

INTERNAL REPORT No. 36

"SRLPIP -- A File Manipulation
Program for the PDP-11"

by James W. Brown

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Space Radiation Laboratory
California Institute of Technology
Pasadena, California 91109

SRLPIP

1. Abstract

SRLPIP is a general input/output driver for the PDP-11, used to transfer and reformat data files from one device to another, using IOXMTA to perform the I/O operations. Devices supported are ASR33 Teletype and paper tape reader/punch, PC-11 high-speed paper tape reader/punch, and TM11/TU10 magnetic tape. PDP-10 compatible format is supported for 9-track tape.

1.1. Conventions

All numeric quantities are octal representations, unless specified otherwise. Carriage-return is represented by <CR>.

1.2. Related Documentation

The user must be familiar with the program IOX, which is described in the PDP-11 PAPER TAPE SOFTWARE PROGRAMMING HANDBOOK (DEC-11-GGPB-D), and the program IOXMTA, described in SPACE RADIATION LABORATORY INTERNAL REPORT No. 32.

2. Data format

The four standard IOX data modes are used. These are:

FA - Formatted ASCII

UA - Unformatted ASCII

FB - Formatted Binary

UB - Unformatted Binary

The unit of data transferred is the file. When a transfer is requested, SRLPIP copies to end-of-file, and (optionally) writes an EOF on the output device. The EOF used is:

- EOF mark for magtape
- ↑P (CTRL-P) for keyboard input
- ↑S (CTRL-S, XOFF) for low speed reader in ASCII mode
- End-of-tape for paper tape (except as above)
- Blank tape for paper tape output (see 5.1 below)

3. Command string format

3.1. Device specification

Standard SRLSYS device specifications are used. These are:

D - Dummy (no data is transferred, read causes EOF)

L - Low speed reader/punch

H - High speed reader/punch

T - Teletype keyboard/printer

Mn - Magtape unit n, file 1

Mn:mmm - Magtape unit n, file mmm (mmm is an octal file number)

Only the first character in each field is significant. Thus LSR may be used to specify the low speed reader. However, the M character must be immediately followed by the unit number, as shown above. In addition to the standard specs above, the keyboard may be specified as K, or KBD.

3.2. Blocksize specification

Normally, data transfers will occur record for record. However, in some instances it may be desirable to change record sizes. The following

rules apply:

- a) SRLPIP will ask for input blocksize always, and for output blocksize if reblocking is requested (see c below).
- b) The blocksize specified for input must always be greater than or equal to the largest input record size expected.
- c) To reblock an unformatted (UA or UB) file, specify the /X switch in either command string. Output blocks will be created which have the requested output blocksize (may be larger or smaller than input blocksize).
- d) Blocksize must always be specified (in bytes) as an unsigned octal integer. The maximum size is core-limited to about 8K words (= 16K bytes = 40000 octal bytes) on a 16K machine. Special block sizes may be requested by typing E (for ED-11M blocksize of octal 400) or P (for PAL-11M blocksize of octal 110).

3.3. PDP-10 Decoding

The /D switch may be used to read or write 9 track magnetic tapes in PDP-10 format. The data format must be UB. The blocksize must be at least 1200 on input, and will be set to 1200 on output to be compatible with the PDP-10. This value will be used if the reply to *BLKSIZE= is a carriage-return.

3.3.1. Data formats for PDP-10

If the input is in PDP-10 format, the input mode must be UB. However, the output format may be any of the four specified above (para. 2).

SRLPIP assumes that the input data can be translated into the specified output mode.

If the output is in PDP-10 format, the input mode must be UA or FA. A PDP-10 ASCII file will be produced. The output mode must be UB.

The /D switch is used only in the string which refers to the PDP-10 compatible tape to be read or written.

3.4 Command strings

SRLPIP requests commands by typing

*INPUT= , *BLKSIZE= ,and *OUTPUT= .

Replies are expected in the following form:

```
*INPUT = dev/switches
*BLKSIZE=nnnnn      (or <CR> if /D specified)
*OUTPUT= dev/switches
*BLKSIZE=nnnnn      (requested if reblocking was specified)
```

Example: To translate a PDP-10 source file on unit 2 to a PAL-11M compatible file on unit 3, file 6:

```
*INPUT = M2/UB,D      (D implies X)
*BLKSIZE=<CR>        (<CR> implies standard PDP-10 block size;
12000                SRLPIP types it.)
*OUTPUT= M3:6/FA
*BLKSIZE=P           (PAL-11M max. block size
110                  SRLPIP types it.)
```

- 3.4.1. Note: after the device code delimiter ("/") all delimiters except carriage-return and semicolon are ignored. Also, the order of switches is unimportant. Thus, the following are all equivalent:

M3/UBDX
 M3/UB/D/X
 M3/DUB
 M3/X/D.UB
 M3/#\$(X)!D,B.U

For this purpose, delimiter is defined as any character not recognized as a switch. Carriage-return and semicolon are considered switches.

