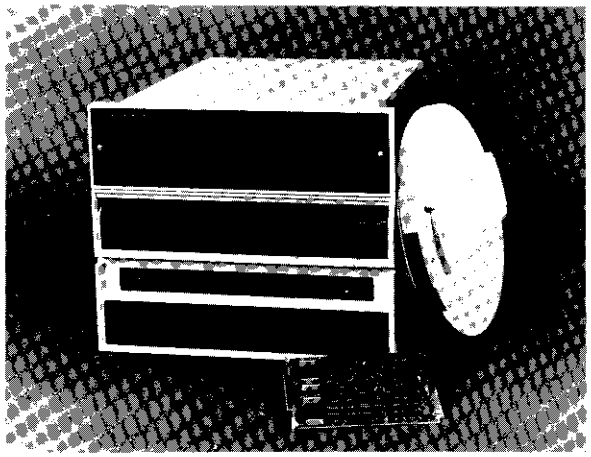
12962A Cartridge Disc Subsystem



HP's latest high performance disc storage subsystem offers both increased thruput and capacity. The 12962A consists of a 15 megabyte disc drive, Storage Control Unit, and interface card for a 2100/21MX Series CPU. The drive and Storage Control Unit (SCU) have built-in power supplies. Only one I/O slot is required to interface to a 2100/21MX Series CPU.

Features

- 15 megabytes of usable storage available in 15.7 inches (39.9 cm) of rack space
- 10 megabytes removable in a convenient, inexpensive front loading cartridge.
- Fastest access cartridge disc available
- Designed to operate in demanding environments
- State-of-the-art serviceability features
- Microprocessor based storage control unit with:
  - Multi-access from up to eight CPU's
  - Up to eight disc drives per storage control unit
  - Error correction for enhanced data reliability
  - Macro I/O operations for increased systems thruput

The 12962A offers increased capacity and high performance in a convenient front-loading cartridge subsystem. Capacity ranges from 14,745,600 bytes to 117,964,800 bytes per subsystem (1 to 8 drives). One to eight CPU's can access the data base in redundant or distributed systems where the operating system supports such a configuration. Note: Although all hardware capabilities are discussed here, actual HP operating system support of those functions may vary between operating systems and/or subsequent releases of those systems.

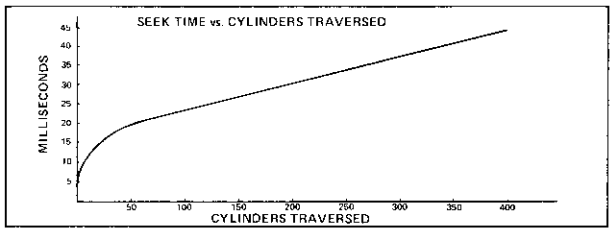
DISC DRIVE (7905A)

Capacity

Data is stored on two sides of the 10 megabyte removable cartridge plus one surface (5 megabytes) of the fixed disc. The remaining surface is used to control positioning of the actuator.

Performance

Voice coil head positioner offers exceptionally fast seek times. Average track to track in 5 ms, Average Random in 25 ms, Maximum Stroke in 45 ms. The 3600 RPM spindle speed yields an average rotational delay of 8.3 ms., which, coupled with high bit density, results in a data transfer rate of 7.5 million bits/sec. (937.5K bytes/sec.).



Typical time required to randomly seek to and read or write 256 byte record	= 33.68 ms
With 12,288 byte record (48 sectors)	= 50.00 ms
With 24,576 byte record (96 sectors)*	= 67.02 ms

*On cartridge. Track index point on under-surface is displaced one sector position from track above.

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Rotational Position Sensing (RPS)
Gives "seek complete" attention only when data transfer can be started immediately. The SCU or channel is not locked up during rotational delay. This can increase system thruput in multiple drive configurations. The amount of RPS "look ahead" can be jumper selected to match I/O system response time.

Built for Demanding Environments
Designed to satisfy HP's Instrument-standard specifications, the 7905A has the widest operating range of any interchangeable drive in the industry. Cartridge interchangeability is guaranteed between drives operating from 50°F to 104°F (10°C to 40°C). Operating altitude is up to 10,000 feet.

Electronically commutated DC motor eliminates all belts and pulleys and generates no RFI. The drive is insensitive to line frequency variations between 47 Hz and 66 Hz. This is particularly useful with smaller power sources (such as mobile motor-generator sets) where line frequency variations are common. Transformer taps are available for the following voltages: 100, 120, 220, 240V, all +5%, to -10%.

