

HOW TO FIX A 1541

--- WARNING!!! ---

The following article details a method of repairing disk drives which are out of alignment. While we believe the information in this article to be accurate and reliable, the executive and directors of the club and those connected with the newsletter have not personally tried these remedies. They should not be attempted by anyone unfamiliar with the equipment or procedures described therein. Any such attempt to do so may result in serious damage to either your disk drive and/or computer. If your disk drive suffers from the complaints described in this article and is under warranty, your best solution is to return it to your dealer for repair or replacement.

The Commodore Computer Club, its executive and directors, and newsletter staff will not be responsible for any damage which results from a failure to observe this warning.

By RAY CADORIN

The 1541 disc drive contains a 6502 microprocessor, 2K of RAM and ROM DOS, current version 5.

The drive determines the head position by reading the track and finding out from it which track it is on. On unformatted discs the microprocessor forces the read/write head to a position beyond track 1. Beyond track one is a head stop which stops the head from travelling any further. After hitting this stop about 6 times the micro determines that it is at track "0". It then advances the head one track to track 1 and starts to record data on the disk, stepping the head through all 35 tracks.

The 1541 was originally designed for the VIC 20 but was upgraded to the C-64 by changing the DOS. Since its introduction as a drive for the C-64 it has had many internal changes to the circuit board as well as the DOS. The first PCB was rev A. In March of 1983 they were shipping rev C. Currently they have an all new circuit board using CMOS chips instead of the TTL chips of the earlier versions. The older units using circuit boards with TTL (7400 series) chips, have 2 video amp chips with gains of up to 400 times each. It appears that these chips are heat sensitive and tend to break down after some time, causing the gain of the signal to drop off. These chips are NE592 or uA733 or LM733 chips. These chips (there are 2 of them in series) feed into a LM311 voltage comparator chip which squares up the signal and feeds it to a 9602 one shot for further signal conditioning. The 2 video amp

*SCANNED for Archival Purposes
RizThomas 07-30-2014*

**COMMODORE
COMPUTER CLUB**

NEWS



VOLUME 1, NUMBER 6 — MARCH, 1984 — VANCOUVER, B.C. • FREE • 24-HOUR CLUB ANSWER PHONE: PET-3311 (738-3311)

Page 1/3

FIX A 1541

(Continued from page 1)

chips are used to amplify the signal coming off the read heads.

The mechanics of the drive seem to have several flaws. According to Jim Butterfield, drives made after September 1983 do not suffer from these problems as much. [Serviceman Randy Atkinson of Conti Electronics told a recent meeting of the club there is no mechanical difference between any of the drives, since they all use the same stepper motor mechanism. -- Ed.] All drives are, however, easy to align. The head stepper motor shaft is connected to a pulley which has attached to it a steel band which in turn is tied to the read write heads which slide back and forth on steel guides. The stepper motor shaft and the pulley are not permanently fixed together. There is slippage between the two parts and this is the cause of all the problems. When the stepper motor drives the heads past track 1 this pulley hits the back stop. On formatting, or even on positioning when the pulley hits the stop there is a very small amount of give between the stepper motor shaft and the pulley, thus when the head goes to read a track it will be slightly off center. However, because there is a certain tolerance width for each track the head will still read the data. Over a period of time (and many disks formatted) the head will be sufficiently out of

alignment to not read the track. If the pulley is allowed to continue to hit the back stop it will eventually throw itself so far out of alignment that it will be clear into the next track. When the CPU sees that it is reading data from a adjacent track, it will simply increment or decrement one track in order to read the correct data, in effect the head is now aligned again, even though it is one track out the CPU is smart enough to adjust accordingly.

This method of alignment is not very good because as the head is going out of alignment, so are your disks that you format. You may be able to read your latest disks but not the ones you formatted 4 months ago, because with each format your heads are slightly different.

The red light on the front of the disk drive is a good indication of head alignment. If this light blinks a lot while reading a disk then there is a very good possibility that it is out of alignment. [Ed. Note: Other indications of problems are drive failing Performance Test on Test/Demo disk, especially Write and Read Track 1, and inability to Read or Write to Track 1 with Disk Doctor.]

