

Using Magnetic Tapes at CNS

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This document describes the use of magnetic tapes at CNS. Topics covered include tape hardware and facilities, purchase and maintenance, converting to 3480 cartridge tapes, tape policies, JCL for tapes, tape compaction, and TMS.

Related subjects include data sets, batch jobs, input/output.

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Preface

This manual describes how to use magnetic tapes at CNS. It highlights local procedures, policies, and facilities to supplement the information provided in vendor manuals. Information provided here should be used instead of information in vendor manuals where there is a difference.

See also the CNS document D0069, *Utilities for Using Magnetic Tapes* [<http://docweb.cns.ufl.edu/docs/d0069/d0069.html>], for documentation on local utilities for tapes.

Please call the CNS Support Desk [http://www.cns.ufl.edu/info-services/support/support_desk.html] at (352) 392-2061, or send e-mail to consult@lists.ufl.edu [<mailto:consult@lists.ufl.edu>], if you need assistance in using magnetic tapes.

Introduction to Magnetic Tapes

The CNS tape librarian maintains the magnetic tape library. The tape librarian is on duty from 8 a.m. to 4 p.m. Monday through Friday in 102C SSRB on the UF campus. This is the only time that you can submit tapes to or retrieve tapes from the CNS tape library.

Governmental agencies that have a tax-exemption certificate on file with CNS Accounting and have a userid whose access number begins with a 1, 4, 5, 6, or approved 7 can purchase cartridge tapes from the tape librarian.

We recommend that you use 3480 cartridge tapes. Avoid using 9-track reel tapes unless the reel is being sent to a computer site that does not support cartridge tapes.

A volume serial name with a maximum of six alphanumeric characters must be assigned to the tape. Avoid using the numerals 0 and 1 and the letters O and I because they are difficult to distinguish.

Before your tape can be used at CNS, it must be given to the tape librarian to enter into the Tape Management System (TMS). A special CNS tape label with the tape volume serial name will be affixed to the tape. This external label will contain your name, telephone number, access number, department, and the tape label type (standard label or non-labeled). It will also indicate whether the tape is a cartridge or 9-track, and if 9-track, whether the density is 4 (6250 bpi) or 3 (1600 bpi). Tapes must be entered into TMS by the tape librarian before they can be used. If you have a problem with the tape label, see the tape librarian. When you bring in a tape that already contains data, the tape librarian can advise you when the tape will be entered into TMS, and how soon you can submit a job that requires that tape. Generally, this will be 30 to 60 minutes after you drop off the tape. However, if you bring in a new, unused tape, it must be initialized before it can be used. Tapes are initialized overnight Monday through Thursday. A tape submitted on Friday will become available on Monday.

There is no charge for cleaning a reel tape if the tape is already in TMS. If the tape is not in TMS, the charge for cleaning is \$2 per reel (see Chapter 6 for more details). CNS does not have equipment for cleaning cartridge tapes.

Only sequential data sets can be stored on magnetic tape reels and cartridges. Tape reels can

hold about 138 million bytes and 3480 tape cartridges can hold about 200 million bytes. (A 3390 disk pack can hold about 2800 million bytes.)

A *byte* of data (usually eight bits plus a parity bit) is stored in a row across the width of the tape. The position of each bit across the tape width is called a *track*. Tape reels usually have nine tracks (eight bits plus a parity bit). The *parity bit* is added to make the number of bits odd so that the tape drive can detect when a bit is lost. Cartridges usually have 18 tracks.

Tape density is an indication of the amount of data contained within a length of the tape. The standard density is 6250 bpi for 9-track tape reels and 38,000 bpi for 3480 tape cartridges.

A *record*, or *logical record*, is a grouping of data and can be any size. *Fixed-length* records are all the same length. *Variable-length* records are various lengths. The first four bytes of each variable-length record specify the length of the record. Undefined-length records are also various lengths, but the record length is not specified in the record. Each record is separated by an *interblock gap* (IBG).

Data is transferred in *blocks*. Each block is separated by an IBG. Several fixed- or variable-length records can be contained in each block; an undefined-length record equals one block.

