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DECUS NO.	8-472
TITLE	PS8IN, PS8OUT
AUTHOR	Hans Mees and Floor Anthoni
COMPANY	Medical Biological Laboratory, T.N.O. Rijswijk, The Netherlands
DATE	November 1971
SOURCE LANGUAGE	PAL-8

ATTENTION

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1 PROGRAM DESCRIPTION

In order to avoid the elaborate PS8 input-output programming, which presupposes a thorough knowledge of PS8 User Service Routines, we tried to design an automatic routine which would appear to the user as a simple character-oriented device like the TELETYPE.
A JMS to the input part would return the next character, and a JMS to the output part would "print" it on the output-file and -device.

The routine should for example, be able to call the COMMAND DECODER and detect when to close the output file.

The routines were designed for a typical class of programs expecting one input source and one output drain, and working with 8 bit structures only (ASCII; BINARY)
In this class of files the terminating character CTRL/Z(232) plays an important role, making the following automatic concept possible:

When entered for the first time, the INPUT part (PS8IN) calls the COMMAND DECODER; fetches the device-handler; reads the first block; and takes the first character to return to the user. In successive calls, the routine reads blocks, takes characters from it etc. until a CTRL/Z is detected. It then opens the next input file and so on, until no input files remain. It then passes the CTRL/Z character for the first time, signaling the real end-of-file situation.

The OUTPUT part (PS8OUT) fetches the device handler and opens the output file*) when entered for the first time. It then writes the character away in the output buffer. In successive calls the output buffer will be filled and buffers will be written to the output device.
Passing a CTRL/Z character to the OUTPUT part closes the output file, and causes an automatic return to the MONITOR.

The main benefits of these building blocks are that they provide bug-free operation, and meaningful error messages when errors are detected. The programmer is also relieved from the bookkeeping of blocks on the input and output. They can also be used to adapt 4K programs to the PS8 programming system.

*) specified to the COMMAND DECODER

The input to the COMMAND DECODER is:

* outdev: FILE <-- indev: FILE 1, FILE 2, ... , FILE 9

The use of the options (/,(), =) is still the same. If more than one output was specified, only the first one will be taken, and no error message results. The maximum number of input files is 9.

The routines were compacted, each to fit into one physical page of core. They are page-relocatable at assembly-time, and they can easily be dimensioned with regard to buffer size and the place of one- and two-page handlers. By compacting the routines, however, some restrictions were implemented too: the routines must reside in FIELD 1, as is the case with the buffers. This was not felt as a major disadvantage. The routines are not restartable, however.

2 HOW TO USE PS8IN and PS8OUT

An example of a program to perform the /A or /B option in PIP is attractively simple:

```
START, CIF 10
       JMS I (PS8IN          /call C.D. and fetch a char.
       CIF 10
       JMS I (PS8OUT         /output the char.
       JMP START
```

Note that the exit to the PS8 monitor is also built-in: the last character (CTRL/Z) closes the output file, and then causes a jump to the monitor.
If the input file has no CTRL/Z as a terminator, PS8IN reads all characters of the last block, and automatically generates one CTRL/Z when trying to read beyond the file limits. This occurs only once !!

Parameters can be set in the "user-equates" at the beginning of each module.
For PS8OUT the following applies:

TWOPAG = 1 . . . . . allows a two-page handler to be loaded in core. The user himself must be sure that the handler area is in agreement with this statement.

TWOPAG = Ø . . . . . means that only one-page handlers are allowed.

HANDLE = 7200

Defines where the device-handler should be loaded in core. Note that device handlers are always loaded in FIELD Ø.

BUFOUT = 6600)
BLKOUT = 1)

Define the buffer area. In this example a buffer of one BLOCK (= 2 pages) beginning at 16600 and ending at 17200 is specified.

Note that the buffer resides in FIELD 1, which is a must.

The buffer may, however, be located in the COMMAND DECODER area.

One can use any multiple of 1 BLOCK as a buffer size.

For PS8IN similar equates exist:

INTPAG = 1

For a two-page handler.

INTPAG = Ø

For an one-page handler.

HANDIN = 7000

The beginning of the handler area. Be careful not to load over the monitor resident areas, as no protection against this offence exists.

BUFIN = 6200)
BLOKIN = 1)

Define a buffersize of 1 BLOCK (2 pages) from 16200 to 16600 in FIELD 1.

The input buffer also must reside in FIELD 1. It may, however, be located in the COMMAND DECODER area.

The buffer size can be any multiple of 1 BLOCK.

