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SuperTracker II

Digital Track Display (and more!)

for 1540/1541/1541 CBM Disk Drives

Installation & Usage Manual

Firmware v1.1

Manual v1.4

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Introduction

Thank you for purchasing the SuperTracker II. This device will show the track (including half-track), density level, write protect status, motor status, and number of syncs on a track. This is the much more advanced version of the original SuperTracker that was first released in 1987.

Installation Requirements

Some disassembly of the disk drive is required, such as a possible metal shield. The SuperTracker II plugs into one of your disk drive's 6522 VIA sockets, with the original 6522 VIA placed on top on the SuperTracker II board. It may be required to de-solder the VIA chip and install a socket (provided). Holes for mounting the display bezel and push button switch are optional (but recommended). You could mount the display and push button externally.

NOTE: POWER TO THE DISK DRIVE MUST BE OFF WHILE INSTALLING THIS PRODUCT!

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SECTION 1 – INSTALLATION

The SuperTracker II can be used with a 1540, 1541, 1541-II, or 1571 disk drive. It's likely that the SuperTracker II will also work in Ocean, Accelerator, Blue Chip, and other aftermarket drives. This installation manual is for the 1540, 1541, and 1541C disk drives.

1. Disk Drive Disassembly

Lay down a towel or something soft on a flat table. This will be our work area. Remove the power cord and any serial cables from your disk drive. Place the disk drive upside-down on the work area so that the screw holes are accessible. Remove the four screws and set them aside. Carefully turn the disk drive over 180 degrees and set it down. Lift off the lid and set it aside.

If there is a metal shield covering the back half of the disk drive's circuit board you will need to remove it. Depending on the exact revision and model of disk drive, there can be 2, 3, or 4 screws holding the metal shield to the drive chassis. Remove the necessary screws and set them aside along with the metal shield.

2. Locating and Removing the 6522 VIA Chip

Locate the 6522 VIA chip that must be removed. See the chart below to determine the IC number used for each model disk drive. Figure 1 shows the location of the 6522 VIA with Assembly #250442.

Disk Drive Model	Description	IC Number
1540/1541	Assembly #1540001	UAB1
1541	Assembly 1540048	UC2
1541	Assembly #250442, 250446	UC2
1541	PCB #251854	UC3

Once you have determined the location of the 6522 VIA that needs to be removed, look to see if the chip is soldered directly to the circuit board or if it is plugged into a socket.

If the chip is soldered to the circuit board, you will need to remove the circuit board, de-solder the chip, and install the included socket. The only exception is for the Commodore 1541-II and 1571 disk drives. For these drives you must remove the 6522 VIA chip and solder the special SuperTracker II w/6522 VIA version directly to the motherboard without using a socket. This is the only way that the SuperTracker II will fit in these disk drives. Also note that you MUST install the OLED screen externally in some type of enclosure that you provide. There is no room for the OLED screen internally in these disk drives!

If the chip is plugged into a socket, carefully remove the chip by “wiggling” it back and forth upwards, from each end. Take your time. A small flat tipped screwdriver can be used to carefully pry each end upwards a little at a time, switching ends frequently. Once removed, set the 6522 VIA chip aside. See Figures 2, 3, and 4 for details.

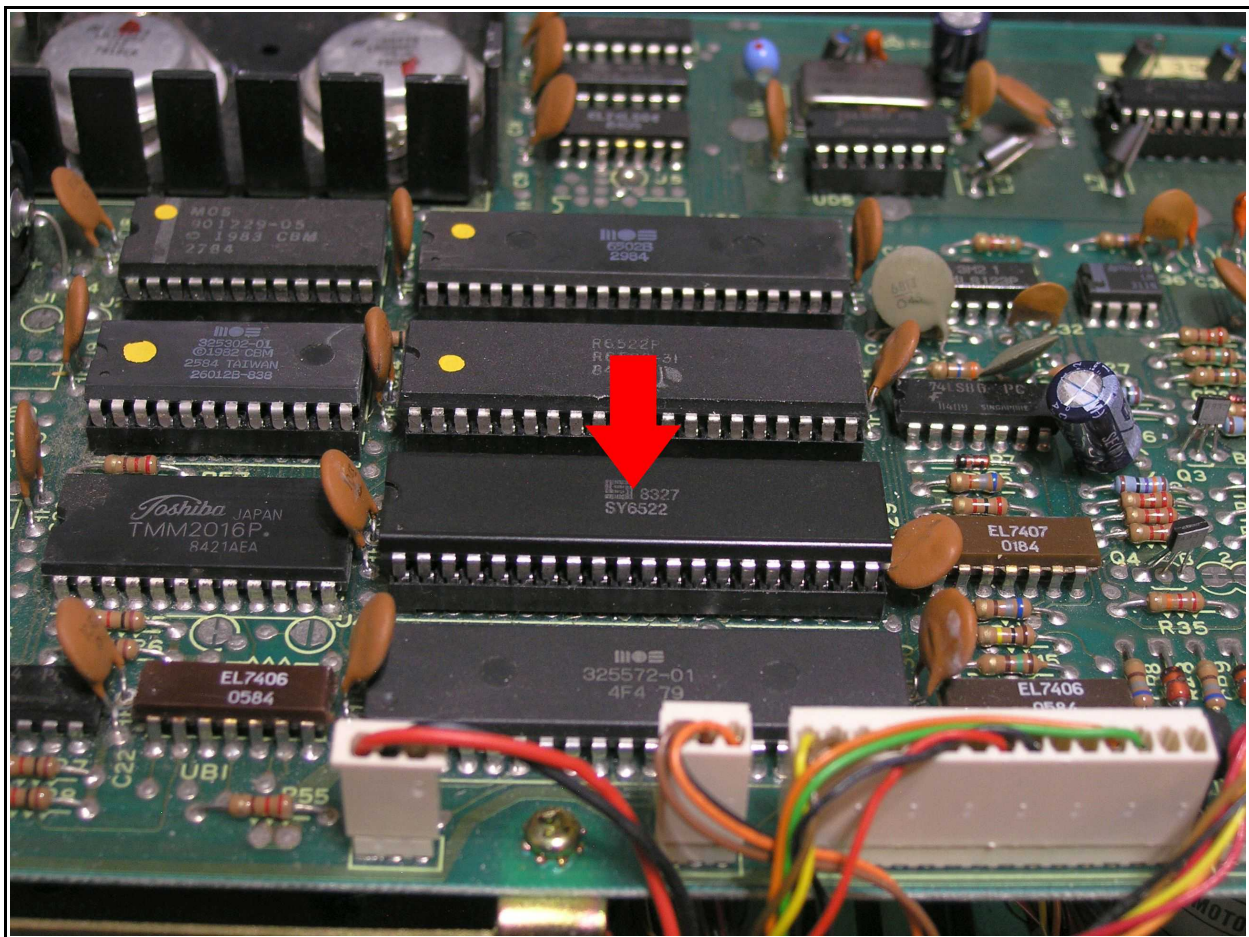


Figure 1 – 6522 VIA Location (Indicated by Arrow)