Information is written in blocks along the length of the tape. Blocking is done for hardware efficiency. The block size must be a multiple of the *logical record length* (**LRECL**) for fixed-length records and greater than or equal to the LRECL for variable-length records. The block size used for tapes has a major impact on tape capacity (the amount of data that fits on a tape) and effective data rate (the maximum speed at which data can be written to, or read from, a tape). The 3480 cartridge tape capacity is greater than that of the 9-track reel tape and has block sizes of 4K (4 x 1024 bytes) and above. If block sizes below 4K are used, the cartridge capacity can be slightly less than the tape reel capacity. Small block sizes are not recommended for either 9-track or cartridge tapes because of decreased performance. Block sizes above 8K use the 3480's buffering capacity to achieve data transfer at channel speeds. The 3480 is designed to provide optimal storage and performance for block sizes from 8 to 32K.

Tapes can be *standard label* or *non-labeled*. CNS supports IBM standard label (SL) tapes. Labels contain information about the tape. Use non-labeled tapes at your own risk; CNS will not give refunds for jobs that use non-labeled tapes, unless the tape was generated on a device that was incapable of creating standard labels.

When you write to a tape, you will automatically write over any previous information on the tape if you are not careful. To help protect your tape from accidentally being erased, a plastic "write-enable" ring is used on 9-track tapes. When the ring is inserted into the back of the tape reel by the tape operator, you are able to write to the tape. When the ring is removed, you can read from the tape but not write to it. For cartridge tapes, a thumbwheel on the case is used to control write access. You can control write protection by using the *LABEL* parameter on the JCL **DD** statement. See the "Batch Job Control Language" chapter in this manual for more information.

Special red rings called "never-write" rings can be inserted into 9-track reel tapes by the tape librarian. You can contact the tape librarian at 392-2291 if you want this extra service.

Hardware

CNS's central-site tape drive configuration is shown in Table 1.

Note

NOTE: We recommend that you convert all reel tapes to cartridges. We are gradually replacing all reel tape drives with cartridge tape drives.

Table 1. CNS Tape Drive Configuration

# of Drives	Model	Tracks	Supported Densities	DEN	Unit Name
16	3480	18	38000		<i>TAPEC</i>
2	3422	9	6250/1600	4 or 3	<i>TAPE9</i>

To use a cartridge tape, use the unit name *TAPEC* and do not specify a density.

The default at CNS is *TAPEC* (cartridge tape) for most local utilities that use tapes.

Standard label (*SL*) is the default for both cartridge and reel tapes.

To use 1600 bpi on a 9-track tape, use the unit name *TAPE9* and the DCB keyword *DEN=3*.

Tapes with the following characteristics can be used at CNS:

- 3480 cartridge tapes
- 9-track (1600 or 6250 bpi), odd parity reel tapes
- Any record size
- Any block size that is not greater than 32760.
- Standard IBM format
- IBM standard label (*SL*) and non-labeled (*NL*) tapes (although use of *NL* tapes is at your own risk--see Chapter 1)
- EBCDIC coding. The **TRANSLATE** command of **TPUTIL** can be used to convert a tape from some types of other coding systems.

Tape Purchasing and Maintenance

Purchasing

If you are associated with a governmental agency and have a tax-exemption certificate on file

with CNS Accounting, you can purchase new cartridge tapes from the tape librarian if they can be charged to an ID requisition or to a CNS userid whose access number begins with a 1, 4, 5, 6, and some 7's. Others may purchase cartridges from the tape librarian by paying with check or cash in the exact amount.

We strongly advise you to keep backup copies of your tapes (see "Protecting Your Data" in this manual). We cannot be responsible for damage to your tapes, including physical damage caused by hardware malfunction.

Reel Tape Handling

Tape reels should only be handled by CNS personnel or by an operator at a tape drive. High-speed tape-winding operations cause air to be trapped between the tape layers, which often causes the tape to stack irregularly on the reel. Although this does not hamper tape performance, it does require careful handling of the tape reel to avoid squeezing the reel flanges and damaging the tape edges. The tape surface can become contaminated by hand oil and moisture when handled improperly. If the tape reel is warped, the edges of the tape can become damaged. This can prevent proper tape-to-head contact, which might cause tape errors. Magnetic tapes should never be handled past the load point. Tape damage will then be restricted to the tape leader, which contains no data.

