCB, but the target motherboard may have the pin pulled high.

The 16kB banks and 32kB banks are selected with jumpers as shown in Table 2 and Table 3. Jumper position 1 is for multiROM CS signal. About that later in chapter 2.4. Jumper position 2 is for mapping A14 signal and enabling 32kB bank mode. Jumper positions 3-5 set the A14-A16 signals to 1 if jumper is present.

	Jumper position					
Address	**1**	**2**	**3**	**4**	**5**	**16kB banks**
0000-3FFF	:	:	:	:	:	BANK 1
4000-7FFF	:	:	■	:	:	BANK 2
8000-BFFF	:	:	:	■	:	BANK 3
C000-FFFF	:	:	■	■	:	BANK 4
10000-13FFF	:	:	:	:	■	BANK 5
14000-17FFF	:	:	■	:	■	BANK 6
18000-1BFFF	:	:	:	■	■	BANK 7
1C000-1FFFF	:	:	■	■	■	BANK 8

Table 2. neatROM 23256 16kB banks.

	Jumper position					
Address	**1**	**2**	**3**	**4**	**5**	**32kB banks**
0000-7FFF	:	■	:	:	:	BANK 1
8000-FFFF	:	■	:	■	:	BANK 2
10000-17FFF	:	■	:	:	■	BANK 3
18000-1FFFF	:	■	:	■	■	BANK4

Table 3. neatROM 23256 32kB banks.

Rows represent the pin header on the neatROM. The black boxes represent jumpers and the colons represent empty pin header pins. Pin header viewed as in Figure 6 where the jumpers are set for bank 6.

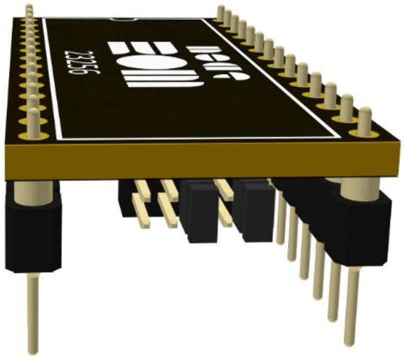


Figure 6. neatROM 23256 pin header and jumpers

2.3 Switchless Kernal Selector

There are some alternative Kernal ROMs for the C64, C128 and VIC-20 which bring extra features to the computers. The most common alternative Kernal is the JiffyDOS [1]. It's mostly used for speeding up the disk drive loading speed.

The old Kernal switching method included a toggle switch which was installed into the case and required to drill a hole. Switchless Kernal Selector design was made to save the drilling and spoiling of cases. I first published it in my blog back in 2014 [2].

Figure 7. First ever Switchless JiffyDOS installation

The Switchless Kernal Selector circuit works by capturing the state of the Restore-key signal at power-up or reset. The state is saved into a D-type flip flop.

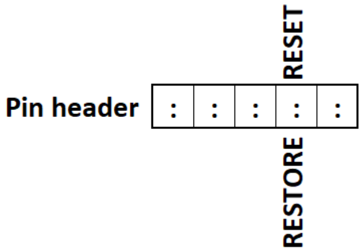
The output of the D-type flip flop IC handles the bank switching of the flash chip containing the original Kernal and JiffyDOS (or other alternative Kernal) images.

Pressing down the Retore-key while power-up/reset maps the same memory bank as having no jumper in the pin header position 4. Power-up/reset the computer without pressing the Restore-key maps the same memory bank as having a jumper in the pin header position 4. Flash the neatROM memory banks accordingly. See chapter 3.1 for examples.

2.3.1 Installation

For the circuit to work two wires need to be connected to the motherboard. The signals are RESTORE and RESET. The signals are connected to the neatROM pin header location 4. The upper pin is RESET and the lower pin is RESTORE.

Table 4. Restore & Reset signal pins



Use a 2-pin or a 2x4-pin female header and solder the wires to the header pins. Cut the pins shorter if desired.

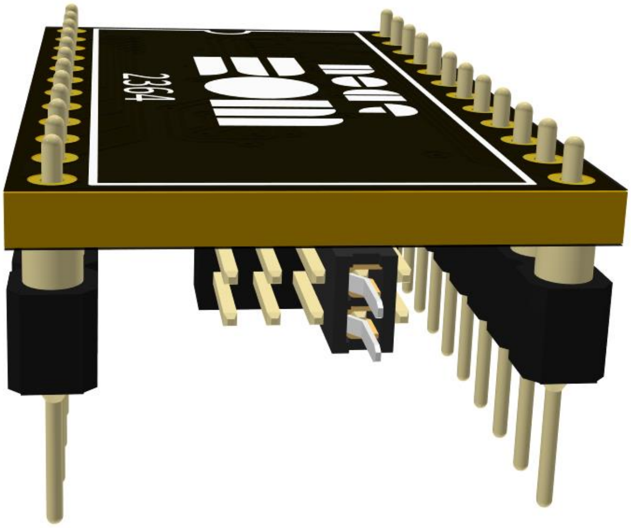


Figure 8. 2pin female header.

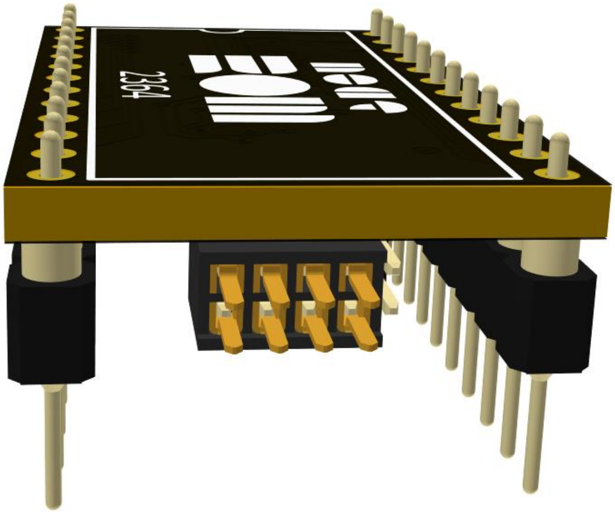


Figure 9. 2x4pin female header.

You can solder wires directly to the computer motherboard or use pin headers and DuPont wires. See chapter 6 for motherboard reference images.

Figure 10 show an example installation for C64 longboard revision 250407. A 2x4pin female header is used. Position 2 pins are bridged together to set bank 3. Through hole right angle pin headers are soldered to the motherboard and connected with DuPont wires.

