X1215
Cartridge Disk Drive Unit
Vol. VII: Maintenance

Data Systems

1.1 GENERAL

The performance of the Cartridge Disk Drive depends on a carefully planned and properly executed program of preventive and corrective maintenance.
The program, if followed, will ensure optimal performance and maximum 'device up' time.
The scheduled maintenance of the device is based on hours, indicated by the elapsed-time meter which can only be viewed from the rear, and on normal office environment on a one shift base an abnormally dirty environment may dictate increased preventive maintenance.
Three levels of scheduled maintenance exist :

a) 1000-Hour or six month scheduled maintenance
b) 2000-Hour or 12 month scheduled maintenance
c) 4000-Hour or 24 month scheduled maintenance.

However, it is advisable to perform a maintenance check the first 500 hours or three months.

1.2 SPECIAL TOOLS

Drive belt adjustment tool
Exerciser XMX 1418
Extender card
Jumper wires
CE cartridge
Head removal and replacement tool
Head alignment and adjustment tool
Torque wrench 7 kg/cm (M3 socket screw)
Berg handtool HT-80
CE write protection card
Servicing disk-pack
Index unit adjustment tool
Optical zero adjustment tool
Tool case
Fault indicator 2L54 (if not installed)

1.3. MATERIALS

Isopropyl alcohol	1322 505 69201
Wad tip-Q-sticks	5122 010 20921
Lint-free dry cloth (Scotch wiper)	5122 010 20911
CAB foil 0.08 mm	
Wooden spatulas	2822 060 15456
Drive belt	
Earthing contact	

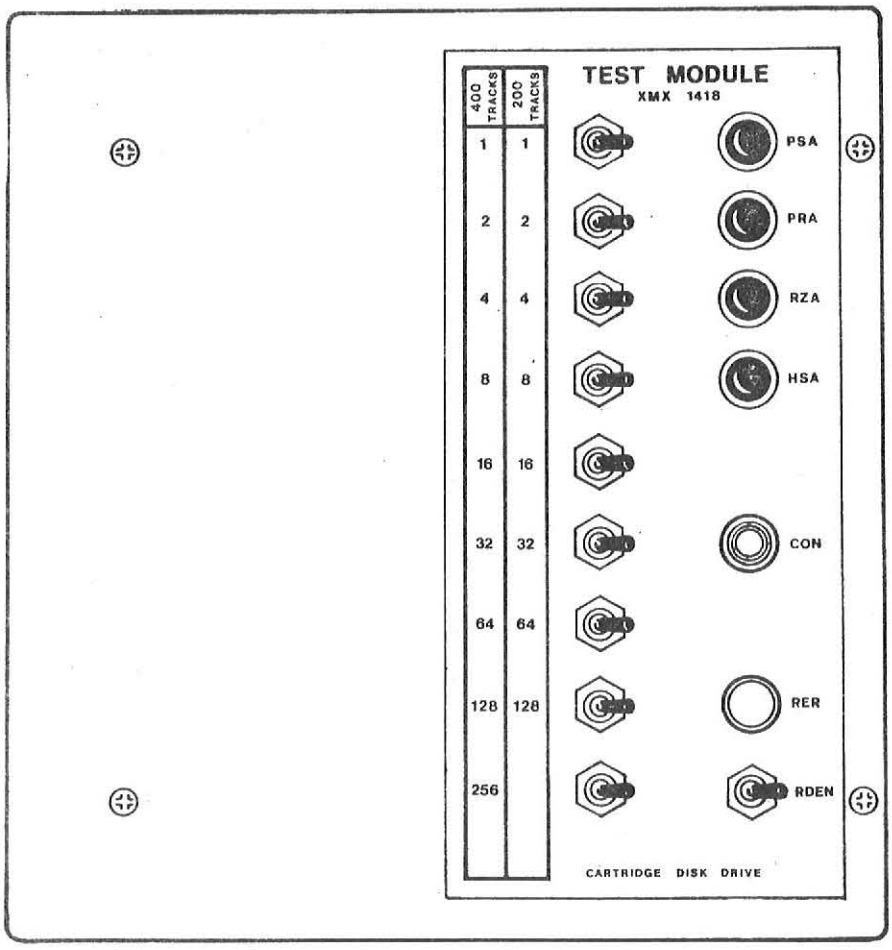

TEST MODULE
XMX 1418
400 TRACKS
200 TRACKS
1
2
4
8
16
32
64
128
256
1
2
4
8
16
32
64
128
PSA
PRA
RZA
HSA
CON
RER
RDEN
CARTRIDGE DISK DRIVE

Fig. 7-1

1.4 EXERCISER fig. 7-1

The Exerciser is provided for use by a service engineer to enable him to instruct the CDD, in moving the heads to a selected cylinder address, or between two selected cylinder addresses, to select one of the four heads, to make a read enable.

Switches and Indicators

The left row consists of nine toggle switches known as track-switches which are identified 1, 2, 4, 8, 16, 32, 64, 128 for 200 tracks and 1, 2, 4, 8, 16, 32, 64, 128, 256 for 400 tracks.
The right row consists of 4 push buttons, two indicators, and one toggle switch.
The four push buttons are identified by.
PSA : Position Single activated

PRA : Position Repeat activated

RZA : Return to zero activated

HSA : Head Select activated

The two indicators are identified by
CON : ON cylinder

RER : Recoverable seek Error

And the toggle switch is called
RDEN : Read enable

Use of the Exerciser

1. Connect the plug of the test module to interface socket of the CDD.
2. Switch on the power at the rear of the disk unit, the cartridge exchange lamp and power on are lit, and insert the cartridge into the correct position.
3. Press the Start/Stop button.
4. Wait until the Unit Ready indicator is lit
5. The unit is ready to accept signals from the test module.

1.5 EXERCISER operation

a. Direct seek :

1. Set cylinder address in switches
2. Press the button PSA, the positioner moves to the selected address

b. Return to zero seek.

1. Press the button RZA, the positioner moves to cylinder zero.

c. Repeat.

1. Set first cylinder address on switches.
2. Press button PSA, the positioner moves to the desired address.
3. Set second cylinder address on switches.
4. Press button PRA, the positioner moves now repeately between the selected cylinder addresses.
5. To stop the positioner, press PRA and the positioner will stop on the first cylinder address or on cylinder zero.

d. Head selection.

Set in the two left switches (1 and 2) the number of the selected head. (see below)

Switch 1	Switch 2	Head
left	left	0
right	left	1
left	right	2
right	right	3

Press button HSA, the selected head will now read, the information, of the track on which the positioner was send, before the head selection. When the toggle switch RDEN is active it is possible to test the whole read channel up till the interface.

2.1 SCHEDULED MAINTENANCE (1000 hours and FIRST 500 hours)

Engineer : Installation :

Data : Unit serial number :

Work time : Running time meter :

Use Maintenance book no. 5122 992 00961	Page	Tech tip	Result
1. Inspect the heads. Use a dental mirror and a bright light. If a head has been repeatedly contacting a surface, it must be replaced. Do not touch the heads with the mirror.			
2. If necessary, clean the heads with a spatule wrapped in a Scotch wiper dampened with Isopropyl Alcohol (1322 505 69201). Use a dry wiper to dry the heads.			
3. Clean the cartridge holder. A lint free dust cloth must be used. The cartridge should fit easily in position. Ensure that no loose particles are left behind when the cleaning has been completed.			
4. Check the cleaning brushes. If there are less than 10 bristles per brush, change the brush assembly. Was it necessary to change it ?			yes/no
5. Inspect the spindle motor drive belt. Was the drive belt worn ? Was the drive belt slack?(If necessary adjust it.)			yes/no yes/no
6. Inspect and clean the positioner. Are the rollers and guides clean ? If not, clean with a dry Scotch wiper.			yes/no
7. Clean the magnetic chuck and spindle cone with a Scotch wiper and alcohol. Use adhesive tape to pick up any loose particles.			

Use Maintenance book no. 5122 992 00961	Page	Tech tip	Result
8. Replace the fine and coarse filter (only for 1000 hour scheduled maintenance). Caution : When fitting the fine filter, make sure that the air flow is in the correct direction (watch the arrow) and do not remove the packing earlier than necessary. 9. Check the steel wire with which the clamps retracts the brushes. 10. Run the test program. Program executed. Note : It is recommended to clean the cone locating hole of the cartridges with a Q-stick.			yes/no

2.2 SCHEDULED MAINTENANCE (2000 hours and 4000 hours)

Engineer :

Installation :

Data :

Unit serial number :

Work time :

Running time meter :

Use Maintenance book no. 5122 992 00961	Pag	Tech tip	Result
1. Inspect the heads. Use a dental mirror and a bright light. If a head has been repeatedly contacting a surface, it must be replaced. Do not touch the heads with the mirror.			
2. If necessary, clean the heads with a spatula wrapped in a Scotch wiper dampened with Isopropyl alcohol (1322 505 69201). Use a dry wiper to dry the heads. Do not touch or breathe on the heads. Do not soak the heads with excess Isopropyl alcohol.			
3. Clean the cartridge holde. A lintfree dust cloth must be used. The cartridge should fit easily in position. Ensure that no loose particles are left behind when the cleaning has been completed.			
4. Check the cleaning brushes. If there are less than 10 bristles per brush, change the brush assembly. Was it necessary to change it ?			yes/no
5. Replace the spindle motor drive belt (only for the 4000 or two years maintenance).			
6. Replace the spindle earthing contact.			
7. Inspect and clean the positioner. Are the rollers and guides clean ? If not, clean with a dry Scotch wiper.			yes/no

Use Maintenance book no. 5122 992 00961	Page	Tech tip	Result
8. Clean the magnetic chuck and spindle cone with a Scotch wiper and alcohol. Use adhesive tape to pick up any loose particles. 9. Replace the fine and coarse filters. Caution : When fitting the fine filter make sure that the airflow is in the correct direction (watch the arrow). Do not remove the packing earlier than necessary. Check the steel wire with which the clamps retracts the brushes. 11. Run the test program. Program executed. Note : It is recommended to clean the cone locating hole of the cartridges with a Q-stick.			yes/no

General.

The adjustments necessary to ensure the satisfactory functioning of the Cartridge Disk Drive (CDD) are described in this section. When an item has been replaced, an adjustment is nearly always necessary so section 4 of this volume should be used in conjunction with this section.
It should be noted that no supply voltage adjustments can be performed.
A multimeter (type PM 2411/04), an oscilloscope (type PM 3250 or 3330), and a Servo Test Card are required.

3.1 MICRO-SWITCHES

The following micro-switches do not require adjustments:

a) The cartridge on switch.

b) The pack switch.

c) The two clamp switches.

3.1.1 Cleaning Cycle Micro-switch Adjustment

The adjustment of the rest position of the cleaning brushes can be performed by turning the cam situated on the brush arm. The cam must be turned so that the micro-switch contacts open at the moment the brushes move outside the cartridge holder ring.
The arm, with its associated brushes, can be turned by hand.
A multimeter must be connected across the normally closed contacts to check the micro-switch action.

3.2

Adjustment in Y and Z-direction of the secundary meander block.

N.B. When possible this adjustment should be carried out with the heads removed.

3.2.1 Adjustment in Y-direction

1) Take away the fuses F5 and F6 on the driver card. (Now the voice-coil is disconnected from the +35 V and -35 V)

2) Switch the power on.

3) Put a cartridge in the disk unit.

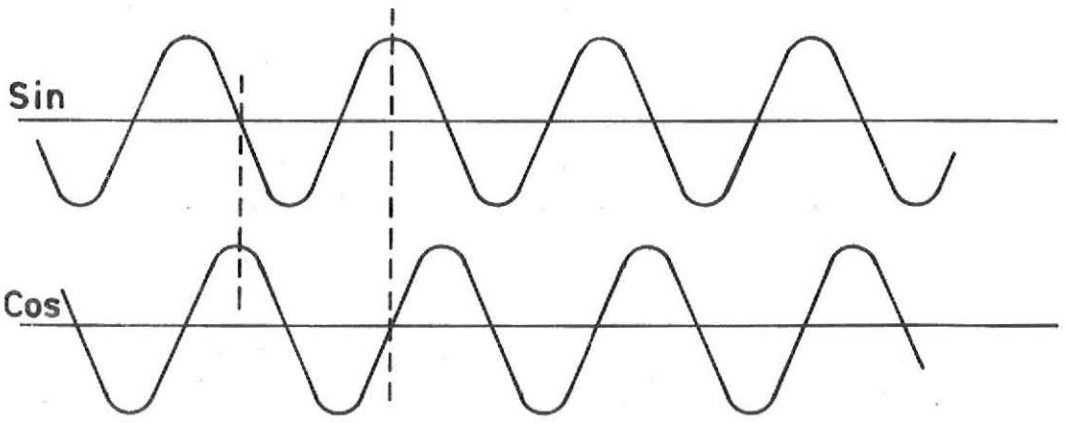
4) Press the start/stop button and wait until the disks are in nominal speed.

5) Move the positioner inwards by hand so that the primary meander is in front of the secundary meander.

6) Monitor the signal SINX on card WI pin 9. The top to top value of this signal must be between 7,5 V and 8,5 V, when moving the positioner between track 000 and track 200. A second examination is, that the largest top to top value should not be more than 110% of the smallest top to top value of the SINX signal.
When the SINX signal is to large, the distance between primary and secundary meander has to be enlarged by moving the secundary meander block. When the signal is to small the distance has to be reduced.
A protective sheet of 80 /um approximately must be placed between the meanders, thus preventing the meanders are damaged.

3.2.2 Adjustment in Z-direction

After adjusting the meander block in the Y-direction, the block has to be fixed again to the base plate.
For adjustment in Z-direction, the signals SINX on card WI pin 9 and COSX on card WI pin 33 must be monitored.
By means of the screws G and K the secundary meander can be adjusted in the Z-direction.
The adjustment should be such that the zero-crossings of the SINX signal correspond with the tops of the COSX signal.