Cleaning

Take your tape reel to the tape librarian in 102C SSRB to have it cleaned. Cleaning will take at least 4 hours. There is no charge for cleaning a tape if the tape is already in TMS. If the tape is not in TMS, the cleaning charge is \$2 per reel. CNS does not have equipment for cleaning cartridge tapes.

Storing Tapes

To store a tape at CNS, contact the tape librarian in 102C SSRB. Tape storage at CNS is currently free. Tapes that have not been used for 450 days will be returned to you at the address that is associated with the tape and is stored in TMS. If you will not be using a tape frequently, do not leave it in the tape library. This frees up space for other users' tapes.

Follow these guidelines when storing tapes to improve tape reliability:

- Store reel tapes in a sealed container to prevent dust from collecting on the tape's surface and eventually causing permanent damage.
- Store magnetic tapes vertically to prevent edge damage.
- Make sure your hands and clothing are clean whenever you handle the tape.
- Keep the temperature and humidity in the storage area constant (with an upper limit of about 70 degrees and 60 percent, respectively) to prevent warping or stretching of tapes.
- Do not store tapes in direct sunlight.
- Do not smoke around magnetic tapes.

- Beware of magnetic fields.

Transporting Tapes

Follow these guidelines when transporting or mailing a tape:

- Seal reel tapes in tape boxes; you can get them from the CNS tape librarian.
- The mailing package (not available from CNS) should leave a clearance of 1 1/2 to 2 inches around the tape. Pad the area around the tape to protect it from mechanical or physical shock.
- Because it is not clear what effect metal detectors have on magnetic tapes, pass tapes around rather than through the detectors. Mark tape packages so they will not be passed through magnetic devices.

When you want to send tapes to other installations, make sure that the tape density you use will be compatible with the tape drives at the other installation. We recommend using cartridge tapes whenever possible.

Find out the following information before sending tapes to other installations or receiving tapes to use at CNS:

- volume serial name
- data set name(s) for standard label tapes
- relative position and name of files on tape
- file number and total number of files on tape
- density for 9-track reel tapes (request 1600 or 6250 bpi)
- compaction for cartridge tapes (other installations may not support the 3480 IRDC compaction feature)
- parity (request odd)
- record format
- block size
- logical record length
- label type (request *SL*)
- documentation showing program code, sample data, and output
- name and telephone number of the person who can provide further information after the

tape has been received

Converting from Reel to Cartridge Tapes

To copy an entire 9-track tape to a 3480 cartridge tape without reblocking your data, use the **BACKUP** command of the CNS utility, **TPUTIL**. This utility is documented in the CNS document D0069, *Utilities for Using Magnetic Tapes* [<http://docweb.cns.ufl.edu/docs/d0069/d0069.html>]. You will need to use the following JCL to copy your tape:

```
//jobname JOB,'your name',CLASS=class,TIME=time,LINES=lines
/*ROUTE PRINT node.location
/*SETUP TAPE9,1
/*SETUP TAPEC,1
// EXEC TPUTIL,DSN2=,UNIT1=TAPE9
BACKUP VOLUMES=(vol1,vol2)
```

where

vol1 is the input (reel) tape volume

vol2 is the output (cartridge) tape volume

To reblock your data sets or to copy a multi-volume data set, you will have to use the **COPY** command in **TPUTIL**. Cataloged data sets must be recataloged with the new volume serial name and a device type of 3480. We suggest that you keep your 9-track tape until you are sure that you have successfully copied to the cartridge. Use **TPUTIL** to map your new tape.

To use the new 3480 cartridges, change all occurrences of *TAPE9* to *TAPEC* in **/*SETUP** statements and in the *UNIT* parameter of **DD** statements.

Tape Compaction Support for Cartridge Tapes

The Improved Data Recording Capability (IDRC) feature on the 3480 cartridge tape system is the z/OS system default. IDRC is a feature in the tape control unit which compacts data as it is being recorded. This increases the amount of data which can be stored on the cartridge tape. IDRC "uncompacts" the data when the tape is read. The amount of compaction is likely to be up to four times or more, but is highly dependent on the nature of the data being compacted. Recording using IDRC enables multi-volume files to take up fewer volumes and improves data transfer rates, since fewer bytes are written to the tape. IDRC tapes can be read by any other IBM 3480 compatible tape drive with the IDRC feature.

