

**UNISYS**

**BTOS**

**Tape Streamer**

**Operations  
and  
Programming  
Guide**

Relative to  
Release Level 6.0

Priced Item

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**SUBJECT: Announcement of BTOS Tape Streamer Module Software,  
Release 6.1**

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Enclosed is the BTOS Tape Streamer Module software, release 6.1.

BTOS Tape Streamer software supports B 22 (cluster only)/B 26/B 27/ B 28/B 38 Systems. It provides various utilities to back up files from the mass storage devices attached to the system.

This package contains:

- One disk containing BTOS Tape Streamer Module software, release level 6.1
- *BTOS Tape Streamer Operations and Programming Guide*, relative to release level 6.0, form 1212974.

Instructions for software installation are in the *BTOS Tape Streamer Operations and Programming Guide*. Read and follow the procedures indicated before attempting any operation of this product.

Features are described in the Specification Sheet, form 1220017. The recommended operating system level for running this release is one of the following:

- BTOS II release 1.0 or higher
- BTOS 8.0 or higher

**UNISYS**

**BTOS  
Tape Streamer  
Operations  
and  
Programming  
Guide**

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# About This Manual

## Purpose

This manual contains information for the operation of both the 1/2-inch reel-to-reel tape streamer module (used with B 22 workstations) and the 1/4-inch cartridge tape streamer module (used with B 26, B 27, B 28, and B 38 workstations).

## Scope

This manual explains the installation and operation of the tape streamer software for both 1/4-inch and 1/2-inch hardware, and provides information for programming the 1/2-inch hardware.

## Audience

This manual addresses the nontechnical user who wishes to use the tape streamer (1/2-inch or 1/4-inch) as an archival or backup device, and the programmer who needs to use the tape streamer (1/2-inch only) to create application programs.

## Prerequisites

The only prerequisite for the nontechnical user is a familiarity with BTOS Executive commands. The programmer should have a good understanding of how BTOS operates, plus a working knowledge of the BTOS Assembler and at least one high-level programming language.

## How to Use This Document

The nontechnical user should read Sections 1 through 5 for installing and using the software. Section 5, in particular, describes how to use the tape backup utilities for both 1/2-inch and 1/4-inch tape systems. Appendix B describes general maintenance procedures for the 1/4-inch tape streamer module and tape cartridges.

The material in the first five sections will also be useful to the programmer. However, Section 6 and Appendices C and D provide details on programming for the 1/2-inch tape system.

**Note:** The acronym QIC, used in some of the file names, command names and command parameters, stands for Quarter-Inch Cartridge.

## Organization

Section 1, "Overview," introduces the 1/2-inch and 1/4-inch tape streamers and the software that operates them.

Section 2, "Software Installation," provides instructions for installing the software and setting up the tape server and the utilities.

Section 3, "Tape Server," describes the tape server and explains how to implement it.

Section 4, "Tape Configuration Files," describes the use of configuration files and explains how to modify them to create custom configuration files.

Section 5, "Tape Backup Utilities," provides instructions for using the backup utilities, which include all the commands needed for backing up and restoring disk files.

Section 6, "Programming Interface," provides all the programming information for the 1/2-inch tape streamer.

Appendix A, "Status/Error Codes," defines status/error codes that may be displayed when an operational fault occurs.

Appendix B, "QIC Tape Module Maintenance," describes general maintenance procedures for the 1/4-inch tape cartridge and the 1/4-inch tape backup module.

Appendix C, "Configuring Tape Byte Streams," explains how to configure byte streams for a 1/2-inch tape streamer user application (not applicable to the 1/4-inch tape streamer).

Appendix D, "Sample Pascal Programs," provides sample programs in Pascal for using the procedural interface in 1/2-inch tape streamer user applications.

A glossary and an index follow Appendix D.

## Related Product Information

You may wish to have the following documents on hand for additional information:

*BTOS Hardware Installation Guide*: general installation procedures for all B 26, B 27, B 28, and B 38 modules (see also *BTOS Systems Tape Streamer Module Installation Guide*).

*BTOS Systems Tape Streamer Module Installation Guide*: specific information for installing the 1/4-inch tape streamer module without the B 25-FXC bus converter module.

*BTOS Systems Operating System Reference Manual (Volumes 1 and 2)*: explains BTOS system services for managing system processes and for communications with memory and peripheral devices.

*BTOS Standard Software Operations Guide (SSOG)*: explains installation, describes BTOS and how to use Executive commands.

*BTOS Status Codes Reference Manual*: defines BTOS system status/error codes. Codes specific to the tape streamer hardware/software are defined in Appendix A of this manual.

*B 27 Systems Diagnostics Operations Guide*: defines the procedures for running hardware diagnostics on B 27 systems.

*B 26/B 28 Systems Diagnostics Operations Guide*: defines the procedures for running hardware diagnostics on B 26 and B 28 systems.

*BTOS Systems Editor Reference Manual:* describes the BTOS Editor, a utility used to create and edit files. (For example, the SysInit.JCL file may be edited so that it installs and configures the appropriate tape server when your workstation is turned on or rebooted.)

*BTOS Linker/Librarian Programming Reference Manual* (Relative to BTOS release level 8.0 or higher): describes the BTOS Linker and Librarian utilities. The Librarian is used to create and modify libraries of object modules produced by the Assembler or Compilers. It is needed when configuring tape byte streams with the 1/2-inch tape streamer (see Appendix C).

*BTOS Assembler Programming Reference Manual* (Relative to BTOS release level 8.0 or higher): describes the BTOS assembler. The assembler is used to generate source modules for configuring a programming language so that you can program tape byte streams in that language (see Appendix C).

Language programming reference manuals. You will need the programming reference manual for the language you wish to use when configuring tape byte streams with the 1/2-inch tape streamer (BASIC interpreter or compiler, Fortran, Pascal, or COBOL; see Appendix C).

*BTOS Customizer Programming Reference Manual:* (Relative to BTOS release level 8.0 or higher): describes the BTOS customizer. The customizer is used to modify device handler routines so that the tape streamer can be accessed via tape byte streams.

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## Overview

BTOS Tape Streamer is a software package that implements the transfer of stored data between disk media and magnetic tape. It supports two specific tape streaming systems. The B9498 Magnetic Tape Streamer Unit (MTSU) uses 1/2-inch tape on a reel-to-reel tape transport. The 1/2-inch tape system operates from B 22 workstations.

The second device is the B25-TS/B27-TS1 1/4-Inch Tape Cartridge Backup Module. The Quarter-Inch Cartridge (QIC) tape system uses 1/4-inch data cartridges and operates from B 26, B 27, B 28, and B 38 workstations.

This release of BTOS Tape Streamer (6.0) requires BTOS Operating System release level 8.0 or higher.

## The Software

The *tape server*, a system service installed with this package, interfaces directly between the tape streamer device and the supporting workstation (see Section 3). The tape server performs the necessary I/O operations to read or write data and to position, erase, and rewind the tape. These procedures are defined collectively as the *direct tape services*.

If you will be using IDS, B-LAN, or the voice processor module with the tape streamer (1/4-inch only), you must install the system service called XBIF *before* you install the tape server.

The Install Tape Server command installs the tape server on the workstation that includes the tape device. Configuration files (see Section 4) are used to preselect certain operational parameters.

The *backup utilities* (Tape Backup Volume, Tape Selective Backup, and Tape Restore) permit archiving selected files or entire volumes to both 1/2-inch and 1/4-inch tape systems. QIC Retension and QIC Unload are for use with the 1/4-inch tape system only (see Section 5 for details).

Additionally, the tape server provides a procedural interface to upper-level applications for the 1/2-inch tape streamer. The Tape Copy utility allows a file to be copied to or from a tape through the use of tape *byte streams*. Tape byte streams allow programs to access the tape in a device-independent manner, consistent with BTOS *Sequential Access Method* (SAM).

Tape byte streams can transfer information to and from non-B 20 systems, but only where the tape format is not too machine-specific. User applications may use tape byte streams to interface with the 1/2-inch tape streamer module (see Appendix C).

**Note:** If the tape is to be read by an XE 500 system, the maximum buffer size must not exceed 16384 (16k) bytes.

## Software Installation

This section describes the software on the product disk (on either 5 1/4-inch or 8-inch disks). It also gives procedures for installing the software to your hard disk.

### Disk Files

Following are the relevant files on the product disks (other files in the <Sys> directory of the product disks are present only for operation of the disk drive):

### Installation Software

*[B20TS6]<Sys>Install.sub* is a submit file that the Software Installation command uses to transfer needed files to your hard disk and to create new commands for operating the tape streamers. It is not copied to your hard disk.

*[B20TS6]<Sys>Qic.sub* is a submit file that you select during execution of the *Install.sub* to install software for only the 1/4-inch tape streamer. It is not copied to your hard disk.

*[B20TS6]<Sys>Mag.sub* is a submit file that you select during execution of the *Install.sub* to install software for only the 1/2-inch tape streamer. It is not copied to your hard disk.

*[B20TS6]<Sys>fdsys.version* is a text file that includes the release level of the software. It is appended, along with the date of the installation, to your [Sys]<Sys>sys.version file during the execution of the Software Installation command.

### 1/2-Inch and 1/4-Inch Tape Systems

*[B20TS6]<Unisys>TapeConfigureFile.run* is the run file used by the Configure Tape File command (see Section 5). It is a utility for creating and modifying configuration files for use with both 1/2-inch and 1/4-inch tape streamer systems (see Section 4).

*[B20TS6]<Unisys>TapeBackupVolume.run* is the run file used by the Tape Backup Volume command. This command does a complete volume backup to tape, with or without regard to last modification date or time (see Section 5).

*[B20TS6]<Unisys>TapeSelectiveBackup.run* is the run file used by the Tape Selective Backup command. This command does a selective backup to tape, allowing you to back up individual directories and/or files, with or without regard to last modification date or time (see Section 5).

*[B20TS6]<Unisys>TapeRestore.run* is the run file used by the Tape Restore command. This command restores entire volumes or selected directories and/or files to a hard disk from tape (see Section 5).

## 1/2-Inch Tape System Only

*[B20TS6]<Unisys>InstallTapeServer.run* is a run file that installs the 1/2-inch tape server, a system service that interfaces directly with the 1/2-inch tape streamer hardware (see Section 3).

*[B20TS6]<Unisys>TapeCopy.run* is the run file used by the Tape Copy command. This command transports data between B 20 and non-B 20 systems using the 1/2-inch tape streamer system (see Section 5).

*[B20TS6]<Unisys>Mws>TapeBackupConfig.sys* is the default configuration file for use with making backups or restores from a master or standalone B 22 workstation to a 1/2-inch tape streamer system connected to that workstation (see Section 4).

*[B20TS6]<Unisys>Cws>TapeBackupConfig.sys* is the default configuration file for use with making backups or restores from a cluster workstation to a 1/2-inch tape streamer system connected to the B 22 master workstation (see Section 4).

