INTRODUCTION TO

CD-ROM DRIVES

CD-ROM DRIVES - GENERAL THEORY

CD-ROM stands for Compact Disk - Read Only Memory. As of this time, there are not any substantial number of writable CD drives due in large part to the price of these units, which are used for mastering and small scale publishing. As the price drops, a larger number will become available.

As with the helical scan drives discussed above, in large part this computer technology and application follows the introduction of

the audio CD players which are standard consumer items.

Essentially the use of the CD in a computer is for "near line" access to massive amounts of data. Each CD generally holds about 600 MB of data, and, as with the audio CDs, all the user needs to do is insert another CD for access to additional information.

There are a number of different CD formats and available speeds, such as the 2x, 4x and 6x CDs. These are all grouped around the initial audio CD standards and speeds as they are all derived from the initial technology from Phillips and Sony.

With this general background, it should not be surprising to learn that all currently known computer CD-ROM drives, irrespective of speed, can play, with appropriate software drives, audio CDs.

This capability is a very useful diagnostic tool. If you are not sure if you have a bad CD or a bad drive, you can always play an audio CD. The human ear, especially on a known piece of music, can rapidly tell you whether you have a tracking problem on the CD-ROM drive.

The CD is actually a reflective disk in which pits are pressed during the mastering by use of a device similar to what was formerly used to press records. Recordable CDs on the other had actually will burn the pits into the recordable media with a laser. Thus, both audio and computer CDs read the data back by means of an optical system using a laser. The laser is directed through a prism, hits the CD and reflects back and since the reflected beam is of a different polarity than the original beam, it is then reflected to a series of diodes to allow the reflected pattern of flat surfaces and pits to be interpreted by the PCB

on the unit.

CD standards require a constant stream of input to these diodes so as to allow correct interpretation of the data patterns. This means that the spindle motor controlling the rotation of the CD must vary as the laser optical head assembly moves across the varying circumference of the disk from the inside to outside tracks. This is called Constant Linear Velocity or CLV.

Because no CD can be cost effectively manufactured perfectly flat, and because the CD may warp slightly due to care, handling and storage by the consumer, one of the most critical elements is the focusing lens through which the laser is routed to the CD.

Additionally, since the CD-ROM has an opening on the front of the unit similar to a floppy drive, it also acts almost as a magnet

for dirt and dust. This dirt and dust does of course cause problems in dirty lenses. The lens should be routinely cleaned by the end user, at least once per month, and by the lab during the repair procedure.

There are generally one of two methods used for tracking in these units, namely a three beam and a single beam system.

The older three beam system starts with a single beam directed through a beam splitter generating three beams. The outside two are slightly weaker in strength and are directed to the outer edges of the data track allowing adjustment by the system if the amount of data being read by one of these two outer beams is reading more data than the other, which indicates that the laser is off track.

The newer single beam system does not contain the beam splitter, but rather uses s

paired diodes on the reflected reader such that if one diode receives the data earlier than the other adjustments in tracking can be made.

A laser is used as opposed to other light sources because the laser is a single frequency and wavelength source as opposed to other lights such as LEDs which have several frequencies and wavelengths. This single frequency and wavelength allows for far better data integrity.

Focus adjustments are handled in a very similar fashion. Between the two tracking diodes is a square pattern of four diodes, and the information from them is routed to a circuit which adds the signal from the each of the two diagonals, and subtracts each such sum from the other, and if the result is other than zero, the objective lens is moved to bring the beam into focus.

Many CD-ROM drives are SCSI I or SCSI II interfaces. Thus general SCSI principals such as the settings of the SCSI ID and the use of terminators also apply to these drives. However, there are also a large number of available units with different interfaces, such as EIDE, ATA, Panasonic (for Sound Blaster cards), and Sony interfaces. Generally these are sold packaged with a sound board with the interface on the sound board. If seeking to upgrade the CD without also replacing the sound card, the interface support of the sound card must be determined.

CAUTION - THESE UNITS CONTAIN LASERS. DO NOT OPEN THE UNIT TO TRY AND PERFORM ANY SERVICE ON THE UNIT UNLESS IT IS IN A PROPERLY EQUIPPED REPAIR LAB. <u>DO NOT LOOK DIRECTLY AT THE LASER. KEEP YOUR EYES AT LEAST 30CM AWAY FROM THE LASER AND FROM THE OBJECTIVE LENS.</u>

THESE UNITS ARE VERY STATIC SENSITIVE,

ESPECIALLY IN AND AROUND THE LASER UNIT. ALL ESD PRECAUTIONS MUST BE USED. NEITHER THE LASER ASSEMBLY NOR THE OBJECTIVE LENS (FOCUSING LENS) SHOULD <u>EVER</u> BE HANDLED WITH BEAR HANDS. THEY ARE <u>EXTREMELY</u> STATIC SENSITIVE.