PHILIPS

data systems

MONO DISK DRIVE X1210

drive

rugged construction
closed loop air system
19 inch rack mountable
maximized data protection

cartridge

top loading design
dust proof construction
standard 14 inch disk
16 and 24 sector models

INTRODUCTION

The trend in automation today is the progressive introduction of small electronic data processing equipment to the industrial and business environment. The X 1210 was conceived to meet the requirements of this fast expanding market and has been designed to provide a low cost, random access mass storage device capable of operation in on-line or off-line configurations.
The most important characteristics of this small single disk drive unit are:

- Storage Capacity
- Average Head Positioning Time
- Data Transfer Rate

20 million bits
125 milliseconds
833 kilobits/sec

The X 1210 uses the Philips mono disk cartridge as the storage medium. This cartridge comprises an industry standard 14 inch magnetic oxide coated disk sealed in a dustproof plastic envelope.

CONVENIENT OPERATION

To facilitate top loading of the Philips mono disk cartridge, the X 1210 has a drawer type construction which can be mounted in a standard 19 inch rack.
The telescopic slides and cable guide supplied with the unit permits partial withdrawal of the X 1210 from the rack for cartridge exchange or full withdrawal to a servicing position. Cartridge exchange consists of simple operations, thus minimising human error. Operator time is saved by particular short start (10 seconds) and stop (5 seconds) sequences. The robust and dustproof design of the cartridge makes it virtually impossible to damage or contaminate the magnetic disk while handling. The X 1210 safety logic only permits the disk unit to start when a cartridge has been fitted and the X 1210 drawer closed.

DATA INTEGRITY

The integrity of the recorded data is ensured by the following two important features:

- Closed loop environmental control maintains the cartridge interior dustproof during all stages of X 1210 operation.
- Security logic inherent in the X 1210 design safeguards the magnetic disk and the recorded data from operator error or equipment malfunction.

The unique design features make the Philips mono disk drive particularly suited to very reliable 2200 bpi recording, resulting in a proven read data error rate of 1 in 10^{10} bits.

MAINTAINABILITY

The design philosophy has been oriented towards creating a disk unit which is simple and economic to service whilst requiring minimal preventive maintenance. This concept has been achieved by designing the mechanical and electronic components in the unit as modular replaceable assemblies. The special servicing tools required comprise a plug in test module – which functionally checks the head positioning mechanism – and a reference cartridge.
This cartridge contains accurately recorded test tracks for checking the head alignment.
The reliability of the X 1210 design is backed by an extensive quality assurance program involving life tests of the unit and its subassemblies and by the expertise of the Philips organization.

CONSTRUCTION

The X 1210 comprises a cast aluminium alloy chassis which supports all the subassemblies. The upper surface supports the precisely aligned spindle, head positioning mechanism and index/sector unit. The cartridge fits into a holder on top of the drive.
A locking ring retains the cartridge in place and opens the sliding head access door. A disk coupling mechanism incorporated into the cartridge handle engages with the spindle.

COOLING

The X 1210 front panel together with the dust covers form a closed environment around the assemblies. All heat generating components, with exception of the electronics rack, are mounted beneath the chassis. Cooling is provided by a laterally mounted fan, which sucks air through a filter in the front panel.

POSITIONING MECHANISM

The read/write heads are precisely positioned over the required track by an electro-mechanical postioner. An electric stepping motor drives the head supporting carriage via a rack and pinion.
The stepping motor provides coarse head positioning and a pair of mechanical detents assures reliable and accurate final positioning.