A separate blower maintains positive inside air pressure during cartridge change. The absolute filter retains 99% of all particles 0.3 microns or larger and is easily replaced from the front of the drive. This feature aids drive reliability even in dusty environments.

Switches and Indicators
The front operator's panel has six backlit indicators: Unit Select, Drive Ready, Protect-Upper Disc, Protect-Lower Disc, Door Unlocked and Drive Fault. There is one switch, Run/Stop.

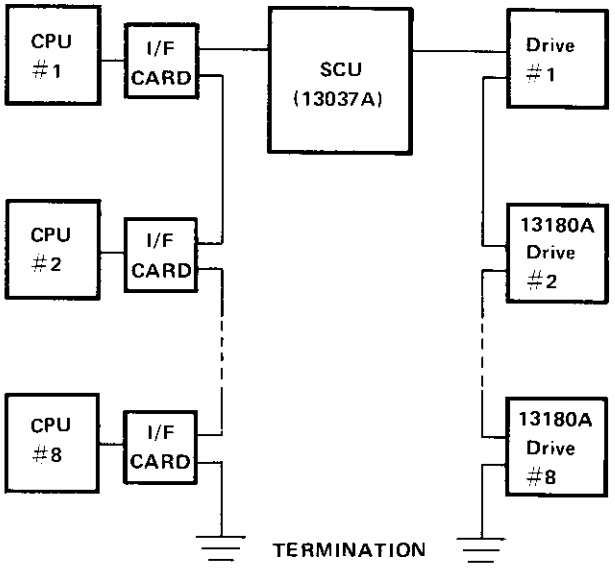
Data Base Protection
There is an additional user panel mounted behind the front screen of the drive. It contains Write Inhibit switches for each disc. These prevent any writing into critical files. There is also a Format Write Switch which can prohibit Format Write operations. The panel also contains a Unit Select switch (0 to 7) and Power On switch.

In the event of power failure, heads are retracted and carriage locked using energy from the filter capacitors plus that from the spindle motor acting as a generator.

STORAGE CONTROL UNIT (13037A)
The following Storage Control Unit features add to the power and flexibility of the 12962A Subsystem:

Multiple CPU s
The 12962A can be interfaced to up to eight CPU s. The I/O interface cards of each CPU are actually linked in a daisy chain from the 13037A. Tri-state lines are used to provide noise immunity and fast signal rise times. Additionally, a "down interface" card causes a disabled CPU to be totally ignored. Should one CPU go down, others in the string are not disabled. CPU s are polled in a true serial fashion. Drives can be reserved and released by individual CPU s under program control. Error information is held for the appropriate processor until cleared by that processor.

Multiple CPU s



Macro I/O Operations
Multiple function commands do not require an interim interrupt to the CPU, which, in many cases, improves processor throughput. For example, in a single CPU configuration, the I/O software may give a Seek command followed by a Read. The SCU initiates the Seek and stores the Read for execution at completion of the seek. No interrupt to the CPU is required between instructions, thereby lowering CPU overhead.

Commands which overflow the track or cylinder necessitating a head switch or a new seek may be handled completely within the SCU without interrupt to the CPU. Operation across cylinder boundaries can be either incrementing or decrementing.

Error Detection and Correction

The Error Correction Code (ECC) hardware increases data reliability by several orders of magnitude. System availability is improved because errors can be corrected faster with a combination of ECC and rereading than with reading alone. Because of ECC, media errors do not significantly affect system performance and the useful life of the media is prolonged.

The ECC hardware and algorithm are together capable of correcting one single-burst error per sector, if the error is of length ≤ 32 bits. Every single-burst error of length > 32 bits but ≤ 48 bits will be detected without being miscorrected. For burst-errors of length > 48 bits, 99.999% are detected.

The ECC sequence

If the 13037A detects an error within a sector, it notifies the CPU at the end of that sector. The CPU then requests the location (displacement) of the error within the sector and three words of mask which are used to correct the record now in CPU memory. The 13037A calculates these masks from information accumulated in special registers. The three words are XOR'd with data in CPU main memory to obtain a corrected record.

Automatic Alternate Track Switching

When a seek reaches a track which has been flagged defective, the 13037A automatically performs the necessary extra seek to an alternate track previously assigned by the operating system. In the event that an additional seek back to the next logical track is required, the 13037A initiates that seek automatically. By leaving control of multiple seeks to the 13037A, interrupts to the CPU are minimized. System overhead is reduced and throughput is increased.

Data Protection

Whenever data is transferred, or track is changed, the address is checked. The programmer may protect any track by inserting a "p" bit in the preamble of each sector of the track during a Format Write. Normal writing is not allowed on tracks so marked.

