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DESPOOL BACKGROUND PRINT UTILITY

OPERATOR'S GUIDE

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1. General.

Most large computer systems perform a function called printer "spooling" where printer output is directed to a disk file rather than the physical printer, leading to the notion that the stream of output characters is wound around a spool. The spooled printer files are then written to the physical printer device at a later time in "background mode" while the computer is performing some other function. This background print function can be thought of as the converse of spooling, resulting in a "despooling" function.

In the CP/M environment, it is often useful to have a background printing facility, especially when operating with a low speed printer device, since the time required to print listings or documents may be inordinately high. In particular, the "dead time" which occurs while the central computer waits for console input provides an opportunity for background operations since printing during this interval does not affect the throughput of the processor.

The CP/M DESPOOL utility is a program specially designed for operation with CP/M Versions 1.4 and 2.2, and provides a background printing facility. When DESPOOL is active, the operator can cause a disk file to be printed during the inactive time that CP/M is waiting for console input. Thus, background printing can take place during normal interactive CP/M operations such as program editing and data entry under ED, or test program debugging using SID or DDT.

Due to the fact that the console command processor (CCP) is retained in memory whenever DESPOOL is active, there is a minimum requirement of 18K of main memory for proper operation.

2. Activating DESPOOL.

The despooling program is started by typing

```
DESPOOL cr
```

at the CCP command level, where cr denotes the carriage return key. The DESPOOL program loads, begins execution with the sign-on message

```
** DESPOOLER READY, TYPE CTL-F
```

and returns to the CCP for subsequent input commands. At this point, the DESPOOL program is active in memory, and

will remain active until removed by a CP/M cold start, or ctl-B, as described below.

If the operator attempts to restart the DESPOOL program when it is already active, the message

DESPOOL ALREADY PRESENT, TYPE CTL-F

will appear at the console.

Following the initial DESPOOL sign-on message, the operator may proceed with the usual CP/M interaction, including DIR, ERA, TYPE, and SAVE commands. Further, the operator can initiate a transient program such as ED, DDT, PIP, or a user-defined program without affecting the operation of DESPOOL. Valid activations are:

```
DESPOOL cr
B:DESPOOL cr
d:despool cr
```

where, again, cr denotes the carriage return key.

3. Printing a File.

When DESPOOL is properly activated, as described above, the operator can cause DESPOOL to print a disk file by first typing ctl-F (control and F keys, simultaneously), which acts as an attention mechanism, whenever CP/M is reading a console character for the CCP or a transient program. When ctl-F is typed, DESPOOL responds with the prompt:

** PRINT FILE:

indicating that DESPOOL is ready to accept the name of a file to print. Note that if DESPOOL is already printing a file, then the current printing operation is discontinued.

The operator then enters a file name using the normal CCP line editing functions (see the manual "CP/M Features and Facilities" for line editing functions). For example, the input:

** PRINT FILE: X.PRN cr

causes DESPOOL to print X.PRN from the currently logged disk in background mode. If the file does not exist, or is an ambiguous reference, the message:

** NO PRINT FILE

is displayed at the console. If the file is present, the background print process commences. In either case, DESPOOL does not retain console control, but instead allows control

to return normal input mode for the program which was interrupted by the ctl-F key.

Note that the file named above can be preceded by a drive name in order to override the default drive. Thus, the following are all valid input file names:

```
B:GAMMA.ASM
d:delta.dat
X.Y
a:X.Y
```

Note that once that a background print operation begins, the operator may change the default drive without affecting the source drive specified in the DESPOOL input file name.

The following point must be emphasized: the initial prompt given by the interrupted program cannot be reissued by DESPOOL following file name input. The following sequence might occur, for example:

```
A>despool cr            (start the despooler)
** DESPOOLER READY, TYPE CTL-F
A>^F                    (get despooler's attention)
** PRINT FILE:X.Y cr    (input file name)
cr                      (single cr gets another A>)
A>
```

which starts the background print operation for X.Y, and returns the cursor to the left for more CCP input commands. Note that in this particular case, the CCP prompt is recovered by simply typing an additional carriage return, as denoted by the cr above.

