

The PHANTOM
Build-it-Yourself
GUIDE
Version 0.1

PLEASE READ THIS
BOOKLET BEFORE
CONSTRUCTING YOUR PHANTOM

INTRODUCTION:

You're either curious as to how you'd go about building a Phantom yourself, or you have a pile of parts in front of you that are destined to become your very own Phantom board. Either way, you need to follow a certain assembly procedure otherwise you'll run into some assembly problems throughout the process.

The assembly of the Phantom board requires good lighting and a reasonable block of un-interrupted time to successfully complete.

You should also be warned, that there are a number of vias in very close proximity to one another, and as such, if you're not careful you could bridge while soldering. Pay close attention while soldering.

So warm up your soldering station and let's get going.

Parts and Tools:

If you don't already have the parts to build this, you can either buy just the PCB from COREi64.com and source the parts yourself, or purchase a complete parts set with PCBs.

If you're getting the parts yourself, use the BOM on the Phantom GitHub as your shopping list of what you need to buy.

There are a number of components that when assembled result in the Phantom system. These components are:

- Phantom Drive Board
- Sync clip for the main Phantom drive board
- Kernel board with switch
- Parallel/userport cable and board

Each of these will be assembled separately, and these components can be assembled in any order.

Full resolution photos taken during the creation of each of these items can be found on the Phantom Github.

Phantom Drive Board:

This is the main board that will reside on top of the 1541 logic board.

Step 1:

Install resistors and diodes

Step 2:

This is crucial that you get this right. All of these machine pins and pin headers need to be perfectly aligned with the 1541's logic board. In the absence of an assembly jig that you likely won't have access to, you should be using your

1541 logic board as the jig. Install the machine pins in the 6502 and 6522 sockets after having first removed those chips from positions UC4 and UC3

Then, install machine pins, P4 P5 and P6 male and female connectors and pin headers.

Once you have all of these connection points soldered onto your drive board, install the sync clip pin header.

WARNING :

Now that you have the machine pins soldered onto your drive board, be VERY CAREFUL not to bend those pins. For these pins to be the correct size to be able to plug into a socket, they have to be as thin as they are, which makes them extremely fragile. IF you were to break off a pin, it is exceedingly difficult to repair a board like that. This kind of damage CAN be repaired, but requires some advanced de-soldering skills as to not damage the PCB in the process.

These pins will be unprotected until you complete the next step. After the next step is completed, you'll be able to put the 40 pin machine sockets over the machine pins you just soldered on, and they will be then well protected.

Step 3:

Install the three 40 pin dual wipe sockets, two 28 pin dual wipe sockets and two 14 pin sockets onto the top of the board and solder them in place. Be careful soldering between the machine pins on the underside, ensuring that you don't melt or bend any pins. Also be careful you don't bridge any sold points with adjacent vias.

Step 4:

Install the two 40 pin machine sockets over the two 40 pin machine pins on the underside of the board. Take your time and be careful not to bend any of these pins. They are very fragile and can easily be bent or broken. Once you've installed these sockets, they will remain in place. These will eventually plug into the 6502 and 6522 sockets when you finally install the Phantom. You should never remove these sockets from the machine pins, as they not only space the board off the 1541 logic board, but also protect these fragile connection points.

Step 5:

Solder all of the remaining IC's onto the Phantom. The Phantom drive board has indications silk screened onto the board as to which chip goes where, as well as the chip orientation. Follow these directions on the board explicitly.

Step 6:

Install the 47pf capacitor, and the two 100nf polyester capacitors on the board. These are the last two components that you should be installing on the Phantom drive board.

Step 7:

Plug the second VIA on the board, as well as the drive rom and SRAM chip. These are marked on the PCB, and you can also review the build photos on the Github for reference.

Step 8:

Success. Provided you haven't bridged any vias or missed any components/solder connections, you

will now have a complete Phantom drive board in front of you. Congratulations.

Sync Clip:

This is a three wire cable that connects from the Phantom drive board to three locations on the 1541 logic board.

There is really only one step here. Connect the IC clips to the end of the three wire harness, and if your wire doesn't have a connector on the end, solder one on. Might be good to mark which wire is which based on the installation instructions. Note that Pins 1, 2 and 3 are marked on the underside of the PCB which indicate the orientation of the connector.