HEAD ASSEMBLIES

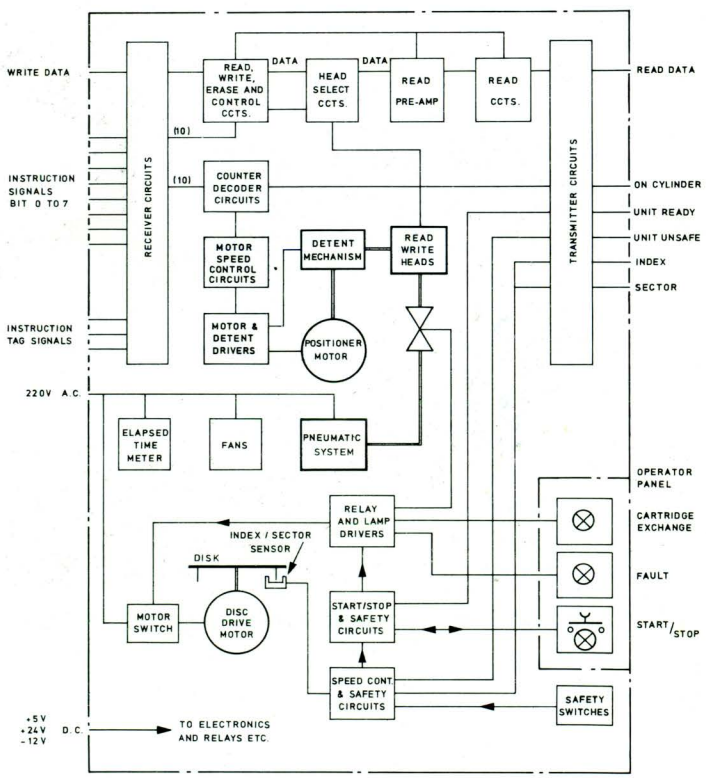
Each head assembly contains a flying shoe magnetic recording head, a nylon cleaning brush and two pneumatically controlled actuators.
When air pressure is applied to these actuators, the nylon brushes are retracted into the head assemblies and the heads are put into flying position over the disk. The heads are retracted instantly upon removal of the air pressure.

PNEUMATIC HEAD CONTROL

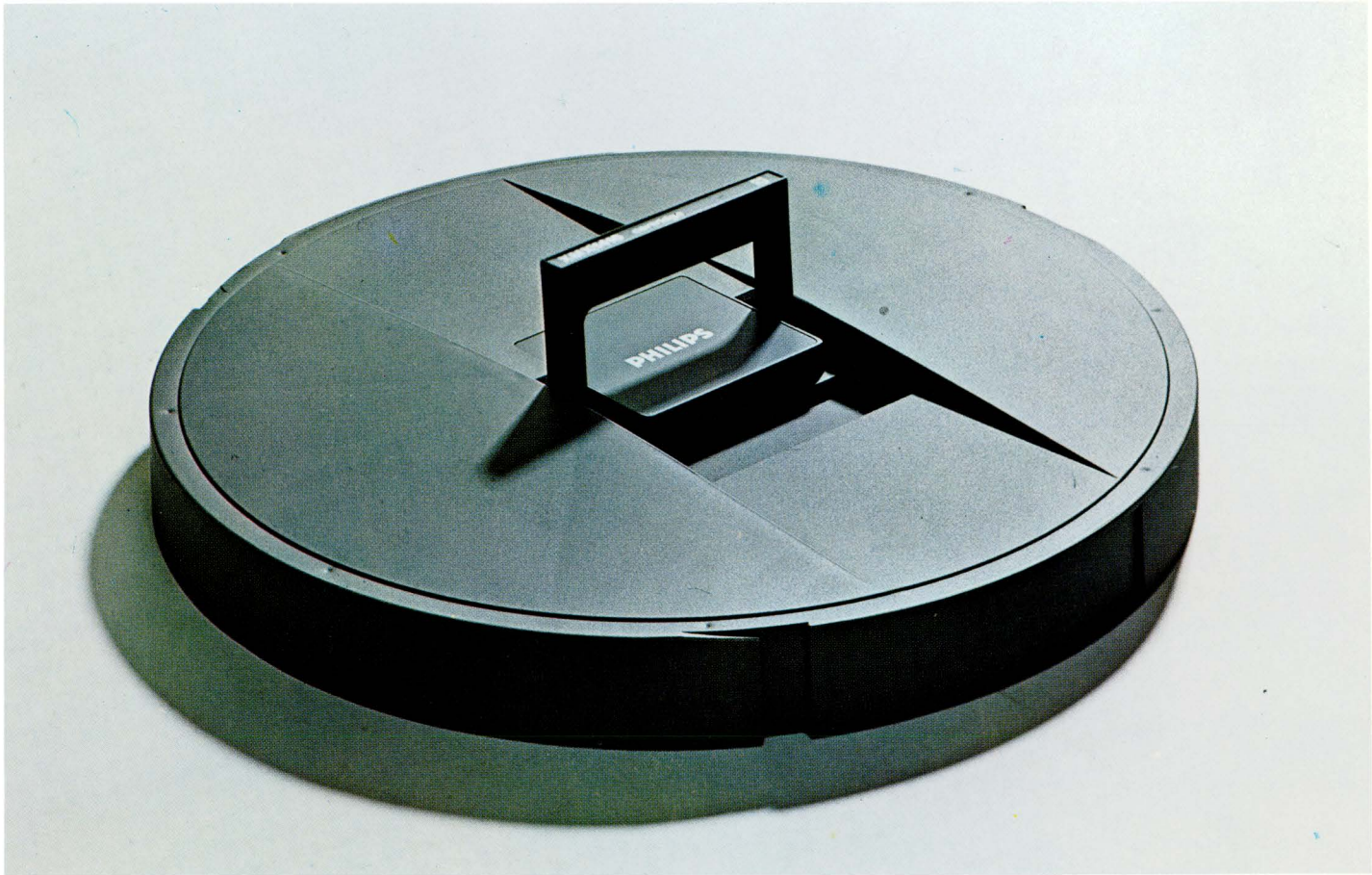
An electric membrane pump feeds its output to an air compression chamber. Here, by means of an adjustable relief valve, pressure is maintained at the value necessary to obtain the correct flying force at the recording heads. An electrically controlled pneumatic valve feeds the pressure to the actuators only when the heads are over the disk surface.