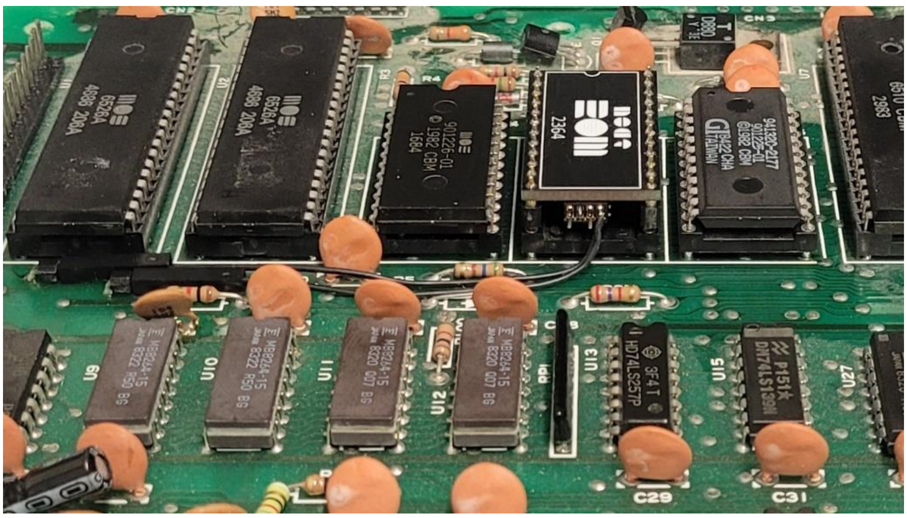


Figure 10. C64 long board SKS example.

Figure 11 show an example installation for C64 shot board revision 250469. A 2pin female header is used with wires soldered directly to the motherboard.

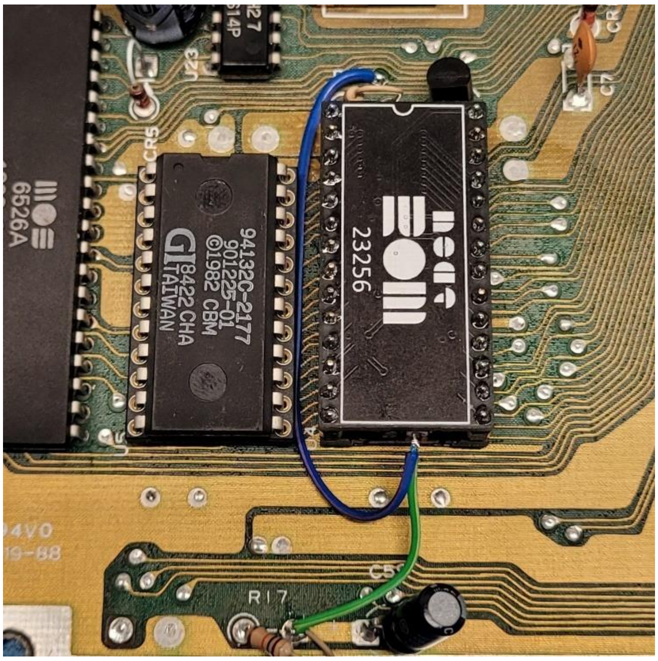


Figure 11. C64 short board SKS example.

2.4 multiROM

multiROM is the name of a feature where one neatROM can replace two or three ROM ICs. In a long board C64 one neatROM 2364 can replace one, two or all three ROM chips (Basic, Kernal & Character ROMs).

In a short board C64 one neatROM 23256 can replace the Basic+Kernal ROM or both Basic+Kernal and Character ROMs.

In VIC-20 one neatROM2364 can replace the Basic ROM or the Kernal Rom or both.

The use in a C128 is under investigation. It’s also possible to use the multiROM feature in other machines where multiple ROM chips are on the same data and address bus.

multiROM has been popular with SixtyClone and other replica builders who want to reduce the current consumption of the computer. Using a flash chip already reduces the current consumption compared to the old masked ROM chips. Using multiROM you can cut the ROM chip current consumption further by getting rid of extra ROM chips.

ROM chips are replaced by connecting the CS signal from the missing ROM empty socket to the pin header of the neatROM.

The neat2364 can have missing ROM CS signals connected to the pin header lower pin in locations 1, 2 and 3. neatROM can replace 4kb and 8kb ROM ICs.

The neatROM 23256 can have the missing ROM CS signal connected to the pin header position 1 both pins. neatROM 23256 can replace 4kb, 8kb and 16kb ROM ICs.

2332 and 2364 ROM ICs have the CS signal in pin 20. 2764, 23128 and 27128 ROM ICs have the CS signal in pin 22.

If the missing ROM is accessed, then the CS signal maps a different memory bank from neatROM to the data bus. The CS signal is low active and matches the same as having a jumper in the same pin header position. See chapter 3.1 for memory bank mapping examples.

2.4.1 CS adapter

A connection to the extra ROM CS signal can be made with a single wire or use a neatROM CS adapter PCB. The neatROM CS adapter got 6 soldering pads all connected to the CS signal pin. There is also a pin header in case a “DuPont connector” is used. If you purchased the neatROM CS adapter in parts you can use a round pin IC socket as a soldering jig. Both 24pin and 28pin CS adapters are available. C64 and VIC-20 computers can use only the 24pin version.

Figure 12. neatROM CS adapter

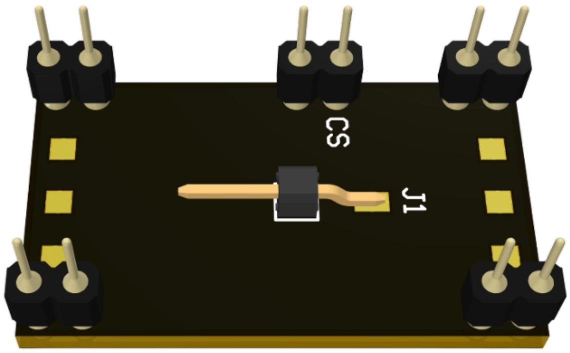


Figure 13. neatROM CS adapter bottom view

2.4.2 multiROM in a VIC-20

The neatROM 2364 can be in the Basic or Kernal ROM socket.

Select the location of the neatROM 2364 with a jumper in locations 1 Basic or 2 Kernal. Connect a wire from pin header locations 1 Basic or 2 Kernal lower pin to missing ROM socket pin 20. See chapter 4.1 for memory mapping example working with this connection.

Table 5. neatROM 2364 pin header

ROM	Basic	Kernal			
Location	1	2	3	4	5
Pin header	:	:	:	:	:

2.4.3 multiROM in a longboard C64

The neatROM 2364 must be in the Basic or Kernal ROM socket. Character ROM socket is missing the A12 signal.

Select the location of the neatROM 2364 with a jumper in locations 1 Basic or 2 Kernal. Connect a wire from pin header locations 1 Basic, 2 Kernal or 3 Character lower pin to missing ROM socket pin 20.

Table 6. neatROM 2364 pin header

ROM	Basic	Kernal	Character		
Location	1	2	3	4	5
Pin header	:	:	:	:	:

Figure 14 show an installation example of using neat 2364 in the Kernal ROM socket and replacing both Basic and Character ROMs. A 2x4 female header is used. CS wires are soldered to the position 1 and 3 lower pins. Location 2 pins are shorted together for memory mapping purpose. Position 4 got Switchless Kernal Selector wires. See chapter 4.2 for memory mapping for this example.

