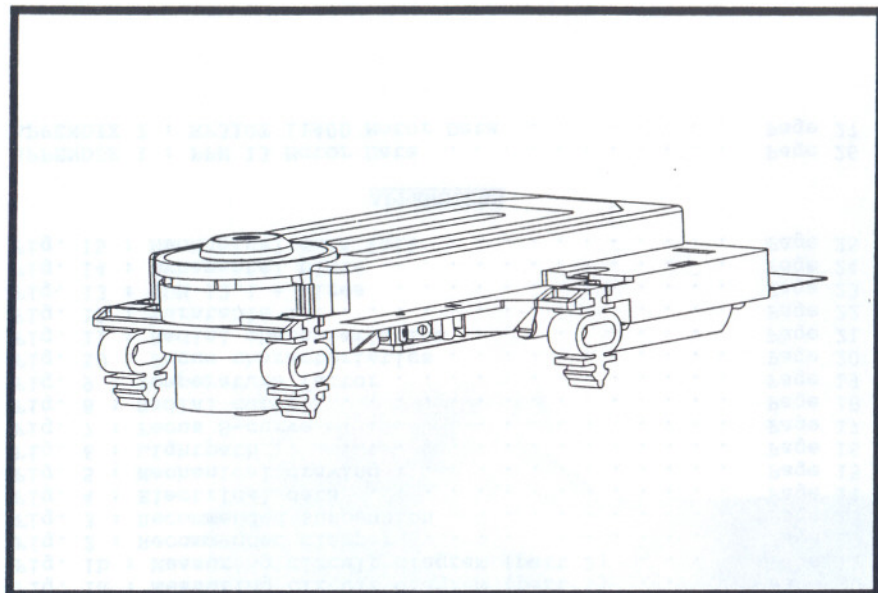




# PHILIPS



## SPECIFICATION CDM 12.1

Philips Laser Optics  
Key Modules Group

## SPECIFICATION

### CDM 12.1

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CDM 12.1 SPECIFICATION

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## 1. GENERAL INFORMATION

The CDM 12.1 is a modular CD-mechanism, using a 2-stage, 3-spot system. It contains the following modules :

- a lightpen with holographic lightpath
- the actuator
- the disc motor : a DC-motor with a turntable prepared for magnetical clamping, equipped with a spring cone
- the frame with the sledge drive
- the foil with the lasersupply

It is suitable for a wide variety of applications : e.g. standalone players (mini and full size), CD-RCR applications, and even home CD-ROM systems.

To cope with this broad application range, the CDM 12.1 needs to be flexible :

- suitable for 12 and 8 cm. discs according to the RED BOOK standard
- limited size
- applicable in horizontal and vertical position
- optional accessories are available, e.g. tray loading mechanism, suspension, clamping device, ornamental plate
- wide temperature range
- prepared for a variety of approbation/safety standards



## 2. SPECIFICATION

### A. Test conditions

Parameter	Min.	Nom.	Max.	Unit
Ambient temperature	20	25	30	°C
Relative humidity	45		75	%
Air pressure	86		106	kPa
Setting angle horizontal	-5	0	5	°
Setting angle vertical	-5	0	5	°

Parameter	Codenumber	Notes
Clamping device	3104 147 10030	See fig. 2
Testdisc	7104 099 24981	SBC444

### B. Specified values

#### 1. General

Parameter	Min.	Nom.	Max.	Unit	Notes
Connections					See fig. 4 for pinning See fig.15 for mechanical data
Current consumption			300	mA	In play condition horizontal
Dimensions					See fig. 5
Min. read-out diameter	46.8	47.4	48	mm	
Max. read-out diameter	117	117.5	118	mm	
Weight		90		gr	
Clamping force	1.35			N	

## 2. Opto-electrical

Parameter	Min.	Nom.	Max.	Unit	Notes
Lightpath					See fig. 6
Focus error detection					Single Foucault
Radial error detection					3-beam method
Numerical aperture		0.45			
Working distance		1.8		mm	
Power intensity out of objective lens			0.5	mW	

### LASER

Parameter	Min.	Nom.	Max.	Unit	Notes
Wavelength	760	780	800	nm	at 30 °C
Supply voltage	4		6	V	See fig. 4 : +laser
Supply current		60	90	mA	See fig. 4 : +laser

### PHOTODIODES

Parameter	Min.	Nom.	Max.	Unit	Notes
Configuration					See fig. 4
CAsum		2/3		of Isum	D2+D3+D4
SATsum		1/3		of Isum	D1+D5
Dark reverse current			10	nA	
Terminal capacitance			3	pF	D2, D3, D4
			5	pF	D1, D5
Response time (5%-95%)			120	ns	D2, D3, D4
			200	ns	D1, D5
Isum	6.5	7.3	8.1	µA	Substrate current crosstracks in focus excl. straylight
Istray			15	% of Isum	Substrate current without disc
HF signal amplitude pp		5.6		µA	HF part of CAsum



## FOCUS

Parameter	Min.	Nom.	Max.	Unit	Notes
S-curve shape/polarity					See fig. 7
Slope					Monothonic
Amplitude pp		34		% of Isum	
Peak-peak value		12		$\mu\text{m}$	
Slope for $ z  < 1 \mu\text{m}$ (d(Ife)/Dz)	18		27	% of Isum/ $\mu\text{m}$	Ife = (D2-D3)/(D2+D3)
Change of slope from 5 to 55 °C, relative to 25 °C	-20		20	%	

## RADIAL

Parameter	Min.	Nom.	Max.	Unit	Notes
Polarity					See fig. 8
Offset (D5-D1)dc/(D1+D5)dc			11	%	
Error signal		10		% of Isum	(D5-D1)ac pp
Change of slope from 5 to 55 °C, relative to 25 °C	-30		30	%	
Change of error signal from track 1 to 24	-15		15	%	

Note : See measuring circuit fig. 1a and 1b :

Parameter	Conversion factors				Notes
	Min.	Nom.	Max.	Unit	
Isum	196	200	204	mV/ $\mu\text{A}$	D1+D2+D3+D4+D5
FOCsum	196	200	204	mV/ $\mu\text{A}$	D2+D3
FE	196	200	204	mV/ $\mu\text{A}$	D2-D3
CASum	196	200	204	mV/ $\mu\text{A}$	D2+D3+D4
SATsum	196	200	204	mV/ $\mu\text{A}$	D1+D5
RE	196	200	204	mV/ $\mu\text{A}$	D5-D1
HF	256	274	289	mV/ $\mu\text{A}$	

## 3. Electro-mechanical

Parameter	Min.	Nom.	Max.	Unit	Notes
<b>ACTUATOR (Focus/Tracking)</b>					
Temperature factor fo					See fig. 9
AC sensitivity		-0.4		%/°C	
Moving mass		0.56		gr	
Q-factor coils	8		12		
Voltage on coils			3	Vdc	Max. 1 second
<b>FOCUS</b>					
Resonance frequency	26	30	34	Hz	at 20 °C
AC sensitivity	0.224	0.28	0.336	N/A	at 200 Hz
DC sensitivity		0.8		mm/V	
Resistance	15.3	18	20.7	$\Omega$	
Working area	-0.8		0.8	mm	
Max. deviations from ideal actuator characteristics					See fig. 10
<b>TRACKING</b>					
Resonance frequency	42	49	56	Hz	at 20 °C
AC sensitivity	0.256	0.32	0.384	N/A	at 200 Hz
DC sensitivity		0.35		mm/V	
Resistance	15.3	18	20.7	$\Omega$	
Working area	-0.6		0.6	mm	
Max. deviations from ideal actuator characteristics					See fig. 11

## SLEDGE MOTOR

Parameter	Min.	Nom.	Max.	Unit	Notes
Motor					Matsushita PPN 13
Transmission ratio		30		krad/m	
For detailed information : see appendix 1					

## DISC MOTOR

Parameter	Min.	Nom.	Max.	Unit	Notes
Motor					Mabuchi RF310T 11400
For detailed information : see appendix 2					



## TURNTABLE

Parameter	Min.	Nom.	Max.	Unit	Notes
Dimensions					See fig. 12
Eccentricity spring cone			40	µm	
Clamping force	1.35		2	N	with clasper of fig. 2
Skew			0.17	°	
Weight on turntable			7	kg	

## POLARITY OF ACTUATORS/MOTORS

Sledge motor : A positive voltage on the marked terminal (DOT : see fig. 13), relative to the unmarked terminal will make the sledge move inwards.

Disc motor : A positive voltage on the terminal with the red mark (see fig. 13), relative to the unmarked terminal will make the disc motor run in clockwise direction.

Radial actuator : A positive voltage on RADIAL+ (see fig. 4), relative to RADIAL- will make the objective lens move inwards.

Focus actuator : A positive voltage on FOCUS+ (see fig. 4), relative to FOCUS- will make the objective lens move up.