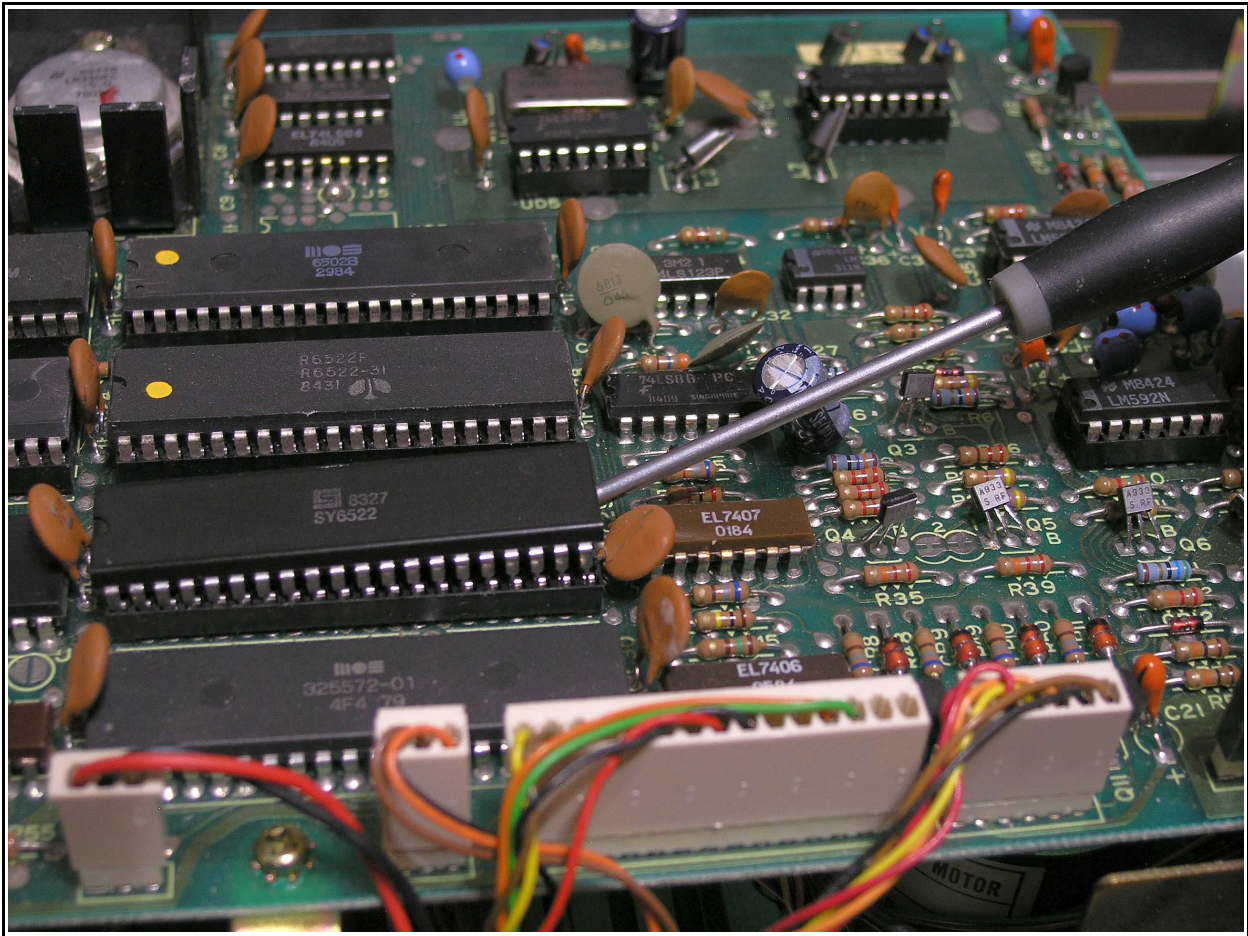


Figure 2 – Removing 6522 VIA by Lifting One End First

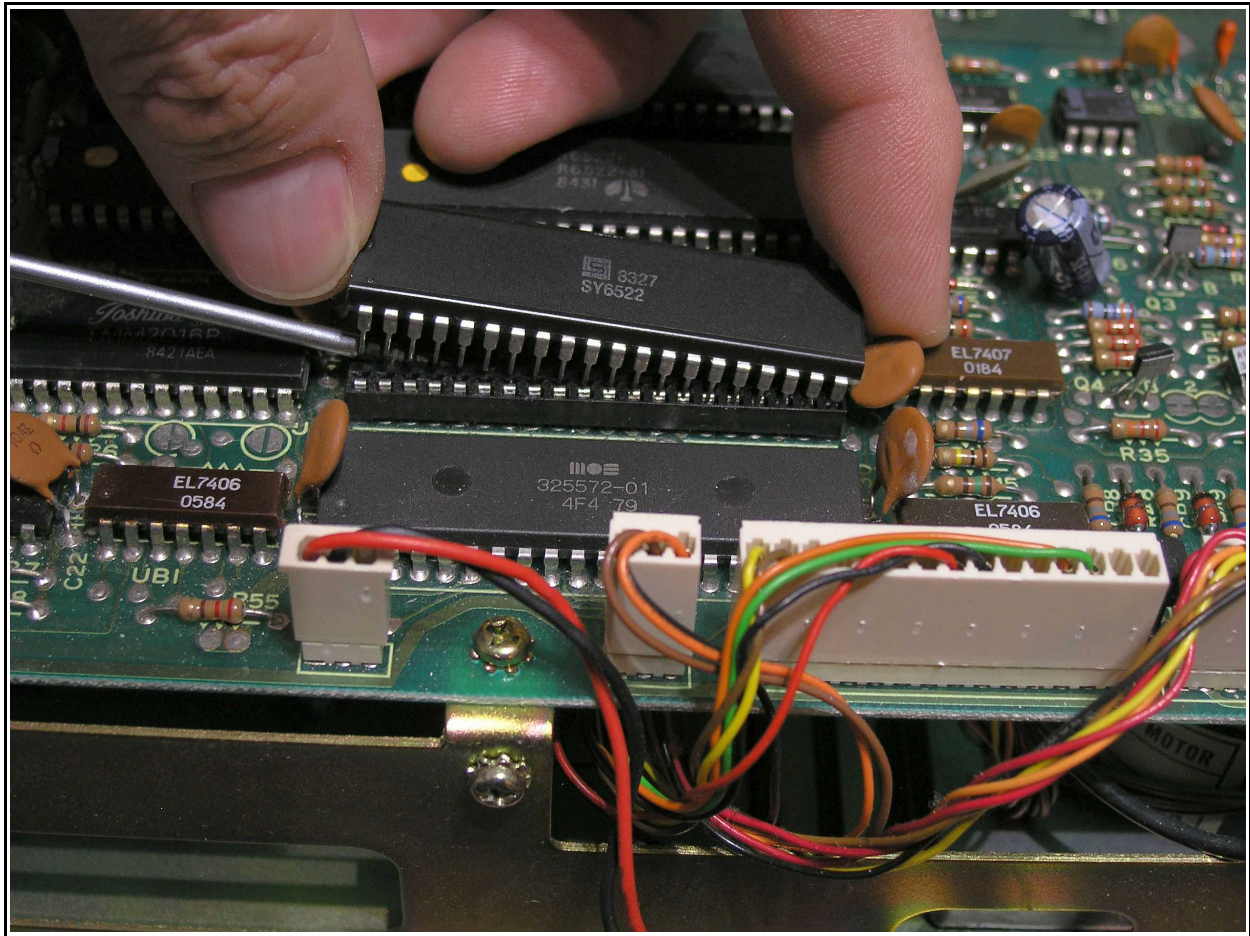


Figure 3 – Removing 6522 VIA by Lifting Other End

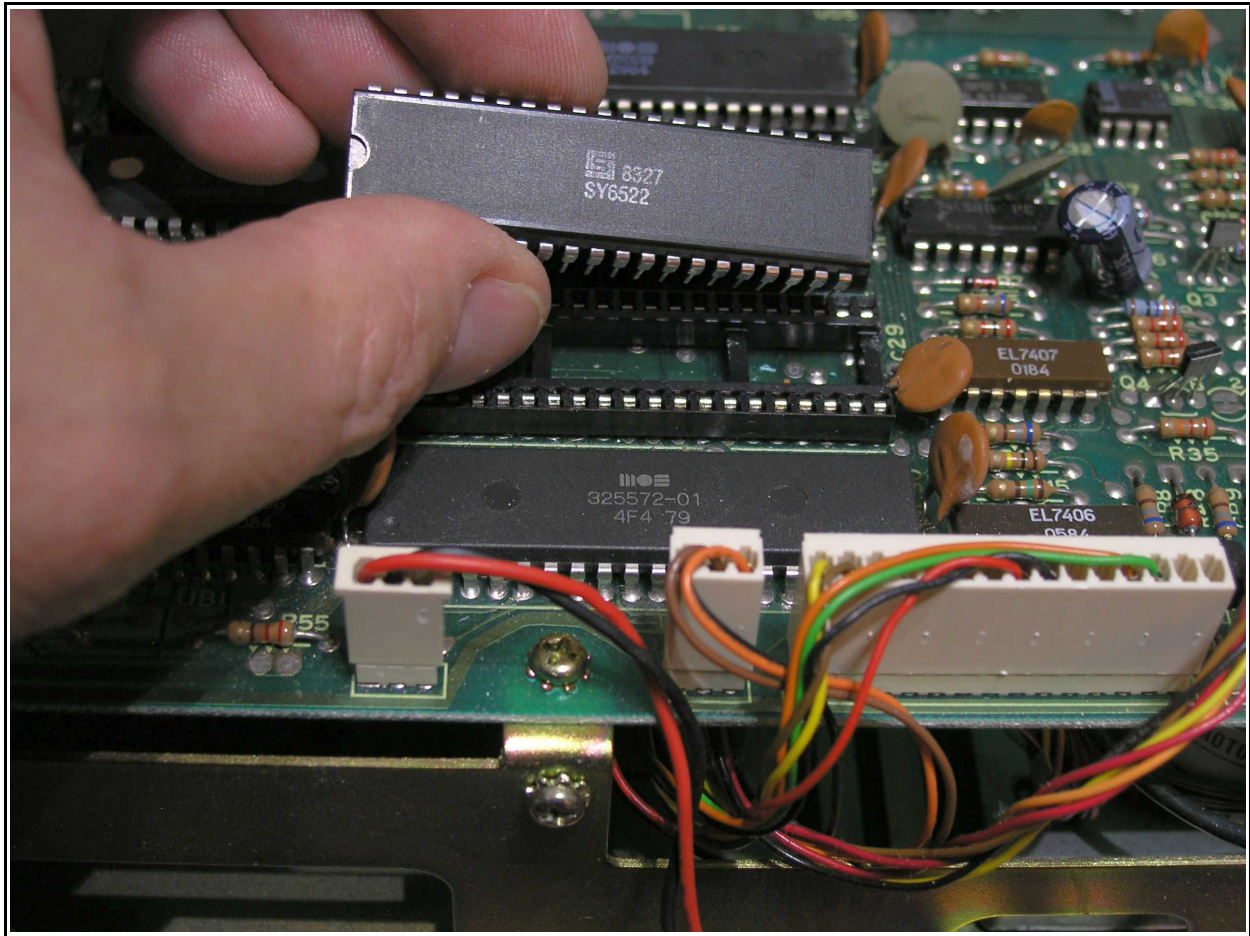


Figure 4 – 6522 VIA Removed From Socket

3. Installing the SuperTracker II Board in Socket

It is possible that your disk drive's circuit board has a large round ceramic capacitor that is at the end of the now empty 6522 VIA socket. You need to carefully bend that capacitor forwards towards the front of the disk drive as far as possible (without breaking it). If this capacitor won't move, then it may be necessary to install the extra socket provided as a "riser" to help with the clearance of the OLED connector. See Figure 3.

The SuperTracker II's gold pins are very fragile and can be bent easily. Care must be taken during handling. The SuperTracker II plugs into the now empty 6522 VIA socket. Orient the SuperTracker II board so that the connectors are facing towards the front of the disk drive. Carefully place the SuperTracker II into the empty 6522 VIA socket, making sure all 40 pins are inside of the socket. Each pin should be centered over top of each of the socket receptacles. See Figure 5 for details. Once the SuperTracker II is position over top of the 6522 VIA socket, press down on the SuperTracker II board from both ends at the same time. Press until it is firmly in place. Once fully seated, the SuperTracker II should look like what is shown in Figure 6.