ELECTRONICS

The X 1210 contains all the functional electronics necessary for operation. As represented in the block diagram the X 1210 contains the logic level TTL interface receivers



and drivers, the control and safety logic, the stepping motor drivers, the write data amplifier and read recovery circuits. These circuits are contained on printed circuit boards plugged into the electronics rack.
Only the read pre-amplifier is mounted directly on the head positioner mechanism. The rack is mounted on the rear left hand side of the chassis and the wiring is accessable from the outside via a removeable grid on the dust cover. One location in the rack is reserved to plug in the positioner mechanism test module.



PURIFIED AIR FLOW

A closed loop filtered air system is used to maintain the magnetic recording media within a stringently clean environment.
A blower in the positioner compartment conveys filtered air into the cartridge through the head access door. This airflow circulates within the cartridge and is then deflected back into the positioner compartment, where it passes again the sub-micron filter placed in front of the blower.
The time between replacements of this filter is maximized due to the closed loop nature of the system. Atmospheric pressure is maintained in the closed system through an overflow filter.

CLEANING CYCLE

When the start button is pressed the disk is run up to speed and the positioning mechanism moves the head assemblies into the mono disk cartridge. During this operation, the nylon brushes are lowered onto the disk until the innermost track has been reached.
Dust or oxide particles are dislodged by the brushes and removed from the cartridge by the purified air flow.
At the instant the positioner mechanism reaches the innermost track, the brushes are retracted into the head assemblies and the read/write heads are loaded into the flying position. The mechanism then positions the heads back to the outermost track of the magnetic disk.

CARTRIDGE LOADING

To load a cartridge into the X 1210 withdraw the drive approximately 50 cm from the rack unit. A 'cartridge exchange' lamp lights if it is safe to install a cartridge. Hold the cartridge by the handle and fit it into the holder on the top of the X 1210.
Then turn the locking ring on the holder fully clockwise and fold the handle down into the recess on the cartridge.
Push the drive back into the rack unit.

CARTRIDGE UNLOADING

To remove a cartridge, stop the X 1210 by pressing the start/stop button and wait until the 'cartridge exchange' lamp lights. Then withdraw the X 1210 from the rack unit. Decouple the disk from the spindle by removing the cartridge handle from the recess and pivot the handle towards the rack unit until is stops. Unlock the cartridge by turning the holder locking ring anti clockwise and lift the cartridge by its handle from the X 1210.

