Year	Format	Sony's Contribution
1965	CV-2000	Introduced world's first 1/2 open reel video recorder.
1971	U-Matic(R) Tape	Invented first successful videocassette for business, industry and professionals.
1975	Betamax(R) Tape	Invented first successful consumer videocassette recorder.
1977	1 Inch Type C	Co-invented this open-reel broadcast video system.
1981	Betacam(R) Tape	Invented the world's most successful broadcast video format.
1982	Compact Disc	Co-invented the format that launched the digital audio revolution.
1982	3.5-inch Micro Floppy Disc	Invented this data format now used in millions of personal computers.
1983	DASH	Introduced world's first Digital Audio Stationary Head tape for professionals.
1985	8 mm	Introduced world's first 8 mm camcorder and tape.
1985	CD-ROM	Co-invented this world standard for high-density data storage.
1987	D8	Co-invented data cartridge format based on 8 mm tape.
1987	DAT	Spearheaded Digital Audio Tape recording for audiophiles and recording studios.
1987	D-1	World's first successful digital videotape for broadcasters and post production.
1988	D-2	World's first successful composite digital videotape.

1988	Magneto Optical	Introduced world's first 5.25 Magneto Optical disks for data storage.
1989	Hi-8TM Metal-E	Introduced world's first Metal Evaporated tape, for Hi-8 video recording.
1989	DDS	Co-invented data cartridge format based on 4 mm tape.
1989	CD-i	Co-invented this standard for multimedia interactive discs.
1990	CD-R	Co-invented the Recordable CD.
1992	MiniDisc	Invented miniature, digital recordable disc for music and data.
1994	Digital Betacam tape	Invented affordable component digital video format for broadcasters.
1994	NT	Invented world's smallest digital audio tape.
1995	CD-Erasable	Co-invented and announced standards for recordable/erasable CD.
1995	DV	Spearheaded world's first digital videotape format for consumers.
1996	DVCAMTM tape	Invented professional version of the consumer DV format.
1996	Betacam SXTM tape	Invented 4:2:2 component digital format for broadcast news gathering.
1996	AIT	Invented a data cartridge with Memory IC for fast random access.
1996	DVD	Sony is a leading company behind this new, ultra-high-density disc for digital video and data.

Optische Speicher

DVD & Co.

Sven Lill

http://www.ipe.uni-stuttgart.de/content/web3/handouts/dvd.pdf

Datenspeicher

Massenspeicher

+ große Speicher-kapazität

Arbeitsspeicher

+ kurze Zugriffszeit

Komponenten

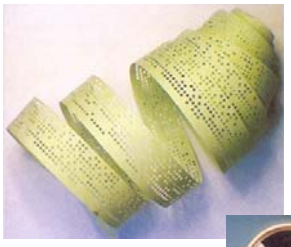
- Lese-Schreibkopf
- Speichermedium

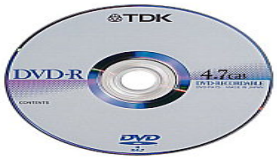
- matrixförmige Ver-bindungsleitungen
- Speicherelemente an Knoten

Zugriff

- mechanisch
  - Plattenspieler
  - Lochkarten, -streifen
- magnetisch
  - Tonband, Kassette
  - Diskette, Festplatte
- optisch
  - CD, DVD, MO-Disc
  - Hologramme

- elektrisch
  - DRAM, SRAM
  - MRAM



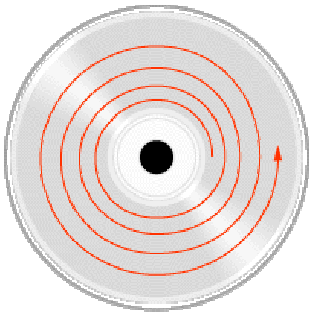


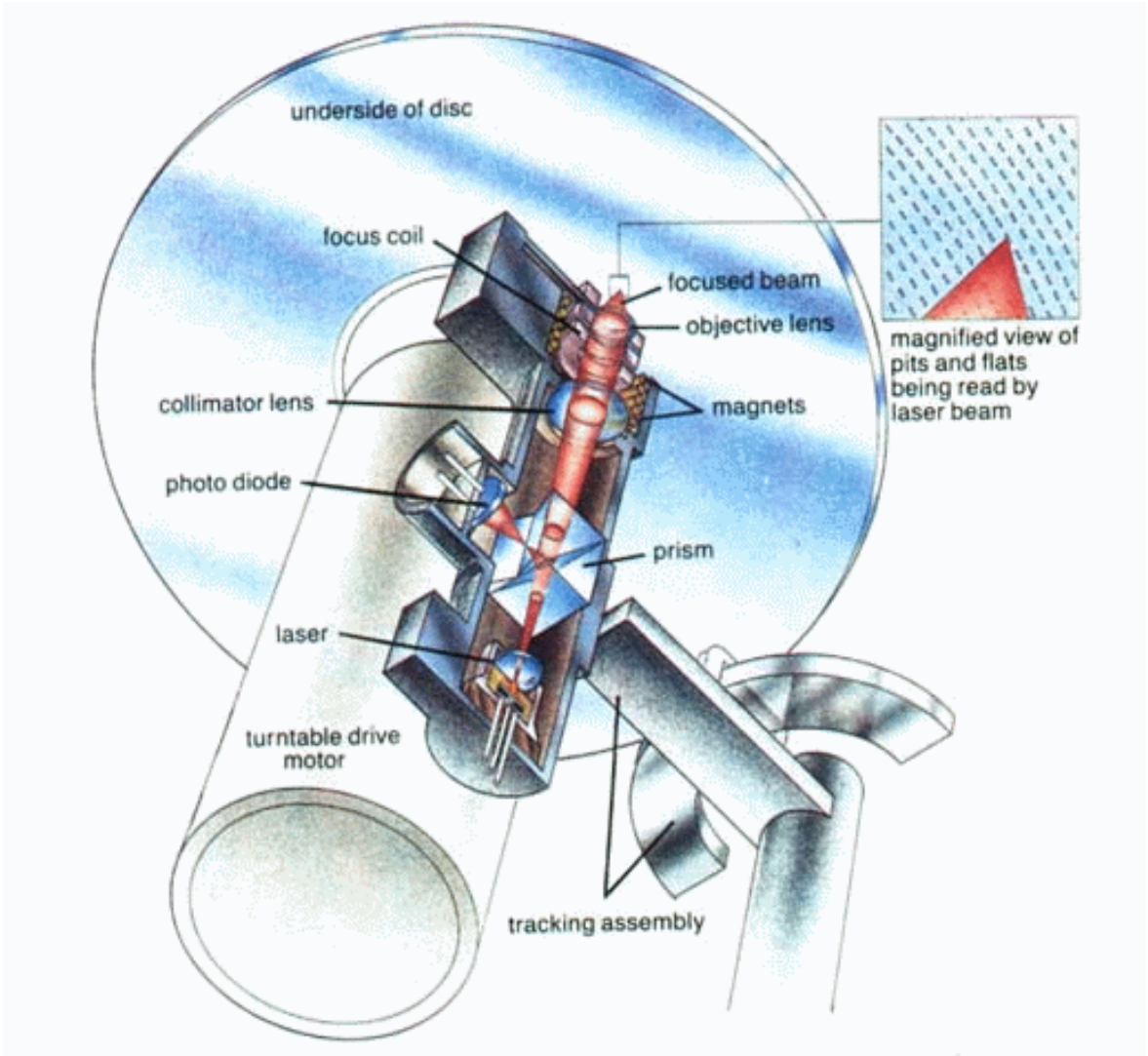
Überblick CD-Formate

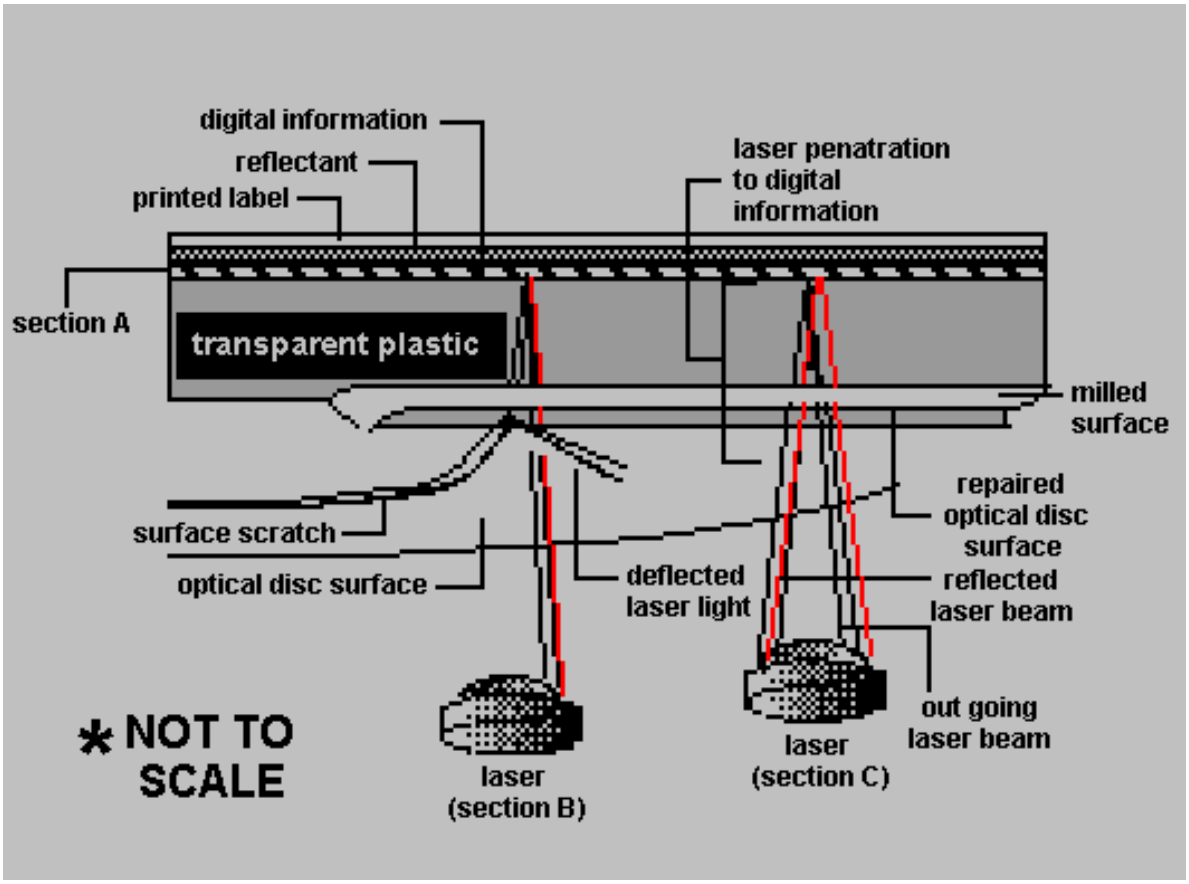
- Audio-CD
  - 74/80 min Musik
  - Abtastfrequenz 44,1 kHz, Auflösung 16 bit
- CD-ROM
  - Datenspeicher für PC, 650/700 MB
- CD-R/-RW
  - einmal/mehrfach beschreibbar
- DVD ähnlich CD
  - kleinere Strukturen, deshalb Erklärung der DVD

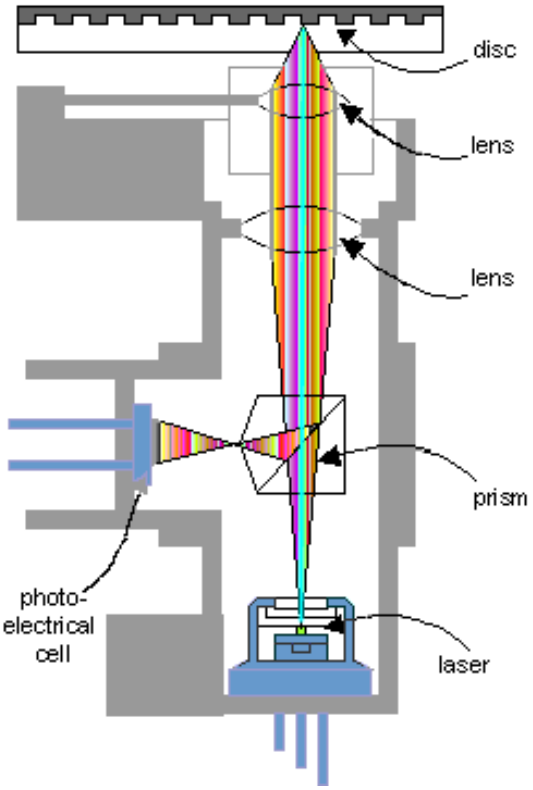
prinzipieller Aufbau

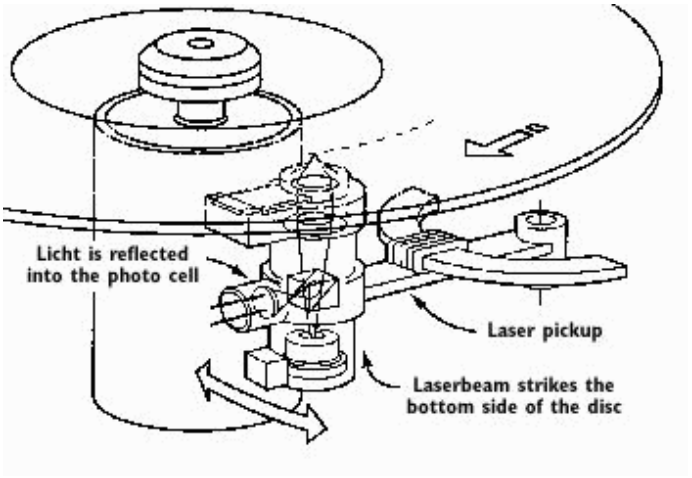
- spiralförmige Nut enthält Daten in Form von pits/bumps und lands
- pit = Loch aus Sicht der reflektierenden Schicht
  schwach reflektierend
- land = Fläche zwischen pits
  stark reflektierend
- bump = pit, aber aus Sicht des Lasers
- Spirallänge DVD ca. 7,5 Meilen = 12 km
- double layer: 2.Spirale kann außen beginnen



