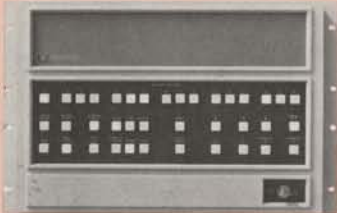
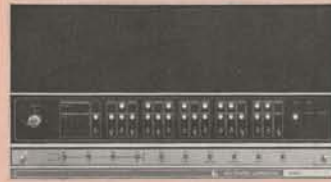


DEC 17 1974



Computer Operations, Inc.



**LINC TAPE II-
DIRECT ACCESS MINI-COMPUTER MASS STORAGE SYSTEM**

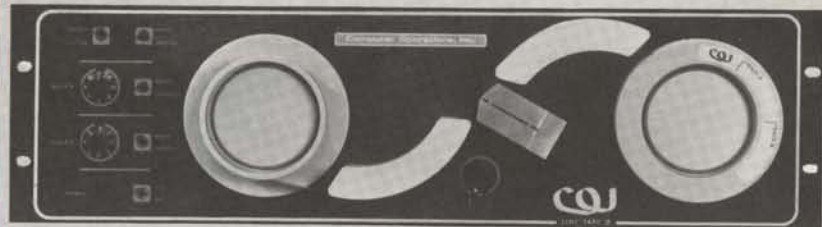


Introduction

LINC Tape II offers the mini-computer user a reliable, economical, mass storage device. Four inch reels of $\frac{3}{4}$ " wide magnetic tape are used to store 671,744 bytes of data in blocks of 512 bytes. Any individual block(s) can be selected for reading or writing. Thus, LINC Tape II has the addressing characteristics of a disc combined with the convenience of small, pocket sized, removable reels.

LINC Tape II is plug compatible with over ten popular mini-computers. Each LINC Tape II is supplied with necessary cables, power supplies, interfaces, etc. Complete Operating Systems supporting assemblers, FORTRAN compilers, BASIC interpreters, text editors, loaders, file utility routines, etc. are available for seven of these computers.

These Operating Systems utilize LINC Tape II in lieu of paper tape or cassettes for a five times increase in throughput. Hundreds of programmers are successfully using LINC Tape Operating Systems to develop software for their mini-computers.



Features

- Bi-directional direct access to any block on tape
- Fast 8,400 bytes/second transfer rate
- 671,744 bytes/reel (almost three times the capacity of floppy disc)
- Any block or string of blocks may be read or *written*
- Plug compatible with over 10 popular mini-computers
- Field proven software operating systems
- Expandable up to 8 transports on one controller for 5,373,952 bytes
- Ultra-reliable tape transport and electronics
- Ideal for shock and vibration prone environments
- Power failure/automatic restart for unattended applications
- Operator switchable unit select
- 100,000 tape passes guaranteed
- Redundant mode for industrial environments
- Immune to wide power variations
- Guaranteed tape interchangeability

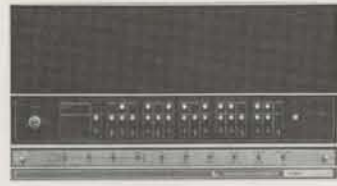
Applications

LINC Tape II is used for a variety of applications including:

- Program loading
- Data logging
- Disc backup
- Program compiling and assembling
- Text editing
- Bootstrapping a "dead" computer
- Business systems

AVAILABLE LINC TAPE II/MINI COMPUTER CONFIGURATIONS

Data General/Rolm



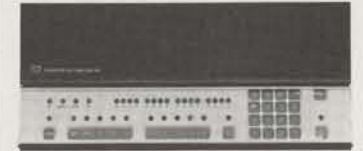
LINC Tape II for the Data General Nova and Rolm militarized series computers is available in two models: Programmed I/O or Data Channel. The programmed I/O model uses the usual Done/Busy logic and the accumulators while the data channel model frees up the computer in a real-time environment while LINC Tape is in motion. No slots within the computer are utilized as the physical connection is through the external I/O bus. A complete operating system is supplied which supports D.G. FORTRAN IV, Extended BASIC, Extended Assembler, Extended Relocatable Loader, Text Editor, Library File Editor, and RTOS. Software is also available to support LINC Tape II under RDOS.

Interdata



LINC Tape II is available for the Interdata 70, 74, 7/16, and 7/32 computers. No card slots within the computer are used; a COI supplied cable attaches to the rear of the backplane. Either the multiplexer or selector channel can be used for communications between the computer and LINC Tape. A LINC Tape version of BOSS is supplied that incorporates a named file directory. Interdata software including TIDE, the assembler, the general loader, BASIC, and FORTRAN IV and its library is fully supported by the LINC Tape BOSS program generation system. A single 5-1/4" high enclosure houses the first transport, controller, and power supply. Up to 7 slave transports can be added to the master unit.