## SWITCH

Parameter	Min.	Nom.	Max.	Unit	Notes
Switching point distance	23.1	24.1	25.1	mm	Centre of lens (nominal position) to centre of turntable
Condition of switch		OPEN			Actuator outside the switching point distance
		CLOSED			Actuator inside the switching point distance

## 4. Absolute maximum ratings

Parameter	Max.	Unit
Laser reverse voltage	2	V
Monitor diode reverse voltage	30	V
Photodiodes reverse voltage	15	V
Disc motor voltage	6	V
Sledge motor voltage	8	V

## 3. APPLICATION CONDITIONS

Note : With discs according to the RED BOOK standard

Operational	Temperature range	5 to 55 °C
	Humidity range	5 to 90 % R.H.
Storage	Temperature range	-25 to 55 °C
	Exposure	70 °C (48 hours)
	Humidity range	5 to 95 % R.H.
Shock resistivity	Impact (on the mechanism)	Max. 100 g during 6 msec. 3 times 6 directions
	Bumps (on the mechanism)	Max. 40 g during 6 msec. 500 times 3 directions
	In the packing	Frequency 10 Hz, 2 g, 20 min/side, 3 sides

Note : After being exposed to the above mentioned conditions, and given a recovery time of 4 hours in 25 °C, the CDM 12.1 will comply to the specification.

## Position for operation and storage

Horizontal	Allowed	
Vertical	Allowed	Side A or B below and all positions in between by rotating around the X-axis (see fig. 5)
	Recommended	Side A below (see fig. 5)

## 4. RELIABILITY

Lifetime	5000 h	B10
	500 h	B1
MTBF (100% duty cycle)	10000 h	



## 5. STANDARDS

The CDM 12.1 has been designed to comply with safety standards of various countries. However, since its approval depends on the application, this unit is not approved as a unit.

It is prepared for the following standards :

UL1270  
UL1409  
CSA C22.2 No. 1-M90

Partname	Material manufacturer	UL-file	Grade	Generic name	Type No.	ID-mark
Laser (LDGU)	Sharp				LTOH30P2	
Mounting plate	Bayer AG	E41613	94V1	PC	Makrolon 8035	
Turntable	Bayer AG	E41613	94V2	PC	Makrolon 8035	
	General Electric	E45329	94V2	PC	Lexan 121R	
Lightpen	Hoechst Celanese	E83005	94V0	LCP	Vectra A130	
Guide block	LNP	E45195	94V1	PC	DFL 4044	
Flexfoil	Nitto Denko	E69892	94V0			N-A
	M-flex	E132084	-	-	-	-

## 6. HANDLING INSTRUCTIONS

- Storage in dusty, high temperature and high humidity environments should be avoided.
- To avoid damage to the LDGU by electrostatic discharges, measuring equipment and operators should be grounded during handling.
- Contamination of the objective lens will influence the performance. Avoid fingerprints on the lens, handle the mechanism in a clean environment.
- The actuator with lightpath has been adjusted carefully during manufacturing. Avoid touching this part !! Do not disassemble or readjust !!
- Safety : The laserbeam may damage the human eye. Avoid that people can look directly or indirectly into the objective lens.
- Fast heating up (e.g. by bringing the mechanism from a cold place into a warm and humid room) can result in moisture condensating on the lens, thus influencing the playability for a certain time. Before checking the performance the mechanism should stabilize for at least 4 hours.
- Please keep the short circuit clip on the flexfoil mounted as long as possible. Remove just before installing the CDM 12.1 in his final application to avoid the risk of damage by electrostatic discharges.

## 7. VERSIONS/CODENUMBERS

Type	Single codenumber (*)	Packaged codenumber (**)	Notes
Basic mechanism	3104 147 00300	3104 147 90150	
Mechanism with wiring	3104 147 00450	3104 147 90400	See fig. 13

(\*) To be used for sample quantities

(\*\*) 1000 pcs./pallet

Optional accessories	Codenumber	Notes
Tray loader		See L121X specification
Suspension	3104 144 00650	See fig. 3
Clamper	3104 147 10030	See fig. 2
Ornamental plate	3104 141 20210	See fig. 14



Fig. 1a : Measuring circuit diagram (part 1)

Note : S/N : better than 45 dB

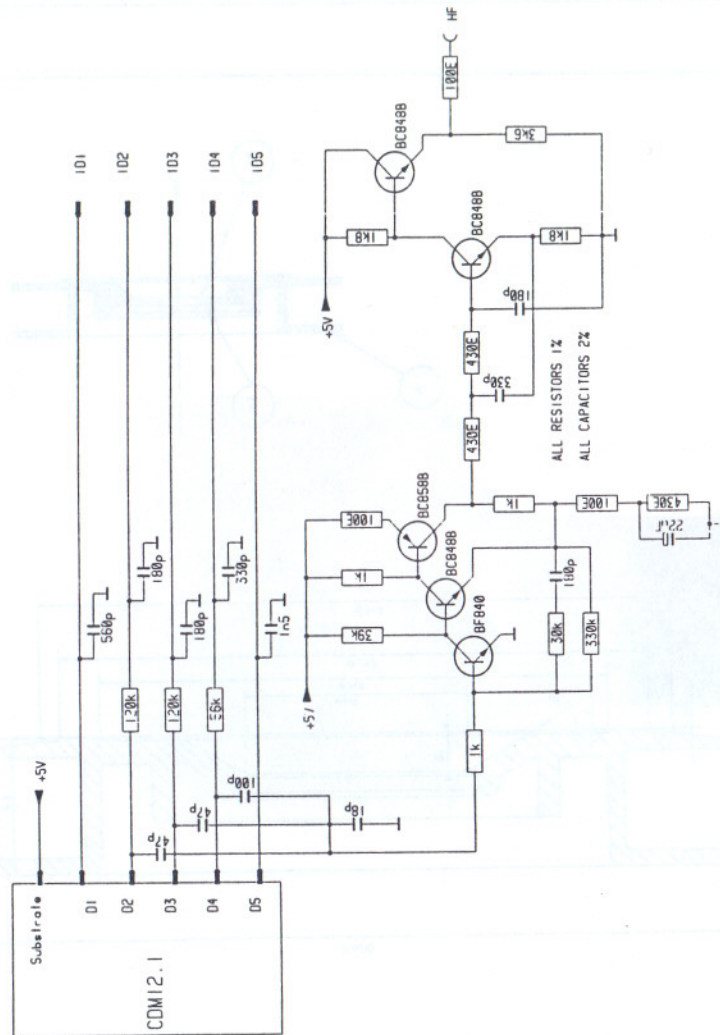


Fig. 1b : Measuring circuit diagram (part 2)

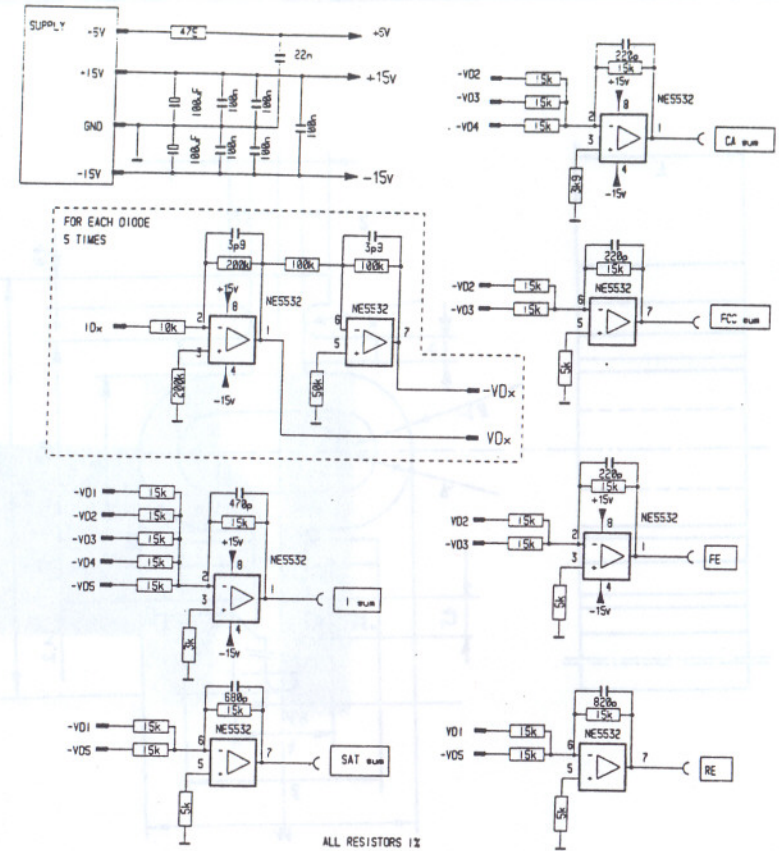


Fig. 2 : Recommended clamber

Note : Measures are in mm/10.