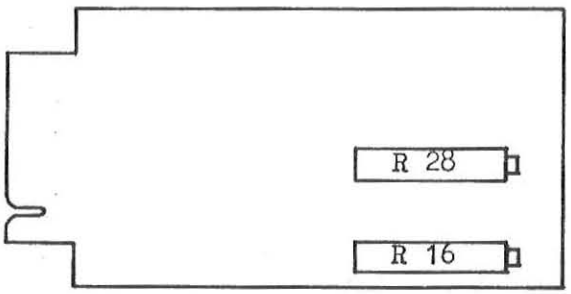


Fig 7-2 Meander Card

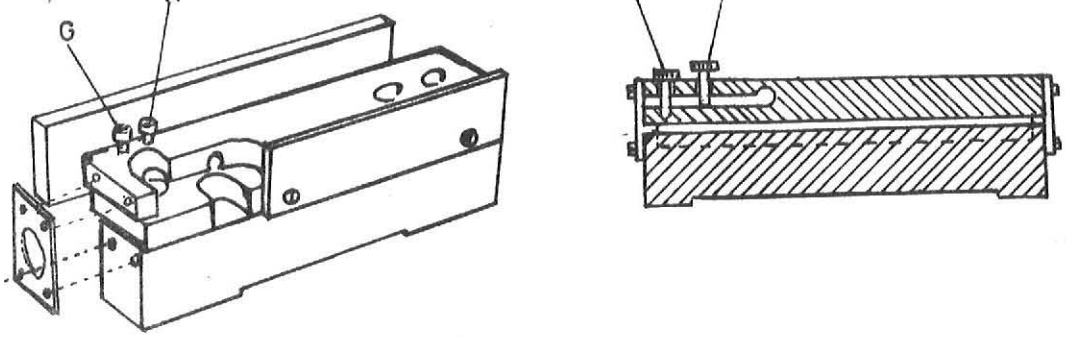


Fig 7-3 Meander block

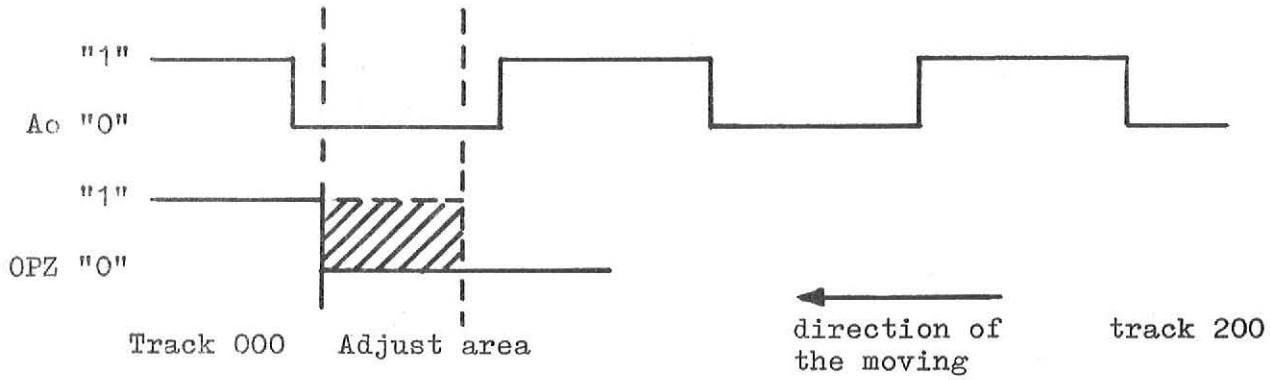
3.3 ADJUSTMENT OF THE MEANDER CARD POTENTIOMETERS

a) Switch the power on.
b) Make sure the positioner is in the retracted position.
c) Measure between pin 9 of card WI (signal SINX) and earth. The voltage difference has to be less than 50 mV. If it is not, turn the potentiometer R16 until it is less than 50 mV.

Both potentiometers R16 and R28 are situated at the meander card.

3.4 OPTICAL ZERO ADJUSTMENT

a) Execute point a, b, c, d, e of 3.2.
b) Monitor the signals OPZ (card SS pin 48) and A0 (card SS pin 33).
c) Move the positioner from track 200 to track 000. In the vicinity of track 000 the signal OPZ becomes a '1', when the front side of the vane reaches the optical zero transducer. By beding the vane the figure below has to be competed.



3.5 POSITIONING SPEED ADJUSTMENT

Starting with this adjustment, the meander signals, 'optical zero' and index pulses of the cartridge and the fixed disk must be correct. All cards must be installed for location of the potentiometers, see fig. 7-4

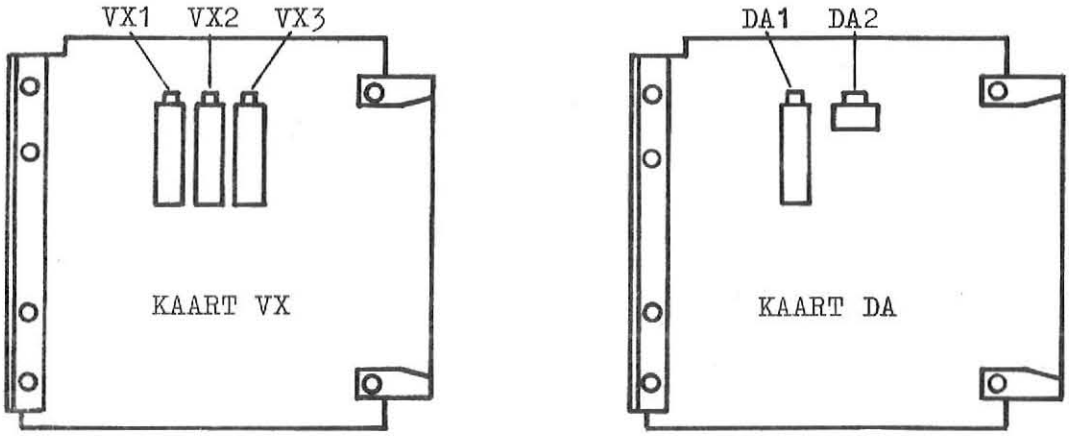


Fig 7-4

1) Turn the potmeters VX1 and VX2 fully CW, and then 5 turns CCW.
2) Turn potmeter VX3 (CS) fully CCW then ca 4 turns CW.
3) Turn potmeter DA1 (max. speed) fully CW. The speed is now minimal.
4) Connect one probe of an oscilloscope to pin 11 of card DA the "off set" of the speed signal, the positioner is in the retracted position. The "off set" must be $\leqslant$ 20mV. If not adjust with potmeter DA2.
5) Connect pin 33/HUP (signal $\overline{BPDA}^{**}$) to pin 04/HUP (ground).
6) Place a cartridge in the machine and start.
7) After 30 sec.the positioner starts with the first seek. When the positioner is unsteady during the first seek (whistle) turn VX3 another half a turn CW.
8) By means of the exerciser, do a repeat seek between track 64 and 128.
   Connect a trigger probe of the oscilloscope on signal EC pin 13 of card DC. Trigger the scope extern neg.
   Connect probe A on pin 31 of card PA (positioner current).
   Connect probe B on pin 11 of card DA (speed signal).
9) Turn potmeter DA1 CCW (speed is increased) till the current is correct, see fig.7-5with due regard to mentioned on point 11. When the speed becomes higher turn VX3 CW till it is correct, see fig.7-6 and 7-7

Note : It is important to switch between point 9 and point 11 during the adjustment. This can be done easily by switching only the polarity of the trigger level of the oscilloscope.

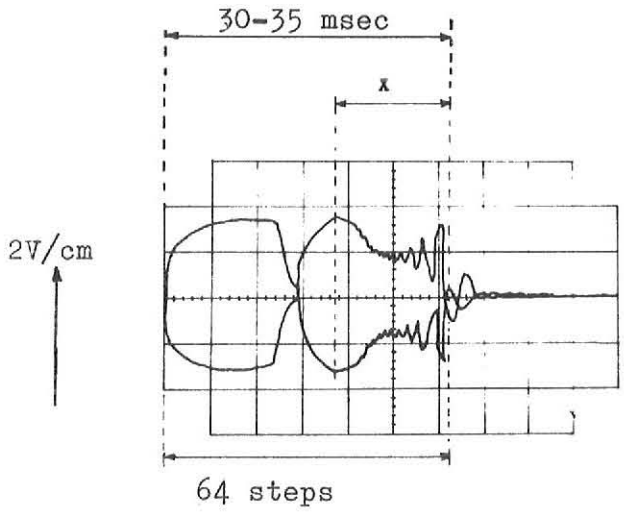


Fig. 7-5

The current should not be limited, fig. 7-6/7-7.
If it is limited turn the potmeter DA1 to the right.

10) Repeat point 8 but now between track 0 and 64 and between track 128 and 192, with due regard to mentioned on point 11.

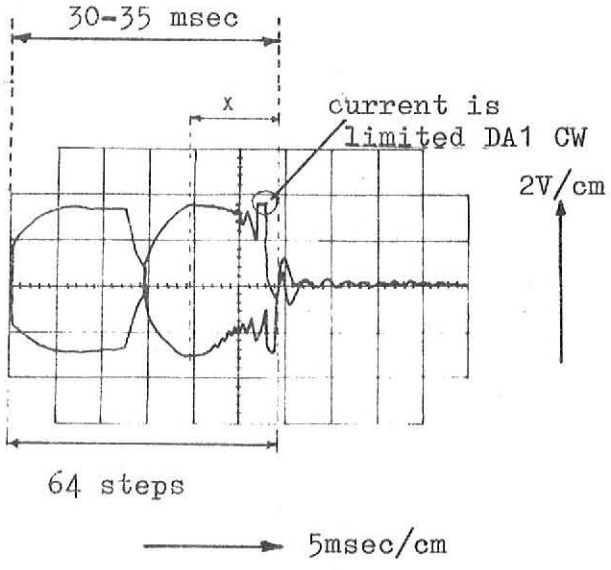


Fig. 7-6

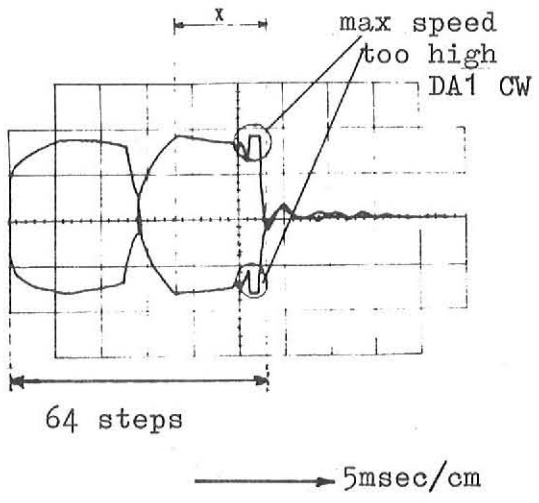


Fig. 7-7

11) Now trigger the scope pos on sign. EC, pin 13 of card DC.
Connect channel B on pin 11 of card DA (speed signal).
Measure the speed of incidence.
This must be between 10 and 13 cm/sec. This agrees with a voltage of 400-450 mV.
The fig. 7-8/7-9 give the correct pattern A1 and A2 must be 400-450 mV

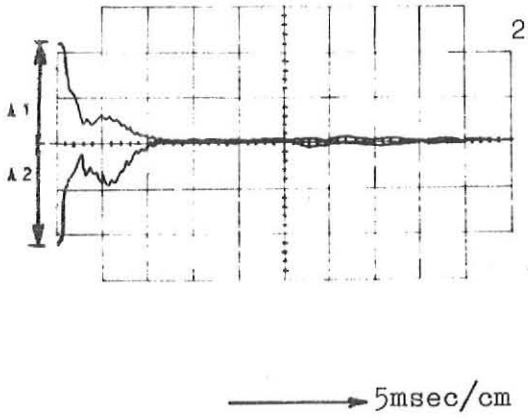


Fig 7-8

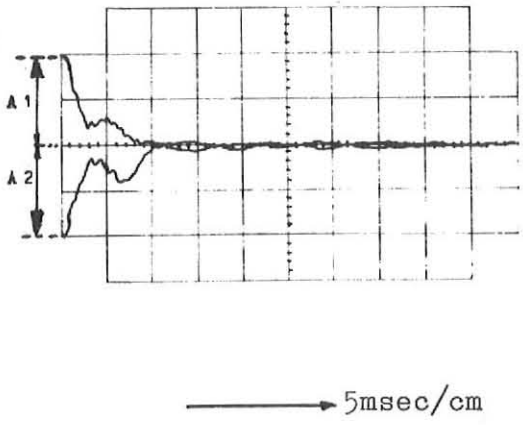


Fig 7-9

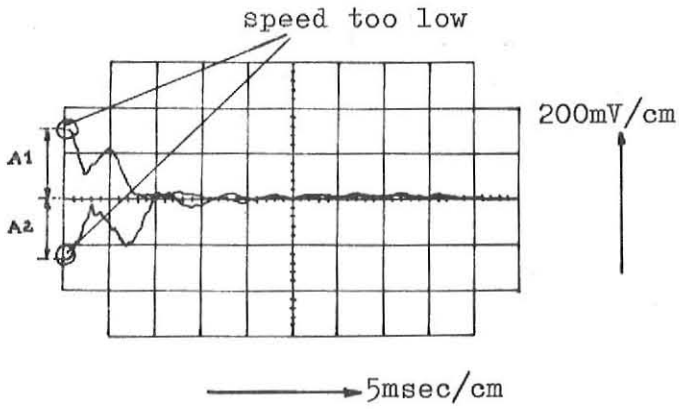


Fig 7-10

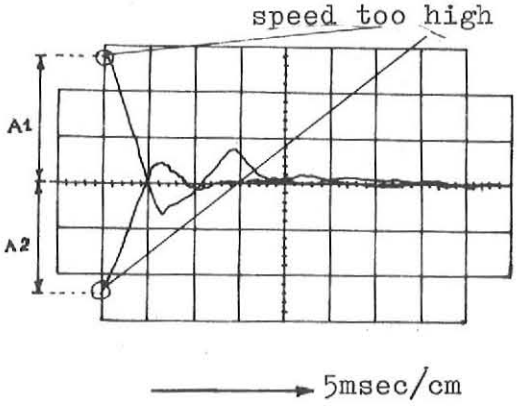


Fig 7-11

12) Check again on channel A of the scope the positioner, see point 8, 9, 10. When it is necessary to adjust DA1 do point 11 again.

