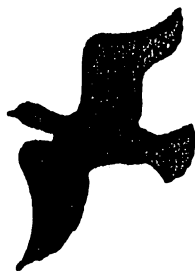# 1541/1571
DRIVE ALIGNMENT

Free Spirit
Software Inc.

**FOR COMMODORE
DISK DRIVES**

1541/1571 DRIVE ALIGNMENT

for
The Commodore 64/128 Computer
from
Free Spirit Software &
[BSD] Software

Instruction Manual by
Mark Brannon

The 1541/1571 Drive Alignment System is a precision alignment program that will return your disk drive to better than new alignment.

The Alignment System will automatically evaluate the alignment condition of your drive and provide you with the necessary information to realign your drive, with friendly 'on-screen' help available at all times.

The Alignment system is designed to operate with the C-128, 128D, (in either 64 or 128 mode), the C-64 (& C-64C), and the SX-64 computer. The Alignment System will work with the following disk drives:

1) 1541 and 1541C drive
2) 1571 drive
3) SX-64 drive
4) Commodore compatible drives

Program Loading:

For the C-128 computer, simply insert the Alignment disk, (programs side up) in the disk drive and reset or turn on the computer.

For the C-64, type LOAD"*",8 then press [RETURN]. Then type RUN [RETURN].

For the SX-64, press [C=] and [RUN/STOP] simultaneously.

For multiple drive systems, if drive number 8 is so badly out of alignment that it will not load a program, type LOAD "ALIGNMENT 64",9,1 for the C-64 or RUN "ALIGNMENT 128",U9 for the C-128.

For single drive systems that drive number 8 is so badly out of alignment that it will not load a program, see notes on *Loading with a miss-aligned drive*.

Does my drive need alignment?

If your disk drive chatters or bangs or the DRIVE ACTIVE light continues to flash rapidly during UN-PROTECTED program loads, or programs fail to load at all, or if it has difficulty writing files to a disk, chances are it is in need of alignment.

Why disk drives need alignment?

Commodore disk drives use a moveable read/write head that is connected through a mechanical linkage to a stepper motor. This stepper motor is in turn controlled by the disk drive microprocessor. During read/write activity, the microprocessor moves the head over the disk surface collecting (or writing) data. If a particular track isn't where the microprocessor thinks it should be, or it encounters an error on the disk (very common with protected disks), it then attempts to "realign" the head by smacking it against the head stop assembly. This way the microprocessor makes sure it knows precisely where the head is at, then it attempts the read or write activity again. This will happen a few times before the microprocessor will declare an error.

The microprocessor's attempts to realign itself are what causes drive alignment problems. The read/write head, banging against the head stop, causes the stepper motor shaft to slip inside the stepper motor hub. This causes the head to be positioned to a different location than the microprocessor has ordered. And you now have drive alignment problems.

Although the 1571 uses a photo-electric cell to eliminate head knock, occasionally it will encounter a disk error that will cause it to chatter loudly. This is the sound of heads going out of alignment!

Using the 1541/1571 Drive Alignment System

After loading, press any key to pass the introduction screen, then you will be asked to select a drive number. Select the drive number of the suspect drive. It is now a good idea to review the on-screen instructions, especially the Safety and Legal notes. Familiarize yourself with the procedure to check alignment. Before checking alignment, insert the reverse side of the program disk into the suspect drive. This is the calibration disk. Follow the on-screen instructions to evaluate the alignment condition of your drive. If alignment is indicated, review the adjusting instructions for your drive type before attempting it. Make sure you always exit the program with the [Q] option from the alignment screen menu. This will return your drive to normal operation.

Disassembly and adjusting

For all models of disk drives covered by this program, the basic adjusting procedures will be the same. The idea is to make VERY SMALL adjustments to the stepper motor that will place the read/write head in the location the microprocessor has ordered. Patience is required as satisfactory results will not happen instantly. The basic alignment procedures are not complex, but some mechanical ability is required. Always use extreme caution when working around exposed electronic equipment.