- 1 : Pressure ring
- 2 : Magnet
- 3 : Metal ring

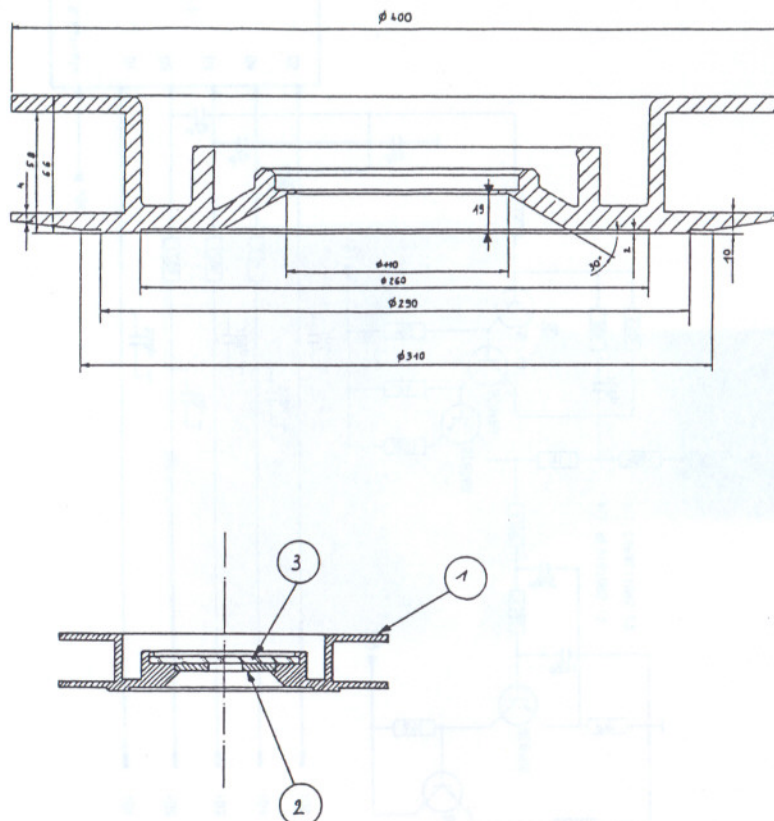


Fig. 3 : Recommended suspension

Material	Typical suspension characteristics		
	Orientation	Frequency	Reduction
Silicone rubber Type : PFT-K1761 Color : Natural Hardness : 60 Shore	X	16 Hz	20 dB
	Y	23 Hz	20 dB
	Z	34 Hz	20 dB
	Φ	36 Hz	20 dB
Note : Free space around should be minimum 2 mm.			

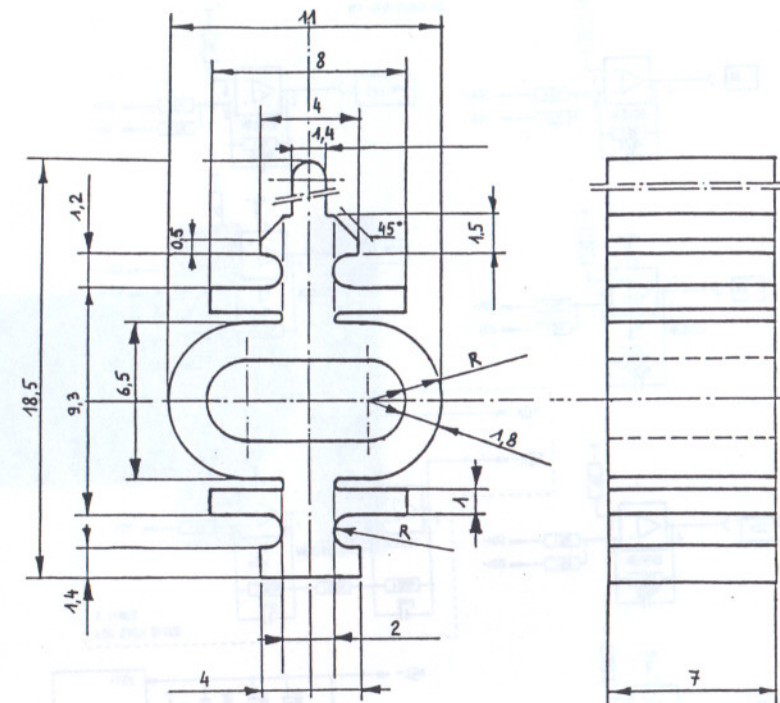
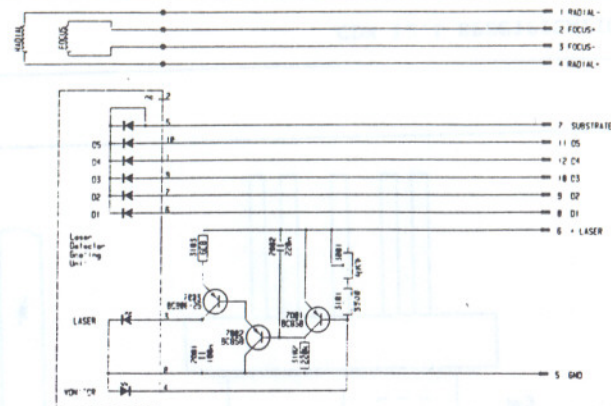


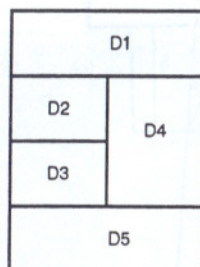


Fig. 4 : Electrical data

Electrical circuit :



Photodiodes layout :



Flexfoil connections :