13) Trigger scope pos on sign. $\overline{EC}$ pin 13/DC.
Connect channel A on signal SCX pin 49 of card VX.

⌘ Adjust the positioning 1 or 2 steps forward/reverse in the neighbourhood of track 2 - 64 - 128 and 192 with VX1 and VX2.

14) By adjusting VX1 and VX2 in turn, a correct place position loop will be obtained. The slope will be adjusted by turning VX2 to the left means steeper, and to the right means shallower. By VX1 the overshoot is adjusted.
To the left means damping (less overshoot), to the right means less damping.
The figures 7-11/7-12 show the correct adjustment for respectively one and two steps, from the areas mentioned in point 13.

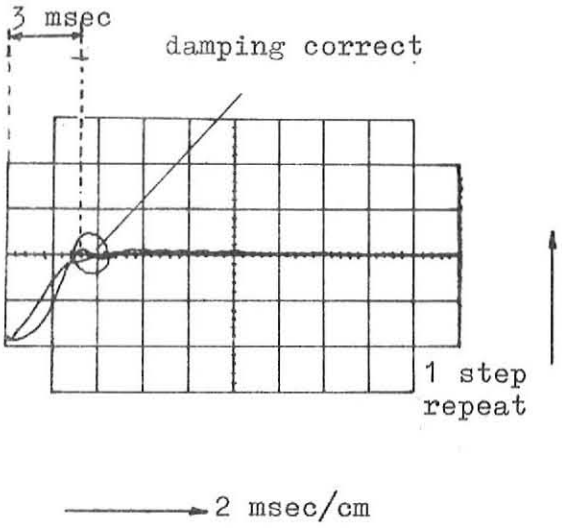


Fig 7-12

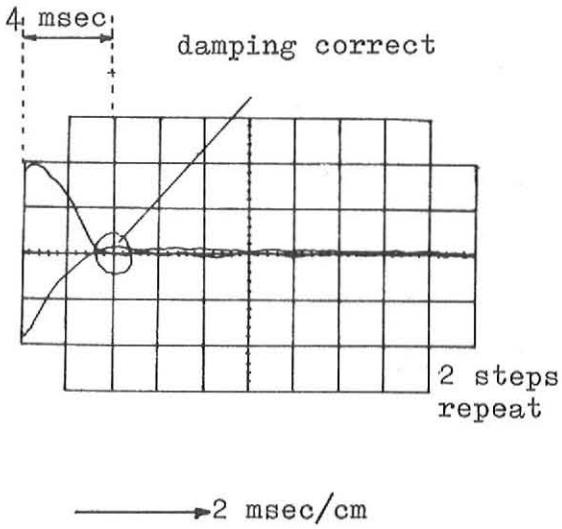


Fig 7-13

When the potmeter VX2 makes the slope too steep, the place position loop can become unstable, fig.7-14turn potmeter VX2 CW.

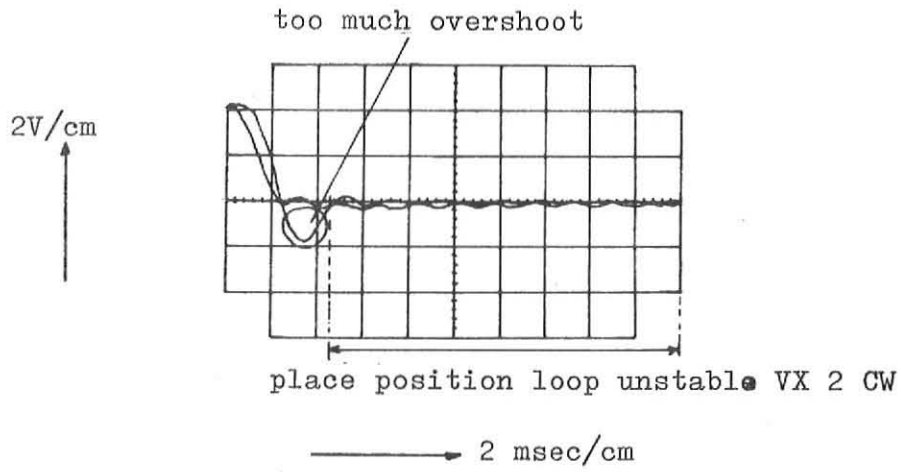


Fig 7-14

The polarity of the signal is dependent on the direction in which, and the polarity from where will be positioned.

The fig.7-15,7-16,7-17&7-18show examples of an incorrect adjusted position loop.

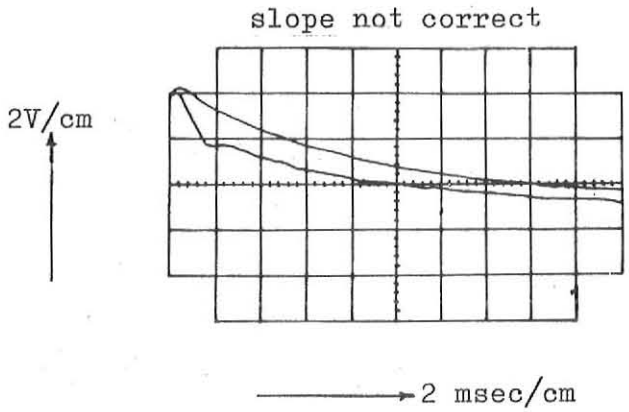


Fig 7-15

Positioning over one step.
VX2 must be turned CCW slope to shallow.

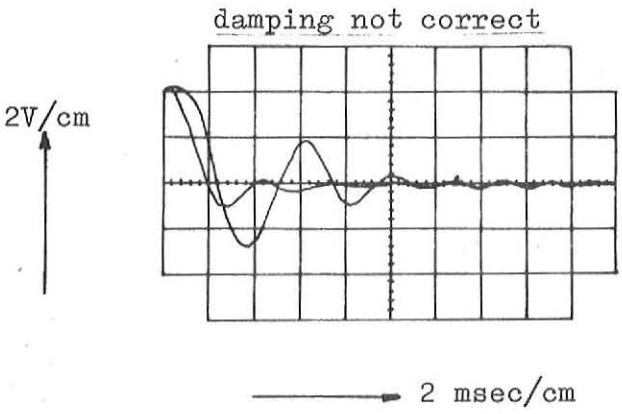


Fig 7-16

Positioning over one step.
Damping is insufficient.
Turn VX1 CCW and if necessary VX2 CW to reduce the slope.

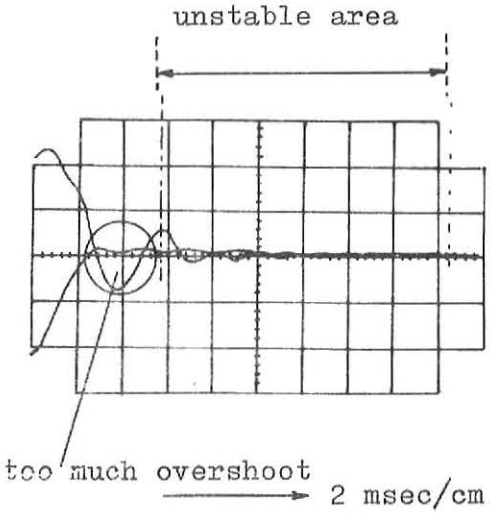


Fig 7-17

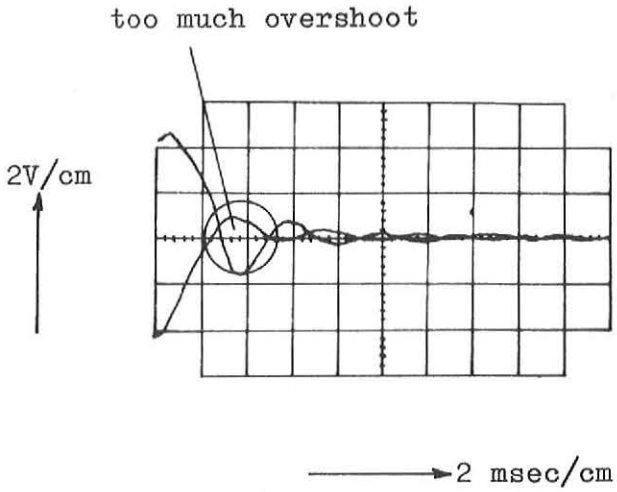


Fig 7-18

In figures 7-17&7-18 positioning is over two steps. The slope is too steep so the area x becomes unstable.
Also VX1 is not adjusted correctly.
Turn VX2 CW.

15) Start positioning over the next distance, and check the incidence shown in fig. 7-12&7-13 for scope adjustment see point 13.
Positioning from cylinder X to cylinder Y forward/reverse.

Cylinder X	Cylinder Y
0	1
0	2
0	8
0	32
0	64
32	33
32	34
32	40
32	64
32	96
64	65
64	66
64	72
64	96
64	128
128	129
128	130
128	136
128	160
128	192
192	193
192	194
192	200

16) Do point 15 again, with the following scope connections.
Trigger the scope positive, extern to signal $\overline{EC}$ pin 13 of card DC.
Connect channel A to signal WTC pin 27 of card HUP, and channel B to signal PONC pin 19 of card HUP.
In all the areas, the signal WTC must stay a '1' after signal PONC goes to a '0', (seek error).
The relationship between WTC and PONC is shown in fig. 7-19.
The time T must be at least 1 msec.

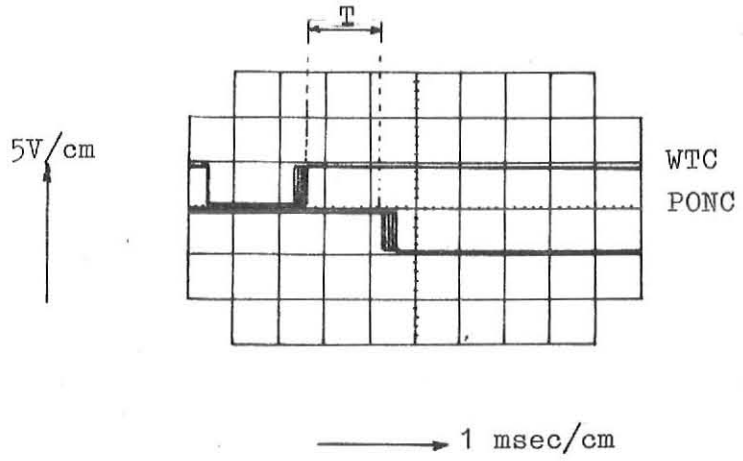


Fig 7-19

Fig.7-20 shows an incorrect situation, the place position loop must be adjusted again, starting with point 13.

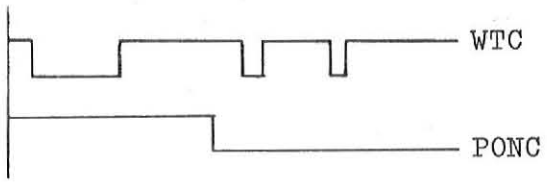


Fig 7-20

17) After the correct adjustments, turn potmeter DA1 on card DA $\frac{1}{4}$ revolution CW.

3.6 ADJUSTMENT OF HEADS 0 AND 1

The adjustment of the heads and the index unit must be done with the aid of a CE cartridge, and the CE card.
Also the torque tool must be used.

1) Insert the CE-card at cardposition 13 WC (write protect).
2) Insert the CE-cartridge.
3) Push power on and then start.
   Wait 30 minutes.
4) Connect the signal $\overline{\text{BPDA}}$ pin 33/HUP to the ground.
5) Connect channel A of the scope to pin 07/RR (read signal).
6) Connect channel B of the scope to pin 61/SS and trigger intern, positive at the same signal (index pulse). (Spindle disk index pulse 5 6)
7) Position the heads to track 073 by means of the test case.
8) Select head 0.
9) Adjust head 0 as shown in fig. 7-21.
   The centre zero must be ± 0,2 cm.

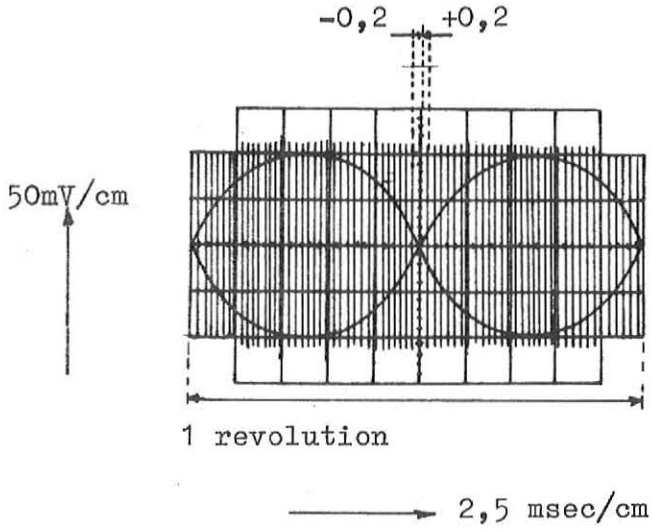


Fig 7-21

10) Repeat step 9 for the head 1.
11) Switch the time base calibration again to normal, and set the time base to 5 µ sec/cm, using pas triggering like step 5.
12) Positioning to track 005.
13) Select head 0.
14) Adjust the index
15) Select head 1.