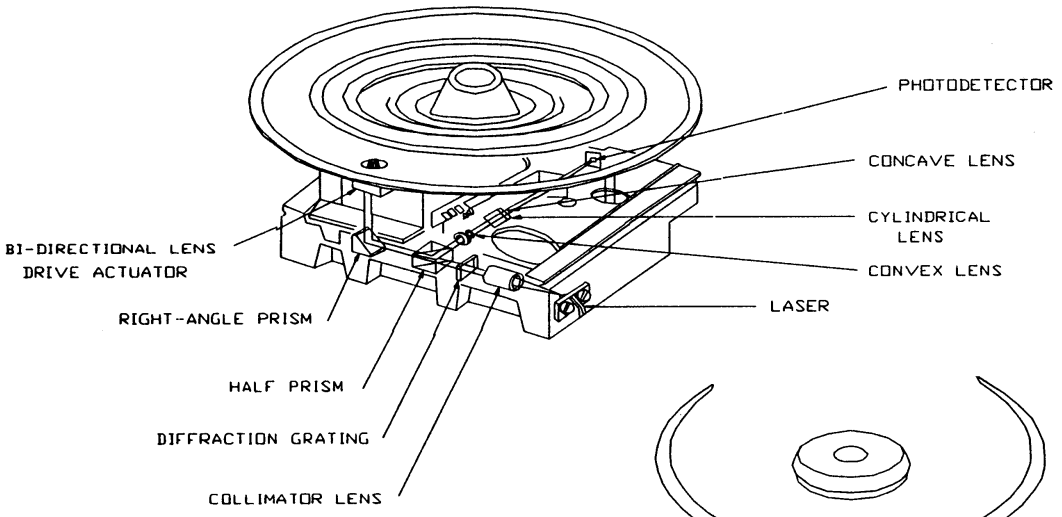




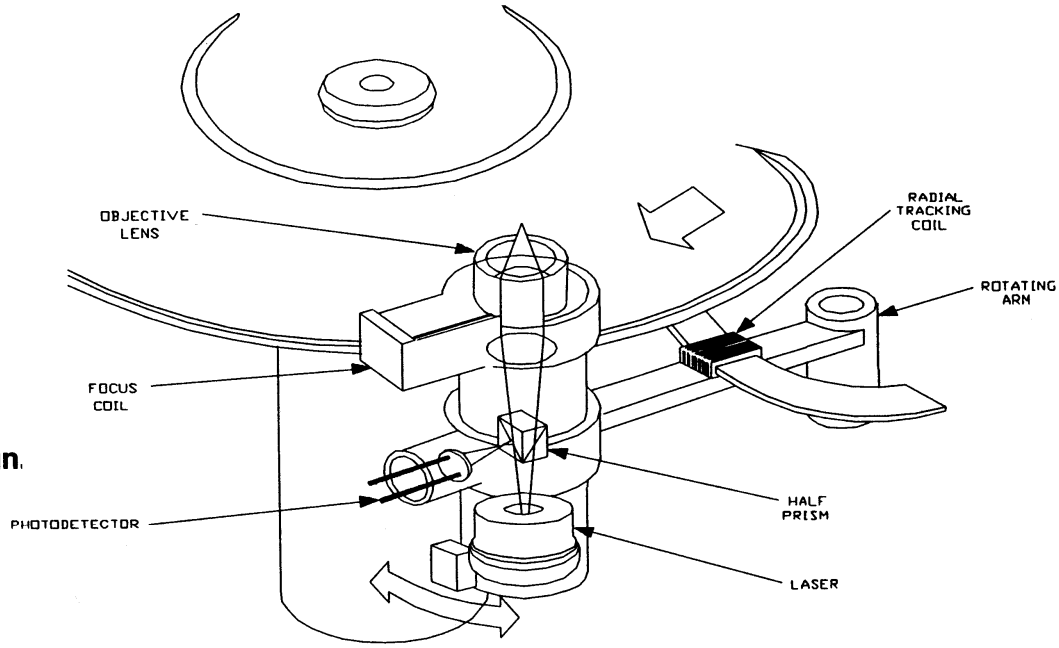




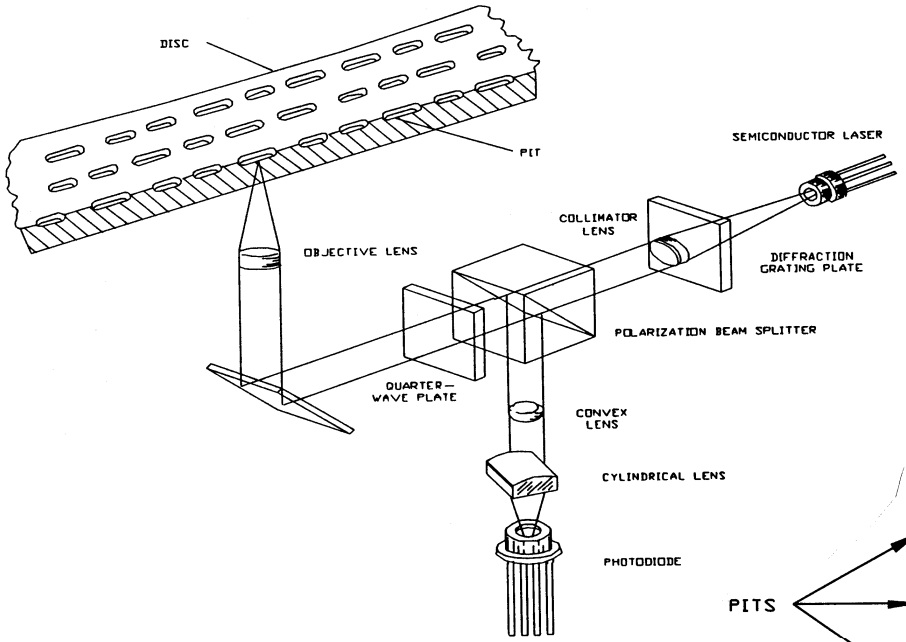
18.6.99, E. Riedle, Uni München



Slide pickup design.



Rotating arm pickup design.



The internal parts of the optical pickup unit.

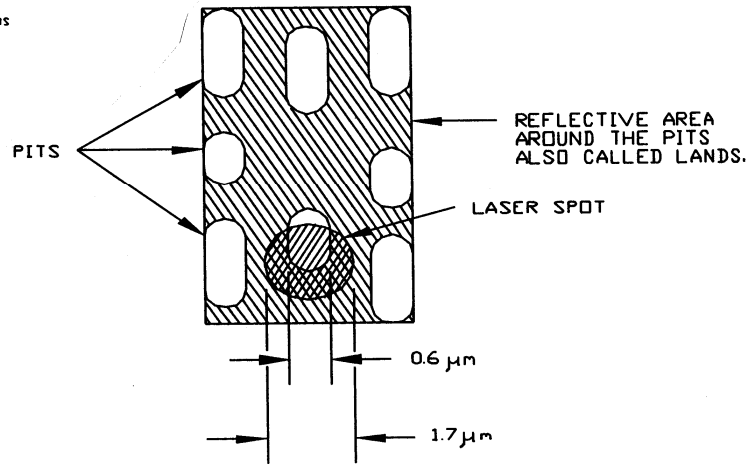
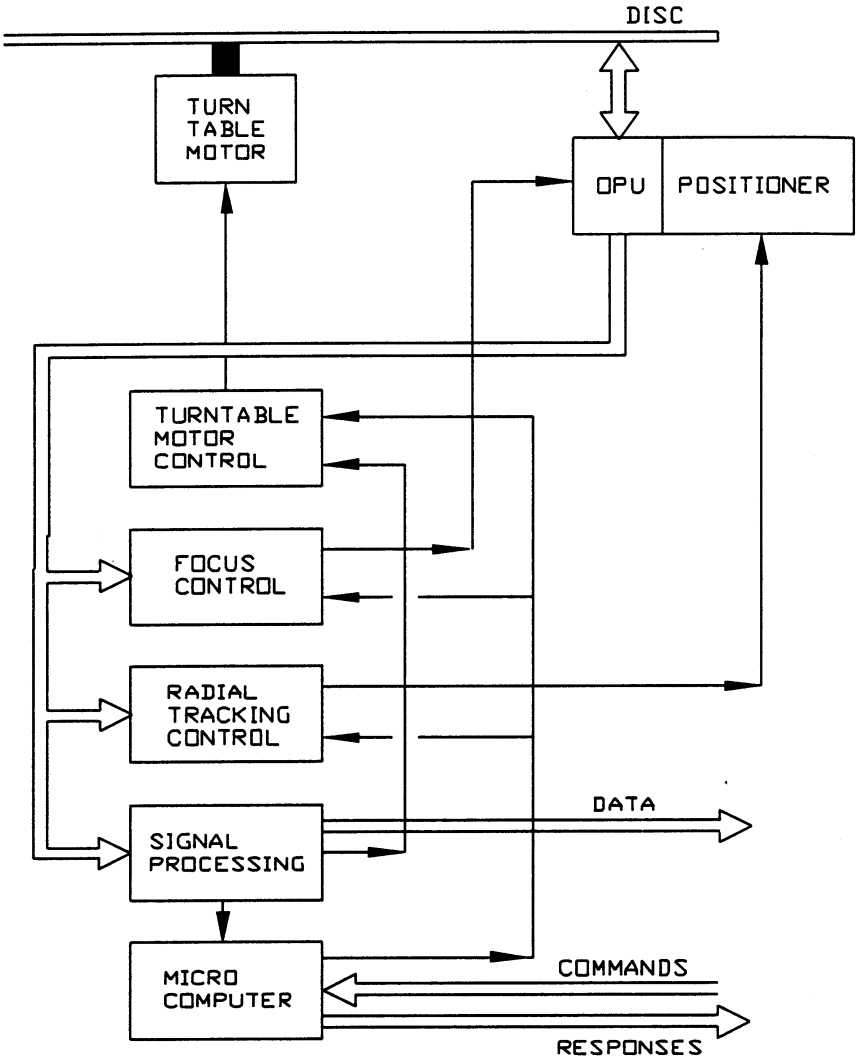
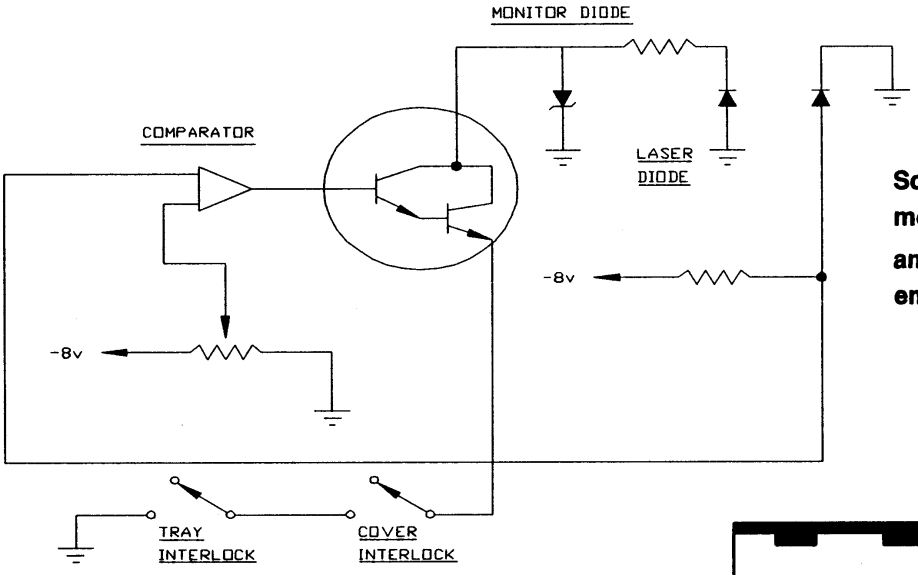


Figure 4-1 Laser spot touching a pit and adjacent land. The reflections from the pit and the land will interfere with each other.



Servo System and Signal Processing



Schematic of circuit monitoring and controlling amount of light emitted by laser diode.

