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PS/8 PROGRAM CNGMWA

CNGMWA is used to change the size of the manuscript working area of the SCOPE editor. A new copy of SCOPE will be put on the output device with a new MWA of the size specified by the user.

To run the program, the user types

.R CNGMWA

The file specifications are then required. The format is

**OUTPUT DEVICE:SCOPE.SV[MWA SIZE]<INPUT DEVICE:*

The current copy of SCOPE.SV on the *INPUT DEVICE* will be used to generate a new SCOPE.SV, with a different MWA size, on the *OUTPUT DEVICE*. The input file name need not be specified, in which case SCOPE.SV will be assumed, or the input file name may be explicitly specified as SCOPE.SV. If the input and output devices are the same, then the old copy of SCOPE will be deleted. *MWA SIZE* is the desired size (in decimal) of the MWA in 256_{10} word blocks and is enclosed in brackets. The specified size can be no smaller than 1 and no larger than 235 ($1 \leq \text{SIZE} \leq 235$). The final length of SCOPE will be the specified MWA size plus 20_{10} . Any file-structured input or output device may be used. The user should remember though that SCOPE must run from the system device. If the input device is omitted, the system device is assumed.

Error Diagnostics

The following error diagnostics may be printed while running CNGMWA. Control is then returned to the Keyboard Monitor. No new copy of SCOPE will have been created; the current copy remains unchanged. The error messages will be of the form

USER ERROR *N* AT XXXXX. XXXXX has no significance.

N Meaning

- 1 MWA size specified <1 or size specified >235.
- 2 Not enough room on output device for new SCOPE editor with MWA size specified.
- 3 The output file name was not 'SCOPE.SV', or an input file name other than 'SCOPE.SV' was specified, or a copy of 'SCOPE.SV' could not be found on the input device.
- 4 Trouble loading or executing input device handler.
- 5 Trouble closing output file on output device.
- 6 Trouble loading or executing output device handler.

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SCOPE-ORIENTED PS/8 EDITOR

SCOPE (SCOpe-Oriented PS/8 Editor) is a symbolic editor for the PS/8 system on the PDP-12. It is used to create and/or modify source (ASCII) files for input to other systems programs such as FORTRAN, SABR, and PAL-8. The segment of the source text being edited is displayed on the PDP-12 scope. A key-controlled cursor denotes the point in the text at which the next insertion or deletion will be made. The user may freely move both forward and backward through the entire source text, using a variety of control keys and special commands to select the segment of text to be viewed and edited.

CALLING AND USING THE SCOPE EDITOR

SCOPE must be called only from the system device. Type

.R SCOPE

followed by the RETURN key, where the dot was printed by the Keyboard Monitor. SCOPE responds by alerting the Command Decoder, which prints an asterisk (*) at the left margin. The user then types his output file designation (0-1 allowed), a left angle bracket (<), and his input file designations (0-9 allowed). Any input or output device with a two-page handler (or less) is allowable. SCOPE will read in the specified input files (if any) using the specified devices and then use its own internal Teletype handler for editing, thus TTY is normally not specified as an input device. No input or output file extensions are assumed and no I/O options are recognized.

Example:

*LTA1:SAMPLE.FT<LTA1:SAMPLE.FT

The input file will be SAMPLE.FT from LINCtape 1¹. After editing is completed, the new version of SAMPLE.FT will be written on LINCtape 1, replacing the previous version.

After the I/O files are specified, SCOPE copies the input files to its internal scratch file, called the Manuscript Working Area (MWA). If more than one input file is specified they are concatenated. The MWA is then displayed to the user for editing from the Teletype. All editing done at this point (using special control keys and commands described later) affects only the copy of the input files

1. This writeup assumes a configuration in which LTA0 to LTA7 are the names given to LINC tape handlers.

residing in the MWA. After editing is completed, the MWA is copied to the output file (if one was specified) followed by a return to the system. Since the MWA retains a copy of the last file edited, the user may repeatedly call SCOPE and edit a copy of this file simply by not specifying an input file.

Example:

```
*LTAL:SAMPLE.FT<
```

SCOPE will display the contents of the MWA as they were the last time SCOPE was used. After exiting, the MWA will be saved as SAMPLE.FT on LINCtape 1.

The user may type a completely new source manuscript into SCOPE by specifying no input file, giving a special clear command after the display appears (see Special Commands) and then typing in the new source.

When no output file is specified to SCOPE the MWA will not be saved in a file. This can be used to bring a file to the MWA and browse through it by displaying portions on the scope. (Later calls to SCOPE could, of course, edit and output the MWA).

