Chapter 2

Using the Integrated Tape System

ITS provides a number of utilities for transferring files between SDA systems and tape systems connected to the ITS tape controller board. These are functionally equivalent to the tape I/O utilities provided for the CMIO bus environment — **ibmtape**, **cmdd**, **cmtar**, **cmdump**, and **itsrestore** — except they are executed on an ITS node running CMIX.

Each ITS-based utility has the same base name as its CMIO counterpart, but has an **its** prefix instead of **cm**. The ITS versions are summarized below.

- **itsibmtape** — This utility supports the interchange of IBM data sets between the SDA and IBM 3480−compatible cartridge tape drives. See Section 2.1 for details.
- **itsdd** — This utility moves tape file images to and from tape when the data is in a format not ordinarily supported by UNIX. See Section 2.2 for details.
- **itstar** — This is a version of the GNU **tar** program with enhancements to support the StorageTek 4980 tape drive system. See Section 2.3 for details.
- **itsdump**/**itsrestore** — These utilities provide backup and restore capability for the CM-5 SDA disk storage systems. See Section 2.4 for details.

In addition, ITS supports the use of standard SunOS tape commands, such as **mt**, **tar**, **cpio**, **dump**, **restore**, and **dd**. For best ITS performance, however, the Thinking Machines versions of **tar**, **dump**, **restore**, and **dd** should be used.

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To use these utilities, you simply log on to the ITS node and issue the applicable command(s) at the CMIX prompt. These commands are described in Sections 2.1 through 2.4. Examples showing these commands in use are provided in Chapter 3.

2.1 The itsibmtape Command

The **itsibmtape** command is designed to allow IBM data sets to be imported and exported on IBM Standard Label 3480−type tapes via a 3480-compatible tape drive attached to an ITS. The ITS acts as a gateway between the SCSI bus used by the tape drives and the Data Network that connects the ITS to an SDA. **itsibmtape** allows the operator to use the buffering resources built into the ITS to optimize throughput between the tape units and the SDA. It also performs the standard tasks of label reading, writing, and verification.

itsibmtape command syntax is as follows:

```
itsibmtape
      if=inputfile of=outputfile
      [-tosda | -fromsda]
      label={isl | ial | osl | oal | osl, wsl |
             osl, wal}
      vsn=list_of_vol_serial_nos
      dsn=data setname
      [bs=buffersize]
      rformat=fmt:blen:rlen
      [stackers=n] [-leds] [-compress] [-a]
```

The various arguments and switches for **itsibmtape** are described below.

if=inputfile, **of**=outputfile

if=*inputfile* specifies the name of the input file to be used for the transfer. If a data set is being written (SDA-to-tape), this specifies the name of the SDA source file. If a data set is being read from tape, this specifies the name of the device to read it from (e.g., **/dev/rst0**, **/dev/rst1**, etc.).

NOTE: When the source is an SDA file, it may be specified as a standard UNIX filename or given in the form *hostname*:**/***filename*, where *hostname*

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is the name of the host processor on which the SDA file system is mounted. An input file must be specified.

of=*outputfile* specifies the name of the output file. It takes the same format as the **if=** argument. An output file must be specified.

[−**tosda** | −**fromsda**]

The file's transfer direction must be specified by either the **−tosda** or **−fromsda** switch. If **−tosda** is specified, it is assumed that the input file is an IBM 3480−compatible tape unit and the output file resides on the SDA. If **−fromsda** is specified, the reverse is true.

One or the other of these switches must be used, but not both.

label={ isl | ial | osl | oal | osl, wsl | oal, wal }

This argument specifies the type of label processing to use on the data set. The first character in these tokens indicates whether the data is being read from (**i**) or written to (**o**) tape. **sl** and **al** indicate that the label is written as either Standard Label (EBCDIC) or ANSI. Specifying **wsl** or **wal** with the corresponding option indicates that the user wishes to replace the existing label with the given label data, rather than just use it for verification.

2.1.1 **vsn**=list_of_vol_serial_nos

Specifies one or more six-digit volume serial numbers in the data set. These numbers are separated by commas without spaces. On input tapes, only the specified volumes are processed. For output tapes, enough VSNs must be specified to accommodate all the data; extra VSNs are ignored.

dsn=data setname

Specifies the IBM data set name of the input or output data set. This is matched against the data set name in the label of each input or output tape in turn.

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bs=buffersize

Specifies the buffer size to allocate in ITS main memory to support transfers between tape storage and the SDA.

rformat=fmt:blen:rlen

Specifies the format of the data on the tape. If this option is omitted for input Standard Label tapes, the formatting information is extracted from the label. This option must be provided for output data.

- *fmt* specifies the format of the records on the tape, and must be one of **f**, **fb**, **v**, **vb**, **vbs**, or **u**.
- *blen* specifies the length of each physical tape block.
- *rlen* specifies the length of each logical record on the tape (0 for variable-format tapes). The record length must divide evenly into the block length, and the block length must divide evenly into the buffer size. That is,

  bs >= *blen* >= *rlen*
  and
  bs % *blen* = 0 and *blen* % *rlen* = 0).