If you generate tapes that are to be read on a system that does not have the IDRC feature installed, you will need to change your JCL to specify that you do not want to use compaction on your output tape.

To instruct z/OS not to use IDRC, code *TRTCH=NOCOMP* in the *DCB* parameter on the **DD** statement for that data set. The following JCL example uses **IEBGENER** to write

non-compacted data to an output tape:

```
/*SETUP TAPEC,1
//COPY EXEC PGM=IEBGENER
//SYSIN DD DUMMY
//SYSPRINT DD SYSOUT=A
//SYSUT1 DD DSN=my.input.dataset,DISP=SHR
//SYSUT2 DD DSN=my.output.dataset,DISP=(NEW,KEEP),
// UNIT=(TAPEC,,DEFER),VOL=SER=mytape,
// LABEL=(1,SL),DCB=(TRTCH=NOCOMP)
```

The recording technique of the first file on the tape determines whether the remaining files on the tape are created using compaction. Since IDRC-capable tape cartridge drives automatically recognize whether or not the tape they are reading was created with IDRC compaction, you will not need to take any special measures to read such tapes.

Tape Policies

CNS uses the Tape Management System (TMS) to monitor tape use, tape location in the library, and tape submission and retrieval.

A tape librarian is on duty from 8 a.m. to 4 p.m., Monday through Friday to receive and release tapes, to ensure proper logging of tapes into TMS, and to manage the CNS tape library. The tape librarian will also initialize previously unused tapes and tapes for which the label must be modified. Tapes containing data have already been initialized and must not be initialized again because the data will be lost.

The following policies govern the submission, removal, and handling of magnetic tapes at CNS:

- 1. All tapes will be logged into TMS by the tape librarian between 8 a.m. and 4 p.m., Monday through Friday. You must provide information for the external tape label such as the owner's name, access number, telephone number, and department; a volume serial (six characters or less and do not use the digits 0 or 1, or the letters O or I because they are hard to distinguish); and the label type (standard label or non-labeled). This external tape label needs to be filled out only once for each tape.
- Tapes will be accepted for initialization only when the tape librarian is on duty. Tapes will be initialized overnight Monday through Thursday. Tapes submitted for initialization during the day will not be initialized until the following morning. Tapes submitted Friday will be available Monday. Tapes containing data will not be initialized unless the tape librarian has been specifically instructed to do so because the data will be lost when the tape is initialized.
- If you want to submit more than 5 tapes at one time to the CNS tape library, call the tape librarian first to check if there is enough room in the library.
- Jobs referencing a tape should not be submitted for execution until the tape librarian has indicated that the tape is ready for use (ask the tape librarian for this information when you drop the tape off).
- Tapes that will be accessed frequently should be left in the tape library rather than be removed between uses. If you must remove a tape temporarily from the tape library, tell the tape librarian to leave the tape in TMS.

- Tapes that will be inactive for several months or that will not be used again should be removed from the tape library because CNS does not have room to provide archival storage. Tell the tape librarian to delete these tapes from TMS. Tapes that have not been used in 450 days will be mailed to you at your risk.
- Tapes will not be released by CNS when the tape librarian is not on duty. Operators can neither accept tapes nor be responsible for them.
- Tapes with standard labels provide extra security for the data on the tape. Use non-labeled tapes at your own risk. CNS will not give refunds for jobs that use non-labeled tapes unless the tape was generated on a device that was incapable of creating standard labels.
- CNS will not be responsible for non-labeled or mixed-density tapes, or for restoring data from any tape if no backup tape exists.
- You will be charged \$2 for each cleaning of a reel tape that is not in the tape library or that has not been successfully used at least once while in the library. CNS does not have equipment for cleaning cartridge tapes.

Protecting Your Data

You are responsible for making backup copies of all data stored on your tapes. CNS cannot recreate or reconstruct data if no backup tape exists, even if the loss is caused by faulty equipment or mishandling. Magnetic tape drives malfunction occasionally; therefore, be sure to make backups to protect your data.