Following the disassembly and adjusting instructions below will invalidate your factory warranty.
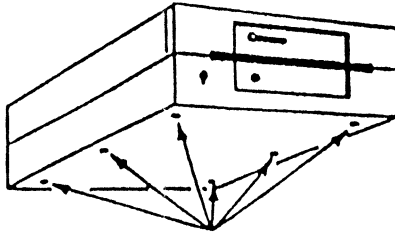
The 1541 drive:

Remove the 6 screws from the bottom of the drive. Lift off the upper cover. Remove the perforated shroud from the top of the circuit board and un-plug the small plug that connects the power light. Now remove the 6 screws that connect the metal chassis to the lower half plastic housing. Carefully lay the chassis on its side. Look to the underside of the chassis for two recessed enamel covered screws. These are the stepper motor adjusting screws. Loosen these slightly. Plug in and turn on the drive. Begin drive alignment as per the on-screen instructions. When adjustments are required, remember to make VERY SMALL adjustments by twisting the stepper motor gently as indicated by the Alignment Screen display. The stepper motor mount screw holes are slotted for this purpose. After re-tightening the screws, always RECHECK alignment. When completed, turn off and un-plug the drive before reassembly.

The SX-64 drive:

This is not a job for the timid. Complete disassembly of the computer housing is required to gain access to the drive. Once the drive has been removed from its frame, a helper will be required to suspend the drive above its frame while adjustments are made. The SX-64 drive is functionally identical to the 1541. The stepper motor adjusting screws are located on the underside of the drive chassis. This is a dangerous undertaking because the drive chassis is connected to the computer through numerous wiring harnesses that make it difficult to gain access to the underside of the drive. Use EXTREME caution.
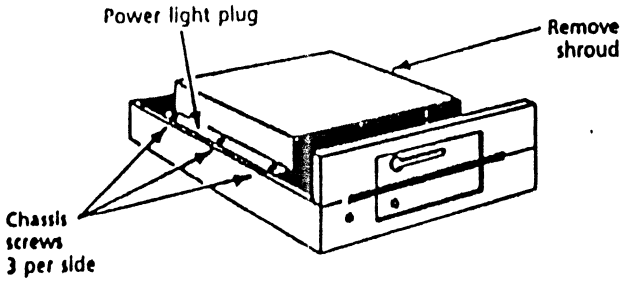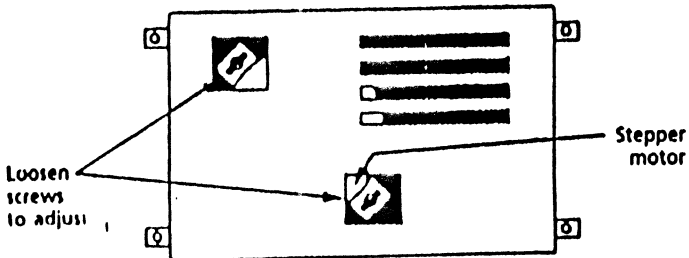
The 1541 Drive

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Case screws

Unplug all cables before beginning.

The 1541 Drive

Power light plug

Remove shroud

Chassis screws
3 per side

All Drives (but the late model 1571)

Loosen screws to adjust

Stepper motor

Underside of drive chassis

The 1571 drive:

There are two versions of the 1571. The early version has a stepper motor and head movement linkage functionally identical to the 1541. The later version has above-chassis side-mounted stepper motor. To determine which version you have, remove the 4 screws from the underside of the drive and remove the upper cover. On both versions the chassis is divided into two parts, the drive assembly and the circuit board. The later version will have a thin metal shroud over the drive assembly. Early versions do NOT have this shroud.
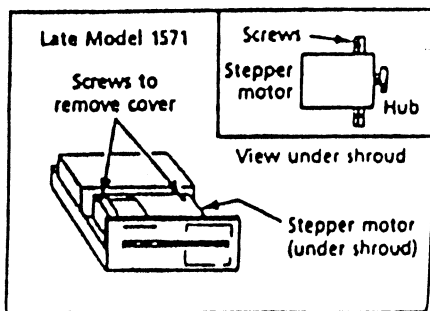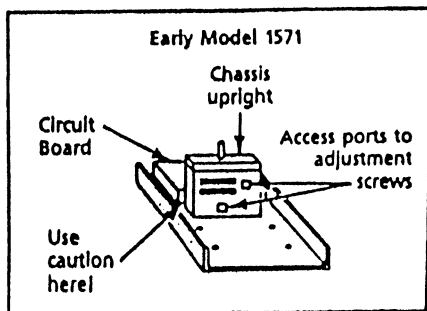
Adjusting the early version 1571 drive:

A helper will be required! Remove the door latch lever (by pulling straight out) and the nose piece. Remove the 4 screws that hold the drive assembly to the plastic case. Raise the drive assembly high enough to gain access to the stepper motor adjusting screws. Be VERY careful here as the BACK of the drive assembly can crush electronic components on the FRONT of the circuit board. The helper should hold the drive assembly up as the necessary adjustments are made.

Adjustments are made exactly like the 1541 drive. This is a very awkward drive to align, which is why CBM probably designed the above-chassis stepper motor on the newer 1571 drives.

Adjusting the later version 1571:

Remove the 2 ground straps from the drive assembly..(These connect the drive assembly to the circuit board). Remove the metal shroud from over the drive assembly and re-connect the two straps to the same location. The stepper motor is the black box located at the rear left of the drive assembly. Loosen slightly the two stepper motor adjusting screws. These screws should be left snug, but not tight. The later version 1571 is the easiest to gain access to the stepper motor, but the most difficult to actually align because of the ULTRA SMALL adjustments required. To make small adjustments, gently tap the front or rear of the stepper motor with the handle of the small screwdriver, or similar device, to move it on its slotted mounts the microscopic amounts required, as indicated by the screen display.

Early Model 1571

Chassis upright

Circuit Board

Access ports to adjustment screws

Use caution here!

Late Model 1571

Screws to remove cover

Screws

Stepper motor

Hub

View under shroud

Stepper motor (under shroud)

Checking and Adjusting Drive Motor Speed and Head Stop Position.

1541 Drive (SX-64)

Drive motor speed and head stop position are fully adjustable on the 1541 drive. However, routine adjustments to these are not recommended. Both the Drive Speed and Head Stop adjusting screens are accessed from the Alignment Screen. Before selecting either of these options, use the [I] command to initialize the calibration disk.

Drive Speed: The Check Drive Motor Option uses a system of averaging to calculate the actual drive speed. With this method, adjustment process is much smoother. If the screen display indicates a 'TOO LOW' drive speed, increase speed by turning the small potentiometer on the upper circuit board a small amount, then wait for the program to complete another averaging pass. (Adjustments for the SX-64 are made from the underside of the drive chassis.) Make sure that a full averaging pass in conducted between adjustments. If the drive active light flickers, you have increased (or decreased) speed too much. Continue adjustments until the Speed Analysis display indicates EXCELLENT or SATISFACTORY. Remember, electric motors don't slow down by themselves. If your drive motor is running too slow, it is probably caused by a loose or worn drive belt, worn idler hub bearings or a binding floppy disk.

Head Stop Position: Checking head stop position on the 1541 should be done as infrequently as possible. The routine to check head stop position is the same ROM routine that causes all the drive alignment problems to start with. If the screen display indicates adjustment is necessary, loosen the head stop retaining screw and move the head stop out (away from the stepper motor hub) in VERY small increments, then retest. (The ideal position of the head stop is just past the point that the display changes from 'TRACK 1' to 'TRACK 0'.) Continue this procedure until the screen display indicates a satisfactory head stop position with a TRACK of '0'. After checking or adjusting head stop, always recheck drive alignment.

1571 Drive

Drive Motor Speed and Head stop position are not adjustable on the 1571 drive. A fixed, electronic method is used to limit head movement. If drive speed indicates 'TOO LOW' the cause is probably a loose or worn idler hub bearings or a binding floppy disk. The Head Stop Check will return an 'Unsatisfactory', 'TRACK: 1' display. This is due to the head limiting electronics that will not allow the 1571 head to move to track '0'.