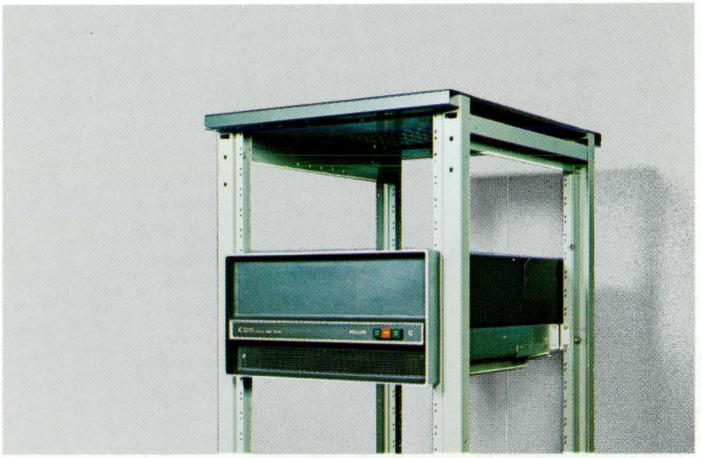
ACCESSORIES

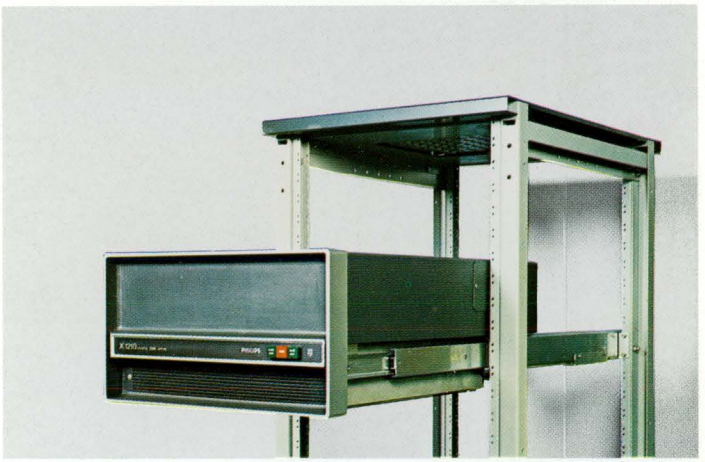
With the following options the X 1210 can be installed in a standard rack unit:

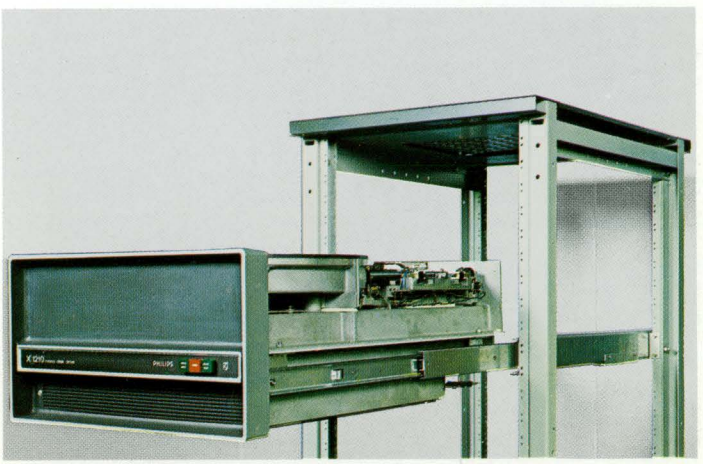
- rack unit slides, with brake to provide smooth gliding and to maintain the X 1210 in three positions for operation, cartridge exchange and servicing.

- rack unit cable guide with 3 meters of power and I/0 cables. Connectors are provided at the X 1210 sides of the cables.

A rack mountable power supply unit, which provides one X 1210 with AC and DC power, is also available.
A test module, which plugs into a reserved location in the electronics rack, allows simulation of the interface track and head selection instructions. This module therefore facilitates alignment of positioner and heads.







Interface

INTRODUCTION

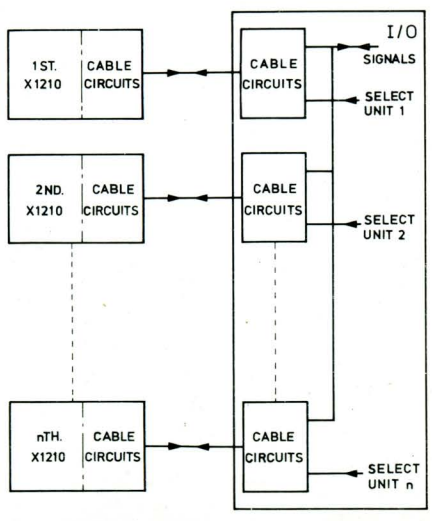
The interface has been tailored to the needs of small computer systems. These systems often require connection of several disk drives. Economy, inherent simplicity and trouble free operation have been the guiding principles to adopt the star type interface.
Connection of the DC power supply and control signals should be effected by means of multicore flat cables. These cables should be no longer than 3 meters and the control signal cable should be terminated at the control unit by receiver/transmitter circuits using TTL positive logic. Two connectors are provided at the rear of the drive to supply the DC and AC power and I/0 signals.

DATA SIGNALS

Special care is given to the read and write data signals, which are transferred by separate coaxial cables.

