

TU80 Industry-Standard Streaming Tape Subsystem

digital



The TU80 Brings Low Cost, High Reliability to Midrange Applications.

The TU80 is Digital's lowest cost industry-compatible magnetic tape subsystem for UNIBUS computers. As the perfect complement to Digital's midrange systems and disks, the TU80 offers the lowest cost of ownership and the highest reliability of any Digital-supported nine-track tape drive. Speeds of 25 and 100 inches per second, competitive pricing, compact space-saving packaging, and ease of use provide the ideal match to needs usually found in midrange applications.

The TU80 conforms to the ANSI standard for Phase Encoding (PE) with 1,600 bits per inch on half-inch nine-track tape. As such, the TU80 can read and write tapes for data interchange with other PE tape systems—both Digital's and those of other manufacturers.

Efficient design allows the TU80 and the 121-Mbyte RA80 or 456-Mbyte RA81 to be packaged in a single waist-high cabinet for a fully integrated disk and tape subsystem. This minimal use of floorspace and the drive's exceptionally quiet operation make the TU80 ideal for today's open office environments.

With its streaming tape technology, the TU80 is ideal for applications involving sustained tape input/output such as disk backup, data archiving, or recording data from high-speed test equipment. Yet it also uses traditional start/stop technology for shorter data transfers of the type associated with journaling, transaction processing, and classical data processing.

Highlights

- Conforms to the ANSI standard for Phase-Encoding (1,600 bits per inch on half-inch nine-track tape) and provides a 40-Mbyte capacity (eight-Kbyte block size) on a standard 2,400-foot reel.
 - Optimizes performance with the TU80 controller automatically selecting 25-inches-per-second start/stop, 25-inches-per-second streaming, or 100-inches-per-second streaming based on the CPU data input/output rate. Reads tape in forward or reverse to provide faster overall data retrieval.
 - Offers exceptional reliability through a microprocessor-based servosystem, air bearings, gentle tape handling, and a reduced number of mechanical parts.
 - Provides high data integrity with read-after-write verification and automatic error detection and correction during operation.
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- Designed for ease of use with no required adjustments and no preventive maintenance except for normal head cleaning.
 - Designed for serviceability—with an extensive set of fault-isolating diagnostics and easy access to all field-replaceable units from the front of the cabinet.
 - Human engineered for the office environment—quiet, easy to operate, easy to load, and attractively packaged with space for either an RA80 or RA81 in the bottom of the cabinet.
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Optimized Performance.

The TU80 features an adaptive speed control that automatically selects the speed most appropriate to the CPU data input/output rate. For example, with sustained high performance output, the TU80 automatically streams at 100 inches per second (ips). If, however, the CPU data rate consistently falls below the rate needed to maintain the 100 ips, the drive's microprocessor-based controller automatically changes the speed to 25 ips streaming. Conversely, if the TU80 has been successfully streaming at 25 ips for a predetermined time period, the adaptive speed control raises the speed to 100 ips.

A similar algorithm controls changes between 25 ips streaming and 25 ips start/stop. This ability to revert to more conventional start/stop technology is extremely important since streaming tape drives cannot stop and restart within the ANSI-defined interblock gap. They must first slow to a stop, back up over a section of previously processed tape, await the next command, then accelerate to operational speed by the time they reach the interblock gap. In order to prevent excessive time being spent on this repositioning, the TU80's adaptive speed control automatically changes to the 25 ips start/stop mode when the CPU cannot maintain a streaming data rate.

Enhanced performance also comes from the microprocessor-based controller's ability to read in forward or reverse direction. Combined with the controller's automatic tracking of tape position, this results in faster overall data retrieval with minimal tape movement.

Reliability and Serviceability.

With the TU80—a greatly simplified tape subsystem—most of the mechanical components associated with conventional tape drives have been eliminated. Electronic elements have replaced vacuum columns, tension arms, roller guide bearings, mechanical tension/velocity transducers—even the capstan.

