

INTRODUCTION TO CD/DVD TECHNOLOGY

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REFERENCE:

www.howstuffworks.com

FOR AUDIO CDS, IN LEFT HAND COLUMN, UNDER TOP 10 ARTICLES
CLICK ON "HOW CDS WORK"

FOR ALL OTHERS UNDER SUPER CATEGORIES, CLICK ON "COMPUTERS"
ON FOLLOWING PAGE CLICK ON "HOW CD BURNERS WORK"

FOR DVDS, CLICK ON LINK TO DVD IN TEXT WHILE READING
DESCRIPTIONS

SOME TERMINOLOGY:

CD:	AUDIO CD	READ ONLY
CD-ROM:	DATA CD	READ ONLY
DVD	VIDEO	READ ONLY
DVD-ROM	DATA DVD	READ ONLY

CD-R ; DVD-R RECORDABLE
MULTIPLE WRITE SESSIONS CAN BE MADE ON SAME DISK

CD-RW ; DVD-RW READ / WRITE OR REWRITABLE

LASER LIGHT:

SINGLE FREQUENCY, PERFECT FOR FOCUS TO MICROSCOPIC SPOTS
PERFECT TO CONCENTRATE LIGHT ENERGY TO GENERATE VERY HIGH
TEMPERATURES

CAN BE PULSED AT ELECTRONIC SPEEDS

THERE ARE THREE TYPES OF MEDIA FOR CDS OR DVDS

READ-ONLY	METAL / BUBBLE	MOLDED	YOU BUY
RECORDABLE	METAL / DYE	BURNED	YOU MAKE
READ/WRITE	METAL / COMPOUND	COOKED	YOU MAKE

READ ONLY DISKS:

MANUFACTURED BY AN INJECTION MOLD PROCESS
LIKE WAFFLE MAKER

VERY INEXPENSIVE TO MAKE.
COST IS LESS THAN CASE THAT IT COMES IN
COMPARE WITH (AUDIO / VIDEO) CASSETTES
AND THE TIME TO MAKE COPIES

INSIDE OF INJECTION MOLD HAS ONE SMOOTH SURFACE, AND
BIT SIZE PUNCHES ON THE OTHER SURFACE MAKE HOLES

SURFACE WITH HOLES IS COATED WITH THIN ALUMINUM FILM
THEN PROTECTIVE COATING AND LABEL ARE APPLIED

SMOOTH SURFACE TRANSPARENT TO LIGHT
LASER LOOKS AT BACK SIDE OF MOLDED SURFACE THROUGH THE
PLASTIC

LASER LIGHT BEAM REFLECTS ON SMOOTH RIDGES,
AND IS SCATTERED BY WHAT NOW LOOKS LIKE BUMPS
(BACK SIDE OF HOLES)

REFLECTED LIGHT IS A "ONE"
NO LIGHT AT THE SENSOR IS A "ZERO"

DISK ROTATION SPEED IS SLOWER AT THE OUTER EDGE
THAN IN THE CENTER TO KEEP SURFACE SPEED CONSTANT

READ SPEED FOR ROM APPLICATION IS FASTER THAN FOR AUDIO
EXAMPLE: 8X MEANS SURFACE SPEED IS 8 TIMES AUDIO SURFACE SPEED

[DEMO FROM "HOW STUFF WORKS"]

AUDIO FORMAT

BASED ON 2 BYTE SAMPLE - 65,536 LEVELS - FOR HIGH FIDELITY

BITS ON TRACK CONTAIN:

SAMPLE DATA

TRACK FOLLOWING DATA

TRACK LOCATION DATA

ERROR CORRECTION DATA

DATA ALSO IS INTERLEAVED TO BETTER CORRECT FOR SCRATCHES

INCOMING DATA: A1A2A3A4 B1B2B3B4 C1C2C3C4 D1D2D3D4

RECORDED DATA: A1B1C1D1 A2B2C2D2 A3B3C3D3 A4B4C4D4

ERROR CORRECTION DATA TELLS:

IF THERE IS AN ERROR

WHERE IT IS LOCATED

HOW TO CORRECT

IF IT IS UNCORRECTABLE

ALL IN ALL 588 BITS ARE USED FOR EVERY 192 (24 BYTES) OF AUDIO

ROM FORMAT

BASED ON AUDIO FRAME (24 DATA BYTES)