As a final note, you must take care not to erase a file which is currently being printed by DESPOOL. Although such action will not destroy the integrity of your data files, the erase command releases data storage areas which could be reallocated during the printing process, resulting in improperly printed data.

4. Warm Starts.

A normal warm start of the CP/M system, caused by typing ctl-C or at the termination of a transient program, does not deactivate DESPOOL. Thus, if a file is being printed while an edit session is in progress, for example, the edit can be terminated without aborting the print process. As noted above, however, cold starts reload the entire CP/M system, and thus cause any background printing to be discontinued.

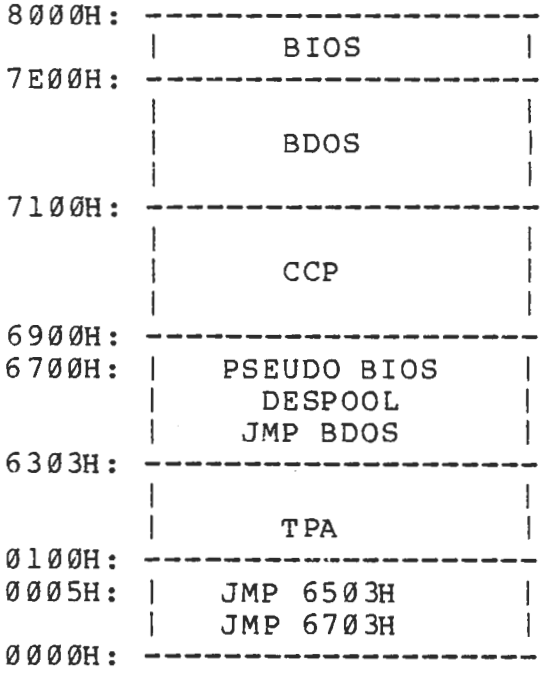
5. Deactivating DESPOOL.

DESPOOL is deactivated and removed from memory by

typing ctl-B (control and B keys, simultaneously) when in command input mode. The ctl-B "boot" operation acts like the normal ctl-C warm start function when CP/M is operating without DESPOOL. Note that unlike the ctl-F attention key, ctl-B can only be issued in command line input mode, similar to ctl-C under normal CP/M operation. Further, the ctl-B key must be the first key typed in the command line. These restrictions are present to reduce chances of accidental ctl-B input during command or data entry. Thus, for example, ctl-B can be entered during editing immediately following the standard "*" ED prompt, while the ctl-B is ignored when typing characters in input mode using the I command.

6. Implementation Notes.

The DESPOOL utility is a self-relocating program, similar to DDT and SID. Upon initial startup, DESPOOL is loaded into the base of the Transient Program Area where it receives control from the CCP. The DESPOOL program is then moved into high memory, directly below the CCP where it resides during the time it is active. The memory image during DESPOOL operation in a 32K 1.4 CP/M system, for example, appears as follows:



The normal BDOS jump address at location 0005H is changed to reflect the reduced amount of free memory (0100H through 6302H in the example given above). Thus, programs such as ED, DDT, PIP, and similarly written user programs which "size" memory using the BDOS jump address will operate properly when DESPOOL is active. Due to the fact that DESPOOL depends upon physical contiguity with the CCP module, it cannot be operated under DDT or SID (although DDT or SID can operate under DESPOOL).

The PSEUDO BIOS portion of the memory image contains a slightly altered version of the jump vector normally contained at the beginning of the BIOS. The jump vector is aligned on an even page boundary, so that it appears programmatically similar to the jump vector in high memory. The jump instruction at location ØØØØH is altered to address this pseudo jump vector in order to accommodate programs which directly access the BIOS without calling the CP/M BDOS. Although there are no Digital Research programs which directly access the BIOS, there are CP/M compatible language processors, such as Microsoft and Tarbell BASIC, which obtain their console characters directly through the BIOS. Given that a particular program locates the BIOS jump vector though the address field of the jump at ØØØØH, it will operate properly under DESPOOL.