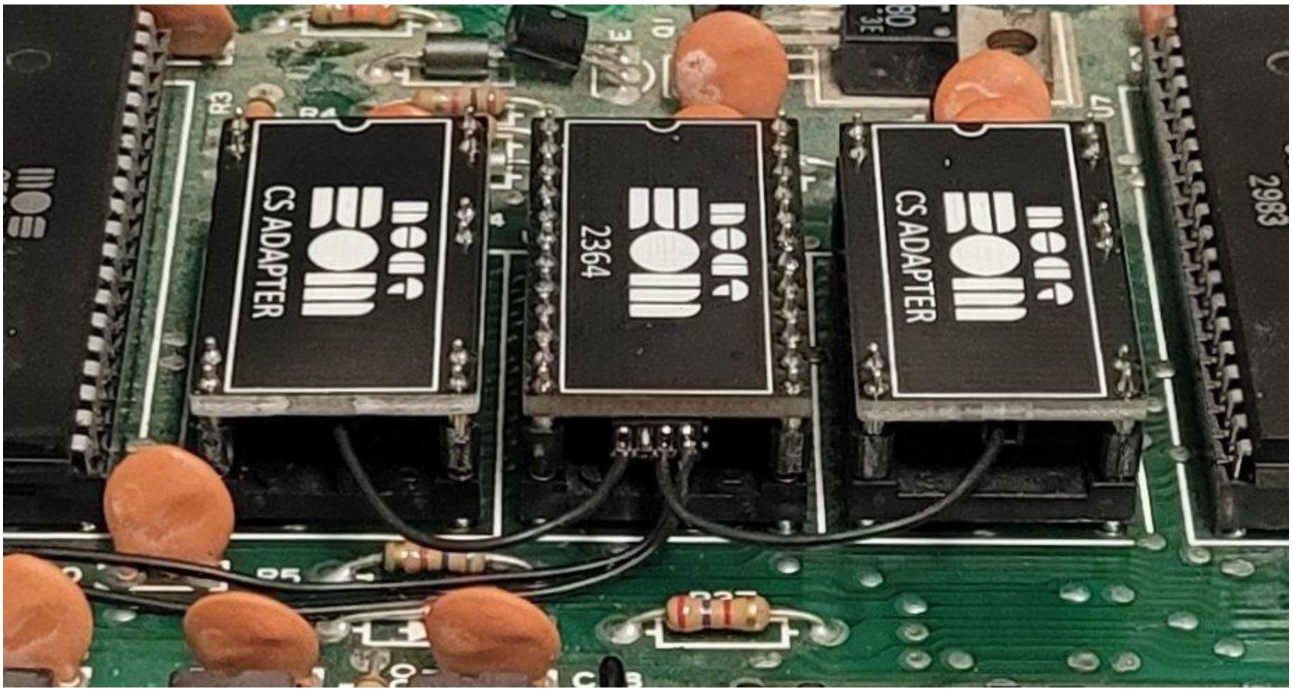


Figure 14. multiROM in C64 long board.

2.4.4 multiROM in a short board C64

The neatROM 23256 fits only into the Basic+Kernal ROM socket U4.

Use a 2pin or 2x4 female header and solder a wire to both pins of header locations 1. Both pins of location 1 must be shorted together and connected to the missing Character ROM socket U5 pin 20.

Below are installation examples of using neatROM 23256 and replacing both Basic+Kernal and Character ROMs. Locations 2-5 in the pin header can be used for bank switching with jumpers and/or Switchless Kernal Selector feature. Figure 15 show an installation with a wire connected to Character ROM socket pin 20. Figure 16 show an installation using a neatROM CS adapter. Both figures also got the Switchless Kernal Selector wires. See chapter 4.3 for memory mapping for this example.

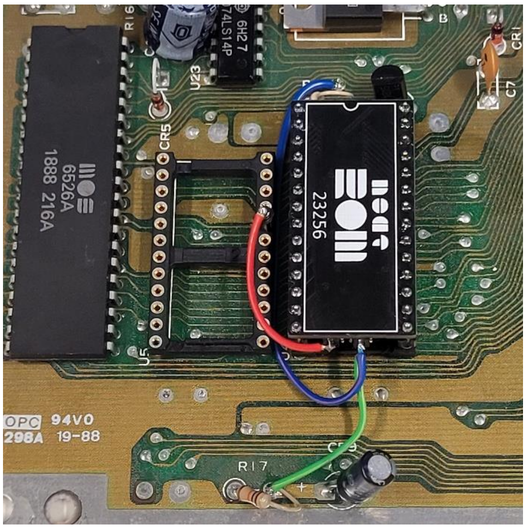


Figure 15. neatROM 23256 with wired multiROM

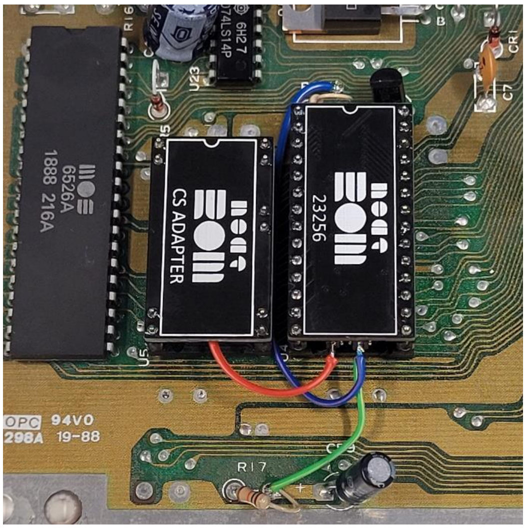


Figure 16. neatROM 23256 with multiROM & CS

3 Programming adapter

Use a neatROM programming adapter to update the content of the flash IC. Remove all jumpers and connectors from the neatROM pin header. The flat cable must be in J6 pin header if neatROM 2364 is programmed and in J5 pin header if neatROM 23256 is programmed. Move the flat cable to the correct header if needed. Connect the flat cable other end to the neatROM pin header. Push the neatROM into the programming adapter IC socket. There are separate IC sockets for both neatROM models. A 24-pin socket for neatROM 2364 and a 28-pin socket for neatROM23256. Connect only one neatROM at once. neatROM 2364 must have the bottom side solder bridge in the D position. See chapter 2.1.1.

Figure 17. neatROM programming adapter

Programming have been tested with a TL866-II programmer with the Xgpro software. Select IC SST39SF010A TSOP32. Deselect “Pin Detect” from the options.