*[B20TS6]<Unisys>TapeConfig.sys* is the default configuration file used by the Tape Copy command (see Section 4).

[B20TS6]<Sys>*TapeBs.obj* and [B20TS6]<Sys>*TapeRq.obj* are object files that you may add to your [Sys]<Sys>CTOS.lib file to configure a programming language for byte stream data transfers using the 1/2-inch tape streamer (see Appendix C). *TapeBs* adds the necessary openbytestream procedures and *TapeRq* supplies the respective request codes. These files are *not* copied to your hard disk by the Software Installation command.

## 1/4-Inch Tape System Only

[B20TS6]<Unisys>*InstallQicServer.run* is a run file that installs the 1/4-inch tape server, a system service that interfaces directly with the 1/4-inch tape streamer hardware (see Section 3).

[B20TS6]<Unisys>*QicUnload.run* is the run file used by the QIC Unload command (see Section 5). This command rewinds a 1/4-inch tape cartridge to the beginning of the tape. Always execute this command before removing a cartridge from the tape streamer module.

[B20TS6]<Unisys>*QicRetension.run* is the run file used by the QIC Retension command (see Section 5). This command adjusts the tension on a 1/4-inch tape by winding and then rewinding it.

[B20TS6]<Unisys>*QicConfig.sys* is the default configuration file for use with making backups or restores from a workstation to a 1/4-inch tape streamer system (see Section 4).

[B20TS6]<Unisys>*XBIF.run* is a system service that must be installed prior to installing the tape server if you will be using IDS, B-LAN, or the voice processor module with the tape streamer.

## System Memory and Hard Disk Requirements

The tape server is an installed system service that requires 75kB of system memory. In addition, the utilities require between 100kB and 150kB of system memory. The tape streamer software runs on a minimum of 175kB of system memory but performs better if more is available.

Installation of the tape streamer software and associated system services requires the system hard disk space shown in Tables 2-1 and 2-2.

**Table 2-1 Hard Disk Space for 1/2-Inch Tape System**

Files	Hard Disk Space (sectors)
InstallTapeServer.run	20
TapeBackupVolume.run	181
TapeSelectiveBackup.run	156
TapeRestore.run	169
TapeCopy.run	156
TapeConfigureFile.run	78
Mws>TapeBackupConfig.sys	1
Cws>TapeBackupConfig.sys	1
TapeConfig.sys	1
TapeBs.obj	8
TapeRq.obj	1
	709
Total Sectors	709

**Table 2-2 Hard Disk Space for 1/4-Inch Tape System**

Files	Hard Disk Space (sectors)
InstallQicServer.run	28
TapeBackupVolume.run	181
TapeSelectiveBackup.run	156
TapeRestore.run	169
QicUnload.run	5
QicRetension.run	92
TapeConfigureFile.run	78
QicConfig.sys	1
	632
Total Sectors	632

## Software Installation

The Software Installation command copies required files onto the system hard disk and creates the necessary commands. The software may be used on a standalone, cluster, or master workstation.

**Note:** The tape streamer product disk as supplied is write-protected; do not write-enable the disk. Instead, make a copy of the disk (using the Executive command Floppy Copy), store the original in a safe place, and use the duplicate as a working copy.

Install the software as follows:

- 1 Turn on and/or log in your workstation by completing the sign-on form (use your volume password if there is one).
- 2 Insert the tape streamer product disk into the disk drive identified as [f0].
- 3 At the Command prompt, type **Software Installation**, and then press GO.

**Note:** See "Command Options" in this section for details on default and optional parameter values for the Software Installation command.

- 4 A screen message tells you to log out all cluster workstations appears (other stations on the cluster need not be turned off). Log out all cluster workstations, and then press GO to continue.
- 5 You are given the options of tailoring the installation for only 1/4-inch or only 1/2-inch tape systems. As shown in the prompt, press GO to select the currently displayed option (1/4-inch comes up first) or press CANCEL and then GO to skip the option.
- 6 When the screen message indicates that the tape streamer installation is complete, remove the product disk and store it in a safe place.
- 7 (1/4-inch only) If you are also using IDS, B-LAN, or the voice processor module on your system, you will need a version of XBIF that is supplied on a second disk. Insert the second disk and execute the Software Installation command. When the XBIF installation is complete, you *must* reboot your workstation to incorporate the new files.

You may now resume normal cluster operations.

## Command Options

The Software Installation command is fully described in the *BTOS Standard Software Operations Guide* (SSOG). Supplementary information is given here as to its specific application for installing the tape streamer software.

Type **Software Installation** and press RETURN. The following form appears:

```
Software Installation
[Cmd File]
[Files to]
[Install file]
```

All command parameter fields have default values, but you may enter different values. Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields; press GO to execute the command with the default or your entered values.

### Default and Optional Values

*[Cmd File]* The default is *[Sys]<Sys>Sys.Cmds*. This parameter creates the new commands in the file specified. *[Sys]<Sys>Sys.Cmds* is the usual location; you would change this only if your system command file is located elsewhere. For example, to place the commands in a directory called *CMD*, you would enter this parameter as *[Sys]<CMD>Sys.Cmds*.

*[Files to]* The default is *[Sys]<Sys>*. This parameter allows you to select the volume and directory to which all relevant files on the product disk will be copied. *[Sys]<Sys>* is the usual location; you would change this to place the files elsewhere. For example, to place the files in a directory called *CMD*, you would enter this parameter as *[Sys]<CMD>*.

---

*[Install file]* The default is *[f0]<Sys>Install.sub*. This parameter selects the volume or device, the directory, and the name of the installation submit file. Usually, the floppy drive you are using is designated as *[f0]*, and the directory and file name are always *<Sys>Install.sub*. If you use a floppy disk drive that is not identified as *[f0]*, you need to enter the full file name, including the correct device identification or volume name (for example, *[f1]<Sys>Install.sub*, if the disk drive used is identified as *[f1]*).



## Tape Server

The tape server is a system service that provides the BTOS interface for an application to access the tape streamer module. In most cases, it must be installed into memory to implement the tape backup utilities.

There are two versions of the tape server: one for 1/4-inch tape systems, and one for 1/2-inch tape systems. The appropriate tape server is installed either with an Executive command after log-in, or with the appropriate run file included in the *SysInit.jcl* file at boot up. These two methods are discussed in detail in this section.

### Install Tape Server

To install the 1/2-inch tape server, type **Install Tape Server** and press RETURN. The following form appears:

```
Install Tape Server
[Buffer Size (default=2560 bytes)]
```

**Note:** Generally, the tape server should be installed before you can use any of the tape backup utilities or the direct tape services. However, there is a special instance with the 1/2-inch tape system when *not* using the tape server may be recommended.

### Command Fields

[*Buffer Size (default=2560 bytes)*] This specifies the size of the tape server's internal buffer (in bytes), which is used for backup and restore operations over the cluster line. When backup and restore operations are using a local tape drive, this buffer is not used and its size may be set to zero to avoid wasting memory. In a cluster environment, the maximum buffer size is 2,560 bytes. The maximum buffer size allowable also depends on the amount of memory available to the workstation. Increase the size of the buffer if error code 45 is returned.

Press GO to execute the command when the form is complete.

## Install QicTape Server

**Note:** If XBIF is required, it must be installed in memory prior to installing the 1/4-inch tape server.

To install the 1/4-inch tape server, type **Install QicTape Server** and press RETURN. The following form appears:

```
Install QicTape Server
[Buffer Size (default 63K)]
```

**Note:** The tape server must be installed on a workstation that contains a 1/4-inch tape module (B25-TS/B27-TS1). If not, the installation is terminated and error code 9058 is displayed.

### Command Fields

*[Buffer Size (default=63K)]* This specifies the size of the tape server's internal buffer (in Kbytes), which is used for backup and restore operations over the cluster line. When backup/restore operations are using a local tape streamer, this buffer is not used and its size may be set to zero to avoid wasting memory.

If it is necessary to conserve memory while operating over the cluster line, the buffer size may be set to a value lower than 63 Kbytes. However, this may adversely affect performance. When backing up over the cluster line, the size of the buffer must be equal to or greater than the record size as defined in the QIC configuration file.

When restoring over the cluster line, the size of the buffer must be equal to or greater than the record size as defined in the QIC configuration file that was used when the tape file was created.

**Note:** If the tape will be read by an XE 500 system, the maximum buffer size must not exceed 16384 bytes (16 kBytes).

Press GO to execute the command when the form is complete.

## Using SysInit.jcl

Depending on how a specific workstation is configured, a SysInit.jcl file may or may not already exist. If it does not, create it in the [Sys]<Sys> directory on the workstation's hard disk, as follows:

- 1 Set the path to [Sys]<Sys>.
- 2 Use the Edit command to create SysInit.jcl.
- 3 Modify or build the SysInit.jcl file as follows:

**\$JOB SYSINIT**

[other system services]

**\$RUN [Sys]<Sys>InstallTapeServer.run (parameters)**

[other system services]

**\$END**

**Note:** If you need help using the BTOS Editor, refer to the *BTOS Systems Editor Reference Manual*. Alternatively, the SysInit.jcl file may be created and/or revised using the word processor. For more information on creating the JCL file and entering command parameters, see the *BTOS Standard Software Operations Guide*.

- 4 Press FINISH and GO to exit the Editor.
- 5 Reboot the workstation and the tape server will be installed.



## Tape Configuration Files

A configuration file is a collection of parameters that governs the interaction of a device (such as a printer or a tape streamer) with the workstation. The parameters are placed in this file for access by a data transfer utility.

The four kinds of tape configuration files are for data transfer:

- Between a master workstation and 1/2-inch tape. The default file is *Mws>TapeBackupConfig.sys*.
- Between a cluster workstation and 1/2-inch tape. The default file is *Cws>TapeBackupConfig.sys*.
- Between a cluster or master workstation and 1/4-inch tape. The default file is *QicConfig.sys*.
- Via tape bytestreams with a 1/2-inch tape streamer. The default file is *TapeConfig.sys*.

Default tape configuration files are created at the installation of the tape streamer software, or when using the Tape Configuration utility. To examine the default parameters, use the Tape Configure File command. These configuration files are changed only if new values are specified for the optional parameters in the form.

For tape backup utilities using 1/2-inch tape, the configuration files allow you to specify the size of data blocks within a file on tape. You can also specify the use of stop/start mode or streaming mode and whether the tape is to be rewound at the end of the operation. The default configuration file names are [Sys]<Sys>Mws>TapeBackupConfig.sys for the master workstation and [Sys]<Sys>Cws>TapeBackupConfig.sys for a cluster workstation.

For tape backup utilities using 1/4-inch tape, the configuration file allows you to specify the size of data blocks within a file on tape and whether the tape is to be rewound at the end of the operation. The default configuration file name is [Sys]<Sys>QicConfig.sys.

