

TA79 and TA81 Magnetic Tape Subsystems

A Shared Resource with Enhanced Performance to Complement VAXcluster Systems

digital



Now You Can Have the Best in Tape Subsystems for Your VAXcluster System

Digital's two HSC-based tape subsystems – the TA79 and TA81 – offer significant advantages to VAXcluster System users, and allow you to select the performance you need and a price that fits your budget. The TA79 is the high-performance, top-of-the-line subsystem that incorporates major enhancements for reliability and operator convenience. The TA81 offers midrange price and performance and extraordinary reliability. Both units offer dual-density recording and outstanding data integrity.

Both subsystems act as shared resources, available to users anywhere in the cluster. Assuming that your cluster is configured with multiple tape drives, this unique accessibility provides redundancy for increased availability and increases the likelihood of your finding a tape drive free when you need it. And you can enjoy these benefits at lower cost than if you tried to provide them on a series of nonclustered systems. One tape subsystem per CPU goes a lot further in a VAX-cluster configuration.

There are performance benefits as well. By attaching your tape subsystems to an HSC50 or HSC70 Storage Server, you can take advantage of the controllers' Local Backup Utility, which shortens backup time significantly. VMS Backup operations may also show significantly faster performance. You also gain the benefits of the Digital Storage Architecture (DSA), which moves much of the I/O overhead from the CPUs to the HSC Storage Server. This leaves the CPUs free to perform other tasks and helps increase overall system throughput.

DSA also protects your investment by providing product compatibility. With DSA, you can be assured that future expansion will be less costly in both time and dollars.

Highlights

Both the TA79 and TA81 tape subsystems:

- Allow increased availability and reduce the likelihood of multiple users contending for a limited resource.
- Allow high-speed backup to run offline. A local tape utility that runs on the HSC50 and HSC70 Storage Servers reduces backup time without affecting cluster performance.
- Are engineered for high reliability. The new TA79 offers dramatically enhanced reliability and data integrity as compared to its predecessor, the TA78.
- Offer a distinct choice that allows you to select the performance and price that fit your needs and budget.
- Offer outstanding data integrity with read-after-write verification and automatic error detection and correction during operation.
- Are easy to use because they provide automatic tape threading and loading (TA79, TU79) or short manual tape paths (TA81), and conveniently located operator controls.
- Conform to the ANSI standard for Group Code Recording (GCR) (6,250 bits per inch) and for Phase Encoded (PE) recording (1,600 bits per inch) on half-inch, nine-track tape.
- Protect your investment; upgrading TU79 to TA79 or TU81 to TA81 tape subsystems can be done at your site in one day or less.
- Are delivered with a one-year warranty.



Price-performance Choices to Meet Your Needs

Digital offers two tape subsystems for both the HSC50 and HSC70 Storage Servers – each with its own price-performance characteristics – to provide you with a subsystem that meets your needs. The *Relative Backup Performance of Clustered and Local Tape Subsystems* chart (see page 4) graphically compares the backup performance of the TA79 and TA81 with their nonclustered counterparts.

Common Attributes and Flexibility

Both TA tape subsystems offer common attributes that allow you flexibility in their use.

- Flexibility in applications – Both subsystems can be used as data interchange, data acquisition, and software load devices. And both are excellent backup devices.

- Flexibility in configuration – The HSC5X-CA interface module has four ports – not just one. This means you need not buy a separate module for each subsystem. And TA79 and TA81 subsystems can be mixed on the same interface module.
- Flexibility in recording format – Both subsystems record and read in either Phase Encoded (PE) or Group Code Recording (GCR) formats (1,600 or 6,250 bits per inch).

As dual-density drives, these subsystems can read and write industry-standard tapes for interchange with other tape subsystems – both Digital's and those of other manufacturers. When recording in GCR format, these subsystems have a capacity of 145 megabytes per reel, using 8-kilobyte records; maximum capacity is 167 megabytes, using 64-kilobyte records.