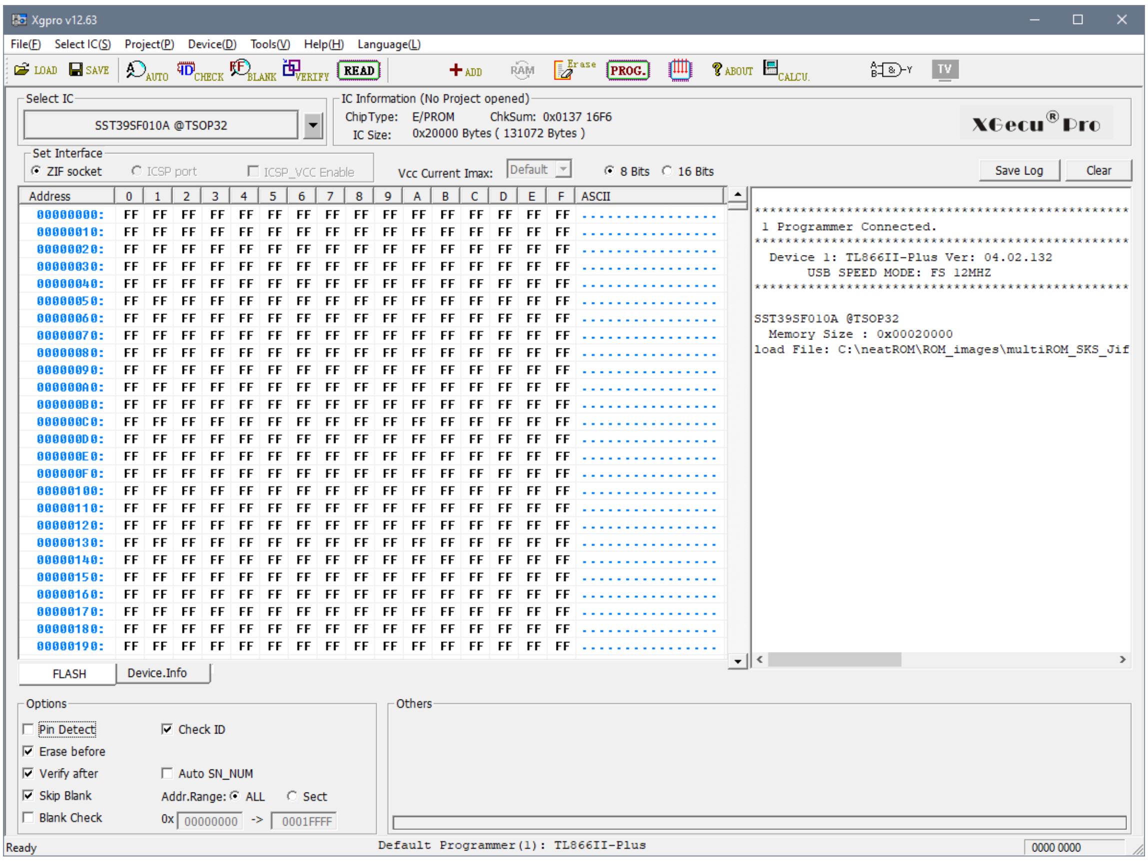


Figure 18. Xgpro programming software.

3.1 Assembly of programming adapter

If you got the programming adapter as a kit, use the following instructions for assembly.

Programming adapter part list:

- neatROM programming adapter PCB
- J3: DIP socket, 24 position, double leaf spring
- J4: DIP socket, 28 position, double leaf spring
- J5, J6: Header SMD, 10 position 2 row, 1.27mm pitch, shrouded
- J1, J2: Header through hole, 16 position, 2.54mm pitch
- PR1, PR2, PR3, PR4, PR5: Test probe, R50-3C receptacle, P50-J1 probe
- Flat cable with female IDC connectors, 8cm.

Test probe alignment tool part list:

- Test probe alignment tool PCB
- J1, J2, J3, J4: Header through hole, 2 positions, round pin, 2.54mm pitch

First assemble the test probe alignment tool. Use the programming adapter PCB as a jig for assembly. This helps to align the round pin headers.

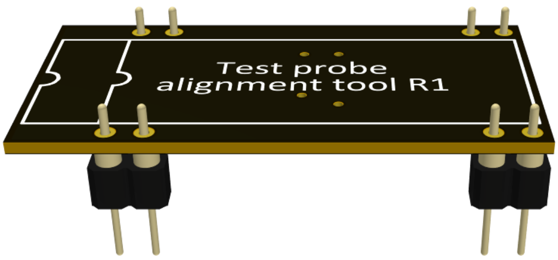


Figure 19. Test probe alignment tool.

Next assemble the programming adapter. Solder the J5 & J6 headers. Notice the slot on the shroud.
Next solder the J3 & J4 IC sockets. If the sockets got a center ridge it need to be cut away.
Pin headers J1 & J2 are assembled from the bottom side.

Lastly solder the test probes. Place the test probe alignment tool into one of the IC sockets. Place the test probes from bottom side of the programming adapter PCB. Align the test probe straight into the alignment tool hole. Solder the test probe so the spring-loaded pin is at the same level as the alignment tool top surface. Repeat for other IC socket. Test probes are inside a receptacle and are replaceable. Just pull out the probe and replace it if needed. The model code is in the part list.

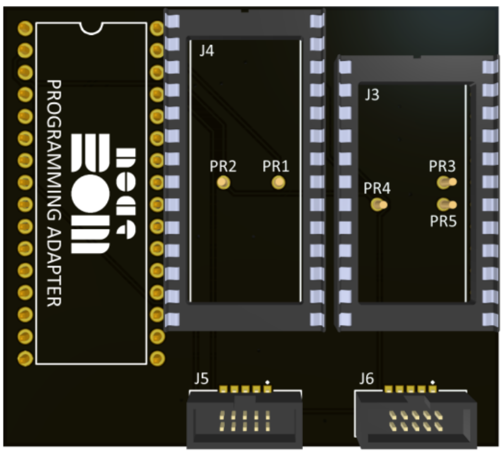


Figure 20. Top view

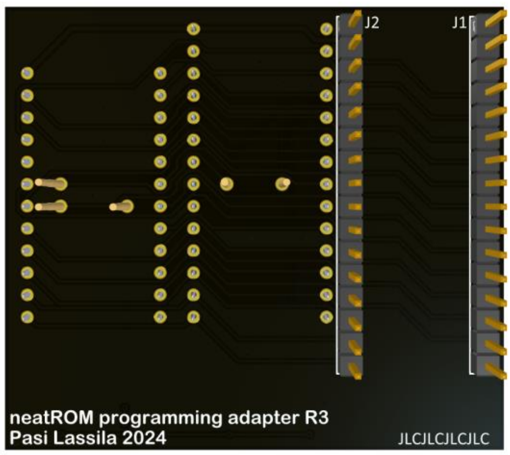


Figure 21. Bottom view

4 Memory bank mapping

Addresses and memory banks have been already presented in Table 1, Table 2 and Table 3. Following tables present memory banking examples for use in VIC-20 and C64 long and short board versions. The tables match the examples in the 2.3 Switchless Kernal Selector and 2.4 multiROM chapters.

With the information presented in this document you can also mix features and ROMs as you like.

4.1 VIC-20 example

With the memory mapping example presented in Table 7, the jumper position 1 and 2 select if the neatROM 2364 is in Basic or Kernal ROM socket. The order is the same as how the Basic and Kernal ROM chips are located on the motherboard. Basic is the left one and Kernal is the right one of the ROM chips pair.