Backup tapes should be maintained for any data that are hard to replace. Backups are essential for data that result from involved research or experiments, for data from outdated or very old files, or for data that cannot be recreated.

A backup copy to a separate tape is preferred. Two tape backups are recommended for data that are difficult or impossible to recreate. A computer printout can also serve as a backup, but if the data are destroyed, both time and money will be required to have the information reentered. To backup a tape, see the **TAPEDISK** or **TPUTIL** utilities documented in *Utilities for Using Magnetic Tapes (D0069)* [<http://docweb.cns.ufl.edu/docs/d0069/d0069.html>].

We also recommend that you limit the number of files stored on a single tape. Even though multiple tapes are more expensive, this cost is minimal compared to the cost of recreating data if a tape is destroyed or erased.

If you want your tape data sets to be especially secure from being read or written over by others, contact CNS to request special security arrangements.

Batch Job Control Language

This chapter describes the `/*SETUP` and the data definition (**DD**) statements you will need to use tapes at CNS.

This section assumes that you have a basic knowledge of IBM job control language (JCL). See

the IBM publication *MVS/ESA JCL Reference*, or CNS document D0013, *IBM Job Control Language Conventions at CNS* [<http://docweb.cns.ufl.edu/docs/d0013/d0013.html>], or the the latest version of the JCL book by Gary DeWard Brown for more detailed explanations of JCL statements. Also see the programmer's reference manual for the computer language you are using for more information about accessing files on tape with that language.

The **/*SETUP** Statement

If you want to use magnetic tapes during a job, you must include a **/*SETUP** statement in your JCL to tell the system what type of tape drives and how many you want to use. The **/*SETUP** statement must be inserted after the **JOB** statement and has the following format:

```
/*SETUP unit,n
```

where

unit is the type of tape drive:

- **TAPEC** (cartridge)
- **TAPE9** (9-track)

n is the maximum number of tape drives to be used simultaneously during the job. See the "Hardware" chapter for the number of drives available for each type.

The **/*SETUP** statement is used to avoid initiating jobs that require more tape drives than are currently available for use. A tape job will be canceled by the operator if the **/*SETUP** statement is incorrectly formatted.

The **DD** Statement

The **DD** statement is used to define data sets to the operating system so that they can be accessed.

To read from or write to a tape, you must tell the operating system that a read or write in the program applies to a tape and you must describe the tape to the operating system.

The **DD** statement tells the operating system what your data set looks like, where it is located if it already exists, or where it is to be located if it doesn't exist.

The **DD** statement for tapes has the following format:

```
//name DD UNIT=(TAPEx,number,DEFER),VOL=SER=volser,  
// DSN=data.set.name,  
// DISP=(status,normal-termination,abnormal-termination),  
// LABEL=(filenumber,labeltype,,inoutstatus),  
// DCB=(BLKSIZE=blocksize,LRECL=recordlength,  
// RECFM=recordformat,DEN=density,TRTCH=option)
```

For detailed explanations of these parameters, see the IBM MVS JCL Reference

DCB Parameter

The Data Control Block (*DCB*) supplies information about the block size, record length, and record format of the data set. This information is stored in the label on standard label tapes and, once the file is created, it need not be repeated. The *DCB* parameter is coded as follows: *DCB=(BLKSIZE=blocksize, LRECL=recordlength, RECFM=recordformat, DEN=density, TR*

where

<i>blocksize</i>	is a multiple of the record length. For variable-length records, add four to the multiple of the record length. The "blocksize" cannot be greater than 32,760. Using block sizes greater than 6400 for any tape datasets is recommended to improve performance.
<i>recordlength</i>	is the length of the logical record for fixed-length records. For variable-length records, this should be the maximum record length plus four.
<i>recordformat</i>	is the record format to be used (e.g., FB , VB , etc.)
<i>density</i>	is a specification indicating the quantity of data within a length of tape. The DEN keyword should only be specified for 9-track reel tapes. DEN=3 indicates a density of 1600 bpi and DEN=4 indicates a density of 6250 bpi.
<i>option</i>	is used to specify the data compaction mode for a cartridge tape. Use COMP to request 3480 IRDC compaction and NOCOMP to specify no data compaction. COMP is the CNS default.