  In addition, the upper bound for *blen* is 65536.

[**stackers=**n]

Causes up to four input stackers to be used. This allows the operator to overlap rewinding of one tape with the loading and reading or writing of the next tape in the data set. It also allows more than 10 tapes to be loaded concurrently, each stacker on an IBM 3480−compatible tape system typically holding 10 tapes.

NOTE: Multiple stackers must be sequential, beginning with the device specified by the **if=** or **of=** option. For example, the arguments

```
itsibmtape if=/dev/rst0 . . . stackers=2
```

would cause **itsibmtape** to use **/dev/rst0** and **/dev/rst1**. If the arguments used were

```
itsibmtape if=/dev/rst2 . . . stackers=3
```


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`itsibmtape` would instead use **`/dev/rst2`**, **`/dev/rst3`**, and **`/dev/rst4`**.

[−leds]

Displays the volume serial number of the tape currently being processed on the status display of the tape drive.

[−compress]

Enables use of any built-in data compression hardware in the IBM 3480−compatible tape drives. This option is used only for writing to tape. Compressed tapes are uncompressed automatically on input and require no special processing.

If compressed tapes are loaded on a drive that does not have the compression hardware, the operator is alerted and the tapes are rejected. New compressed tapes are labeled as such and cannot be read by tape units that do not have data compression hardware.

[−a]

Specifies that the data set is to be appended to the destination file.

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2.2 The itsdd Command

The **itsdd** command enables the user to move data to and from the tape system in the form of tape-file images when the data is in a format not ordinarily supported by UNIX (i.e., not **tar** or IBM Standard Label format via **itsibmtape**).

itsdd does relatively little processing of the data it handles; it simply copies from its input stream to its output stream without interpreting the file contents. **itsdd** is useful for reading and writing tapes that are shared with systems that do not support **tar** or IBM Standard Label format.

itsdd syntax is derived from the standard UNIX utility, **dd**, and bears a strong syntactical resemblance to it. It is also similar to **itsibmtape** (they are based on the same code), but functions slightly differently. For example, **itsdd** does no label processing.

Unlike **dd**, **itsdd** is able to use buffer memory and the I/O daemon. It also supports *fixed-block mode*. These are the chief differences between **itsdd** and its simpler cousin.

itsdd adds the following ITS-related options to **dd**:

ifbs=*n*

ofbs=*n*

tosda

fromsda

These options are described below. All other **itsdd** options are the same as for **dd**. See the UNIX man page for descriptions of the basic **dd** options.

ifbs=n, **ofbs**=n

These options specify the input and output block sizes for fixed-block mode. *n* is the block size in bytes. The default is 512 bytes.

−tosda, −fromsda

These switches have the same function for **itsdd** as for **itsibmtape** — they specify the file's transfer direction. If **−tosda** is specified, it is assumed that

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the input file is an IBM 3480−compatible tape unit and the output file resides on the SDA. If **-fromsda** is specified, the reverse is true.

One or the other of these switches must be used, but not both.

2.3 The itstar Command

The **itstar** program is an enhanced version of the Gnu **tar** program, with additions to support the StorageTek 4980 tape-drive system. The **itstar** command allows the user to create UNIX **tar** format tapes of files and directories stored on an SDA.

itstar enables the user to take advantage of the high speed of the 3480/3490 tape system and to use multiple stackers. **itstar** can also be used with other SCSI-compatible tape drives and can read **tar** images created by other versions of the **tar** program. **itstar** provides the basis for the **itsdump** and **itsrestore** commands. See Section 2.4.

itstar is generally used for UNIX-style backup and archival of a file system. It is virtually identical to standard **tar**, with the same added functionality as **itsibmtape** and **itsdd** — i.e., it is able to exploit the I/O characteristics of the ITS board to get better file system performance than would be possible with standard **tar**.

itstar also understands some of the special features of the 3480 cartridge tape drive. For example, it supports use of multiple stackers and can split a tape archive across multiple volumes. It can also use fixed-block mode to achieve reasonable tape performance.

itstar syntax is the same as standard **tar**, with the following exceptions:

- Multiple instances of the **-f** option can be used to involve multiple drives in a backup. This corresponds to the **itsibmtape** command's **stackers=** argument.
- A **-M** option is provided, which specifies that a multivolume dump is to be performed.
- A **-V** option allows the operator to label the backup with a name. This feature offers functionality similar to that of an IBM tape label.

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NOTE: By default, **itstar** assumes that its destination is a 3480-class device and blocks its output accordingly. As it is using its own internal format, it is generally not necessary to reblock the data manually.

An example of **itstar** in use is provided in Chapter 3.

2.4 The itsdump and itsrestore Commands

The commands **itsdump** and **itsrestore** provide backup and restore capabilities for the SDA. Files can be dumped to tape and selectively restored by various attributes.

itsdump and **itsrestore** are not CM versions of **dump** and **restore**, but are front ends to **itstar**.

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