The memory mapping also supports the character ROM with a single jumper in position 3. Notice the solder bridge on the bottom side of the PCB must be in C position.

For the above single ROM replacement functionality, it is enough to fill banks 2, 3 & 4 only and use a single jumper in position 1, 2 or 3.

multiROM feature is also supported with this memory mapping as explained in chapter 2.4.2. Replace Basic or Kernal or both ROMs.

Switchless Kernal Switcher requires filling banks 7 and 8. Kernal 2 is selected by default and Kernal 1 is selected if Restore-key is pressed down during power-up or reset.

Jumper position 5 can be used to select the default boot Kernal (Restore-key not pressed). This requires filling banks 11, 12, 15 and 16. Banks 3 & 15 have the same Kernal and banks 7 & 11 have the same Kernal. If jumper position 5 is empty, then Kernal 2 is booted by default. If there is a jumper in position 5, then Kernal 4 is booted by default.

	Jumper positions						
Address	1	2	3	4	5	8Kb banks	ROM image
0000-1FFF	:			:	:	BANK 1	Not in use
2000-3FFF	:	:		:	:	BANK 2	Character x2
4000-5FFF	:		:	:	:	BANK 3	Kernal 1
6000-7FFF		:	:	:	:	BANK 4	Basic
8000-9FFF	:				:	BANK 5	Not in use
A000-BFFF	:	:			:	BANK 6	Not in use
C000-DFFF	:		:		:	BANK 7	Kernal 2
E000-FFFF		:	:		:	BANK 8	Basic
10000-11FFF	:			:		BANK 9	Not in use
12000-13FFF	:	:		:		BANK 10	Not in use
14000-15FFF	:		:	:		BANK 11	Kernal 3
16000-17FFF		:	:	:		BANK 12	Basic
18000-19FFF	:					BANK 13	Not in use
1A000-1BFFF	:	:				BANK 14	Not in use
1C000-1DFFF	:		:			BANK 15	Kernal 4
1E000-1FFFF		:	:			BANK 16	Basic

Table 7. VIC-20 memory bank mapping example.

4.2 C64 long board examples

With the memory mapping example presented in Table 8, the jumper position 1, 2 and 3 select if the neatROM 2364 is in Basic, Kernal or Character ROM socket. The order is the same as how the Basic, Kernal and Character ROM ICs are located on the motherboard. Basic is the left one, Kernal is in the middle and Character ROM is on the right.

For the above single ROM replacement functionality, it is enough to fill banks 2, 3 & 4 only and use a single jumper in position 1, 2 or 3.

multiROM feature is also supported with this memory mapping as explained in chapter 2.4.3. multiROM feature does not work in the Character ROM socket as it misses the A12 signal.

Switchless Kernal Switcher requires filling banks 6, 7 and 8. Kernal 2 is selected by default and Kernal 1 is selected if Restore-key is pressed down during power-up or reset.

Jumper position 5 can be used to select the default boot Kernal (Restore-key not pressed) or swap between two alternative Kernals. This requires filling banks 10-12 and 14-16. If jumper position 5 is empty, then Kernal 2 is booted by default. If there is a jumper in position 5, then Kernal 4 is booted by default.

	Jumper position						
Address	**1**	**2**	**3**	**4**	**5**	**8Kb banks**	**ROM image**
0000-1FFF	:			:	:	BANK 1	Not in use
2000-3FFF	:	:		:	:	BANK 2	Character x2
4000-5FFF	:		:	:	:	BANK 3	Kernal 1
6000-7FFF		:	:	:	:	BANK 4	Basic
8000-9FFF	:				:	BANK 5	Not in use
A000-BFFF	:	:			:	BANK 6	Character x2
C000-DFFF	:		:		:	BANK 7	Kernal 2
E000-FFFF		:	:		:	BANK 8	Basic
10000-11FFF	:			:		BANK 9	Not in use
12000-13FFF	:	:		:		BANK 10	Character x2
14000-15FFF	:		:	:		BANK 11	Kernal 3
16000-17FFF		:	:	:		BANK 12	Basic
18000-19FFF	:					BANK 13	Not in use
1A000-1BFFF	:	:				BANK 14	Character x2
1C000-1DFFF	:		:			BANK 15	Kernal 4
1E000-1FFFF		:	:			BANK 16	Basic

Table 8. C64 long board memory bank mapping example.

4.3 C64 short board examples

With the memory mapping example presented in Table 9, jumper position 1 is for multiROM feature replacing the character ROM as explained in chapter 2.4.4. multiROM feature requires character ROM image in banks 1, 3, 5 and 7. Character ROM is copied 4 times to fill one bank.

Switchless Kernal Switcher requires filling banks 6, 7 and 8. Kernal 2 is selected by default and Kernal 1 is selected if Restore-key is pressed down during power-up or reset.

Jumper position 5 can be used to select the default boot Kernal (Restore-key not pressed) or swap between two alternative Kernals. This requires filling banks 6 and 8. If jumper position 5 empty, then Kernal 2 is booted by default. If there is a jumper in position 5, then Kernal 1 is booted by default.

	Jumper position						
Address	1	2	3	4	5	16kB banks	ROM images
0000-3FFF	:	:	:	:	:	BANK 1	Character x4
4000-7FFF	:	:		:	:	BANK 2	Basic + Kernal 1
8000-BFFF	:	:	:		:	BANK 3	Character x4
C000-FFFF	:	:			:	BANK 4	Basic + Kernal 2
10000-13FFF	:	:	:	:		BANK 5	Character x4
14000-17FFF	:	:		:		BANK 6	Basic + Kernal 3
18000-1BFFF	:	:	:			BANK 7	Character x4
1C000-1FFFF	:	:				BANK 8	Basic + Kernal 4

Table 9. C64 short board memory bank mapping example.

4.4 Making custom flash images

You can make your own custom flash images by combining ROM images in the programmer software like Xgpro or use some hex editor like HxD etc. You can also combine binary ROM images in Windows command prompt with this command example: `copy /b file1.bin+file2.bin combined.bin`

In Linux the command is: `cat file1.bin file2.bin > combined.bin`

5 neatROM order options

The order options were made following the memory mapping examples presented in chapter 4.

5.1 VIC-20

neatROM 2364 can be ordered preprogrammed with four following options:

- **VIC-20 option 1:** Original ROMs only. Both Kernal 1 and Kernal 2 are original Kernals. PAL version.
- **VIC-20 option 2:** Original ROMs only. Both Kernal 1 and Kernal 2 are original Kernals. NTSC version.
- **VIC-20 option 3:** JiffyDOS. Kernal 1 is original and Kernal 2 is JiffyDOS. PAL version.
- **VIC-20 option 4:** JiffyDOS. Kernal 1 is original and Kernal 2 is JiffyDOS. NTSC version.

Extra fee of 7€ is added for the JiffyDOS license unless a receipt of license purchase is provided.