- 3.4.2. Only the last appearance of the format characters (A, B, F, U) is significant, and the defaults are A and F. Thus the following format specifications are all equivalent:

FA
 AF
 BAUF
 (none)

- 3.5. EOF suppression

To suppress writing an EOF on the output device when an input EOF is encountered, use the /C (continue) switch in either the input or the output string.

- 3.6. Double buffering

If neither the input device nor the output device is magtape, double buffering may be requested by using the /2 switch in the input string. Error recovery (see 4 below) is inhibited if this switch is used. Its advantage is that input and output can occur simultaneously. The output mode specification is ignored, and the input spec is used for output.

3.7. Density Selection for 7-track tapes

The default density for 7-track tapes is 800 (decimal) bytes per inch, in the PDP-11 coredump mode. To use other densities, the following switches are available:

#8 for 800₁₀ bpi

#5 for 556₁₀ bpi

#2 for 200₁₀ bpi

Example:

```
*INPUT = M4:2/UB#5
```

will read from file 2 of unit 4, setting the density to 556₁₀ bpi. These should never be used with 9-track tape.

4. Error recovery

4.1. Several types of errors are handled for input/output operations. These are:

- a) Input checksum error (FB mode only)
- b) Reader timeout (EOM)
- c) Magtape command error (e.g. unit offline)
- d) Magtape parity error (includes PAE, CRE, and BTE)
- e) Truncation error (includes magtape RLE)
- f) Magtape NXM (Non-existent-Memory reference)

These are handled as follows:

- a) On reader, pause to allow repositioning of paper tape for a retry; on magtape, treat as (d) below;

- b) Treat as EOF
- c) IOXMTA pauses to allow manual correction of the error; SRLPIP asks whether a retry is desired by typing `RETRY?` ; a carriage-return will cause a retry, any other character (followed by `<CR>`) will cause a restart;
- d) Retry dialog as above; if retry is requested, the tape is backspaced one record, and the command is reexecuted;
- e) Causes a restart; a bigger blocksize should be requested;
- f) This is always fatal and causes an IOX FATAL ERROR (code `0`) jump to loc. `40`.

4.2. Command string errors cause a new command request. Attempting to skip past a double EOF on magtape will leave the tape positioned between the two EOF marks. The command string may be repeated and the DEOF will then be ignored.

5. Special Command Functions

5.1. The `/L` and `/T` switches may be used to create extra Leader and Trailer on paper tape output. Each appearance of these switches will produce four inches of blank tape, e.g. `*OUTPUT=L/FALLTL` will produce 16_{10} inches of leader and 8 inches of trailer. (Four inches of each is standard.) Trailer is not produced if the `/C` switch is used.

5.2. The `/Rnnnn` switch causes the transfer to be stopped and an input EOF simulated when `nnnn` records have been input (or output if `/Rnnnn` appears in the output string). Only the last occurrence in each string is honored.

- 5.3. The /Snnnn switch spaces nnnn records on magtape before beginning data transfer. In this case only, nnnn may be a negative (octal) integer, indicating space reverse. E.g.:

```
*INPUT= M4:11/FAS15R0
*BLKSIZE= 1          (must be >0)
*OUTPUT= D
```

will position unit 4 to the beginning of record 16₈ of file 11₈. The same result may be accomplished by

```
*INPUT M4:11/FAR15
```

etc., but in the latter case the records will be read into core, and transferred to the output device (if the latter is not D).

- 5.3.1. Each occurrence of the /S switch is honored separately, thus the effects are cumulative.

- 5.4. Note on numeric arguments

Numeric fields are terminated by any character with an octal value less than 60 or greater than 67, and their default value is always ±1. Thus the following are equivalent:

```
M4/UBS/15/R-/72
M4:1/UBS1/R-1,2
M4:1/UBSR-1/2
```

(note that the character 2 is recognized as the double-buffering request, while the 7 is ignored. The /2 switch will cause an error because double buffering is not permitted with magtape.)

- 5.4.1. The numeric character following the tape density character (e.g. #8) is not considered a numeric field, but is simply part of a two-character switch.

5.5. Note on writing a double EOF

To write a double EOF on a magtape, simply write a null file after the last real file, e.g.

```
*INPUT = L
*BLKSIZE=110
*OUTPUT= M2:3
*INPUT = D
*BLKSIZE=1
*OUTPUT= M2:4
```

5.6. Note on Low Speed Punch

At the beginning of a low speed punch operation, SRLPIP types:

PUNCH READY?

Turn the punch on and type <CR> to start output. When the punch stops, turn it off and type <CR> to reenter command mode.

5.7. Operational Note

Sometimes it is desirable to process ASCII records containing more than one line terminator (linefeed or formfeed). If normal procedures produce improperly formatted lines (e.g. on the TTY) use the /X switch in an unformatted mode. For example, if PAL-11M or PAL-11MR listing output is on magtape, use the following command strings to list it:

```
*INPUT = Mn:fff/UAX
*BLKSIZE=E
400
*OUTPUT= TTY/FA
*BLKSIZE=E
400
```

This ensures that each character will receive individual attention.

