Disk Spinners

Replacements and Enhancements for the Commodore 1541

By Morton Kevelson

This month we examine the Indus GT and Commander II drives, 1541 Physical Exam, and On Track Indicator. Next month we continue with Kwik-Load!, Fast Load, and 1541 Flash.

DISK DRIVES AND OTHER GIMMICKS

It is interesting to note how good products are often imitated, usually by lower cost competitors. We have all seen this in the microcomputer world, most notably with the flock of IBM PC lookalikes presently available. Interestingly enough, no one makes a low cost lookalike for the Commodore 64. This tells us something about the price and performance of the computer which many of us have chosen as our own.

When it comes to the matter of major peripherals for the C-64, there seem to be many who have something to offer. Recently, it is the 1541 disk drive which has come under attack. Invariably, these are not lower cost alternatives. The price of the 1541 disk is on the order of $200 in the New York City area as of this writing. By the time you read this, it may be even lower.

What all these competitors offer is improved performance—most notably in the area of speed. This is not normally possible. The time required to perform the basic operations of LOADing and SAVEing programs is primarily in the hands of the computer. The same is true for reading and writing data files. Certain disk operations, such as formatting, can be improved upon. But let's face it: just how much time does the average user spend on formatting disks?

This is not to say that improved speed is not possible. On the contrary, a quick look at the accompanying reviews will show that speed improvements of better than five to one have been achieved. In all cases, without exception, this speed improvement is accomplished by a change in the software which is responsible for controlling both the computer and the disk drive. In some cases, an accompanying change in the hardware is required as well.

As a potential purchaser of a non-Commodore disk drive or of a disk drive enhancement product, you will have one other major concern: compatibility. The problems with compatibility are subtle. They make take some time to manifest themselves, very often in unexpected ways. An excellent example is the destructive write incompatibility between the Commodore 4040 and the 1541 disk drives. The specific details of this have been well-documented. We are reasonably certain that problems of this sort will not crop up in the disk drives being offered as replacements for the 1541.

There are two levels of compatibility which the user must be concerned with. The first is compatibility with the Commodore DOS commands. Since these have all been well-documented at this time, we do not expect to find any problems in

Commander II: *1541 compatibility.*
READER SERVICE NO. 101

Indus GT: *utilities stored in ROM.*
READER SERVICE NO. 102

this area. The second level deals with commercial software and the concept of copy protection.

The Commodore disk drive is an intelligent peripheral. It is in effect an independent computer with quite literally, a mind of its own. It comes complete with its own microprocessor, a 6502—identical to the one in the VIC 20 and closely related to the 6510 used in the C-64. It has built-in RAM—two kilobytes of the stuff. It is complete with its own input/output (I/O) hardware—a pair of 6522 versatile interface adapter chips (VIA). Unlike with the C-64, the I/O channels are not humanly understandable. Instead of a keyboard and video monitor, the disk drive communicates with the computer via the serial bus on the one end and the

drive mechanism motors on the other end.

The built-in controlling package, the DOS, is a sixteen kilobyte machine language program which is stored in two eight kilobyte ROM chips inside the 1541. This program is the equivalent of BASIC and the Kernal in your computer.

Like the computer, the user may tell the DOS what to do next. Unlike the computer, the disk drive has no keyboard for user interaction. Instead, all instructions are passed along via the serial bus. Like the computer, the disk drive has some built-in RAM for storing data and additional machine language instructions. This memory is rather limited, just two kilobytes for the 1541. Also like the computer, there is a DOS command which is similar to BASIC's SYS command. This is the MEMORY-EXECUTE command. Clever commercial programmers have used these features to make the disk drive behave in totally unexpected ways. This forms the basis for commercial copy protection schemes.

These protection methods will usually involve direct execution of machine language routines which are stored in the DOS ROMs. This is where the compatibility problems crop up. Unlike the computer, the DOS has no equivalent to the Kernal routines. Commodore makes no guarantees about the internal organization of the DOS. In addition, the copyright laws prohibit the exact duplication of the 1541 DOS by unlicensed manufacturers. As a result there are no guarantees that the clever routines which are being used will be the same in somebody else's disk drive. For that matter, there is no guarantee that future versions of the 1541 DOS from Commodore will be the same.