5.2 C64 long board

neatROM 2364 can be ordered preprogrammed with four following options:

- **C64 long board option 1:** Original ROMs only. All Kernals are original.
- **C64 long board option 2:** JiffyDOS. Kernals 1&4 are original and Kernals 2&3 are JiffyDOS. Change default with jumper in position 5.
- **C64 long board option 3:** JiffyDOS+JaffyDOS. Kernals 1&3 are original. Kernal 2 is JiffyDOS and Kernal 4 is JaffyDOS. Jiffy-/JaffyDOS booted by default. Original kernal is booted with Restore-key pressed. Change Jiffy-/JaffyDOS with jumper in position 5.
- **C64 long board option 4:** JiffyDOS+JaffyDOS. Kernals 2&4 are original. Kernal 1 is JiffyDOS and Kernal 3 is JaffyDOS. Original Kernal booted by default. Jiffy-/JaffyDOS Kernal is booted with Restore-key pressed. Change Jiffy-/JaffyDOS with jumper in position 5.

Extra fee of 7€ is added for the JiffyDOS license unless a receipt of license purchase is provided.

5.3 C64 short board

neatROM 23256 can be ordered preprogrammed with four following options:

- **C64 short board option 1:** Original ROMs only. All Kernals are original Kernals.
- **C64 short board option 2:** JiffyDOS. Kernal 1&4 is original and Kernal 2&3 is JiffyDOS. Change default with jumper in position 5.

- **C64 short board option 3:** JiffyDOS+JaffyDOS. Kernal 1&3 is original. Kernal 2 is JiffyDOS and Kernal 4 is JaffyDOS. Jiffy-/JaffyDOS booted by default. Original kernal is booted with Restore-key pressed. Change Jiffy-/JaffyDOS with jumper in position 5.
- **C64 short board option 4:** JiffyDOS+JaffyDOS. Kernal 2&4 is original. Kernal 1 is JiffyDOS and Kernal 3 is JaffyDOS. Original Kernal booted by default. Jiffy-/JaffyDOS Kernal is booted with Restore-key pressed. Change Jiffy-/JaffyDOS with jumper in position 5.

Extra fee of 7€ is added for the JiffyDOS license unless a receipt of license purchase is provided.

5.4 Other order options

Other order options will be listed here as they are made and tested. They will contain collections of 24 and 28 pin ROMs, C128 version etc.

6 Motherboard images

Below are motherboard images for helping with locating different ROM ICs and Restore and Reset signals. Signals are available at multiple locations and only one or two locations are marked. You can follow the copper traces for other locations or check schematics for component pins. You can solder a wire to the motherboard or use right angle pin headers and DuPont cables. Some users have used hook clips for connecting to component pins as a solder free solution.

6.1 VIC-20 ASSY 324003

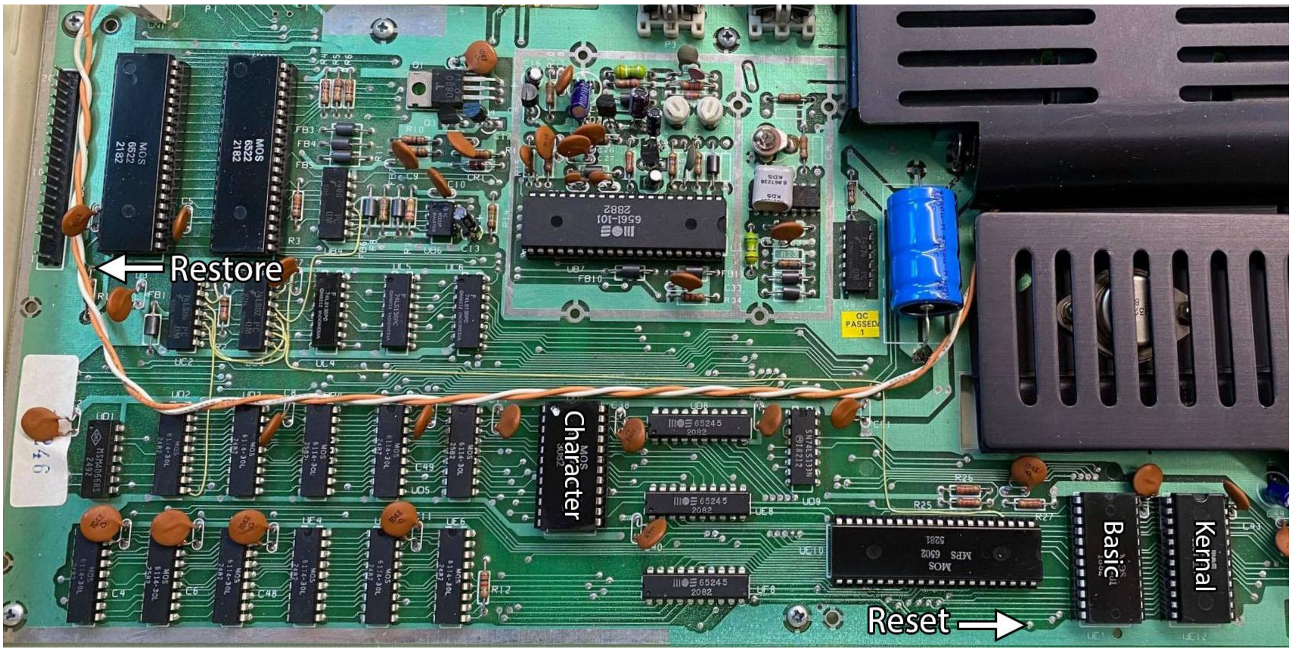


Figure 22. VIC-20 ASSY 324003.