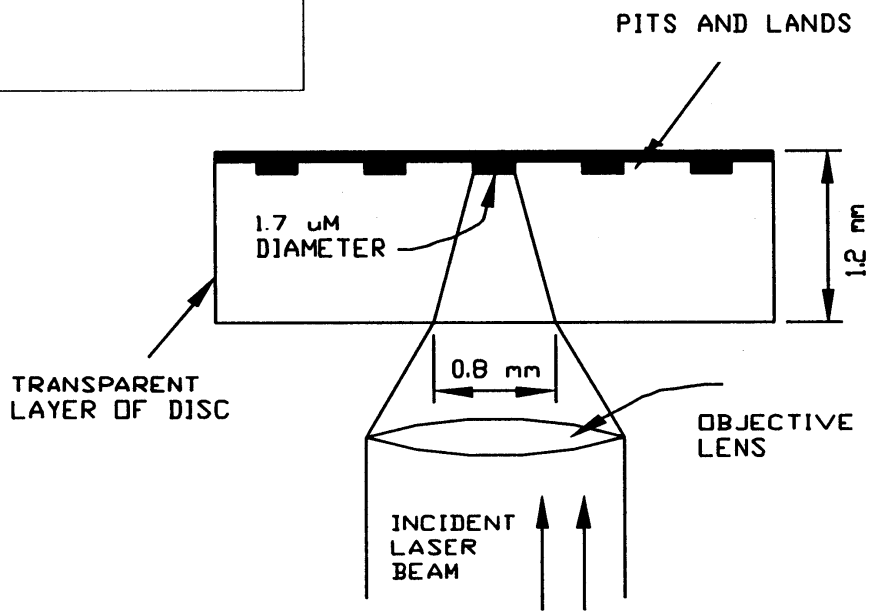
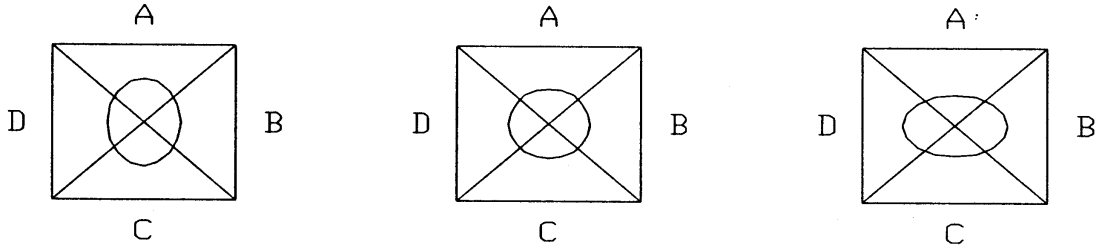


Diagram of laser light on disc surface.

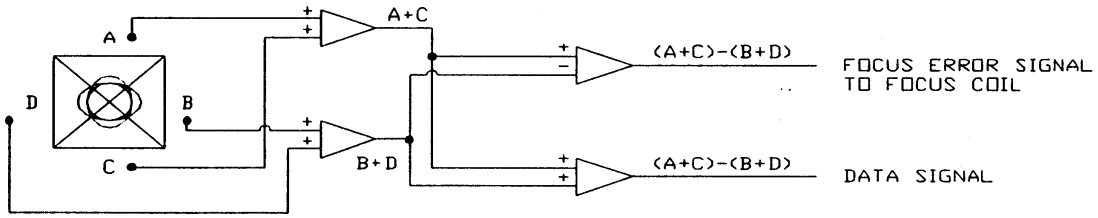
A: **Four-quadrant diode with laser spot when disc and objective lens are too close.**

B: **Four-quadrant diode with laser spot when disc is in focus.**

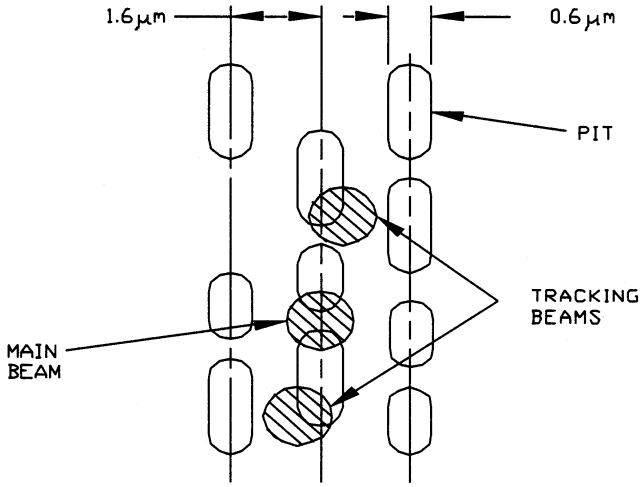
C: **Four-quadrant diode with laser spot when disc and objective lens are too far apart.**



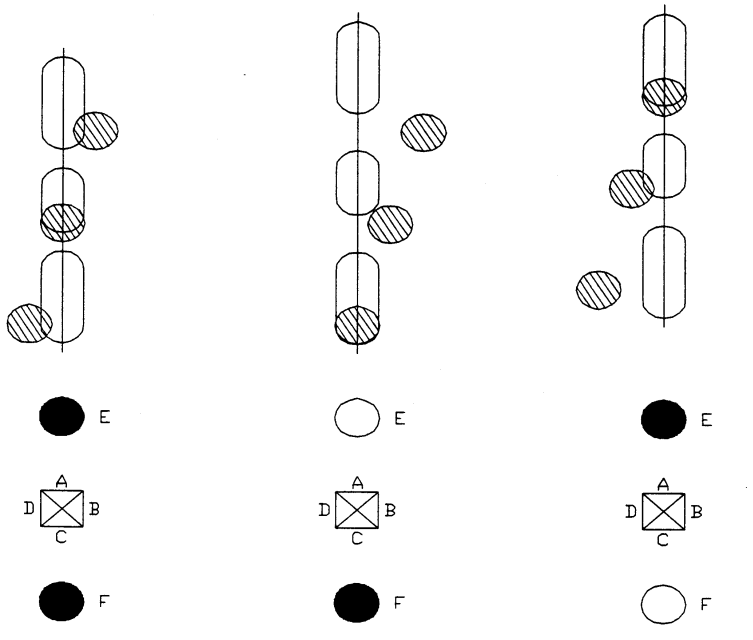
Four-quadrant diode, with laser spot in and out of focus.



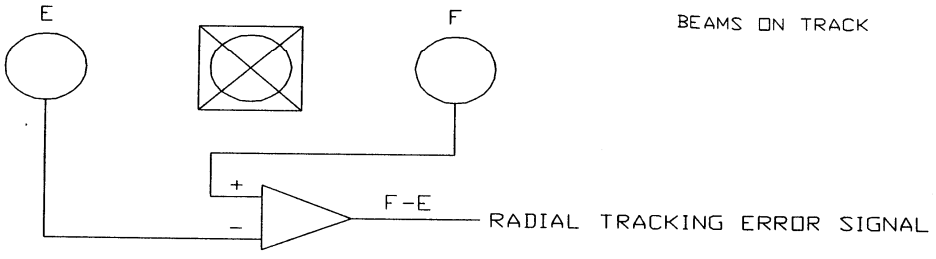
Four-quadrant diode, focus error signal, and data signal.



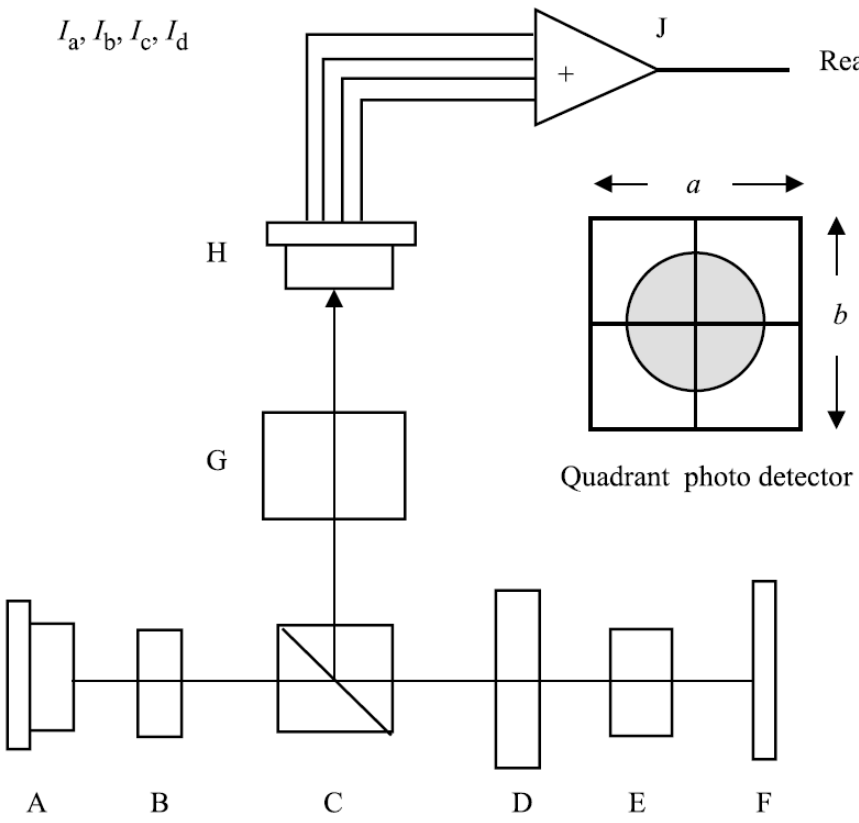
Main beams with radial tracking beams as they appear on the disc.



Two radial tracking photo diodes.



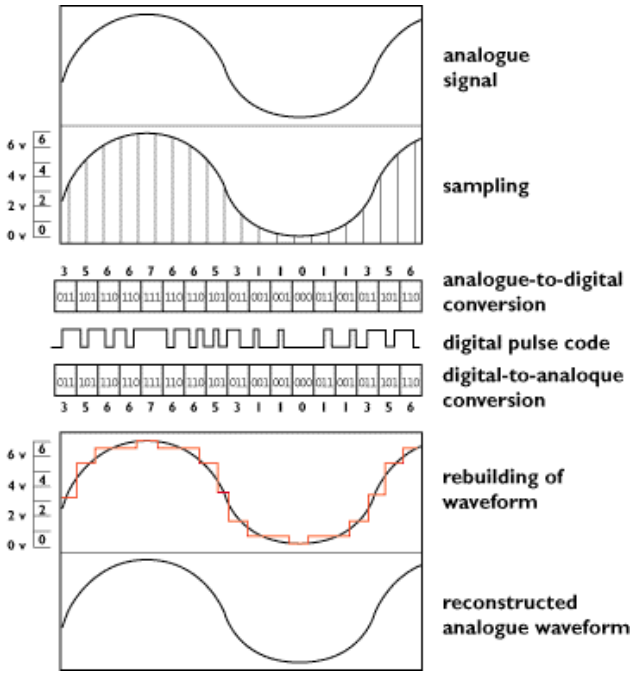
Generation of radial tracking error signal using side beam photodiodes E and F.

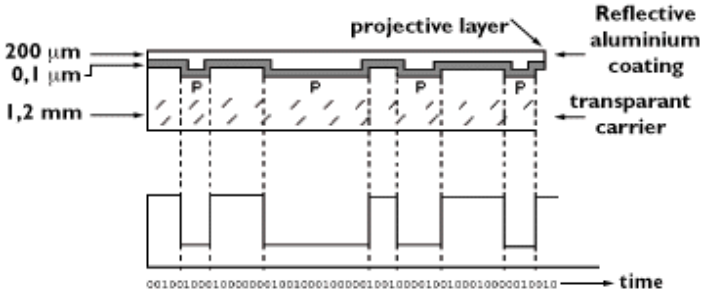


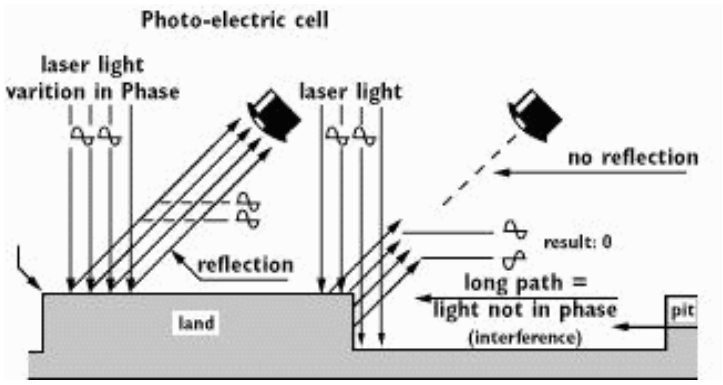
A Laser diode
B Collimator lens
C Polarizing beam splitter
D Quarter-wave plate
E Objective lens
F Optical disk
G Optics for the astigmatic focusing method
H Quadrant photo detector

I_a, I_b, I_c, I_d
J
Output from the quadrant photo detector
d.c. coupled amplifier