Be careful ensuring that you make the correct connections to the board, otherwise your Phantom will not work, and you could potentially damage the board and/or drive.

Kernal Board with Switch:

This is the kernal replacement board that will be installed inside the C64 you plan on using with your Phantom equipped 1541.

Step 1:

If the surface mounted 2.2K resistors are not pre-soldered for you on the PCBs, then solder those components on first.

Step 2:

Solder the two 12 pin machine pin strips to the under side of the board (opposite side to where the resistors are soldered on).

Step 3:

Solder the 28 pin dual wipe socket to the top of the board.

Step 4:

Solder the 3 pin 90 degree male header onto the board beside where the resistors are. They should be mounted from the top side of the board.

Step 5:

Solder the three wire cable to the DPDT switch. If no connector is on the other end of the cable, solder a female dupont connector to that. This will mate to the 3 pin header you soldered on in Step 3.

Step 6:

The kernal board is now complete. Follow the installation instructions to replace your factory kernal in the 64 with this new switched Phantom kernal.

Parallel /Userport Cable and Board:

This is the parallel data cable that connects between the Phantom logic board and the userport of your Phantom equipped Commodore 64 computer.

Step 1:

With your 10 wire ribbon cable in hand, separate a couple inches on each end, strip and tin the conductor.

Step 2:

Install the machine pin headers to the underside of the parallel connection board. Refer to the photos on the Github.

Step 3:

Feed the ribbon cable through the slots of the parallel cable and solder them in according to the color sequence found in the photos on the Github.

Step 4:

Solder the ribbon cable to the user port connector, again referencing the photos provided on the Phantom github.

Take note that the side that has the single black wire represents the top of the connector.

Step 5:

Install the connector and cable into the custom designed user port connector housing. Ensure you have the orientation correct in the housing. The single black wire connected to the user port connector should be on top. Please refer to the github photos to ensure your orientation is correct. The small cylindrical piece is the cable block that will help reduce strain on the solder points if the cable is pulled.

Once the top and bottom of the housing has been mated, tighten the two M3 screws from the underside of the housing.

Do not over tighten the M2 screws that attach the userport connector to the housing, as this will pull the heatset through the user port connector. Just make it snug, that's all it needs.

Step 6:

The parallel cable construction is complete, and you've reached the end of the construction of

your Phantom system. Now all that's left is that you carefully install it into your 1541 drive.

I will caution you that you should take your time installing this onto your 1541. There are a LOT of connection points between the Phantom drive board and the 1541. If any one isn't quite right, your Phantom drive system will not work. If after you've carefully installed it, you find it's not working, you may need to press down or lift and lower the edge of the board over the Px pins to establish a positive connection. These pins on your 1541 may have corroded over the years, so patience should be observed in installing this. ESPECIALLY in the 6502 and 6522 connection points. A broken or offset pin will render the Phantom installation non-functional.

Appendix: INSTALLATION:

Installation of this board into your drive will take approximately 30 minutes. Make sure you have a well lit and tidy work area before starting.

Additionally, your Commodore 64 will need to have a socketed kernal. If your Commodore 64 Kernal ROM (the chip marked as 901227-03) is soldered onto your computers mainboard, then please seek a qualified professional to remove the chip and install a socket. Attempting this yourself can cause irreparable damage to your computer if you don't know what you're doing. Nobody including Trilogic cannot be held responsible for any damage to your Commodore 64.

Tools required are:

- Phillips head screw driver
- Small flat head screwdriver
- Anti-static grounding strap for yourself.

STEP 1 : Remove / Replace the Kernal ROM in your 64.

Estimated Install time: 10 minutes

In this step, you will be removing your Kernal ROM from your machine and replacing it with THE PHANTOM rom provided in your package. This Phantom kernal replacement rom actually contains TWO ROMS.