Semiconductor sensors measure the pressure in the cushion of air between the tape and the air bearings to provide an accurate assessment of tape tension. Velocity tachometers on the reel motors sense each reel's speed. The information is continually fed to a microprocessor servosystem that modulates each reel's velocity to maintain constant tape speed and tension across the read/write head.

Typical Disk Backup Time in Minutes

	RA80 (121 Mbyte)	RA81 (456 Mbyte)
VAX-11/780 VMS	30	115
VAX-11/750 VMS	40	150
VAX-11/730 VMS	80	300
PDP-11/70 RSX	40	
PDP-11/44 RSX	45	

The result is extraordinary reliability and user convenience. Digital's electronic controls are inherently more reliable than their traditional mechanical



counterparts. The elimination of these mechanical elements also eliminates the need for adjustments and preventive maintenance.

Finally, gentle tape handling further enhances reliability. The tape contacts only the reels, the heads, and the tape cleaner. Even if a power failure during operation causes a short length of tape to unwind, the drive will take up tension slowly and gently, before accelerating to speed.

To reinforce user confidence, self-test diagnostics automatically check the drive and controller for proper functioning each time the TU80 is powered on and during rewind. User diagnostics that exercise the TU80 and check the overall operation are easily initiated through dedicated front-panel diagnostic switches. Should errors be found, LED indicators display error codes that, in many cases, define operator-correctable conditions.

Should a malfunction occur, the TU80 has extensive diagnostics to isolate and quickly identify the failure. It also has several features that enable fast and effective repair. Resident microdiagnostics, accessible from the front panel, help a service representative quickly isolate an error. In addition, host diagnostics on both VAX and PDP-11 systems are available to thoroughly test the entire TU80 subsystem. Any component that needs replacement can be easily reached from the front of the cabinet.

Data Integrity.

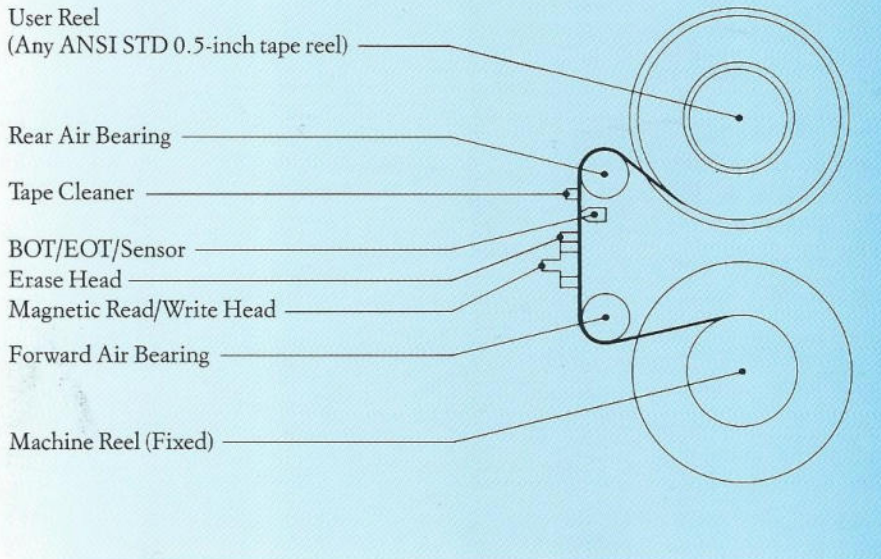
The TU80 is designed for very high data integrity, with specifications that call for *no* write errors and extremely rare read errors.

The TU80 performs a read-after-write check to ensure that each bit written is verified immediately after it has been recorded. Vertical parity is checked, character by character, when reading and writing.

The TU80 further ensures data integrity by using standard Phase Encoding algorithms to make single-track error corrections. If the drive cannot successfully read a data block, it will retry reading in both forward and reverse and can frequently retrieve the data by this technique.