Head Stop Assembly

Move plate

Track 0 Stop

Circuit Board

Speed Adjustment

jumpers
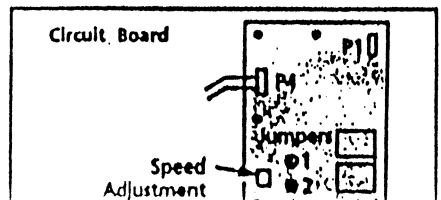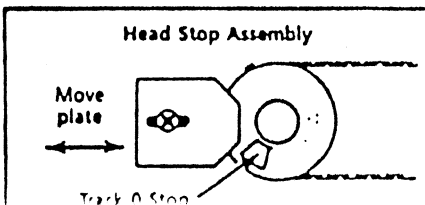
Loading with a miss-aligned drive:

For single drive systems that the drive is so far out of alignment that it will not load the Alignment System, the following is a method of loading that will work given some time and patience.

First, disassemble the drive and loosen the stepper motor screws. Re-connect the drive. If the drive is a 1571 (and 128 computer), DON'T try to autoboot. Shift it to C-64 mode with the reset button and Commodore key.

Attempt to load the Alignment System by typing LOAD "ALIGNMENT 64",8,1 [RETURN]. If the program won't load, move the stepper motor as small an amount possible and try to load the program again. Continue with this procedure until the program loads, then use the Alignment System to perform a precision alignment.

A Special note for C-128/1571 users

If difficulty is experienced in loading the Alignment System due to drive miss-alignment, shift the 128 to 64 mode (from reset or power-up) and retry. The 1571 is extremely sensitive to alignment problems when using the FAST serial transfer mode. Even the slightest miss-alignment, which the 1541 could accommodate, will cause problems with the 1571 in 1571 mode.

WARNING! Removal of the disk drive cover exposes the electrical components of the disk drive. Accidently touching an exposed wire could result in a severe electrical shock! Perform this procedure at your own risk! If you are unfamiliar with electronic equipment consult a trained electronics technician. Free Spirit Software, Inc. assumes no responsibility, either expressed or implied, for any accidental injury as a result of the performance of these procedures.

If your disk drive is still under warranty, removal of the cover will invalidate the warranty. Free Spirit Software, Inc. assumes no responsibility, either expressed or implied, for the invalidation of the warranty on your disk drive.

Limited Warranty

Free Spirit Software, Inc. warrants that the diskette on which the enclosed program is recorded will be free from defects in materials and workmanship for a period of 90 days from the date of purchase. If within 90 days from the date of purchase, the diskette proves defective in any way, return it to Free Spirit Software, Inc., 905 W. Hillgrove, Suite 6, La Grange, IL 60525 and Free Spirit will replace it free of charge.

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The enclosed software program and instructions are copyrighted. All rights reserved.

IMPORTANT NOTICE
For users of the 1541/1571 Drive Alignment Program
In Europe, Australia and New Zealand.

Due to differences in the machines sold in the United States and those sold in Europe, Australia and New Zealand, the ideal speed for non-US machines is 320 RPM's. Consequently, the screen titled "CHECK DRIVE SPEED" will show that your disk is operating too fast when it, in fact is properly adjusted.

Proper adjustment should be made to the speed of 320 RPM's to insure proper disk drive operation.