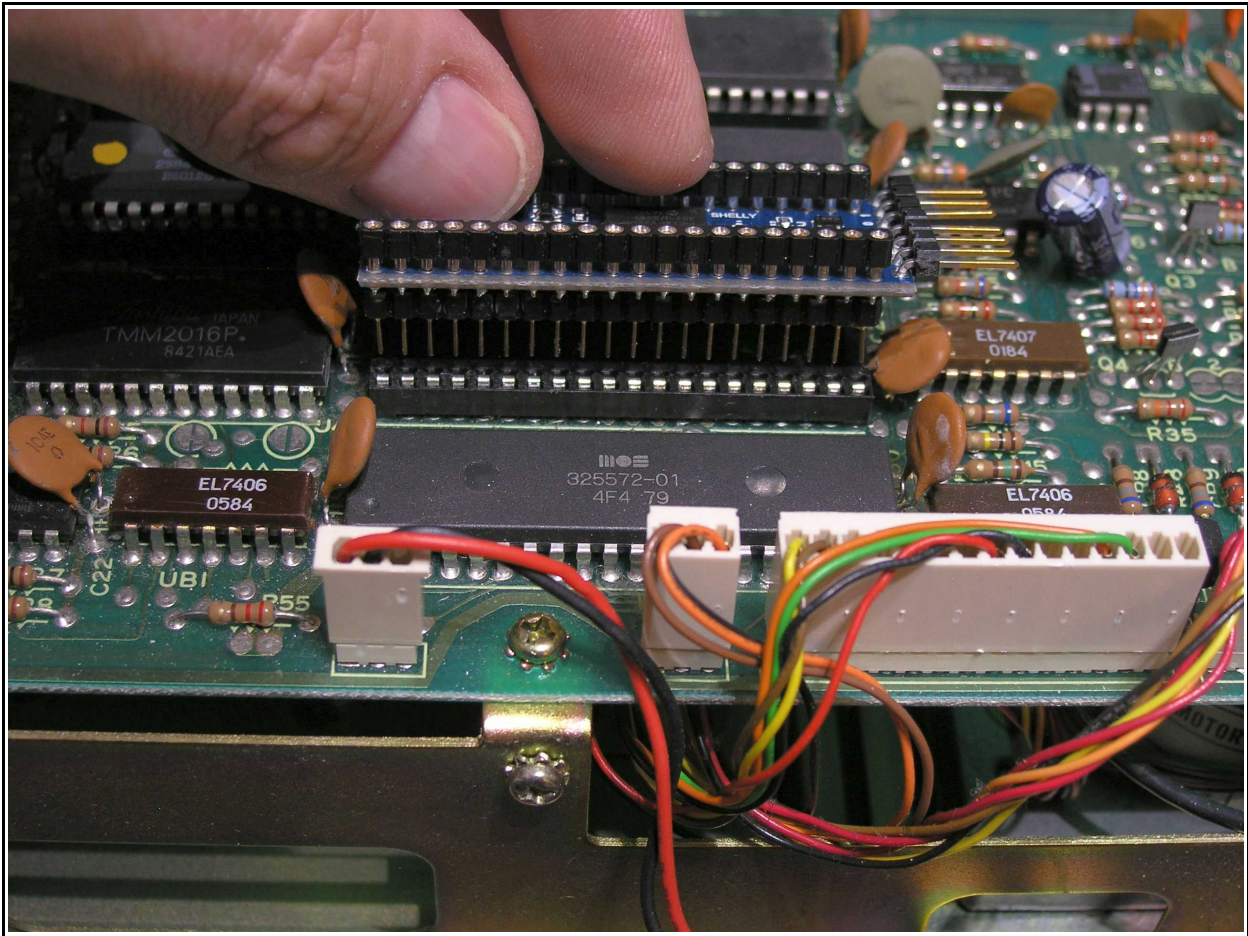


Figure 5 – SuperTracker II Board Sitting Over Socket

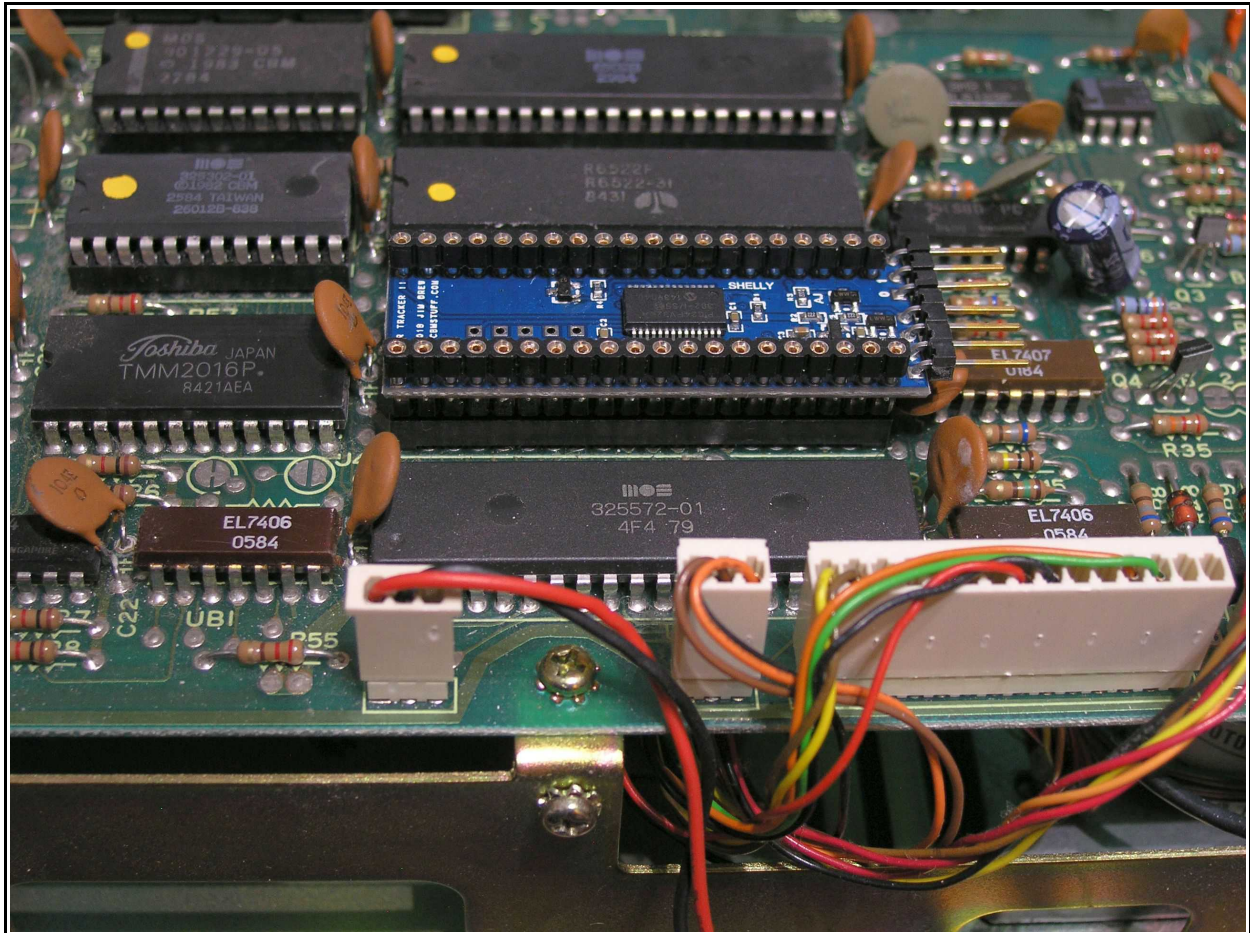


Figure 6 – SuperTracker II Board Pressed Flush in Socket

4. Installing the 6522 VIA on SuperTracker II Board

Locate the 6522 VIA chip that you removed. That chip will be placed on top of the SuperTracker II board. Position the 6522 VIA chip so that the end with the "notch" is facing towards the back of the disk drive (opposite of the SuperTracker II's connectors). Make sure that each pin goes into a corresponding hole in the socket. This could take some effort if the 6522 VIA pins were bent at some point. Take your time! Once every pin is inserted into every hole, slowly press down on both ends of the 6522 VIA chip so that the 6522 VIA chip is flush as possible. See Figures 7 and 8 for details.