16) Repeat step 14.

17) When steps 14 and 16 have a different value, take the average deviation, in such a way that T = 20, 0 /u sec ± 3 /u sec, see fig. 7-22.

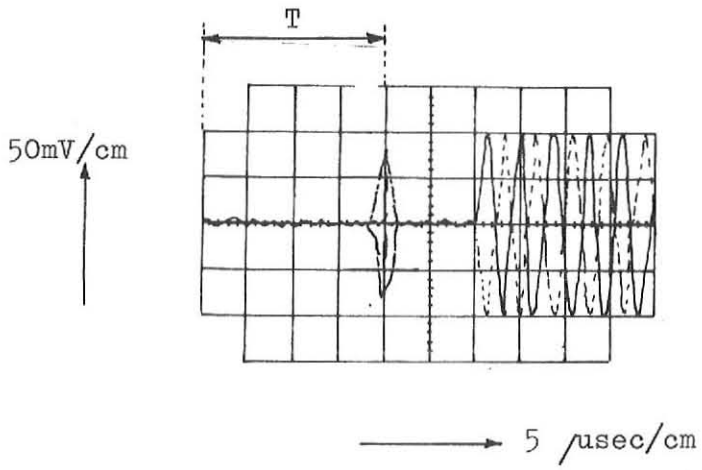


Fig 7-22

3.7 ADJUSTMENT OF THE INDEX UNIT (CARTRIDGE)

1. Connect channel A of the ascilloscope with pin 53 of card LCE (IC2) and trigger intern neg.
2. Insert a cartridge with broad slots.
3. Start the CDD.
4. Check if the signal in the ascilloscope is the same as fig 7-23.

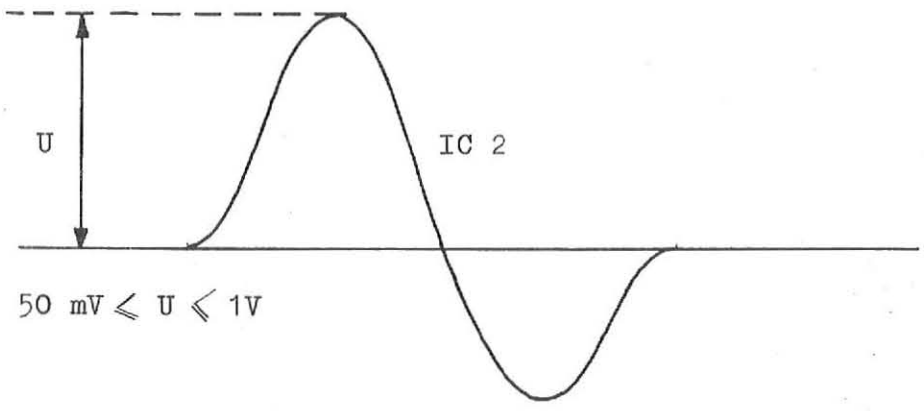


Fig 7-23

5. Do the same check again with a cartridge with small slaks.

3.8 ADJUSTMENT OF THE INDEX UNIT (FIXED DISK)

1. Connect channel A of the ascilloscop with pin 43 of card LCE (IF1) trigger intern neg.
2. Start the CDD.
3. Check if the signal on the ascillascope is the same as fig 7-24.

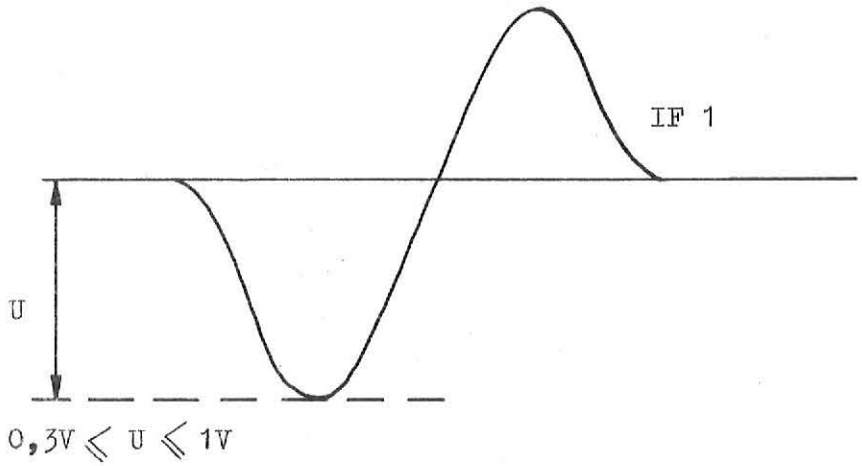


Fig 7-24

4.1 INDEX UNIT CARTRIDGE

1. Remove the bottomplate which is above the fixed disk (3 screws).
2. Adjust the height of the index unit sec fig 7-25

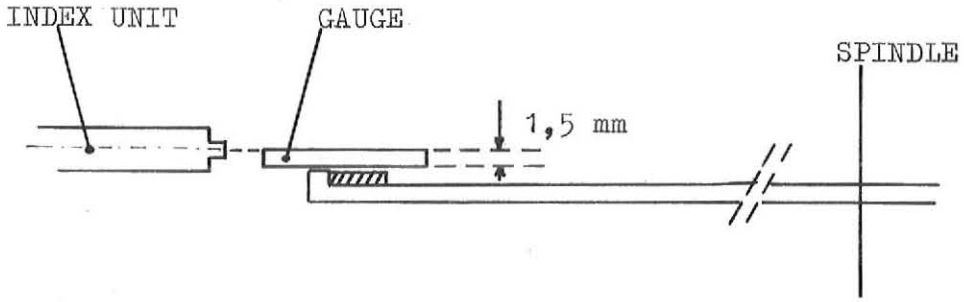


Fig 7-25

3. Loosen the two fixing screws of the index unit.
4. Adjust the index unit with the gauge, so that it is just free. See fig 7-26

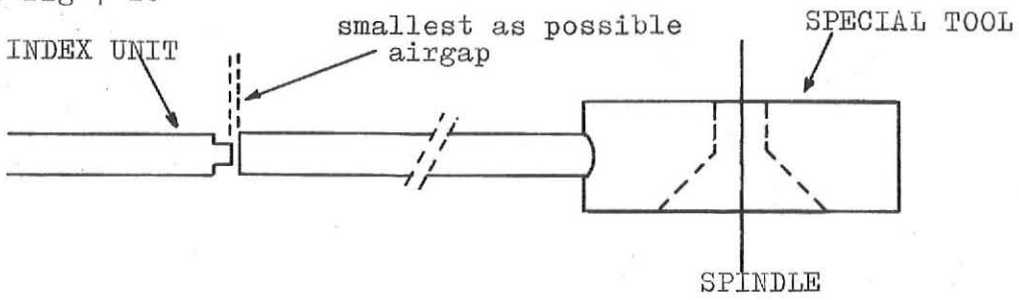


Fig 7-26

5. Tighten the wro fixing screws of the index unit.

4.2 INDEX UNIT FIXED DISK

1. Loosen the locknut of the index unit.
2. Adjust the index unit with respect of the sector ring by means of a feeler gauge 0.35 mm. See fig 7-27

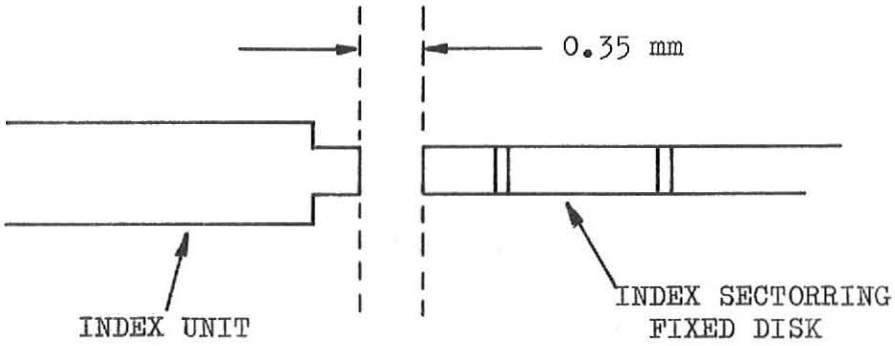


Fig 7-27

3. Check that the sector ring doesn't touch the index unit.

4.3 RETRACTED SWITCH

1. Loosen the screws of the micro switch and shift it so, that it is activated 1 mm $\pm$ 0.5 before retracted.
2. Tighten the screws.

N.B. When it is not possible to shift the retracted switch, the switch arm may be bent.

4.4 CLEANING THE HEADS

1. Remove rear top cover.
2. Remove air guide and push the brushes carefully inside the cartridge holder.
3. Remove meander card, and meander house (2 screws).
4. Clean the heads (see page 7-7).
5. Replace meander house, and than meander card.
6. Replace air guide and rear top cover.

5.1 GENERAL

Before replacing any part switch off the power on the rear.
All cards except VX and DA can be replaced without preliminary adjustments.
Be aware of the strong magnetic field of the positioner magnet (watches, tools, measuring equipment).

5.2 AIRFILTERS

5.2.1 Fine filter (fig 7-28)

1. Disconnect connector of front panel (JF-PF)
2. Remove four dixing screws of the frontpanel, remove frontpanel.
3. Take out the fine filter and replace new one; be sure of the correct air flow (red arrow).
4. Replace frontpanel.
5. Connect JF - PF.

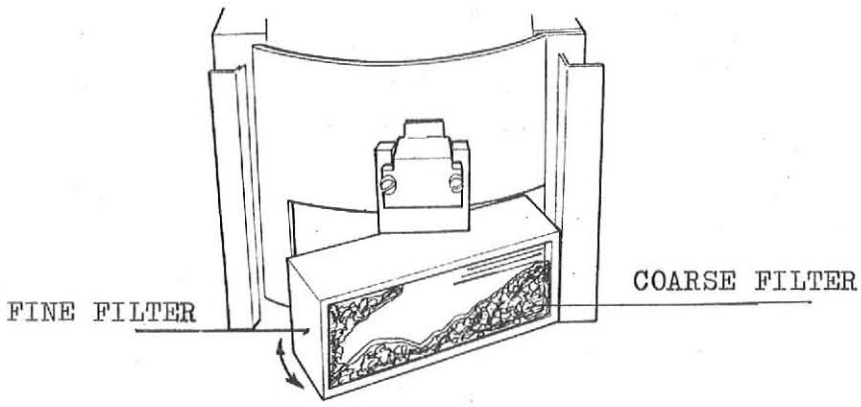


Fig 7-28 FILTERS

5.2.2 Coarse filter

1. The coarse filter can be taken out by hand, out of the fine filter.

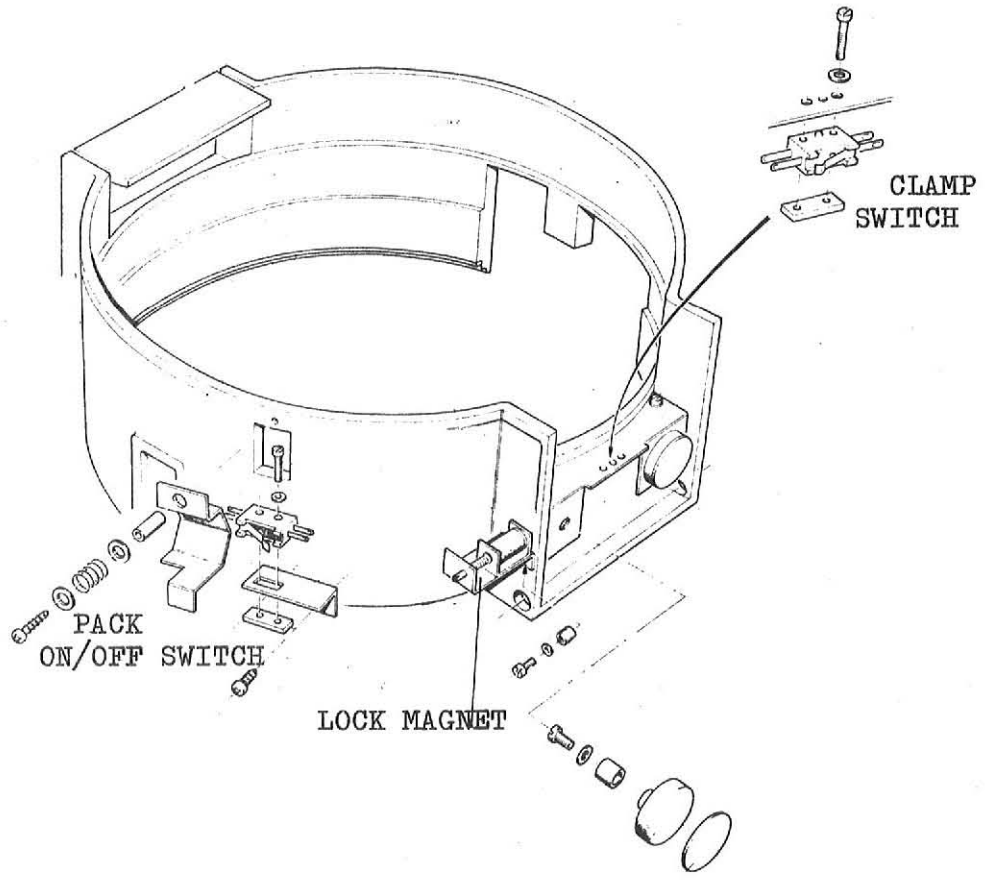


Fig 7-29 SWITCHES

5.3 LOCK MAGNET (fig 7-29)

1. Remove front top cover.
2. Remove unit from cartridge holder.
3. Insert new one.
4. Remove wires from the old one and connect to the new one.