INPUT SIGNALS

Control of the X 1210 is effected by eight parallel instruction lines (bit 0 to bit 7) together with one of three tag signals. An instruction is only accepted by the X 1210 while one of these tag signals is active. Moreover, the instructions implemented depend upon the tag signal active:



TYPICAL INTERFACE STUCTURE

- When the difference select tag signal is active, this signal informs the X 1210 of the difference (in BCD form) between the actual track position and the required track position.

- Similarly the head select tag signal informs the drive (via bit 0) which head should be selected. The lower head is selected when bit 0 is active, the upper head when bit 0 is not active.

- The control select tag signal instructs the drive which operation should be performed, as indicated by the particular active instruction bit.

The following table summarizes the instructions supplied to the X 1210 in a short form.

	Instructions		
Instruction signals	Difference select	Head select	Control select
bit 0	1	1	write enable
bit 1	2	not used	read enable
bit 2	4	not used	seek forward
bit 3	8	not used	not used
bit 4	16	not used	erase enable
bit 5	32	not used	seek reverse
bit 6	64	not used	return to zero
bit 7	128	not used	not used

NOTE: The difference select instructions are shown in decoded form.

OUTPUT SIGNALS

The X 1210 supplies the following output signals:

- Index signal : a pulse generated once per disk revolution.

- Sector signal : pulses generated 16 or 24 times per disk revolution, dependent on the type of the cartridge used.

- Unit ready signal : this indicates that the X 1210 is ready to operate i.e. a cartridge has been inserted, the drive is locked in the rack and the disk has been run up to speed.

- On cylinder signal: this indicates that the heads have been positioned and stopped.

- Unit unsafe signal: this indicates a fault condition due either to a wrong input command or to failure within the X 1210.

Specifications

Recording technology

recording method	double frequency
recording medium	standard oxide coated 14 inch disk
bit density	2200 bits per inch (innermost track)
track density	100 tracks per inch
number of read/write heads	2
number of tracks per surface	200 (with 4 spare)
data transferrate	833 Kbits per second
disk speed	800 revolutions per minute

Recording capacity

capacity without formatting	62500 bits nominal per track 25×10^6 bits per drive
formatting	16 or 24 sectors available, depending on cartridge

Error rate

recoverable errors	1 in 10^{10} bits

Access times

head positioning (including head settling)

track-to-track	50 milliseconds
full stroke (200 tracks)	260 milliseconds
random average	125 milliseconds
average rotational delay	37,5 milliseconds

Start/Stop time

start sequence	10 seconds
stop sequence	5 seconds

Environmental conditions

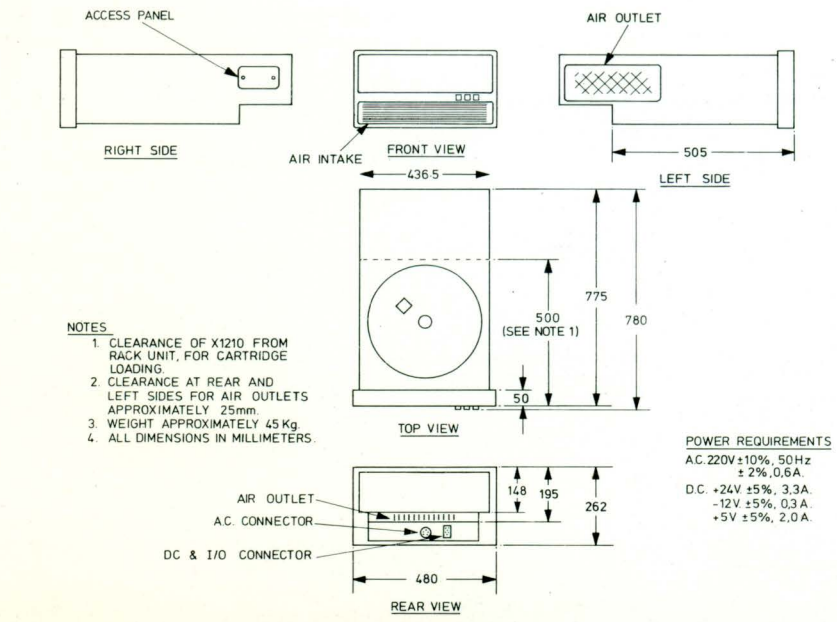
temperature

operating	+10 to + 32 °C
non-operating	- 15 to + 65 °C

relative humidity

operating	20 to 80 %
non-operating	5 to 85 %

INSTALLATION



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