TUNING THE COMMODORE 1541

How to align and time the 1541

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■While the Commodore 1541 disk drive is a marvel of electronic hardware, it has its flaws. Sooner or later it will require servicing. The following is a description of what you might try before sending it off on a long and expensive vacation.

One day my 1541 began to blink slightly while trying to load my favorite program and this led me to believe a problem might be brewing. Since the 1541 doesn't give up easily, it continued to re-read the data and finally load the required blocks from the disk. The blinks, which meant mis-read data bits, kept getting worse until one day, it gave up and refused to load those programs at all. Often, it would get completely through the load and reset itself back to the ready prompt screen.

On newly-written programs, where I had just formatted the diskette, there was no problem. The light stayed on continuously and the programs loaded fine. If I tried to load a piece of commercial software or a program from a friend's machine, things got really bad. After losing a complete database file disk from which I couldn't recover, I decided that now was the time to fix it. Fix what? I wasn't quite sure.

I found that there are three main mechanical malfunctions that could cause blinking lights and mis-read data. These are a dirty read head, a slow disk speed, and a misaligned head to the data track. Since these problems are mainly mechanical, they can be fixed by the average mechanical tinkerer. However, poking around inside a delicate piece of equipment such as the 1541 with a screwdriver does require some experience and is recommended only to those who feel capable and confident.

Case disassembly and head cleaning

Occasional program glitches and garbage on the screen without a blinking red light could mean a dirty read head. Rather than pay a small fortune for a head cleaning kit, use a cotton swab slightly dampened with alcohol. The only problem is getting at the head in order to clean it.

The drive case is formed of an upper and lower half. The top is held together by four screws through the bottom. Unplug the 1541 from the power cord and serial buss. Turn the drive over and remove the four screws. Then re-invert the drive carefully and remove the top cover. You will see part of the circuit board and some of the diskette guides. The rest is covered by a steel cover. This interior cover is attached by two small screws on the left side of the drive's metal frame. The right side is secured by two small detents that hold the cover in place. Remove this cover and you can view the rest of the circuit board and drive mechanics. Also, you can easily see the read head near the center below the circuit board.

The head is the small white square towards the bottom of the case that is recognizable by the black line that crosses it from left-to-right as shown in Figure 1. Most people think that the head is the gizmo that rides on top of the diskette. This is only a small piece of white felt that holds the diskette surface close to the head. The data is read from the bottom of the diskette, not the top.

Using a good-quality cotton swab which is slightly damp with alcohol, you can gently clean the surface of the head at this point. Make sure you don't soak the swab, or you may flood the head causing more problems. You'll be surprised to find a generous amount of grime on the swab if you have used your drive extensively. Many times, this cleaning is all that is required to get the drive back to normal operation. You may want to try a program or two before proceeding further. Always replace the metal cover and case top before powering up.

Speed adjustment

The 1541 is tolerant of variations in diskette speed. Several things can cause the speed to vary. Drag on the drive mechanics, aging in the electronic drive components and slipping in the drive hub, to name a few. If the drive makes a low, screeching sound, the bearing that holds the plastic centering guide may have become dry. This bearing is located in the center and on top of the diskette guide arm. A small washer holds the shaft in place and lifts the centering guide when the door is raised. This shaft is directly over the center hole of the diskette when the disk is locked in place. A small drop of light machine oil on the washer will oil the bearing further down this shaft. Be sure that only one drop is used and any excess is wiped from the top of the assembly.

To actually check the speed of the drive, Commodore has included a dynamic speed indicator
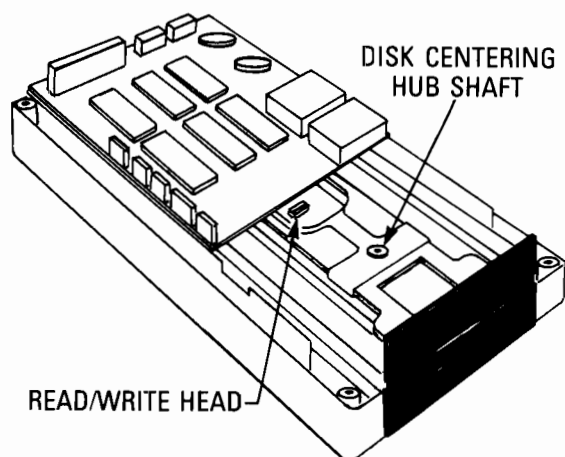