E. Riedle Physik[LMU]







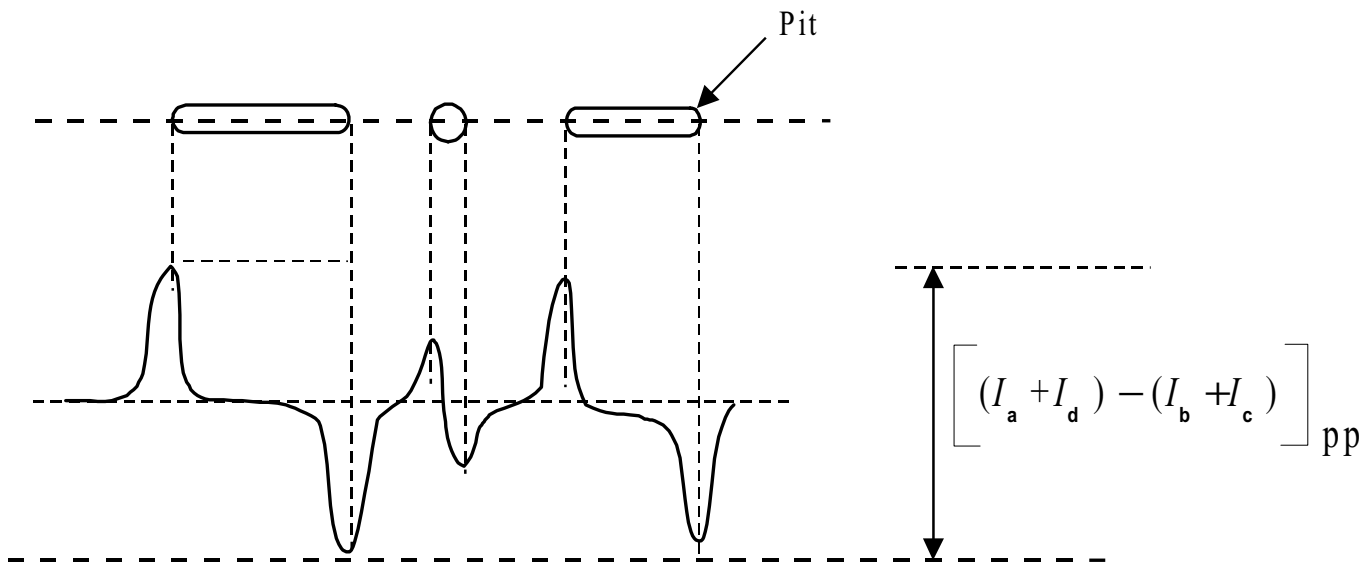


Figure 15 - Tangential push-pull signal

Eight-to-Fourteen-Modulation (EFM)

EFM bezeichnet das Verfahren, nach dem der Datenstrom, der auf CDs und Minidiscs gespeichert ist, codiert wird.

Jedem Byte (Datenblock, bestehend aus 8 Bits), wird dabei ein 14 Bit langes Codewort aus einer Tabelle (definiert für CD-ROM im Yellow Book) zugeordnet.

Zwischen diesen 14-Bit-Codewörtern werden dann noch drei sogenannte Trenn-Bits eingefügt.

Ein kurzer Spurabschitt von ca. 1/3 Mikrometer Länge (eine Bitzelle) entspricht einem Bit.

Damit eine CD zuverlässig abgespielt werden kann (damit die Pits und Lands lang genug sind, um vom Laser sicher erkannt zu werden), müssen sich zwischen den Einsen mindestens 2 und höchstens 10 Nullen befinden (sogenannte d/k-Bedingung). Durch einen Code, der die d/k-Bedingung erfüllt, braucht eine Bitzelle nur noch 1/3 der Länge zu haben, die sie haben müsste, wenn zwei Einsen (zwei Bitzellen, die einen Übergang haben und damit Anfang und Ende, sprich die Länge, des Pits bzw. des Lands bestimmen) unmittelbar aufeinanderfolgen dürften. Obwohl mehr als doppelt so viele Bits abgespeichert werden müssen, passt wegen der auf 1/3 verkürzten Länge einer Bitzelle im Ergebnis 50 % mehr Information auf die CD.

http://de.wikipedia.org/wiki/Eight-to-Fourteen-Modulation

00000000	01001000100000	01000000	01001000100100
00000001	10000100000000	01000001	10000100100100
00000010	10010000100000	01000010	10010000100100
00000011	10001000100000	01000011	10001000100100
00000100	01000100000000	01000100	01000100100100
00000101	00000100010000	01000101	00000000100100
00000110	00010000100000	01000110	00010000100100
00000111	00100100000000	01000111	00100100100100
00001000	01001001000000	01001000	01001001000100
00001001	10000001000000	01001001	10000001000100
00001010	10010001000000	01001010	10010001000100
00001011	10001001000000	01001011	10001001000100
00001100	01000001000000	01001100	01000001000100
00001101	00000001000000	01001101	00000001000100
00001110	00010001000000	01001110	00010001000100
00001111	00100001000000	01001111	00100001000100
00010000	10000000100000	01010000	10000000100100
00010001	10000010000000	01010001	10000010000100
00010010	10010010000000	01010010	10010010000100
00010011	00100000100000	01010011	00100000100100
00010100	01000010000000	01010100	01000010000100
00010101	00000010000000	01010101	00000010000100
00010110	00010010000000	01010110	00010010000100
00010111	00100010000000	01010111	00100010000100

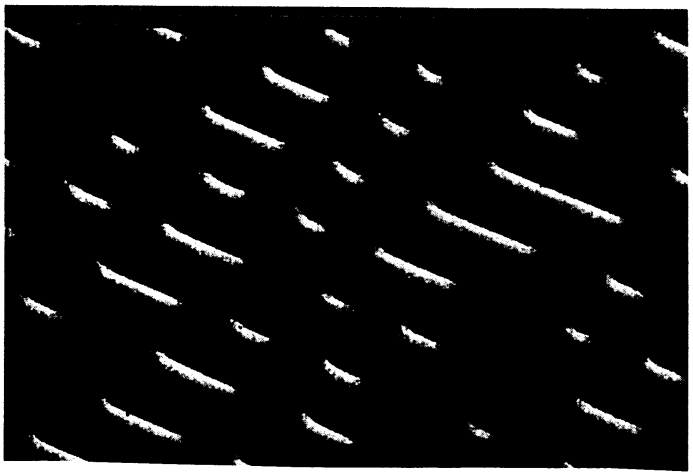
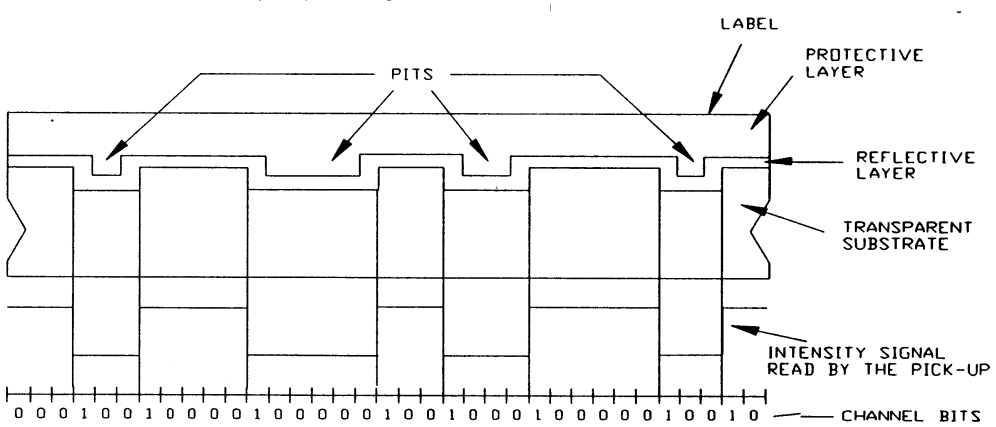


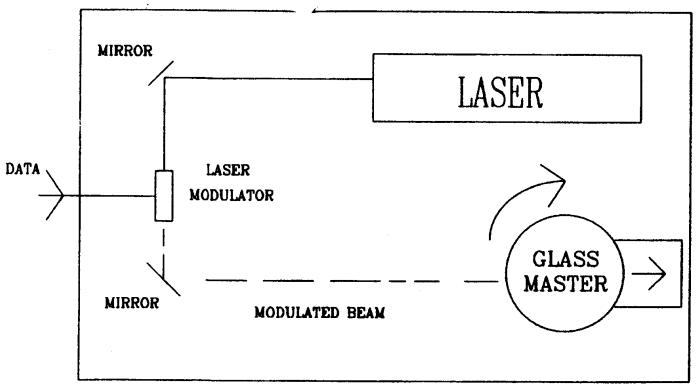
Figure 15-2 5000X magnification. Scale at top line is 10 μM. (Photo by Alvin Jennings, Jr.)

Eight-to-Fourteen Modulation

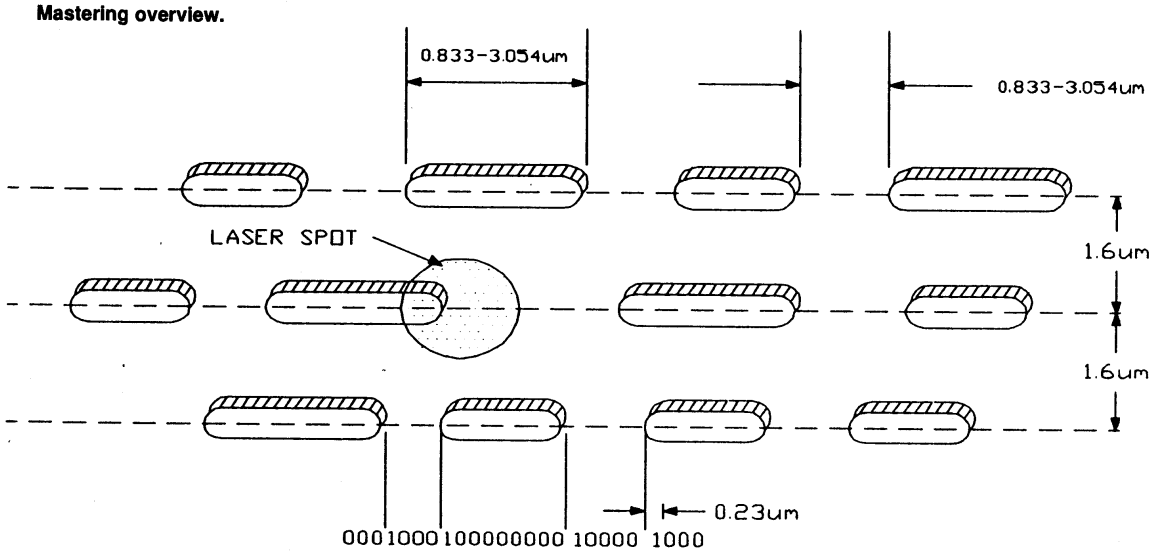
Data	EFM
00001000	01001001000000
00001001	10000001000000
00001010	10010001000000
00001011	10000100100000
00001100	01000001000000
00001101	00000001000000
00001110	00010001000000



Relationship between pits and binary data.



Mastering overview.



Pit and track dimensions.

Eight-to-Sixteen Modulation for DVDs (EFMplus)

Abhängig von der Anzahl Nullen, die ein Codewort am Ende hat, wird das nächste Codewort aus der entsprechenden Status-Codiertabelle gewählt.

8-bit byte	State 1		State 2		State 3		State 4	
	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State	Code Word msb lsb	Next State
0	00100000000001001	1	01000001001000000	2	00100000000001001	1	01000001001000000	2
1	00100000000010010	1	00100000000010010	1	10000001001000000	3	10000001001000000	3
2	00100001001000000	2	00100001001000000	2	10000000000010010	1	10000000000010010	1
3	00100000010010000	2	01000100100000000	4	00100000010010000	2	01000100100000000	4
4	00100000100100000	2	00100000100100000	2	10000001001000000	2	10000001001000000	2
5	00100000000100100	2	00100000000100100	2	10010010000000000	4	10010010000000000	4
6	00100000000100100	3	00100000000100100	3	10001001000000000	4	10001001000000000	4
7	00100000010010000	3	01000000000010010	1	00100000010010000	3	01000000000010010	1
8	00100000100100000	3	00100000100100000	3	10000100100000000	4	10000100100000000	4
9	00100001001000000	3	00100001001000000	3	10010010000000001	1	10010010000000001	1
10	00100100100000000	4	00100100100000000	4	10001001000000001	1	10001001000000001	1
11	00100010010000000	4	00100010010000000	4	10000000100100000	3	10000000100100000	3
12	00100100100000001	1	00100100100000001	1	10000000100100000	2	10000000100100000	2
13	00100010010000001	1	00100010010000001	1	10000100100000001	1	10000100100000001	1
14	00100000010010001	1	01000000000100100	3	00100000010010001	1	01000000000100100	3

Ecma International is a not-for-profit association under Swiss Law/Geneva, established in 1961