The configuration file for tape bytestreams allows you to specify the same parameters as for tape backup, plus the choice of a variable record length. Also, this configuration file provides a method for specifying parameters to be used with tapes produced on a non-B 20 system. The name of the default configuration file for tape bytestreams is [Sys]<Sys>TapeConfig.sys.

## Configure Tape File Command

The tape configuration files are accessed, created, or revised via the Configure Tape File command. To invoke this utility from the Executive, type **Configure Tape File** and press RETURN. The following form appears:

```
Configure Tape File
Configuration type (Master, Cluster, QIC, or
Bytestream)
[File name]
```

Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields.

The default and permitted optional values are given in the following subsection. Press GO when the form is complete.

### Command Fields

#### *Configuration type (Master, Cluster, QIC, or Bytestream)*

This parameter specifies the type of configuration file. Appropriate entries are Master, Cluster, QIC or Bytestream. Type the full name or only the first letter of each type.

*[File name]* This parameter allows you to call up an existing configuration file or create a new one with the name that you type. If you enter nothing, the default file for the type specified above is selected. Once an alternative configuration file is created, it may be appended to the *Tape file name* entry in the command form for any of the tape backup utilities (see Section 5).

## Secondary Command Form

After you complete the Configure Tape File command form and press GO, a new list of options is displayed in a secondary command form. For Master, Cluster, and QIC types, the form appears as follows:

Tape Parameters  
[Record Size]  
[Streaming Mode?]  
[Rewind Tape On Close?]

For the Bytestream type, the tape parameters form is the same, except for the addition of a final field:

[Variable Length Records?]

Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields.

The default and permitted optional values are given in the following subsection. Press GO when the form is complete.

### Secondary Command Fields

*[Record Size]* This parameter allows you to specify the size, in bytes, of each physical tape record. (For the tape backup utilities, this is the same as specifying the data block size).

For the tape backup utilities on 1/2-inch tape, the acceptable range is from 1024 to 16384 bytes. The default value is 8192 bytes for master workstations and 2048 bytes for cluster workstations.

For the tape backup utilities on 1/4-inch tape, the acceptable range is from 2048 to 64512 bytes. This value must be a multiple of 512. The default is 64512 bytes.

For tape bytestreams, the acceptable range is from 1 to 16384 bytes. If the variable length records option is selected, this parameter specifies the largest record that can occur. The default value is 512 bytes.

**Note:** If the tape will be read by an XE 500 system, the maximum buffer size must not exceed 16384 bytes (16 kBytes).

*[Streaming Mode?]* Specify *Yes* to perform read/write operations in streaming mode. Bytestreams and backups from a cluster workstation should not be used in streaming mode. This parameter does not apply to the tape backup utilities on 1/4-inch tape.

*[Rewind Tape On Close?]* Specify *Yes* if the tape is to be rewound to the BOT (Beginning Of Tape) when the tape operation has been completed. The default value is *Yes*.

*[Variable length records?]* This field appears only when the bytestream type configuration file is selected. The default is *No*, which specifies the tape records are of equal length. Specify *Yes* if the tape records are not all the same size.

---

## Tape Backup Utilities

This section describes how to use the tape backup utilities. The following archival features are provided:

- Multiple backups on one tape
- Backups to multiple tapes
- Backups from cluster workstations

### Backup File Names

The primary element of a backup file name is [TAPE] when accessing 1/2-inch tape files and [QIC] when accessing 1/4-inch tape files. Since more than one file can be placed on one tape, the suffixes *n* or *+* may be appended to the file name to tell the tape streamer where to perform the next read or write operation. Also, a custom configuration file can be requested along with the file name.

File marks are placed on the tape to designate the separation of adjacent tape files. The file mark following the last file written to the tape is a location called the logical End Of Tape (EOT). Also, the start of the first file written to the tape is a location that is called the logical Beginning Of Tape (BOT). The only exception to these two rules is that EOT and BOT are the same location on a blank tape; that is, the first physical location to which data may be written.

Uses of the [TAPE] and [QIC] file names, with and without suffixes, and the custom configuration option are defined in the following subsections.

**Note:** For either 1/2-inch or 1/4-inch tape, a read operation is performed at any file mark except EOT. If a read is called for at EOT, the operation aborts and an error code is displayed.

---

**Caution:** The following options allow you to overwrite an existing file. When you do this, all subsequent files (if any exist) are lost.

---

## **[TAPE] or [QIC]**

Without a suffix, these file names tell the tape streamer to read or write at the next meaningful location.

For 1/2-inch tape streamers, the next meaningful location is the current location on the tape. This assumes that a file mark has been found at the current location. Otherwise, the tape advances to either the next file mark or the EOT. A write operation is performed at this location, even if it overwrites an existing file.

The 1/4-inch tape streamer must be at a file mark when the name [QIC] is used without a suffix; otherwise, the operation aborts and an error message is displayed. For a write operation, if the tape is at a file mark other than the EOT, a prompt is displayed asking whether you wish to overwrite an existing file.

## **[TAPE]*n* or [QIC]*n***

The suffix *n* may be any unsigned, single-digit, decimal number. When this suffix is used, the tape streamer searches for the *n*th file mark from the BOT, and then it performs the requested read or write operation (*n* = 0 always refers to BOT). For a read operation, if the *n*th file mark does not exist or is EOT, the operation is aborted and an error message is displayed.

For a 1/2-inch tape write operation, *n* must be less than or equal to the file mark at EOT. If *n* is less than the file mark at EOT, the 1/2-inch tape streamer immediately overwrites an existing file. The 1/4-inch tape streamer displays a prompt asking whether you wish to overwrite an existing file. For [QIC]*n*, *n* must be 0.

## **[TAPE]+ or [QIC]+**

This option is valid only for write operations with either 1/2-inch or 1/4-inch tapes. They cause the tape streamer to search for the EOT and begin writing at that location.

## Custom Configuration File

The name of a custom configuration file may be appended to the backup file name, if you do not wish to accept the default configuration file. To use this option, type the backup file name, the ampersand character (&), and the name of your custom configuration file. Do not enter any spaces. Example: `[QIC]1&CustomConfig.file`

## Multiple Backups on One Tape

**Note:** Throughout the following discussion, [TAPE], the file name root for 1/2-inch tape operation, is used. If you replace [TAPE] with [QIC], the information applies equally to 1/4-inch tape operation.

Multiple backups can be placed on one tape. One method is to use [TAPE]0 for the first backup and [TAPE]+ for subsequent backups. Alternatively, if multiple backups are being performed in one backup session, use [TAPE]0 for the first backup and [TAPE] for each successive backup.

**Note:** For this alternate method, the *Rewind Tape On Close?* parameter of the tape configuration file must be set to *No* (see Section 4).

You may also use [TAPE]0, [TAPE]1, [TAPE]2, etc., for successive backups (writing to the tape), as long as you apply the suffix digits in the correct ascending order. With a restore operation (reading from the tape), you may use the same suffix digits to select any file on the tape.

## Backup to Multiple Tapes

A large backup may use more than one 1/2-inch or 1/4-inch tape. In this case, the last record on the tape indicates continuation to another tape. A new tape is mounted and the backup continues on that tape.

---

**Caution:** The continuation *must* take place at the beginning of the second tape.

---

## Backup Utilities

Tape backup utilities are described in the following subsections. Although most of the utilities are common to both 1/2-inch and 1/4-inch tape streamers, they have different names and commands. Those utilities that are specific to either 1/2-inch or 1/4-inch tape operations are so designated.

### Backup Volume

The Backup Volume utility copies an entire disk to one or more tapes. The master workstation may be backed up without disabling the cluster workstations. However, if any file is accessed during the backup, that file may not be backed up. To ensure a back up of every file on the master disk, first disable the cluster workstations.

To initiate this utility, type **Tape Backup Volume** and press RETURN. The following form appears:

```
Tape Backup Volume
Volume or device name
[Volume or device password]
[Incremental from (e.g., Mon Jun 2 1986 8:00 pm)]
[Suppress backup?]
[Suppress verification?]
[Tape file name (default=[QIC]0)]
[Delete existing archive file?]
[Log file]
[Display structures?]
```

**Note:** The command form gives the default file name for 1/4-inch tape backup. For 1/2-inch tape operation, you must type in at least the root file name [TAPE].

Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields.

The default and permitted optional values are given in the following subsection. Press GO to execute the command with the default or your entered values.

## Command Fields

*Volume or device name* This is the volume or device name of the disk to be backed up. You must enter something for this parameter.

*[Volume or device password]* This is the password (if one exists) of the volume or device to be backed up. If the volume name is entered, the volume password is required; if the device name is entered, the device password is required.

*[Incremental from (e.g., Mon Jun 2 1986 8:00 pm)]* Only files modified on or after the specified date and time are backed up. The default (nothing entered) copies *all* files without regard to date or time.

**Note:** As an alternate form, you may enter the date in numbers (e.g., Mon 6/2/86). However, if you do not enter the day of the week, the command will not work. Use at least the first three letters (*Mon* and *Monday* are both acceptable).

*[Suppress backup?]* The allowable entries are *Yes* or *No* (the default is *No*). A *Yes* verifies the integrity of the volume control structures without performing an actual backup.

*[Suppress verification?]* The allowable entries are *Yes* or *No* (the default is *No*). A *Yes* performs only the backup pass and suppresses the verification pass.

*[Tape file name (default=[QIC]0)]* This is the name of the tape file to which the files are written. The default parameter is *[QIC]0*. For 1/2-inch tape operation, you must type in at least the file name root [TAPE]. See "Backup File Names" earlier in this section for file name options and the use of custom configuration files.

*[Delete existing archive file?]* The allowable entries are *Yes* or *No*. The default is *No*. If *Yes* is entered, all data on the tape is erased before new data is entered. If *No* is entered and the tape already contains a valid archive file, a message describes the file and asks whether you wish to overwrite it.

*[Log file]* This is the name of the file to which a report of the backup is written. If the specified log file already exists, the new log is appended to it. If it does not exist, the specified log file is created. If a log file is not specified, the log appears only on your screen.

*[Display structures?]* The allowable entries are *Yes* or *No* (the default is *No*). If *Yes* is entered, a detailed analysis of the volume control structures is displayed. This information will also be copied to the log file if one was specified.

### Command Performance

After you complete the form and press GO, the system takes over and instructs you with screen messages as needed. The names of the files are written to the screen as they are copied to the tape.

If verification is requested, the system appears to sit idle at the completion of the backup pass while the verification pass is performed. Upon completion of the verification, the screen displays the results and returns to the Executive.

### Backup Errors

At the completion of a backup to 1/4-inch tape, the following message appears and should be heeded:

To ensure the integrity of the tape files, please perform "Tape Restore" with "List Files Only".