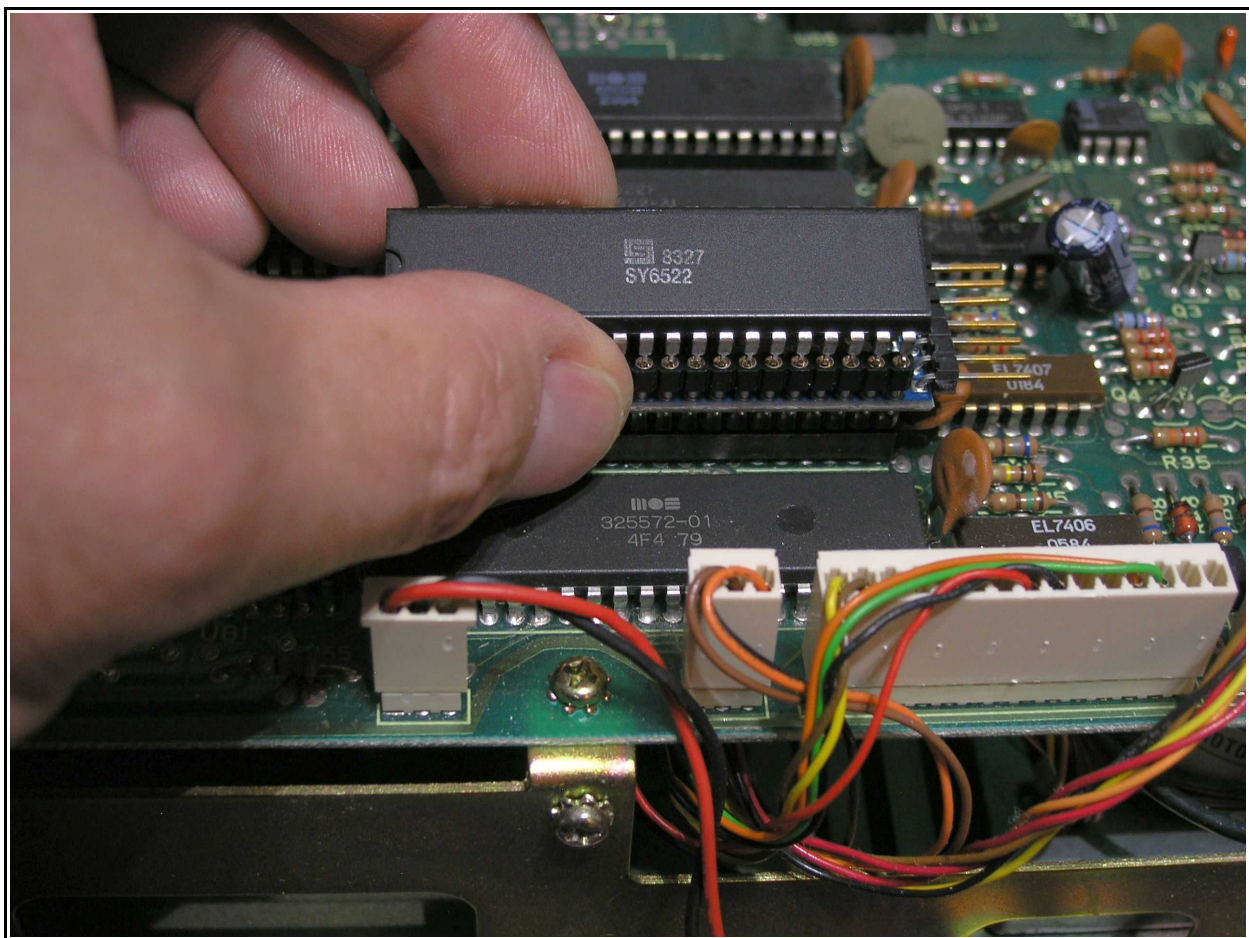


Figure 7 – Place 6522 VIA Pins Into SuperTracker II Board

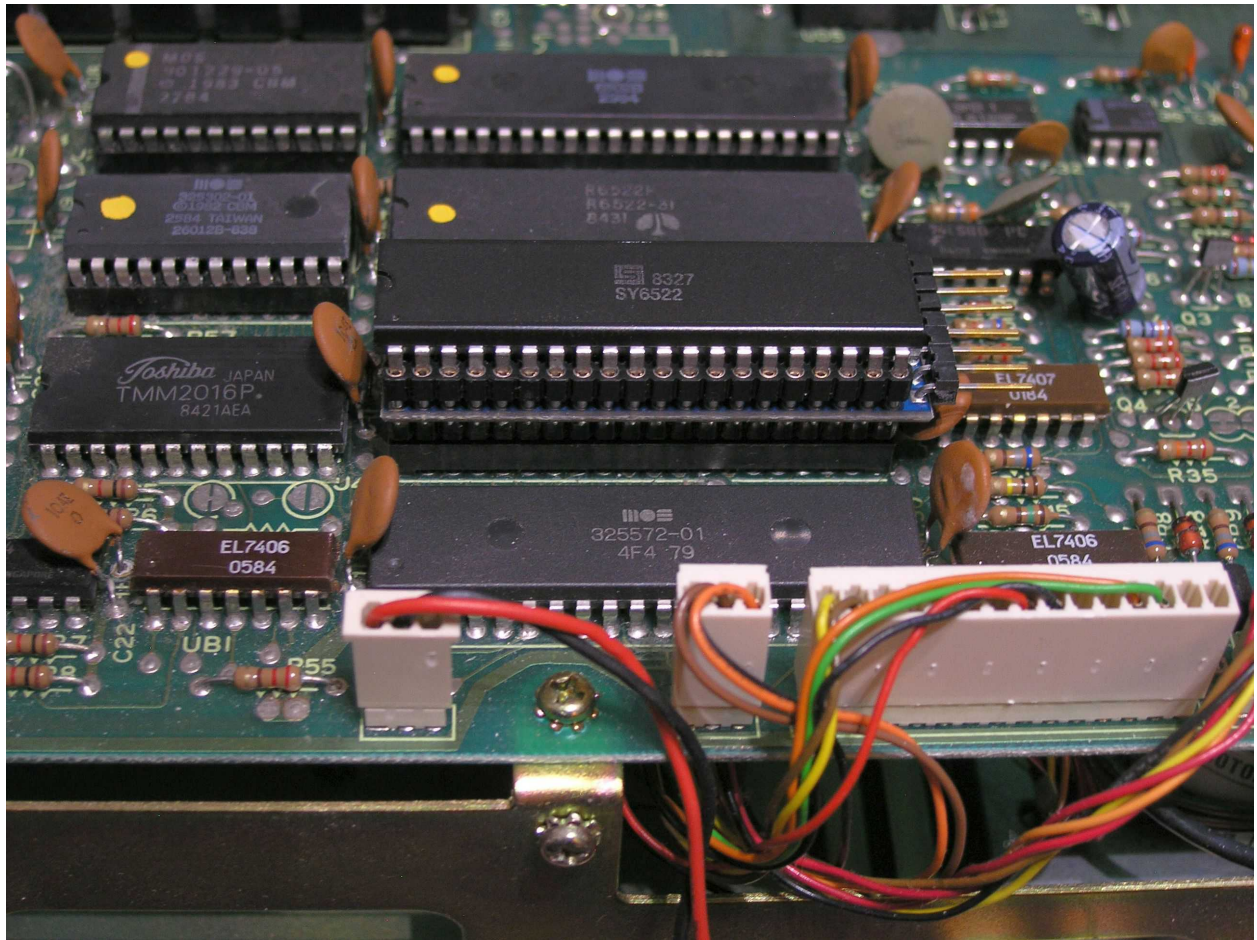


Figure 8 – 6522 VIA Installed in SuperTracker II Board

5. Plugging in Switch/AUX and OLED Cables

Once the SuperTracker II board is installed you will need to plug in the cables for the switch/AUX and the OLED screen. Refer to Figure 9 to determine the SuperTracker II's two connector pinouts. You will need to follow the connector pinout for proper cable connection. The switch/AUX connector pinout (from right to left) is GND, AUX, and SWITCH. The switch connection uses the outer two pins (GND and SWITCH). The center AUX pin would connect to either the drive 8/9 device jumper pad, or a ROM select line if you are using an alternate ROM set such as JiffyDOS.

The OLED connector pinout (from left to right) is VCC, GND, SCL, and SDA. The OLED screen itself is labeled with the pinout. Make sure that the cable you are using has the matching set of pins for the SuperTracker II's connector and the OLED's connector. Cable coloring doesn't matter. The connection from SuperTracker II to the OLED does!

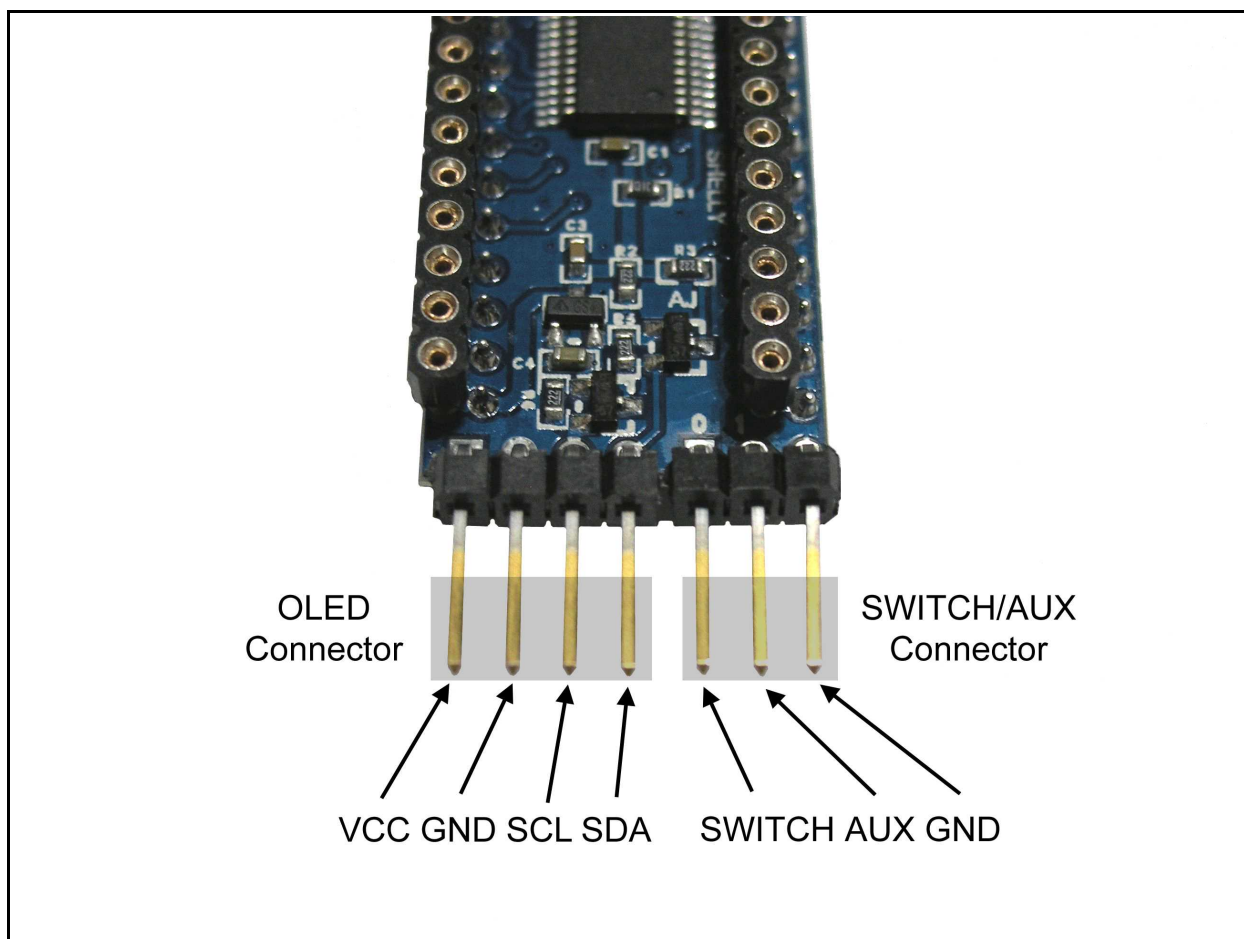


Figure 9 – SuperTracker II Connector Pinouts

6. Quick Test Procedure

Once the cables are plugged into the proper positions, you can do a quick test to make sure that everything is installed correctly. Drape the OLED screen and switch/AUX outside of the disk drive so that they do not touch the disk drive chassis. Attach the power cable to the disk drive. Turn on the power to the drive. The disk drive should power up and the disk drive's red activity LED should come on and then turn off. If the installation was done correctly, the OLED screen will show information. If the disk drive's red activity LED does not turn off or the display is blank, power off the drive and check the installation! If the disk drive's LED did not turn off then check to make sure that the 6522 VIA chip is installed correctly on top of the SuperTracker II board. The "notch" should be facing towards the rear of the disk drive, and every pin should be in a matching socket hole. If the disk drive's red LED did turn off but there is nothing showing on the OLED screen, then check to make sure that you have the OLED cable attached correctly. Typical causes for this problem are the one end of the cable being reversed or the cable plugged in one pin off.

If the SuperTracker II passes the quick test then you are ready to mount the OLED screen and switch.

Remove the cables from the SuperTracker II board and proceed to the next section.

SECTION 2 – INSTALLING THE OLED SCREEN AND SWITCH

1. OLED Bezel Installation

For a standard 1541 disk drive the best location for mounting the OLED is in the metal face plate, just to the left of the '1541' logo.

Use the included OLED bezel and mark the inside area of the bezel as a guide of where to cut the bezel hole. See Figures 10 and 11 for details.

Once you have marked the location to cut, use a 1/4" drill bit to drill several overlapping holes and then use a file to shape the hole. Test fit the display bezel as you take material away from the hole. Don't take too much material! See Figures 12 and 13 for examples. Figure 14 shows the final result with the bezel pressed into the rectangular hole.



Figure 10 – Use OLED Bezel as Template For Marking



Figure 11 – Marking Made Using OLED Bezel



Figure 12 – Rough Cut Hole

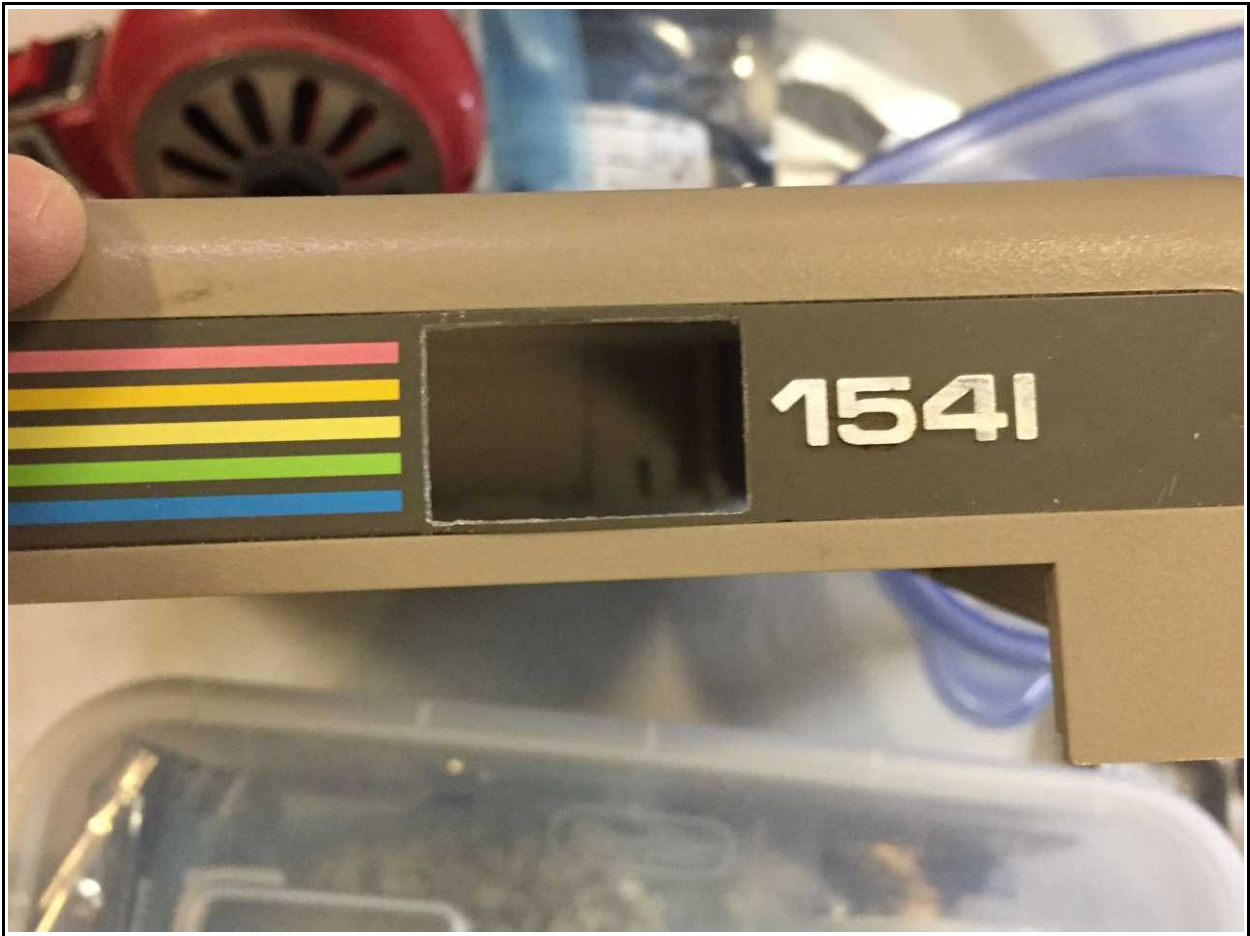


Figure 13 – Finished Hole



Figure 14 – Finished Bezel Installation

Once the OLED bezel has been installed you can then mount the OLED screen. With the suggested installation, the OLED screen will be flipped upside-down so that the connector is closest to the edge of the disk drive opening (nearest the blue stripe in the rainbow logo). You will need to use a rubber or silicon based glue (like "ShoeGoo") to hold the display in place. Hot glue would also likely work.