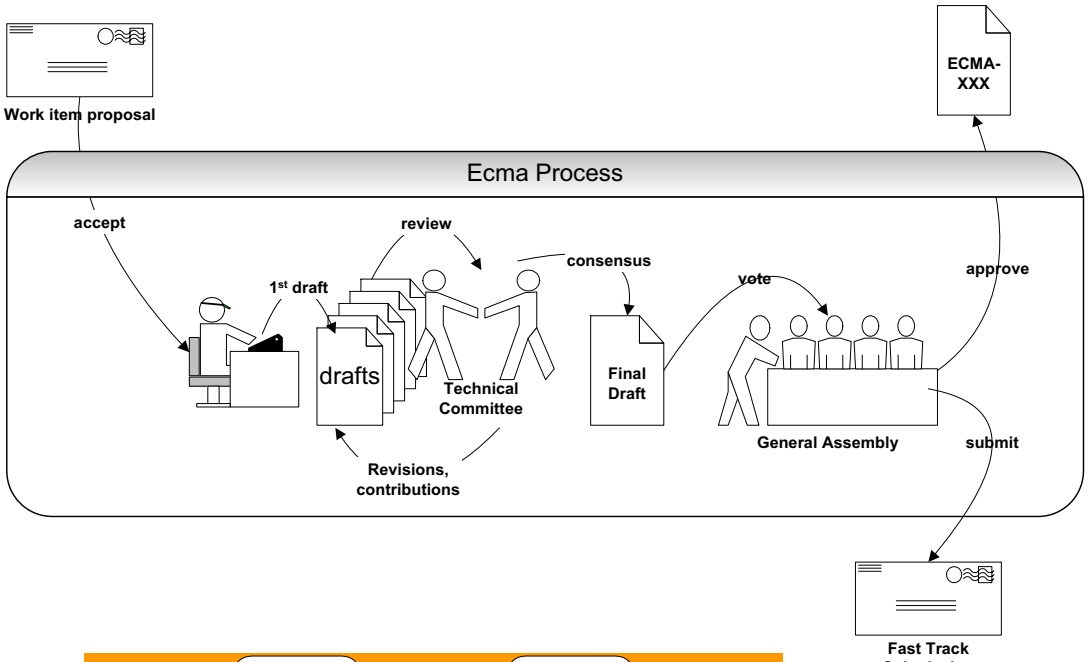
Purpose of Ecma: Development and publication of standards/TRs for Information & Communication Technology and Consumer Electronics

Track record: 450 publications, 2/3 also published by ISO/IEC

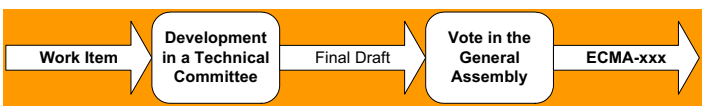
Ecma publications are free of charge and can be freely downloaded from the Ecma website www.ecma-international.org

A-liaison with ISO/IEC JTC 1 accelerates Ecma technical input into JTC 1

ISO/IEC Fast-track procedure (6-month international ballot) originally proposed by Ecma and accepted in 1987: over 80% of all 300 fast-tracked standards since 1987 have come from Ecma



In short:



To begin work, several (3, or more) existing or potential Ecma members must agree a standard is required:

- **If the work (area) is new, the GA has to approve it by simple majority, and the Secretary General of Ecma forms a new Technical Committee (TC) responsible for creating the standard.**
- **If the work fits in an existing TC, then the TC has to approve a project for the new work.**

Industry experts work together in the TC to create and prepare the standards for industry use, by means of successive drafts.

An editor, or editing team, is responsible for the drafts: An editor is essential for the contribution-driven progress in a TC.

TCs may use additional tools, e.g., a spreadsheet to control open issues and their progress.

What is Ecma's value?

A proactive, problem solving experts' group that ensures "high speed" publication of international standards;

Right balance between process and agility

Offers industry a "fast track" to global standards bodies, through which standards are made available on time;

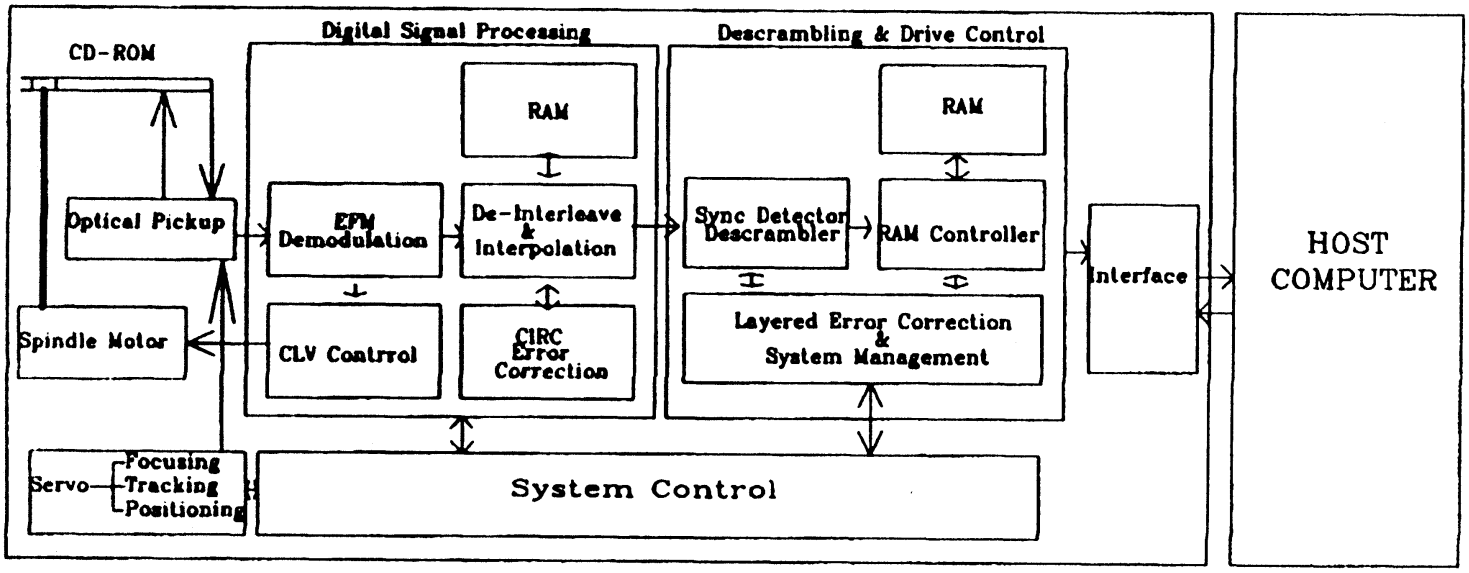
Solid IPR policy and practice

Balances Technical Quality and Business Value:

- **Quality of a standard is pivotal, but the balance between timeliness and quality as well: Better a good standard today than a perfect one tomorrow!**

Further advantages:

- **International membership with an international reputation**
- **"Pay one price and participate as much as you want"**
- **"Bring new work – only need 3 members to sponsor – no extra cost"**



Signal processing in the CD-ROM player (courtesy of Sony)

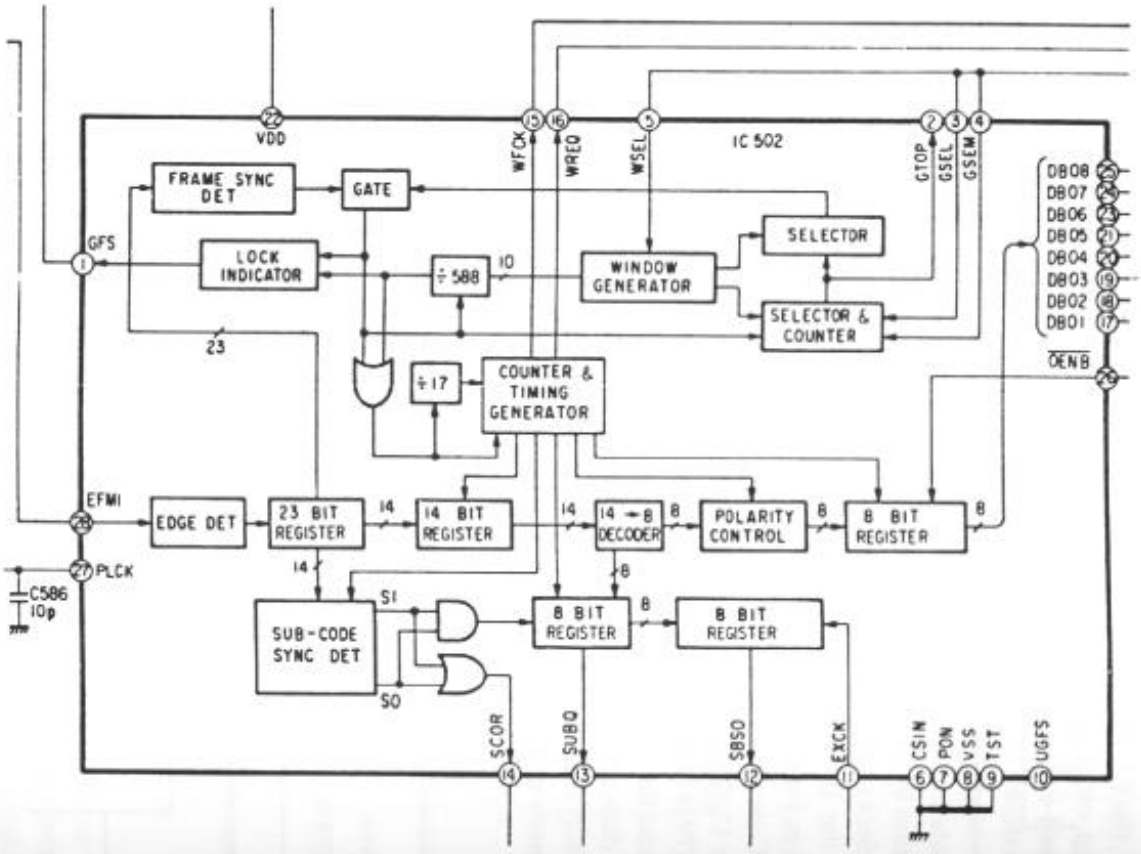


Figure 12.5 *Block diagram of the CX7933 integrated circuit: which performs EFM demodulation in the CDP-101*

Navigation

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- Von A bis Z
- Zufälliger Artikel

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- Permanentlink
- Artikel zitieren

Cross Interleave

(Weitergeleitet von CIRC)

Cross Interleave (Abk. CIRC) bedeutet **C**ross **I**nterleave (auch: Interleaved, Interleaving) **R**eed-Solomon **C**ode.

CIRC ist ein Fehlerkorrekturcode, der bei aktuellen Speichermedien wie CD-ROM und DVD eingesetzt wird.

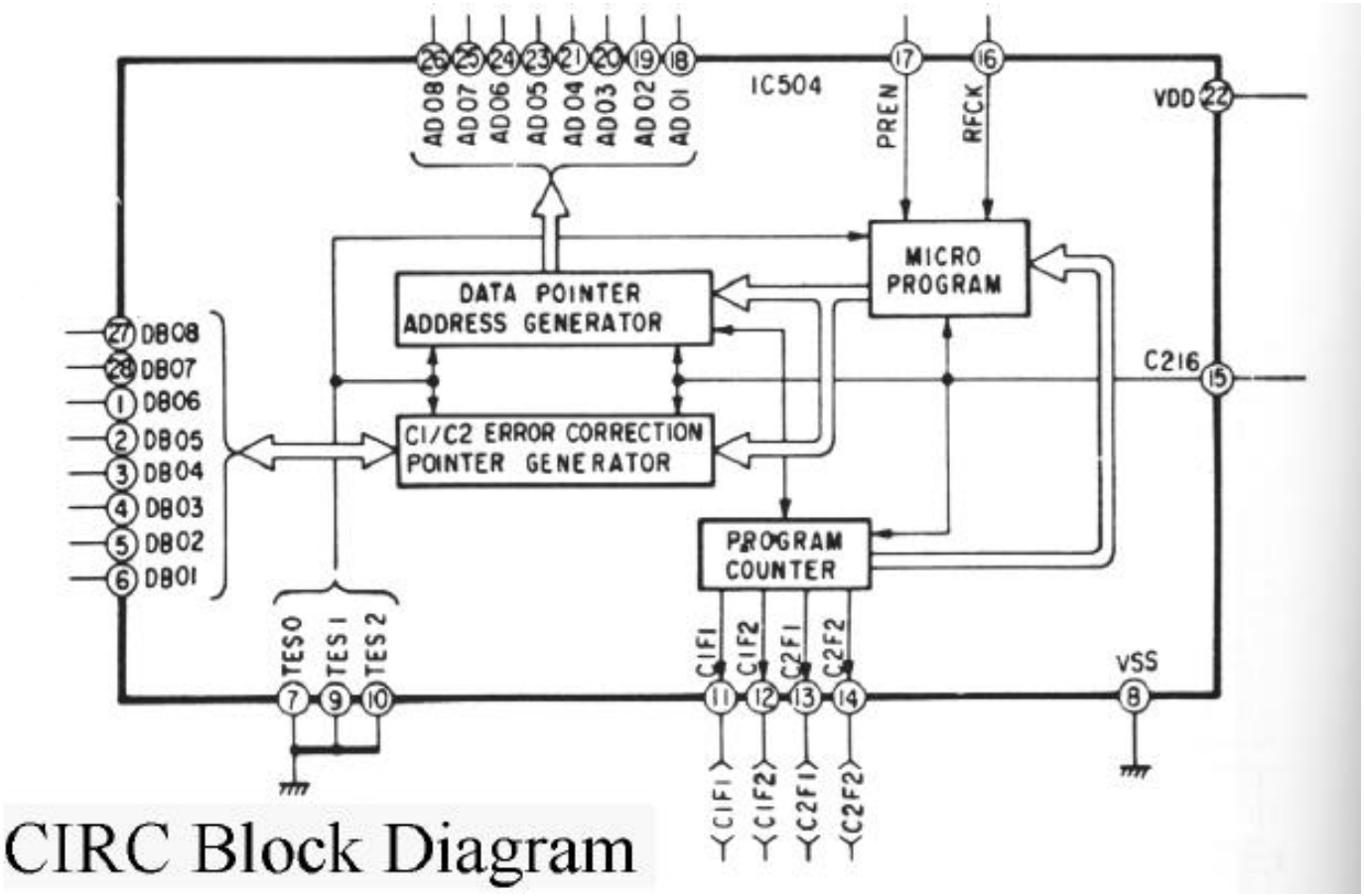
Digitale Speichermedien haben eine immer höhere Datendichte und werden so immer anfälliger für Fehler, was ein Fehlerkorrekturverfahren unbedingt notwendig macht. Um Einzelfehler und Flächenfehler zu korrigieren, wird die sehr sichere CIRC (Cross Interleaving Reed-Solomon Code) Codierung verwendet. Sie verwendet drei Cross-Interleaving Stufen, die die Daten in verschiedenen Intervallen auf dem Datenträger verschachtelt. Dadurch können Flächenfehler zerlegt werden und so, mit Hilfe von Paritätbits, bis zu 200 Einzelfehler pro Sekunde korrigiert werden.