5.4 CLAMP SWITCHES (fig 7-29)

When opening or closing right hand clamp switch, pull out the lock magnet pin.

1. Remove top front cover.
2. Remove the plate on which the switch is situated by removing the screws
3. Take out the micro-switch by loosening the screws,
4. Insert a new one.
5. Connect wires from the old one to the new one in the right order.
6. Insert the plate.
7. Check working.

5.5 PACK ON/OFF SWITCH (fig 7-29)

1. Remove front top cover.
2. Remove micro-switch unit from cartridge holder.
3. Install new micro-switch.
4. Connect wires in correct order.
5. Check working.

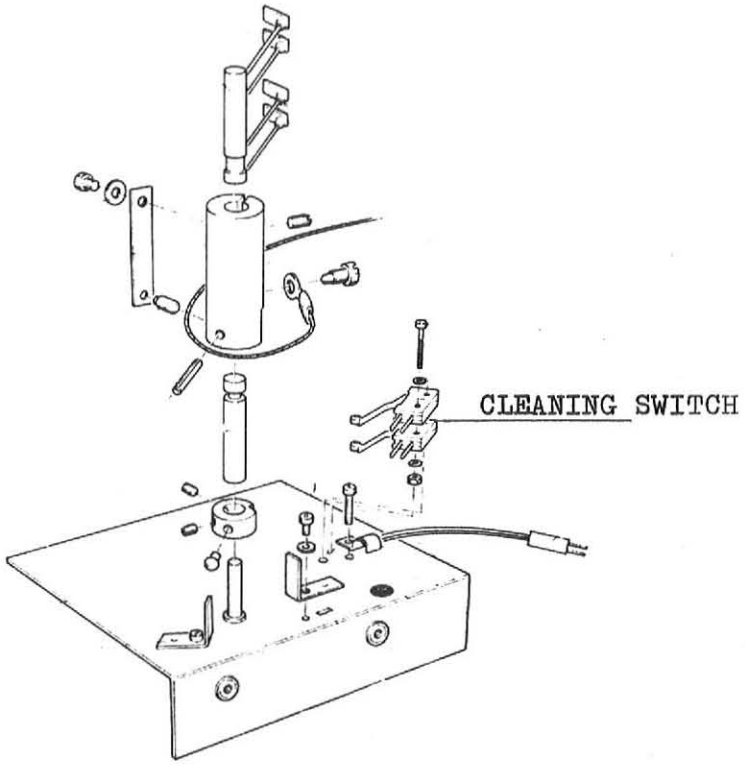


Fig 7-30

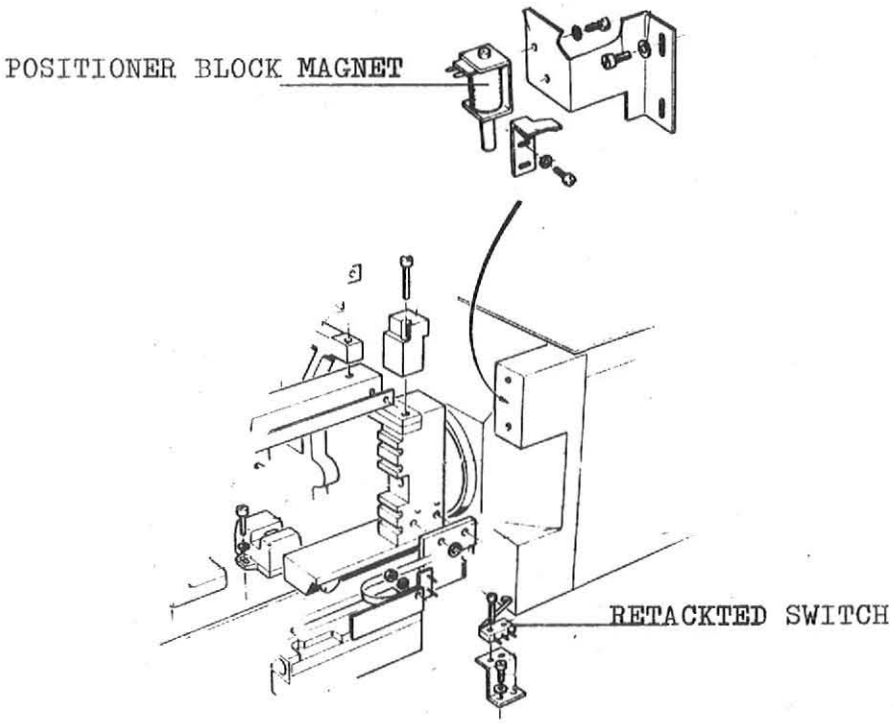


Fig 7-31 POSITIONER

5.6 CLEANING SWITCH (fig 7-30)

1. Remove rear top cover.
2. Remove air guide cover (fixed with two screws to the cartridge holder).

   CAUTION: WHEN REMOVING BE SURE THE HOUSING CAN NOT TOUCH THE FIXED DISK

3. Replace micro-switch.
4. Remove wires from the defect one and connect in correct order to the new one.
5. Check working.
6. Refit air guide cover.

5.7 RETRACTED SWITCH (fig 7-31)

1. Remove rear top cover.
2. Pull the positioner to the fully retracked position.
3. Remove the switch and replace a new one.
4. Connect wires to the corresponding pins.
5. Check working.

   CAUTION: DO NOT MOVE POSITIONER TOO MUCH FORWARD SO THAT THE HEADS BECOME LOADED

5.8 POSITIONER BLOCK MAGNET (fig 7-31)

1. Remove rear top cover.
2. Push the positioner to the fully retracted position.
3. Remove the magnet and replace new one.

   CAUTION: DO NOT MOVE POSITIONER TOO MUCH FORWARD SO THAT THE HEADS BECOME LOADED

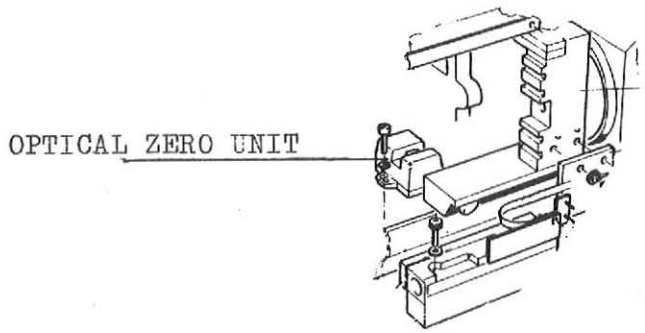


Fig. 7-32

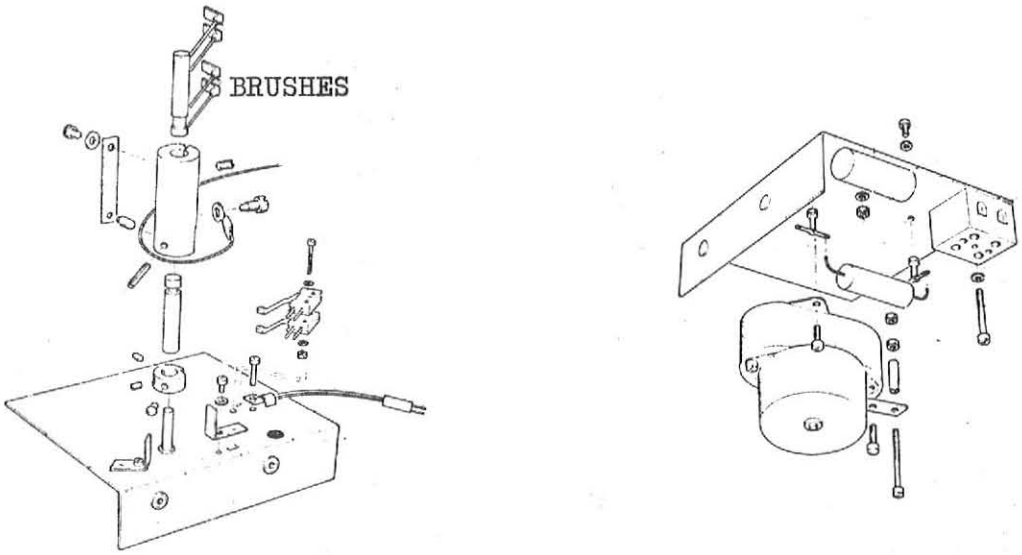


Fig. 7-33 CLEANING UNIT

4. Connect wires to the corresponding pins.

5. Check working.

5.9 OPTICAL ZERO UNIT (fig 7-32)

1. Remove rear top cover.
2. Disconnect plug OP2 - unit.
3. Remove unit (2 screws).
4. Insert new one.
5. Connect plug.
6. Adjust OP2 (see 3.4).

5.10 CLEANING UNIT (fig 7-33)

1. Remove bottom cover.
2. Remove air guide cover.
3. Remove cable from connecting block.
4. Disconnect plug PD.
5. Remove rear- and front top cover.
6. Disconnect brush retracting cable.
7. Remove brush arm assembly.
8. Remove unit by loosening two screws at the right side of the disk unit.
9. Install new unit.
10. Adjust position of the cleaning unit (special tool).
11. Check that the brush arms never touch the disk.

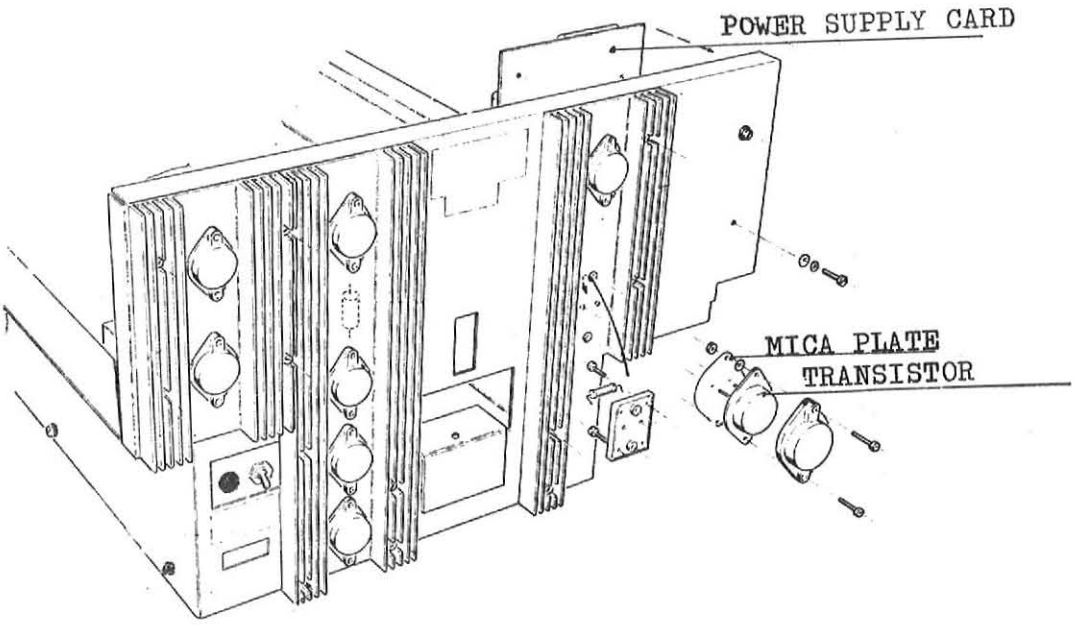


Fig.7-34 POWER SUPPLY

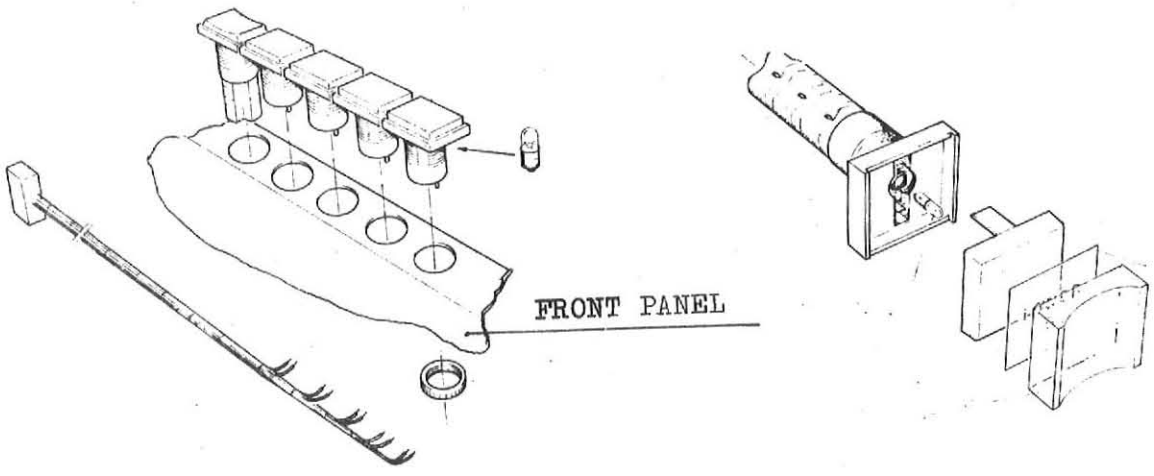


Fig.7-35 PUSHBUTTON AND INDICATORS

5.11 POWER SUPPLY CARD (fig 7-34)

1. Remove rear top cover.
2. Remove connector PV on power card.
3. Remove wires from connecting block.
4. Remove four screws on the rear, holding the power supply card.
5. Replace card.
6. Fit wires in connecting block.
7. Connect plug PV.
8. Check voltage without all cards.