These desirable attributes are common to both subsystems. However, there are significant differences in performance and, of course, price. Choose the one that best fits your needs.

The TA79 Tape Subsystem – Digital's Newest High-performance Choice

The TA79 is the high-performance subsystem and is packaged with its own data formatter and power supply – in a single cabinet. The sophisticated start/stop design of the TA79 provides

the flexibility to handle a wide variety of applications with ease. Because of the start/stop design, it is well suited for journaling and transaction processing applications and provides maximum performance in backup operation as well. The TA79 is based on the proven design of the TA78 and has been re-engineered for significantly enhanced reliability.

Re-designed read/write electronics dramatically reduce the TA79's soft error rate and thus improve read/write data reliability. These changes also improve the drive's ability to read tapes of marginal quality and make the drive less sensitive to media changes. Mechanical changes (re-designed card cage, improved door, and a new power supply) as well as the new electronics enhance the drive's reliability, reduce the need for Field Service adjustments and make repairs easier. The net result is higher drive availability and lower cost-of-ownership for you. In addition, operators will enjoy the drive's new fast-access tape loading window and its enhanced autoloader capability for full-sized reels.

As many as three TU79 slave tape transports can be attached to each TA79 master tape subsystem. These add-on drives are functionally identical to the TU78 slave tape drives now in the field. This protects your investment by allowing you to connect any TU78 slave you now have to the newer TA79 master tape subsystem, and also allows you to attach the new TU79 slave onto an existing TA78 string.



The TA81 Tape Subsystem – The Economical Midrange Choice

The TA81 is Digital's midrange, HSC-based magnetic tape subsystem. Because it is a streaming tape drive, the TA81 is mechanically simpler than the TA79. The TA81, therefore, costs less to own and maintain. Efficient design allows the TA81, with its formatter, to be packaged in a single waist-high cabinet with room left over for a disk drive in the same cabinet.

With its streaming tape technology, the TA81 is ideal for applications involving sustained input/output such as high-capacity disk backup, data archiving, or recording from high-speed test equipment. It can also use traditional start/stop technology for the slower data transfers associated with journaling, transaction processing, and classical data processing. This low-speed start/stop function is useful for limited activity of this type, but heavy transaction-processing applications are better served by the high-speed TA79 subsystem.

Tape Resource Sharing for Greater Accessibility and Availability at Lower Cost

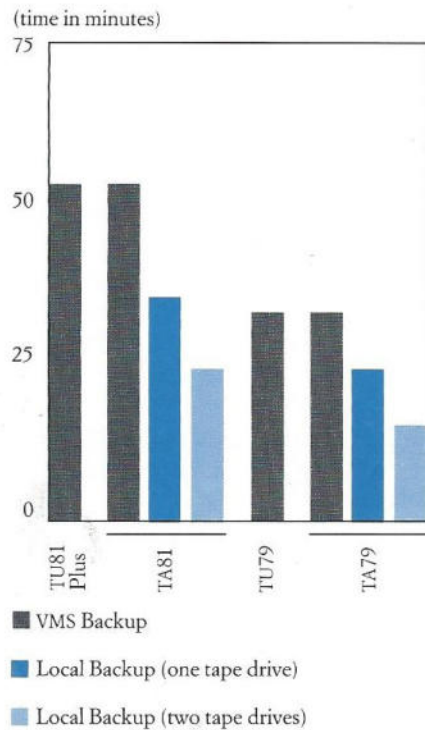
The TA79 and TA81 subsystems provide a fast, shared-access resource for all VAXcluster System users. The ability to share resources is exceptional because the TA79 and TA81 are connected to the HSC50 or HSC70 Server, using DSA interconnects and protocols. The server operates as a specialized, independent node in the cluster, performing many I/O functions and leaving the host CPUs free to perform other tasks.

Resource sharing provides many benefits—but the two most important ones save you time and money. When multiple tape drives are shared via the HSC server, rather than being local to a single CPU, there is less likelihood of multiple users contending for a single drive, and more likelihood that you can access a drive when you need it. You also save time in the event that a tape drive malfunctions. Rather than waiting for repairs to be completed, you can generally access a functioning drive and complete your application.