5.8. Multi-file Input

Multiple input files (on magtape) may be processed using the Mnn switch. This causes nnn files to be processed with one set of command strings. Whether or not the files are combined depends on whether the /C switch is used. The action requested by the /R and /S switches applies only to the first file. Other switches apply for all files.

6. Comments

The semicolon (;) causes all remaining text on the current command line to be ignored.

7. Summary of implemented switches

A	ASCII
B	Binary
C	Continue enable: suppress output EOF
D	Decode/code PDP-10 format tape (9-track)
F	Formatted data mode
L	Leader (4 inches extra, paper tape output only)
Mnnnn	Multi-file input (nnn files)
Rnnn	Records, maximum number input/output
S±nnn	Skip records (magtape only) before transferring data
T	Trailer (4 inches extra, paper tape output only)
U	Unformatted data mode
X	Reblocking requested
2	Double buffering requested
#8	800 bpi 7-track data mode

#5 556 bpi 7-track
 #2 200 bpi 7-track
 ; Comments follow
 <CR> End of command string

7.1 Summary of incompatible switches

X indicates illegal combination

L indicates only last occurrence honored

	A	B	C	D	F	L	R	S	T	U	X	2
A		L		X								
B		L										
C												
D	X			* X X					X			X
F				X						L		
L				X								
R							L					
S												X
T				X								
U					L							
X												X
2				X				X			X	

* D switch not allowed on both input and output.

3.1.1. Mn:* may be used to specify the current position of unit n.

4.3 Extended error recovery.

Replies to RETRY? may be any of the following:

RETRY?<CR>	retry
RETRY?A	accept record
RETRY?E	end output file
RETRY?S	skip record (backspace if output)
RETRY?#	print record number (octal)
RETRY??	print this list

Any other reply will cause a restart.

8. Record numbers

At the end of each operation, the output record number is printed in octal. This is counted from zero at the beginning of each file operation, and is modified by the use of the /Snnn switch in the output string. This number will not reflect any records in the output file before the current operation if Mn:* is used.

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4.4 WRITE ERROR RECOVERY

If a magtape write error occurs, do not attempt to recover using the RETRY?⟨CR⟩ feature. Current implementation will cause the output tape to be backspaced one record, then rewritten. Because of the physical separation of the read and write heads, this is not the correct procedure to rewrite a record.

The correct sequence will be implemented in SRLPIP V004A. This is: backspace two records, space forward one record, rewrite.

4.4.1 TEMPORARY PROCEDURE

If a simple copy is being performed (no reblocking), either restart the entire copy operation, or try:

RETRY?NO

INPUT = Mu:/S-1, other switches as needed

*BLKSIZE = as before

OUTPUT = Mn:/S-2, S1, etc.

If reblocking is being performed, the operation must be restarted from the beginning. If the write error persists, use a different tape for output.

ADDENDUM #3 to SRL Internal Report #36

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SRLPIP V004A

TLG

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3.4.1.1. The fifth line on page 5 (para. 3.4.1.):

M3/#\$(X)!D,B.U

should be deleted.

3.4.3. Default data mode has been changed from FA to UB.

4.4.2. The problem noted in Addendum 2 has been fixed, i.e., if a mag tape write error is detected and a retry is requested the tape will be backspaced two records and spaced forward one record, then a rewrite attempted.

4.3.1. Modification of paragraph 4.3 in Addendum 1. A reply of "X" to the "RETRY?" query when writing will cause the record to be written with extended record gap.

7.0.1. Modification of Section 7.

Three new switches have been added for output: H, O, and W. These switches are intended to allow the binary input to be rewritten in ASCII coded hexadecimal (H) or octal (O) representation. The default conversion is one byte at a time; the W switch allows conversion of a word. An ASCII space is inserted between words and a carriage-return, line-feed is inserted after each 10th word in a record and at the end of each record to improve legibility when output is to the teletype (which is the most likely output device). The record count is the output record count and will be different from the input record count since output is line-blocked.

ADDENDUM #3 SRLPIP V004A (cont.)

- 7.1.1. The H, O, and W switches are incompatible with the D, X, and 2 switches. The last occurrence of the H and O switches in a string is honored.

9. Control-P restart has been modified so that the I/O RESET is not executed, i.e., IOXMTA "remembers" the tape position.

ADDENDUM #4 to SRL Internal Report #36

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JWB

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3.3.2. If ASCII data is translated to or from PDP-10 format using the /D switch, nulls and rubouts are deleted.

5.5.1. An extra output EOF may be written at the end of an operation by specifying the /E switch in the input or the output string. Thus:

```
*INPUT = M1:3/M4E
*BLKSIZE = nnnnn
*OUTPUT = M2
```

will copy four files starting with the third file on unit 1. The fourth file on unit 2 will be followed by a double EOF. However:

```
*INPUT = M1:3/M4EC
*BLKSIZE = nnnnn
*OUTPUT = M2
```

will combine four files from unit 1 onto unit 2, writing a single EOF at the end.

7.0.2. The /E switch causes an extra output EOF to be written. See para. 5.5.1.

8.1. Both input and output record numbers are printed in the form:

```
LAST RECORD = input/output
```