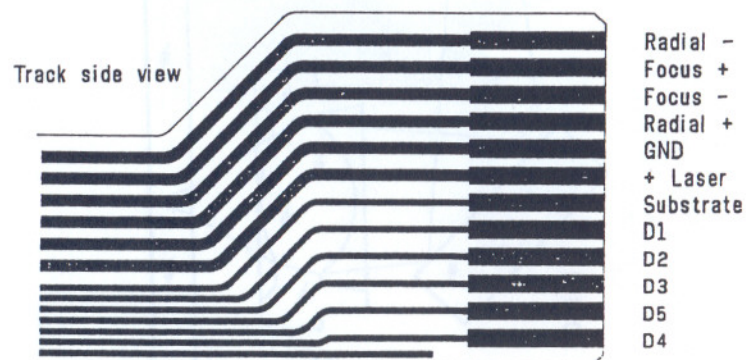


Fig. 5 : Mechanical drawing

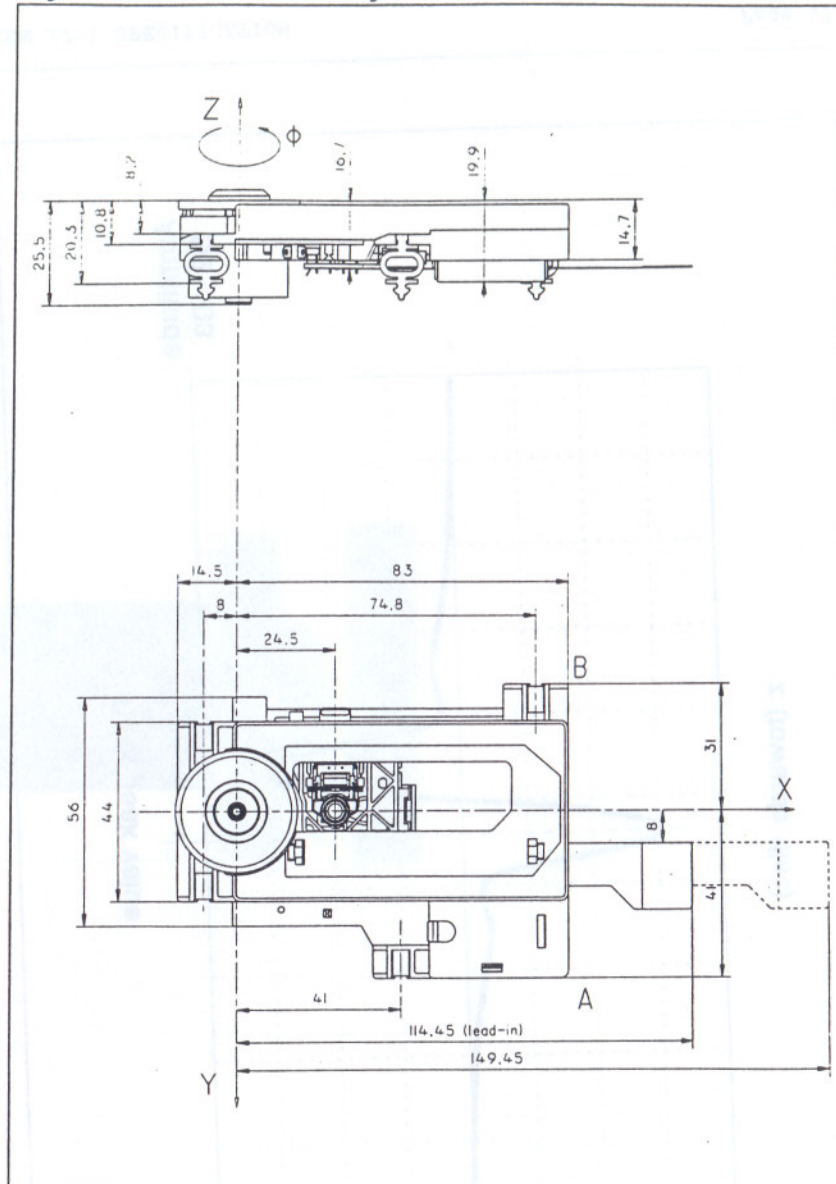


Fig. 6 : Lightpath

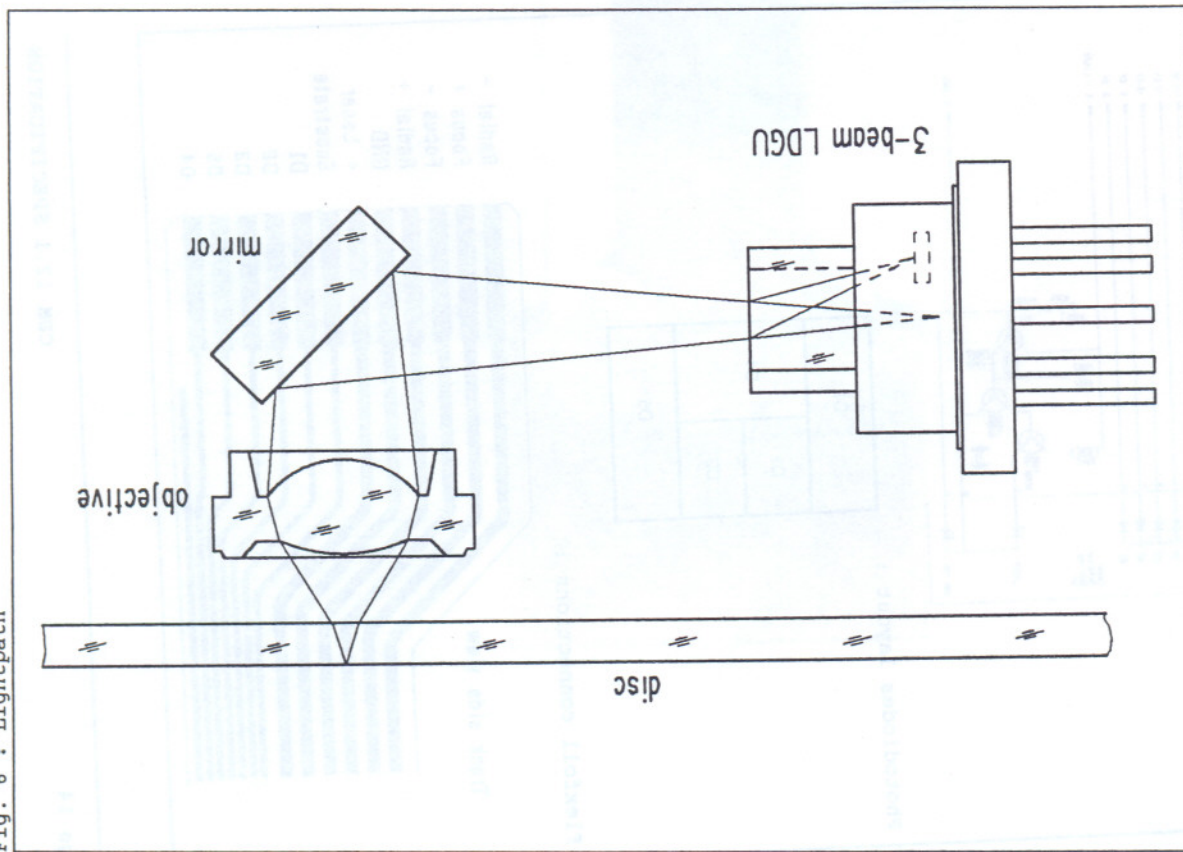


Fig. 7 : Focus S-curve

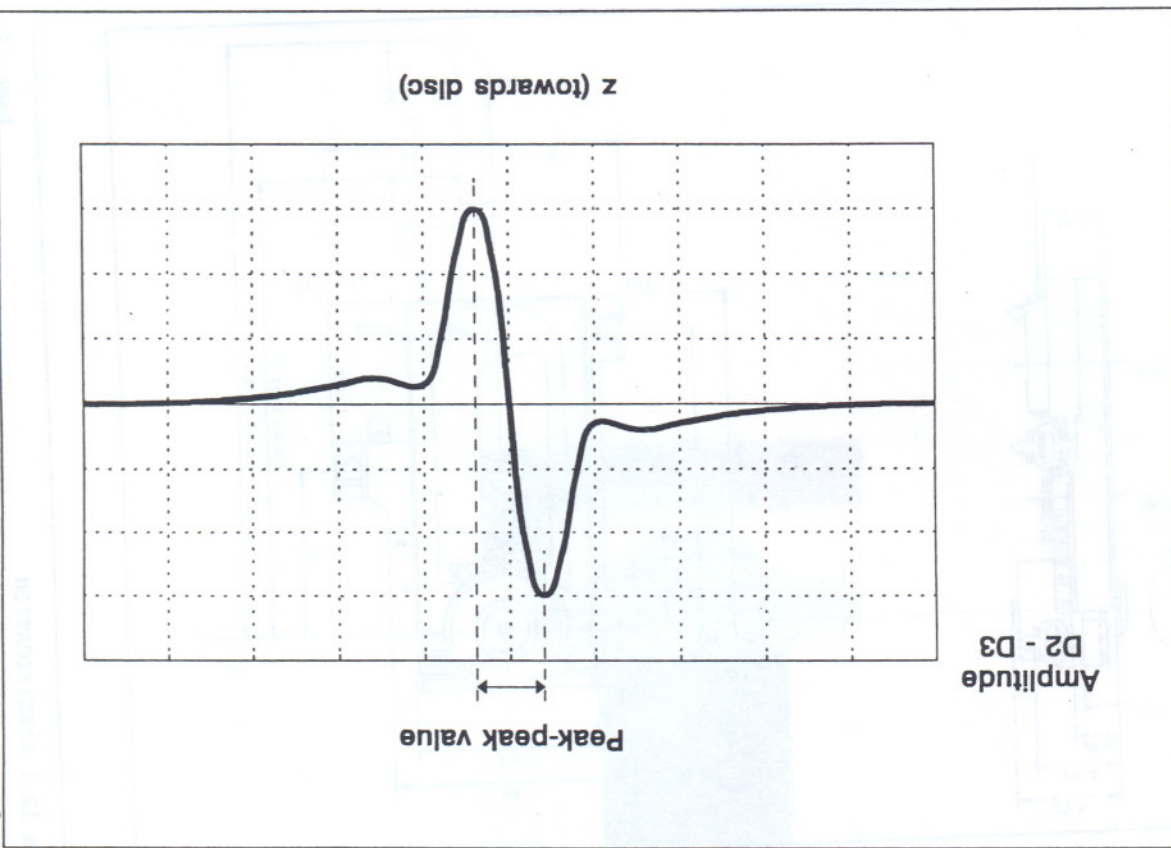




Fig. 8 : Radial curve

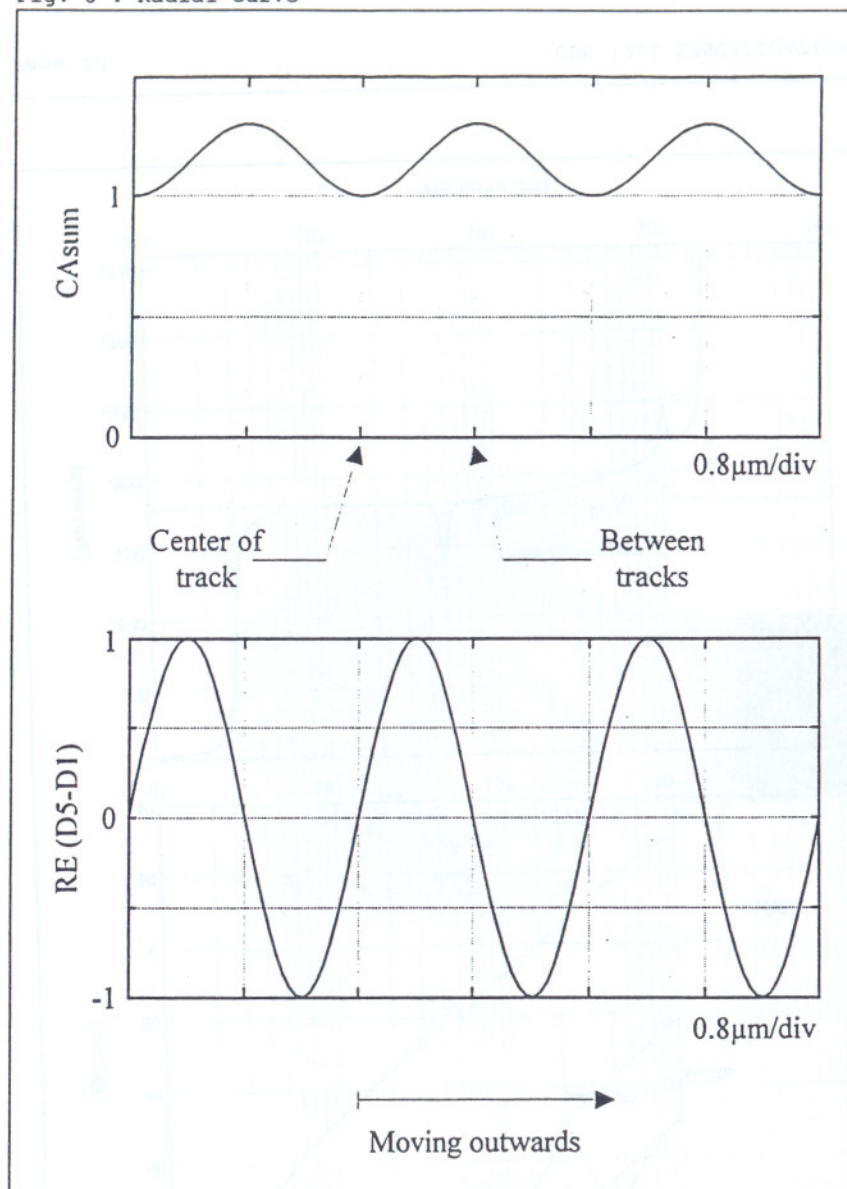


Fig. 9 : Temperature factor