If the message *VOLUME VERIFICATION MAY BE SUSPECT* is displayed, it is possible that one or more files on the disk were in use during the backup. Also, warnings of bit map errors may indicate that an unregistered bad spot was discovered on your hard disk.

Whenever the integrity of your hard disk is in question, use the Tape Restore command and specify *yes* in the List Files Only field (to ensure that your tape copy is good). Reinitialize your hard disk, and then perform a complete Tape Restore. Using a hard disk with unregistered bad spots could result in irrecoverable loss of data.

## Selective Backup

The Selective Backup utility copies to tape individual files or directories that you specify.

To initiate this utility, type **Tape Selective Backup** and press RETURN.

The following form appears:

```
Tape Selective Backup
File List
[Incremental from (e.g., Mon Jun 2 1986 8:00 pm)]
[Confirm each?]
[Tape file name (default=[QIC]0)]
[Delete existing archive file?]
[Log file]
```

**Note:** The command form gives the default file name for 1/4-inch tape backup. For 1/2-inch tape operation, you must type in at least the root file name [TAPE].

Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields.

The default and permitted optional values are given in the following subsection. Press GO to execute the command with the default or your entered values.

### Command Fields

*File list* This is a list of the files you wish to archive. The list can include single files, selected directories, or groups of files (wild card characters may be used).

*[Incremental from (e.g. Mon June 2 1986 8:00 pm)]* Only files modified on or after the specified date and time are backed up. The default (nothing entered) copies all files specified in *File list* without regard to date or time.

**Note:** As an alternate form, you may enter the date in numbers (e.g., Mon 6/2/86). However, if you do not enter the day of the week, the command will not work. Use at least the first three letters (*Mon* and *Monday* are both acceptable).

*[Confirm each?]* The allowable entries are *Yes* or *No*. The default is *No*. If *Yes* is entered, you are asked for confirmation before each file is copied. If *No* is entered, the files are backed up without individual confirmation.

*[Tape file name (default=[QIC]0)]* This is the name of the tape file to which the files are written. The default parameter is *[QIC]0*. For 1/2-inch tape operation, you must type in at least the file name root *[TAPE]*. See “Backup File Names” earlier in this section for file name options and the use of custom configuration files.

*[Delete existing archive file?]* The allowable entries are *Yes* or *No*. The default is *No*. If *Yes* is entered, all data on the tape is erased before new data is entered. If *No* is entered and the tape already contains a valid archive file, a message describes the file and asks whether you wish to overwrite it.

*[Log file]* This is the name of the file to which a report of the backup is written. If the specified log file already exists, the new log is appended to it. If it does not exist, the specified log file is created. If a log file is not specified, the log appears only on your screen.

### **Command Performance**

After you complete the form and press **GO**, the system takes over and instructs you with screen messages as needed. The names of the files are written to the screen as they are copied to the tape. Unlike backup volume, open files are *not* backed up.

After the backup pass is complete, the system appears to sit idle while a verification pass is performed. Upon completion of the verification, the screen displays the results and returns to the Executive.

## Backup Errors

At the completion of a backup to 1/4-inch tape, the following message appears and should be heeded:

To ensure the integrity of the tape files, please perform "Tape Restore" with "List Files Only".

If the message *VOLUME VERIFICATION MAY BE SUSPECT* is displayed, it is possible that one or more files on the disk were in use during the backup. Also, warnings of bit map errors may indicate that an unregistered bad spot was discovered on your hard disk.

Whenever the integrity of your hard disk is in question, use the Tape Restore command and specify *yes* in the List Files Only field (to ensure that your tape copy is good). Reinitialize your hard disk, and then perform a complete Tape Restore. Using a hard disk with unregistered bad spots could result in irrecoverable loss of data.

## Restore

The Restore utility copies files to a disk from an archive tape that was created by either the backup volume or selective backup utilities. This may be a complete restore to a disk that has been reinitialized or a partial restore to copy only specified files or directories to a disk.

To initiate this utility, type **Tape Restore** and press RETURN. The following form appears:

```
Tape Restore
[Tape file name (default=[QIC]0)]
[File list from]
[File list to]
[Overwrite ok?]
[Confirm each?]
[Sequence number]
[Merge with existing file?]
[List files only?]
[Log file]
```

**Note:** The command form gives the default file name for 1/4-inch tape backup. For 1/2-inch tape operation, you must type in at least the root file name [TAPE].

Optional parameters are indicated by the square brackets around a field label. Use the RETURN or NEXT key and the up and down arrow keys to select among parameter fields.

The default and permitted optional values are given in the following subsection. Press GO to execute the command with the default or your entered values.

### Command Fields

*[Tape file name (default=[QIC]0)]* This is the name of the tape file to which the files were written. The default parameter is *[QIC]0*. For 1/2-inch tape operation, you must type in at least the file name root *[TAPE]*. See "Backup File Names" earlier in this section for file name options and the use of custom configuration files.

*[File list from]* This is a list of the files to restore. The file specifications must be in the form *<directory>file*. Volume name must not be used. If you accept the default (enter nothing), all directories and files on the tape are restored. In this case, the default for *File list to* must also be accepted.

*[File list to]* This specifies where the restored files are copied to. The file specifications are of the form *[volume]<directory>file*. The volume and directory specifications are optional.

If only file names are entered, the specified files (assuming they exist on the tape) are restored in the current directory of the currently logged-in volume. Wild card characters may be used for all or part of a directory and/or file names (applies to "\*" wildcard only).

If the default is accepted, the files are restored on the currently logged in volume and to the directories of origin. If these directories do not exist, they are created.

*[Overwrite ok?]* The allowable entries are *Yes*, *No* or nothing. If you enter nothing, you are prompted for confirmation before an existing file is overwritten. If you enter *Yes*, an existing file of the same name is automatically overwritten. If you enter *No*, an existing file of the same name is *not* overwritten; restore is skipped for that file.

*[Confirm each?]* The allowable entries are *Yes* or *No*. The default is *No*. If you enter *Yes*, you are prompted for confirmation before an existing file is restored. If you enter *No*, confirmation is not requested.

*[Sequence number]* This refers to the sequence number of the tape, which applies only when restoring from a backup that required two or more tapes. The default is 1, the first (or only) tape of the backup.

*[Merge with existing file?]* The allowable entries are *Yes* or *No*. The default is *No*. If you enter *Yes* and the corresponding sector of the archive file is unreadable, the sectors of the target file are bypassed. If you enter *No* and any input/output error is detected on the archive file, the sectors of the target file are written with zeroes.

*[List files only?]* The allowable entries are *Yes* or *No*. The default is *No*. If you enter *Yes*, the file names are listed to the display, but the files are not restored.

*[Log file]* This is the name of the file to which a report of the restore operation is written. If the specified log file already exists, the new log is appended to it. If it does not exist, the specified log file is created. If a log file is not specified, the log appears only on your screen.

### **Command Performance**

Once this form is complete, press GO to begin the backup.

**Note:** When a tape restore is performed on a tape file that was created through the Tape Selective Backup utility, any directories that are created have a page count of 10 and a protection level of 15. This is true regardless of the page count of the original directories. If these directory attributes are not desired, use Tape Backup Volume or create any needed directories before the tape restore is used.

## Tape Copy (1/2-Inch Tape Only)

The Tape Copy utility transports data between B 20 and non-B 20 systems (often mainframe systems). For this reason, the 1/4-inch system would not be useful because mainframe systems cannot read from the 1/4-inch cartridge format. It is used to either copy one B 20 disk file to tape or copy one tape file to disk. The Tape Copy utility requires that the tape server be installed in memory on the B 22 workstation that contains the 1/2-inch tape streamer.

When copying to tape, the utility creates a tape file that contains fixed-length records. The size of the fixed-length records is obtained from a tape configuration file. The tape file is terminated by two file marks. If this is not the first tape file written on the tape, it is separated from the previous tape file by a single file mark.

The Tape Copy utility copies from tape, provided the tape contains one file mark at the end of each tape file and two marks at the logical end of tape (EOT). That is, data between the beginning of tape (BOT) and the first file mark is considered the first tape file, the data between the first and second file marks is considered the second tape file, etc.

The size of the records on the tape must be specified in the *Record Size* field of the tape configuration file (see Section 4). If the records are not of fixed-length, the size of the largest record must be specified and the *Variable Length Records?* field of the configuration file must be set to *Yes*.

To initiate this utility, type **Tape Copy** and press RETURN. The following form appears:

```
Tape Copy
File From
File To
[Overwrite ok?]
[Confirm each?]
```

### Command Fields

*File From* This specifies the source file name. If copying a file from tape to disk, specify the tape file name. For example, specify [Tape]0 for the first tape file, and [Tape]2&CustomConfig.file for the second tape file (using a custom tape configuration file).

If you are copying a file from disk to tape, specify the disk file name. Also, a device name such as [KBD] may be used. However, [Nul] may *not* be used.

*File To* This specifies the destination file name. If you are copying a file from tape to disk, specify the disk file name. Also, a device name may be used such as [SPL], [VID], [LPT], etc.

If you are copying a file from disk to tape, specify the tape file name. For example, specify [Tape]0 for the first tape file, and [Tape]2&CustomConfig.file to specify the second tape file (using a custom tape configuration file).

**Note:** Wild card characters are not permitted in the *File from* and *File to* parameters of the Tape Copy command.

*[Overwrite ok?]* The allowable entries are *Yes*, *No*, or nothing. If you enter nothing, you are prompted for confirmation before an existing file is overwritten. If you enter *Yes*, an existing file of the same name is automatically overwritten. If you enter *No*, an existing file of the same name is *not* overwritten; restore is skipped for that file.

*[Confirm each?]* The allowable entries are *Yes* or *No*. The default is *No*. If you enter *Yes*, you are prompted for confirmation before the operation is executed.

### Command Performance

After you complete the form and press GO, the system takes over and performs the tape copy operation.

## QIC Retension (1/4-Inch Tape Only)

The QIC Retension utility does a retension pass on 1/4-inch tape cartridges as recommended by tape manufacturers. See "Command Performance" for a description of the operation.

To initiate this utility, type **QIC Retension** and press RETURN. The following form appears:

```
QIC Retension
[Erase Tape ok?]
```

### Command Fields

*[Erase Tape ok?]* The allowable entries are *Yes* or *No*. The default is *No*. If you enter *No*, the retension operation is executed (see Command Performance). If *Yes* is entered and the tape already contains a valid archive file, a message describes the file and asks whether you wish to overwrite it. If you choose to overwrite, the tape is erased in its entirety during the tape retension operation.

### Command Performance

After you complete the form and press GO, the system takes over and instructs you with screen messages as needed. If you entered *No* to the *[Erase Tape ok?]* prompt, the tape moves to BOT, next to EOT, and then back to BOT.