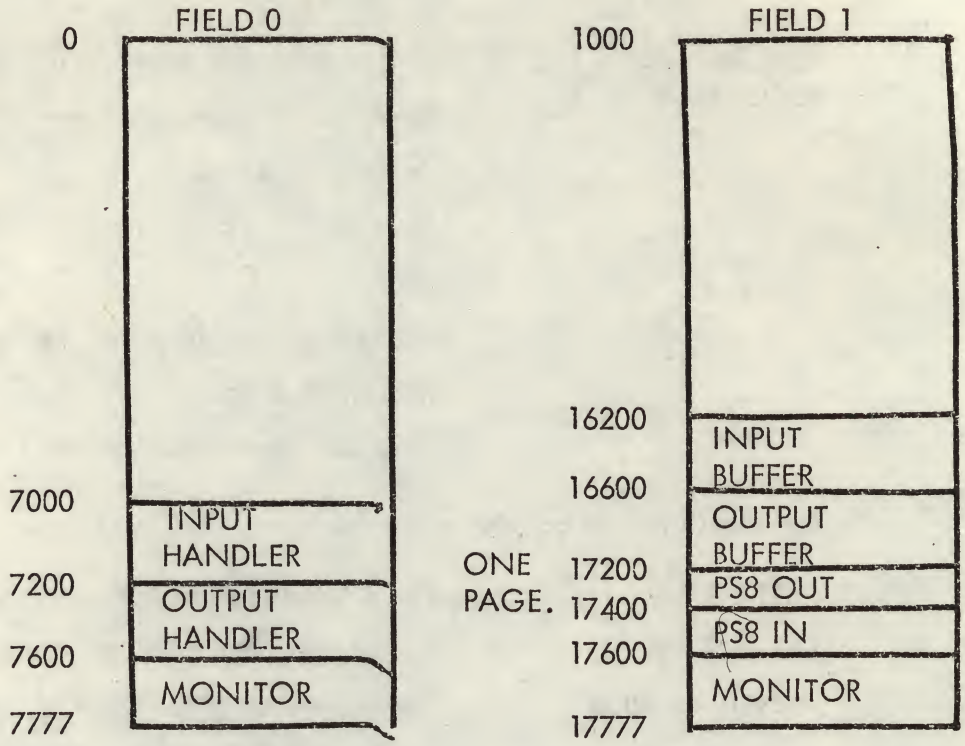
PSEXT = 0123

Defines a default extension (.AS) if no extension was specified in the input file. For example: if the user typed

* SYS: TRY ← SYS:TEM

the COMMAND DECODER searches the filename TEM.AS prior to the filename without an extension.

PS8IN and PS8OUT as structured in the available listings occupy core as follows:



When the user detects the CTRL/Z himself, he may suspend the termination of the program. He should, however, cause a monitor return with the CTRL/Z character to PS8OUT, in order to close the file.
If other devices were used in the program, he should clear the hardware flags before terminating the program. This is to prevent "unexpected interrupts" to occur in programs that do not use these devices, while running with the interrupt on.

Although PS8IN and PS8OUT were designed to run together, they can nevertheless be used separately. PS8IN, when used alone, will be quite self-supporting: it calls the COMMAND DECODER, and sets the JOB STATUS word to prevent the restart of the program.

The use of PS8OUT alone needs more help: as the command-decoder is not called automatically, the user should do so himself. He should also set the JOB STATUS word to prevent a restart of the program.

For a COMMAND DECODER call:

```
CIF 1Ø
JMS I (7700
    5
  PSEXT                    /Default extension 0123 = AS
                           /Return.
```

To set the JOB STATUS word bit 2 (not restartable):

```
CDF Ø
TAD I (7746                /Do an inclusive OR.
AND (6777
TAD (1000
DCA I (7746
```

Instead of using the command decoder, the user can write to a fixed file on a fixed device, by filling in locations 17600 to 17604 of the output file table (chapter 3.4.1 of the PS8 software support manual). An example of a fixed output file, named TEM.FD on the system-device (device 1) follows below:

```
17600      0001    /length undetermined; device#1
17601      2405    /TE
17602      1500    /M
17603      0000
17604      0604    /.FD
```

For the device numbers see appendix 4.2.

Note that PS8OUT can not be used to delete an existing file. The user can delete an existing (or not existing) file as follows:

The user wants to delete the file TEM.FD on the system-device (device-number 1)

```
TAD (1              /DEVICE NUMBER
CIF 10
JMS I (7700         /CALL USR
      4             /CLOSE
      NAME          /POINTER TO NAME "TEM.FD"
      Ø             /ZERO BLOCKS = DELETE
NOP                 /IF TEM.FD NOT FOUND IS O.K. TOO.
```

NAME, FILENAME TEM.FD

Note that the 4-word name block should be located in the field of the USR-call.

3 LIMITATIONS

The limitations of PS8IN and PS8OUT are listed here, point by point

1) The program works in FIELD 1 only; it may not be loaded into 10000-11777 or 17600-17777.
2) Input and output buffers in FIELD 1 only. They may, however, be located in the COMMAND DECODER area.
3) Device-handlers in FIELD Ø only (restriction of PS8).
4) The program is not restartable.
5) PS8OUT is not fully self-supporting (COMMAND DECODER) and JOB STATUS word) when used alone.
6) Only ASCII and BINARY files can be processed.
7) All error messages are fatal; they cause a MONITOR return.
8) The size of the output file will always be a multiple of the output buffer. When closing a file, the remaining blocks will be filled with zeroes. The use of small buffers minimizes this "rounding off".
9) PS8OUT cannot be used to delete a file.