6.2 VIC-20 ASSY 250403

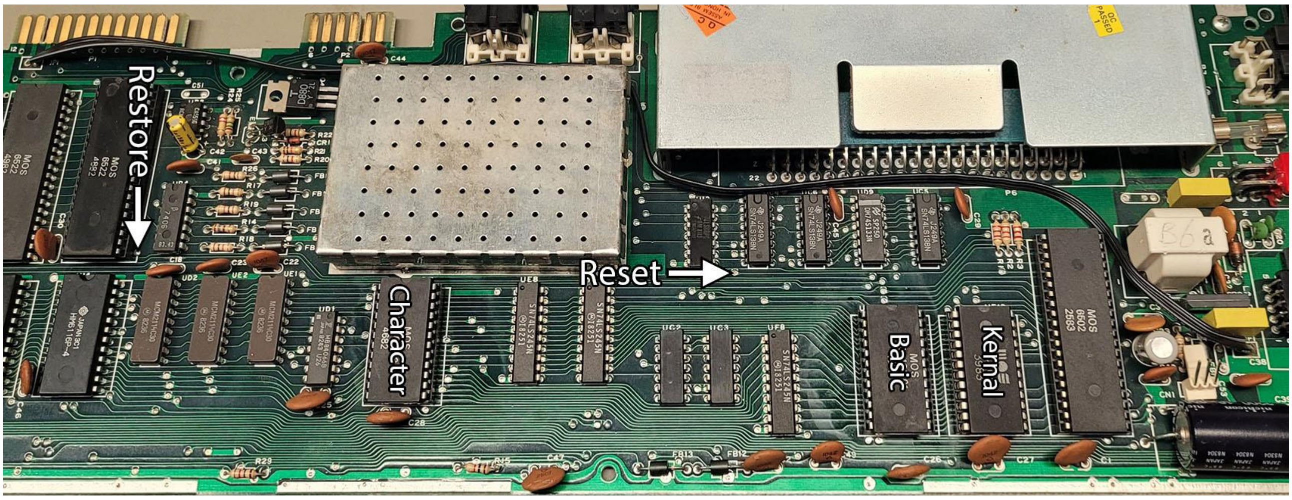


Figure 23. VIC-20 ASSY 250403

6.3 C64 ASSY KU-14194HB

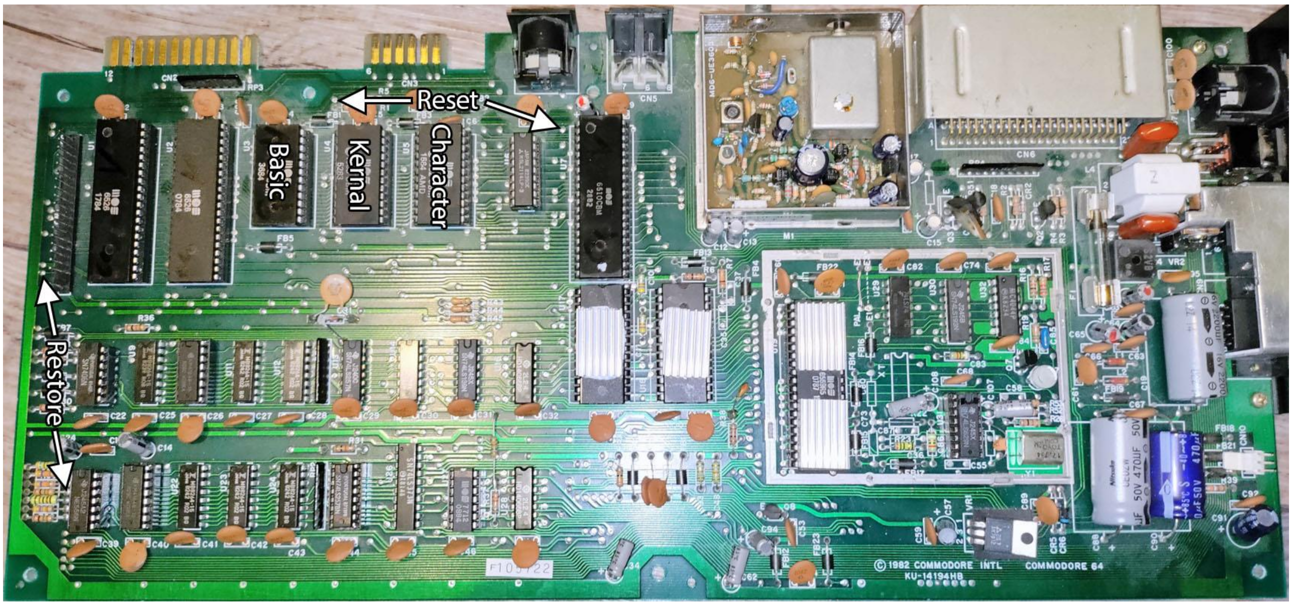


Figure 24. C64 ASSY KU-14194HB.

6.4 C64 ASSY 250407

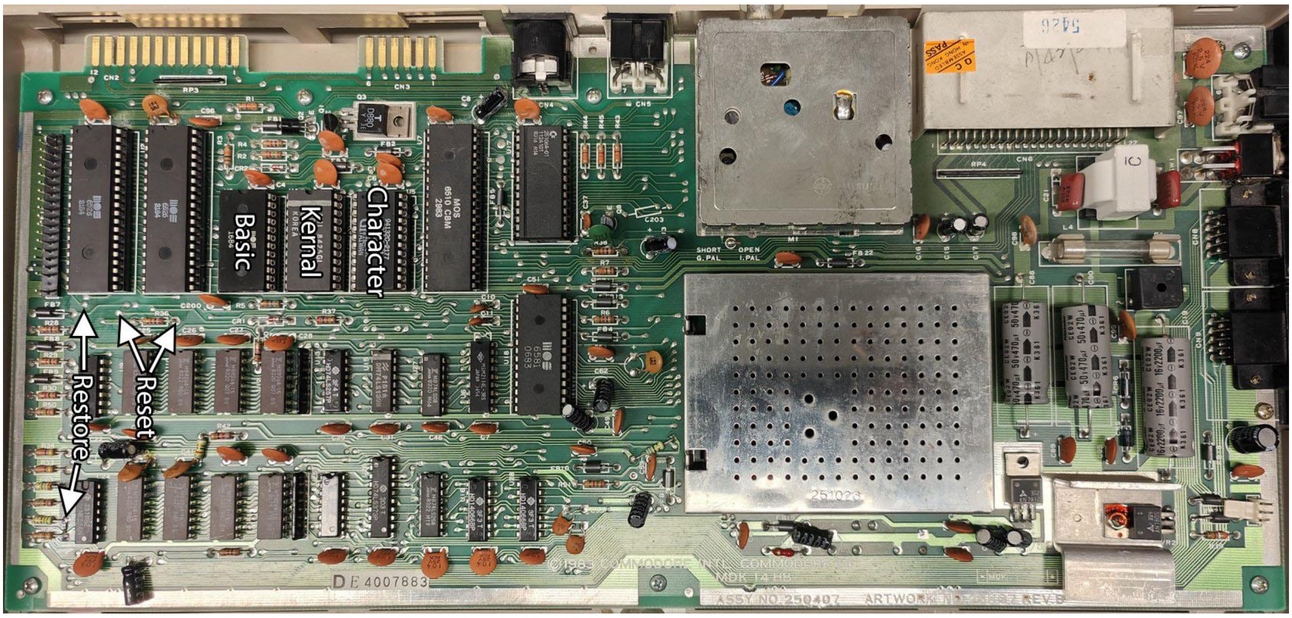


Figure 25. C64 ASSY 250407.