Computer Automation



LINC Tape II for the Alpha 16 and LSI-2 mini computers uses a single 1/2 width card to interconnect the I/O bus. Either programmed I/O or interrupt I/O can be used to communicate between the computer and LINC Tape. An operating system exists that will support a powerful text editor, the Beta assembler, and the Lambda loader to facilitate the program development process. LINC Tape II, under this operating system, is used to store all files by using a named file directory. Paper tape is eliminated from the program development cycle and a throughput increase of five times is realized using LINC Tape.

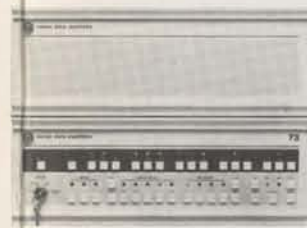
Digital Equipment Corp.



PDP-8

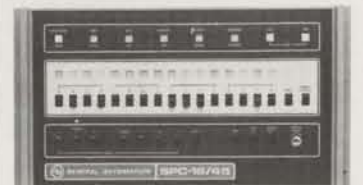
LINC Tape II for the PDP*-8e(a/f/m) computer is 100% plug compatible with Digital's TC08/TU55-56 DECTape* mass storage system. This is the data-break version of the DECTape and frees the PDP-8e for other tasks during tape I/O operations unlike the TD-8/e programmed I/O DECTape system. The LINC Tape II for the PDP-8/e is 100% compatible with existing DECTapes, the Omnibus*, and all DEC diagnostics and software including OS-8. The KA-8/e positive bus converter and KD-8/e data break cards are *not* required. The LINC Tape II is only 5-1/4" high and includes the first transport, controller, and power supply. A single interface card that plugs into any Omnibus slot is supplied. The LINC Tape II in dual track mode stores 379,518 12 bit words/reel, twice the capacity of a standard DECTape.

Varian



LINC Tape II plugs into any Varian 620 series or 70 series computer through a single I/O card that mounts in the mainframe or I/O chassis. Either programmed I/O or DMA can be used for data transfer. The DMA model requires a Varian BIC card. A simple nine instruction bootstrap loads an 8K computer in two seconds. An operating system supporting the DAS assembler, a powerful text editor, AID, and a named file maintenance system is supplied. A 5-1/4" high rack mountable enclosure houses the first transport, power supply, and read/write electronics. Additional slave transports also occupy 5-1/4" of rack space.

General Automation



LINC Tape II for the SPC-16 uses the DMAC feature to implement direct memory access. A single card controller mounts in any available I/O slot. A five-foot cable between the I/O backplane and the LINC Tape II transport is supplied. A software driver for use under GA's disc operating system is available that makes LINC Tape II appear to be an additional disc drive. Thus LINC Tape can be used for convenient storage of user files under DOS and for disc backup. A single 5-1/4" high transport also houses the power supply and read/write electronics. Up to 7 slave transports can be added to the master unit.

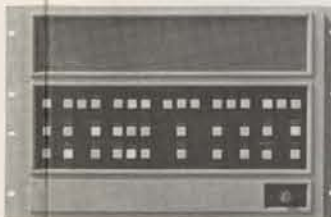
Digital Equipment Corp.



PDP-11

LINC Tape II for all DEC PDP-11* computers is 100% plug compatible with DEC's TC11/TU56 DECTape* system. An eight-foot Unibus* cable is supplied to mate with the PDP-11 and provision is made to extend or terminate the bus at the LINC Tape. A 5-1/4" rack mountable enclosure houses the first transport, controller, and power supply. Up to seven additional slave transports can be added to the master unit. The LINC Tape II in dual track mode stores 294,912 16 bit words/reel, twice the capacity of a standard DECTape. All of DEC's diagnostics and operating systems that support DECTape also support LINC Tape II without *any* changes. This includes RT-11, RSX-11D, DOS-11, RSTS, etc. The CO-1000-D-11 utilizes DECTapes as supplied by DEC or COI and can format blank tapes.

Hewlett-Packard



LINC Tape II plugs into any Hewlett-Packard 2100 series computer through a single circuit card supplied by Computer Operations, Inc. Either programmed I/O or interrupt driven I/O can be used to read and write LINC Tape. Up to three slave drives can be added to the master unit. A complete operating system is supplied supporting PCS, BCS, BASIC, FORTRAN, the assembler, editor, and a named file maintenance system. Program generation can be performed with a five times improvement in throughput over paper tape operation. The ruggedness of H-P computers make the LINC Tape an ideal match in hostile environments.