If *Yes* was entered for the *[Erase Tape ok?]* parameter and the tape already contains a valid archive file, a message describes the file and asks whether you wish to erase it. If you press GO in response to this message, the tape retension is performed as described in the previous paragraph, but the tape is erased in its entirety as it moves from BOT to EOT. If you press CANCEL or FINISH instead of GO, the command aborts and returns to the Executive.

## **QIC Unload (1/4-Inch Tape Only)**

Before you remove a cartridge from the tape streamer module, rewind the tape to BOT and inform the tape streamer of the intended removal. The QIC Unload utility performs these tasks.

To initiate this utility, type **QIC Unload** and press GO.

This command requires no parameters. The tape rewinds to BOT, unless it is already at that location. If the tape is at BOT, the Executive command prompt returns and the tape does nothing.

---

**Caution:** Wait for the tape to rewind completely before removing the cartridge from the tape streamer.

---



---

## Programming Interface

**Note:** This section applies to the 1/2-inch tape streamer only.

The tape server provides a procedural interface available to application programs. These procedures are collectively referred to as the *direct tape services*. The following procedures are contained in the direct tape services:

- OpenTape
- CloseTape
- ReadTapeRecords
- WriteTapeRecords
- TapeOperation
- PurgeTapeUser
- TapeStatus

Appendix C outlines procedures for configuring the BTOS high-level programming languages (BASIC Interpreter and Compiler, Pascal Compiler, Fortran Compiler, and COBOL Compiler) so that you can write application programs to access the tape server. Sample programs in Pascal are listed in Appendix D.

### OpenTape

The OpenTape service reserves the tape streamer for your exclusive use. The tape is not positioned by the OpenTape service. A *tape handle* is returned to you. This tape handle must be provided to the tape server on subsequent tape requests.

## Procedural Interface

<b>OpenTape</b>	(pbTapeName, cbTapeName, fStreaming, fHighDensity, fClear, mode, pThRet) : ErcType
pbTapeName	is a pointer to the name of the tape streamer to be opened (e.g., [Tape]).
cbTapeName	is the number of characters in the tape name.
fStreaming	is a flag that indicates whether data transfer operations are to be performed in streaming mode.
fHighDensity	must be TRUE (OFFH).
fClear	is a flag that, when set to FALSE, indicates data errors require a TapeStatus request to be issued before an error condition is cleared.
mode	is a word that contains <i>mr</i> or <i>mw</i> for mode read and mode write respectively.
pThRet	is the memory address of a word in which the tape handle is returned.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	6
2	nReqPbCb	1	1
3	nRespPbcb	1	1
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	190
12	fStreaming	1	
13	fHighDensity	1	
14	fClear	1	
15	reserved	1	
16	mode	2	
18	pbTapeName	4	
22	cbTapeName	2	
24	pThRet	4	
28	cbThRet	2	2

## CloseTape

The CloseTape service closes the tape, making it available to other users. The tape position is unaffected by the CloseTape request.

### Procedural Interface

**CloseTape** (th) : ErcType

th is the tape handle returned by the OpenTape service.

### Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	2
2	nReqPbCb	1	0
3	nRespPbcb	1	0
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	194
12	th	2	

## ReadTapeRecords

The ReadTapeRecords service reads the next  $n$  fixed-length records from tape into your buffer. The length of the record is computed by dividing the size of the buffer by the number of records to be read.

If an error condition occurs, pCRecordsRet reflects the number of records or blocks successfully read. pCbRet is updated with the number of bytes read.

If an error condition occurs and the fClear flag was false when the tape was opened, TapeStatus must be issued prior to any subsequent reads/writes. Tape reads/writes issued without the intervening TapeStatus request returns the Tape Error Outstanding status code (9039). This allows you to return to the application where tape error recovery may be performed.

## Procedural Interface

**ReadTapeRecords** (th, nRecords, pb, cb, pCRecordsRet, PCbRet): ErcType

th	is the tape handle returned by the OpenTape service.
nRecords	is the number of records to read. If nRecords is negative, the number of records to read is interpreted as the 2's complement of nRecords and the records are read in the reverse direction (toward the load point).
pb	is the pointer to where the data read is to be stored. This must point to an even address.
cb	is the size in bytes of the area for storing the data. The size of each record is computed as cb/nRecords.
pCRecordsRet	is a pointer to the location where the number of records that were successfully read is stored.
pCbRet	is a pointer to the location where the number of bytes read is stored.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	6
2	nReqPbCb	1	0
3	nRespPbcb	1	3
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	191
12	th	2	
14	nRecords	2	
16	reserved	2	
18	pb	4	
22	cb	2	
24	pCRecordsRet	4	
28	cbRet	2	2
30	pCbRet	4	
34	cbRet	2	2

## WriteTapeRecords

The WriteTapeRecords service writes one or several fixed-length records. The length of the record is computed by dividing the size of the buffer by the number of records to be written.

If an error condition occurs, pCRecordsRet reflects the number of records successfully read. pCbRet is updated with the number of bytes read.

If an error condition occurs and the fClear flag was false when the tape was opened, a TapeStatus must be issued prior to any subsequent reads/writes. Tape reads/writes issued without the intervening TapeStatus request results in the Tape Error Outstanding status code (9039). This allows you to return to the application where tape error recovery may be performed.

### Procedural Interface

**WriteTapeRecords:** (th, nRecords, pb, cb, pCRecordsRet, PCbRet): ErcType

th	is the tape handle returned by the OpenTape service.
nRecords	is the number of records to write. The value of nRecords must be positive.
pb	is the pointer to where the data is. This must point to an even address.
cb	is the size in bytes of the data. The size of each record is computed as $cb/nRecords$ .
pCRecordsRet	is a pointer to the location where the number of records that were successfully written is stored.
pCbRet	is a pointer to the location where the number of bytes written is stored.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	6
2	nReqPbCb	1	1
3	nRespPbcb	1	2
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	192
12	th	2	
14	nRecords	2	
16	reserved	2	
18	pb	4	
22	cb	2	
24	pCRecordsRet	4	
28	cbRet	2	2
30	pCbRet	4	
34	cbRet	2	2

## TapeOperation

The TapeOperation service allows you to issue commands to the tape streamer, which include Rewind, Skip Record(s), Search Mark(s), Write Tape Mark(s), Erase and Erase Tape.

Operations that do not use the *subOp* field are labeled with *subOp = x*. Operations that do use the *subOp* field have *n* labels. If *n* is greater than 0, the operations proceed with the tape moving forward. If *n* is less than 0, the operations proceed with the tape moving backward. For example, TapeOperation (th, 0, 3, -1) backspaces one record.

## Procedural Interface

**TapeOperation** (th, fFast, command, subOp) : ErcType

**th** is the tape handle returned by the OpenTape service.

**fFast** is a flag that indicates whether or not these operations should be done in streaming mode. This flag overrides the parameter given in the OpenTape command. This allows the user to read/write records in incremental mode (25 ips) and to skip records in streaming mode (100 ips).

**Command** is the command code of the operation to be performed (see table of Tape Operation Commands that follows).

**argument** is the argument to be supplied to certain commands. For example, TapeOperation (SkipRecord, 3) skips the next three records.

## Tape Operation Commands

Commands	Tape Command/Description
Rewind (1,X)	Rewinds the tape to the load point.
Unload (2,X)	Rewinds and unloads the tape.
SkipRecord (3,n)	Skips <i>n</i> records.
SearchMark (4,n)	Searches for <i>n</i> tapemarks.
WriteTapeMark (5,n)	Writes <i>n</i> tapemarks.
Erase (6,n)	Erases <i>n</i> * 3.5 inches of tape.
EraseTape (7,n)	Erases the tape until the physical end of tape (EOT) is reached.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	6
2	nReqPbCb	1	0
3	nRespPbcb	1	0
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	193
12	th	2	
14	fFast	1	
15	command	1	
16	subop	2	

## PurgeTapeUser

The PurgeTapeUser service aborts all outstanding tape requests and releases all the tape streamers reserved by you. Each aborted request returns with error code 4 (Operation Terminated).

## Procedural Interface

**PurgeTapeUser** (work) : ErcType

work is a temporary work area for the service.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	2
2	nReqPbCb	1	0
3	nRespPbcb	1	0
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	195
12	work	2	

## TapeStatus

The TapeStatus request determines the status of the tape streamer and clears outstanding read/write error conditions.

The status returned is as follows. The number within parentheses specifies the bit value of the status indication (i.e., status = 4Ah indicates that the tape is on-line, ready and write-protected).

Write Protect (2)	Indicates whether the tape in the streamer is write-protected.
Ready (8)	Indicates that the tape streamer is ready for new commands.
End of Tape (10h)	Indicates that the end of the tape has been reached. This bit is valid only after an end-of-media error has occurred.
Load Point (20h)	Indicates that the tape is at the load point.
On-Line (40h)	Indicates that the tape streamer is on-line.

## Procedural Interface

**TapeStatus** (th, pStatusRet) : ErcType

th is the tape handle returned by the OpenTape service.  
 pStatusRet is a pointer to the location where the one-word tape status is to be written.

## Request Block

Offset	Field	Size (bytes)	Contents
0	sCntInfo	2	6
2	nReqPbCb	1	0
3	nRespPcb	1	1
4	userNum	2	
6	exchResp	2	
8	ercRet	2	
10	rqcode	2	196
12	th	2	
14	reserved	4	
18	pStatusRet	4	
22	cbRet	2	2

## Tape Streamer Diagnostics

**Note:** This section applies to the 1/2-inch tape streamer only.

The tape streamer diagnostics test the following:

- Proper controller/cabling installation
- Proper tape operation

## Installing Magtape Diagnostics

Insert the distribution disk into disk drive [f0] and reboot your system using the Bootstrap command as follows:

Command	<b>Bootstrap</b>		<b>RETURN</b>
Bootstrap			
Filename		[f0]<sys>SysImage.sys	
[Sys volume or wsNNN]	f0		<b>GO</b>

## Operation

The tape streamer diagnostics operates similar to other B 20 hardware diagnostics: The diagnostics software loads into the memory of the workstation, a header is displayed, and the prompts are as follows:

### *Change Parameter (Y/N)?*

To run a test sequence with standard parameters, type **n** and press **RETURN**. The diagnostic runs through five tests, verifying the proper installation and operation of the tape streamer.

If you type **y** and press **RETURN**, you are given the option of selecting the tests that are run, starting with the prompt:

### *Test # to run:*

Type each test number to run, followed by **RETURN** (descriptions follow). If an incorrect number is entered, the beep sounds. When all tests are selected, press **RETURN** a second time. All diagnostic errors are text messages that suggest actions to be taken.

## **Test Descriptions**

### **Test 1 - TapeMaster Installation Test**

Test 1 verifies that the tape controller is correctly installed. The diagnostic attempts to detect improper switch settings. Some installation errors may cause the diagnostic to freeze, however. If this occurs, check the S2 switch setting on the CPU board and pins 31 - 50 on the tape controller board.