Example:

```
*<LTAL:SQRT.PA (or equivalently *LTAL:SQRT.PA)
```

File SQRT.PA will be brought to the MWA and displayed; no output file will be created.

The size of the manuscript being edited is limited to the length of the MWA. If the combined input files exceed the capacity of the MWA, an error message will be printed on the Teletype followed by a return to the Keyboard Monitor. At this point the user should use CNGMWA (DECUS program) to create a SCOPE with a larger MWA. If the MWA becomes full during normal keyboard input, further input lines will be ignored. Special commands, however, will still be accepted. The user should exit and use CNGMWA.

A CONTROL C may be typed during the use of SCOPE to terminate execution and return directly to the Keyboard Monitor without creating an output file. The CTRL/C must be the first character on an input line. If the CTRL/C is received before the manuscript first appears on the scope, the contents of the MWA are unpredictable. If the CTRL/C is received anytime after the display appears, the current contents of the MWA will be preserved, but will not be saved in the user's specified output file.

SCOPE DISPLAY AND LOCATE REQUESTS

After the input files have been transferred to the MWA, SCOPE displays the last section of the concatenated input files and awaits Teletype input from the user. The display will consist of lines from the source files, a cursor (^) and a line number.

Example:

```
SAMPLE MANUSCRIPT LINE,  
MAY BE FOLLOWED BY MORE LINES.  
A CURSOR AND LINE NUMBER ARE  
ALWAYS PRESENT.  
^                               <5>
```

The manuscript lines displayed at any one time are called the current manuscript frame. The frame size may be changed by turning potentiometer knob 3 on the PDP-12 console.

The line number in brackets on the scope is called the "current line number" and identifies the manuscript line being, or about to be, typed in. It also denotes the relative position of the current line within the total manuscript. SCOPE assigns an octal line number to each line of the manuscript, ranging from 1 to 7775. Input beyond line 7775 is ignored. The number 1 appears as the current line number when the manuscript is erased by →CL (see Special Commands). The line numbers are not physically part of the manuscript.

The cursor may be relocated to any character within any line of the manuscript for reading or editing. The manuscript is always positioned such that the cursor is in or following the last line of the display. Insertions or deletions of text occur only at the point marked by the cursor. Movement of the cursor is controlled by the following undisplayed key combinations:

- CONTROL Q - Forward one frame
- CONTROL A - Backward one frame
- CONTROL W - Forward one line
- CONTROL S - Backward one line
- CONTROL E - Forward one character
- CONTROL D - Backward one character
- RETURN - Move the cursor past the current line

Any of the above control keys except CONTROL Q and CONTROL A may be typed when the cursor is situated within a line; all may be typed when the cursor is located on an empty current line. RETURN has no effect when the cursor is located on an empty current line.

Note that the magnitude and direction of the cursor movement is directly related to the physical keyboard position of the above control keys, and that the keys are grouped together for easy typing while watching the scope.

| | <u>Page</u> | <u>Line</u> | <u>Character</u> |
|----------|-------------|-------------|------------------|
| Forward | Q | W | E |
| Backward | A | S | D |

These control keys as well as those described below may be struck while the REPEAT key is depressed, giving a rapid continuous flow to the cursor movement.

Teletype input to SCOPE appears only on the scope, there is no printed echo.

ADDING OR DELETING MANUSCRIPT

Characters or manuscript lines may be added or deleted wherever the cursor is located. To insert characters in the manuscript, locate the cursor as described above and then type the desired characters. Characters and lines to the right of the cursor will shift over and down as new ones are inserted. End each line with the RETURN key. After the RETURN key, the cursor is always located at the beginning of an empty line. A series of new lines may be input simply by typing each line and ending it with RETURN.

CONTROL I (TAB) - Store the TAB character at the current cursor position. SCOPE will display spaces up to the next "tab stop" (every eighth position).

The TAB character is part of the source manuscript and may be inserted, deleted, etc., just like any other character. It is different only in its effect on the SCOPE display and in the interpretation FORTRAN and other programs give it.

A manuscript line may be longer than can be stored on a single horizontal line on the scope. When this occurs the line is displayed on two or more scope lines with the first scope line containing 48 characters, followed by indented 32 character segments. Only one line number is associated with the manuscript line regardless of the number of scope lines which it occupies.

Example:

| |
|--|
| <p>A SINGLE EXCEEDINGLY LONG MANUSCRIPT LINE WHICH IS DISPLAYED IN TWO OR MORE SEGMENTS ON THE SCOPE.</p> <p>^ <2></p> |
|--|

For deletions first position the cursor past the segment to be deleted and then use the following undisplayed key combinations:

CONTROL P - Delete all the lines on the currently displayed frame.