HAS ADDITIONAL ERROR CORRECTION

USES TRACK FOLLOWING BURST PATTERNS INSTEAD OF IMBEDDED BITS

**THIS IS WHY RECORDING SOFTWARE WILL ASK YOU WHETHER
YOU WANT TO RECORD AUDIO OR DATA**

RECORDABLE TECHNOLOGY (R DISKS):

TOP AND BOTTOM OF DISK ARE SMOOTH

RECORDABLE SIDE HAS A DYE LAYER AND AN ALUMINUM LAYER

THE LASER(S) OPERATES THROUGH THE PLASTIC SUBSTRATE
LIKE WITH CDS

DYE LAYER IS TRANSLUCENT (TRANSPARENT) UNLESS “BURNED”
SO THE WHOLE SURFACE STARTS OUT WITH NOTHING BUT ONES

DYE IS GOOD REFLECTOR BUT ALSO ABSORBS HEAT EASILY

BURNER HAS TWO LASERS ONE FOR READING, ONE FOR BURNING.

ZEROS ARE BURNED BY MAKING THE DYE SPOT OPAQUE
AND PREVENTING THE READ LASER LIGHT FROM REFLECTING

THE BURN LASER IS PULSED WITH THE (ZERO) BITS TO BE RECORDED

THE CD BURNER IS CHARACTERIZED BY TWO SPEEDS
BURN SPEED, AND READ SPEED
EXAMPLE: 1X-8X.

RECORDING SESSIONS CAN BE MADE UNTIL THE DISK IS FULL
THE RECORDING CAN ONLY BE READ BY THE ORIGINATING COMPUTER
UNTIL THE SESSION IS CLOSED (YOU HAVE TO TELL THE SOFTWARE)

A SESSION CAN RECORD A NUMBER OF FILES OR PHOTOS.

PREFORMATING IS NOT REQUIRED
AUDIO, DATA, AND VIDEO CAN BE RECORDED ON THE SAME DISK

AUDIO CD-RS MAY NOT WORK ON OLD CD PLAYER

READ / WRITE TECHNOLOGY (R/W DISKS):

BURNER HAS A WRITE AND AN **ERASE** FUNCTION (I.E. 3 LASERS TOTAL)

A “COMPOUND” LAYER IS PLACED BETWEEN THE REFLECTING ALUMINUM AND THE DISK SURFACE

THE COMPOUND MATERIAL IS TRANSLUCENT WHEN HEATED
TO **200 DEGREES** CELSIUS (ERASE TEMPERATURE)
AND STAYS THAT WAY

IT IS OPAQUE WHEN HEATED
TO **600 DEGREES** CELSIUS (BURN TEMPERATURE)
AND STAYS THAT WAY

WHEN THE SPOT IS OPAQUE NO LIGHT IS REFLECTED TO THE DETECTOR

IT IS POSSIBLE TO WRITE OVER PREVIOUSLY WRITTEN DATA **BUT**
THE AREA MUST BE ERASED FIRST (COMPOUND MADE TRANSPARENT)
THIS CAN BE VERY SLOW

PRE-FORMATting IS NECESSARY AND SOFTWARE WILL ASK
WHAT TYPE TO USE

R/W BURNERS, AND R/W DISKS OPERATE AT 3 SPEEDS
BURN, ERASE, AND READ EXAMPLE 1X-2X-4X

THE MORE RECENT CD PLAYERS CAN PLAY AUDIO CD-RW
IN FACT MOST DVD PLAYERS SHOULD BE ABLE TO PLAY DVD-RW

SONY SAYS THAT R/W DISKS CAN BE REWRITTEN THOUSANDS OF TIMES

CDS AND DVDS COMMON ATTRIBUTES:

CDS AND DVDS HAVE THE SAME DIMENSIONS (MAX 4.8 INCH)

CDS AND DVDS USE SIMILAR TECHNOLOGIES

SPIRAL TRACK STARTS FROM CENTER
BUT MECHANISM CAN JUMP TO ANY TRACK POSITION
BEGINNING OF SPIRAL HAS DIRECTORY INFORMATION

DISK CAN HAVE SMALLER DIMENSION
(VIDEO BUSINESS CARDS)

CDS AND DVDS DIFFERENCES:

DVDS HAVE HIGHER RECORDING DENSITY

SMALLER BITS, CLOSER TRACK SPACING, LONGER TRACK

CD TRACK = 3.5 MILES DVD TRACK = 7.5 MILES

DVDs CAPACITY CAN BE QUADRUPLED BY
HAVING RECORDED LAYERS ON EACH SIDE
AND TWO RECORDED LAYERS ON TOP OF EACH OTHER

ARCHIVAL CONSIDERATIONS:

EVERYONE AND EVERYTHING AGES

PLASTIC DISK DEFORMS WITH AGE,
THIN LAYERS CAN HAVE CHEMICAL CHANGES

10 TO 30 YEAR SHELF LIFE, MAYBE MORE WITH EXPERIENCE

SHOULD REMEMBER TO ASK YOUR CHILDREN
TO COPY FAMILY PHOTOS, AND HOME VIDEOS EVENTUALLY.

BUT THEN THERE WILL BE ANOTHER TECHNOLOGY WHICH
TAKES LESS SPACE ANYWAY.

SOFTWARE CONSIDERATIONS

SOFTWARE MASKS MOST OF THE TECHNOLOGY DIFFERENCES

LEGALLY WE DON'T COPY, WE **BACKUP**

BEFORE DOING **REAL BACKUP** MAKE SURE THAT THE BACKUP SOFTWARE
WILL WORK

RW DISKS CAN BE USED JUST LIKE FLOPPIES OR ZIP DRIVES
BUT WHEN IT COMES TO FORMATTING THE BURNER DRIVER
WILL ASK WHAT FORMAT TO USE

MOST SOFTWARE KNOWS NOTHING ABOUT THE DEVICE YOU WRITE TO
SO ERROR MESSAGES MAY BE SURPRISING

EXAMPLE: FAMILY TREE MAKER TELLS YOU THAT YOU ARE NOT
ALLOWED

TO USE THE DEVICE IF YOU USE A CDR, OR IF THE CD-RW IS NOT
FORMATTED.

ADAPTEC EASY CD CREATOR:

CD COPIER DELUXE COPIES DISK TO DISK
EASY CD CREATOR COPIES FILES TO DISK

ADAPTEC DIRECT CD PREPARES DISK TO BE USED JUST LIKE A FLOPPY

SOFTWARE GUIDES YOU THROUGH ALL THE PREPARATION STEPS

MP3:

COMPRESSED VERSION OF A CD TRACK

MAINTAINS CD QUALITY WHILE REDUCING THE FILE SIZE BY 10X TO 14X

LOOKS FOR REDUNDANCY, OR NO CHANGE IN LEVEL

TAKES A SNAPSHOT AND COUNTS HOW MANY TIMES IT REPEATS.

AT 41,000 SAMPLES PER SECOND A LOT OF AUDIO LEVELS DON'T CHANGE MUCH

SOFTWARE LIKE MUSICMATCH GUIDES YOU THROUGH THE STEPS

COMPARISON WITH HARD DISK TECHNOLOGY:

CD AND DVD DISKS ARE REMOVABLE
SO THEY WILL NEVER BE ABLE TO HAVE THE SAME CAPACITY

MAGNETIC DISKS ARE MATED FOR ETERNITY WITH THEIR R/W HEADS

SO AERIAL RECODING DENSITIES OF HARD DISKS ARE HUGE

EXAMPLE: IBM PC DRIVE

3 ½ INCH DISK
20 GIGABYTES PER HEAD
RECORDING BAND IS ½ INCH PER HEAD

ONE CD (650 MB) FITS IN A 2/100TH OF AN INCH BAND

CONCLUSION:

IN CALIFORNIA IT IS THE CHEESE
WITH READ ONLY, RECORDABLE, AND READ/WRITE IT IS THE MEDIA

AND THEY ARE ALL AVAILABLE ON CDs AND DVDs

PLAYERS HAVE ONE LASER AND ONE SPEED
R BURNERS HAVE 2 LASERS AND 2 SPEEDS
R/W BURNERS HAVE 3 LASERS AND 3 SPEEDS

AUDIO AND DATA HAVE DIFFERENT FORMATS

YOU CAN USE “R” AND” R/W” LIKE A FLOPPY

YOU CAN WRITE OVER A R/W WITHOUT REFORMATTING

YOU CAN KEEP ADDING TO A “R” DISK UNTIL FULL

R/W DVDs WORK WITH MOST DVD PLAYERS

SOFTWARE WILL GUIDE YOU ON WHAT TO DO

SO GO DO IT BURN BABY BURN