To provide these benefits with locally attached drives, you would need two tape transports per CPU. In the cluster environment, one HSC-based tape drive per CPU gives you equal or better availability at significantly lower cost.

For even greater availability and performance, the tape subsystems can be divided between two HSC5X-CA modules instead of all being connected to a single module.

Relative Backup Performance of Clustered and Local Tape Subsystems



This data represents RA81 backup on a range of VAX systems using HSC Local Backup or VMS Backup (with VMS switches used to optimize performance). See text for details. TU81-PLUS tape subsystems were paired with UDA50-based disks, and TA drives were paired with HSC-based disks. Performance on your system may vary based on several parameters, but you can use this data as a guideline to relative performance.

Dramatically Increases Local Performance

The HSC Storage Servers support a unique utility that allows them to maximize tape drive performance and to back up or restore a disk at very high speed. Because this Local Backup and Restore utility does not involve the host CPUs, it is possible to perform backup with virtually no effect on the other operations of the cluster. Similarly, the backup operation is not hindered by the timesharing activities of the CPUs. Throughout the Local Backup operation, your data is protected by the outstanding data integrity features of the GCR tape formatter, as described on the facing page.

The TA79 and TA81 tape subsystems also support all standard VMS tape utilities but these programs are run under host CPU control. When host-based tape utilities are run, the CPUs use the HSC50 Server as an intelligent controller. Several VMS switches can also be used to optimize the performance of VMS Backup without compromising data integrity, when operating at 6250 bits per inch density (GCR mode). The settings used to generate the performance graph included Buffer = 5/NOCRC/Block Size = 16 kilobytes.

In Local Backup, a physical copy of a disk is written to tape. The copy is a block-for-block transfer with no data compaction or file reorganization. Local Backup and Restore runs on either HSC Server, with no involvement of the host CPUs, and can access any disk and tape drives on the same HSC Server. The utility program is extremely fast and can back up an RA81 disk in 15 to 25 minutes using a TA79 tape subsystem. The chart depicting backup performance shows the impact of the Local Backup utility.

For optimum performance, two tape drives can be used. This arrangement allows the HSC Server to run backup continuously – writing to one tape drive while rewinding the other – so that no operating time is lost for rewind or reel changing.

During the local backup operation, the disk and tape drives involved in the data transfer are under HSC control and are unavailable to the host CPU. However, any other disk and tape drives on that HSC are unaffected and are fully available to the CPU. Therefore, most of the cluster's operation can continue while backup is taking place. To eliminate even this minor effect, you can use Local Backup in conjunction with VMS Shadowing. Full cluster operation can continue with one member of a shadow set while Local Backup uses a second member. The Local Restore utility reverses the entire operation, copying data block-by-block from the tape subsystem to a disk subsystem.

Backup Performance Highlights

- Optimized switch settings provide up to 100 percent performance improvement when operating in GCR mode (6250 bits per inch).
- The TA79 provides approximately twice the performance of the TA81.
- TA81 tape subsystems perform up to 50 percent faster than TU81s, and approximately the same as TU81-PLUS drives.

Outstanding Data Integrity

Constant data checking and error correction in both recording modes ensure outstanding data integrity. Both the TA79 and TA81 perform read-after-write verification to ensure each bit written is verified immediately after it is recorded. Vertical parity is checked, character-by-character, at both densities when reading and writing. Data integrity on both the TA79 and TA81 is further ensured by recording Error Correcting Code (ECC) and Cyclic Redundancy Check (CRC) characters on the tape when in GCR mode. The tape subsystems use this extra information to make single- and double-track error correction without CPU intervention. Electronic enhancements in the TA/TU79 further reduce the number of soft (correctable) errors, thus improving data throughput and trouble-free operation.