Recovery of Marginal Data

Should it become necessary to recover data which has been marginally recorded, either because the track is not precisely aligned, or the clock and data are slightly out of phase, the 13037A has an instruction to assist in retrieval. Track Offset positions the head in any of 63 steps on either side of the nominal track position. The clock/data offset portion of the instruction advances or delays the separator clock with respect to the data.

Specifications

CAPACITY

	Formatted - 48 Sectors/Track - 400 Tracks*				
	Data Bits Per	Data Bytes Per	Data Words Per	Sectors Per	TR. Per
Byte	8				
Words	16	2			
Sector	2,048	256	128		
Track	98,304	12,288	6,144	48	
Surface	39,321,600	4,915,200	2,457,600	19,200	400
Cartridge	78,643,200	9,830,400	4,915,200	38,400	800
Drive	117,964,800	14,745,600	7,372,800	57,600	1,200

*The six additional spare tracks/surface are not included in capacity table

SEEK TIME: Track to Track 5 ms (avg)
Average Random 25 ms
Maximum Stroke 45 ms (max)

ROTATIONAL SPEED: 3600 RPM
Average Rotational Delay: 8.3 ms

RECORDING: 4680 bits/inch (inside track)
192 tracks/inch
406 tracks/surface, guaranteed usable.

DATA TRANSFER RATE: 7.5 million bits/sec
937.5K bytes/sec

CARTRIDGE CHANGE
Spindle Stop Time: 25 sec.
Spindle Start Time: 30 sec.

ACTUATOR
Voice coil actuator with velocity feedback and position feedback from top surface of fixed disc.

INTERCHANGEABILITY
Any disc written on any 12962A within its operating specifications may be read on any other 12962A operating within that range.

POWER REQUIREMENTS
100, 120, 220, 240V, all +5%, -10%
Single phase, 47 to 66 Hz
7905A 500 watts (1707 BTU) at 120V/60 Hz
500 watts (1707 BTU) at 220V/50 Hz
13037A 175 watts (648 BTU) at 120V/60 Hz
200 watts (683 BTU) at 220V/50 Hz

ENVIRONMENTAL CONDITIONS
Operating: 50° to 104°F (+10°C to +40°C)
8% to 80% R.H. (non-condensing)
Wet bulb temp $\leq$ 78°F (25.5°C)
Non-operating: -40°F to +149°F (-40°C to +65°C)
5% to 95% R.H. (non-condensing)
Wet bulb temp $\leq$ 78°F (25.5°C)
Altitude:
Operating: Sea Level to 10,000 ft.
Non-operating: 1000 ft. below Sea Level to 25,000 ft.
Tilt: ±30° about either horizontal axis

PHYSICAL CHARACTERISTICS

Weight: 7905A: 162 lbs. (73.5 kg)
13037A: 35 lbs. (15.9 kg)

Dimensions:

7905A - Panel Height 10.44 in (26.52 cm)
Width 18.91 in (48.03 cm)
17.38 in (44.15 cm)
(behind panel)
Depth 28.00 in (71.12 cm)
(behind panel)

13037A - Panel Height 5.25 in (13.34 cm)
Width 18.91 in (48.03 cm)
16.75 in (42.55 cm)
(behind panel)
Depth 22.69 in (57.63 cm)
21.55 in (54.61 cm)
(behind panel)

Cable Lengths: Drive to drive or drive to SCU is 12 ft. CPU to SCU is 18 ft.

ORDERING INFORMATION

12962A*: Cartridge disc subsystem for 2100/21MX Series Systems
12962A-015: Provides 220/240V, 47-66Hz option
13180A: Second to eighth drive. Includes drive, cartridge, rack slides and cable.
13180A-015: Provides 220/240V, 47-66Hz option
13178A: 2000-Series Multi-CPU interface kit. Includes interface card (without termination) and necessary cables and connectors to attach 2nd through 8th 2100/21MX-Series CPU. One kit required per added CPU.
12940A: Formatted Disc Cartridge.

*Prerequisite: Dual Channel Port Controller (21MX) (12897A) or DMA (2100A) (12895A)

HARDWARE SUPPLIED

12962A includes disc drive, cartridge, storage control unit, 2100/21MX Series interface card, rack slides and cables.

SOFTWARE SUPPLIED

Diagnostics (12962-16001)

DOCUMENTATION SUPPLIED

12962A Installation and Service Manual (12962-90003)
7905A Disc Drive Operator's Manual (07905-90009)

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Sales and service from 172 offices in 65 countries.
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