### **Test 2 - TapeMaster Interrupt Test**

Test 2 verifies the correct operation of interrupts from the tape controller.

### **Test 3 - Tape Drive Status Test**

Test 3 verifies the correct installation of the cables to the tape drive and the functioning of the tape drive itself. The majority of errors from this test are most likely caused by incorrect cable installation.

### **Test 4 - Tape Drive Positioning Test**

Test 4 performs tape positioning functions and tests the results.

### **Test 5 - Tape Drive Write/Read Test**

Test 5 writes and reads 100 records. Errors from this test indicate drive, cabling and/or media problems.

## Parameter Prompts

After the test sequence is selected, test parameters can be varied. These parameters should be modified only by persons knowledgeable with tape controller operation. Descriptions of these parameters follow.

*Times to run:*

The default is *1*. The test sequence selected runs for the specified number of times unless an error occurs or FINISH is pressed to stop testing.

*Tape Controller Channel Address:*

The default is *80AAh*. Specifies the channel address of the tape controller board.

*Tape Controller Interrupt Level:*

The default is *6*. Specifies the interrupt level to be used when interrupting.

*Tape Drive Number:*

Must be *0*.

*Tape Speed/Density Option*

The default is *Yes*. Asserts the Speed/Density signal. For the MTSU asserting this signal selects streaming mode. Specify *No* to test the tape drive in incremental mode.

*Data Buffer Size:*

Specifies the size of the tape record during test 5. The acceptable range is 1,024 to 16,384 bytes.

*Stop on error?*

The default is *Yes*.

## Exiting Magtape Diagnostics

When you rebooted your workstation with the distribution disk in [f0], the resident operating system was replaced with the one on the floppy disk. The only way you can exit the Magtape Diagnostics is to remove the disk from f0 and reboot your workstation by pressing the reset button or switching the power off and on.



## Status/Error Codes

This appendix defines the BTOS tape streamer status/error codes and messages that you may see during the use of your tape streamer.

**Note:** The occurrence of any of the following error conditions is logged to the system log file, which you may examine using the PLog command.

<b>Code</b>	<b>Description</b>
0004	Operation terminated by PurgeTapeUser request or operator intervention.
9001	Timed out waiting for expected Data Busy false.
9002	Timed out waiting for expected Data Busy false, Formatter Busy false, and Ready true.
9003	Timed out waiting for READY to be de-asserted while reading status.
9004	Timed out waiting for READY to be asserted at command completion.
9005	Timed out waiting for expected Data Busy true.
9006	A memory time-out occurred during a system memory reference.
9007	Blank tape was encountered where data was expected.
9008	An error occurred in the micro-diagnostic.
9009	End of Tape. The end of the tape cartridge was reached.
9010	Tape hardware failure. The tape hardware is not responding correctly.
9011	A read overflow or write underflow occurred. This error indicates that the FIFO was empty when data was requested by the tape during a write, or full, when the tape presented a byte during a read.
9012	No buffer allocated to tape server. See Install Qictape server command.
9013	A read parity error occurred on the byte interface between the drive and the tape controller.
9014	An error was detected while calculating a checksum on the tape controller PROM.
9015	A tape time-out occurred because the tape drive did not supply an expected read or write strobe. This normally occurs when attempting to read a larger record than was written. It may also occur during a write due to a damaged tape.
9016	Tape not ready.
9017	A write or erase operation was attempted on a tape that was opened in read mode.
9021	An unexpected tape mark was encountered during a read data operation.
9022	An error in specifying a parameter was detected by the tape controller. The usual cause is a byte count that is zero or too large.

Code	Description
9024	An unidentifiable hardware error occurred.
9025	A streaming read or write operation was terminated by the operation system or disk.
9032	Bad tape handle. A tape request was issued with an unrecognized tape handle. This is typically caused by an error in a user program. It may also occur when using the tape backup utilities, if the cluster workstation was taken off-line during the backup operation.
9033	Bad tape parameters. The tape server request contained invalid tape parameters. These include: zero-length buffers, requests to read or write zero records, etc.
9035	Bad Tape File Name. The tape name supplied was invalid for the currently installed server. Tape names have the form [QIC], [QIC]n, or [QIC]+ if the tape server is installed or [TAPE], [TAPE]n, or [TAPE]+ if the tape server is installed.
9036	Tape is in use. The tape drive is currently reserved by another user.
9037	A write or erase was attempted on a tape that was write-protected.
9038	Indicates one of the following: <ul style="list-style-type: none"> <li>a. Illegal tape operation. An illegal command code was supplied in the TapeOperation request.</li> <li>b. Illegal Tape request. An illegal request code was sent to the Server.</li> </ul>
9039	Tape error outstanding. A read or write request was issued while a tape error was outstanding. Issue a TapeStatus request to clear the tape error before issuing another read or write request.
9040	Unknown tape mode. Tapes may be opened for only mode read ( <i>mr</i> ) or mode write ( <i>mw</i> ).
9041	Tape operation is outstanding. A CloseTape request was received before all previous requests for this drive were completed.
9042	Illegal tape buffer address. The address of the buffers are illegal for tape operations.
9043	Tape record is truncated. The buffer provided was not large enough for the tape record.
9051	Corrupt tape. The tape is not a valid backup tape or has been corrupted.
9052	Invalid tape position. The tape is neither at the load point nor at the start of a tape file.
9053	Invalid tape set. The tape is not part of the backup set currently being used. Verify that the correct tape is mounted.
9054	Invalid tape sequence. The tape cartridge is mounted out of the correct sequence for backup (e.g., the program expected tape 2 of 3 and the third tape was mounted).

Code	Description
9055	Invalid tape configuration file. The tape configuration file is invalid. Use the tape Configure File command to create the configuration file.
9056	Missing tape configuration file. The tape configuration file cannot be found. Use the tape Configure File command to create the tape configuration file.
9057	Bad tape record size. Tape records must be between 1024 and 16384 bytes for 1/2-inch tape backup, between 2 and 16384 bytes for tape byte streams, and be a multiple of 512 between 2048 and 63512 bytes for 1/4-inch tape backup. Use the Configure Tape File command to create valid parameters.
9058	Indicates one of the following for 1/4-inch tape: a. No tape module. b. Tape drive is missing or not receiving power. c. Cannot install tape server on this machine. d. Tape has been unwound off cartridge. Indicates one of the following for 1/2-inch tape: a. Missing tape controller. b. Improperly configured tape controller.
9060	Tape controller failure. The tape controller is not correctly responding. Run the tape streamer diagnostic to diagnose the failure.
9073	Tape cartridge not in place. If this message appears when the cartridge is in place, it may mean that the cartridge is broken.
9080	Buffer too small; there is insufficient RAM space to accommodate requested record size. Install more RAM or decrease amount of RAM in use.
9081	Too many tape modules.
9085	<b>Warning:</b> A marginal data block was detected. The tape hardware had to do 8 or more retries to read a block of data. This usually indicates that the tape cartridge is nearing the end of its useful life.
9086	The tape hardware was unable to read or write a data block after 16 retries. The cartridge will be rewound to BOT if the error occurred during a write operation.

Code	Description
9087	<p><i>Illegal command</i> exception occurred. This was caused by one of the following:</p> <ul style="list-style-type: none"> <li>a. Attempt to select other than one drive.</li> <li>b. Attempt to change drive selection when tape has been moved away from BOT.</li> <li>c. Attempt to BOT, Initialize Cartridge, or Erase simultaneously.</li> <li>d. Attempt to Write/Read Records, or Write/Read Tape Marks with Online off.</li> <li>e. Attempt to issue a command other than Write Record or Write Tape Mark during a Write Records command.</li> <li>f. Attempt to issue a command other than Read Record or Read Tape Mark during a Read Records command.</li> <li>g. Attempt to issue any command not implemented.</li> <li>h. A write data, write tape mark or erase tape operation was attempted on a tape that was opened in read-only mode.</li> </ul>
9088	<p>Indicates one of the following:</p> <ul style="list-style-type: none"> <li>a. Timed out waiting for <i>command accepted</i> interrupt.</li> <li>b. Timed out waiting for <i>transfer complete</i> interrupt during a read or write data operation.</li> <li>c. Timed out waiting for <i>exception</i> interrupt during a <i>read tape mark</i> operation or software reset.</li> </ul>
9089	Unable to read tape status after exception.
9090	<p>Indicates one of the following:</p> <ul style="list-style-type: none"> <li>a. Ready not asserted during command execution.</li> <li>b. Ready not asserted at beginning of command execution.</li> </ul>
9091	Tape status shows unexpected power-on/Reset.
9092	The tape controller board's <i>block count</i> register did not reach terminal count during a read or write to the tape.
9093	No free tape control block data structure.
9094	Inconsistency. Internal variables have unexpected values.
9095	Bad user number. The user number received is OFFFh which is invalid.
9099	The tape server is already installed.

---

## **QIC Tape Module Maintenance**

### **How the Tape Streamer Works**

The 1/4-inch tape streamer module has two heads, one behind the other, that float very close to the tape media and read and write to it. When the drive is writing, the first head (write head) writes and the second head (read head) reads what has been written. If the drive is writing and the read head cannot read what was written, a write error is reported.

### **Tape and Tape Streamer Maintenance**

#### **Tape Cartridge**

The tape cartridge requires no maintenance beyond routine retensioning. Retensioning ensures that the tape is properly erased before writing data to it and that the tape is centered on the reels, providing less chance for error to occur during read or write operations. See Section 5 for a description of the QIC Retension command.

#### **Module**

The read/write head assembly and tape hole sensor openings of the 1/4-inch tape streamer should be cleaned periodically. The recommended frequency of cleaning is after every eight hours of actual tape motion. The drive should also be cleaned after an initial pass of a new cartridge or, if you are initializing a series of new cartridges, after every two hours of tape motion.

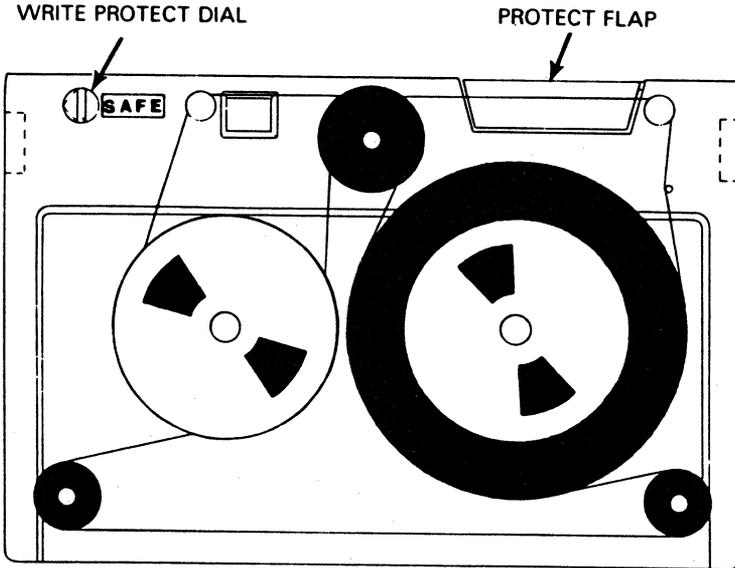
A head cleaning system, consisting of a cartridge tape head cleaner and a cleaning solvent, should be used for cleaning the read/write heads and the tape entrance sensor openings. If the cartridge tape head cleaner is not available, then cotton swabs and TP35 cleaning solvent can be used instead. Follow the directions included with the cleaning system you use.