Fortunately, things are not all that bad. Commodore seems to be making some efforts to keep changes in the DOS to a minimum. The only problem that remains is if a software producer chooses a protection scheme which happens to involve portions of the Commodore DOS that are just not the same in the non-Commodore drive. Even in this re-
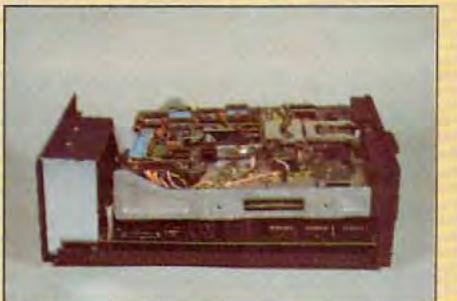
gard, things are looking up. Both the disk drive makers and the software producers have recognized the need to maintain compatibility to avoid limiting their own markets.

ON SPEED

The simplest way to improve the speed of disk operations is to indirectly modify the machine language controlling routines buried in the Kernal and the DOS. This of course requires the storage and some additional code somewhere in the computer's RAM. This is just the approach used by Indus and Datamost with their products. The problem, of course, is that if you can find a tidy spot in RAM for the speedup software, someone else is apt to covet the same location for their own purposes. This is just what actually happens to limit the performance of this approach.

The other approach is to replace the code in firmware, as with the Skyles *Flash*. This raises the problems of possible built-in incompatibility with some software or hardware problems.

What it all boils down to is that no matter what approach you take, there will be some compatibility risk involved. The ultimate decision lies in the hands of the user. □

Upon examining this disk drive, the first question that comes to mind is: what happened to Commander I? The model II is your plain, no frills disk drive. Its compact 11 by 6 by 3½ inch steel package makes it only 52 percent of the volume of a 1541. This is a true size reduction, as the power supply is built in.

Operating speed is basically the same as for the 1541 with a 75 second disk formatting time—a slight improvement. Compatibility is very high, giving us no trouble with any of the software we tried.
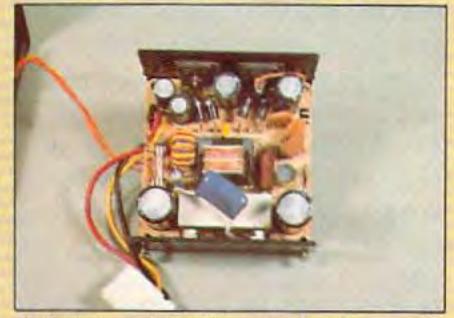
Physical construction is a bit unusual. The twin serial port connectors are on the left side of the drive as opposed to the traditional back location. The power indicator light on the front panel is red, while the drive activity light is green—the opposite of the 1541. A separate red indicator light tells you when the drive mechanism itself is active.

A pair of protruding lips flank the

LEFT: *removing cover of Commander II disk drive reveals power supply module on left, drive mechanism on top, and main circuit board on bottom.* **RIGHT:** *bottom of drive, left to right: stepper motor, direct drive disk motor manufactured by JVC.*

LEFT: *three subassemblies of Commander II (left to right): drive mechanism, main circuit board, and power supply module with cover removed.* **RIGHT:** *closeup of the power supply module. The hidden fuse is to the left.*

disk insertion slot. Squeeze these once and the disk is clamped in place. Squeeze them a second time and the disk pops out.

Internally, the drive mechanism by Chinnon sports a JVC direct drive disk motor. As with the 1541, the track one stop is mechanical; however, the anticipated head chatter is much gentler. Overall operation of the Commander II drive is very quiet with disk surface noise the predominant factor.

The main circuit board, right beneath the drive mechanism, has sockets for all of the chips, making for easy replacement. As with the 1541, the device number can be changed by cutting one or two printed circuit traces located at the very rear of the circuit board. The brief manual made no mention of this.