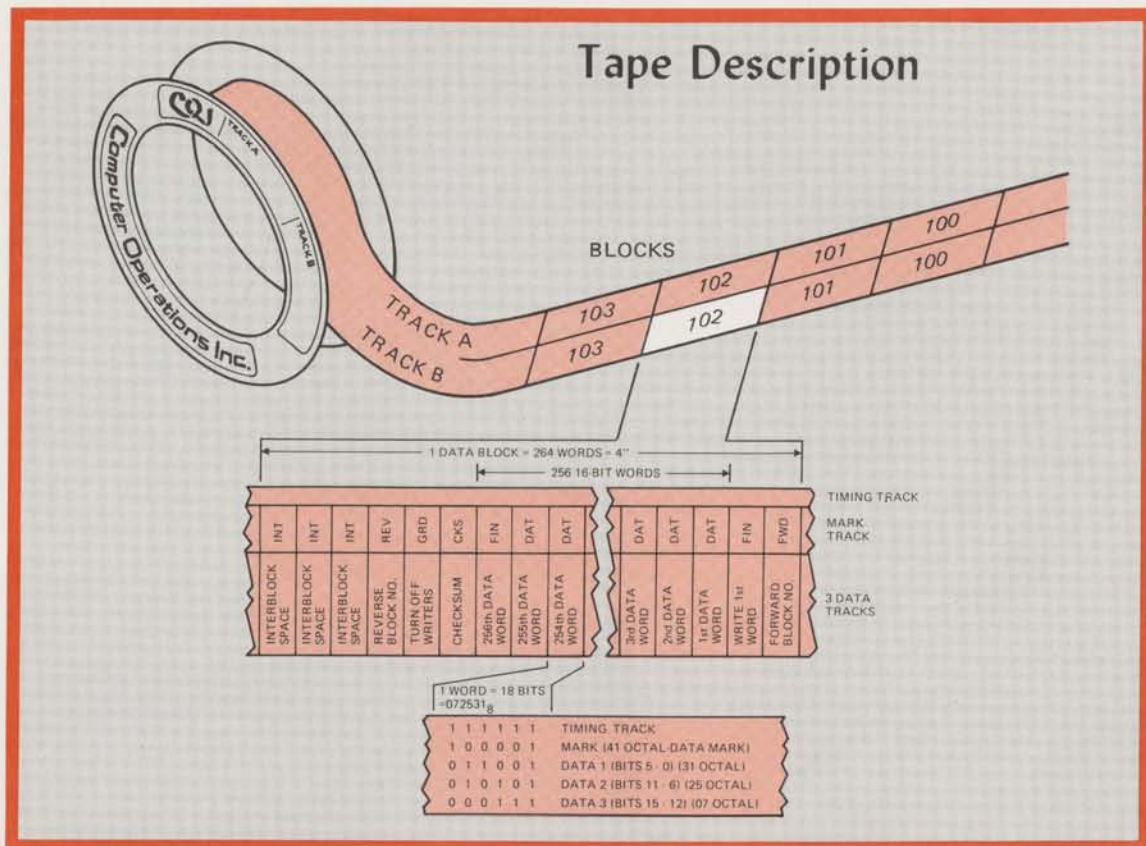
Honeywell



LINC Tape II for the Honeywell 316/516 digital computers connects to the computer through two cables that attach to the end of the I/O bus chain. Provision is made to either terminate or extend the bus to other devices. The programmed I/O feature of the 316/516 is used for all LINC Tape/computer communications. A short bootstrap and a LINC Tape Keyboard Executive routine are supplied to facilitate rapid program loading and dumping. Up to three additional slave transports can be added to the master unit.

*DECTape, PDP, Unibus, and Omnibus are registered trademarks of Digital Equipment Corp.

Individual Data Sheets and Manuals are Available on any of these LINC Tape II/Mini Computer Configurations. Please Contact Us for Additional Information.



The unique direct addressability of the LINC Tape II is due to the use of permanent timing (clock) and mark tracks to locate each type of information stored in the data tracks. A pair of block numbers in every LINC Tape block is used to bi-directionally locate the area of interest. Once a block is located, the data within that block is either read or written. During writing, a sixteen bit algebraic checksum of the data in a block is generated and written at the end of the block. To verify data, the words in a block are added as they are read and the resultant sum is compared with the previously written checksum. This insures that the information just read is correct.

The ten physical tracks of a LINC Tape are divided as follows: The outer two tracks are redundant timing tracks wired in series. The composite output of the timing tracks is used to strobe the mark and data tracks. The mark tracks are also redundant and are adjacent to the timing tracks. The mark track is used by the LINC Tape controller to differentiate between block numbers, data words, checksum words, and various control information permanently recorded on the tape. The six data tracks contain the permanent block numbers and the variable data and checksum information. In the A/A mode, all data bits are recorded redundantly, i.e., a 3 bit data word is recorded in two unique positions across the tape.