In the rare event of an unrecoverable error, the TU80's controller alerts the CPU immediately. Data reliability tests, available on VAX and PDP-11 processors, can then be used to examine the error rates and data integrity and to help identify the problem.

The TU80's simple tape path



Ease of Use.

The TU80 has a simple 13-inch tape path for fast manual loading. This is the shortest of any ANSI-compatible tape product in the industry. Loading the TU80 involves simply:

- Taking the tape off the supply reel
- Guiding it around an air-bearing and across the tape head assembly
- Guiding it around a second air-bearing onto the take-up reel

Complementing the easy tape handling process is a conveniently located membrane control panel with touch-sensitive switches.

The TU80 is also easy to install on any UNIBUS system. The controller requires only one quad slot in the CPU backplane, and is compatible with the TS11 so that no software modifications are needed.*

Low Cost of Ownership.

The TU80, with its competitive pricing and the lowest maintenance cost of any of Digital's industry-standard tapes, has a substantially reduced cost of ownership as compared to other tape drives. The TU80's low power consumption and cooling requirements also contribute to the drive's low operating cost. For example, the TU80 uses only $\frac{1}{4}$ the power and generates $\frac{1}{4}$ the heat of the TS11. These two factors alone can save you 5 to 10 percent of the cost of the drive per year.

Whatever your tape processing needs—disk backup, archiving, data interchange between systems, or journaling—the TU80's high technology and simple but elegant engineering make it a reliable performer that is easy to use and inexpensive to own.

For More Information . . .

For more information about the TU80 and other reliable, high performance mass storage products, contact your local Digital representative.

*This is true for current versions of Digital's operating systems, but may not apply to certain older versions. Consult your sales representative to be sure that you have an operating system release that will support the TU80.

Specifications

Performance

Read/Write Speed	25 ips, start-stop 25 and 100 ips, streaming
Max Data Transfer Rate	160 Kbytes per second
Average Rewind Speed	192 ips
Rewind Time	2.5 minutes (2,400-ft reel)

Data Organization

Number of Tracks	9
Recording Method	Phase Encoded to ANSI Standard X3.54-1976
Recording Density	1,600 bpi
Capacity	40 Mbytes (Kbytes block size)
Recording Medium	0.5 in magnetic tape, conforms to ANSI Standard X3.40-1981
Reel Diameter	10.5 in (26.67 cm), 8.5 in (21.59 cm), 7 in (17.78 cm)
Interface	UNIBUS TS11 software compatible

Operating Environment

Temperature Range	15 to 33 °C (59 to 90 °F)
Relative Humidity	20 to 80%
Max Wet Bulb	25°C (77°F)
Max Altitude	3,000 m (10,000 ft)
Max Acoustic Noise	51 dBA

Power Requirements

Standards	UL listed CSA certified FCC Class A compliant
Voltage	120 Vac @ 60 Hz 240 Vac @ 50 Hz
Phase	Single
Power Consumption	300 W standby, 500 W max
Max Heat Dissipation	1,024 Btu/hr
Power Plug	60 Hz—NEMA 5-30 50 Hz—NEMA 6-15P
Cable Length	7.4 m (24 ft) Provides 20 ft intercabinet distance

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Specifications (cont.)

Physical Dimensions

Height	105.7 cm (41.64 in)
Width	53.9 cm (21.25 in)
Depth	76.2 cm (30 in)
Weight	102.5 kg (225 lb)
Mounting	Horizontal, in dedicated cabinet Space available for 10.5-in rack-mounted RA80 or RA81

Configuration Rules

Components	Subsystem includes: Cabinet Horizontally mounted drive Power controller UNIBUS adapter module with cables 24 ft shielded intercabinet cables User's manual Reel of tape
Max Drives Per Controller	1
Max Controllers Per CPU	4
UNIBUS Loads	1.8 ac 1.0 dc
Current Drawn (dc)	4 A @ 5 V
Mounting Requirements	1 quad slot