Siehe auch

[Bearbeiten]

- Fehlerkorrektur#Compact Disc

Kategorie: Theoretische Informatik



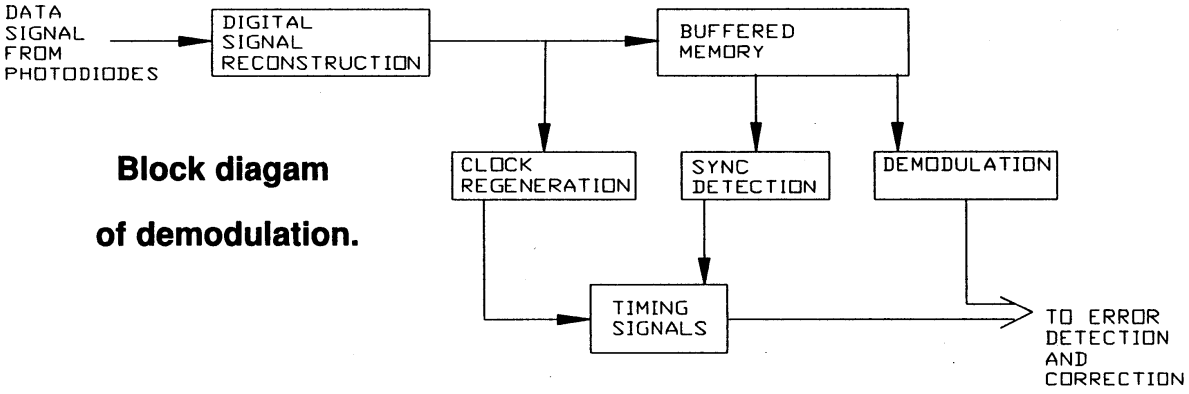
CIRC Block Diagram

24 SYNC BITS	14 CONTROL AND DISPLAY BITS	168 DATA BITS	56 PARITY BITS	168 DATA BITS	56 PARITY BITS	102 MERGING BITS

One frame comprised of 588 channel bits.

12 SYNC BYTES	4 BLOCK ADDRESS BYTES	2048 DATA BYTES	288 LAYERED ECC BYTES		
			4 DETECTION BYTES	276 CORRECTION BYTES	8 UNUSED BYTES

One block = 2352 bytes = 98 frames.



Block diagam of demodulation.

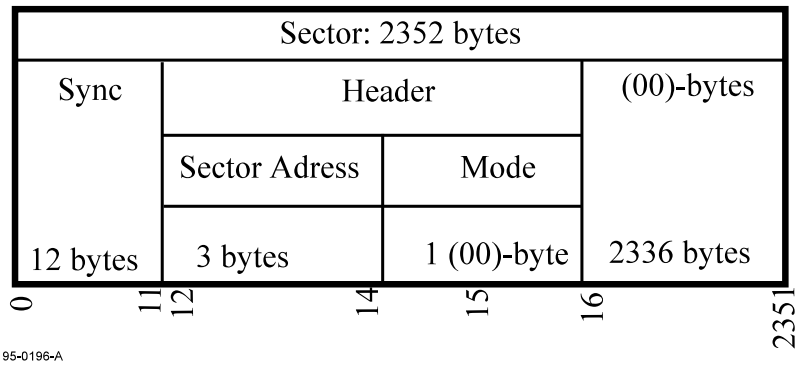
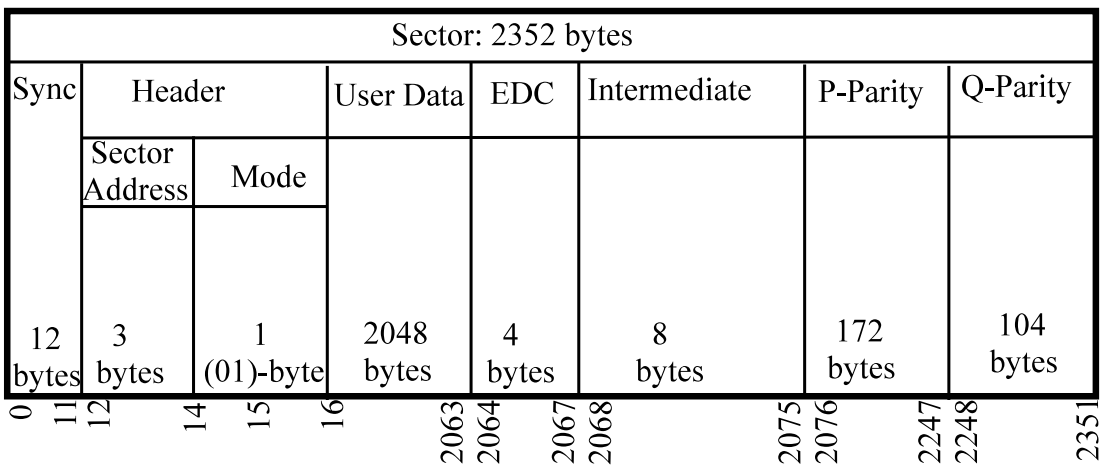


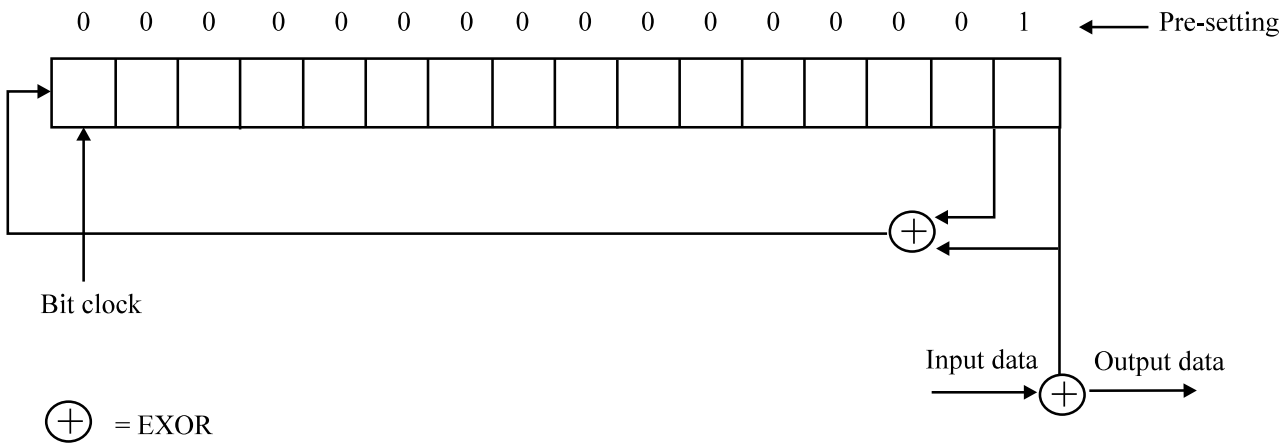
Figure 10 - Sector Mode (00)

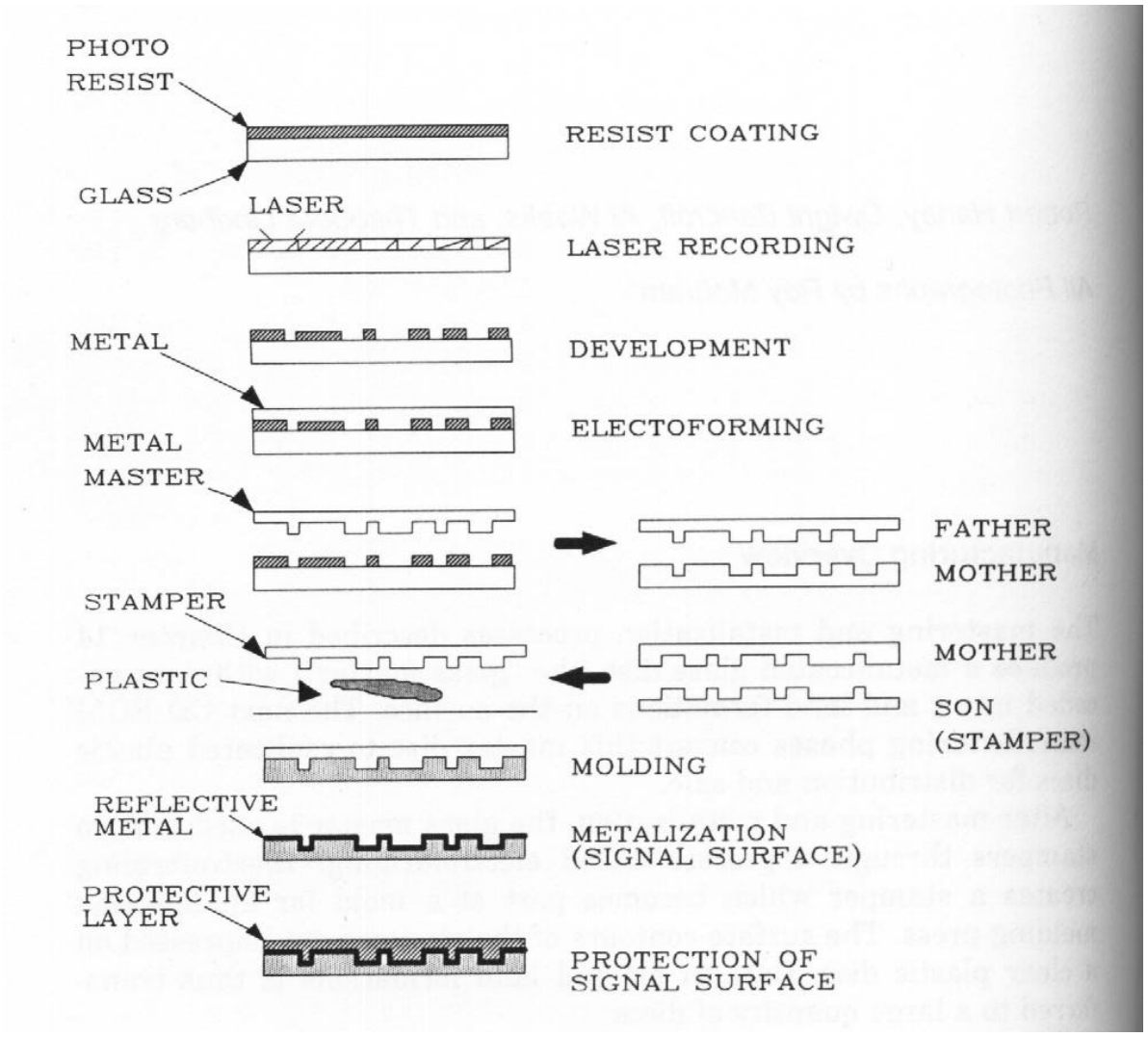
Figure 11 - Sector Mode (01)



Scramble

A regular bit pattern fed into the EFM encoder can cause large values of the digital sum value in case the merging bits cannot reduce this value (see annex E). The scrambler reduces this risk by converting the bits in byte 12 to 2 351 of a Sector in a prescribed way. Each bit in the input stream of the scrambler is added modulo 2 to the least significant bit of a maximum length register. The least significant bit of each byte comes first in the input stream. The 15-bit register is of the parallel block synchronized type, and fed back according to polynomial $x^{15} + x + 1$. After the Sync of the Sector, the register is pre-set with the value 0000 0000 0000 0001, where the ONE is the least significant bit.





