

## NMR NOTES #2

### NMR Data Storage on 1/4 inch Tape (Spectrometer Systems)

NMR data can be stored or archived on 1/4 inch magnetic tape cartridges using the streaming tape drive on each of the XL series spectrometers. Magnetic tape is useful for large volume and archival storage of data, but is not useful for routine, daily operation. The media used on the streaming tape drives is a DC 300 or DC 300 XL cartridge tape. These tapes have either 300 feet (DC 300) or 450 feet (DC 300 XL) of tape and nominal capacities of either 30 or 45 Mbytes. However the Varian software will only store a single disk partition on a tape cartridge. Since disk partitions are limited to 16 Mbytes, data stored on a tape cartridge is also limited to 16 Mbytes. There is no reason then to buy the DC300XL tapes if you can find DC300 tapes, although they are getting scarcer. These cartridges have a button that can be rotated to write protect the cartridge against accidental overwriting. It is strongly recommended that you use this feature. When the arrow on the button is pointing at the word 'SAFE', the cartridge is write-protected. Rotate the button 180 degrees to write-enable the cartridge.

NMR data cannot be stored directly from an experiment to a the streaming tape drive - you must use the **svf** or **svcf** commands to store it on a disk first and then write the data out to the tape. Also, there is no provision in the Varian software to append data to an existing tape file: you must read the existing tape back to the disk, add your new data, and then write the modified disk partition back to the tape. Although the 16 Mbytes that you can store on a tape is only a fraction of its real capacity, it is still large enough that you will want to organize your data into subdirectories in order to make it easier to find data later. Also, it is possible to read back a single subdirectory from the highest level of the subdirectory tree, without reading back the remainder of the tape. Having your data in logical subdirectories can thus help speed access to your data as well.

Since using the tape requires reading or writing as much as an entire disk partition, two partitions have been set aside as streaming tape buffers. Logical units **DSK3** and **DSK4** on all systems should be available for general purpose use in connection with the streaming tape unit. **EVERYTHING** stored on these disk partitions should be considered temporary data, and may be removed as needed

**STAPE** is the command that reads and writes to the streaming tape drive. You can use **STAPE** by itself to get a help screen of information, but most of the commands and options are fairly straight-forward. In order to maintain backward compatibility with some older systems, the STAPE command includes **BACKUP** and **RESTOR** functions. These are used to backup or restore an entire disk partition as a bit-image rather than as separate files. This is an extremely inefficient way to operate the system and is not recommended. Rather, we will use the **READ** and **WRITE** commands to store data on a file by file basis. Once you have data ready to archive, use the command **STAPE(WRITE,DSK3,'THIS IS A DESCRIPTIVE COMMENT')** to write the contents of DSK3 out to the tape and include the specified descriptive text in the tape header. **STAPE(CAT)** will provide a catalog showing the highest level directory as well as your descriptive text.

When you want to recall some or all of this data, use **STAPE(READ,DSK4)** to read the entire contents of the tape back to disk partition DSK4. Note that DSK4 must

have sufficient free space to store the data - the STAPE command will not overwrite existing data. This means that you can retrieve data from several tape cartridges to the same disk partition and then write the combined data out to a new tape cartridge. If you want to read only a portion of a tape, you can specify the directory name you want to read such as **STAPE (READ, DSK4, PROTON)** to read the proton directory from tape to DSK4.

When data is stored to the tape, the system simply does a literal copy of everything in the specified directory, including free space. If there is a lot of free space at the end of your directory, the data storage and recovery will be much faster if you shrink the directory first. This will squeeze the free space from the directory so that only your data is stored. Later, when you want to add more information to this directory, you can read it back to a disk partition and increase its size to again provide more free space. To do this use **STAPE (READ, DSK4, SIZE)** where SIZE is the new total size of the recovered file. It is not possible, however, to read and resize a subdirectory from the tape.

There are several other useful commands available within the STAPE command. **STAPE (VERIFY, DSK3)** will verify the data on the tape against the data on DSK3. This would normally be done immediately after writing data to the tape in order to verify that it was stored properly. The verify will fail if DSK3 is changed in any way between the time that the data is stored and the verification attempted. **STAPE (RETENS)** will run the tape from one end to the other and back in order to retension the tape. This prevents tape speed variations caused by stretched tape, and should be done with all new tapes as well as any tape that has not been used for some time. It is also a good idea to retension tapes that have been exposed to extremes of temperature or humidity as well. **STAPE (ERASE)** will erase a tape, clearing any old data from the tape. This should not normally be necessary, but may be helpful if the system complains about an incorrect data format. Finally, **STAPE (REWIND)** will rewind a tape cartridge, but this should not normally be necessary since all of the other tape commands include a rewind as part of the normal operation.