The jump addresses remain intact upon warm start using ctl-C, but are replaced with their original values when ctl-B is processed.

7. Improving DESPOOL Response.

The DESPOOL program operates by sampling console status while printing a file in background mode. If no console input is ready, then the DESPOOL program prints the next output character. Due to the nature of some printer devices, this can cause a somewhat "sluggish" response to console input characters. In order to alleviate this condition, DESPOOL can be altered in the field to sample the printer status as well as the console status. In this case, printer output characters will not be sent until DESPOOL has sampled the printer status and found that the printer is ready to accept another character. When modified in this manner, the only delays which will be encountered at the keyboard will be during disk accesses.

The printer status change is accomplished as follows. Write a subroutine in your BIOS (if it is not already there) which interrogates the printer status and returns one of two conditions in register A:

A = ØØ	indicates that the printer is not ready to accept an output character
A = FF	indicates that the printer is ready to accept an output character (any non-zero value is treated as FF).

Assume that this subroutine is called PRSTAT, for "printer status." Augment the normal jump vector at the beginning of your BIOS to include a vectored jump to the PRSTAT subroutine, and include this jump at the end of the list given in the Digital Research manual entitled "CP/M System Alteration Guide," resulting in a jump vector which appears as shown below:

```
JMP     BOOT    ;COLD BOOT ENTRY
JMP     WBOOT   ;WARM BOOT ENTRY
JMP     CONST   ;CONSOLE STATUS
JMP     CONIN   ;CONSOLE INPUT
JMP     CONOUT  ;CONSOLE OUTPUT
JMP     LIST    ;LIST OUTPUT
JMP     PUNCH   ;PUNCH OUTPUT
JMP     READER  ;READER INPUT
JMP     HOME    ;HOME THE DISK
JMP     SELDSK  ;SELECT DISK DRIVE
JMP     SETTRK  ;SET TRACK NUMBER
JMP     SETSEC  ;SET SECTOR NUMBER
JMP     SETDMA  ;SET DMA ADDRESS
JMP     READ    ;READ SECTOR
JMP     WRITE   ;WRITE SECTOR
JMP     PRSTAT  ;SAMPLE PRINTER STATUS
```

The addition of the "JMP PRSTAT" element at the end of the list results in a total of sixteen jump vectors elements in the modified BIOS.

Incorporate your modified BIOS into a test CP/M system using the standard procedures given in the "CP/M System Alteration Guide." Cold start your test system, and load the DESPOOL program, using the special form:

DESPOOL *

where the "*" indicates that DESPOOL is to take printer status into account. If the "*" is not included, DESPOOL assumes that printer status is not available, and will not perform calls on the sixteenth jump vector element (JMP PRSTAT, above).

Once you have completed your tests, you may make a permanent change to the DESPOOL memory image using DDT so that it is not necessary to type the "*" character each time you start the DESPOOL program. The change is made by loading the DESPOOL program into the DDT test program area, altering a "printer status available" flag, followed by a SAVE operation which records the altered memory image. The procedure is shown below:

```
DDT  DESPOOL.COM cr          Load DESPOOL under DDT
NEXT    PC
ØBØØ   Ø1ØØ                 Response from DDT
S2Ø6 cr                      Set memory at Ø2Ø6H
Ø2Ø6 ØØ Ø1 cr                Change flag ØØ to Ø1
Ø2Ø7 cr                      Stop "S" mode
GØ cr                        Go to ØØØØH (warm start)
SAVE 1Ø UNSPOOL.COM cr       Record altered program
```

At this point, you have a test version of DESPOOL, called UNSPOOL, which has an assumed "*" input parameter each time it is operated. Test the new UNSPOOL and, when satisfied

that it operates in the same manner as DESPOOL with the "*" parameter, propagate this new program throughout your disks which contain the altered BIOS described above.