Unrecoverable errors rarely occur. However, if one should occur, the tape subsystem alerts the HSC Server. To facilitate rapid repair, diagnostic software in both the tape subsystem and the HSC Server can be used to locate the problem. Diagnostics are run offline without any CPU involvement and have minimal impact on the cluster's operation.



Easy to Use and Maintain

For ease-of-use, the TA79 features automatic loading, and the TA81 has a 13-inch tape path for fast manual loading. (This is the shortest tape path of any of the industry's ANSI-compatible tape products.) All operator controls are conveniently located on the front panel. The controls on the TA81 are touch-type membrane switches.

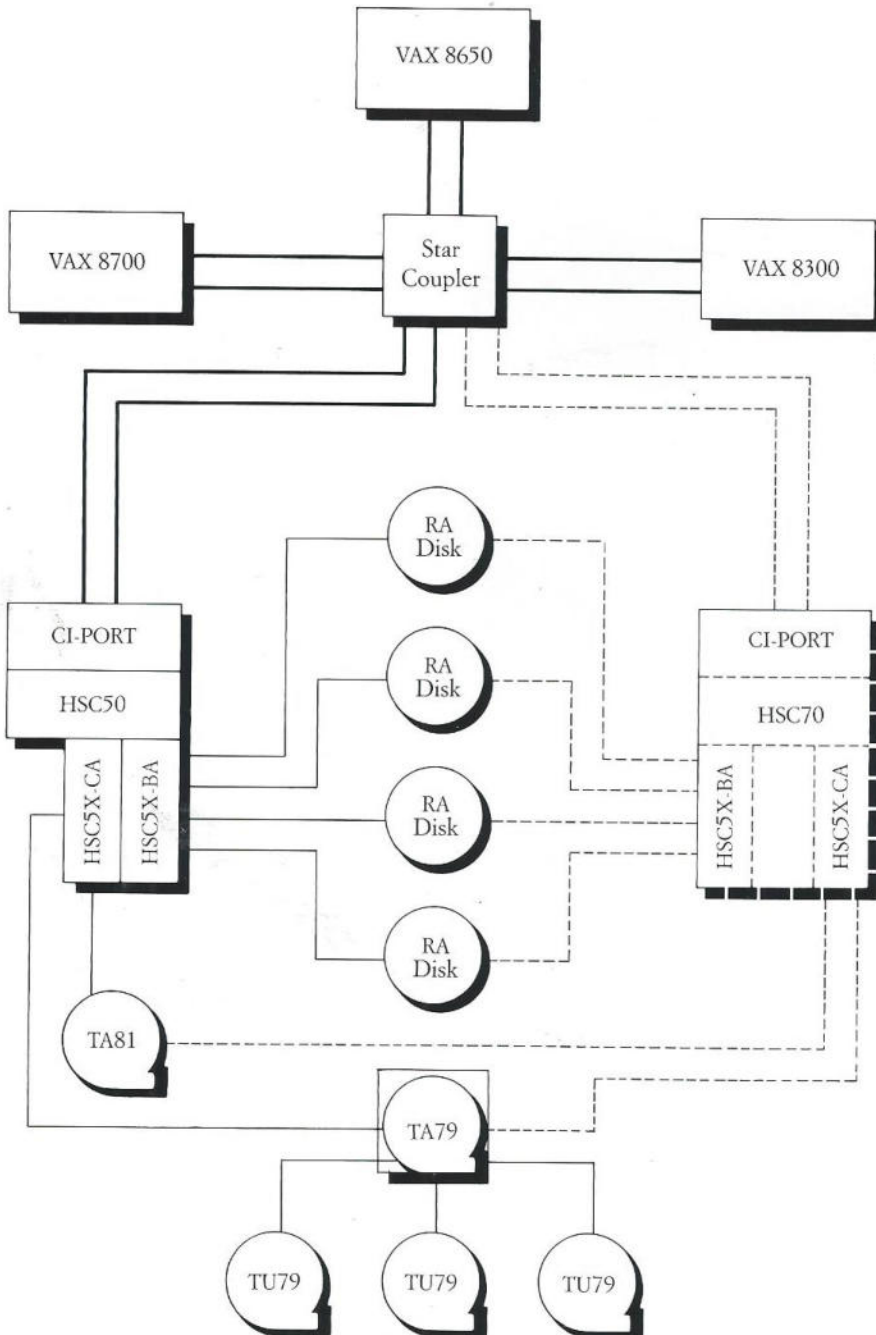
Both models are designed for simplified maintenance and ease of service. Both the TA79 and the TA81 have built-in diagnostic software and allow rapid access to all field-replaceable modules. The TA81 needs no adjustment or preventive maintenance except for routine, customer-performed head cleaning. Both subsystems have