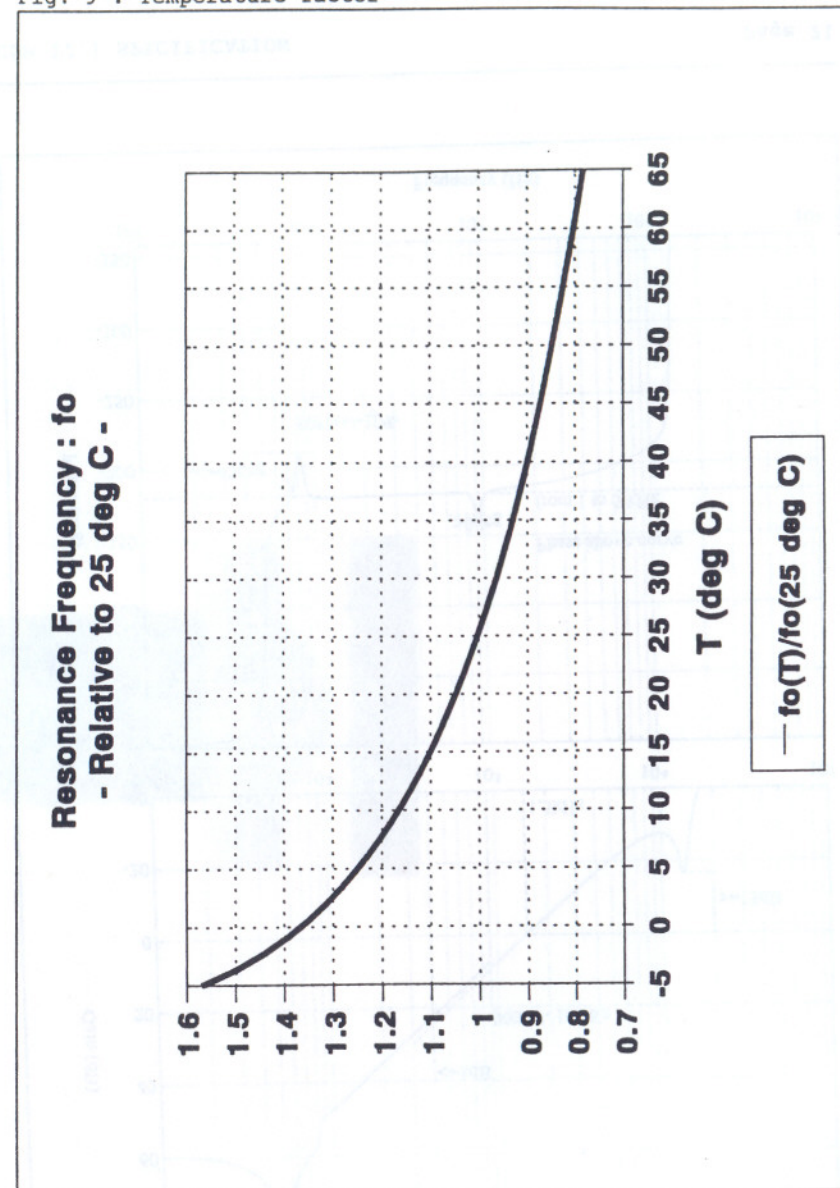


Fig. 10 : Focus characteristics

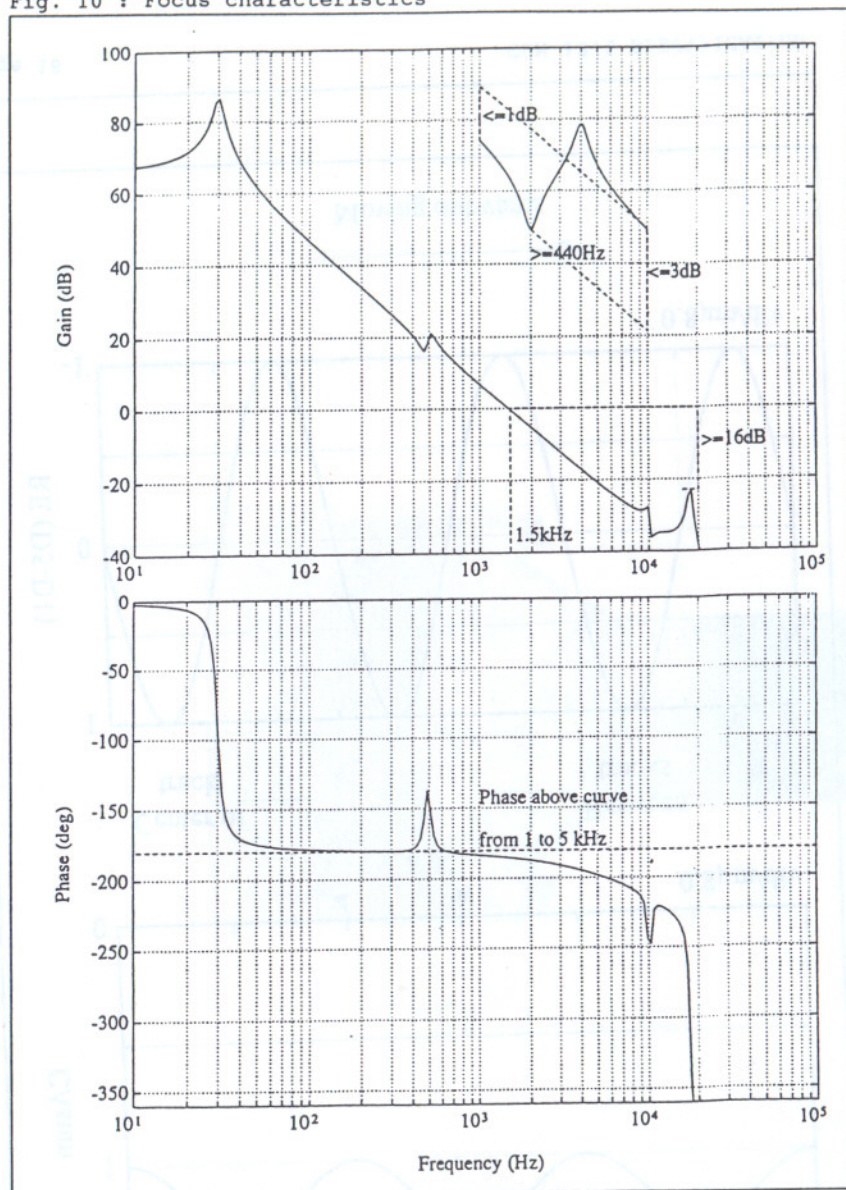


Fig. 11 : Radial characteristics

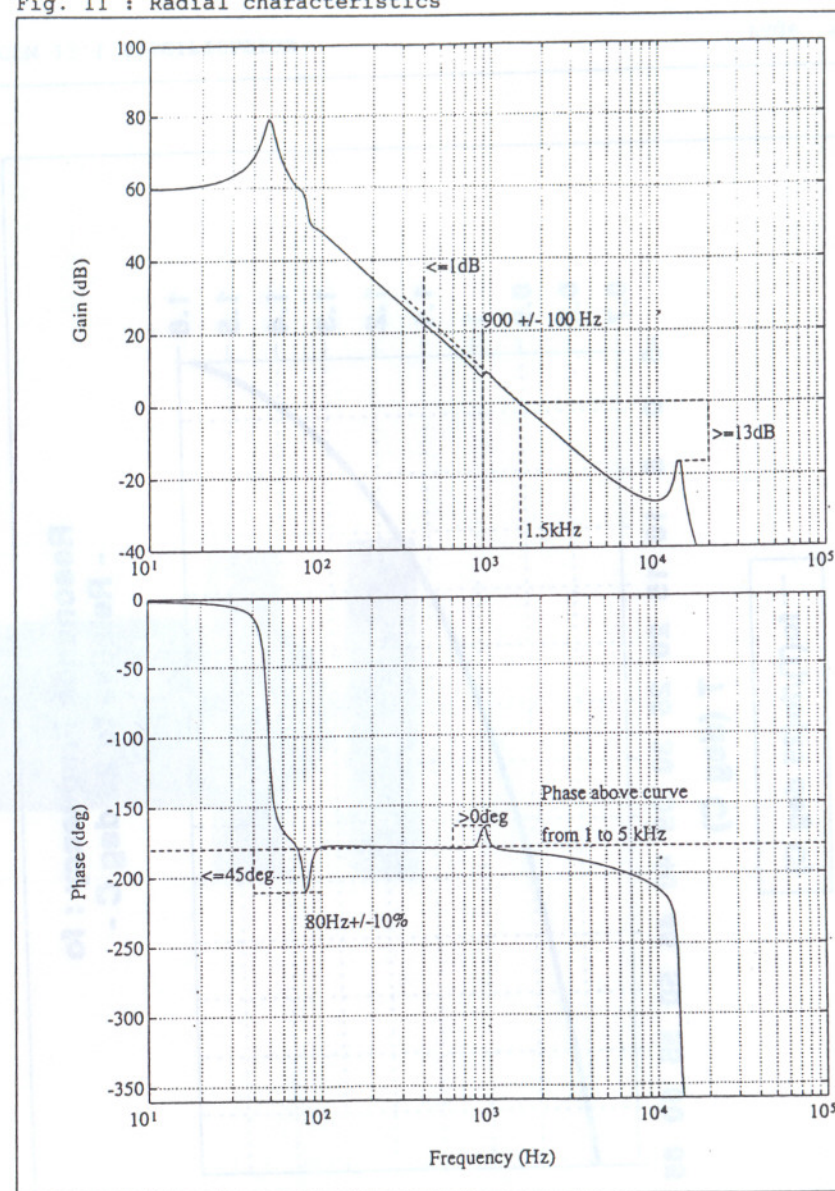




Fig. 12 : Turntable

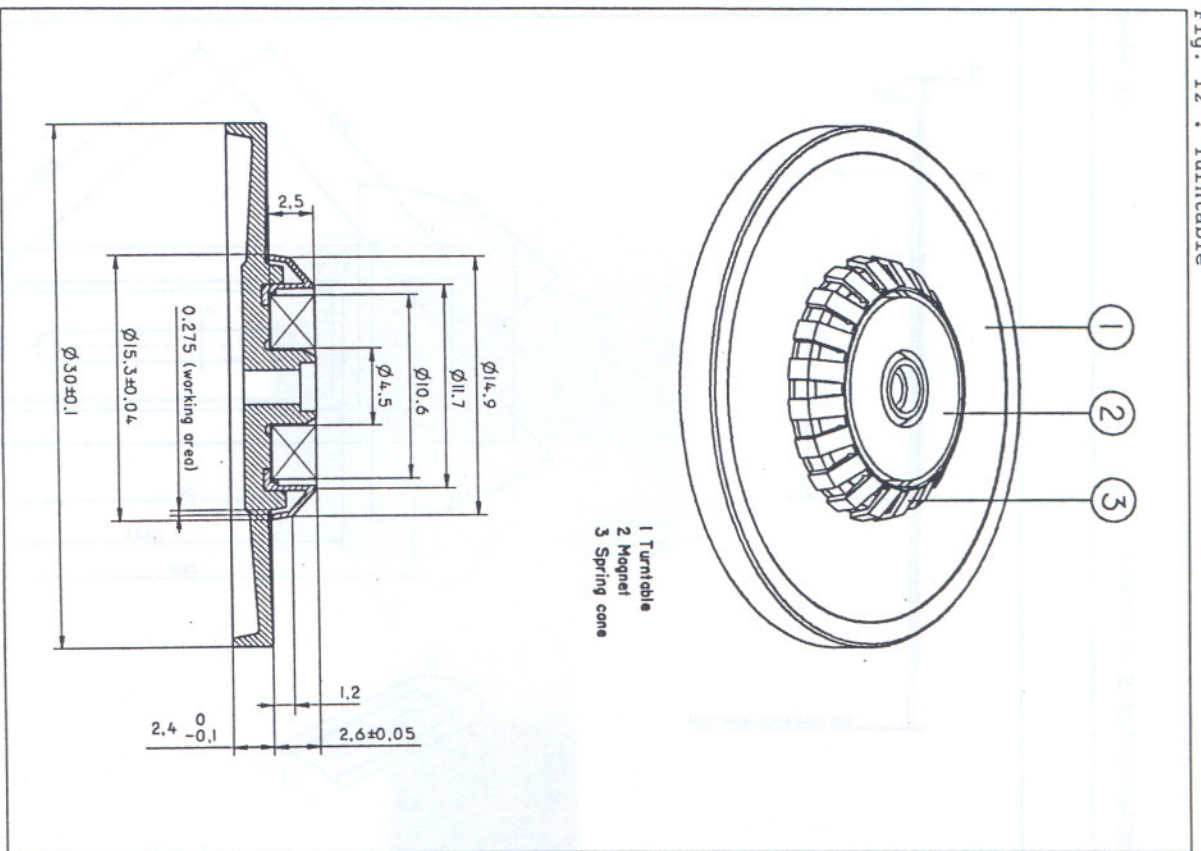
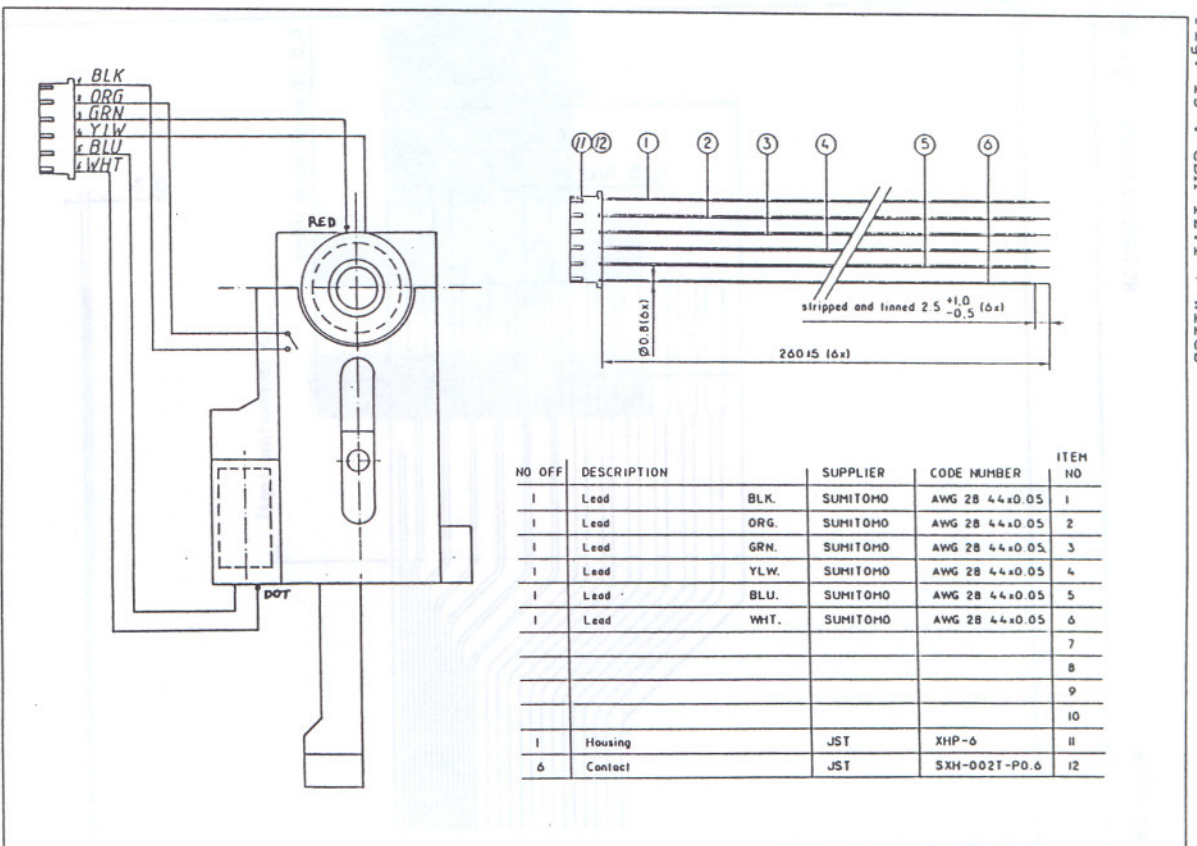


Fig. 13 : CDM 12.1 + wires



NO	OFF	DESCRIPTION	SUPPLIER	CODE NUMBER	ITEM NO	
1		Lead	BLK.	SUMITOMO	AWG 28 44x0.05	1
1		Lead	ORG.	SUMITOMO	AWG 28 44x0.05	2
1		Lead	GRN.	SUMITOMO	AWG 28 44x0.05	3
1		Lead	YLW.	SUMITOMO	AWG 28 44x0.05	4
1		Lead	BLU.	SUMITOMO	AWG 28 44x0.05	5
1		Lead	WHT.	SUMITOMO	AWG 28 44x0.05	6
						7
						8
						9
						10
1		Housing	JST	XHP-6		11
6		Contact	JST	SXH-002T-P0.6		12