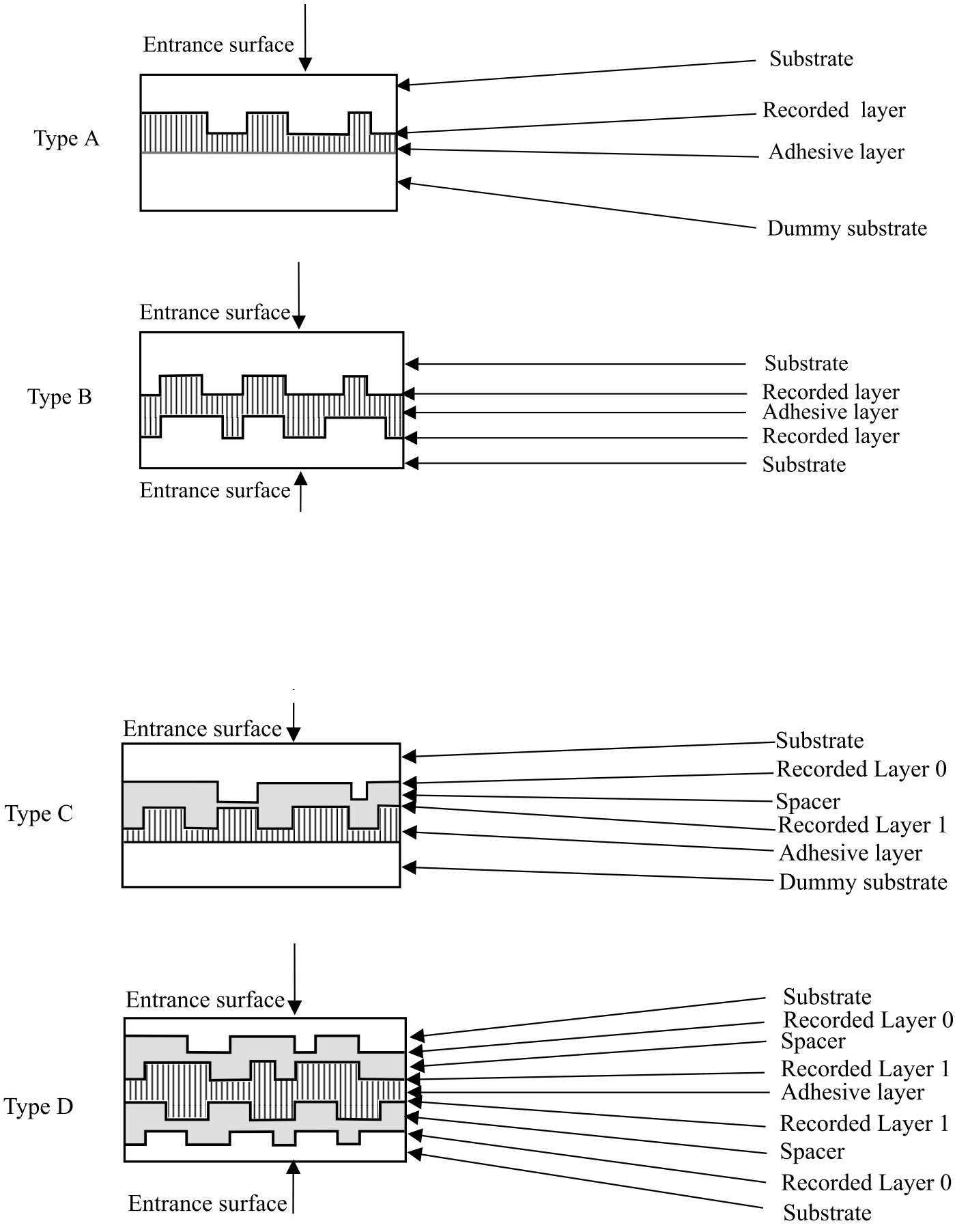
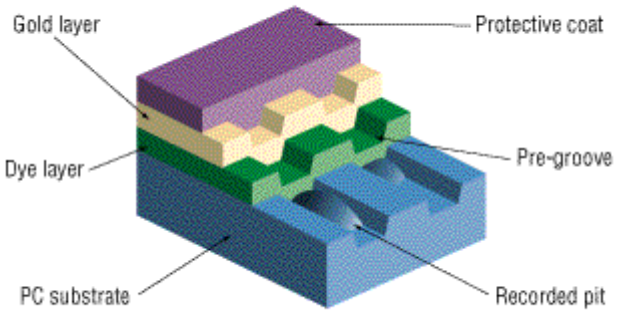


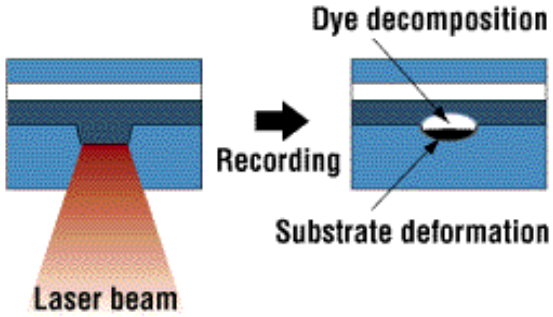
Figure 1 - Types of 120 mm DVD - Read-Only disks

Disc Structures of CD-R



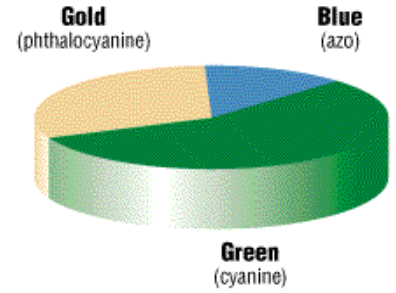
Pit Formation Mechanism of CD-R

To get over 60% modulation amplitude



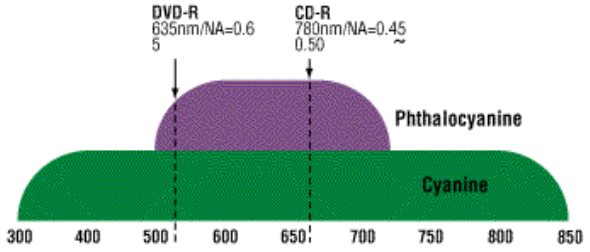
CD-R decomposition and discoloration of the recording layer.

CD-R Type Manufacturing Share



Pie chart with dye market share.

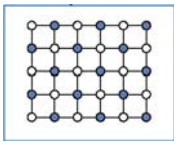
Cyanine Answers to the Strict Characteristics of DVD-R

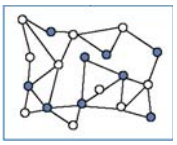


Laser wavelength chart, cyanine versus phthalocyanine

phasenändernde Materialien

- Festkörper besitzen zwei Zustände:
  - kristallin: periodische Ordnung der Strukturbausteine
  - amorph: keine Fernordnung der Strukturbausteine





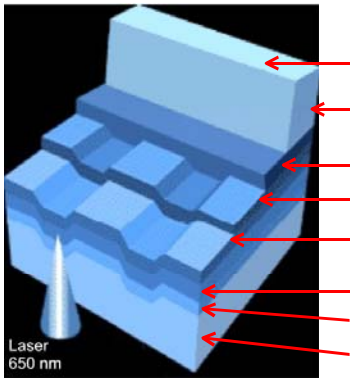
- für Speicheranwendungen werden beide Zustände verwendet
- wird durch unterschiedlich hohe Abkühlraten möglich

phasenändernde Materialien

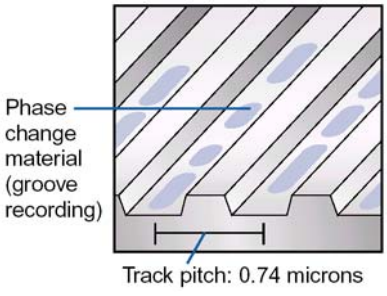
- Schmelztemperatur ca. 500°C
- niedrige Wärmeleitfähigkeit (< 5mW/(µm)²)
- stabiler amorpher Zustand:
  - Rekristallation erst oberhalb 150°C (W > 1eV)
- hoher optischer Kontrast:
  - Reflexion amorpher Zustand < kristalliner Zustand
  - trotzdem niedriger Reflexionskoeffizient als DVD-ROM ⇒ Kompatibilitätsprobleme
- z. B. AgInSbTe

DVD-RW/+RW

- ca. 1000 mal beschreibbar: 3 - 4,7 GB
- technisch nah an DVD-ROM



Label
0,6 mm Polycarbonat
Kleber
reflektierende Schicht
dielektrische Schicht
phasenändernde Schicht
dielektrische Schicht
0,6 mm Polycarbonat



- dielektrische Schicht zur Wärmeisolation

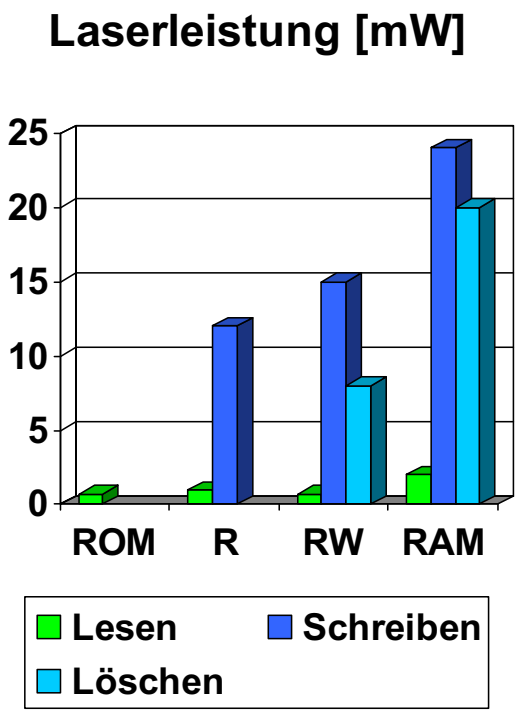
Schreiben

- DVD-R/+R:
  - Laserstrahl verbrennt Farbstoff und schmilzt Substratoberfläche an

  $\Rightarrow$ stark verringerter Reflexionskoeffizient
- DVD-RW/+RW/-RAM :
  - phasenändernde Schicht wird durch Laserstrahl geschmolzen
  - schnelle Abkühlung, Abkühlrate > 10^9 K/s
  - Übergang kristallin - amorph, Reflk. kleiner

Löschen, Laserleistung

- Löschen nur DVD -RW/+RW/-RAM:
  - erneutes Aufschmelzen
  - langsame Abkühlung
  - Übergang: amorph - kristallin
  - Reflektions-koeffizient größer

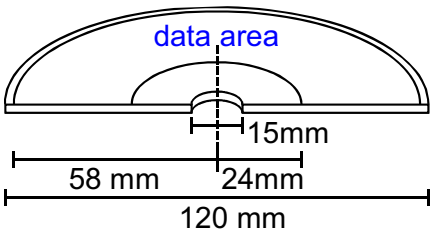


Lastenheft für DVD

Formuliert durch Studio Advisory Comitee im August 1994:

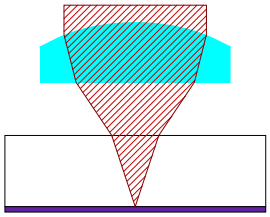
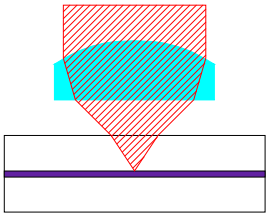
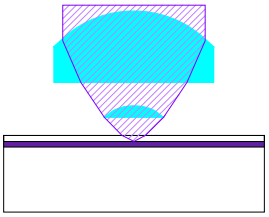
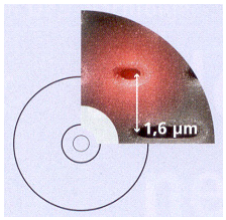
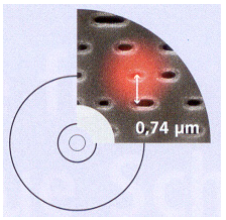
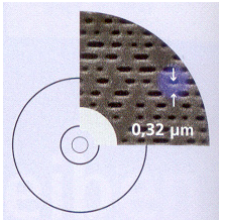
- min. 133 Minuten Video/Seite
- Bildqualität besser als Laserdisc
- 5.1 Dolby Digital Surround Sound
- Spuren für 3-5 Sprachen
- Abmessungen wie CD

technische Daten



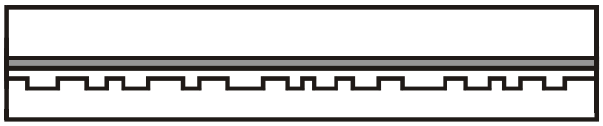
	CD	DVD single layer, side	DVD double layer, side	Blu-ray disc
Speicherkapazität [GB]	0,65/0,7	4,7	17	23,3-27
Dicke [mm]	1,2	2 x 0,6	4 x 0,3	0,1 + 1,1
Spurabstand [µm]	1,6	0,74		0,32
pit-Breite [µm]	0,5	0,32		-
min. pit-Länge [µm]	0,83	0,4	0,44	0,16-0,138
max. pit-Länge [µm]	3,05	1,87	2,05	-
Lesegeschwindigkeit [m/s]	1,2-1,4	3,49	3,84	-

Optik

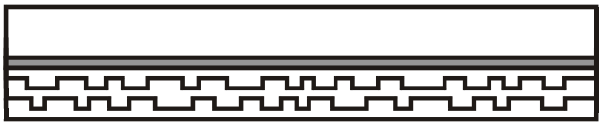
	CD	DVD	Blu-ray disc
Laser	780 nm infrarot AlGaAs	635/650 nm rot AlGaInP	405 nm blau-violett GaN
num. Apertur	0,45	0,6	0,85
Fokusierung			
REM			