Thank You,

Free Spirit Software, Inc.
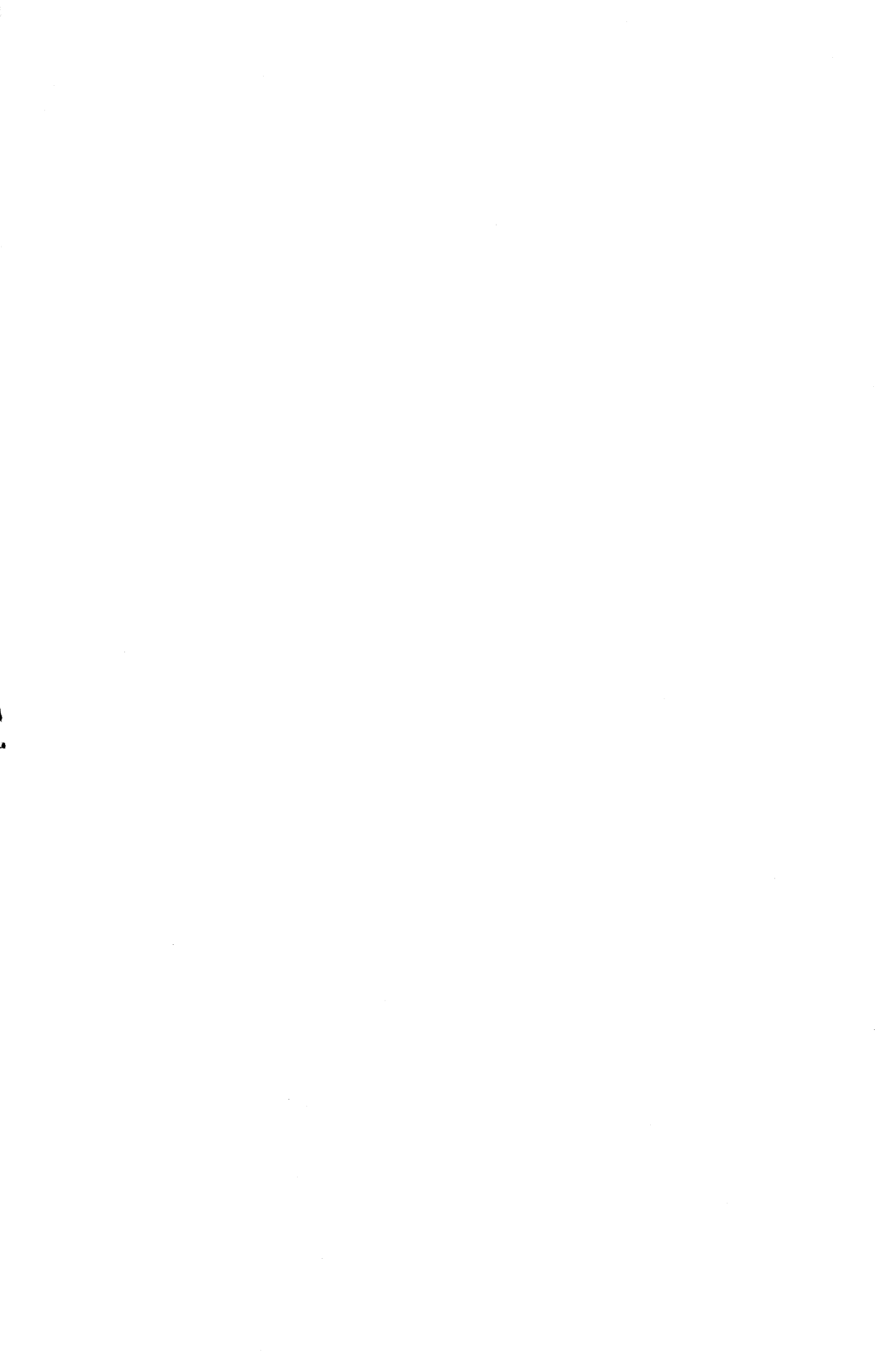
1541/1571
DRIVE ALIGNMENT

1541/1571 Drive Alignment reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for speed adjustment and stop adjustment. Complete Instruction manual on aligning both 1541 and 1571 drives. Even Includes Instructions on how to load alignment program when nothing else will load! Works on the C64, SX64, C128 In either 64 or 128 mode, 1541, 1571 In either 1541 or 1571 model Autoboots to all modes. Second drive fully supported. Program disk, calibration disk and Instruction manual are Included.

Avoid costly repairs! Insure maximum performance from your disk drive.