The CONTROL P key combination can only be given when the cursor is at an empty line.

CONTROL L - Delete the line in which the cursor is positioned, or the preceding line if the cursor is at an empty line.

RUB OUT - Delete the character to the left of the cursor.

If the cursor is on an empty line, the RETURN character which ends the previous line will be deleted when RUB OUT is struck. If the cursor is at the beginning of a non-empty line, then a RUB OUT key will cause the previous line and the current line to be concatenated and the line number will be decremented.

CONTROL X - Split the current manuscript line at the cursor, creating two lines.

This combination has no effect when the cursor is located at the beginning of a line or on an empty current line.

Manuscript lines following the point at which changes are made are automatically re-numbered by SCOPE as necessary. When SCOPE is used with a LINCTape system, the tape will move frequently, but briefly, while locating or editing. It will, however, move at unpredictable times, perhaps even when a manuscript line or special command is being entered. This is indicative of normal operation and requires no user action.

SPECIAL COMMANDS

There are six special commands recognized by SCOPE. A special command is executed by SCOPE after it is typed and deleted from the display at that time. When a LINE FEED or an (↑) is typed as the first character of a manuscript line,¹ a right arrow

1. The LINE FEED and (↑) keys display as (↑) and have no special significance when they are not the first character in a line.

(→) appears at the bottom of the scope. SCOPE is then ready to receive a special command. The command must be terminated by the RETURN key, after which it is executed. Illegal special commands are deleted and ignored.

→*LINE NUMBER* - Move the cursor to just after the line designated (0 to 7777).

To locate at the end of the manuscript, request any line number (octal) larger than the last line number. To locate at the beginning of the manuscript, type →0_{RETURN}. (→7777_{RETURN} is equivalent to →0_{RETURN}). This command is useful in locating to an approximate area of the manuscript after which the above control keys can be used to "zero in" on the exact position.

→*SSSTRING* - (String Search) locate the cursor immediately after the specified character string.

STRING may be no more than eight characters long. Leading, trailing, and embedded blanks are significant. All characters, except RETURN, are permissible. The search for *STRING* begins at the current manuscript line. When the manuscript display reappears, the cursor will be located immediately after the first occurrence of *STRING* encountered during the search. If the specified string is not found, the cursor will be located at the end of the manuscript. If a key is struck while searching, the search will terminate. The manuscript will be located between two manuscript lines and the key will be treated as keyboard input.

→*CS* - (Continue Search) locate the cursor immediately after the next occurrence of the character string specified in the last String Search.

This search works in the same manner as the String Search. When the next string is found and displayed typing RETURN will move the cursor to the end of the line, after which →*CS* may be typed to resume the search.

→*CL* - (Clear) the entire manuscript is deleted from the MWA.

→*AM* - (Add Manuscript) the manuscript just deleted with →*CL* is restored.

This is useful only after →*CL* has mistakenly been executed. After →*AM*, the sections of the manuscript preceding and following the line at which the →*CL* was typed should be checked -- they may be partially incorrect.

→EX - (Exit) exit from the display and write the current Manuscript Working Area to the output file, if one was designated, followed by a return to the system.

The Manuscript Working Area remains unchanged by the Exit command and will be replaced only when a new input file is specified.

EXTENDED CHARACTER CONVENTION

The full 8-bit ASCII character set is not accepted as direct input by SCOPE since SCOPE uses a 6-bit character code for its internal operations. The SCOPE CHARACTER TABLE below lists the characters which SCOPE accepts directly from the keyboard or in source file input. All other ASCII characters may be input to SCOPE by typing them in the form

ALT MODE $D_1D_2D_3$ ALT MODE

where D_1, D_2, D_3 are the three octal digits which represent the character in ASCII. The first digit must be less than 4. ALT MODE will be displayed by SCOPE as a filled-in rectangle (■). This representation will be retained in the SCOPE manuscript as five characters, and may be located or changed just like any other section of manuscript. When the user exits, however, this five character representation will be changed to the equivalent packed 8-bit ASCII character and stored in the output file.