Layeranordnung DVD-ROM

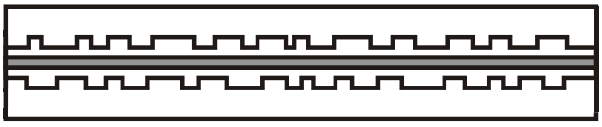
single-side, single layer (4,7 GB)



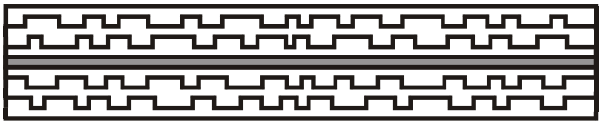
single-side, double layer (8,5 GB)



double-side, single layer (9,4 GB)



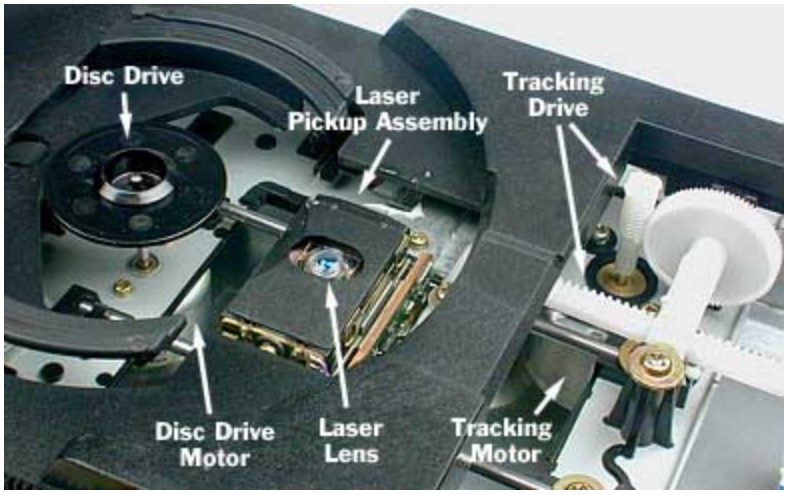
double-side, double layer (17 GB)



- double layer:
  - größere pits
  - äußere Schicht (Gold) reflektiert ca. 25-40%
  - innere Schicht (Alu) reflektiert mehr als 70 %
  - Laser wird auf entsp. Schicht fokusiert
- double side:
  - DVD muss zwischen-durch gedreht werden
  - oder Verwendung von 2 Lasern

DVD-Player

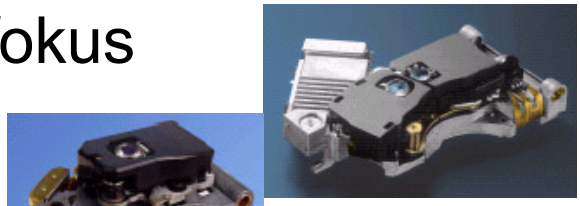
- Laufwerk:



- digitale Signalverarbeitung mit Fehler-korrektur, MPEG-Decoder etc.

DVD-Player Besonderheiten

- Duallaser oder Dualfokus für CD und DVD



- Fertigungstoleranz der DVD
  - Dicke: +0,30/-0,06 mm
  - Durchmesser +/- 0,30 mm

  ⇒ Ausgleich über optisches Abtastsignal

Blu-ray Disc—What Is It?

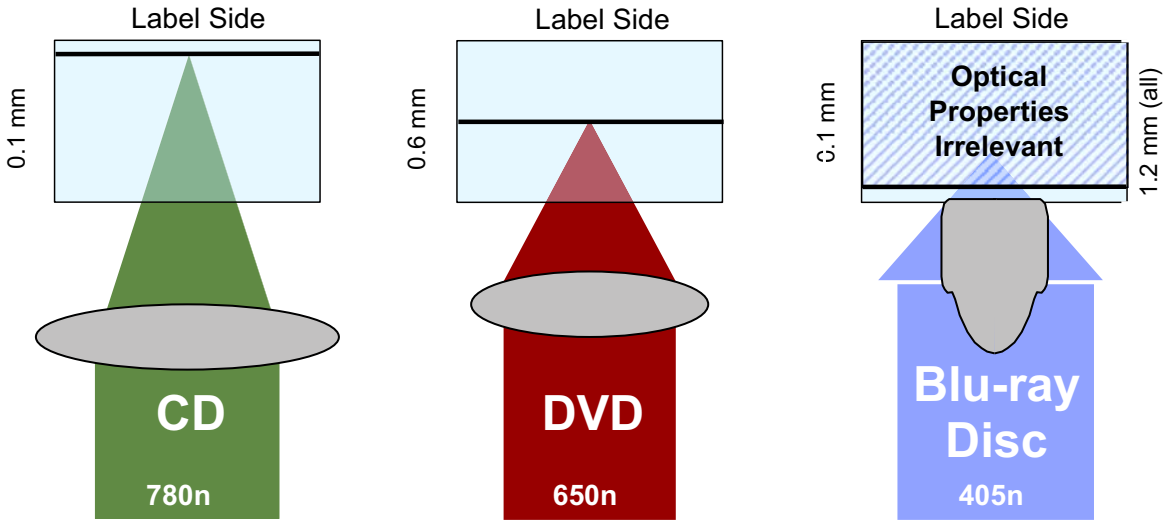
- Next revolution in optical storage solutions for consumer electronics/PC products/game consoles (PS3)
- Incredible audio/video quality

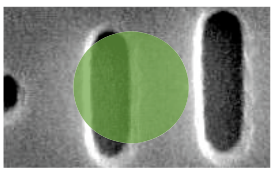
Blu-ray Disc:	1920 x 1080
DVD:	720 x 480
Analog Broadcast TV:	352 x 240

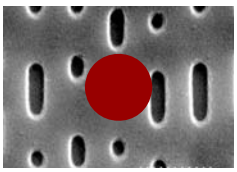
- Huge capacity
  - 25GB (single layer)/50GB (double layer)
  - Future capability to store 200GB (multi-layer)

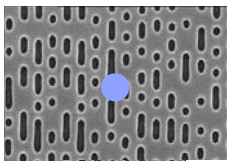
Advanced Java Technology-Based Interactivity

Blue Lasers Enable Increased Capacity




700 MB


4.7 GB

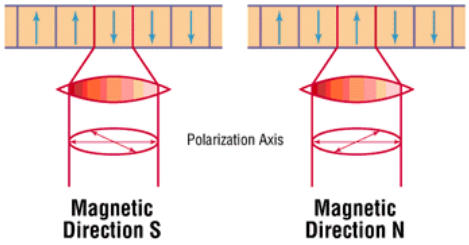

25 GB (5 x DVD)

Note: Single Layer Comparison

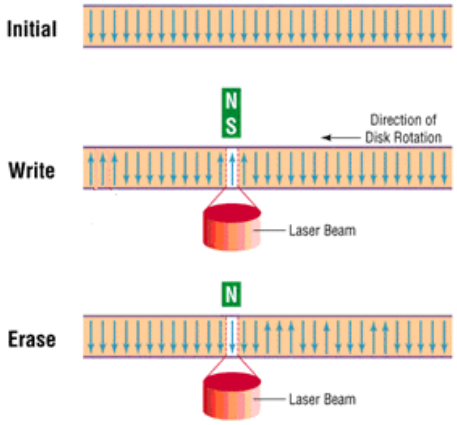
Magneto Optical (MO) Disks

write: "Curie point"

read: "Kerr effect"



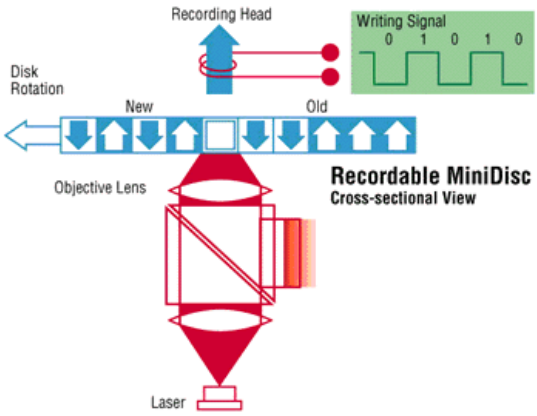
MO read-out requires a special polarizing filter



In MO writing, the magnetic field remains constant while the laser flashes to record a "1"

Erasure requires a separate pass, with a reversed magnetic field

18.6.99, E. Riedle, Uni München



MiniDisc uses a fixed laser and a switching magnetic field. So MD can erase and re-record in a single pass, using a single MO head

ecma INTERNATIONAL

Work programme
Holographic Information Storage Systems(HISS)
Office Open XML Document Formats/Details

Holographic Information Storage Systems (HISS)

Standards for HVD-ROM disk and HVD Recordable Cartridges were published at 12/2006 and 05/2007. Media with Permanent Holographic Information (PHI) are called media of the Phi-Type.

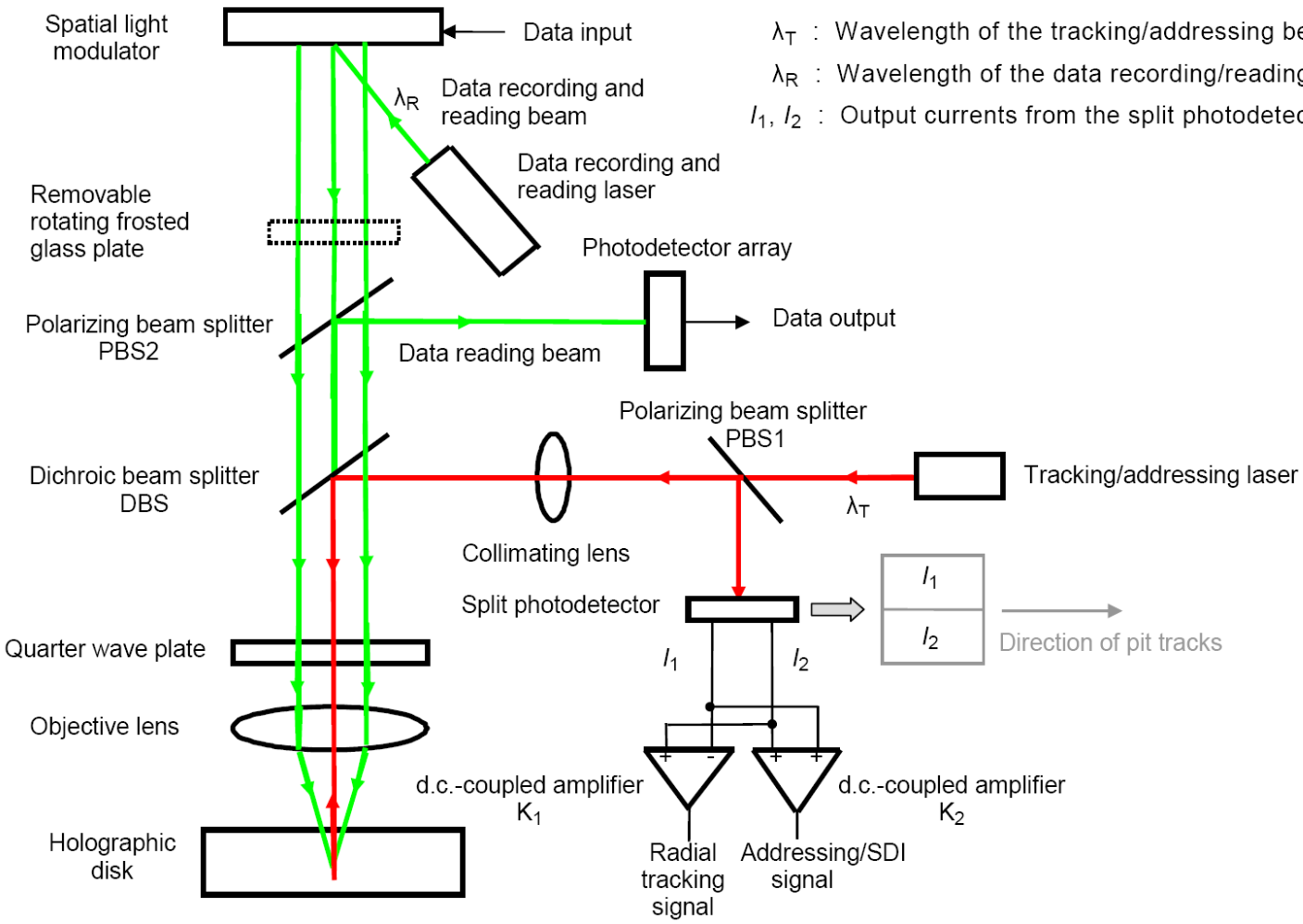
First generation media support capacities from 30 Gbytes (Cards/HVC) to 200 Gbytes (Disks): HVD-R (100 Gbytes) and HVD-ROM (200 Gbytes). Future media is expected to have capacities of 1 Tbyte and more.

ECMA-375, ECMA-377 and ECMA-378 have been approved so far.

Office Open XML Document Formats

- Designed to represent all information of .doc, .ppt and .xls in XML
- Default file format for Office 12
- Proposals for complementary or additional technology are considered for the evolution of the standard, under the proviso of insured backward compatibility.

ECMA-376 is the first standard approved at the end of 2006.



E. Riedle Physik