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* *   THE SLAC UNIFIED GRAPHICS SYSTEM                           *  
* *   PROGRAMMING NOTES FOR THE                                 *  
* *   IBM 370 COMPUTERS UNDER VM                               *  
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Working Paper
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The Unified Graphics System Programming Manual (CGTM No. 170) for the IBM 360/370 under SVS may also be used for the IBM 370 computer running under VM. The VM version of the Unified Graphics System contains all of the standard subroutines in the SVS version and uses the same calling sequences. Both the FORTRAN and PL/1 (Optimizing Compiler) subroutines are available. There are however a few differences:

1. A program may control multiple graphic devices but only one of these graphic devices may be a fully interactive device.
2. UGRATN Has a number of restrictions. First, a timed wait is not possible; if a positive value of TIME is given, it will act the same as a negative value. Second, interrupts are not queued; this means that a value of zero for TIME is useless and the options item LAST is ignored.

Using the Unified Graphics System under VM

The mini-disk containing the modules in the Unified Graphics System is made available by the statements:

```
CP LINK TO RCB 192 AS 292 RR
ACCESS 292 G
```

In these statements, the value "292" may be changed to any valid disk address that the user wants, and the value "G" is only a suggestion. This mini-disk must be made available when you create an executable load module and also when the load module is executed.

When you create a FORTRAN executable load module, you should make the text library UGFTNLIB available with a "GLOBAL TXTLIB" statement. When you create a PL/1 executable load module, you should make the text library UGPLOLIB available with a "GLOBAL TXTLIB" statement.

When you compile a PL/1 program, you may make the entry declarations available by including the macro library named UGPL1DCL in a "GLOBAL MACLIB" statement.

The Supported Graphic Devices

On the IBM 370 computers under VM, graphic devices are supported at three levels instead of the two levels under SVS. These three levels are:

1. Non-Interactive Devices: The pictures are written to a file and the file must later be transmitted to the graphic device.
2. Directly Writable Devices: The pictures are written

directly to the device but the interactive routines (UGEATN, UGDATN, UGRATN, UGKPUT, and UGKGET) are not supported. The user must program his own interactive control. This mode is not available under SVS.

3. Fully Interactive Devices: The pictures are written directly to the device and all of the interactive subroutines are available.

The following sections describe each of the devices that are currently supported.

SEQ4013: Non-Interactive use of the TEKTRONIX 4013

The pictures are written into a sequential file. The ability to write the pictures to a partitioned data set is not supplied because VM does not support PDS's in any reasonable manner.

The options items acceptable to subroutine UGOPEN and their default values are:

- SEQ4013: Selects the TEKTRONIX 4013 in the non-interactive mode.
- DDNAME=UGDEVICE: Selects the output file.
- PICTSQ=PICT and PICTID=1: Used to construct the picture names.
- BAUDRATE=2400: Selects the baud rate at which the terminal will be assumed to be running.
- FULSCR: Makes the full screen available for drawing pictures.

A FILEDEF command must be issued for the output file before your program is executed. A typical command is:

```
FILEDEF UGDEVICE DISK name type mode
(RECFM FB LRECL 80 BLKSIZE 800
```

Note: The above two lines represent a single command.

A program is available that enables a user to look at the pictures in the sequential file. The program is invoked by the command:

```
DTEKPICS
```

The program allows the user to select a file and then view the pictures in the file. When this program begins executing, it lists the instructions for its use at the terminal.

DWT4013: Directly Writable use of the TEKTRONIX 4013

The pictures are written directly to the TEKTRONIX but the subroutines for interactive control are not available.

The options items acceptable to subroutine UGOPEN and their default values are:

- DWT4013: Selects the TEKTRONIX 4013 in the Directly Writable mode.
- BAUDRATE=2400: Selects the baud rate at which the terminal

will be assumed to be running.
 FULSCR: Makes the full screen available for drawing pictures.

TEK4013: Fully Interactive use of the TEKTRONIX 4013

The pictures are written directly to the TEKTRONIX and the interactive control subroutines are available for use.

The options items acceptable to subroutine UGOPEN and their default values are:

TEK4013: Selects the TEKTRONIX 4013 in the Fully Interactive mode.
 BAUDRATE=2400: Selects the baud rate at which the terminal will be assumed to be running.
 FULSCR: Makes the full screen available for drawing pictures.

The KBRD and SPTR attentions will be recognized by subroutines UGEATN and UGDATN. The hardware does not allow both attentions to be enabled at once; if you do try to enable both at once, the effect is as if only SPTR was enabled. The option RDSPTR in subroutine UGCTRL may not be used.

VEP12FF or VEP12CR: The VERSATEC Electrostatic Printer/Plotter Model 1200 using Fan Fold or Continuous Roll Paper

The VERSATEC may be used in the internal sort mode only. There does not seem to be any reasonable way to use the external sort mode under VM.

The options items acceptable to subroutine UGOPEN and their default values are:

VEP12FF or VEP12CR: Selects the VERSATEC printer/plotter.
 DDNAME=UGDEVICE: Selects the output file.
 LINEMX=32: Defines the scan line concurrency in the controller.
 MAXNSA=4096: Defines the size of the blocks used to save the picture internally.
 GENIL: Generate intensity levels.
 FULSCR: Makes the full page available for drawing pictures.

The pictures are written to a pseudo-print file which must be sent to the Printer/Plotter at a later time. A FILEDEF command must be issued for the output file before your program is executed. A typical command is:

```
FILEDEF UGDEVICE DISK name type mode
(RECFM FBA LRECL 126 BLKSIZE 1260
```

Note: The above two lines represent a single command. The commands to send the data to the Printer/Plotter are:

```
CP SPOOL PRINT TO SVS NOCONT CLASS P
PRINT name type mode (CC
```

If you wish to have your output plotted on continuous roll paper, you must also enter another command. If you enter the command at the terminal, you may type:

```
CP TAG DEV PRINT FORMAT PR,DDNAME=,FORMS=ROLL
```

However, if you enter the command from an EXEC file, you must use:

```
PUNCHLIN *<OUTCP> CP* TAG* DEV* PRINT* FORMAT*
```

```
PR, DDNAME=, FORMS= ROLL
```

Note: The above two lines represent a single command.