DISP Parameter

The disposition (**DISP**) field parameters specify whether the data set already exists or is being created and whether or not it is to be saved when the program is finished. The **DISP** parameter is coded as follows:

DISP=(status, normal-termination, abnormal-termination)

"*status*" can be one of the following:

NEW	Tells the operating system (OS) that the data set is being written for the first time. Anything already on the tape will be written over. Any files already on the tape after this file will be lost.
OLD	When reading, tells the operating system that the data set already exists and will be read. When writing, tells the OS that the data set exists and is being replaced. The old data, and any files after this one, will be lost.

MOD Tells the OS that the data set already exists and that the program will add new blocks to the end. The data in the file will be preserved but any files following it will be lost.

"*Normal-termination*" specifies what is to be done with the file if the program finishes normally. "*Abnormal-termination*" specifies what is to be done with the file if the program ABENDS. The possible choices are as follows:

KEEP The file will be reused later and should be saved in the system.

CATLG The file will be cataloged.

DELETE The file will not be reused later and should be deleted from the system.

PASS The file will be used by a later step in this job.

DSN Parameter

The data set name (*DSN*) identifies the data set. The name is assigned when the file is created with *DISP=NEW*, and must be repeated each time the data set is used. The *DSN* parameter is coded as follows:

DSN=data.set.name

The name can consist of letters or digits in groups separated by periods. Each group must start with a letter and be no longer than eight characters. The maximum length is 44 characters; the last 17 will be recorded in the label on standard label tapes.

If the data set is to be cataloged, the names must conform to CNS data set naming conventions. Valid names for cataloged data sets would be as follows:

userid.THIS.IS.IT

UF.userid.NEW.FILM.DATA

Note that only the last 17 characters of the data set name are recorded on the tape label on standard label tapes, so those characters should be unique for every data set name. For example, the second data set name listed above would appear on the tape label as follows:

rid.NEW.FILM.DATA

("rid" being the last three characters of the *userid*). If your data is to be protected by using a dataset name with a secured high level index, the dataset name should be less than 17 characters.

LABEL Parameter

Labels are used to identify magnetic reel or cartridge tape volumes and the data sets they contain. Valid label types at CNS are standard label (SL) or non-labeled (NL). We recommend that you use only standard label. Use non-labeled tapes if you need to transport your tape to a

non-IBM installation.

IBM standard tape labels consist of a volume label and groups of data set labels. These labels are automatically written on the tape during execution of a job that writes on the tape. They contain most of the information necessary to process the tape and to protect it from accidental overwriting. The volume label is always the first record on any SL tape and appears only once on a single tape volume; it identifies the tape volume serial name. The data set label groups (usually two records per group) precede and follow each data set on the volume to identify and describe the data set.

Header labels precede the data set.

Trailer labels follow the data set. They are almost identical to the header labels.

The data set label groups can optionally include standard *user labels*.

The Bypass Label (*BLP*) option is not available at CNS. Either machine-readable *SL* or *NL* must be specified in the JCL. If *BLP* is specified, the system will automatically convert it to *NL* and perform the standard label verification.

The *LABEL* parameter is coded as follows:

LABEL=(*filenumber*,*labeltype*,,*inoutstatus*)

where

filenumber is the file number or relative position of the data set on the tape. Default is 1.

labeltype is **SL** for a standard label tape or **NL** for a non-labeled tape. Default is **SL**.

inoutstatus specifies that the tape should only be used for input (**IN**) or output (**OUT**). Omitting this parameter indicates that the tape can be opened for input or output.

To specify which file you want to read or write, specify the "*filenumber*" in the first parameter of the **LABEL** keyword. File numbers must be in sequential order. If the tape is non-labeled, specify **NL** for the second parameter, which is the "labeltype." The third parameter of the **LABEL** keyword should not be used at CNS. If you need to use additional **LABEL** parameters, an additional comma can be specified to indicate the omitted third parameter. The optional fourth parameter of the **LABEL** keyword can be used to restrict tape access to read-only or write-only. Specifying an "*inoutstatus*" of **IN** will enable write protection for the tape, meaning that the program can only open the tape for input processing. An "*inoutstatus*" of **OUT** will restrict the program to only allow the tape to be opened for output processing.