Fig. 14 : Ornamental plate

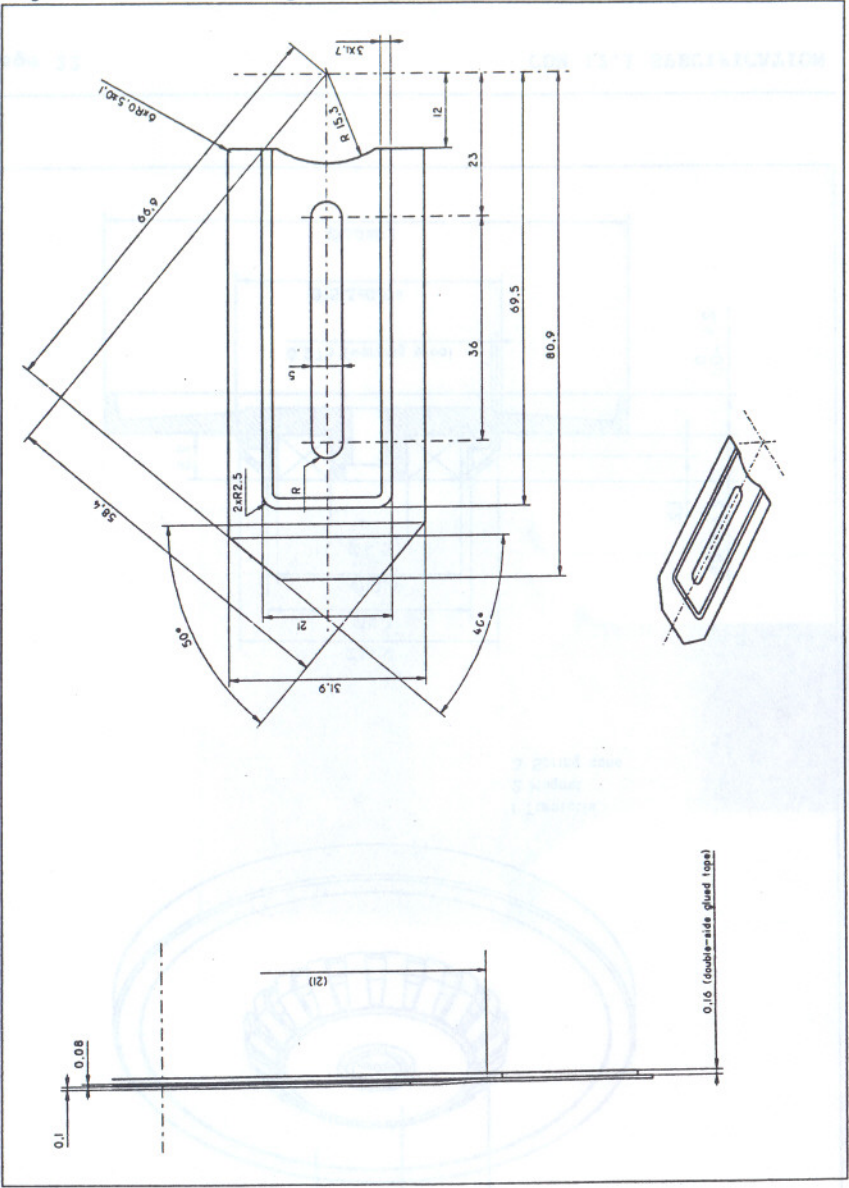
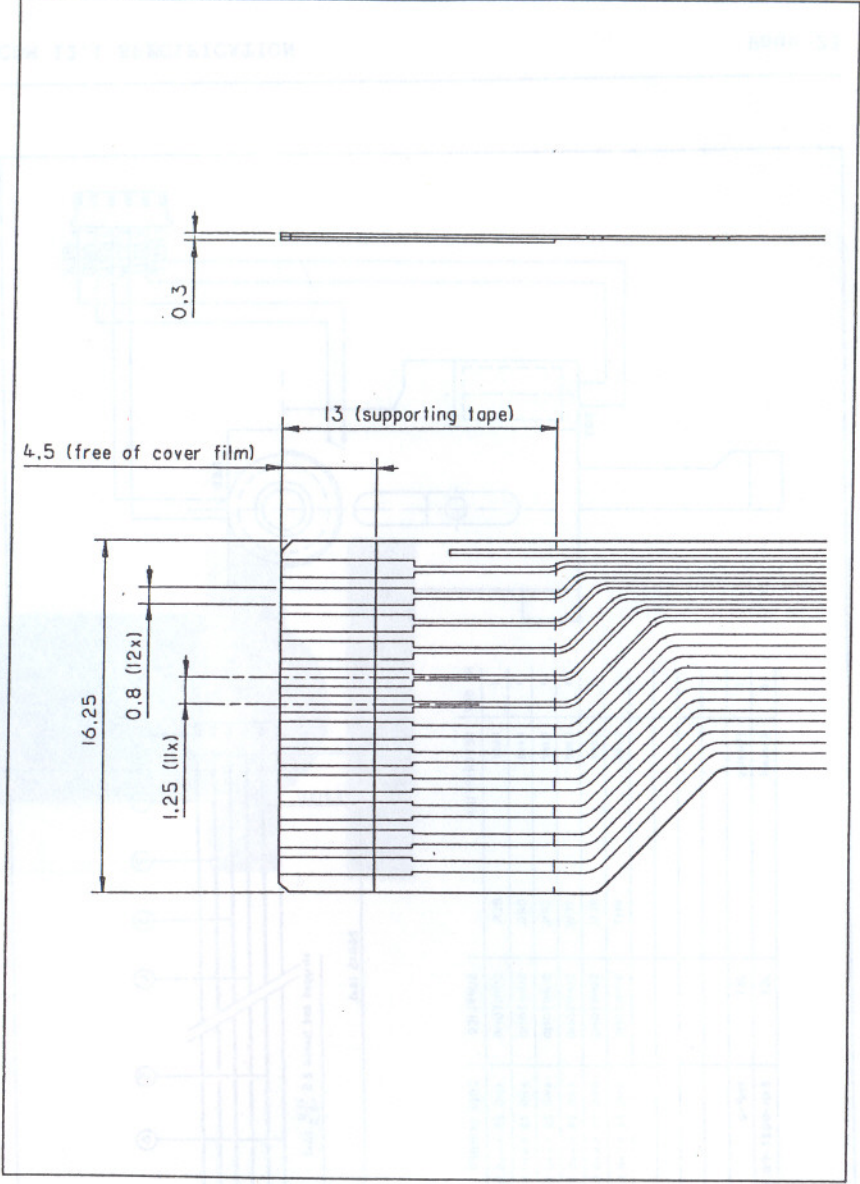


Fig. 15 : Mechanical data foil





# APPENDIX 1 : PPN 13 Motor Data

Note : for information only

## STANDARD OPERATION CONDITION

Parameter	Min.	Nom.	Max.	Unit	Notes
Rated voltage		5		Vdc	
Working voltage range	1.5		8	Vdc	
Rated load		7.5		gcm	
Rotation direction					CW/CCW

## INITIAL CHARACTERISTIC SPECIFICATION

Parameter	Min.	Nom.	Max.	Unit	Notes
No load speed at rated voltage	6120	7200	8280	rpm	
Rated load speed at rated voltage	4165	4900	5635	rpm	
Rated load current at rated voltage			180	mA	
No load current at rated voltage			60	mA	
No load starting voltage			0.8	V	
Starting current at rated voltage			510	mA	
Starting torque at rated voltage	17			gcm	
Insulation resistance	1			MΩ	20 °C, 65 % R.H.
Rotor resistance	9.72	10.8	11.88	Ω	20 °C
Electro-motive force	1.71	1.9	2.09	V	20 °C, 3000 rpm

# APPENDIX 2 : RF310T 11400 Motor Data

Note : for information only

## STANDARD OPERATION CONDITION

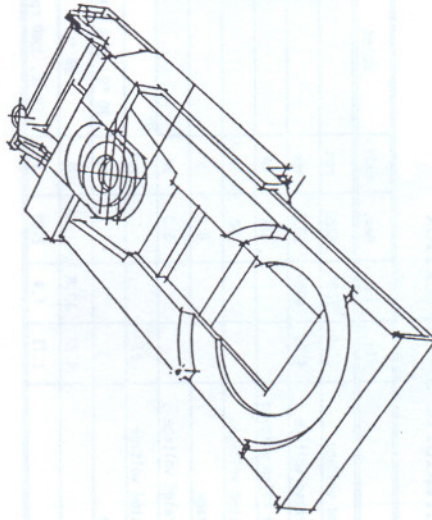
Parameter	Min.	Nom.	Max.	Unit	Notes
Rated voltage		5		Vdc	
Working voltage range	1.8		6	Vdc	
Rated load		6		gcm	
Rotation direction					CW/CCW

## INITIAL CHARACTERISTIC SPECIFICATION

Parameter	Min.	Nom.	Max.	Unit	Notes
No load speed at rated voltage	5100	5800	6500	rpm	
Rated load speed at rated voltage	4000	4600	5200	rpm	
Rated load current at rated voltage			135	mA	
No load current at rated voltage			45	mA	
No load starting voltage			0.8	V	
Starting current at rated voltage	390	450	510	mA	
Starting torque at rated voltage	18			gcm	
Insulation resistance	10			MΩ	20 °C, 65 % R.H.
Rotor resistance	10.12	11	11.88	Ω	20 °C
Electro-motive force	2.26	2.46	2.66	V	20 °C, 3000 rpm

# SPECIFICATION

L1210



PHILIPS — KMG



## SPECIFICATION

L1210

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Note : Philips Laser Optics reserves the right  
to change the data mentioned in this document.

REV. 1.0 (16-09-92)

## 1. GENERAL INFORMATION

The L1210 is an assembly, consisting of a CDM 12.1 mechanism and a tray type loading mechanism, including the suspension, the damping and the clamping parts (see fig.1).  
For specific information on the CDM 12.1 mechanism itself, please refer to the papers addressing this item.

The assembly is designed for 12 and 8 cm. discs according to the RED BOOK standard. It is applicable only in horizontal position.

The assembly is intended to be used in Hifi (low and middle class) home applications. Because of the diversity in applications, different versions are available.

## 2. SPECIFICATION

### A. Test conditions

The following test conditions apply always, unless otherwise notified :

Ambient temperature.....25 °C ± 10 °C

Relative humidity.....45 % < RH < 75 %

Air pressure.....86 to 106 kPa

Setting horizontal (front to back).....0 ± 5 deg

Setting horizontal (side to side).....0 ± 5 deg

Electrical circuit.....see CDM 12.1 spec.