DISK CENTERING HUB SHAFT

READ/WRITE HEAD

FIG. 1—LOCATING THE HEAD is easy if you follow the instructions and refer to the diagram above. Look for the small white square with the black line crossing it from left to right.
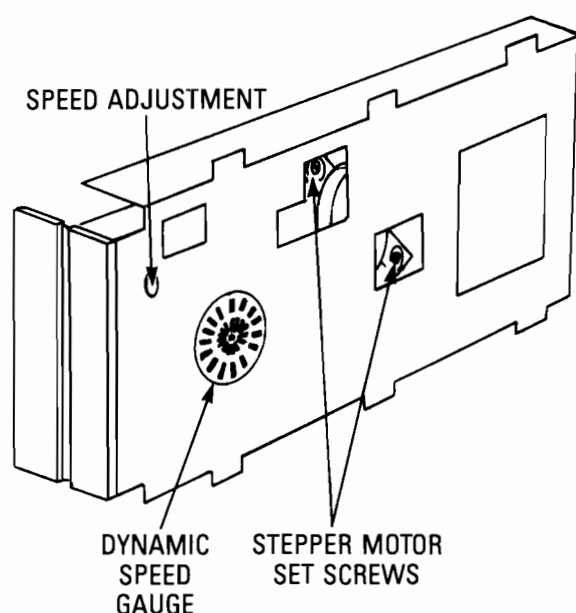
on the bottom of the diskette drive flywheel. To see this, it is necessary to remove the bottom of the plastic case.

You probably noticed that the drive is attached to the bottom of the case with six screws. After these are removed, the drive can be carefully turned on its side. The metal cover should be attached before this is done. The green indicator light is still attached to the case, so care should be used when the assembly is turned on its side in the case bottom.

Figure 2 shows the bottom of the drive assembly. The speed indicator is the pattern on the bottom of the drive flywheel. The pattern is used like the timing light on a car to set the correct rotation speed of the flywheel. The outside pattern is used for house wirings that operate on 60 Hz and the inside patern is for 50 Hz as found in England.

To check the speed of the drive, connect the drive to the computer and load a program while the assembly is on its side. Be careful since many components are exposed and should not be touched while the drive is operating. Shine a small fluorescent lamp on the flywheel with other lights in the room out. The outer pattern on the flywheel should appear stationary. While a small amount of movement can be tolerated, it should be corrected. If the pattern seems to be rotating rapidly, some adjustment to the speed control will be required.

The speed control is located under the metal case below a small access hole above and to the left of the flywheel. It is a small potentiometer with a screw that is held securely by a green glue. A small screwdriver inserted into this screw and turned will either speed up or slow down the pattern. Turn the screw until the pattern stops rotating and remains still. You may have to try several times. You should *not* have to turn the screw more than 1/16th inch in either direction. If you do, there may be other problems causing the incorrect speed. If you cannot get the pattern perfectly still, get as close as possible.

Read-write head alignment

The last and most-probable cause of problems is a misaligned head. The head has a tendency to slip from the correct path over the disk track after awhile. Since the diskette has some 35 tracks and only about one inch of lateral space around the disk, each track can be no more than 1/32 inch wide. Any small deviation can make the head appear to be badly misadjusted. A deviation of even 1/64th inch and the head would be half way off the track.

The problem of course, is to get it back on track and this is no simple task without test equipment. There is a way however, It's called "trial and error." We can do it, but it may take several tries.

Figure 2 shows the bottom of the main drive assembly. Note that the flat stepper motor is to the right of the patterned flywheel that we just used. This stepper motor controls the position of the head. This motor was meant to be moved to correct any small error in head alignment. The motor is held by two screws. These fit through holes that are really channels. They are elongated so the motor can be positioned up to 1/4 inch forward or backward. We use this adjustment to correct head misalignment.

To correct head misalignment, load a commercial program disk. If your head is badly out of line, note that the red indicator blinks as the drive misses data and tries again. Use this disk to check the accuracy of adjustments. With the drive off, mark the position of the motor relative to the metal case. A small scratch or pencil mark on both sides of the motor will do. This is important, as you need to know how far you moved the motor and in what direction.

After marking the starting location, loosen the retaining screws slightly. You will have to scrape most of the green glue from around the washer. The washer will not rotate unless it is free.

By observing the location of the marks, rotate the motor clockwise, only slightly, no more than 1/32 inch. Move too far and you may overshoot the track completely. Tighten the retaining screws and try the blinking disk program again. If the blinking has been reduced, you moved in the right direction. If it has gotten worse, repeat but in the other direction.

Once the red light is steady, turn off the drive. Re-tighten the retaining screws and make a final test. Load a disk with error clatter and make sure the clatter doesn't crash the load. If it does, you'll need to adjust the stepper motor again. You should not have to move the motor more than 1/8 inch in any direction. If all else fails, move the motor back to the original starting point and adjust in even smaller increments.

This is not a job for the faint of heart, and you'd better believe it's better than sending eighty-five big ones to Commodore's repair-replace department. Tuning the 1541 is like tuning up a high-powered race car at the Indy 500. But with just a little effort, you can have your 1541 purring like a kitten. ◀CD▶

SPEED ADJUSTMENT

DYNAMIC SPEED GAUGE

STEPPER MOTOR SET SCREWS

FIG. 2—BOTTOM OF THE DRIVE ASSEMBLY. The speed indicator is the stroboscopic pattern on the bottom of the drive flywheel. Outer pattern is for 60 Hz, inner is for 50 Hz.