When played back, the corresponding track outputs are added algebraically since the heads are wired in series. The composite signals are then fed to three read amplifiers for presentation to the controller. A sixteen bit computer word is recorded as six, three-bit frames, with two bits unused.

In the A/B mode or dual track mode, the six data tracks are split into two sets of three tracks. Track A is selected by addressing the drive number corresponding to the upper (Track A) switch setting. Track B is selected by the lower switch. Any drive number 0 through 7 can be used by each track. When operating in the A/A mode, only the Track A switch is effective.

The dual track mode allows doubling the capacity of a standard LINC Tape. A single physical drive becomes two physical drives from a software point of view, as the two halves appear to the software as separate units. There is a separate write protect switch for each track.

Extensive tests have shown that the dual track mode is as reliable as the redundant mode in office and laboratory environments. The redundant mode is advantageous in industrial and field applications where dirt and dust levels are high.

The format of the tapes used on the LINC Tape II System for the PDP-8 and PDP-11 is identical to the format of DECtape described in Digital Equipment Corporation literature.

Specifications for CO-1000 LINC TAPE II



TAPE FORMAT

Block Length:

256 16-bit words per block (can be changed to suit particular application)

Packing Density:

400 bits per inch

Recording Type:

Bi-phase, redundant timing and mark tracks plus six data tracks

Tape Width: 3/4"

Tape Length: 150'/260'

Tape Capacity (dual track mode):

204,800 16-bit words (409,600 bytes) in blocks of 256 using 150' tape

335,872 16-bit words (671,744 bytes) in blocks of 256 using 260' tape

379,518 12-bit words in blocks of 129 for PDP-8 system (260' tape only)

294,912 16-bit words in blocks of 256 for PDP-11 system (260' tape only)

DATA TRANSFER RATE:

4,200 16-bit words per second (8,400 bytes/sec)

TAPE SPEED: 60 IPS

BLOCK TRAVERSE TIME:

63 milliseconds (256 16-bit words per block)

ERROR RATE:

Less than 1 transient (recoverable) error in 10^{10} bits

EXPANDABILITY:

Up to 7 CO-1005 Slave Transports may be added to the CO-1000 Master Unit. (Hewlett Packard and Honeywell LINC Tape II Systems limited to three additional Slave Units.)

POWER REQUIREMENTS:

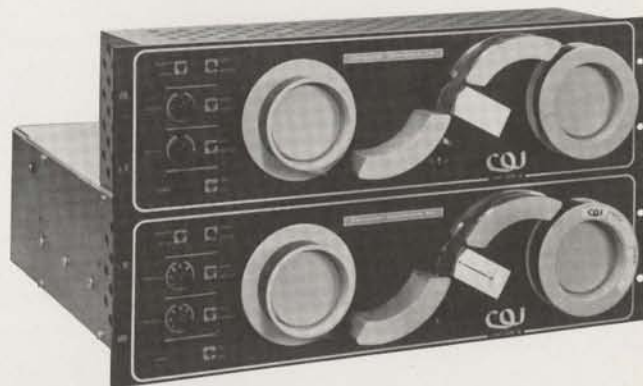
117 VAC $\pm 10\%$, 50 ± 3 or 60 ± 3 Hz (specify), 240 VAC optional

DIMENSIONS:

19 inches wide x 5 1/4 inches high x 16 inches deep - 1 1/8 inches projection from front of panel.

WEIGHT:

Master Unit - 28 lbs. Slave Unit - 10 lbs.



LINC Tape II master drive and slave drive with a total capacity of 1,343,488 bytes. Up to seven slave drives can be added to most LINC Tape II master units.

Tape Compatibility

The LINC Tape format used on all LINC Tape Systems except for the PDP-8 and PDP-11 is unique to Computer Operations, Inc. and is completely interchangeable between computers. The format of the tapes used on the LINC Tape II for the PDP-8 and PDP-11 is identical to the DECTape format developed by Digital Equipment Corporation. These two formats are incompatible and therefore not interchangeable. For example, a LINC Tape generated on a Hewlett-Packard LINC Tape II drive cannot be used on a PDP-8 or PDP-11 LINC Tape II drive and vice-versa. However, a hardware option is available for the Data General/Rolm LINC Tape II Systems which permits DECTapes to be read and written on these computers. DECTape compatibility with all DEC computers is guaranteed with this option. One application is the use of a Data General computer to produce DECTapes for processing on a PDP-10 computer.

Computer Operations, Inc.

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