

# SUPPORT BULLETIN

## SKT and SKM 8mm tape subsystems utilizing Exabyte EXB-8200 tape drives

#27

2/11/92

Status: Technical communication  
Subject: Performance and capacity considerations regarding multiple tape files  
ECO#: N/A  
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### Situation:

Some sites have experienced slow performance when writing data to these subsystems mainly due to a misunderstanding of subsystem implementation with regard to performance. The intended purpose of these subsystems is to back up *large amounts of data to very few tape files*, although many tape files may be created if desired. The main factor affecting the time required to complete a multiple tape file backup is the *file mark*. File marks take a long time to write and this additional time is multiplied by the number of tape files written. File marks also consume considerable data space.

### System Impact:

If data is stored on many tape files rather than a single file (or very few files), the time required to perform a backup operation will be significantly increased, and useable capacity will be decreased. There are other factors affecting performance which are also addressed in this bulletin.

### Time required for file marks:

The DG dump and copy utilities record tape files in the following format:

|     |                |     |     |
|-----|----------------|-----|-----|
| BOT | FILE 0 DATA... | FMK | FMK |
|-----|----------------|-----|-----|

When a file is to be added to the tape by a second dump or copy command, the tape drive must space reverse over the last two file marks (logical EOT), rewrite the first of these two file marks, append the data for the new file, and write a new logical EOT of two file marks. It takes 9.3 seconds for an EXB-8200 to write a file mark. Writing

logical EOT takes 18.6 seconds. Reversing direction takes one second. Spacing over a file mark takes one second. Thus we can see that the file mark operations will equate to 18.6 seconds of the total backup time if only one tape file is created. If more than one tape file is created, we can use the following formula to calculate the time required for file marks:

|       |                              |  |
|-------|------------------------------|--|
|       | 18.6 seconds                 | (first logical EOT)                    |
| +     | 1 second                     | (reverse direction)                    |
| +     | 2 seconds                    | (space reverse over file marks)        |
| +     | 1 second                     | (reverse direction)                    |
| +     | 9.3 seconds                  | (rewrite the first file mark)          |
| ×     | (number of tape files)       |  |
| -     | 13.3 seconds                 | (no reverse/rewrite FMK for last file) |
| <hr/> |                              |  |
| =     | Time required for file marks |  |

- ⇒ **File mark time = 18.6 seconds for 1 tape file.**
- ⇒ **File mark time = 306 seconds (5.1 minutes) for 10 tape files.**
- ⇒ **File mark time = 1582 seconds (26.4 minutes) for 50 tape files.**

Time required to complete a backup:

We can approximate the total time required to complete a backup with the following condensed formula:

|       |  |                          |
|-------|--|--------------------------|
|       | (Number of KBs of data) ÷ 246            | (data time at 246KB/sec) |
| +     | (Number of tape files) × 31.9            | (file mark time)         |
| -     | 13.3                                     | (last file)              |
| ÷     | 60                                       | (convert to minutes)     |
| <hr/> |  |                          |
| =     | Approximate minutes to complete a backup |                          |

- ⇒ **1 GB to a single tape file takes approximately 68 minutes**
- ⇒ **1 GB to 10 tape files takes approximately 73 minutes**
- ⇒ **1 GB to 50 tape files takes approximately 94 minutes**

Other variables affecting time to backup completion:

The above formula is an approximation because the following other variables will also affect the actual time required to complete a backup:

1. If the drive has to compensate for a media flaw there will be a delay while the drive handles the error. The amount of delay will depend upon the severity of the media flaw.

2. System throughput will affect performance as well. If data is not provided to the drive at a rate of at least 246KB/s, the drive will have to stop and wait. Time spent waiting for data will be added to the overall backup time. Additionally, *each time* the drive is forced to stop and wait, it takes approximately one second to reposition the tape.
3. If the tape motion is idle for 5 seconds at BOT or for 15 seconds anywhere else on the tape, tape tension will be released. It takes approximately 1.5 seconds to restore tape tension and resume operation.
4. When there has been no tape motion for 75 seconds, drum rotation is also stopped (the drum is the device which contains the helical scan tape heads). If this occurs, it takes approximately 5 seconds to restore both tape tension and drum rotation and to resume operation.
5. The rewind function takes a significant amount of time to complete. Approximate rewind time for any tape may be calculated with the following formula:

$$\text{Rewind time in seconds} = (\text{length of tape in meters}) \times 1.224$$

| <u>Tape</u>  | <u>Rewind time (min:sec)</u> |
|--------------|------------------------------|
| EXATAPE 15m  | 0:18                         |
| EXATAPE 54m  | 1:06                         |
| EXATAPE 112m | 2:16                         |

Tape efficiency in terms of capacity:

An EXATAPE 112m tape will store approximately 1.2 GB of data. Please note however that this capacity includes *all data* stored on the tape and that one file mark consumes 2.2 MB of data space. Thus, as the number of tape files increases, the number of file marks increase and the amount of space available for user data decreases. One large tape file will provide more usable data storage per tape than several smaller tape files will.

Action Required:

Be aware of the factors which affect the time required to perform the desired operation when configuring your systems and when developing your backup programs and macros. Remember that when time and capacity are critical, ***decreasing the number of tape files will maximize overall performance and capacity.*** Tuning your system to provide for sustained 246KB/s data transfers to the tape will also aid in achieving maximum subsystem performance.