5.12 POWER TRANSISTORS (fig 7-34)

1. Loosen the two screws of the defected transistor.
2. Replace the new transistor. USE A NEW MICA PLATE.

5.13 PUSH BUTTON AND INDICATORS (fig 7-35)

1. Remove front top cover.
2. Disconnect connector of front panel (JF-PF).
3. Remove front panel.
4. Unsolder wires of faulty button/indicator.
5. Take out the button/indicator.
6. Fix new one in position.
7. Solder wires to button/indicator.
8. Fasten front panel.
9. Connect connector (JF-PF).

5.14 LAMP PUSH BUTTON AND INDICATORS (fig 7-35)

1. Disconnect the lenscap.

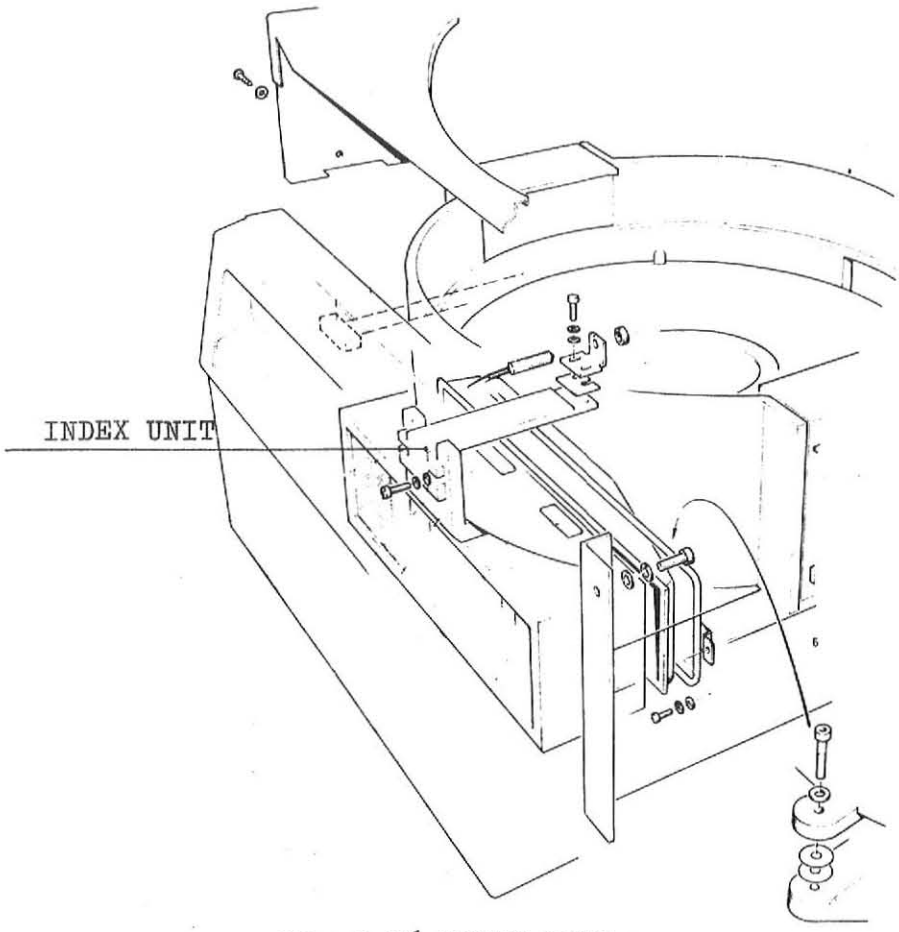


Fig.7-36 INDEX UNIT

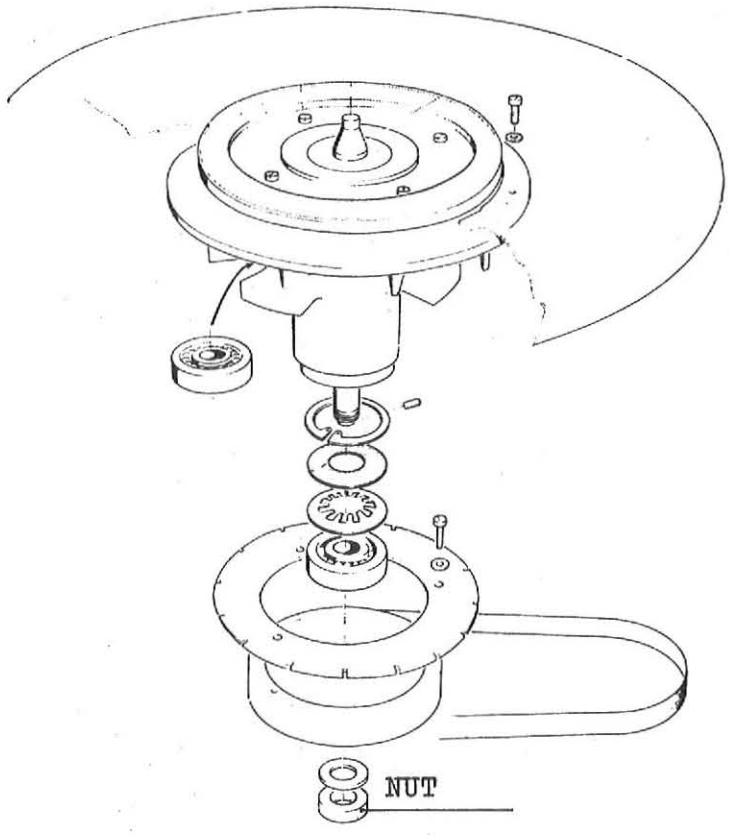


Fig. 7-37 FIXED DISK

2. Remove the defective lamp (by means of a tweezer) and replace a new one.

3. Replace lens cap.

5.15 INDEX UNIT CARTRIDGE (fig 7-36)

1. Remove front top cover.
2. Remove front panel.
3. Remove first bottom plate (three screws).
4. Loosen plug PB.
5. Remove index unit.

   CAUTION: Be careful with the fixed disk.
6. Replace the unit by a new one.
7. Connect plug PB.
8. Adjust the unit mechanical (4.1).
9. Replace base plate.
10. Adjust the unit electrical (3.7).

5.16 FIXED DISK (fig 7-36 and 7-37)

1. Remove front top cover, rear top cover and the front panel.
2. Remove first bottom plate (three screws).
3. Loosen index unit support and take it out as far as possible of the cartridge holder.
4. Remove the fixing ring. Be careful with fixed disk.
5. Take out the fixed disk.
6. Replace new one (use gloves).
7. Replace the fixing ring.
8. Place index unit report.
9. Adjust mechanical (4.1).
10. Instal first base plate.

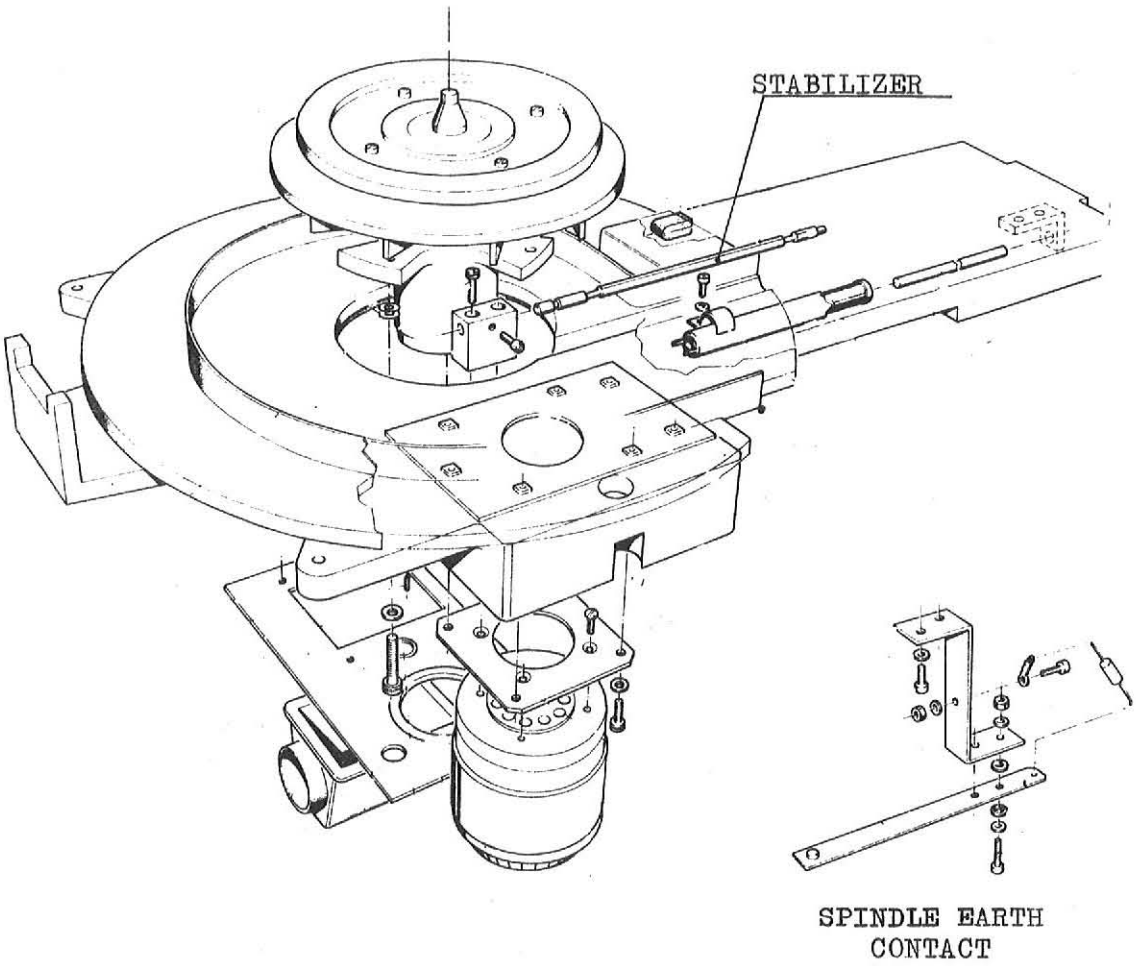
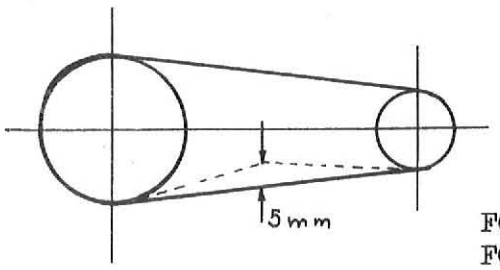


Fig. 7-38 SPINDLE AND PACK MOTOR



FOR 5 MM DISPLACEMENT
FORCE EQUELS 1.25 TO 1.5 KG.