Example:

To represent the FORM character (ASCII 214) type the five characters

ALT MODE 214 ALT MODE

which will be displayed as

■214■

The following characters among others must be represented in the above manner:

| <u>Char.</u> | <u>ASCII</u> |
|--------------|--------------|
| Vertical Tab | 213 |
| FORM | 214 |
| % | 245 |
| ε | 246 |
| ⓐ | 300 |
| ← | 337 |

Source input file characters will automatically be translated to the extended representation if necessary when the input files are brought into the MWA. Since the reverse translation is automatically performed when SCOPE creates the output file, no special action is necessary to use SCOPE with existing source files created by EDIT. Conversely, EDIT will accept source files created by SCOPE provided that the user inserts the representation for the FORM character in the SCOPE manuscript at those points where the user would have normally output a buffer when using EDIT. EDIT will not function without these FORM characters separating sections of a source file. The FORM representation may appear within a line or occupy a line by itself.

SCOPE performs a validity check on all extended character representations when it copies the MWA to the output file. Each must consist of ALT MODE followed by three octal digits (the first digit must be less than 4) and another ALT MODE character. If this test fails, the error message USER ERROR 9 at XXXXX will be printed. The output file specified by the user will not be created.

RESTRICTIONS

The following limitations upon SCOPE exist.

1. The full 8-bit ASCII character set is not directly available to SCOPE. See EXTENDED CHARACTER CONVENTION above.
2. A SCOPE manuscript may be no more than 4093 (7775 octal) lines long, with any line containing at most 512 characters.
3. The (†) key may not be typed as the first character of a line without that line being interpreted as a special command. The (†), however, may be expressed in the extended character form when needed as the first character.

ERROR DIAGNOSTICS

The following error messages may be printed on the Teletype by SCOPE. The errors are fatal and control returns to the Keyboard Monitor without creating the specified output file. The interpretation of some of the errors depends on whether the error occurred before or after the manuscript came up on the scope. The error message is of the form USER ERROR *N* at XXXXX; the XXXXX is without significance.

| <u>ERROR #</u> | <u>Meaning</u> |
|----------------|--|
| 0 | MWA too small for input file. Use CNGMWA to expand the MWA. |
| 1 | Trouble loading input file handler. |
| 2 | Trouble loading output file handler. |
| 3 | Trouble setting up tentative output file on output device. |
| 4 | Before: A complete copy of SCOPE.SV cannot be found on the system device. After: Trouble closing output file on output device. |
| 5 | Not enough room for output file on output device. |
| 6 | Before: Trouble with system handler while writing to MWA. Contents of MWA may be incomplete or incorrect. After: Trouble with handler while writing output file. |
| 7 | Trouble in system handler while editing MWA - the contents of MWA may be incorrect. |
| 8 | Before: Trouble in input handler while reading input file. After: Trouble in system handler while reading from MWA. |
| 9 | The format for an extended character representation is incorrect. |

INTERNAL DESCRIPTION

SCOPE is adapted from the manuscript display portion of LAP6W and is written primarily in LINC code. (LAP6W is an interactive editor, assembler and filer for LINC-class computers developed at the Laboratory Computer Facility). SCOPE consists of two principal parts: a PAL-8 section which interfaces to the PS/8 system and the modified LAP6W editor.

Initially the User Service Routine is loaded into core. The Command Decoder is then called to obtain file specifications from the user. The input file handler for the first input file is loaded into location 7000 in field 0. Two-page device handlers are acceptable. The first input file is read in and processed as explained below. For each subsequent input file, if there are any, the appropriate device handler will be loaded by the USR.

The input file is converted from packed ASCII format (three ASCII characters per two words) into a LAP6W manuscript (two LINC keyboard characters per word). The conversions utilize locations 0 to 7000 in field 0 for the ASCII character buffer and locations 0 to 6000 in field 1 for the LINC character buffer. Any ASCII characters that are not displayable by the internal LAP6W editor are converted to the extended character representation explained above. The CTRL Z (ASCII 232) which ends the last PS/8 input file is converted to the non-displayed 77 character, signifying the end of the manuscript to the LAP6W editor portion. If a file ends with a FORM

(ASCII 214) followed by a CTRL Z (ASCII 232), then the FORM is ignored. The converted input file is written into the Manuscript Working Area by the system handler. The Manuscript Working Area is SCOPE's internal scratch area and begins at relative block 20₁₀ of SCOPE. If no input file was specified, then the Manuscript Working Area remains unchanged.

After the above conversion is completed, the system device handler is used to read in the LINC code LAP6W editor portion of SCOPE into field 0. The LAP6W section makes use of the system device handler that starts at location 7607 in field 0 to read and write the MWA. The LAP6W editor begins processing in field 0, and after editing is complete, returns the number of blocks currently in the Manuscript Working Area to the PAL-8 code portion of SCOPE in field 1.