You need to see exactly where the edges of the viewable area are for the OLED screen. You can use the SuperTracker II's "Screen Align" option (see Section 3 for details) to enable all of the pixels in the display so you can center the OLED screen within the bezel. Once the OLED screen is in the proper position glue it in place. Allow the glue to dry fully so you don't end up with a shifted display! If you used rubber or silicone based glue and you do make a mistake, you should be able to remove the display and try again. Clean up extra glue from bezel and OLED screen if necessary. See Figures 15 through 18 for details.

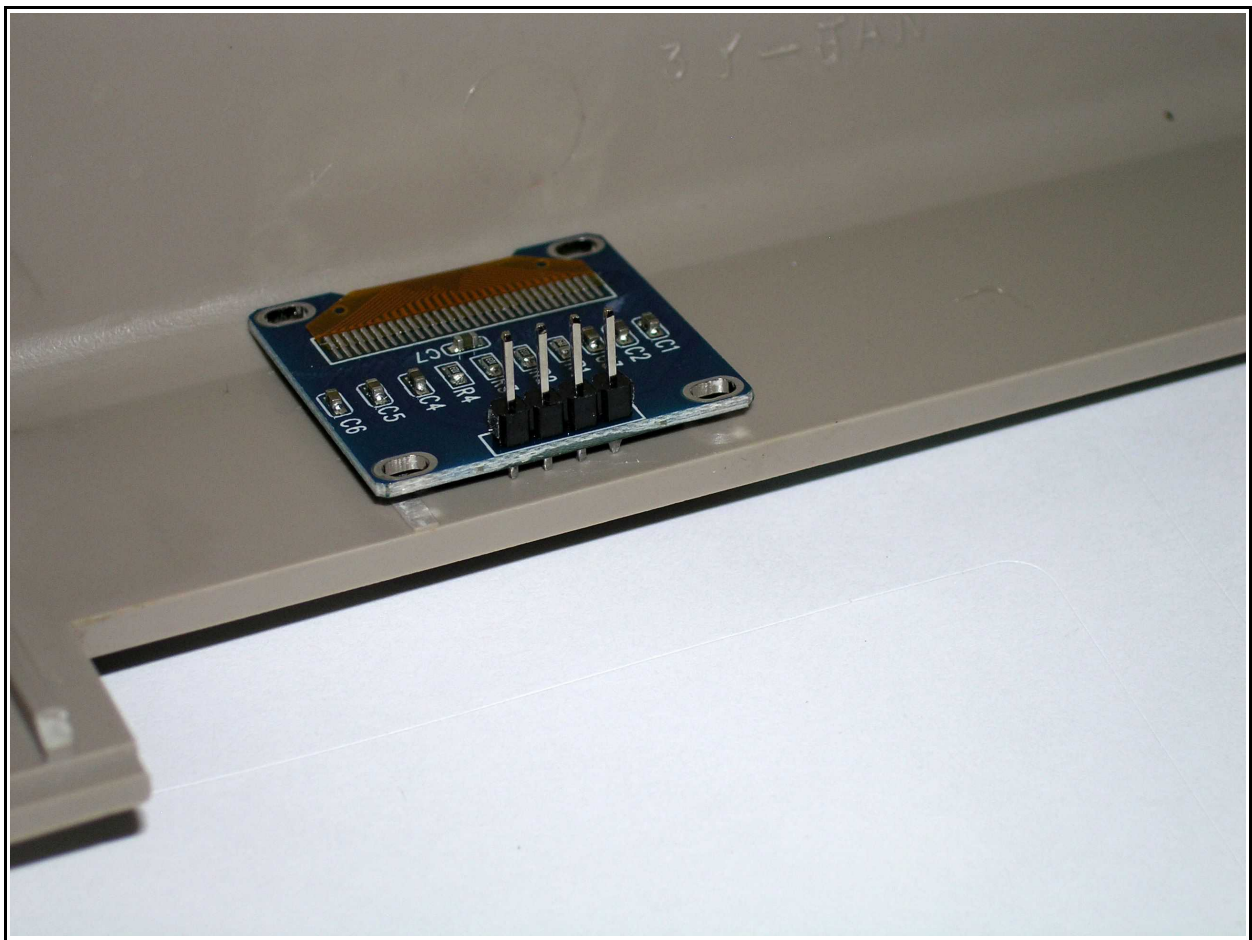


Figure 15 – OLED Mounting Orientation



Figure 16 – “ShoeGoo” Glue Applied to Surface

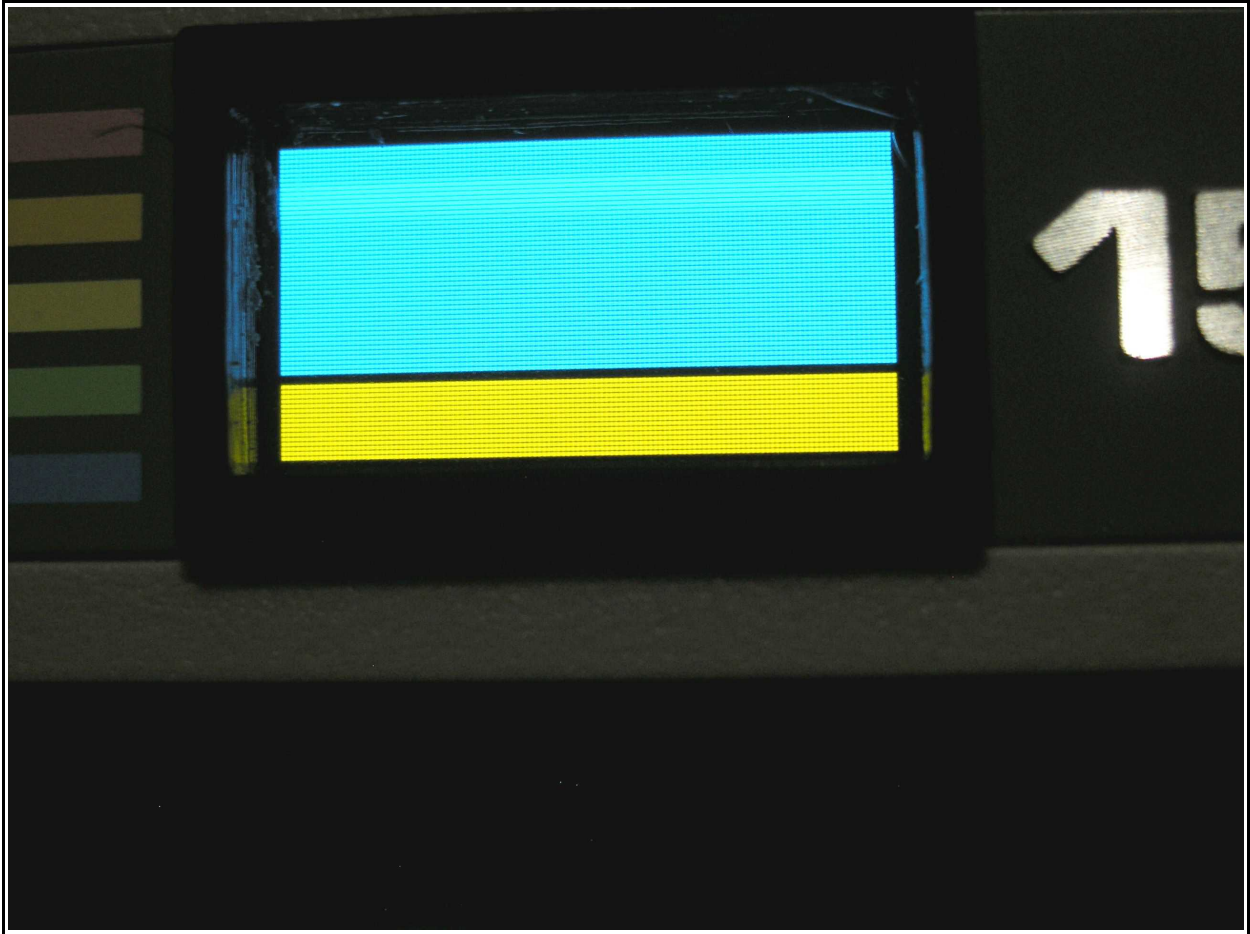


Figure 17 – Hold OLED in Center of Bezel Until Glue Dries

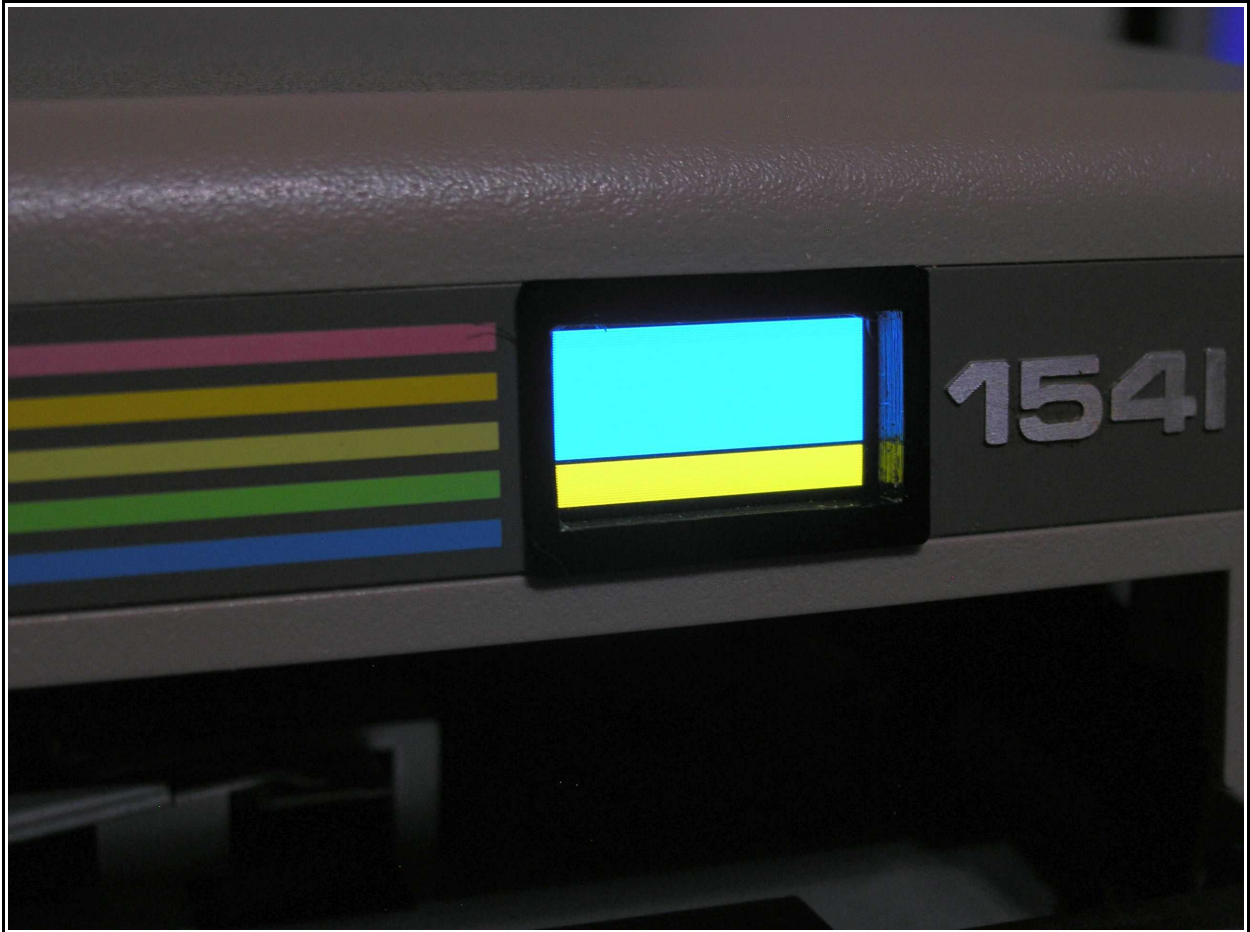


Figure 18 – OLED Installation Complete

2. Mounting the Switch

There are two switch options. One is standard size switch that uses a .25" mounting hole, and the other is a micro-switch that uses a .20" mounting hole.