a diagnostic port that allows a handheld terminal or any ASCII terminal with a serial line interface to be connected to it. With the terminal, a field service engineer can monitor the subsystem's status, exercise the subsystem, and analyze fault conditions.

The TA79 and TA81 are designed for high reliability by eliminating troublesome and short-lived mechanical components and replacing them with solid-state components. Both subsystems are designed to reduce mechanical wear and to help protect the tape from damage and excessive wear. At powerup, the tape subsystems run self-test diagnostics and report any detected problem so that it can be corrected before the drive is needed. The TA79 also runs these tests when no tape is mounted.

Upgrade Kits Protect Your Investment

TA79 and TA81 upgrade kits protect your storage system investments. You can buy a stand-alone VAX System now, upgrade to a VAXcluster System later, and yet retain and use the original tape subsystem peripherals. All that needs to be done is install upgrade kits to your TU79 master or TU81 subsystems. The kits let you convert from TU to TA configuration quickly and easily. The kits contain all that is needed to upgrade the subsystems. If your present system configuration has no HSC-based tape subsystems but does have an HSC Server, you will need the HSC5X-CA tape interface module for your first TA subsystem. It takes about one working day (or less) to install a kit.



One Possible VAXcluster Storage Subsystem

Configuration Parameters

Both the tape units and the HSC Servers offer significant flexibility in configuring your mass storage subsystem. This allows you to tailor your system for cost-effectiveness and efficient performance.

Masters and Slaves—A TA79 master tape subsystem contains one TS79 tape formatter and one TU79 tape transport, packaged in a single cabinet. A maximum of three additional TU79 slave transports can be attached to each TA79 master, connecting to the formatter in a radial fashion. In contrast, TA81 subsystems each contain a tape formatter and do not support the connection of slave transports.

HSC Servers—HSC70 Servers support as many as eight I/O channel modules (HSC50 Servers support six channels), each of which contains four ports. A disk module can connect to four disk drives (one drive per port), while a tape module can connect to four tape units — either TA79 masters or TA81 subsystems. Disk drives and tape transports can be mixed on a mass-storage system (HSC50 or HSC70) but not on one channel module.

Dual Porting—Both systems include two ports and are supplied with two cables for connection to HSC servers. Dual ports are provided to facilitate rapid reconfiguration should an HSC server malfunction. The two ports are *not* intended for functions such as simultaneous access through multiple HSC Servers.

If you are using VMS Version 4.5 or an earlier version, only one port should be enabled at any one time. Version 4.6 allows you to use a single allocation class for both ports and to enable both ports. The operating system will use only one port at a time, and will automatically seek a new port once a failed process is restarted.

If you already have an HSC Server but do not yet have clustered tape units, you will need to order an HSC5X-CA tape channel module with your first TA81 or TA79 tape subsystem. Although each module can support four tape units, you may prefer to add additional modules as your tape farm grows, in order to maximize throughput and increase availability. TA79s and TA81s can be attached to the same HSC5X-CA module.

If you'd like to learn more about these products or other Digital products, call your nearest Digital Sales Office or ask your Digital Sales Representative. Or you can call our toll-free number (in the United States only), 1-800-DEC-INFO (800-332-4636), Monday through Friday, 8:15 A.M. to 5:00 P.M. Eastern Time.