The USR is called to reset the device residency tables. If the user specified an output file, the appropriate output handler is loaded and a tentative output file is opened. If no output file was specified, control is returned to the Keyboard Monitor at this point. Otherwise, the second conversion transforms the LAP6W manuscript residing in the Manuscript Working Area into a packed ASCII PS/8 file. The same buffer areas are used as in the first character conversion. The second conversion will convert LAP6W LINC codes into 8-bit ASCII characters. All extended character representations will be converted into their 8-bit ASCII equivalents. If the format of an extended character representation is not correct, then the output file will not be saved, an error message will be printed on the Teletype and control is returned to the Keyboard Monitor. A LINC 77 (End-of-File) will be converted into a FORM (ASCII 214) followed by a CTRL Z (ASCII 232). The specified output file is then closed and control is returned to the Keyboard Monitor.

A CTRL C typed at the beginning of a line while editing will cause a return to the Keyboard Monitor without writing the MWA to the output file. However, the contents of the MWA will be preserved. If a CTRL C is typed anytime during the second conversion, control is returned to the Keyboard Monitor and the output file will not be closed.

The source for the PDP-8 portion of the editor is originated at 6000 in field 1 and assembles into five blocks of binary. The length of the LINC code binary for the LAP6W editor portion is 15₁₀ blocks. The remainder of the SCOPE Save Image is the Manuscript Working Area, whose size may be changed by use of the program CNGMWA. Assembly of a complete SCOPE is currently difficult due to the LAP6W portion being

in LINC code on 400 word blocks. After assembly by the two separate systems of their respective sections, the two binaries are pieced together by patching the PS/8 directory and copying over the LAP6W section one block at a time directly following the Save Image Binary for SCOPE.

SCOPE CHARACTER TABLE

The following codes may be used in a SCOPE manuscript:

| <u>Char.</u> | <u>ASCII</u> | <u>Char.</u> | <u>ASCII</u> |
|--------------|--------------|--------------|--------------|
| TAB | 211 | ? | 277 |
| RETURN | 215 | A | 301 |
| SPACE | 240 | B | 302 |
| ! | 241 | C | 303 |
| " | 242 | D | 304 |
| # | 243 | E | 305 |
| \$ | 244 | F | 306 |
| ' | 247 | G | 307 |
| (| 250 | H | 310 |
|) | 251 | I | 311 |
| * | 252 | J | 312 |
| + | 253 | K | 313 |
| , | 254 | L | 314 |
| - | 255 | M | 315 |
| . | 256 | N | 316 |
| / | 257 | O | 317 |
| 0 | 260 | P | 320 |
| 1 | 261 | Q | 321 |
| 2 | 262 | R | 322 |
| 3 | 263 | S | 323 |
| 4 | 264 | T | 324 |
| 5 | 265 | U | 325 |
| 6 | 266 | V | 326 |
| 7 | 267 | W | 327 |
| 8 | 270 | X | 330 |
| 9 | 271 | Y | 331 |
| : | 272 | Z | 332 |
| ; | 273 | [| 333 |
| < | 274 | \ | 334 |
| = | 275 |] | 335 |
| > | 276 | ↑ | 336 |

All other ASCII characters must be expressed in the extended character representation.

Scope Editor Control Keys and Commands

| <u>Key</u> | <u>Meaning</u> | |
|-------------|---|-------------------|
| CTRL Q | FWD display frame | } Cursor forward |
| CTRL W | FWD line | |
| CTRL E | FWD character | |
| CTRL A | BWD display frame | } Cursor backward |
| CTRL S | BWD line | |
| CTRL D | BWD character | |
| CTRL I(TAB) | Insert TAB; display spaces to next TAB stop. (multiples of 8 chars.) | |
| CTRL X | Split line at cursor | |
| RETURN | End line | |
| CTRL P | Delete display frame | |
| CTRL L | Delete line | |
| RUB OUT | Delete character | |

Special Commands

| | |
|---------------------|---|
| →LN↓ | Locate to line number <i>LN</i> |
| →AM↓ | Restore the manuscript just deleted with a CL command |
| →CL↓ | Clear Manuscript Working Area |
| →CS↓ | Continue the Search for <i>STRING</i> |
| →EX↓ | Store the manuscript in the Output File and return to PS/8 |
| →SS <i>STRING</i> ↓ | Search for an occurrence of <i>STRING</i> where <i>STRING</i> is up to 8 characters long. |

NOTE: → is created by typing 'LINE FEED' as the first character of the line. ↓ is the RETURN key.

Break Key

| | |
|--------|---|
| CTRL C | Forces a return to the system Keyboard Monitor without copying the Manuscript Working Area to the specified output file. (CTRL C must be typed at the beginning of a line). |
|--------|---|