The location of the switch is entirely up to you. Some may want the switch hidden away on the back side of the disk drive, while others may want the switch to be conveniently located on the front of the drive.

If you choose to use the micro-switch it can be mounted virtually anywhere. Use a 3/16 drill bit to drill the mounting hole for the micro-switch. It must be noted that due to the thickness of the disk drive's plastic case you will not be able to use the metal lock-washer that comes with the micro-switch. In fact, the metal nut that comes with the micro-switch barely fits and will actually scrape the surface of the plastic or metal face plate when you tighten the metal nut. The micro-switch option comes with an optional black plastic washer that can be used as a bezel for the micro-switch. This can be "screwed" on to the micro-switch to make a clean installation. You can optionally glue the switch to the plastic case and not use anything else to hold the switch in place, omitting the metal nut or plastic washer.

If you choose the standard size switch note that the length of the switch does not allow you to easily mount it in the metal face plate (like what is shown in this example of the micro-switch installation)! The standard size switch has to be installed directly below the face plate on the portion of plastic that extends downwards and is directly to the right (or left) of the disk drive mechanics. Use a 1/4" drill bit to drill the mounting hole for the standard size switch.

See Figures 19 and 20 for details on the installation of the micro-switch.



Figure 19 – Micro-switch Glued in Place

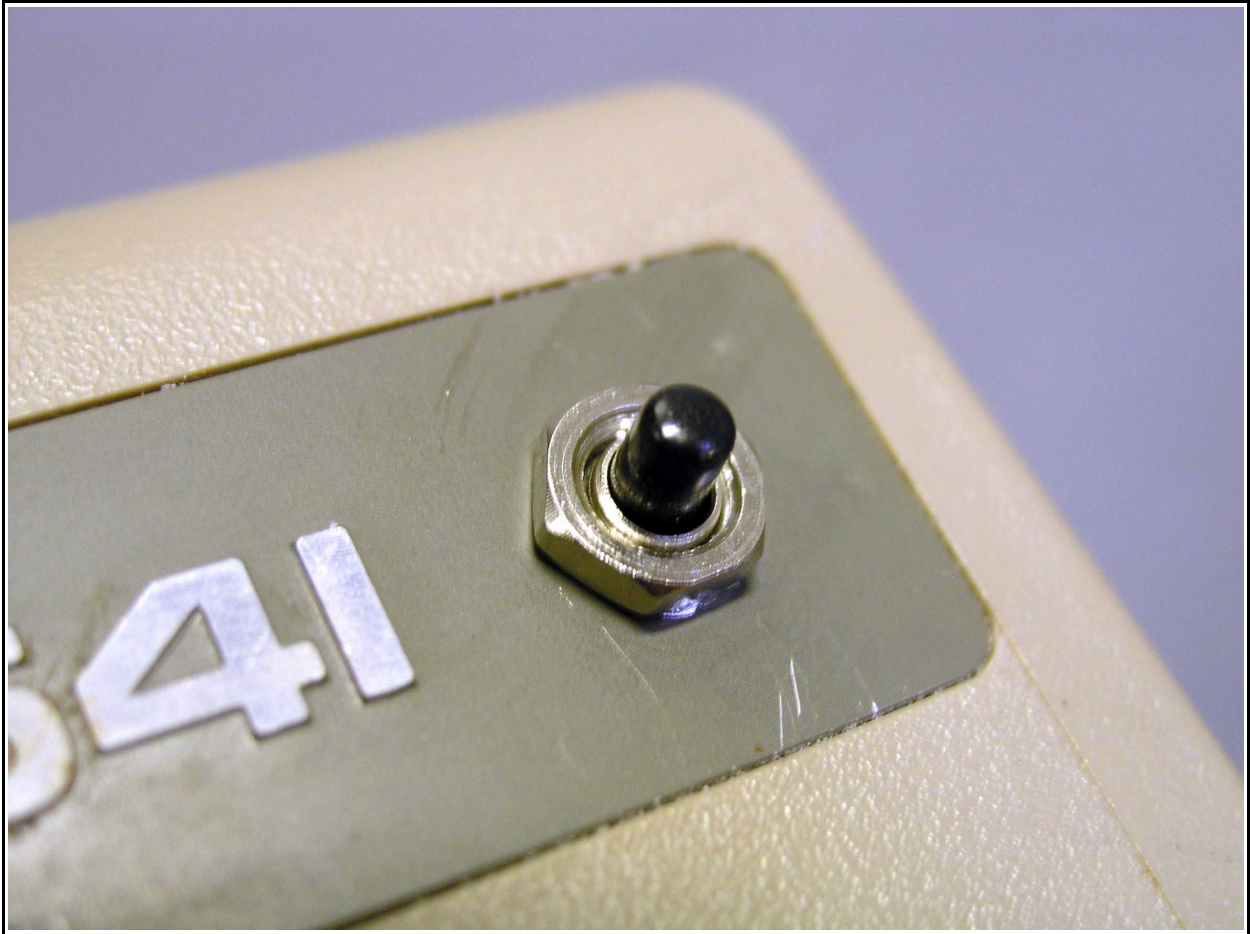


Figure 20 – Micro-switch Mounted With Metal Nut

It is recommended that you twist the OLED cable and then wrap the switch/AUX cable around the OLED cable. See Figure 21 for details. This will move the the wiring off to the side of the drive, which will help eliminate any possible RFI/EMI to (or from) the SuperTracker II. It also makes re-assembly much easier!

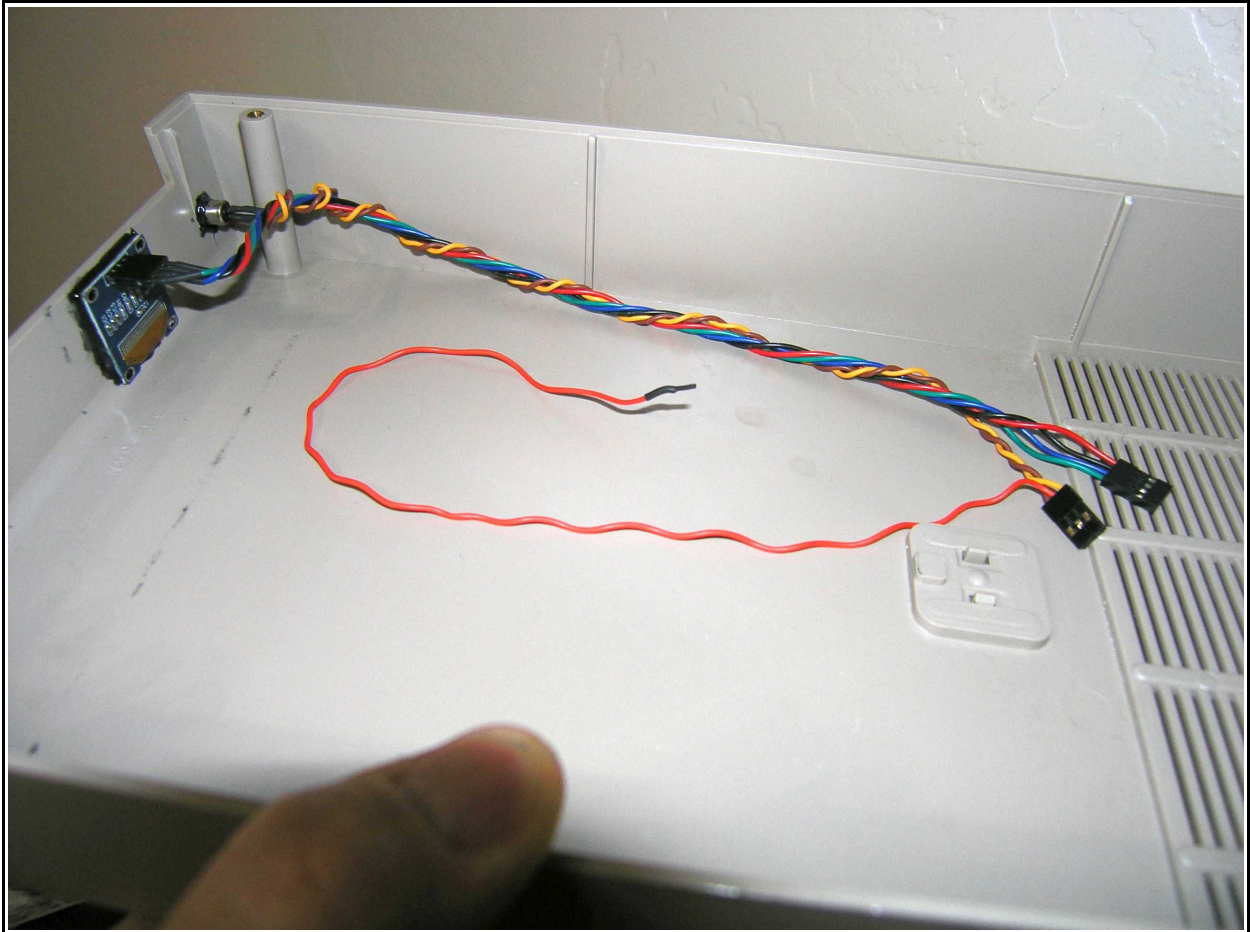


Figure 21 – Recommended Cable Routing

3. AUX Output

The middle pin/wire on the Switch/AUX connector can be driven either “high” (+5v) or “low” (ground), via the menu. See Section 3 for details.

If you have a drive ROM that has ROM selection capabilities using a toggle switch (common for JiffyDOS), you can connect the AUX output to the chip select input on the ROM to control which half of the ROM is used.