6.5 C64 ASSY 250425

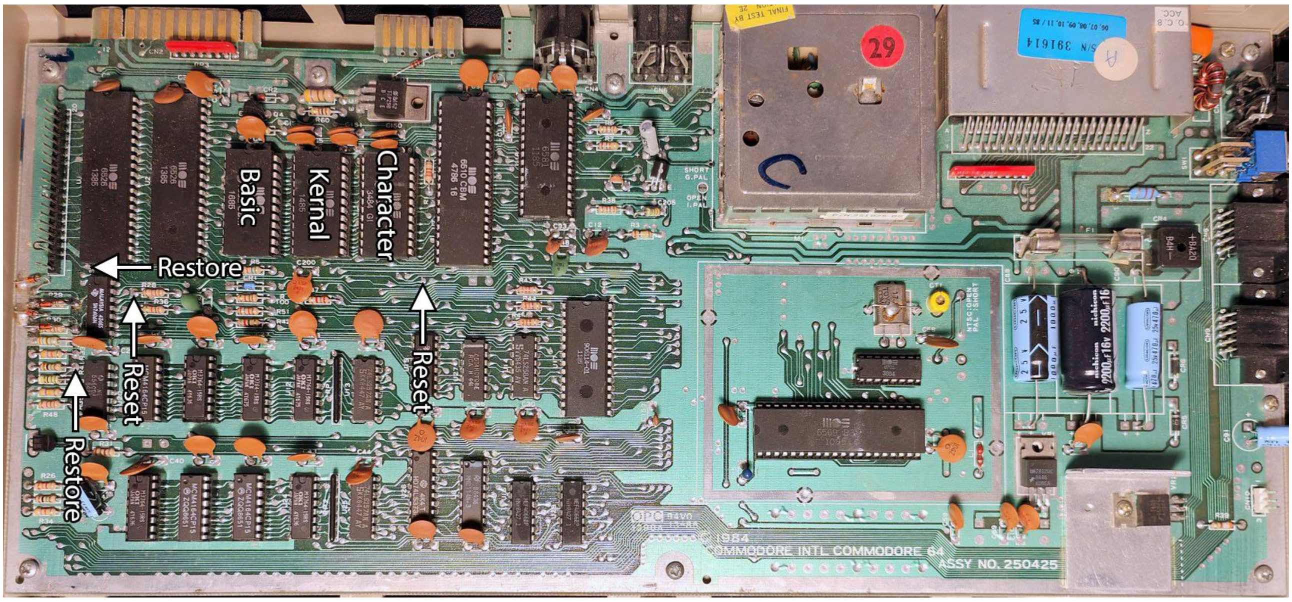


Figure 26. C64 ASSY 250425.

6.6 C64 ASSY 250466

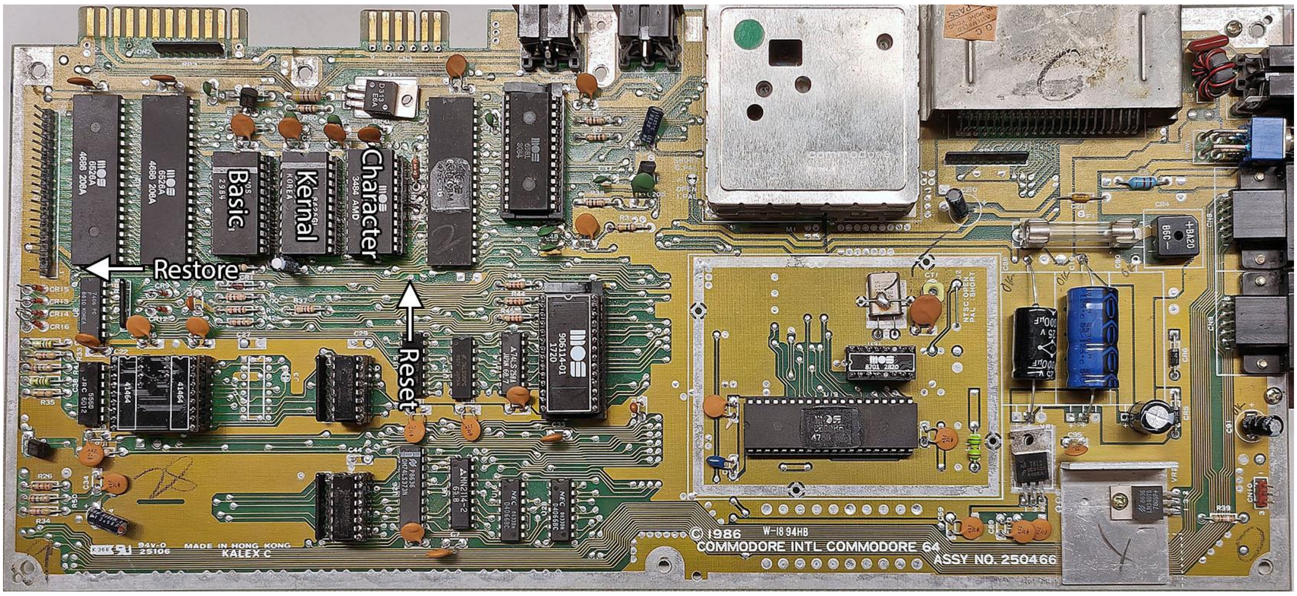


Figure 27. C64 ASSY 250466

6.7 C64 ASSY 250469

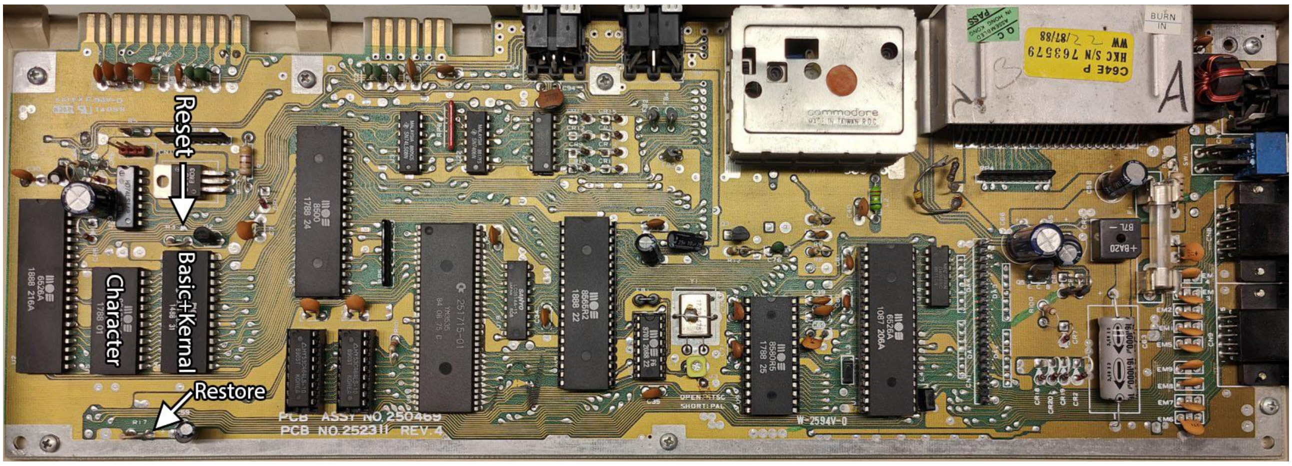


Figure 28. C64 ASSY 250469.

7 References

[1] c64-wiki.com JiffyDOS https://www.c64-wiki.com/wiki/JiffyDOS

[2] Switchless JiffyDOS blog post http://pasilassila.blogspot.com/2014/06/switchless-jiffydos-for-c64.html