Following testdisc are used :

Testdisc	Codenummer	Test
SBC444A.....	7104 099 24991.....	Playability check
Burn-in.....	7104 087 04861.....	Vibration test/Mechanical noise
Skew disc 0.6 (8cm)...	7104 099 28261.....	Skew
Skew disc 0.4 (12cm)...	7104 099 24971.....	Skew
Ecc. disc 150 µm.....	7104 089 07601.....	Eccentricity



## B. Specified values

### a. General

Dimensions.....see fig.2a/2b  
Weight (without disc).....0.34  
Tray displacement.....typical 148 mm  
Load and eject time (at 3.5 V).....typical 1.7 sec  
Push tray stroke.....3.5 +/- 1.5 mm  
Force to activate tray.....Max. 5 N  
See also timing diagram fig. 3  
Max. forces on the loading (all directions)  
in open or closed position.....40 N  
in between position.....10 N

### b. Loader motor

Rated voltage.....4 V DC  
Operating voltage.....3.3 to 4 V  
No load starting voltage.....Max. 1.2 V  
No load current.....Max. 30 mA  
No load speed (at 4 V).....5850 +/- 700 rpm  
Resistance.....11.3 Ohm

### c. Loader switch

Maximum current.....1 A  
Maximum voltage.....15 V

### C. Quality

Lifetime (no. of cycles).....20000

### D. Standards

Laser radiation : IEC 825

Material : IEC 65  
UL 1270 prepared  
CAN/CSA.22.2 Nr. 1M90 prepared

### 3. APPLICATION INFORMATION

#### A. Application conditions

The figures mentioned in this paragraph are valid for the L1210 used with the recommended circuit diagram (see CDM 12.1).

##### Operation :

Temperature range (functional with discs according to the RED BOOK standard).....5 to 55 °C

Temperature range (full specification).....15 to 50 °C

Humidity range (functional with discs according to the RED BOOK standard).....25 to 90 % RH

Humidity range (full specification).....25 to 75 % RH

##### Storage (recovery time of 4 h) :

Temperature range.....-25 to 55 °C

Exposure.....48 h in 70 °C

Humidity range.....5 to 95 % RH

##### Position for usage :

Horizontal (turntable up).....+/- 10 deg  
(all directions)

Horizontal (upside - down).....Acceptable for service purposes. A standard disc will play. There is no guarantee on the specification.

#### B. Playability

Criteria.....No track loss  
No audible mutes

Tests are performed with the testdisc SBC444, SBC444A, 150µ eccentricity disc.

##### Note :

The skew discs (see page 4) can be used without the disc touching any of the stationary parts of the loading mechanism.

#### C. Mechanical noise

Test disc.....Burn-in

During play.....Max. 36 dBA

During jump and search.....Max. 52 dBA

Loading noise.....Max. 73 dBA  
(excluding technical clicks).....Max. 53 dBA

Rattling noise.....Not allowed

Note : The L1210 must be measured in a free field (anechoic room). Hard noise reflecting materials in the direct environment are not permitted.  
The L1210 is to be fixed with his suspension points on a steel plate (0.8 x 250 x 400 mm). This plate is supported by a foam rubber, thickness at least 20 mm. The measuring microphone is to be placed 100 mm. above the centre of the turntable.  
The ambient noise is maximum 22 dBA.



#### D. Shockresistivity during transport

Shocks (on the mechanism).....Max. 60 g during 6 msec  
3 times 6 directions

Bumps (on the mechanism).....Max. 40 g during 10 msec  
500 times 6 directions

#### E. Shocksensitivity in application

Testdisc.....Burn-in

Shocks :

X-Y-Z-axes.....> 4g / 3msec

Criteria.....no audible mute

Notes :

- Definition of axes :
  - Z-axis : parallel with the shaft of the disc motor
  - X-axis : parallel with the loading direction of the disc
  - Y-axis : perpendicular to the X-Z plane
- The L1210 must be fixed to the testing table.

#### F. ESD

20 kV in application

14 kV during handling

#### H. Handling instructions

- Storage in dusty environments should be avoided.

- To avoid damage of the LDGU by electrostatic discharges, measuring equipment and operators should be grounded during handling.

- Contamination of the objective lens will influence the performance. Avoid fingerprints on the lens, handle the mechanism in a clean environment.

- The actuator with lightpath has been adjusted carefully during manufacturing. Avoid touching this part !! Do not disassemble or readjust !!

- Safety : The laserbeam may damage the human eye. Avoid that people can look directly or indirectly into the objective lens (CLASS 1 LASER).

- When the unit is not yet connected to the electronics, voltages over 300 V should be avoided (special attention for static charges !!), the diodes may get damaged.

- Fast heating up (e.g. by bringing the mechanism from a cold place into a warm and humid room) can result in moisture condensating on the lens, thus influencing the playability for a certain time. Before checking the performance the mechanism should stabilize for at least 4 hours.

## 4. VERSIONS

- The assembly can be delivered with the CDM mounted in the loading assembly or not. However, if the mechanism is mounted in the loading assembly, it is impossible to connect the necessary wire assemblies to it. So in this case, the CDM 12.1 should be a version with wires to avoid unwanted extra handling.

- Two chassis are available : one for high mounting applications, one for low mounting applications (see fig. 2a and 2b).

- In case of a high mounting chassis, an optional HF-preamplifier board is available.

- For the choice of the wiring for the CDM 12.1 and for the loader motor and switch, different lengths are available on request.

## 5. DRAWINGS

- 1) Exploded view
- 2a) Mechanical drawing (low mounting applications)
- 2b) Mechanical drawing (high mounting applications)
- 3) Timing diagram

Fig. 1 : Exploded view

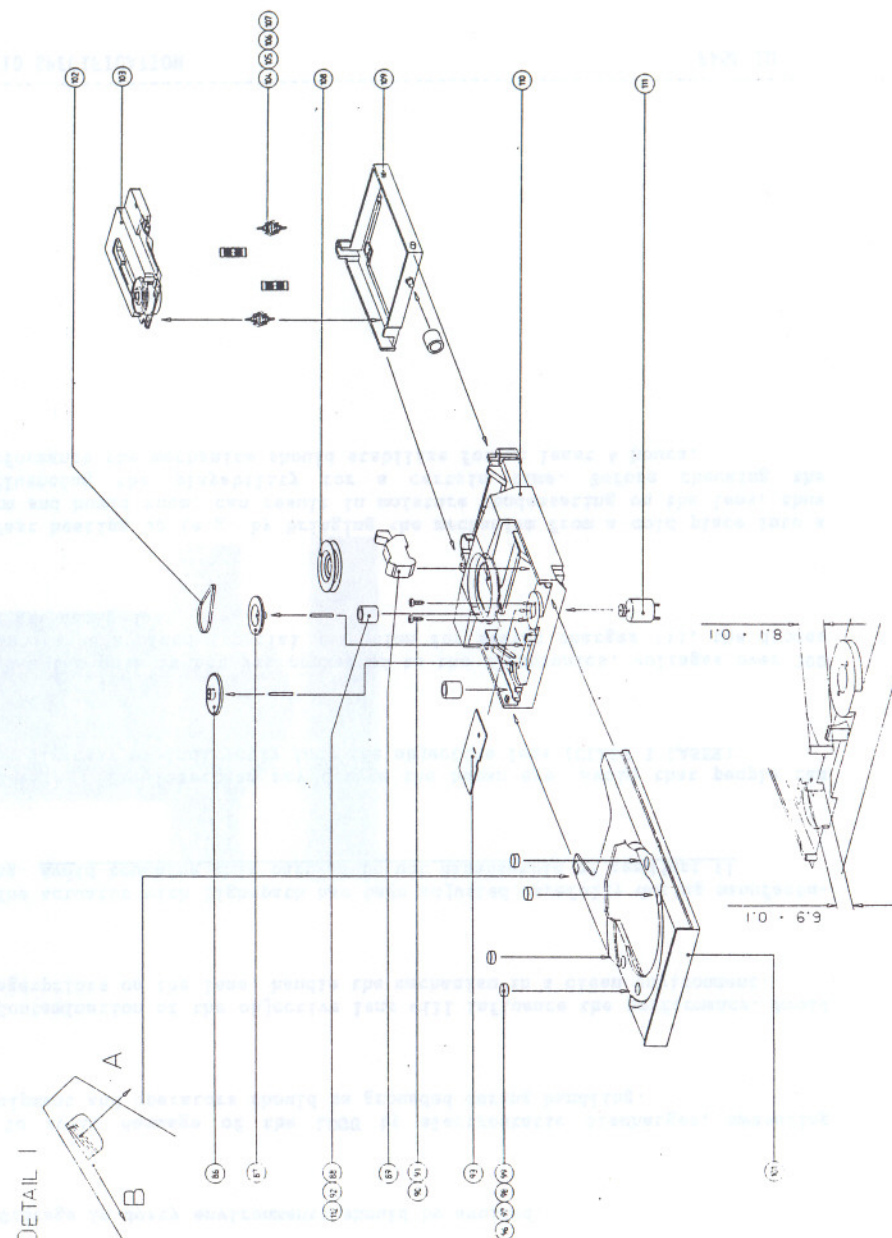




Fig. 2b : Mechanical drawing (high mounting applications)

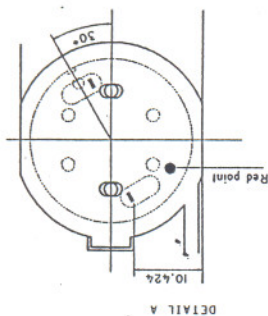


Fig. 2a : Mechanical drawing (low mounting applications)

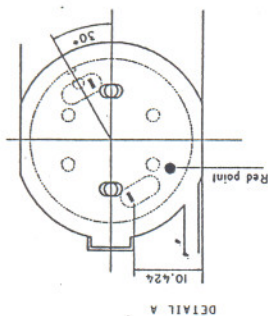


Fig. 3 : Timing diagram