Each disk drive board has it's own unique set of device number selector pad locations, commonly referred to as device jumpers. The AUX output can be connected to one of the device jumper pads if you want to be able to change the disk drive's device number. The pads are dual half-moons with a thin trace between the half-moons. Cutting the trace between the half-moons and soldering the AUX output wire to the pad that is **not** connected to ground (or the other set of half-moon pads) will let you control the device number using the SuperTracker II's AUX output, controlled in the menu. In all cases, to change between device #8 and #9, you would use the pad labeled 1 (or J1). See the table below the various drive types and their device jumper locations:

Disk Drive Model	Description	Pads
1540/1541	Assembly #1540001	1 & 2
1541	Assembly 1540048	1 & 2
1541	Assembly #250442, 250446	1& 2
1541	PCB #251854	J1 & J2
1541-II	Uses DIP switches	N/A
1571	Uses DIP switches	N/A

See Figures 22 through 25 for details on the location of the device number jumpers for the various drives. The red arrow points to the location of the device jumper pads.

Once you have connected the AUX output to where you want it, you can re-assemble the disk drive. Note that the metal shield will likely not fit anymore and can be omitted.

Put the lid on top of the disk drive, noting the routing of the cable assemblies. Flip the drive over and put the four screws into their holes and tighten them. The installation is complete!

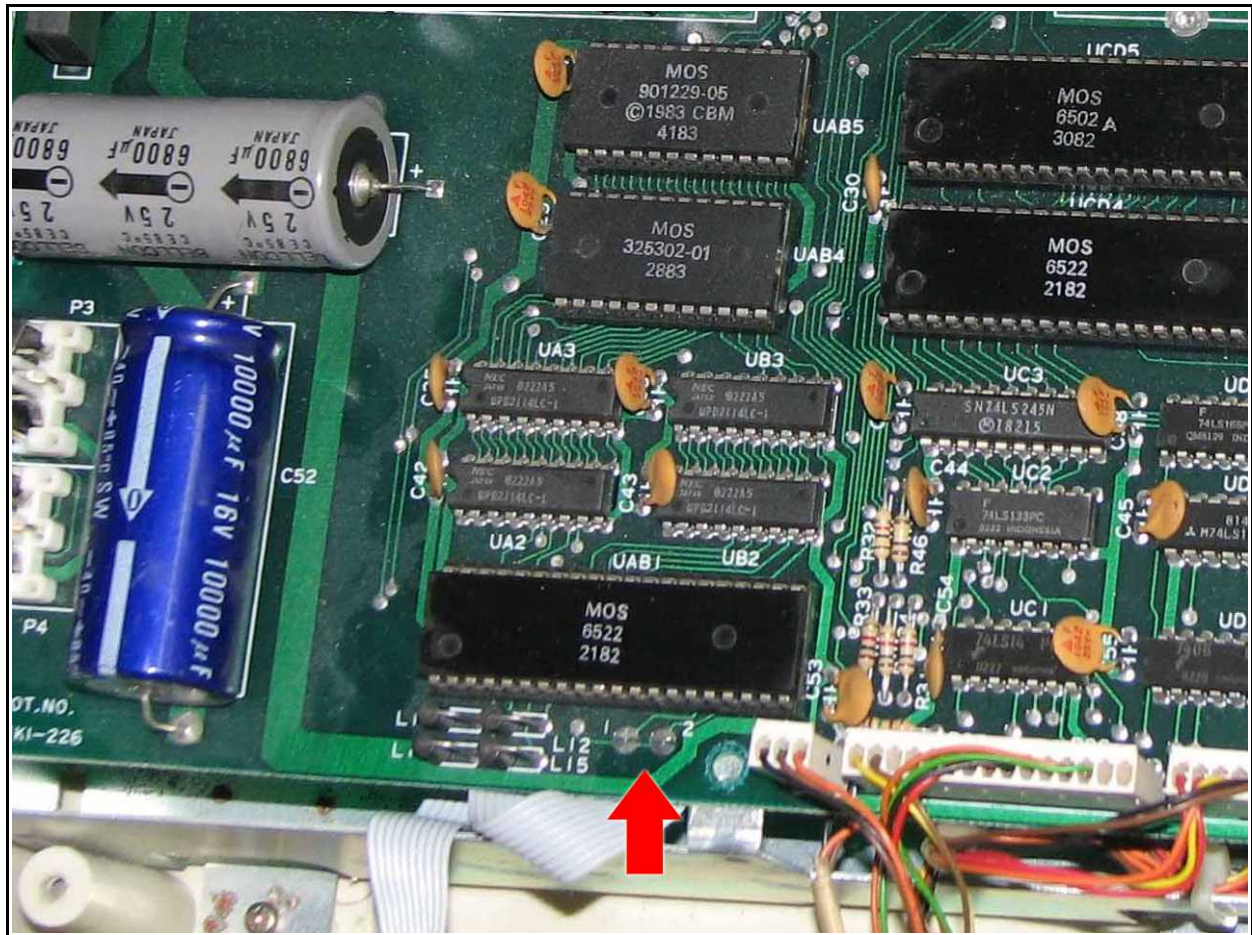


Figure 22 – 1541 Assembly #1540001

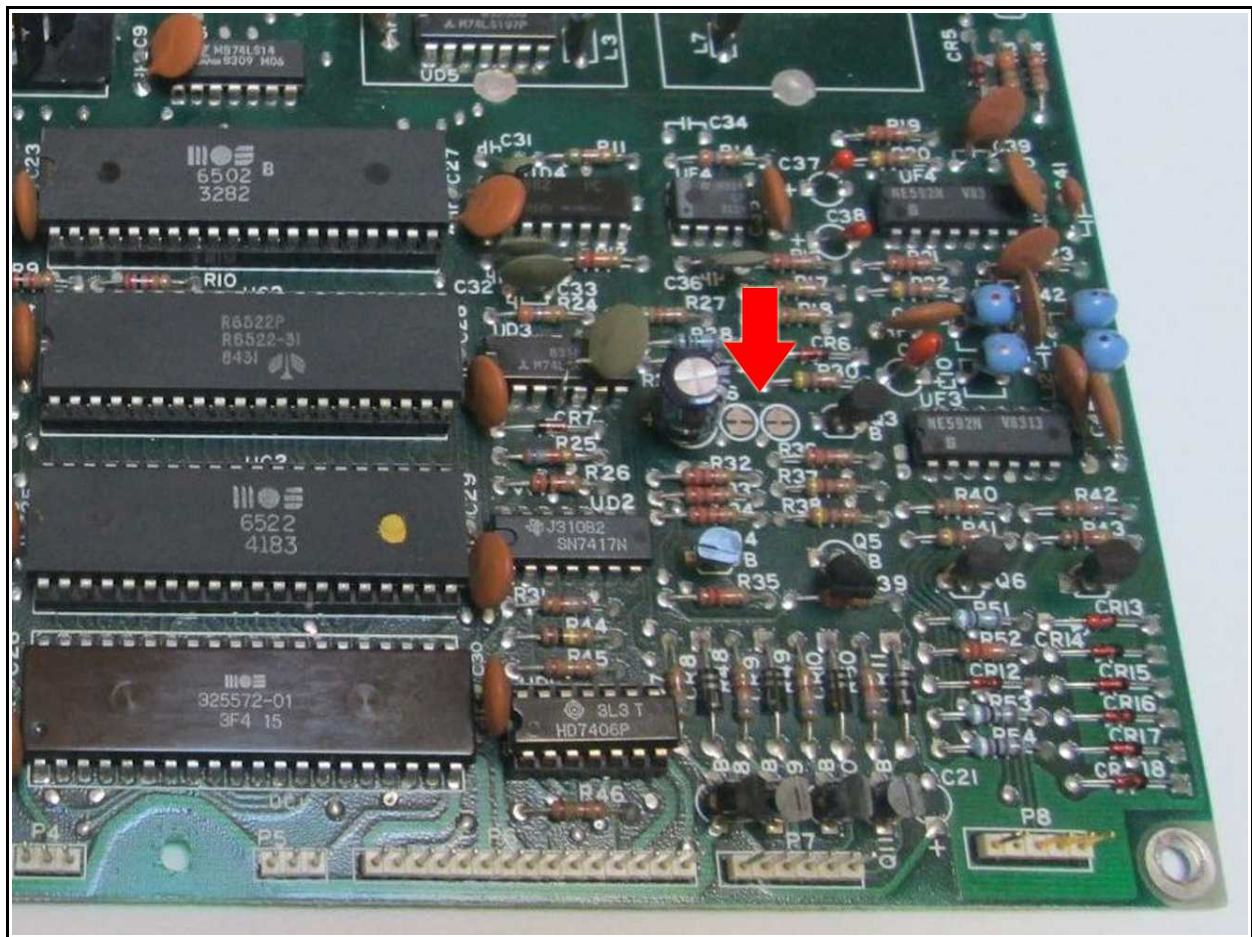
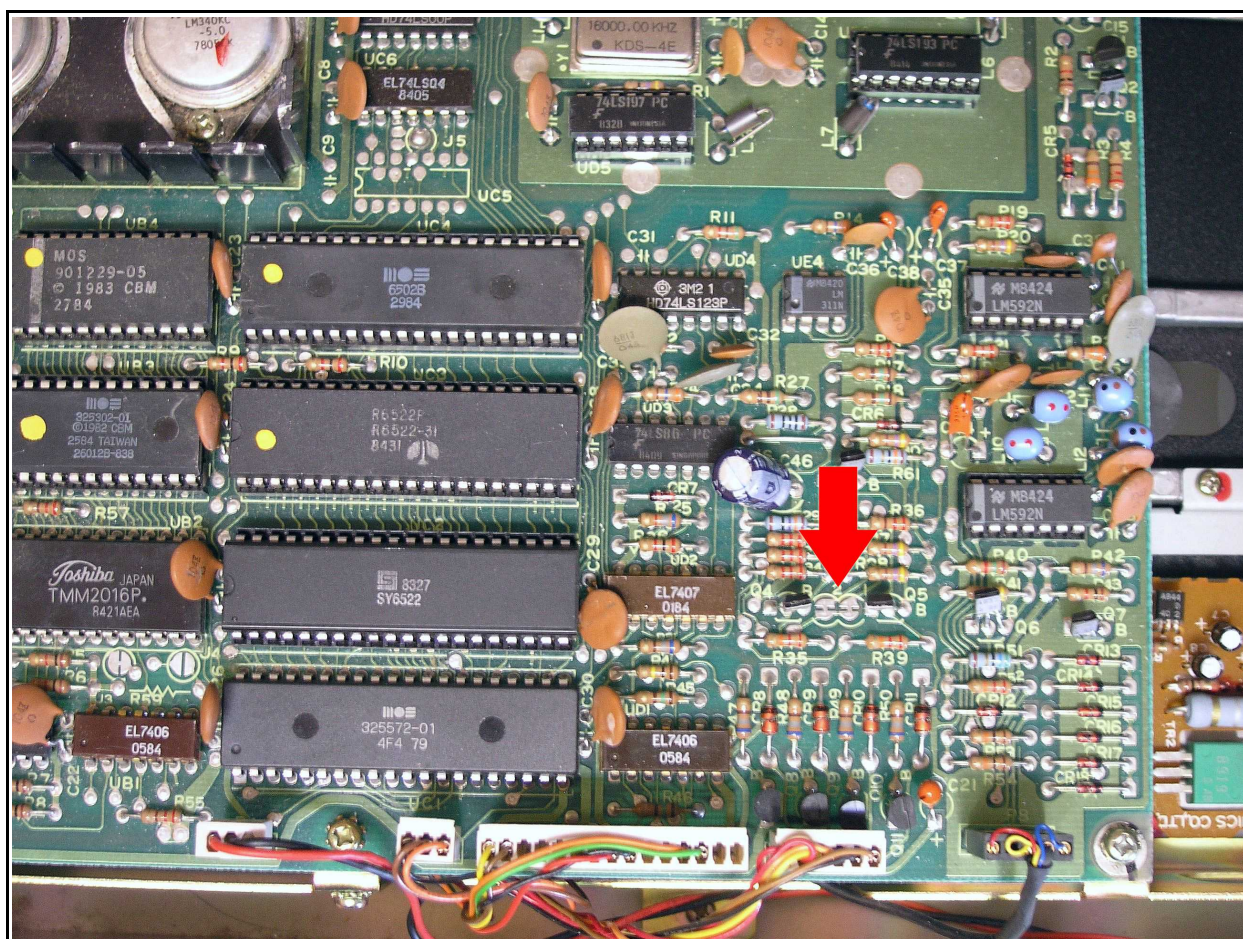