Fig. 7-39 ADJUSTING OF THE BELT

11. Adjust index unit electrical (3.7).

12. Fix front panel and covers.

5.17 SPINDLE (fig 7-38)

1. Remove upper and bottom covers.

2. Remove index unit with support (see 5.15).

3. Remove fixed disk (see 5.16).

4. Remove spindle earth contact fig 7-38.

5. Remove drive belt.

6. Loosen the nut, holding the pulley in position (special-tool).

7. Take of the pulley.

8. Loosen the three screws hoding the spindle, for one screw first remove a plastic cap.

9. Take out the spindle (upwards). Take care of the shims between spindle and frame.

10. Replace new spindle, DON'T FORGET THE SHIMS.

11. Replace pulley.

12. Replace drive belt.

13. Replace earth c ntact.

14. Check belt tension (5.18).

15. Replace bottom cover.

16. Replace fixed disk.

17. Replace index unit.

18. Replace covers.

5.18 PACK MOTOR (fig 7-38)

1. Remove bottom cover.

2. Remove drive belt.

3. Disconnect wires from connecting block.

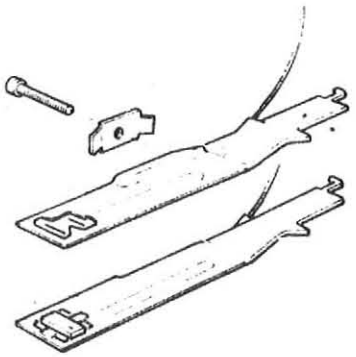


Fig. 7-40 UPPER AND LOWER HEAD

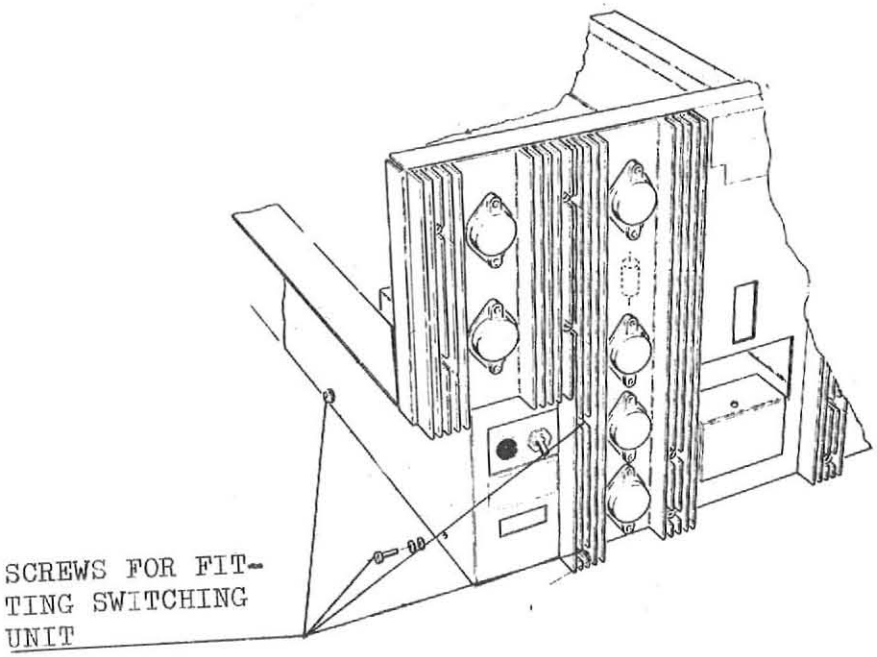


Fig. 7-41 REAR PANEL

4. Remove motor.

5. Insert new motor.

6. Replace drive belt.

7. Adjust tension of drive belt. See fig 7-39.

8. Connect the wires on the connecting block.

9. Replace the bottom cover.

5.19 HEADS (fig. 7-40)

1. Remove rear top cover.

2. Disconnect head plugs from pre-amplifier card.

3. Move the positioner about 2 cm from retracted

DO NOT LOAD THE HEADS

4. Insert head remover (special tool).

5. Unscrew the two head fixing screws.

6. Remove the head screws and clamp.

7. Remove carefully the head.

8. Insert new head in the head remover.

9. Replace new head.

10. Partially fasten the screws.

11. Take off the head remover.

12. Adjust the heads (3.6).

13. Fasten the screws with a tarque wrench 7 kgf/cm.

5.20 SWITCHING UNIT (fig 7-41 and 7-42)

1. Remove rear top cover.

2. Remove bottom cover.

3. Remove earth wires and cables to pack motor and cleaning motor.

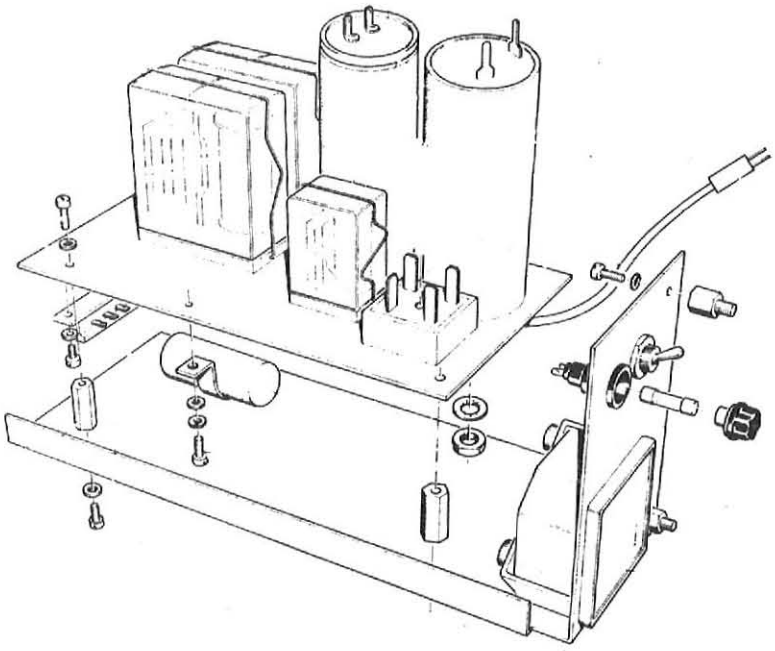


Fig 7-42 SWITCHING UNIT

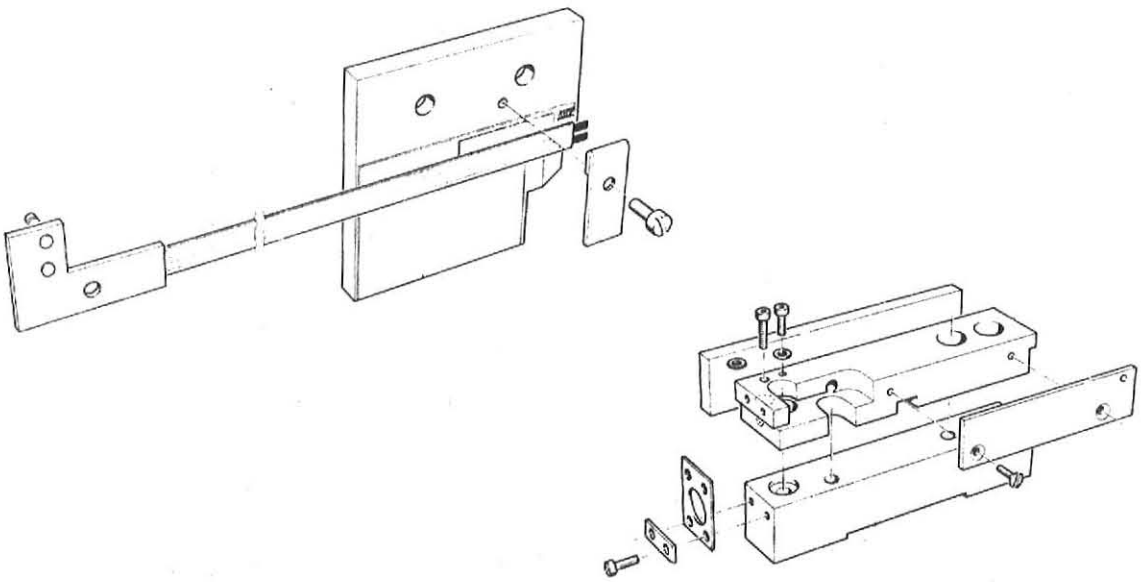


Fig 7-43 MEANDER

4. Loosen the two screws at the right side, and the two at the rear side.
5. Take out the unit as far as possible.
6. Loosen the other wires, noting their position.
7. Fasten the wires to the new unit.
8. Replace new unit.
9. Fasten the cables.
10. Replace bottom-and rear top cover.

5.21 MEANDER (fig 7-43)

1. Remove index unit with support see 5-15.
2. Remove cartridge holder.
3. Remove fixed disk see 5-16.
4. Loosen the screw clamping the stabilizer rod (see fig 7-38).
5. Loosen stabilizer rod from meander block.
6. Loosen prim. meander supply wires.
7. Loosen two screws holding secondary meander block.
8. Carefully take out the meander block.
9. Insert new one; KEEP IT AS FAR AS POSSIBLE FROM THE PRIM MEANDER
10. Fasten the supply wires.
11. Fasten stabilizer rod to meander and clamping block.
12. Replace fixed disk.
13. Replace the cartridge holder, DON'T FORGET THE SHIMS.
14. Replace index unit.
15. Adjust secondary meander (see 3.2).
16. Adjust index unit (see 4.2).

6.1 GENERAL

If there is a fault in the C.D.D. the following fault-finding procedure is recommended.

a) Check that the cards are in the right location in the Electronics Cage.
b) Ceck that the cards are pushed fully home.
c) Check that all plugs are connected.

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Power on indicator on operators panel doesn't light.	a. Driver on LCE defect. b. +12V absent. c. The lamp on operators panel defective. d. Plug P2 loose or defect in wiring.	a. Replace LCE. b. Check and/or replace fuse F3 (See also 6.b). c. Replace the lamp of power on indicator. d. Check P2 and/of wiring.	
2. Exchange indicator on operator panel doesn't light.	a. The lamp on operator panel defective. b. Driver on LCE defective. c. Signal EXC' non active. d. Plug P2 loose or defect wiring.	a. Replace the lamp. b. Replace LCE. c. Replace SS, if necessary measure EXC'. d. Check P2 and/or wiring.	
3. Power on- and EXC indicators operator panel do	a. Fuse F7 defective b. +12V absent fuse F3. c. Power supply card defective. d. 220V AC not present. e. Power On/Off switch defective, S1 defective. f. Plug P2 loose or defective in wiring g. Both drivers on LCE defective.	a. Replace F7 b. Replace F3 (See also 6.b). c. Check DC voltages. See also Power on, point 5 and 6. d. Check 220 V AC circuit viz.: plug PN, wiring internal, external. e. Check and/or replace S1. f. Check P2 and/or wiring. g. Replace LCE.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
4. Cleaning brushes stay on constantly.	a. Signals BIRN/BIRA wrong Measure these.	a. Check wiring and/or replace micro switch S2.	
	b. Defect on LCE signal CME* constantly active	b. Replace LCE.	
	c. Defect on SS, signal CME' constantly active.	c. Replace SS.	
	d. Relay RL3 in switch unit defective	d. Replace R13.	
	e. Adjustment micro switch	e. Check adjustment S2.	
5. No DC voltages present	a. See Power On, point 3 (a.-d. and e.)		
	b. Power supply card plug PV loose	b. Check plug PV.	
	c. AC-wiring to TR1 not o.k.	c. Check wiring.	
	d. Transformer TR1 defective. viz.: klixon	d. check transformer, in case klixon is defective, replace transformer.	
6. One or more of the DC voltages not present.	a. One of the following fuses defective F1(+5V)*-F2(-12V) F3(+24V)-F4(+12V) F5(+35V)-F6(-35)	a. Check and/or replace fuses in in question.	
	b. One of the power transistors on the heat sink defective T6 (+5V) - T7 (+24V) T8 (+12V)- T9 (-12V)	b. Check and/or replace the transistor in question.	
	c. Wiring of transformer to power supply card defective	c. Check and repair the wiring.	
* In case of defective fuse F1, the spindle starts immediately after power on.	d. Wiring from the power supply card to the power transistor on the heat sink defective	d. Check and repair the wiring.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
	e. Defect on power supply card.	e. Replace power supply card.	
	f. Defect on driver print resp. +5V and ±35V	f. Repair defect.	
	g. Diode stack RF1, mounted on plate under the driver print defective (±35V)	g. Replace RF1.	
	h. Diode stack RF2, mounted on plate under the driver print, defective (+5V)	h. Replace RF2.	
7. Clamp right-hand blocked. Cartridge not removable.	a. Lock magnet defective	a. Replace lock magnet	
	b. Signals on LCE out of order	b. Replace LCE	
	c. Controlling from SS out of order	c. Replace SS.	
	d. Defect in wiring from back panel to the lock magnet	d. Check and/or repair wiring.	
	e. Lock magnet is blocked	e. Repair clearance safety pin.	
8. Lock magnet on positioner stays without power.	a. Lock magnet defective	a. Replace lock magnet	
	b. Wiring, or fasten connection from driver print to lock magnet defective	b. Check and/or repair the connection.	
	c. Diode D7, under the driver print defective	c. Replace D7	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
9. Positioner stays without power, if carefully pushed out of retracted position.	a. +35V and/or -35V not present	a. Check and/or replace fuse F5 and/or F6, measure the voltages to the fuses.	
	b. +35V and/or -35V absent. F5 and F6 are in order. Diode stack RF1 defective.	b. Check wiring and if necessary, replace R1.	
	c. Retracted switch defective, causing at the same time, PA to be defective.	c. Check switch and adjustment, check PA and replace, if necessary, switch and/or PA.	
	d. Power transistors defective, resp. T1/T2 and T3/T4.	d. Check and/or replace T1/T2 and T3/T4.	
	e. Defect on card PA signals RP' and/or DRS defective.	e. If necessary, measure RP' and/or DRS. Replace PA.	
	f. Defect on SS. signal RP' constantly active.	f. Replace SS.	
	g. Retracted switch defective, causing at the same time R10 on the driver print to be defective (This error occurs only after EMB action).	g. Check switch and adjustment, check R10 and replace it necessary switch and/or R10.	
10. After Power ON, Fault indicator lights immediately.	a. Driver on LCE defective signals UNS and UNS*.	a. Replace LCE.	
	b. Signal UNS on HUP constantly active.	b. Replace HUP.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Spindle does not start. Start/stop indicator does not	a. Cartridge on/off switch function wrong signal RTO	a. Check switch function, wiring, adjustment switch, replace if necessary the switch.	
	b. Function of clamp switches left or right wrong. Signal RTO	b. Check switch functions, wiring, adjustment, replace if necessary the switches.	
	c. Start conditions wrong on SS.	c. Replace SS.	
	d. Start/stop switch S1 function on operators-panel wrong measure SBU/SBD	d. Check switch S1 and/or replace this.	
	e. Wiring defect in electronic box to plug P2	e. Check wiring.	
	f. Plug P2 defect of loose	f. Check connecting plug.	
	g. Signal POC constantly active. measure this on LCE	g. Replace LCE	
	h. For P142/143-P460-P400 interface signal for releasing the statue is not active in parallel with RTO	h. Check interface Replace, if necessary, IC.	
2. Spindle does not start. Start/stop indicator lights.	a. +24V not present.	a. Check and/or replace fuse F3.	
	b. PME* on LCE does not become active	b. Replace LCE	
	c. Relay RL1, in power-on unit, defective	c. Replace RL1.	
	d. Relay RL2, in power-on unit, defective	d. Replace RL2.	
	e. Drive belt defective or run off pulley	e. Check drive belt and/or replace.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
	f. Connections to pack-motor defective.	f. Check connections.	
	g. Drive motor defective or blocked.	g. Check the motor.	
	h. Spindle of cartridge blocked.	h. Check spindle and/or cartridge.	
3. After stopping, EXC already lights while spindle still turns.	a. Brake voltage absent, through defect in RF3.	a. Replace RF3.	
	b. Relay RL2 defective.	b. Replace RL2.	
	c. Connection from transformer to diode RF3 defective.	c. Check connections.	
	d. Signal DPM on LCE and/or PMD* wrong.	d. Measure signals and/or replace LCE.	
4. Spindle does start start/stop indicator does not light.	a. Lamp on operators panel defective.	a. Replace lamp.	
	b. +12V not present, fuse F4 defective.	b. Replace fuse F4.	
	c. Driver on LCE defective measure the signals START and START*.	c. Replace LCE.	
	d. Plug P2 defective or loose.	d. Check P2.	
	e. Wiring to and from P2 wrong.	e. Check wiring.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
5. After pushing in start button, immediate FAULT.	a. -12V not present fuse F2 defective.	a. Check and/or replace F2.	
	b. + 5V circuit on PA defective	b. Replace PA.	
	c. 50 HzW out of order	c. Replace LCE.	
	d. Signal STHE active	d. Replace WI.	
	e. Signal UNS on HUP defective	e. Replace HUP.	
	f. Signal ELER of WC constantly active	f. Replace WC.	
	g. Signal SD' from SS active	g. Replace SS.	
6. After stopping, The EXC indicator does not light after 30 sec. (60 Hz version 25 sec.)	a. Lamp on operators panel defective	a. Replace lamp.	
	b. EXC*' on LCE defective driver	b. Replace LCE.	
	c. Signal EXC' from SS not active.	c. Replace SS.	
	d. Plug P2 defective or loose	d. Check Plug P2	
7. After stopping, the cartridge is not removable, because clamp on the right is blocked.	a. See Power On, point 7		