## 1/4-Inch Tape Cartridge

Figure B-1 illustrates a tape cartridge. The write protect dial is located on the upper left corner. Use a coin to turn the dial so the arrow points to *SAFE* in order to write-protect the tape. Similarly, turn the slot so that the arrow points away from *SAFE* in order to enable writes to tape.

A protective cover flap keeps dust and fingerprints from marring the tape when not in the drive. Do not touch the tape.

Figure B-1 1/4-Inch Tape Cartridge



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## Configuring Tape Byte Streams

**Note:** This appendix applies to the 1/2-inch tape streamer only.

This appendix describes the procedures necessary for accessing the tape server via several programming languages.

You need the following:

- Language Development System (release level 7.0 or higher) installed (see the *BTOS Linker/Librarian Programming Reference Manual* and the *BTOS Assembler Programming Reference Manual*).
- Programming language of your choice: interpreted or compiled BASIC, Fortran, Pascal, or COBOL (see the respective programming language reference manual).
- Object modules *TapeBs.obj* and *TapeRq.obj* from your tape streamer product disk.

### Initial Set Up

- 1 Set the path to [Sys]<Sys>.
- 2 Copy the tape object modules (*TapeRq.obj* and *TapeBs.obj* on the <Sys> directory of your BTOS tape streamer disk), using the LCopy command as follows:
 

```

Command      LCopy                      RETURN
LCopy
File list          TapeRq.obj TapeBs.obj
[File prefix(es) from] [f0]<sys>
[File suffix(es) to]  [Sys]<sys>          GO
[Overwrite ok?]
[Confirm each?]
[Continue on error?]
[Verify copy?]

```
- 3 *TapeBs.obj* adds the necessary openbytestream procedures and *TapeRq.obj* supplies the respective request codes. Add these modules to the CTOS library, using the Librarian command (part of the Language Development System package) as follows:

Command	Librarian	RETURN
Librarian		
Library File	CTOS.lib	
[Files to add]	TapeRq.obj TapeBs.obj	GO
[Modules to delete]		
[Modules to extract]		
[Cross-Reference File]		
[Suppress confirmation]		

4 Edit the SamGen.asm (or SamGenAll.asm) file in the [Sys]<Sys> directory, using the Executive Edit command as follows:

- To the %DeviceOpen section, add these two entries:  
 %DeviceOpen([Tape],OpenByteStreamTape)  
 %DeviceOpen([Tape]0,OpenByteStreamTape)
- To the %tagProc section, add these two entries:  
 %tagProcs(tagTapeRead,FillBufferTape,  
 FlushBufIllegal,ChkptNop,ReleaseByteStreamTape)  
 %tagProcs(tagTapeWrite,FillBufIllegal,  
 FlushBufferTape,ChkptNop,ReleaseByteStreamTape)

**Note:** Do *not* use any spaces in these entries; do *not* break any of the entries with a carriage return.

Refer to the *BTOS Customizer Programming Reference Manual* for more information about the %DeviceOpen and %tagProc macros.

5 Assemble the SamGen.asm file using the Assemble command (part of the Language Development System) as follows:

Command	Assemble	RETURN
Assemble		
File	SamGen.asm	GO
[Errors Only?]		
[GenOnly, NoGen, Gen]		
[Object file]		
[List file]		
[Error File]		
[List on pass 1?]		

- 6 The assembler will create the object file SamGen.obj; add this file to the CTOS library, using the Librarian command as follows:

```

Command      Librarian                RETURN
Librarian
  Library File CTOS.lib
  [Files to add] SamGen.obj
  [Modules to delete]
  [Modules to extract]
  [Cross-Reference File]
  [Suppress confirmation]                Yes    GO

```

Linking applications using the new CTOS.lib will include tape bytestreams. The 1/2-inch tape streamer may now be accessed through the programming languages.

The two methods of access available are SAM bytestream calls and Tape Server calls. These methods are discussed for each programming language in the subsections that follow.

## BASIC Interpreter (Release level 5.1)

**Note:** For the following operations, you need two files that are named Basic.lib and BasGen.asm. These files are available on your BASIC Interpreter installation disk, but are not copied to your hard disk with the Software Installation command. If they do not currently exist in your [Sys]<Sys> directory, perform the following step.

If Basic.lib and BasGen.asm are not in your [Sys]<Sys> directory, copy all of the files from the [f0]<BAIBLD> directory of your BASIC Interpreter installation disk, using the LCopy command as follows:

```

Command      LCopy                RETURN
LCopy
File list          *
[File prefix(es) from] [f0]<BAIBLD>
[File suffix(es) to]   [Sys]<sys>    GO
[Overwrite ok?]
[Confirm each?]
[Continue on error?]
[Verify copy?]

```

Change the name of `SamGen.Obj` to `Bas-SamGen.Obj`, using the `Rename` command as follows:

```

Command      Rename                      RETURN
Rename
Old file name      SamGen.Obj
New file name      Bas-SamGen.Obj          GO
[Overwrite ok?]
[Confirm each]

```

Add `Bas-SamGen.Obj` to the `Basic.lib` file using the `Librarian` command as follows:

```

Command      Librarian                      RETURN
Librarian
Library File      Basic.Lib
[Files to add]    Bas-SamGen.Obj
[Modules to delete]
[Modules to extract]
[Cross-Reference File]
[Suppress confirmation] Yes          GO

```

Edit the `BasGen.asm` file in the `[Sys]<Sys>` directory, using the `Executive Edit` command as follows:

- 1 Press `CODE-F` to use the `Find` command of the Editor; answer the *String:* `<>` prompt with `sSamBuffer dw`; press `GO`.
- 2 The value following `sSamBuffer dw` may be 512 or 1,024; for this application, it must be set to 1,024. Change the value for `sSamBuffer dw` to 1,024, if necessary.
- 3 Press `FINISH` to exit the Editor; `Yes` is the default answer to the *Save?* : `<>` prompt; press `GO` to save your changes and return to the Executive.

## Tape Bytestreams

To use the tape bytestreams access method, assemble the `BasGen.asm` file using the `Assemble` command as follows:

```

Command      Assemble      RETURN
Assemble
Source files  BasGen.asm    GO
[Errors only?]
[GenOnly, NoGen, or Gen]
[Object file]
[List file]
[Error file]
[List on pass 1?]

```

Several questions appear on the screen. Press `RETURN` (defaults as *n* answer) for all questions except:

Are you calling the Sequential Access Method (y or n)?

For this question, type **y** and press `RETURN`. This makes an entry in the assembly language module that defines *rgProcedures* for calling the *Sequential Access Method*.

Link `BasGen.obj` along with the library file, `Basic.lib`, to create a new `Basic.run` file, using the `Link` command as follows:

```

Command      Linker              RETURN
Linker
Object modules  BasGen.obj
Run file       Basic.run
[List file]
[Publics?]
[Line numbers?]
[Stack size]
[Max memory array size]
[Min memory array size]
[System build?]
[Version]
[Libraries]     Basic.lib      GO
[DS allocation?]
[Symbol file]

```

## Tape Server

Using the Editor, add the following entries to the BasGen.asm file after the *ADD NEW ENTRIES HERE* notation:

```
%TableEntry(1,8,TAPEOPERATION)
%TableEntry(1,18,OPENTAPE)
%TableEntry(1,2,CLOSETAPE)
%TableEntry(1,18,READTAPERECORDS)
%TableEntry(1,18,WRITETAPERECORDS)
%TableEntry(1,2,PURGETAPEUSER)
%TableEntry(1,6,TAPESTATUS)
```

Assemble this edited BasGen.asm file to produce a new BasGen.obj file. Then link BasGen.obj along with Basic.lib, as described previously under "Tape Bytestreams," to create a new Basic.run file.

To write a BASIC program that invokes tape server calls, see the *BTOS BASIC Interpreter Programming Reference Manual*.

## BASIC Compiler (Release level 5.1)

Using the Editor, add the following entries to the file Basgen.asm in the "Add new entries" section:

```
%TableEntry(1,8,TAPEOPERATION)
%TableEntry(1,18,OPENTAPE)
%TableEntry(1,2,CLOSETAPE)
%TableEntry(1,18,READTAPERECORDS)
%TableEntry(1,18,WRITETAPERECORDS)
%TableEntry(1,2,PURGETAPEUSER)
%TableEntry(1,6,TAPESTATUS)
```

The entries are assembled into the new Basgen.obj. Add the new BasGen.Obj to your program at compile time. For additional information refer to the *B 20 Systems BASIC Compiler Reference Manual* for linking this application.

To write a BASIC program that invokes tape server calls, see "Calling non-BASIC procedures" in the *B 20 Systems BASIC Compiler Reference Manual*.

## Fortran (Release level 5.1)

Add the following entries to the file Forgen.asm in the “Add new entries” section:

```
%Mediate(OpenTape, TAOPEN,7,r,w,w,w,w,r)
%Mediate(CloseTape, TACLOS,1,w)
%Mediate(ReadTapeRecords, TARDRC,6,w,w,r,w,r,r)
%Mediate(WriteTapeRecords, TAWRRC,6,w,w,r,w,r,r)
%Mediate(TapeOperation, TAOPER,4,w,w,w,w)
%Mediate(PurgeTapeUser, TAPUSR,1,w)
%Mediate(TapeStatus ,TASTAT,2,w,r)
```

The entries are assembled into the new Forgen.obj. Add the new ForGen.Obj to your program at compile time. For additional information refer to the *B 20 Systems Fortran Reference Manual* for linking this application.

To write a FORTRAN program that invokes tape server calls, see “Calling non-FORTRAN procedures” in the *B 20 Systems Fortran Reference Manual*.

## Pascal (Release level 5.1)

Tape server calls must be declared in the source program. For details, see the “Accessing B 20 Systems Operations from PASCAL” in the *B 20 Systems Pascal Reference Manual*.

## COBOL (Release level 5.1)

### Tape Bytestreams

Assemble file COBOLgen.Asm and answer *YES* to the question “Are you calling Tape?”. Reconfigure COBOL with this new COBOLGen.Obj. For more information, see “Reconfiguring COBOL” in the *B 20 Systems COBOL Language Reference Manual*.