Figure 23 – 1541 Assembly #1540048



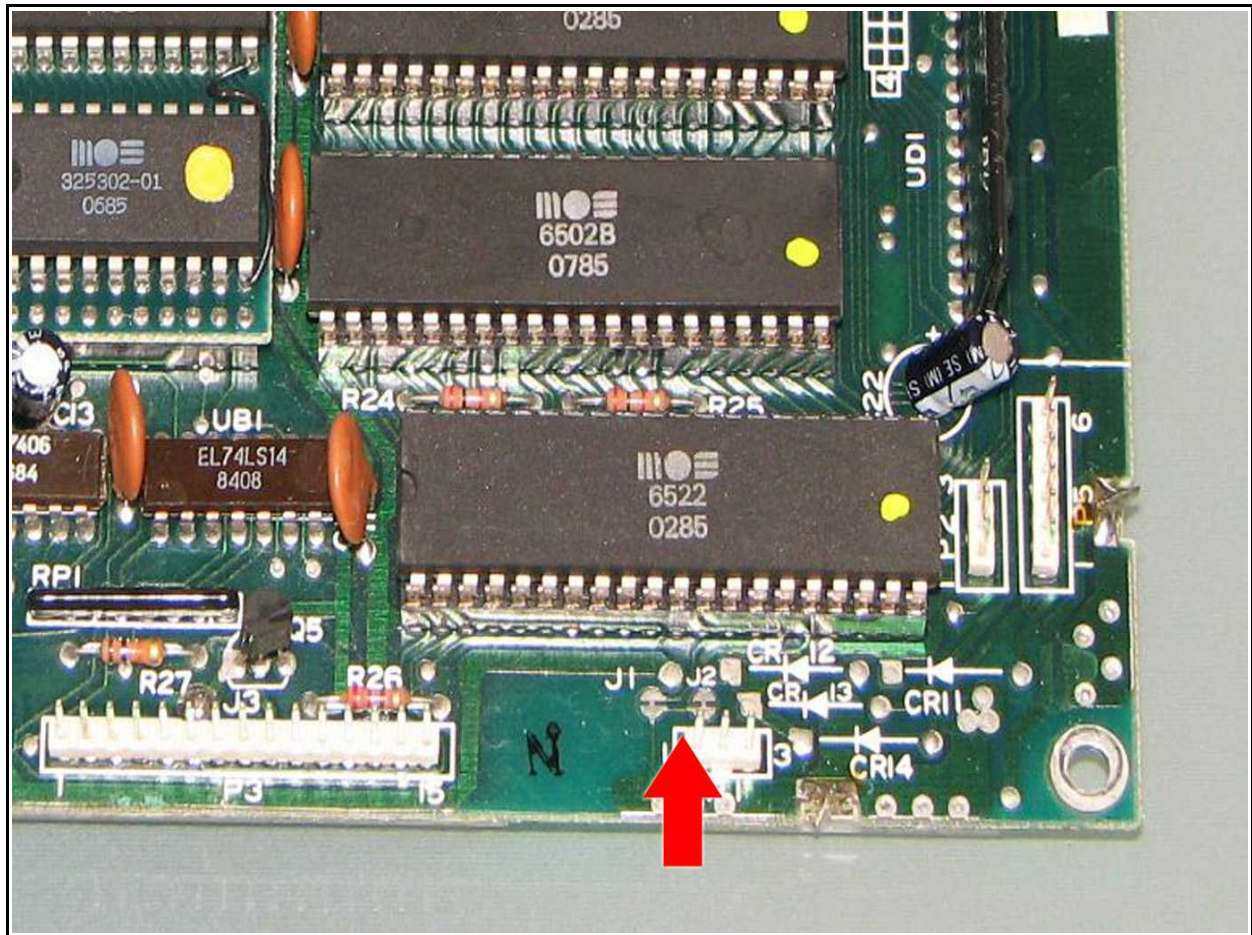


Figure 25 – 1541 PCB #251854

SECTION 3 – USAGE

1. Introduction

The Commodore 1541 series disk drives do not have ability to provide a reference point for any particular track using a hardware means. In order for the SuperTracker II to know where the disk drive's head is, it must be first set to a known location. The directory track on all Commodore drives is track 18. If you load a directory using LOAD"\$",8 the head will step to track 18. You can also step the head to track 18 using the DOS "initialize" command:

```
OPEN15,x,15,"I":CLOSE15
```

'x' = the device number, which would be device 8 for a stock disk drive.

Using JiffyDOS, you can use @\$ to view the directory or the @I command to initialize the disk drive.

Once the head is on track 18, briefly pressing and releasing the switch will cause the track display to reset to track 18.0. From this point, the SuperTracker II's track display will follow the head stepping. You need to do this procedure after first powering up the drive or when the drive is reset. You typically do not need to do this procedure after changing disks.

If you press and HOLD the switch, the text that displays "SuperTracker II" will change to **RESET**, then to **Record**, and then to **Playback**. If you continue to HOLD the switch longer, the menu will appear.

If you immediately release the switch while **RESET**, **Record**, or **Playback** is shown, then that function will be done.

If you press and HOLD the switch until you see **RESET** and then immediately release the switch, the drive will reset.

If you press and HOLD the switch until you see **Record** and then immediately release the switch, the record mode will be started.

If you press and HOLD the switch until you see **Playback** and then immediately release the switch, the playback mode will be started.



2. OLED Screen Information

The OLED screen shows the following information: *track number (including half-track)*, *density level*, *drive motor status*, *write-protect status*, and *number of syncs* on the current track.

The *track and half-track* is the position of the head on the disk. Commodore disk drives normally use tracks 1 to 35, but some copy protections and extended DOS systems use up to track 42. However, most disk drive mechanics can not physically move the head beyond track 40 without the head being jammed due to nothing stopping the head from moving too far.

The *density level* can be 1 to 4, representing one of the possible four density levels that the disk drive's data separator hardware can use for clocking in the bits of data from the disk. Many copy-protection schemes will use non-standard density levels for tracks.

Commodore DOS uses the following density levels for regions of the disk:

Tracks	Density Level	Number of Sectors
1 – 17	1	21
18 - 24	2	19
25 - 30	3	18
31 - 35	4	17

The *drive motor status* is an important feature because custom DOS loaders will often times turn off the red activity LED, so you may not know that the drive motor is actually turned on. 'MTR' is displayed when the motor is running. The MTR text will be briefly reversed (blue background with black text) when the drive motor is on and spinning up to speed. When the drive motor has been spinning long enough to reliably read or write data, MTR is shown as normal text (black background with blue text). If you see the MTR text constantly showing as reversed it means that the loader code is deliberately turning off and on the drive motor. Some loaders and copy-protection schemes do this.

The *write-protect status* shows WP any time the write-protect sensor's optical beam is broken. This can occur when a disk is write-protected, and occurs while a disk is being inserted or removed.

The *number of syncs* is the number of sync marks that appear on the track. With Commodore DOS, there are two sync marks for every sector. So, for track 18, which has 19 sectors, the number of syncs would normally be 38. A sync mark is a series of 10 or more 1 bits in a row. Commodore DOS uses a series of 40 bits (1's) in a row for each sync mark. Many copy-protection schemes use a different number of sync marks on a track.

3. Record Mode

One special feature of the SuperTracker II is its ability to record and playback up to 1500 changes of the track, motor state, density, and number of syncs.

To start the **Record** function, press and HOLD the switch until **Record** appears, and immediately release the switch. You will see **Recording...** with a counter number.

That counter is the number of changes that have occurred while in record mode. There will be a flashing square while in record mode to let you know it is recording data.

If you briefly press and release the switch while in record mode, the counter will be reset to 0.

If you press and HOLD the switch, the record mode will be terminated. At that point the SuperTracker II can be put into playback mode if you want to view all of the changes.

4. Playback Mode

To start the **Playback** function, press and HOLD the switch until **Playback** appears, and immediately release the switch. You will see **Playback...** with a counter number. That counter is the current step in the sequence of changes that occurred during the recording. There will be a right-arrow symbol while in playback mode to let you know recorded data is being played back.

Briefly pressing and releasing the switch while in playback mode will advance the step by one, and the display will be updated with the next change. When all steps have occurred a warning message will be shown and the counter will reset back to 0 and start the playback over.

If you press and HOLD the switch, the playback mode will be terminated.



5. Menu Options

There are five menu options. Briefly pressing and releasing the switch will advance to the next menu item. If you press and HOLD the switch while a menu item is highlighted, then that function will be executed.

The first menu item is **Set AUX**, which will allow you to set the what output level is on the AUX output line. Press and HOLD the switch until a second menu appears with the options to set the AUX output LOW or HIGH. Select which output level you want by briefly pressing and releasing the switch to toggle between the two options, and then press and HOLD the switch to select that option. The main menu will re-appear after choosing one of the two options.

The second menu item is **Flip Display**, which will let you invert the display 180 degrees. This may be necessary depending on how you intend to install the OLED screen. With example mounting given in this manual, the display had to be inverted.

The third menu item is **Screen Align**, which will fill the entire display with color so that you can use the viewable display area as a reference when aligning the OLED screen with the bezel. Press and HOLD the switch until all of pixels are filled in and then release the switch. Press and HOLD the switch to exit back to the menu.

The fourth menu item is **Info**, which will show you the firmware version number and copyright information. Press and HOLD the switch to view the Info. Press and HOLD the switch to exit back to the menu.

The last menu item is **Exit Menu**, which will return the SuperTracker II to it's normal display. Press and HOLD the switch to exit the menu.

SECTION 4 – FAQ

Q: What is the difference between the "Kit" and "Plug-n-play" versions?

A: The Kit version requires that you solder one end of the OLED connector and solder the switch to the switch/AUX cable. Both versions require soldering if you want to use the AUX output to set the device number or be able to select a ROM.

Q: Can the SuperTracker II be installed in a 1581 disk drive?

A: No, this design only works with the 5.25" Commodore disk drives.

Q: Can the SuperTracker II be installed in a Indus GT disk drive?

A: Yes, but there is already a track display!

Q: Can the SuperTracker II be installed in a MSD-1 or MSD-2 disk drive?

A: No, these drives are not supported.

Q: Can the SuperTracker II be installed in an Accelerator or Ocean disk drive?

A: Yes, but these drives are small so the OLED and switch would have to be mounted externally.

Q: Can the SuperTracker II be installed in a Blue Chip disk drive?

A: Yes.

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