1. Original Commodore Kernal ROM
 2. Custom PHANTOM ROM The most current version of the PHANTOM ROM is v1.07
- Remove the screws from your Commodore 64 (the three screws along the bottom front edge of the machine, and lift up the top half of the computer (like you would the hood of your car).
 - Locate the kernal rom location on your Commodore 64 and remove it, taking note of the notch location on the chip.
 - Insert the Phantom kernal rom adapter board into the same location, taking care to ensure the notch on the Phantom rom is oriented in the same fashion.
 - Locate and install the provided switch in the case, or use the provided jumper if you prefer to always use the Phantom kernal on your machine.
 - If you choose the jumper option, then unplug the switch and discard, and place the jumper across the two pins closest to the notch end of the chip on the Phantom kernal board.
 - Close up your Commodore 64, and do a power on test of your Commodore 64. One of the switch positions will provide you with the factory start up screen, and the other position will be the Phantom start up screen that will look like figure 1.

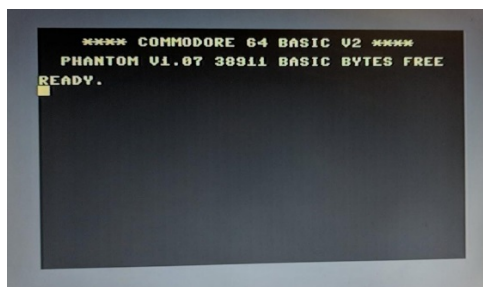


Figure 1

Step 2: *Install The Phantom Drive Board*

Estimated Install time: 30 minutes

In this step, you will be installing the brains and brawn of The Phantom. It may seem daunting, but take your time and make sure you have good lighting in your work area to ensure everything is plugged in as it should when you're done.

Taking photos of the process as you go along before and after you remove/install components will help you should you forget how things were before and after during the installation process.

1. Open up the 1541 drive by removing the four screws on the underside of the drive. This requires that you use a Philips head screwdriver.
2. Once the top has been removed from the drive, if there is a metal shield installed above the main logic board, remove that as well. You won't be able to use that shield if it is place after the Phantom is installed, as the Phantom occupies that space.
3. Remove the 6502 CPU at location UC4, and the 6522 VIA at location UC3 On the 1541 main board.

4. Remove the cables from locations P4, P5, P6 on the edge of the board taking note of their orientation. It helps to mark these connectors appropriately with a felt marker before removing them so you don't forget how they were installed.
5. Connect the "sync" cable to the three pins on UC1 and UC2. Ensure you connect them to the correct pins as marked on the cable.

MOS325572-01 (UC1) : 1 – Pin19, 2 – Pin21

MOS6522 (UC2) : 3 – Pin 17

6. The next part is a little tricky, so make sure you really take your time lining up all the pins. Bending the pins on the underside of the Phantom board would be catastrophic, as that is not easily repaired.

It is for this reason it is HIGHLY RECOMMENDED that you install the two 40 pin sockets onto the male pin headers on the underside of the board BEFORE installing the board. In this way, if you happen to bend a pin installing the Phantom in your 1541, it will only be on the socket, not the male pin header on the Phantom. The socket is easier to replace than the pin headers on the board.

7. Once the board is successfully pressed into the socket and pin locations on the board, insert the cables you removed from the logic board in step 4 and sync cable you installed in step 5 to their respective points on the Phantom.
8. Insert the parallel cable connector onto the Phantom board (if you have not already done so), and route the ribbon cable out the back of the drive.

9. Before closing up the drive, connect the parallel cable to the Commodore 64 user port (taking note of which side is up), connect your serial cable from the Commodore 64 to the 1541 drive containing your newly installed Phantom board, and power on the system.
10. You should be greeted with the Phantom start screen when you power on your Commodore 64.
11. Press the '@' symbol and press return. The computer should respond with the startup DOS response from the drive as follows:

73, 8K PHANTOM DOS V1. 1E, 00, 00

If you received this message then the board is successfully installed, and you may close up your 1541 drive.

If you do not, and/or the computer locks up when you do that, then you have not properly installed the board in the drive. More than likely, you probably have not pressed the board down sufficiently onto the 1541 logic board, or you have bent a pin or pins.

At this point, you should remove the Phantom logic board, and examine all of the pins. If you bent some, very carefully and slowly try to straighten them. In most cases, unless the pins have been severely kinked, you can straighten the pins once if you're careful before they break off. If you break off any pins, the board will need to be repaired and the connector strip will need to be replaced.

Assuming that you've gotten the correct DOS response, congratulations!