## Sample PASCAL Program

```

Program Status (Input, Output);

(*.....*)
(*
(* The sample program listed below will require modification *)
(* by the user so that it will conform to specific
(* application design requirements and styling conventions *)
(*
(*.....*)

Const
  modeRead = #6d72;
  modeWrite = #6d77;
Type
  adsword = Ads of Word;
  adsChar = Ads of Char;
Var
  Th : word;
  TStatus, Status : Integer;
  erc : Integer;
  TapeName: LString(30);
  cbTapeName : Integer;
  fStream, fDen, fClear : Byte;
  openmode : Integer;
  modeOpen : word;

Function CloseTape (Thdie : word) : Integer; Extern;

Function OpenTape (pbTname : adsChar; cbTname : Integer;
  fStreaming : byte; fDensity : Byte;
  fCl : Byte; mode:word; pThRet: adsword):
  Integer; Extern;

Function TapeStatus (thdie: word; pStatusRet: adsword):Integer;
  Extern;
Begin (* Main *)

  Write('Enter tape name and press RETURN, TapeName: ');
  Readln (TapeName);
  cbTapeName := Ord(TapeName[0]);
  Write('Enter value for fStream and press RETURN,
  fStream= ');
  Readln (fStream);
  Write ('Enter value for fClear and press RETURN,
  fClear = ');

```

```
Readln (fClear);
fDen := 0;
Write ('Enter the value for openmode (0 for read, 1 for
      write): ');
Readln (openmode);
If openmode = 0
  Then
    modeOpen := modeRead
  Else
    modeOpen := modeWrite;
erc := OpenTape (ads TapeName[1], cbTapeName, fStream, fHid,
               fClear, modeopen, ads Th);
If erc <> 0
  Then
    Writeln ('Error in OpenTape, erc = ', erc);
erc := TapeStatus (Th, ads Status);
If erc <> 0
  Then
    Writeln ('Error in TapeStatus, erc = ', erc)
  Else
    Begin
      TStatus := (Status DIV 16)*10 + (Status MOD 16);
      Writeln ('Tape Status = ', TStatus);
    End;
erc := CloseTape (Th);
If erc <> 0
  Then
    Writeln ('Error in CloseTape, erc = ', erc);

End. (* Main *)
```

```

Program TapeOp (Input, Output);

Program Purge (input* output)*

(*.....*)
(*
*)
(* The sample program listed below will require modification *)
(* by the user so that it will conform to specific
*)
(* application design requirements and styling conventions* *)
(*
*)
(*.....*)

(* This program should be given SearchMark(4) and subOp(1) to*)
(* TapeOperation* The tape is expected to already have at *)
(* least 6 files consecutively* After Search for 4 marks* *)
(* PurgeTapeUser is called to stop the execution of the rest *)
(* of the program* *)

Const
  modeRead = #6D72;
  modeWrite = #6D77;

Type
  adsChar= ads of Char;
  adsword= ads of word;

Var
  fStream, fDen, fClear, fFast: Byte;
  Command:Byte;
  SubOp, erc : Integer;
  Th : word;
  TapeName: LString(30);
  cbTapeName : Integer;
  openmode : Integer;
  modeEntry : word;

Function CloseTape (Thdle: word): Integer; Extern;

Function OpenTape (pbTname: adsChar; cbTname:Integer; fStreaming:
  Byte; fDensity: Byte; fCl:Byte; mode: word;
  pThret: adsword):Integer; Extern;

Function TapeOperation (TapeHdle: word; flagFast: Byte;
  Commandcode:Byte; argument: Integer): Integer;
  Extern;

Begin (* main *)

  Write('Enter tape name and press RETURN: ');
  Readln (TapeName);
  cbTapeName := Ord(TapeName[0]);
  fStream := 0;
  fDen := 0;
  fClear := 0;

```

```
Write ('Enter value for opentape(0 for read or 1 for ');
Write ('write ), OpenMode = ');
Readln (OpenMode);
If openmode = 0
  Then
    modeentry := modeRead
  Else
    modeentry := modeWrite;

erc := OpenTape (ads TapeName[1], cbTapeName, fStream, fDen,
  fClear, modeentry, ads Th);

If erc <> 0
  Then
    Writeln ('OpenTape failed, erc = ', erc);

Write('Enter value for fFast and press RETURN, fFast = ');
Readln (fFast);
Write('Enter command code and press RETURN, Command = ');
Readln(Command);
Write('Enter the value for subOp press RETURN, subOp = ');
Readln(subOp);
erc := TapeOperation(Th, fFast, command, subOp);

If erc <> 0
  Then
    Begin
      Writeln('Error in TapeOperation, erc =', erc);
      Writeln ('Command code = ', command, 'subOp= ', subOp);
    End;

erc := CloseTape (Th);

If erc <> 0
  Then
    Writeln ('CloseTape failed, erc =', erc)

End. (* main *)
```

```

Program Purge (input, output);

Program Purge (input* output)*

(.....)
(*
*)
(* The sample program listed below will require modification *)
(* by the user so that it will conform to specific *)
(* application design requirements and styling conventions* *)
(*
*)
(.....)

(* This program should be given SearchMark(4) and subOp(1) to*)
(* TapeOperation* The tape is expected to already have at *)
(* least 6 files consecutively* After Search for 4 marks* *)
(* PurgeTapeUser is called to stop the execution of the rest *)
(* of the program* *)

Const
  modeRead = #6D72;
  modeWrite = #6D77;

Type
  adsChar = ads of Char;
  adsword = ads of word;

Var
  i : Integer;
  WA : word;
  fStream, fDen, fClear, fFast : Byte;
  Command : Byte;
  Th : word;
  TapeName : LString(30);
  cbTapeName, openmode, SubOp, erc : Integer;
  modeEntry : word;

Function PurgeTapeUser (work:word) : Integer; Extern;

Function CloseTape (Thdle: word) : Integer; Extern;

Function OpenTape (pbTname : adsChar; cbTname : Integer;
  fStreaming : Byte; fDensity: Byte; fCl:Byte;
  mode : word; pThret : adsword) : Integer;
  Extern;

Function TapeOperation (TapeHdle : word; flagFast : Byte;
  Commandcode: Byte; argument: Integer);
  Integer; Extern;

Begin (* Main *)
  Write('Enter tape name and press RETURN: ');
  Readln (TapeName);

```

```

cbTapeName := Ord(TapeName[0]);
fStream := 0;
fDen := 0;
fClear := 0;
Write ('Enter value for opentape (0 for read or 1 for
      write)');
Write ('OpenMode = ');
Readln (OpenMode);
If openmode = 0
  Then
    modeentry := modeRead
  Else
    modeentry := modeWrite;

erc := OpenTape (ads TapeName[1], cbTapeName, fStream, fDen,
                fClear, modeentry, ads Th);

If erc <> 0
  Then
    WriteIn ('OpenTape failed, erc = ', erc);
    Write('Enter value for fFast and press RETURN,
          fFast = ');
    Readln (fFast);
    Write('Enter command code and press RETURN, Command = ');
    Readln(Command);
    Write('Enter the value for subOp press RETURN, subOp = ');
    Readln(subOp);

  I := 0;
  While I < 4 Do
    Begin
      erc := TapeOperation(Th, fFast, command, subOp);
      If erc <> 0
        Then
          Begin
            WriteIn('Error in TapeOperation, erc = ', erc);
            WriteIn ('Command code = ', command, 'subOp= ',
                    subOp);
          End;
        I := I + 1;
    End;

WriteIn ('The number of records read, I = ', I);
erc := PurgeTapeUser(WA);
If (erc <> 0) AND (erc <> 4)
  Then
    WriteIn ('Error in PurgeTapeUser, erc = ', erc);
erc := TapeOperation(Th, fFast, command, subOp);
If erc <> 0
  Then
    Begin
      WriteIn('Error in TapeOperation, erc = ', erc);
      WriteIn ('Command code = ', command, 'subOp= ', subOp);
    End;

```

```
erc := CloseTape (Th);  
If erc <> 0  
  Then  
    Writeln ('Error in CloseTape, erc = ', erc);
```

```
End. (* Main *)
```



---

# Glossary

**Backup utilities.** Utilities invoked by Executive commands to archive selected files or entire volumes to 1/2-inch or 1/4-inch tape and to rewind, position, or erase the tape.

**BOT.** Beginning of tape.

**Byte streams.** A concept of the Sequential Access Method that uses a readable (input) or writable (output) sequence of eight-bit bytes. An input byte stream can be read until either the reader chooses to stop reading or it receives status code 1 (end of file). An output byte stream can be written until the writer chooses to stop writing. (See also *Sequential Access Method*.)

**CloseTape.** A procedural interface that closes a 1/2-inch tape file and releases the tape streamer so that it is available to other applications programs. (See also *OpenTape*.)

**Direct tape services.** An interface that performs the necessary I/O operations to read or write data and to position, erase and rewind the tape from Executive commands (backup utilities) or application programs. The direct tape services are provided by the tape server. (See also *Backup utilities* and *Tape server*.)

**EOT.** End of tape.

**MTSU.** Magnetic Tape Streamer Unit; the 1/2-inch tape streamer.

**OpenTape.** A procedural interface that opens a 1/2-inch tape file and reserves the tape streamer exclusively for use by the issuing applications program. (See *CloseTape*.)

**PurgeTapeUser.** A procedural interface that aborts all outstanding tape requests and releases all tape streamers that have been reserved by the issuing applications program.

**ReadTapeRecords.** A procedural interface that reads the next  $n$  fixed-length records from tape into a specified buffer. (See *WriteTapeRecords*.)

**SAM.** See *Sequential Access Method*.

**Sequential Access Method (SAM).** Provides device-independent access to devices (such as the tape streamers, video displays, printers, files, and keyboards) by emulating a conceptual, sequential, character-oriented device called a byte stream. (See also *Byte streams*.)

**Tape handle.** An identifier returned to an application when a procedural interface has been correctly executed.

## Glossary-2

---

**TapeOperation.** A procedural interface that allows you to issue operational commands to the tape streamer, such as rewind, skip record(s), search mark(s), write tape mark(s), erase, and erase tape.

**Tape server.** A system service that provides the BTOS interface for a backup utility or an application to access the tape streamer module. (See also *Backup utilities* and *Direct tape services*.)

**TapeStatus.** A procedural interface that allows an application to request status of the specified tape streamer.

**WriteTapeRecords.** A procedural interface that writes one or several fixed-length records to tape from a specified buffer. (See *ReadTapeRecords*.)

---

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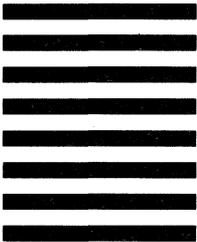
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