The internal power supply is in a self-contained module at the back of the drive. We found an unlabeled, unidentified fuse hidden within this module. This fuse should have been in an external fuse holder mounted on the rear panel. Fuse changing with the existing arrangement would be beyond the capability of most users. The power supply itself was surprisingly compact compared to the other drives we had looked at.

Of the two drives we worked with, one ceased functioning after a brief interval. The second unit developed an internal rattle. This turned out to be an improperly glued stepper motor nameplate which had worked itself loose. This was promptly replaced before it could cause any damage.

Documentation supplied with the drive was extremely sparse. The brief manual was devoted exclusively to LOADing, SAVEing, and formatting disks. No mention was made of any of the more advanced disk operations, file handling, or commands. The included test disk contained only a single program for performing a fundamental operational check on the drive.

Overall, the Commander II seemed to be a competent piece of hardware which could use a good boost from improved quality control. □

THE INDUS GT—A DRIVE AND A QUARTER

Indus Systems Inc.
9304 Deering Avenue
Chatsworth, CA 91311
Phone: 800-54-INDUS
Price: $399

Inasmuch as you're all bound to be wondering about the cryptic significance of the title of this review, we'll get right to the point. Indus Systems has taken the ramdisk concept one step further in their implementation of a single disk drive for the Commodore family of home computers. They have included several useful disk utility programs in ROM as a pseudo drive 1. These programs can be LOADed as if they were on a conventional floppy disk by specifying the drive 1 parameter in the LOAD command. For example,

LOAD "1:FIO&DW",8,1

will boot the Indus fast input/output and DOS wedge utilities.

The drive 1 directory which is accessed by LOAD "$1",8, will produce the following display when LISTed:

```
1  "INDUS GT C64    " ID 2A
1  "FIO&DW"           PRG
1  "FIO"              PRG
2  "FAST I/O"         PRG
1  "DW"               PRG
3  "DOS WEDGE"        PRG
1  "FC"               PRG
5  "FAST COPY"        PRG
0  BLOCKS FREE.
```

These programs are permanently stored in the Indus drive. They cannot be changed, nor can any additional programs be SAVEd on drive 1. This, in our opinion, merits the designation of an extra one quarter drive for the Indus GT. Placing these three utilities, *Fast Input and Output*, the *DOS Wedge*, and *Fast Copy*, in ROM makes them instantly available every time the drive is powered up.

The *DOS Wedge* is similar to the one supplied by Commodore. The commercial at (@) symbol eliminates the need to OPEN and CLOSE the disk drive command channel

(secondary address 15) when issuing drive commands. It also serves to read and display the DOS error report. As with the Commodore Wedge, the Indus Wedge lives at 52224 ($CC00) in the C-64.

SPEED OF OPERATION

The *Fast I/O* utility is said to speed up disk LOAD and SAVE operations. As we mentioned earlier, there is no way to build a single disk drive that is inherently faster than the 1541 without modifying the computer in some way (with the exception of internal operations—disk formatting, for example, a computer-independent operation, takes only 21 seconds with the Indus GT). The *Fast I/O* utility, when LOADed into the C-64, performs the modifications to the computer's operating system which will allow for faster data transfers. The *Fast I/O* program lives at 51200 ($C800) in the C-64.

In actual use, *Fast I/O* sped up a straight LOAD by over five times. It had no appreciable affect on SAVE times. The actual benefit you will derive from the *Fast I/O* utility will depend on the specific way in which you use your computer. Since the *Fast I/O* resides in the C-64 RAM, it is linked into the operating system by modifying the system vectors stored in low RAM. As a result it will be disconnected by virtually all autorun commercial software. The *Fast I/O* utility will only be of benefit for LOADing BASIC or binary files which do not modify the system memory usage in low RAM.

Note that the *DOS Wedge* and *Fast I/O* are provided both as separate programs and as a combined utility. This gives the user maximum flexibility in configuring the system to suit his own requirements.

Lastly, the *Fast Copy* utility performs a full disk backup in under five minutes with four swaps of the disk. The limitation to this utility is the inability to back up a disk with any errors on it. Encountering a read error results in the immediate interruption of the program. The moral of the story is not to wait for your disks to start going bad before making a backup copy.