A non-labeled tape can contain any number of data sets, each one followed by one tape mark. There is no information on the tape that the operating system can use for verification.

A double tape mark (TM) indicates the end of the last data set on the tape volume, that is, End of Volume (EOV).

It is not possible to read or write to an SL tape if NL is specified, or vice versa. Therefore, you must remember if a tape is SL or NL. If it is SL, you must also know the volume serial, data set name, and file number to access the tape properly.

If you do not know how a tape is labeled, or if you want to selectively dump portions of a tape, the **TPUTIL** program (described in the CNS document Utilities for Using Magnetic Tapes (D0069)) will give the information necessary to properly access the tape.

UNIT Parameter

UNIT defines what type of tape drive is required. The UNIT parameter is coded as follows:

UNIT=(TAPE x , number, DEFER)

where

x is **C** for tape cartridges, or 9 for 9-track tape reels

number specifies the number of units requested for this data set. Default is 1. Specifying more than 1 is necessary only if the data set spans volumes and is repeatedly read and reread within the step.

DEFER should be specified. If the second operand is not specified, **DEFER** must be preceded by two commas as follows: **(TAPE x , , DEFER)**. **DEFER** tells the system not to mount the tape until it is needed for that job.

VOL=SER Parameter

The volume serial name must be used at all times to refer to a specific tape. The volume serial name chosen by you is placed on the outside of the tape and registered in the system. Standard label tapes also have the volume serial name stored in the volume label that is written on the tape. The **VOL=SER** parameter is coded as follows:

VOL=SER=volser

where "volser" is the six-character name assigned to that volume. The default is **SCRATCH** (for a tape from the scratch pool). Note, however, that CNS does not provide 3480 cartridge tapes in the system default scratch pool.

FORTRAN Tape JCL

FORTRAN programs use a logical unit number in each read or write. Other languages use a file name. The read or write is associated with a **DD** statement by placing the FORTRAN filename in the name field of the **DD** statement. For FORTRAN logical unit number nn (zero-padded on the left if necessary), the name field on the **DD** statement is as follows:

```
//FTnnF001 DD
```

Unformatted READ/WRITE

To put a data set on tape instead of on a direct-access device, the only change required is in the DD statement for the relevant FORTRAN reference number. The basic form for the unformatted READ/WRITE is as follows:

```
//GO.FTnnF001  
DD UNIT=(TAPEx,,DEFER),VOL=SER=volser, // LABEL=(filenumber,labeltype), // DSI
```

where

<i>nn</i>	is the FORTRAN reference number used in the program
<i>x</i>	is the type of tape (C for cartridge or 9 for 9-track)
<i>volser</i>	is the tape volume serial
<i>filenumber</i>	is the file number
<i>labeltype</i>	is SL for a standard label tape or NL for a non-labeled tape
<i>status</i>	is NEW or OLD , depending on whether the data set is being created or already exists
<i>normal-termination</i>	is KEEP or DELETE

For example, **DISP=(NEW,KEEP)** specifies a new data set that you want to keep in the system. If **NEW** is specified and **KEEP** or **DELETE** is not explicitly given, the system will assume **DELETE**; if **OLD** is specified and **KEEP** or **DELETE** is not given, the system will assume **KEEP**.

Formatted READ/WRITE

For a formatted **WRITE** statement, you must specify the **DCB** parameters **RECFM**, **LRECL**, and **BLKSIZE**, where:

LRECL=	the length in bytes (or characters or columns) of the logical records being read or written
BLKSIZE=	the maximum number of bytes (greater than or equal to 18) per physical block read or written
RECFM=	codes for fixed, variable or undefined length records, blocked or unblocked

When all logical records written have the same length, the parameters would be **RECFM=F** with **BLKSIZE** equal to the logical record length, or **RECFM=FB** with **BLKSIZE** equal to an integral multiple of **LRECL**. Large block sizes are more efficient on our operating system; however, other installations might not be able to handle very large block sizes (for example, 32K on 6250 bpi tapes). If FORTRAN carriage control characters are to be used, this must be

specified in the **RECFM** parameter by appending the character "A" to the other codes, for example, **RECFM=FA** or **FBA**.