4.1 A SUMMARY OF ERROR-MESSAGES

All PS8IN and PS8OUT error-messages are fatal. They are printed by the user service routines in the following format:

USER ERROR N AT XXXXX

Where N is the error code, explained below, and XXXXX is related to a location in core where the error call came from. As all error calls come from the same 2 origins in PS8IN and PS8OUT, XXXXX has no meaning to the user.

USER ERROR 1: The output-device handler could not be found; An attempt was made to load a 2-page handler into one page.

USER ERROR 2: The output file could not be opened or closed; the device was a read only device; No room for output; two tentative files on this device; An illegal device name was specified.

USER ERROR 3: Output file too long.

USER ERROR 4: Write error in output.

USER ERROR 5: The input-device handler could not be found.

USER ERROR 6: Read error in input.

4.2 DEVICENNUMBERS IN PS8

DEVICE NUMBER	DEVICE
01	SYSTEM-DEVICE
02	DEFAULT DEVICE "DSK"
03	TELETYPE PRINTER
04	LINE PRINTER
05	DECTAPE 0
06	" 1
07	" 2
10	" 3
11	" 4
12	" 5
13	" 6
14	" 7
15	PAPERTAPE PUNCH
16	PAPERTAPE READER
17	CARD READER

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THE NETHERLANDS

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Note that the exit to the PS8 monitor is also built-in: the last character (CTRL/Z) closes the output file, and then causes a jump to the monitor.
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Defines where the device-handler should be loaded in core. Note that device handlers are always loaded in FIELD Ø.

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Define the buffer area. In this example a buffer of one BLOCK (= 2 pages) beginning at 16600 and ending at 17200 is specified.
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The buffer may, however, be located in the COMMAND DECODER area.
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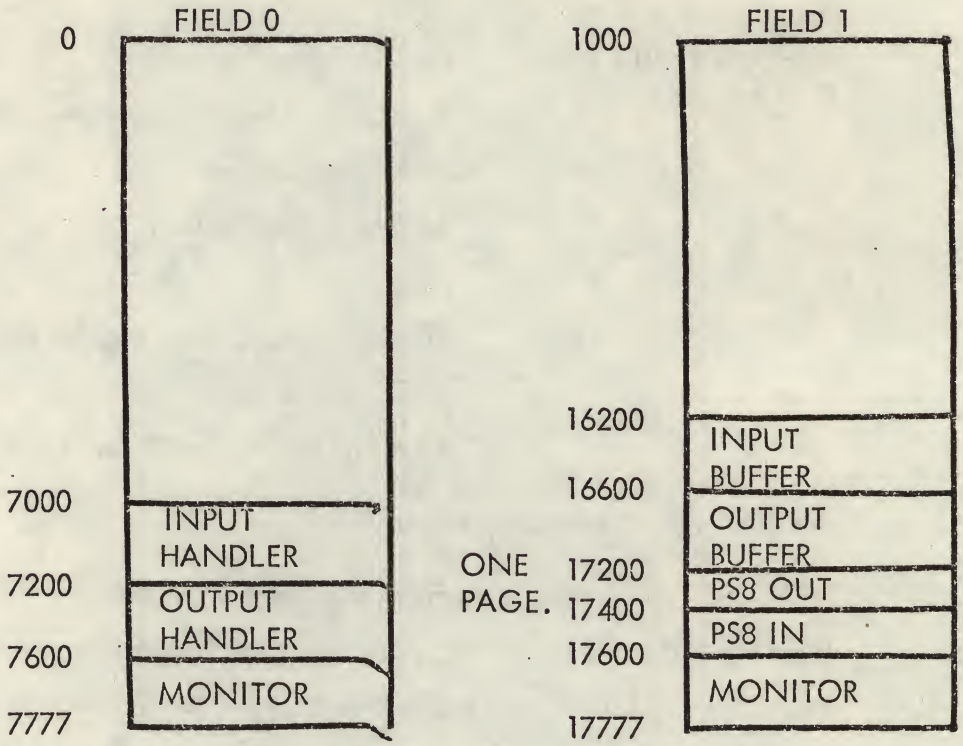

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TAD I (7746                       /Do an inclusive OR.
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The user wants to delete the file TEM.FD on the system-device (device-number 1)

```
TAD  (1           /DEVICE NUMBER
CIF   10
JMS I (7700       /CALL USR
       4          /CLOSE
       NAME       /POINTER TO NAME "TEM.FD"
       Ø          /ZERO BLOCKS = DELETE
NOP               /IF TEM.FD NOT FOUND IS O.K. TOO.
```

NAME, FILENAME TEM.FD

Note that the 4-word name block should be located in the field of the USR-call.

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