Many arguments exist pro and con about the need for slippage on the

page 2/3

FIX A 1541

page 3/3

stepper motor pulley, however the majority opinion is that Lock-Tite or Krazy Glue placed on the pulley will lock the two parts together thus preventing slippage. Another more permanent method would be to drill a "key way" hole and insert a pin between the stepper motor shaft and the pulley. In any case, after the fix is in it might not be a bad idea to scribe a line across the pulley and the shaft to see if there is any further movement. **INCIDENTALLY, ANY OF THESE QUICK FIXES OR ALIGNMENTS MAY VOID YOUR WARRANTY.**

Generally the back stop will not need any adjustment, but if it is felt that it is out of adjustment then you can set it correctly by placing the head on track 1 and adjusting the back stop for 15 thousandth of a inch of clearance with the head stop.

The heads should be cleaned regularly and also demagnetized every once in a while with iso-propyl alcohol, available at most drug stores for only a buck or so. **DO NOT USE RUBBING ALCOHOL** as it has impurities in it. Use cotton swabs to wipe the iso-propyl over the heads.

The screen shield over the main circuit board can be left off to allow the circuit to run cooler.

It should be noted that not all problems are due to the disk drive. Bad disks are common, as are disks borrowed from someone with a misaligned drive.

Incidentally, the track spacing on the disk is 1/100 of an inch so it wouldn't take much to misalign the drive.

* * *

The 1541 Disk drive can be aligned

using a known good disk and an oscilloscope.

A recommended alignment disk is the Test/Demo disk that was supplied with the disk drive when it was new.

STEP 1. Remove plastic case by removing 4 mounting screws on the bottom of the drive (Phillips screws).

STEP 2. Remove disk unit from bottom of case by removing 6 more screws along the base of the drive.

STEP 3. Remove 2 screws that hold the metal shield on the top of the drive and remove the shield.

STEP 4. Locate integrated circuit UH4 (the only 8 pin IC on the circuit board). It is located near the front, about dead center.

STEP 5. Attach scope probe to pin 2 of UH4 (LM311N chip), attach the ground to pin 8 of IC UG3 (9602).

STEP 6. Power up the drive and load DISK DOCTOR. Set scope to 1 volt per 1 and .2mS horizontal.

STEP 7. Seek to track 18 or 17 and adjust stepper motor for maximum scope deflection. The stepper motor is held in place by 2 screws on the under side of the chassis. Loosen the screws just enough to allow the motor to move slightly under pressure. The disc must be rotating when checking output. When maximum deflection is detected tighten the motor mounting screws and recheck scope deflection. Disk is now aligned, check tracks 1 and 35 but do not adjust. Scope trace at track one is much greater than at 35.

STEP 8. To further check head alignment seek to track 1 and watch the read head as it goes there, it should go and stop without hunting for the track. Repeat for tracks 18, 35, 18, 1 in that order.

STEP 9. Seek head to track 1. Adjust back stop for 15 thousandths of an inch from the head stop.

STEP 10. Reassemble shield, remount

disk in case, and install top of case.

ALIGNMENT IS NOW COMPLETE.

PLEASE NOTE: Worn discs, and even different brands have different outputs. Adjust waveform for maximum deflection only, not for a specific value.

It is possible to align the disk drive without an oscilloscope. Two other methods have been tried and have worked.

METHOD 1: In place of the scope in the previous alignment instructions, a VTVM with a high impedance input can be used, adjust the heads for maximum deflection on the meter scale, at maximum deflection the heads are aligned.

METHOD 2: This method is somewhat hit and miss and is downright crude, but it works. Disassemble the drive as above and loosen the stepper motor screws and load a known good disk. Force the drive to read the directory (LOAD"\$",8). If the red light on the drive flickers (does not stay on) then turn the motor very slightly counterclockwise and try again. Depending how far out your drive is it may require several tries. If you have to move the motor more than 1/16 of an inch then you might try turning it in the other direction. If your drive is still out, you will have to take it in to have it adjusted or repaired.

Industrial standard alignment disks are available for the 1541 drive. These disks have a pattern on them called a "cats-eye," which is used to perfectly align a disk, and is the only accurate way of aligning a disk drive. If you have to take your drive in for alignment, ask the service person if it will be aligned with a "cats-eye" alignment disk, if he doesn't know what one is or says you don't need one, then take your drive elsewhere for alignment.