When using tapes for input-only access from FORTRAN and other programs, you must specify "**LABEL=(filename, labeltype, , IN)**" in the JCL for the tape data set where "filename" is the file sequence number of the file requested, "**labeltype**" is the label type (**SL** or **NL**), and **IN** should be coded as shown. This will protect the data from accidental destruction.

FORTRAN Tape Examples

With the FORTRAN WRITE statement:

```
WRITE (9,100) (ARRAY(I),I=1,8) 100 FORMAT (8F10.2)
```

the **DD** statement below could be used. It specifies a standard labeled (**SL**) cartridge tape (**TAPEC**) to be used by a **WRITE(9,xxxxx)** statement in FORTRAN. The volume serial is "**TAPE23**" and the data set name is "**U.userid.RESEARCH.DATA**". The record format is fixed-length, blocked records (**FB**) with a maximum block size of 6400 bytes (or characters). It will create file number two on the tape (file number one should already exist).

```
//GO.FT09F001 DD UNIT=(TAPEC, ,DEFER),VOL=SER=TAPE23,
// DSN=U.userid.RESEARCH.DATA,DISP=(,KEEP),LABEL=(2,SL),
// DCB=(RECFM=FB,BLKSIZE=6400,LRECL=80)
```

The next example specifies a 9-track tape, which can be used by a **READ(5,xxxxx)** statement. The file already exists on the tape (**DISP=OLD**). The program will read 80-character records with a default density of 6250 bpi from file number 3. The tape is non-labeled.

```
//GO.TAPEIN DD UNIT=(TAPE9, ,DEFER),VOL=SER=TAPE24,LABEL=(3,NL),
// DISP=OLD,DCB=(RECFM=F,BLKSIZE=80,LRECL=80)
```

Appendix A TMS Facilities

CNS's Tape Management System (TMS) is used to supervise the storage and use of every magnetic reel or cartridge tape at CNS.

More detailed information on TMS can be found in the TMS User's Guide, which you can print using the following MVS batch job:

```
//jobname JOB , 'your name', CLASS=class, TIME=5, LINES=5
/*ROUTE PRINT node.location // EXEC MANUAL, MANUAL=TMS, FORMS=forms, COPIES
```

If you omit the **FORMS** and **COPIES** parameters, you will get one copy of the manual on standard paper in upper and lower case at six lines per inch (forms 3001). Specify 5,000 lines of printed output for EACH copy of the manual printed (as shown in the example).

Warning

Be sure that you understand what the results will be before you try using TMS commands. The TMS manual has NOT been revised to reflect current system information, so CNS recommends that most updates to the TMS database be performed by the CNS tape librarian.

Appendix B Tape Utilities

The following utility programs can be used to create, scratch, and manipulate data sets on tapes. Each of these utilities is fully documented in specific CNS documents. You can find these by searching for the term 'tape' when you are in DOCWEB [<http://docweb.cns.ufl.edu/>].

Please be aware that some of these utilities use **TAPEC** as the default, while others still use **TAPE9**.

CARDTAPE. The **CARDTAPE** utility creates a tape data set from 80-byte card images, or adds card images to the end of an existing tape data set.

DISKTAPE. The **DISKTAPE** utility copies a disk data set to an output tape, or appends a disk data set to the end of an existing tape data set. If the tape is created properly, it can make a specified disposition of the original disk data set.

ROTATE. The **ROTATE** utility cycles or rotates tape volumes on which generations of a generation data group reside. It can also catalog any data set using the volume information of an existing cataloged data set.

TAPEDISK. The **TAPEDISK** utility copies a tape data set to a disk data set or appends a tape data set to the end of an existing disk data set. If the data set is created properly, it can make a specified disposition of the original tape data set.

TPUTIL. The **TPUTIL** utility manipulates magnetic tapes. It can be used to copy, dump, map, or backup tapes. For each function you can specify optional formatting and record selection or checking. Translate tables are provided.

Your Comments are Welcome

We welcome your comments and suggestions on this and all CNS documentation. Please send your comments to:

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