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
8. During starting of the spindle, strange noise present.	a. Cartridge wrongly installed.	a. Check cartridge-holder and spindle seating.	
	b. Disk rubs against cartridge, defective lock on the cartridge itself	b. Repair lock or replace cartridge.	
	c. Bearing of the spindle defective	c. Replace spindle.	
	d. Bearing of the motor defective	d. Replace the drive motor.	
	e. Drive belt damaged	e. Replace drive belt.	
9. "Stop" during normal operation	a. Motor runs too sluggish	a. Check clearance and/or replace.	
	b. Spindle turns too sluggish	b. Check clearance and/or replace.	
	c. Drive belt defective	c. Check drive belt and/or replace.	
	d. Motor becomes overheated	d. Wait until motor is cooled down and try once again.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Cleaning cycle does not start	a. Timing counter on HUP does not start. Signal TC8 does not become active.	a. Replace HUP. See also First Seek 1.a.	
	b. Signal 50 Hz from LCE not present, or defective relay driver.	b. Replace LCE	
	c. Signal CME on SS not active.	c. Replace SS.	
	d. Relay RL3 in power on unit defective	d. Replace RL3.	
	e. Cleaning motor defective	e. Check and/or replace cleaning motor.	
	f. Switch S1 on cleaning unit defective	f. Replace micro switch S1.	
	g. Wiring defective	g. Check wiring.	
2. Cleaning cycle does not stop.	a. See Power On, point 4.		
	b. Signal TC 10 11 on HUP does not become active.	b. Replace HUP.	
3. Brushes are damaged.	a. Height alignment of the cleaning brushes wrong.	a. Replace the brush assy and adjust the height.*	
	b. Brush assy arms not parallel (bent).	b. Replace the brush assy.*	

* Check in both cases, whether cartridge or fixed disk, is damaged.

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. First seek does not start.	a. Timing counter on HUP does not start. signal TC 8 and/or TC 11 12 does not become active.	a. Replace HUP See also CLEANING CYCLE 1-a.	
	b. Signal 50Hz from LCE not present	b. Replace LCE.	
	c. Signals TCZO'/FSF wrong	c. Replace SS.	
	d. Defect on PA	d. Replace PA.	
	e. Fault in servo electronics DA or VX.	e. Check servo signals check control, replace, if necessary, DA and/or VX and adjust once more.	
	f. Power transistor on heat sink defective - in case of constant EMB - in case of non energizing	f. Check and/or replace power transistor. - replace T5 - replace T3 and/or T4.	
	g. Connection to voice coil defective	g. Check connection.	
	h. Plug P1 loose or defective	h. Check P1.	
2. First seek does not start, after 60 sec. (50 Hz) resp. 50 sec. (60Hz) unsafe.	a. Index transmitter of the fixed disk defective	a. Replace transmitter.	
	b. Index circuit on LCE defective signal ISPF not present	b. Replace LCE.	
	c. Pulse separator on SS does not work. SPF not present	c. Replace SS.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
	d. Lock magnet on the positioner or supply voltage to same not present	d. Check lock magnet and circuit R18 - C4 - C7. See also Power On, point 8.	
	e. Signal DFF on DC not active	e. Replace DC.	
	f. Plug P3 on back panel or PE to transmitter loose.	f. Check these plugs.	
	g. Carriage of positioner is in some way blocked	g. Check clearance of carriage.	
	h. Motor does not start fast enough, one of the starting capacitors defective	h. Check capacitors and/or motor.	
	i. Relay RL3 does not switch on the starting capacitor	i. Replace RL3.	
	j. Spindle turns too sluggish	j. Scheck spindle or replace.	
3. First seek finished but (USA 2)	a. Optical zero indicator (signal OPZ*) defective	a. Replace transmitter and adjust.	
	b. Adjustment OPZ wrong	b. Adjust OPZ indicator.	
	c. Signal MNC not present on VX	c. Replace VX and adjust.	
	d. CON not present on HUP	d. Replace HUP.	
	e. Signal TRZ or timing CDS wrong.	e. Replace SS.	
	f. Meander signals wrong: sin X-cos X-AC-A12--OTP-ETP.	f. Check appropriate signals on WI and replace, if necessary, meander card and/or WI.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
	g. Plug P4 defective or partly loose.	g. Check plug P4.	
	h. Adjustment servo-loop not entirely correct.	h. Check adjustment and/or adjust.	
4. First seek correctly finished but no CON on the interface.	a. No output signal CON* on card IC.	a. Replace IC.	
	b. No CON on HUP.	b. Replace HUP.	
	c. Wiring of back panel.	c. Check wiring.	
	d. Defect on card WI.	d. Replace WI and adjust meander signal COS X.	
5. After fi st seek UR, indicator does not light and/or no UR on interface.	a. Driver on LCE defective signals UR and URI*'.	a. Replace LCE.	
	b. Signal UR from SS not active.	b. Replace SS.	
	c. Signal UR*' on IC not active.	c. Replace IC.	
	d. Lamp UR indicator on operator panel defective.	d. Replace lamp.	
	e. Wiring from back panel to interface plug PI defective.	e. Check wiring.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
6. After first seek no index pulses and/or sector-pulses from resp. fixed disk or cartridge on interface.	a. Defective IC-Card Check signals: IPC-IPF-SPC-SPF	a. Replace IC.	
	b. No signals from SS- (IPC-IPF-STC-SPF)	b. Replace SS.	
	c. Wiring from back panel to interface plug PI defective	c. Check wiring.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Positioning action does not start.	a. Defec ive interface-signals. AB2-AB5-CTS	a. Measure these signals Replace IC.	
	b. Functions on DC defective	b. Replace DC.	
	c. Recoverable error USA1	c. Check DA/WI/VX and/or adjust servo loop once more.	
	d. No CON from HUP	d. Replace HUP.	
	e. Wrong commands from CU	e. Check signals on interface.	
	f. Wiring from plugs of the back panel to the interface plug PI defective	f. Check wiring.	
2. Positioning errors (USA 1).	a. Max. speed on DA adjusted too high	a. Lower max. speed DA 1 CW.	
	b. Position control loop wrongly adjusted. VX 1 and VX 2	b. Check adjustment servo positioner.	
	c. Speed loop wrongly justed. VX 3 and DA 1 if necessary, "offset" with DA 2.	c. Check the adjustment of the servo - positioner.	
	d. Adjustment meander-signals wrong	d. Adjust meanders.	
	e. CON circuit on HUP defective	e. Replace HUP.	
	f. Defect on one of the servo cards DA/WI/VX	f. Replace one of these cards and adjust servo loop again.	
	g. Output speed transducer too low, measure speed signal on DA	g. Replace speed transducer and/or magnet rod.	
	h. Defect on PA	h. Replace PA	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
3. Positioning to fault address.	a. One or more AB signals defective on interface card.	a. Replace IC.	
	b. Addresses, or counting on DC wrong	b. Replace DC.	
	c. Faulty commands from CU.	c. Check interface signals.	
	d. Wiring from back panel plugs to interface plug PI defective.	d. Check wiring.	
4. Every positioning action ends unsafe (FAULT) USA2.	a. Max. speed on DA adjusted too high.	a. Lower max. speed DA1 C.W.	
	b. Defect in unsafe circuit on PA; signals STL-STHE-EMB.	b. Replace PA.	
	c. One of the power transistors on the heat sink defective T1, T2 T3 or T4.	c. Check or replace transistors.	
	d. Counter/latches or full adder on DC defective.	d. Replace DC.	
	e. Adjustment servo-loop wrong or defect on DA/VX or WI.	e. Check adjustment and/or replace one of the cards DA/VX or WI.	
	f. Adjustment meander signals wrong.	f. Check adjustment.	
	g. Meander card defective (sin x and cos x).	g. Replace meander card.	
	h. Flat cable to primary meander broken	h. Check flat cable.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
5. The positioner "whistles" after positioning.	a. Adjustment servo-loop wrong, viz., VX1 and VX2.	a. Check adjustment	
	b. Positioner works in one direction only, approx. half the current present (VPC*), because of defect in one of the power transistors T1, T2, T3 or T4.	b. Replace T1, T2, T3 or T4 on the heat sink.	
6. Positioning often ends with USA 1 (recoverable error)	a. Adjustment of servo-loop wrong and/or defect on DA/VX or WI- on VX signal MNC not active.	a. Check and/or adjust servo-loop.	
	b. Defect on HUP signals WTC and PONG.	b. Replace HUP.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Data fault on one address.	a. Bad spot on fixed disk and/or cartridge	a. Change fixed disk and/or cartridge, repeat.	
	b. Write error and/or check write amplifier	b. Start writing again.	
2. Data faults on one head.	a. Head dirty	a. Clean the head.	
	b. One side of fixed disk or cartridge damaged	b. Replace fixed disk or cartridge.	
	c. Poor contact of the head plug	c. Clean contacts of plug.	
	d. Head surface damaged	d. Replace the head.	
	e. Adjustment of head wrong (for head 0 or 1 only)	e. Adjust on CE-cartridge	
	f. Head defective wire rupture	f. Replace head.	
	g. Write error (WRDA')	g. Check WC andIC.	
	h. Selection fault	h. Replace DC or read preamplifier.	
3. Data faults on tracks 128 up to	a. Write/erase current wrong (WEV)	a. Check write voltage WEV and/or replace WC.	
	b. Signal RWC not active	b. Replace DC.	
	c. Read channel wrong RD 1/2 output preamplifier RDDA output read recovery RDDA* output interface card	c. Replace resp. the preamplifier-RR-	
	d. Positioning errors on high tracks	d. Check servo-loop	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
	e. Springs of the heads rub against the cam bridge	e. Carefully bend the head springs.	
	f. Ground contact spindle wrong	f. Repair or replace ground contact.	
4. Random data faults.	a. Read channel defective RD 1/2 output read preamplifier RDDA output read recovery RDDA* output interface card	a. Check and/or replace RR-IC or read preamplifier.	
	b. Write channel defective WRDA'. output interface card write voltage WEV on WC.	b. Check or replace WC or IC.	
	c. Heads are dirty	c. Clean the heads.	
	d. Damaged or dirty cartridges and/or fixed disk	d. Replace or clean cartridge and/or fixed disk.	
	e. Contacts of head plugs dirty	e. Clean plugs.	
	f. Adjustment of the heads wrong head 0 and 1 only	f. Adjust the head on CE-cartridge.	
	g. Adjustment of index to burst wrong	g. Adjust on CE-cartridge	
	h. Ground contact spindle wrong	h. Repair or replace ground contact.	
	i. No index- resp. sector- pulses on interface	i. See First seek, point 6.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
5. Only one of the heads reads correctly.	a. Diode leakage read preamplifier.	a. Replace read preamplifier	
6. No compatability	a. Adjustment heads 0 and 1 wrong.	a. Adjust heads on CE-cartridge.	
	b. Index to burst wrong	b. Adjust heads on CE-cartridge.	
	c. Zero point (0 P Z) wrong (displaced)	c. Check and/or adjust zero point correctly.	
	d. Alignment positioner wrong	d. Check alignment positioner.	

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
1. Data in danger (DID)	a. Signal DID on HUP defective.	a. Replace HUP	
	b. Interface signals wrong, particularly for WRE-ERE and RE.	b. Replace IC.	
	c. Wrong interface signals from CU to CDD.	c. Check the signals on behalf of WRE-ERE-RE.	
2. Electronic error (ELER)	a. Check by means of signal AMER. Plural head selection Write without erase Both write drivers on etc.	a. Replace WC	
	b. Head circuit out off	b. Check head plug and head wiring. Replace head if necessary.	
	c. Defect of the resp. enable signals.	c. Replace HUP.	
	d. Commands for the enable signals from IC wrong.	d. Replace IC.	
	e. Faulty interface commands from CU to CDD.	e. Check interface.	
	f. Selection fault on read preamplifier	f. Replace read pre-amplifier.	
	g. Complete diode leakage (short circuit) on read preamplifier.	g. Replace read pre-amplitier.	
3. Speed drops (SD)	a. See FIRST SEEK, point 2.		
4. Positioner is not on track 000 (PONO).	a. See FIRST SEEK, point 3.		

SYMPTOM	PROBABLE CAUSE	REMEDY	REFERENCE
5. Speed too high electronic (STHE).	a. Signal STHE constantly active	a. Replace WI.	
	b. Adjustment servo-loop not correct	b. Check adjustment.	
	c. Defect on PA	c. Replace PA.	
	d. See also POSITIONING, point 4		
6. Seek too long (STL)	a. See FIRST SEEK, point 2d.		
	b. Positioner carriage somehow mechanically blocked	b. Check and/or repair the clearance of the positioner.	
	c. Counter or timing on HUP incorrect (signal TC 07)	c. Replace HUP.	
	d. See POSITIONING point 4.		
7. Immediately after starting the FAULT indicator lights.	a. See START/STOP, point 5.		
8. After power on FAULT lights immediately.	a. See POWER ON, point 10		