Specifications

	TA79 Subsystem	TA81 Subsystem
Performance		
Read/write speeds:		
Start/stop mode	125 ips	25 ips
Streaming	Not applicable	25 & 75 ips
Data transfer rate (max.)	781 Kbytes/s	468 Kbytes/s
Rewind speed (avg.)	440 ips	192 ips
Rewind time (2,400-ft tape)	65 s	150 s
Data Organization		
ANSI Standards:		
PE to Std X3.39-1973	Yes	Yes
GCR to Std X3.54-1976	Yes	Yes
Number of tracks	9	9
Recording density in PE mode	1600 bpi	1600 bpi
Recording density in GCR mode	6250 bpi	6250 bpi
Capacity:		
in PE mode (2 Kbyte blocks)	40 Mbytes	40 Mbytes
in GCR mode (8 Kbyte blocks)	145 Mbytes	145 Mbytes
in GCR mode (64 Kbyte blocks)	167 Mbytes	167 Mbytes
Maximum record length	64 Kbytes	64 Kbytes
Recording medium (ANSI Std.)	0.5-in magtape	0.5-in magtape
Reel diameters:		
	17.8 cm (7 in)	17.8 cm (7 in)
	21.6 cm (8.5 in)	21.6 cm (8.5 in)
	26.7 cm (10.5 in)	26.7 cm (10.5 in)
Tape cartridge	IBM Easyload*	Not Applicable
Operating Environment		
Temperature range		
	15°C to 32°C	15°C to 32°C
	59°F to 90°F	59°F to 90°F
Relative humidity	20 to 80 %	20 to 80 %
Wet bulb temperature (max.)	25°C (77°F)	25°C (77°F)
Altitude (max.)	2400 m (8000 ft)†	3000 m (10,000 ft)
Noise level (max.)	70 dBa	51 dBa

continued

Specifications continued

	TA79 Subsystem	TA81 Subsystem
Power Requirements:		
Voltage at 60 Hz	208 V ac	120 V ac
Voltage at 50 Hz	240 V ac	240 V ac
Phase	Single	Single
Power consumption (max.)	3.7 kVA	0.5 kVA
Heat dissipation	6.7 KBtu/h	1.03 KBtu/h
Power plug type:		
for 60 Hz	NEMA L6-30R	NEMA 5-30
for 50 Hz	NEMA L6-30R	Schuko/CEE 7-7
Cable length (max.)‡	30.5 m (100 ft)	30.5 m (100 ft)
Physical Characteristics		
Height	152 cm (60.0 in)	106 cm (41.6 in)
Width	67 cm (26.5 in)	54 cm (21.3 in)
Depth	82 cm (32.3 in)	76 cm (30.0 in)
Weight	286 kg (630 lb)	106 kg (235 lb)
Configuration Parameters		
Drives per formatter	4	1
Formatters per HSC5X-CA	4	4
Drives per HSC§		
Dual porting	#	#

* IBM and Easyload are trademarks of International Business Machines Corporation.

† At altitudes above 610 meters (2000 feet), the TA79 subsystem must have a high-altitude kit installed. Contact your local field service office to arrange for installation.

‡ From HSC Server to the tape drive. Note: This is cable length not linear distance from server to drive. The cable may have to be diverted around obstacles and even though the distance between the server and the drive measures less than the maximum, the cable length may exceed the maximum.

§ Specifications for the HSC Servers can be found in the information sheet for that family of devices.

|| An HSC Server supports at least eight tape drives in any combination of masters and slaves, whether attached to one or more HSC5X-CA modules. The number of tape subsystems supported will increase as VAXcluster capabilities evolve. Consult your Sales Representative to be sure you have a VAXcluster and VMS Operating System release that supports this subsystem or if you need more information on configuration requirements.

Dual porting to two HSC Servers is supported with VMS Version 4.6. With earlier versions, it is possible with caution. Contact your Field Service Representative for details.

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